CPS 9475/1 - Supporting Information - Clearing Assessment Report

Clearing Assessment Report

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Marble Bar Road Upgrades

October 2021

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Contents

Amendments

Report Compilation & Review	Name and Position	Document Revision	Date
Author:	Environment Officer	Draft v1	20/08/2021
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Reviewer:	Senior Environment Officer	Final	18/10/2021

1 PURPOSE

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.

2 SCOPE

2.1 Project Scope

Project Name: Marble Bar Rd upgrades

Project Purpose / Components: Road upgrades to this section of Marble Bar Road including sealing and a Nullagine bypass will allow hauling and improved safety.

The proposed clearing undertaking is: up to 500 ha within a development envelope of 13646 ha.

The proposed temporary clearing undertaking using CPS 818 is: none.

Project Location(s): The project area is located on Marble Bar Road, 97 - 179 SLK, Shire of East Pilbara as shown in Figure 1.

Start of proposal coordinate
120°4'8.613"E 21°35'41.8"S

End of proposal coordinate
120°1'16.314"E 22°29'38.909"S

The location of the proposed works is at Figure 1.

2.2 Assessment Report Scope

The study area, see Figure 1, is confined to a local area of a 40km radius. Further constraints mapping is located in Appendix B.

2.3 Alternatives to clearing

No feasible alternatives that don't involve clearing have been identified for the Proposal. To upgrade the road to a safe level clearing is required.

2.4 Measures to Avoid, Minimise, Reduce and Manage Project Clearing Impacts

The design and management measures implemented to avoid and minimise the clearing impacts by the project are provided in Table 1.

Requirement to widen corners but avoid moving utilities
Increasing road safety through improvement of sight lines
Existing alignment utilised as much as possible

Table 1. Measures undertaken to Avoid, Minimise, Reduce and Manage the Project Clearing Impacts

Design or Management Measure	Discussion and Justification
Steepen batter slopes	Due to the traffic volumes, vehicle type and posted speeds these batters cannot be changed significantly.
Installation of safety barriers	Safety barriers to be utilised however design has not progressed to that stage yet.
Alignment to one side of existing road	Not applicable as whole alignment needs upgrading
Alternative alignment to follow existing road (or) to preferentially locate within pasture or a degraded areas	Where possible existing alignment has been utilised
Installation of kerbing	Kerbing has been considered and implemented in the design where possible however large amounts of storm water makes kerbing limited in effectiveness.
Simplification of design to reduce number of lanes and/or complexity of intersections	Only necessary intersections at towns and mine sites are being constructed.
Preferential use of existing cleared areas for access tracks, construction storage and stockpiling	Temporary clearing will be avoided as the site office, materials storage areas, construction vehicles/machinery and access tracks will be located on previously disturbed or cleared areas.
Drainage modification	Drainage modelling will bring the surface hydrology back to closer to natural models due to to increase culvert installations.

2.5 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 (see Section 1.3), Main Roads has also had regard to the below instruments.

Other Legislation of relevance 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 (WA) (RIWI Act)
- Aboriginal Heritage Act 1972 (WA)
- Town Planning and Development Act 1928 (WA)

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 (DEC, December 2014)
- Procedure: Native vegetation clearing permits (DWER, October 2019)
- Environmental Offsets Guidelines (Government of Western Australia, August 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
- Approved Recovery Plans for threatened species
- EPBC Act Referral guidelines for the three threatened black cockatoo species
- Strategic advice - EPA

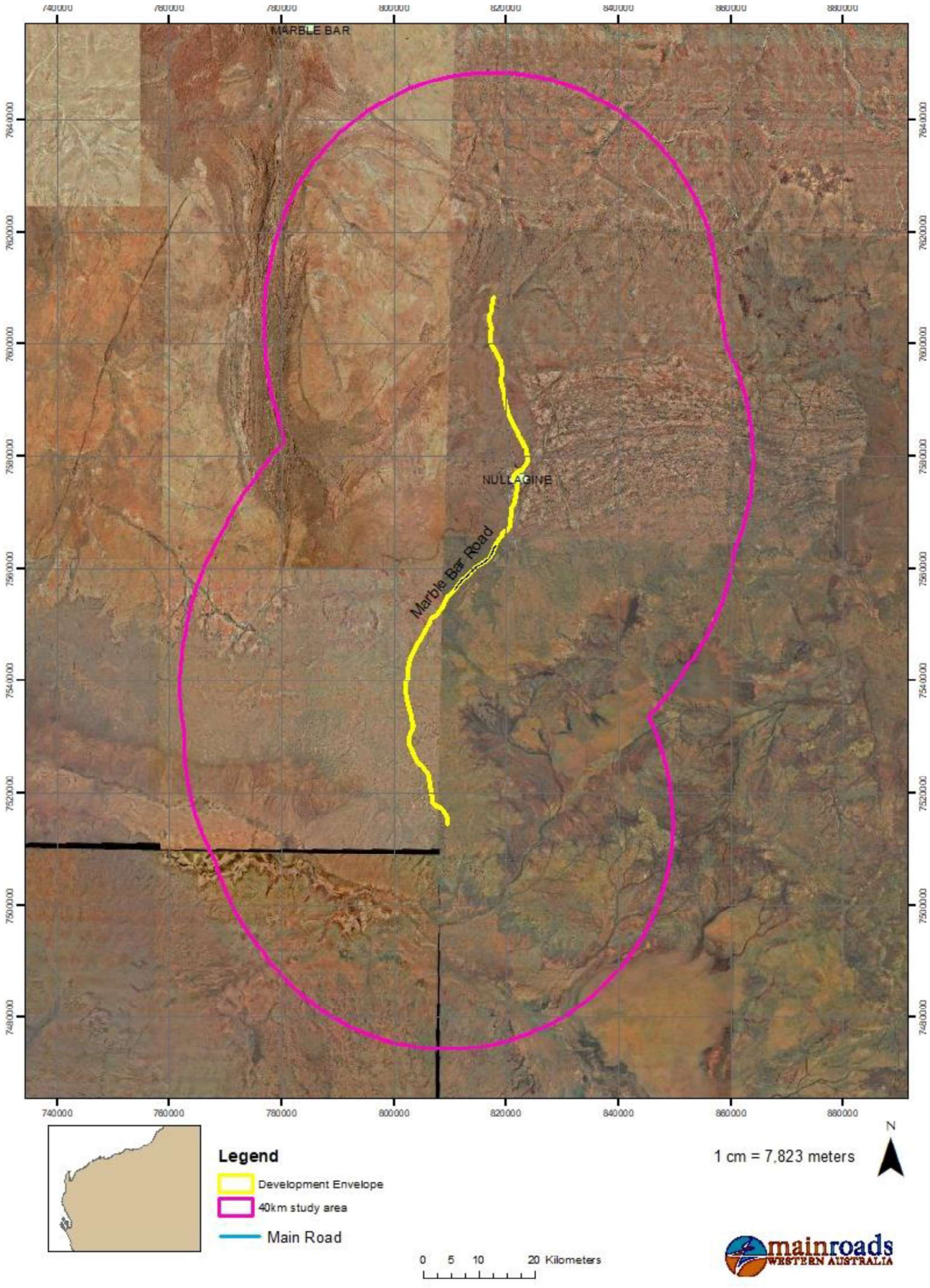

Figure 1. Development Envelope and Study Area

3 SUMMARY OF SURVEYS

The Marble Bar Road upgrades primary biological survey was conducted in March 2020 by Biota Environmental Sciences. A secondary targeted flora survey was conducted in April 2021 by Pilbara Environmental. An additional survey has been utilised which covers some portions of the proposed Nullagine bypass by WoodGIS conducted in April 2019.

3.1 Summary of Biological Survey (Biota)

The spatial scopes for the Biota biological survey comprised:

- the survey area (a 100 m wide corridor around Marble Bar Road SLK 97-179, plus a 5 km extension at the southern end, and the Nullagine Bypass around the townsite);
- a contextual area (a 500 m buffer around the survey area); and
- a study area (a 40 km buffer around the survey area).

A desktop flora and fauna assessment was undertaken for the study area, to identify key biological constraints. This was followed by a detailed and targeted flora and vegetation survey in the survey area, and a Level 1 and targeted fauna field survey in the survey area and contextual area. The surveys were undertaken in March 2020 and followed high rainfall in January.

Vegetation and Flora

Approximately 19% of the survey area comprised cleared ground. A total of 23 vegetation types were identified for the remainder of the survey area, broadly grouped into hills, saline / gravelly plains, cracking clays, drainage lines and Mulga vegetation. None of the units comprised Threatened Ecological Communities, however two vegetation types represent Priority Ecological Communities (PECs):

- Type P1 represents Priority 3 "Stony saline plains of the Mosquito land system" PEC.
- Type C1 appears to correspond to the Priority 1 "Cracking clays of the Chichester and Mungaroona Range" assemblage of the "Four plant assemblages of the Wona land system" PEC.

A total of 466 native vascular flora species from 166 genera and 55 families were recorded from the survey area, along with the alga Chara sp., and 25 weed species. No Threatened flora were recorded from the survey area, and none are expected to occur. Fourteen Priority flora species were recorded from the survey area, comprising:

- four Priority 1 species *Acacia aphanoclada*, *A. cyperophylla* var. *omearana*, *Atriplex spinulosa* (historical records only) and *Solanum* sp. Mosquito Creek (A.A. Mitchell et al. AAM 10795);
- three Priority 2 species: *Euphorbia inappendiculata* var. *inappendiculata*, *Ipomoea racemigera* and *Paspalidium retiglume*;
- six Priority 3 species: *Eragrostis crateriformis*, *Nicotiana umbratical*, *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479), *Rhagodia* sp. Hamersley (M. Trudgen 17794), *Swainsona thompsoniana* and *Themeda* sp. Hamersley Station (M.E. Trudgen 11431); and
- one Priority 4 species: *Goodenia nuda*.

It is considered that two other Priority 3 herbs may occur in the survey area: *Iotasperma sessilifolium* and *Rostellularia adscendens* var. *latifolia*.

Fauna

Database and literature searches identified a total of 338 vertebrate fauna species with the potential to occur in the study area, of which 33 are listed as significant. Prior to the field survey, 10 taxa were assessed as "likely to occur" within the survey area, with a further seven that "may occur".

The field survey recorded 15 fauna habitat types. During the field survey, a combined total of 134 species of vertebrate fauna were recorded within the survey area and contextual area, including nine terrestrial mammals, 13 bats, 78 birds, 30 reptiles and four amphibians. Two mammal taxa of significance, both of which were considered likely to occur prior to the field survey, were recorded from the survey area:

- Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia* Pilbara form; State and Federal: Vulnerable); and
- Western Pebble-mound Mouse (*Pseudomys chapmani*; State: Priority 4).

A track likely attributable to Northern Quoll (*Dasyurus hallucatus*; Endangered) was also recorded within the survey area, and a Ghost Bat *(Macroderma gigas*; Vulnerable) was observed in close proximity to the contextual area. Both of these species are considered likely to occur in the survey area, along with three Vulnerable species: Bilby (*Macrotis lagotis*), Pilbara Olive Python (*Liasis olivaceus barroni*) and Grey Falcon (*Falco hypoleucos*); the Migratory species Fork-tailed Swift (*Apus pacificus*); the Peregrine Falcon (*Falco peregrinus*), which is listed as Other Specially Protected Fauna; and the Priority 1 skink *Ctenotus nigrilineatus*.

3.2 Summary of Targeted Flora Survey (Pilbara Environmental)

Main Roads engaged Pilbara Environmental Pty Ltd (Pilbara Environmental) to conduct a targeted flora survey to further delineate significant flora within the proposed development envelope and surrounding areas. Pilbara Environmental botanist Nick Tidmarsh and consulting botanist Dr Shane Chalwell conducted a targeted flora survey from the 19th to the 27th of April 2021.

The targeted survey was undertaken to assess the presence, extent and abundance of Priority flora within the development envelope. A targeted search was also conducted outside the development envelope in order to assess proportional impacts of the project on Priority flora. The field survey was undertaken with reference to 'Flora and Vegetation Surveys for Environmental Impact Assessment' (EPA 2016a) and 'Environmental Factor Guideline: Flora and Vegetation' (EPA 2016b).

Due to the large size of the development envelope, it was not feasible to survey all suitable habitat for Priority flora within it. Rather, a habitat based approach was utilised to assess a subset of suitable habitats likely to contain Priority flora.

During the targeted survey ten of the fourteen target species were recorded, including nine species recorded during the Biota (2020) survey and one species (*Atriplex spinulosa*) that was not recorded in 2020 but was considered likely to occur. The species recorded during the targeted survey were:

- *Acacia aphanoclada* (P1)
- *Acacia cyperophylla* var. *omearana* (P1)
- *Atriplex spinulosa* (P1)
- *Euphorbia inappendiculata* var. *inappendiculata* (P2)
- *Ipomoea racemigera* (P2)
- *Nicotiana umbratica* (P3)
- *Dolichocarpa* sp. Hamersley Station (A.A. Mitchell PRP 1479) (P3)
- *Paspalidium retiglume* (P2)
- *Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)

Four of the target species previously recorded during the Biota (2020) survey were not recorded during the targeted survey however are still considered likely to occur, these were:

- *Eragrostis crateriformis* (P3)
- *Goodenia nuda* (P4)
- *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3)
- *Swainsona thompsoniana* (P3)

3.3 Summary of Additional Survey (Woodgis)

An additional flora and vegetation survey was utilised which was commissioned by Novo Resources. The survey focused on the Beatons Creek area of interest covering approximately 1,532 ha adjacent to the Nullagine townsite in the Shire of East Pilbara, and included the 356 ha Haul Road Area survey by Woodgis in 2018/2019.

A total of 8 vegetation types were defined in terms of the presence/absence of perennial species, and 25 vegetation subtypes identified on the basis of differences in cover/dominance of species and/or distinct landscape/landform position. The vegetation units strongly reflect the landform patterns, and land systems, which were floristically distinct.

The Area of Interest does not support high species diversity, it is not located in an area listed for high species and ecosystem diversity, and the vegetation formations (site types) present typically support low to moderate diversity.

4 VEGETATION DETAILS

4.1 Project Site Vegetation Description

Up to 500 ha of native vegetation within 755 ha development envelope is proposed to be cleared. The breakdown of vegetation types within the development envelope and surrounding areas based surveys by Biota (2021) and Woodgis (2020) is provided in Table 2.

None of the vegetation types recorded are equivalent to any listed TECs. Vegetation types associated with the two PECs are noted in Table 2.

For full vegetation descriptions please refer to the biological survey.

Table 2. Summary of Vegetation within Development Envelope and Surrounds

Vegetation Unit	Survey and Contextual Areas Combined		Development Envelope		
	ha	% of total survey and contextual areas	ha	% of Development Envelope	% of mapped extent in survey and contextual area
Vegetation of Hills					
H1	935.65	6.86%	27.86	3.69%	2.98%
H2	1364.25	10.00%	49.96	6.62%	3.66%
H3	279.71	2.05%	48.44	6.42%	17.32%
H4	534.83	3.92%	24.1	3.19%	4.51%
H5	774.01	5.67%	21.03	2.79%	2.72%
H6	3228.66	23.66%	145.13	19.23%	4.50%
H7	1295.69	9.49%	20.11	2.66%	1.55%
H8	496.91	3.64%	36.29	4.81%	7.30%
5c	2.36	0.02%	1.62	0.21%	68.64%
6a	5.9	0.04%	3.15	0.42%	53.39%
6b	0.59	0.00%	0.58	0.08%	98.31%
7a	0.35	0.00%	0	0.00%	0.00%
7b	0.08	0.00%	0.08	0.01%	100.00%
8a/b/c	2.64	0.02%	0	0.00%	0.00%
8g	3.9	0.03%	2.64	0.35%	67.69%
Subtotal	**8925.53**	**65.41%**	**380.99**	**50.48%**	**4.27%**
Vegetation of Saline and Gravelly Plains					
P1 (PEC Priority 3)	605.97	4.44%	100.18	13.27%	16.53%
P2	988.33	7.24%	72.47	9.60%	7.33%
P3	365.91	2.68%	11.64	1.54%	3.18%
P4	293.01	2.15%	40.05	5.31%	13.67%
P5	34.65	0.25%	6.23	0.83%	17.98%
2d	0.01	0.00%	0	0.00%	0.00%
2c	31.09	0.23%	11.41	1.51%	36.70%
4a (PEC Priority 3)	32.32	0.24%	12.97	1.72%	40.13%

Vegetation Unit	Survey and Contextual Areas Combined		Development Envelope		
	ha	% of total survey and contextual areas	ha	% of Development Envelope	% of mapped extent in survey and contextual area
5a	1.19	0.01%	0	0.00%	0.00%
5b	0.43	0.00%	0	0.00%	0.00%
Subtotal	**2352.91**	**17.24%**	**254.95**	**33.78%**	**10.84%**
Vegetation of Cracking Clays					
C1 (PEC Priority 1)	**256.37**	**1.88%**	**12.83**	**1.70%**	**5.00%**
Mulga Vegetation					
M1	**70.7**	**0.52%**	**3.16**	**0.42%**	**4.47%**
Vegetation of Drainage Lines					
D1	311.43	2.28%	5.94	0.79%	1.91%
D2	47.9	0.35%	2.16	0.29%	4.51%
D3	74.39	0.55%	4.66	0.62%	6.26%
D4	591.26	4.33%	32.63	4.32%	5.52%
D5	63.18	0.46%	11.32	1.50%	17.92%
D6	129.54	0.95%	1.71	0.23%	1.32%
D7	11.15	0.08%	0.67	0.09%	6.01%
D8	62.99	0.46%	2.82	0.37%	4.48%
1a	5.59	0.04%	2.08	0.28%	37.21%
2e	3.03	0.02%	0.01	0.00%	0.33%
1b	0.16	0.00%	0	0.00%	0.00%
2a	8.46	0.06%	6.18	0.82%	73.05%
2b	16.23	0.12%	14.63	1.94%	90.14%
4b	2.27	0.02%	1.35	0.18%	59.47%
Subtotal	**1327.58**	**9.73%**	**86.16**	**11.42%**	**6.49%**
Other					
Dam	0.35	0.00%	0	0.00%	0.00%
NA (cleared/developed)	701.94	5.14%	5.93	0.79%	0.84%
Unmapped	10.74	0.08%	10.73	1.42%	99.91%
Subtotal	**713.03**	**5.23%**	**16.66**	**2.21%**	**2.34%**
Overall Total	**13646.12**	**100.00%**	**754.75**	**100.00%**	

Table 3: Vegetation condition within the total surveyed areas and development envelope

Vegetation Condition	Survey and Contextual Areas Combined		Development Envelope	
	ha	% of Total survey and contextual areas	ha	% of Development Envelope
N/A	19.17	0.13%	5.93	0.79%
Excellent	4816.25	32.54%	110.8	14.78%
Excellent to Very Good	5003.53	33.81%	308.61	41.15%
Very Good	2626.66	17.75%	193.75	25.84%
Good	380.15	2.57%	42.48	5.66%
Good to Poor	109.96	0.74%	5.29	0.71%
Poor	715.07	4.83%	29.28	3.90%
Very Poor	237.05	1.60%	6.65	0.89%
Completely Degraded	131.07	0.89%	16.86	2.25%
Degraded	51.39	0.35%	24.1	3.21%
NA	701.77	4.74%	5.93	0.79%
Unmapped	0	0.00%	4.84	0.65%
Very Poor to Very Good	8.93	0.06%	0.22	0.03%
Total	14801		754.74	

Table 4: Summary of Development Envelope's Mapped Pre-European Vegetation Associations

Pre-European Vegetation Association(s)	Clearing Description	Vegetation Condition	Comments
Vegetation Association 173 described as shrub steppe of Kanji (*Acacia inaequilatera*) over soft spinifex and *Triodia wiseana* hummock grasslands on basalt (Government of Western Australia, 2019)	Clearing of up to 500 ha.	Excellent – Very Poor	Vegetation description and condition determined from Biota biological survey in March 2020.
Vegetation Association 93 described as hummock grasslands, shrub steppe; kanji over soft spinifex.			
Vegetation Association 190 described as hummock grasslands, sparse shrub steppe; *Acacia bivenosa* & *A. trachycarpa* over hard spinifex, *Triodia wiseana*, Very poor rocky country on gneiss			

Table 4. Pre-European Vegetation Representation

Pre-European Vegetation Association	Scale	Pre–European (ha)	Current Extent (ha)	% Remaining	% Remaining in DBCA reserves
Veg Assoc No. 93	**Statewide**	3,044,309.52	3,040,640.98	99.88	1.96
	IBRA Bioregion Pilbara	3,042,114.27	3,038,471.67	99.88	1.96
	IBRA Sub-region PIL 1 Chichester	2,940,348.04	2,936,731.54	99.88	2.02
	Local Government Authority Shire of East Pilbara	11,445.97	11,333.54	99.02	19.15
Veg Assoc No. 173	**Statewide**	1,753,104.09	1,748,260.83	99.72	13.62
	IBRA Bioregion Pilbara	1,752,520.89	1,747,677.63	99.72	13.62
	IBRA Sub-region PIL 1 Chichester	1,744,029.51	1,739,189.58	99.72	13.69
	Local Government Authority Shire of East Pilbara	1,085,704.89	1,081,937.46	99.65	9.90
Veg Assoc No. 190	**Statewide**	169,199.72	169,051.00	99.91	No data
	IBRA Bioregion Pilbara	169,199.72	169,051.00	99.91	No data
	IBRA Sub-region PIL 1 Chichester	169,199.72	169,051.00	99.91	No data
	Local Government Authority Shire of East Pilbara	169,199.72	169,051.00	99.91	No data

5 ASSESSMENT AGAINST THE TEN CLEARING PRINCIPLES

In assessing whether the project's proposed clearing is likely to have a significant impact on the environment, the project was assessed against the ten Clearing Principles (*Environmental Protection Act 1986*, Schedule 5).

Each principle has been assessed in accordance with DWER's 'A Guide to the Assessment of Applications to Clear Native Vegetation' and other relevant CPS Decision Reports prepared by DWER.

The proposed clearing is at variance to principle f and not likely to be at variance with the other Clearing Principles.

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

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

The proposal falls within the Pilbara bioregion 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 of up to 500 ha of native vegetation within the development envelope of 755ha, ranging in condition between Excellent and Very Poor with approximately 82 of the development envelope being within the range of Excellent to Very Good (Biota 2021, WoodGIS, 2020).

36 different vegetation types were recorded through the development envelope (Biota 2021, WoodGIS 2020):

- Vegetation of Hills – Vegetation types H1, H2, H3, H4, H5, H6, H7, H8, 5c, 6a, 6b, 7a, 8a/b/c, 8g (50.48%)
- Vegetation of Saline and Gravelly Plains - Vegetation types P1, P2, P3, P4, P5, 2c, 2d 2e, 4a, 5a, 5b, 6a, 6b (33.78%)
- Vegetation of Cracking Clays – Vegetation type C1 (1.70%)
- Mulga Vegetation – Vegetation type M1 (0.42%)
- Vegetation of Drainage Lines - Vegetation types D1, D2, D3, D4, D5, D6, D7, D8 1a, 1b, 2e, 2a, 2b, 4b (11.42%)

All of the vegetation types were recorded both within the development envelope and the surrounding areas. Further breakdown of the vegetation types within the development envelope and the surrounds is provided in Table 2.

The most common vegetation type found within the development envelope is H6 with 145.13 ha taking up 19.23 % of the development envelope. This vegetation type is described as *Acacia inaequilatera* scattered tall shrubs to tall open shrubland over *Triodia epactia* hummock grassland. This vegetation type occurred through the northern half of the survey area on low hills with a substrate of basalt boulders, and occurred elsewhere on stony hills through all but the southernmost 10 km of the survey area. This vegetation type does not represent a PEC or TEC and is common and widespread throughout the region with more than 911 ha mapped within the survey and contextual areas as per the Biota biological survey (Biota 2021).

Two PECs were recorded within the development envelope (Biota 2021). The "Stony saline plains of the Mosquito land system" PEC (Priority 3) is described by DBCA as "*Triodia longiceps* perennial grasslands with scattered *Maireana melanocoma* and *Sclerolaena* spp. and includes the Priority 1 flora taxa *Atriplex spinulosa* and *Ptilotus wilsonii* dissected by drainage lines. Dominated by (but not limited to) *Melaleuca eleuterostachya* and *Acacia bivenosa* occurring on saline red brown non-cracking clays with a mantle of quartz gravel and neutral subsurface soil material on level to undulating plains. Largely restricted to an

area east of Nullagine." Threatening factors for this community are listed as "preferential grazing (livestock and feral herbivores), clearing for mining and associated activity" (DBCA 2020, Biota 2021).

Vegetation types P1 and 4a are equivalent to this PEC, and were recorded mainly in association with the Mosquito land system around Nullagine. A total of 113.15 ha of this PEC was mapped within the development envelope, which represented 14.99% of the total development envelope and 17.73% of the extent of the PEC mapped within the combined biological surveys (Biota 2021, WoodGIS 2020). The PEC is known to cover an extensive area to the east of the development envelope with only approximately 0.2% of the known extent falling within the development envelope (Biota 2021, WoodGIS 2020).

The second PEC found within the development envelope is called "Four plant assemblages of the Wona land system" PEC and includes four distinct communities. One of these, the "Cracking clays of the Chichester and Mungaroona Range" (Priority 1) assemblage, appears to correspond to the grassland/herbland areas of vegetation type C1 mapped in the survey area (Biota 2021). DBCA (2020) describes this assemblage as follows: "This shrubless plain of stony gibber community occurs on the tablelands with very little vegetative cover during the dry season, however during the wet a suite of ephemerals/annuals and short-lived perennials emerge, many of which are poorly known and range-end taxa". Vegetation type C1 was mapped over 256.37 ha in the central section of the survey area (Biota 2021). Only 12.83 ha are within the development envelope which makes up 1.70% of the development envelope and 5.00% of the mapped extent of the PEC in the Biota (2021) survey and contextual areas.

Given the clearing will be predominately confined to a linear strip of vegetation either side of the existing Marble Bar Road, and extensive areas of all vegetation types, including the two PECs, have been mapped in the local area outside the development envelope, the proposed clearing is not likely to have a significant impact on any of the vegetation types.

No other Threatened or Priority ecological communities have been recorded in the proposal or are considered likely to occur (Biota 2021).

Database searches (WA Herbarium, DBCA Threatened and Priority Flora list, NatureMap and EPBC Protected Matters) returned 33 Priority species from the 40km buffer from the survey area. As EPBC protected matters search is included, the results include both species that have been recorded or are considered to have potential to occur (Biota 2021). A total of 466 native vascular flora species from 166 genera and 55 families were recorded from the survey area (Biota 2021), including 14 Priority species but no Threatened flora.

Priority 1 *Acacia aphanoclada* is a tall spindly shrub that has a relatively restricted distribution, with known records distributed over a range of 66 km east-west and 40 km north-south being centred in the Mosquito Land System in the vicinity of Nullagine (Biota, 2021). Through the combined survey efforts (Biota 2021, Pilbara Environmental 2021, Woodgis 2020) a total of more than 10,000 plants have been recorded in vegetation types D1, D5, H2, H3, H4, H5, H6, H8, P1, P4, 5a, 5b and 7a. Further surveys mentioned in CPS 7595 (MML 2017, Waters 2017) recorded over 16,000 individuals approximately 10 km south of Nullagine. These results support statements by Woodgis (2020) and others that the species is widespread and abundant within the Mosquito Land System. Assuming suitable habitat is limited to the above mentioned vegetation types, only 6.07% of suitable habitat mapped by Biota (2021) falls within the development envelope. Extensive suitable habitat is also known to be present outside the available vegetation mapping areas and the species would be expected to occur at similar densities in the surrounding areas (Pilbara Environmental 2021). In Waters (2017) the number of *Acacia aphanoclada* individuals on the Mosquito Land System was estimated to be 1,362,088. Only a small proportion, less than 0.2%, of the known Mosquito Land System falls with the development envelope. Overall the project is not expected to have significant impact on *Acacia aphanoclada*.

A single individual of Priority 1 *Acacia cyperophylla* var. *omearana* was recorded in vegetation type D1 from the southern bank of the Nullagine River (Biota 2021, Pilbara Environmental 2021, Woodgis 2020). This plant will not be cleared as it is located outside the development envelope. Based on the specific habitat

requirements of this species and the targeted survey effort applied it is considered unlikely any further individuals exist within the development envelope (Pilbara Environmental 2021).

Priority 1 *Solanum* sp. Mosquito Creek (A.A. Mitchell et al. AAM 10795) was recorded within vegetation types P1, P2 and H8 (Biota 2021, Pilbara environmental 2021) and 2c, 2d and 2e (Woodgis 2020). Only 10.37% of the mapped extent of these vegetation types (Biota 2021, Woodgis 2020) falls within the development envelope. Also, as P1 and 4a represent the Stony saline plains of the Mosquito land system PEC (Priority 3), the impact on potentially suitable habitat of the species in the wider landscape is expected to be less than 0.2%. It is noted that WoodGIS (2019) described densities of the species being considerably higher in recently burnt areas (6,533 plants per ha), compared to unburnt sites (up to 156 plants per ha) around Nullagine and a similar trend was observed by Pilbara Environmental (2021). Based on the extensive areas of suitable habitat available and the abundance of the species following fire, it is unlikely the proposed linear clearing will have a significant impact to the local population.

Priority 1 *Atriplex spinulosa* was recorded in the survey area restricted to stony saline plains (P1, 4a, 4b) (Biota 2021, Pilbara Environmental 2021, Woodgis 2020). As noted earlier, only 0.2% of the stony saline plains of the Mosquito land system falls within DE. Considering this and that WoodGIS (2020) reported densities of 444 plants/ha and 1,667 plants/ha in suitable habit, it is unlikely the project will significantly impact the local population.

Priority 2 *Euphorbia inappendiculata* var. *inappendiculata*, a small annual herb was recorded in cracking clay (mostly vegetation type C1) (Biota 2021, Pilbara Environmental 2021), which is the known preferred habitat of this species. Only 5% of the mapped extend of this vegetation type (Biota 2021) falls within the development envelope. Further, of the 142 individuals were found in the survey efforts (Biota 2021, Pilbara Environmental 2021) only one individual is located with the development envelope. Clearing of this individual will not have a significant impact on the local population of this species.

Priority 2 *Ipomoea racemigera,* an annual creeper was recorded from creeklines (vegetation types D1, D2 and D4), which comprise the preferred habitat of this species (Biota 2021, Pilbara Environmental 2021). In WA, *Ipomoea racemigera* is distributed over a range of 360 km across the Pilbara. 39 individuals were recorded as part of the combined survey effort with 9 within the development envelope. Only 4.28% of the mapped extent of D1, D2 and D4 (Biota 2021) falls within the development envelope. Due to the linear nature of the project, the proportion of drainage line and attendant floodplain habitat within the development envelope is minimal in proportion to the extent of habitats associated with drainage lines across the study area and hence it would be unlikely the project will have a significant impact on this species.

Priority 2 *Paspalidium retiglume* was found within the broader survey area however these records are not within the current development envelope (Biota 2021, Pilbara Environmental 2021). This species was recorded within cracking clay habitat (C1) and only 5% of the mapped extent of C1 falls within the development envelope (Biota 2021). Further, there is a relative abundance of cracking clay outside the development envelope, that is highly likely to provide suitable habitat for this species (Pilbara Environmental 2021). Impacts on the species are not expected to be significant.

Six Priority 3 species were found within the biological survey *Eragrostis crateriformis*, *Nicotiana umbratica*, *Oldenlandia* sp. Hamersley, Station (A.A. Mitchell PRP 1479), *Rhagodia* sp. Hamersley (M. Trudgen 17794), *Swainsona thompsoniana* and *Themeda* sp. Hamersley Station (M.E. Trudgen 11431); however impacts to the these species will not be significant with less than 10% of suitable habitat within the mapped vegetation extent within DE (Biota 2021) and further suitable habitat available outside the mapped vegetation areas.

One Priority 4 species, *Goodenia nuda* was found within the Biota survey. This slender annual herb was recorded as scattered individuals from three quadrats located in creeklines or in low-lying areas on plains (vegetation types D5, P1 and P4), spread from 3.2 km north to 35.9 km south of Nullagine. This species has a broad distribution over 900 km east-west and 720 km north-south. No individuals of the species were found in the development envelope and proposed clearing of suitable habitat is not significant in the local context with vast areas of suitable habitat remaining.

Priority 3 *Iotasperma sessilifolium* was assessed as maybe occurring within the survey area prior to the surveys taking place. This small annual daisy is restricted to clay substrates. The vegetation type C1 would be potentially suitable for this species, although the closest record to these is approximately 18 km southwest. This daisy typically germinates and flowers later in the year (i.e. (May)August-September), so would not have been visible during the field surveys, if present. Even if the species was present, no significant impacts on the species are expected, as only 5% of the mapped extent of C1 (Biota 2021) falls within the development envelope.

Priority 3 *Rostellularia adscendens* var. *latifolia* may occur in the development envelope. This species is known from one record in the locality and has broad habitat preferences (stony plains, hills, creeklines etc). While it was not recorded on either field survey, it is an inconspicuous herb, and there is an abundance of suitable habitat.

A Level 1 fauna assessment of Marble Bar Road study area, recorded a total of 134 species of vertebrate fauna, consisting of 78 birds, 22 mammals, 30 reptiles and 4 amphibian (Biota, 2021), including following significant fauna species.

There is suitable foraging habitat for several significant native fauna species within the development envelope including Pilbara Leaf-nosed Bat and Western Quoll. However, there was no evidence of any breeding/ denning habitat for any significant species. Vegetation within the development envelope is potentially suitable for foraging by these species however is considered not to be critical as it does not represent denning/ breeding habitat as discussed in principle (b).

Overall, while the development envelope includes two PECs and several priority flora species, the vegetation and habitat types available have been shown to extend outside the development envelope and are locally common in the region where more than 99% of pre-European vegetation extent remains. Therefore the development envelope largely along an existing road is highly unlikely to have greater biodiversity than other undisturbed areas in the locality. Further, only a small linear section will be removed at any one location.

Based on the above, the proposed clearing not likely to be at variance to this principle.

Methodology
DBCA shapefiles
DBCA (2020)
EPBC Act PMST (DAWE 2021)
Florabase (WAH 2021)
Main Roads GIS Shapefiles
NatureMap (DBCA 2021)
Biota (2021)
Woodgis (2020)
Pilbara Environmental (2021)

(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

15 fauna habitats were recorded within the Biota survey and contextual area in 2020 (Biota, 2021) as shown in table below.

Biota noted degraded grassland as providing very little habitat value to fauna other than introduced predators and herbivores. The most common habitat type found within the development envelope is Hills and mesas with approximately 35 % of the development envelope.

Habitat Types	**Survey and Contextual Areas**		**Development Envelope**	
	Ha in combined surveyed area	% combined surveyed area	Ha in development envelope	% of development envelope
Hills and Mesas				
HS: Low rolling stony hills	5176.38	39.04%	212.75	28.19%
MB: Mesa breakaways and scree slopes	154.62	1.17%	1.74	0.23%
HB: Volcanic boulder hills and outcrops	1331.42	10.04%	52.93	7.01%
Subtotal	**6662.42**	**50.25%**	**267.42**	**35.43%**
Plains				
GSP: Gravelly spinifex plains	605.78	4.57%	98.67	13.07%
OS: Open shrubland/woodland on spinifex plains	3735.95	28.17%	226.81	30.05%
CCP: Cracking clay plains	256.38	1.93%	12.83	1.70%
GP: Grassland plains	203.35	1.53%	9.02	1.20%
MW: Mulga woodland plains and knolls	58.76	0.44%	3.16	0.42%
Subtotal	**4860.22**	**36.64%**	**350.49**	**46.44%**
Drainage Lines and Waterholes				
MDL: Major drainage lines and associated tributaries	998.05	7.53%	43.30	5.74%
RTG: Rocky tributaries and gullies	29.54	0.22%	1.97	0.26%
PW: Permanent waterholes	0.25	0.0019%	0	0.00%
MFL: Minor flowlines	199.26	1.50%	13.48	1.79%
Subtotal	**1227.1**	**9.25%**	**58.75**	**7.79%**
Artificial / Degraded Habitats				
NR: Nullagine reservoir	5.02	0.04%	0.10	0.01%
NA	699.34	5.27%	5.79	0.77%
DG: Degraded grassland	62.96	0.47%	2.29	0.30%
Subtotal	**767.32**	**5.78%**	**8.19**	**1.08%**
TOTAL	**13517.06**		**684.85**	
Unmapped fauna habitat			**69.9**	

A desktop search identified sixteen significant fauna species with known records in the study area (40 km radius):

- Northern Quoll, *Dasyurus hallucatus* (State and Federal: Endangered)
- Bilby, *Macrotis lagotis* (State and Federal: Vulnerable);
- Night Parrot, *Pezoporus occidentalis* (State Critically Endangered; Federal Endangered);
- Pilbara Olive Python, *Liasis olivaceus barroni* (State and Federal: Vulnerable);
- Ghost Bat, *Macroderma gigas* (State and Federal: Vulnerable);
- Pilbara Leaf-nosed Bat, *Rhinonicteris aurantia* (State and Federal: Vulnerable);
- Grey Falcon, *Falco hypoleucos* (State and Federal: Vulnerable);
- Fork-tailed Swift, *Apus pacificus* (State and Federal: Migratory);
- Peregrine Falcon, *Falco peregrinus* (State: Other Specially Protected Fauna);
- *Ctenotus nigrilineatus* (State: Priority 1);
- *Anilios ganei* (State: Priority 1);
- Western Pebble-mound Mouse, *Pseudomys chapmani* (State: Priority 4);
- Long-tailed Dunnart, *Sminthopsis longicaudatus* (State: Priority 4);
- Spectacled Hare-wallaby, *Lagorchestes conspicillatus leichardti* (State: Priority 4);

- Short-tailed Mouse, *Leggadina lakedownensis* (State: Priority 4); and
- Brush-tailed Mulgara, *Dasycercus blythi* (State: Priority 4).

Biota (2021) recorded two species of significance with certainty from the survey area; the Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia* Pilbara form), and Western Pebble-mound Mouse (*Pseudomys chapmani*). Two records of the Pilbara Leaf-nosed Bat and one recordded of the Western Pebble-mound Mouse were situated within the Development envelope. A track likely attributable to Northern Quoll (*Dasyurus hallucatus*) was also recorded from the survey area however outside the Development area. An additional five mammal taxa of significance were assessed as "likely to occur" or "may occur" within the survey area.

The Pilbara Leaf-nosed Bat is semi-desert adapted and has specific roosting requirements, requiring roost sites in caves or mine adits with stable, very hot (28 – 32ºC) and very humid (96 – 100%) microclimates (Biota 2021). Caves deep enough to create this environment are relatively uncommon in the Pilbara (Biota 2021), which limits the availability of diurnal roosts for this species. Observed foraging habitat includes *Triodia* hummock grassland, sparse tree and shrub savannah and riparian vegetation along drainage lines (Biota 2021).

Pilbara Leaf-nosed Bat calls were detected on ultrasonic ARUs at two sites in the survey area (Biota, 2021). These areas included a drainage line and a hill outcrop. No suitable roosting or denning habitat for the species is available in the development envelope or the wider survey area (Biota 2021). The Pilbara Leaf-nosed Bat has a broad range of locally abundant foraging habitat. The species is mobile in nature only a small amount of the foraging habitat in a local context is proposed to be cleared. Therefore, the project is not likely to have a significant impact on the species (Biota, 2021).

The Western Pebble-mound Mouse is listed as a Priority 4 species by the DBCA. Previously described as endemic to the central and eastern parts of the Pilbara, it is now known to occur much more widely across the entire Pilbara region and into the Gascoyne, where it is commonly found on stony hillsides with hummock grasslands (Biota, 2021). This habitat is locally abundant (Biota 2021). Therefore and considering linear nature of the proposed clearing adjacent to an existing road, the proposal will not have a significant impact on critical habitat for this species (Biota, 2021).

The Northern Quoll is most abundant in open, rocky habitat and commonly utilises gorges, breakaways and hills, particularly for denning purposes, but also occurs near creek lines and drainage lines, where adjacent plains and vegetated areas provide habitats for foraging and dispersal of young (Biota, 2021). A single track exhibiting a size and gait consistent with Northern Quoll was found in the sandy bed of a major drainage line in the northern end of the survey area (location 51J 196177mN, 7607146mE). There is considerable good quality habitat for the species in the survey area and contextual area, particularly along major drainage lines and surrounding rocky areas, and the species has previously been recorded in close proximity to the development envelope. The project is not proposing to clear any Quoll denning habitat and will not isolate any access to denning habitat as the foraging habitat is abundantly widespread locally and in good condition. The proposed clearing is not likely to cause significant impact to the Quoll local population (Biota, 2021).

Extant populations of Bilby occur in a variety of habitats, usually on landforms of low topographic relief and light to medium soils. In the Pilbara, the species prefers areas suitable for burrowing where the substrate comprises sand, soil, sandy clay or sandy gravel, though it is also known from atypical stony gravelly areas (Biota, 2021). During the survey, no primary or secondary evidence of Bilby was recorded, despite extensive search effort. The majority of the survey area, including the development envelope is characterised by relatively hard and stony substrates that are less suitable for Bilby, though as noted above, they have been known to occur in such areas on occasion however these areas would not be considered significant habitat in the local context (Biota, 2021).

The present distribution of the Brush-tailed Mulgara, as shown from recent surveys and specimens lodged with the WA Museum, is widespread, including the Gascoyne, Murchison, Pilbara and some deserts in WA.

The Brush-tailed Mulgara was not recorded from the survey area or contextual area during the survey. Substrates across the majority of the survey area were relatively hard and stony, and therefore not optimal habitat for Brush-tailed Mulgara. Areas of more suitable habitat generally occurred along the margins of drainage lines, however these were usually degraded by cattle (Biota, 2021).

The Spectacled Hare-wallaby was not recorded from the survey area or contextual area during the survey, and has not previously been recorded in close proximity. The species reportedly prefers sandy substrates, which are relatively sparse in the area, but is known from the broader locality in the vicinity of Roy Hill, so it may occur in the survey area however the habitat proposed to be cleared would not be classed as significant for the Spectacled haired wallaby (Biota, 2021).

The Long-tailed Dunnart was not recorded from the survey area or contextual area during the survey, and has not previously been recorded in close proximity. However, it is known from the broader locality, and suitable rocky habitat is present within the survey area and contextual area, so it may occur. Research has shown that the species is relatively common and widespread but is restricted to a specific habitat. Clearing for the proposed project is unlikely to be significant to The Long-tailed Dunnart. (Biota, 2021)

The Short-tailed Mouse was not recorded from the survey area or contextual area during the survey. A small area of suitable cracking clay habitat was identified in the southern part of the survey area, but substrates in the majority of the survey area and contextual area are stony and less suitable. The species has not been previously recorded in close proximity to the survey area, but is known from the broader locality. As only a small portion of suitable habitat in the local area is proposed to be cleared, the proposal is unlikely have a significant impact on The Short-tailed Mouse (Biota, 2021).

A total of 78 bird species were recorded from the survey area and contextual area during the survey. No bird taxa of significance were recorded during the survey, however five significant taxa (Grey Falcon, Fork-tailed Swift, Peregrine Falcon, Night Parrot and Oriental Plover) were assessed as likely to occur or may occur within the survey area. The Grey Falcon, Fork-tailed Swift, Peregrine Falcon and Oriental Plover are mobile and there is abundant local habitat in pristine condition adjacent to the development envelope. Therefore, it is unlikely the project would have a significant impact on these species (Biota, 2021).

The Night Parrot was not recorded during the survey. Some small areas of suitable old-growth spinifex roosting habitat which is their recognised preferred habitat were identified within the survey area and contextual area, but these were small and relatively isolated area, and no calls were detected on ARUs deployed at these sites. Night Parrots appear to call reliably from their roosts every evening and recording conditions during the survey were good, so it is unlikely that the species was using these areas as roost sites (Biota, 2021).

Overall, all of the habitat types within the development envelope are well represented in the surrounding areas. While the proposal area may provide some habitat value for fauna, including for significant species, given the linear nature of the clearing and extent of native vegetation adjacent to the development envelope, the proposed clearing is not likely to form significant habitat for fauna.

Based on the above, the proposed clearing is not likely to be at variance to this principle.

Methodology

DBCA Shapefiles
EPBC Act PMST (DAWE 2021)
Biota (2021)
NatureMap (DBCA 2021)
WoodGIS (2019)

(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
A desktop search determined that no species listed as Threatened flora under State legislation have been recorded in within 40 km of the development envelope to date. Biota (2021) likelihood of occurrence assessment determined that no Threatened flora are expected to occur within the survey area (and therefore not within the development envelope). Field surveys (Biota 2021, WoodGIS 2020, Pilbara Environmental 2021) including targeted flora survey components have not found any Threatened flora occurring in the development envelope. Based on the above, the proposed clearing is not at variance to this principle.
Methodology DBCA shapefiles Florabase (WAH 2021) Biota (2021) Pilbara Environmental (2021) WoodGIS (2019)

(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
Comment According to available databases, no TECs listed under the BC Act are known to occur within the development envelope (GIS Database). None of the vegetation types recorded in the development envelope represent a state listed TEC (Biota, 2020). Based on the above, the proposed clearing is not at variance to this Principle.
Methodology DBCA shapefiles Biota (2021) WoodGIS (2019)

(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 development envelope falls within the Pilbara Bioregion of the Interim Biogeographic Regionalisation for Australia (IBRA). Approximately 99.6% of pre-European vegetation extent still remains in this bioregion (Government of Western Australia, 2018). The development envelope is broadly mapped as Beard vegetation associations 173, 190 and 93. Approximately 99% of the pre-European extent of these vegetation associations remain uncleared at all scales (Government of Western Australia, 2019) as shown in Table 3 earlier. Therefore, the development envelope does not represent a significant remnant of native vegetation in an area that has been extensively cleared. Based on the above, the proposed clearing is not at variance to this Principle.
Methodology Pre-European vegetation (Beard 1975) Government of Western Australia (2019) Biota (2021)

(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 at variance to this Principle

The project traverses through several designated watercourses and adjacent floodplains. These watercourses are only expected to flow following significant rainfall events. Approximately 86.16 ha of vegetation within the development envelope is growing in association with a watercourse and has been mapped as riparian (D1, D2, D3, D4, D5, D6, D7, D8, 1a, 2e, 1b, 2a, 2b,4b) (Biota 2021, WoodGIS 2020). The area proposed to be cleared predominantly follows the existing road allignment that already crosses the watercourses. Removal of vegetation has potential to result in an increase in runoff and may increase sediment loads in surface water flows, however the impacts on any watercourses are likely to be minimal as the clearing is linear in nature and Main Roads standard environmental management measures will be implemented. Existing hydrology will be maintained through installation of culverts and roadside drainage.

There are no wetlands in the vicinity of the proposal area.

Based on the above, the proposed clearing is at variance to this principle.

Methodology
DWER and DBCA shapefiles
Biota (2021)
WoodGIS (2020)

(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

Eleven land systems are mapped within the development envelope:

- Capricorn System
- Granitic System
- Mosquito System
- Rocklea System
- Taylor System
- Wona System
- River System
- McKay System
- Newman System
- Bonney System
- Robe System

The vast majority of the development are fits within the Rocklea and Mosquito landsystems with approximately 53% of the development envelope. These land systems have been mapped and described in technical bulletins produced by the former Department of Agriculture (now the Department of Primary Industries and Regional Development).

The Rocklea land system is described as basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex (and occasionally soft spinifex) grasslands. This land system is not generally susceptible to erosion (van Vreeswyk et al. 2004).

The Mosquito land system is described as Gently undulating stony plains and prominent ridges and hills (relief up to 100 m) of schist and other metamorphic rocks, largely restricted to a large single area to the east of Nullagine. This land system is not also generally susceptible to erosion (van Vreeswyk et al. 2004).

The development envelope intersects only a small proportion (<0.001%) of the extent of each land system which are all located within the Chichester subregion. The great majority of all 11 of these land systems remain vegetated in the local area.

The proposed clearing is linear in nature and largely adjacent to an existing road. Main Roads' standard environmental management measures will be implemented and address erosion and other land degradation processes. Overall, the proposed clearing is unlikely to cause appreciable land degradation.

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

Methodology
Biota (2021)
Van Vreeswyk et al. (2004)

(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 nearest DBCA managed land is Mungaroona Range Nature Reserve which is approximately 18 km south west of the development envelope.

The proposed clearing of locally abundant road side vegetation will not impact on any adjacent or nearby conservation reserves and will not impact on ecological connectivity of the area that could indirectly impact on nearby conservation areas.

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

Methodology
Biota (2021)
DBCA shapefiles

(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 be at variance to this Principle

The project traverses through one public drinking water source area which is Nullagine water reserve (P1). This reserve is greater than 11,000ha primarily composed of vegetated land with 126ha within the development envelope (1%). To ensure the protection of water resources, all activities within the water reserve will be conducted in accordance with the Nullagine Water Reserve Water Source Protection Plan (DoW, 2017). The clearing activities associated with the proposal will be compatible with the DoW's (now DWER's) Land Use Compatibility Tables and activities will comply with the DoW's (now DWER's) Water Quality Protection Notes and Guidance (DWER, 2021).

The proposed clearing will be linear in nature predominantly along the existing road corridor which would unlikely be detrimental to the current surface hydrology. Creek lines in the region are dry for most of the year, only flowing briefly immediately following significant rainfall.

The proposed clearing is unlikely to cause deterioration in the quality of groundwater as the scale of clearing at any one location is minor and there is no abstraction, dewatering or deep excavation being proposed.

The areas surrounding the development envelope will remain largely vegetated, which also minimises the risk of water quality deterioration.

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

Methodology
Biota (2021)
DBCA shapefiles

(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 climate of the region is arid, with a low average rainfall of approximately 403.1 millimetres per year (BOM, 2021). Drainage lines in the area are dry for most of the year, only flowing briefly immediately following significant rainfall (BOM 2021).

The project crosses several seasonal drainage lines that are common in the region and temporary localised flooding may occur briefly following heavy rainfall events. There are no permanent watercourses or waterbodies within the development envelope. The proposed works are inclusive of upgrades of drainage management inclusive of appropriate culverts 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.

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

Methodology
Biota (2021)
BOM (2021)

6 STAKEHOLDER CONSULTATION

Main Roads will continue to undertake stakeholder consultation in reference to the project.

7 ENVIRONMENTAL MANAGEMENT

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

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APPENDIX A: ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan				
Project Component	**Management Action**	**Monitoring/Maintenance Program**	**Responsible Person**	**Completion Timeframe**
Standard Vegetation Clearing and Fauna Management				
Avoid and manage project clearing	• Minimise vegetation clearing within the approved clearing envelope where possible and by utilising existing cleared area where possible.	• Extent of clearing for project is recorded within one week and entered in EOS, once it is available.	Environment Officer	Within one week once clearing has been completed
	• At the pre-start meeting (or equivalent) – Provide clear maps (and spatial data) indicating the areas approved to be cleared (as per the CPS approval) to the crew undertaking the clearing works.	• One compliance inspection will occur prior to clearing. Record sheet will be signed at the pre-start meeting by all personnel and emailed to the Environment Officer.	Project Manager	Prior to clearing commencing
	• Have on site a copy, and implement actions within, the *(where relevant)*: - CEMP & other relevant management plans.	• One compliance inspection will occur prior to clearing.	Project Manager / Environment Officer	Prior to clearing commencing
	• All vegetation proposed to be cleared will be demarcated on site prior to the commencement of project activities. • 'No go' areas or trees that are to be retained will be marked accordingly.	• One compliance inspection will occur prior to clearing. Site will be driven / walked to ensure site is marked out and is ready for clearing.	Project Manager / Environment Officer	Prior to clearing commencing
	• Vegetation shall be conserved as far as practicable, and shall not be disturbed for such temporary works as side tracks, access tracks, temporary storage areas, campsites, spoil areas or site offices.	• One compliance inspection will occur within two weeks once clearing has been completed. The project area will be driven/walked to ensure the extent of clearing was not exceeded and where possible/safe mature trees retained.	Project Manager / Environment Officer	Within two weeks once clearing has been completed
	• Any over clearing shall be recorded and reported immediately to Environment Branch. • Any damage caused (beyond the extent of approvals) during the construction to vegetation, landforms, or fauna habitat shall be rehabilitated to the pre-clearing condition in consultation with the Environment Officer.	• One compliance inspection will occur within one week once clearing has been completed. The project area will be driven to ensure no damage to vegetation, landforms or habitats occurred during construction.	Project Manager / Environment Officer	Within one week once clearing has been completed
	• Burning of cleared vegetative materials or burning within the road reserve will not be permitted under any circumstances. •	• One compliance inspection will occur within two weeks once clearing has been completed. The project area will be driven to ensure the extent of clearing was not exceeded.	Project Manager / Environment Officer	Within two weeks once clearing has been completed

Environmental Management Plan				
Project Component	**Management Action**	**Monitoring/Maintenance Program**	**Responsible Person**	**Completion Timeframe**
	• Clearing activities must be completed in accordance with Main Roads Specifications: 204 (Environment), 301 (Clearing), 302 (Earthworks). Specifications are available from iRoads link.	• One compliance inspection will occur within one week of the commencement of clearing. The project area will be examined to ensure clearing activities comply with Main Roads specifications.	Project Manager / Environment Officer	Within two weeks once clearing has been completed
Avoid and manage impacts to fauna.	• Commence clearing in such a way as to allow fauna to move out of the clearing area if possible • No pets, traps or firearms are allowed within the project area. • Fauna are not to be fed or intentionally harmed or killed. • 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.	• Monitoring will be undertaken through the corporate audit process and remedial actions managed through Main Roads internal incident management process.	Management Action - Project Manager Monitoring Program – Environment Branch	Project lifespan/ ongoing
Hygiene management.	• Clean earth-moving machinery of soil and vegetation prior to entry. • Ensure no weed affected soil, mulch, fill or other material is brought into the area cleared. • Restrict movement of machines and other vehicles to the limits of the areas cleared.	• Machinery checked prior to entering project site. • Demarcation to be checked by EO prior to clearing commences	Project Manager	Project lifespan/ ongoing
Weed Control	• Declared weeds controlled prior to clearing commencement • Remove or kill any serious environmental weeds growing in project area that are likely to spread and result in environmental harm to adjacent areas of native vegetation that are in good or better condition.	• EO to undertake compliance audit • One annual compliance inspection undertaken to manage spread of weeds.	Project Manager	• Prior to clearing • Within five years from commencement of clearing
Standard Record Keeping Management				
Record Keeping - Clearing	Maintain the following records for the areas cleared: • a map and an ESRI Shapefile showing the location of the areas cleared (clearing of 0.5 hectares or less will only require a single GPS coordinate); • the size of the area cleared (in hectares); and • the dates on which the clearing was done in day/month/year format.	• Monitoring will be undertaken through the corporate audit process and remedial actions managed through Main Roads internal incident management process.	Environment Officer	Records maintained during construction and finalised within 4 weeks of the completion of clearing.
Record Keeping – VMP	Maintain the following records for the project area: • the location of the area to which the VMP has had action applied; • an ESRI Shapefile showing the locations of the areas of clearing for project activities; • a description of the management actions implemented; and • the size of the area to which the management actions were applied (in hectares).	• Monitoring will be undertaken through the corporate audit process and remedial actions managed through Main Roads internal incident management process.	Environment Officer	Records maintained during vegetation management activities and finalised within 4 weeks of all management plan actions being completed.

Environmental Management Plan				
Project Component	**Management Action**	**Monitoring/Maintenance Program**	**Responsible Person**	**Completion Timeframe**
Record Keeping – Weed and other pathogen control	Maintain the following records for the project area: • For any pathogen other than dieback, the appropriate steps taken to minimise the risk of the pathogen. • For any weed, the appropriate steps taken to minimise the risk of the weed spread causing environmental harm.	• Monitoring will be undertaken through the corporate audit process and remedial actions managed through Main Roads internal incident management process.	Project Manager / Environment Officer	Records maintained during activities done to minimise spread of other pathogens and weeds and finalised within 4 weeks of all actions being completed.
Standard Monitoring Actions				
Monitoring	Monitor compliance with; • the VMP/ECD/CEMP • the revegetation plan implementation	• Monitoring will be undertaken through the corporate audit process and remedial actions managed through Main Roads internal incident management process.	Environment Officer	Within 4 weeks of revegetation plan and/or offset proposals successful completion.

APPENDIX B: CONSTRAINTS MAPPING

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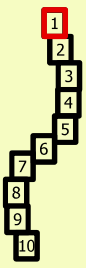
Coordinate System: GCS GDA 1994
Scale: 1:40,000 @ A4
Created Date: 20/10/2021
Author: c8322

Marble Bar Road Upgrade

Priority Flora and Priority Ecological Communities

0 0.5 1 2 Kilometres

mainroads WESTERN AUSTRALIA



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Marble Bar Road Upgrade

Priority Flora and Priority Ecological Communities

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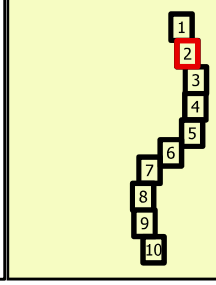

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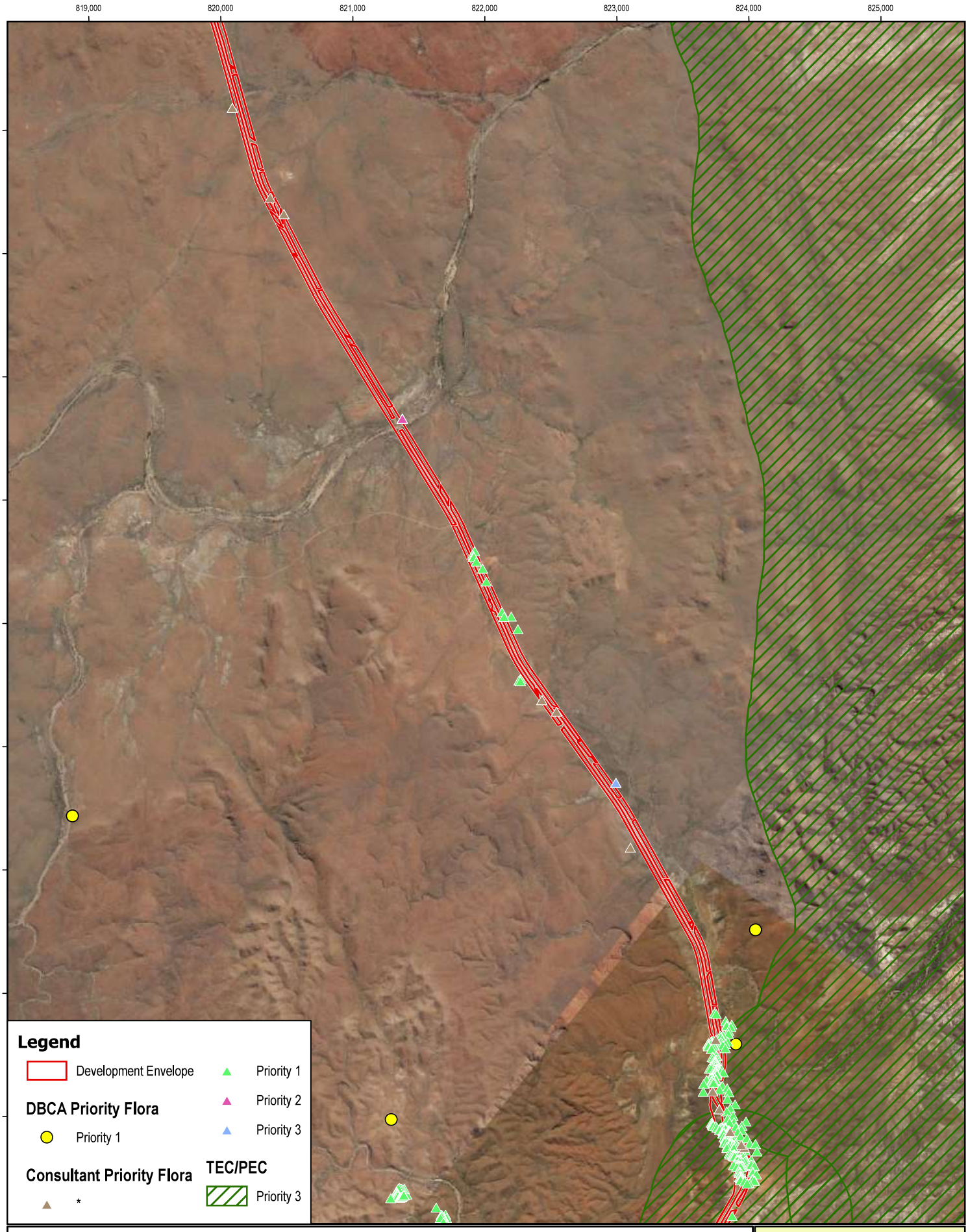

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Marble Bar Road Upgrade

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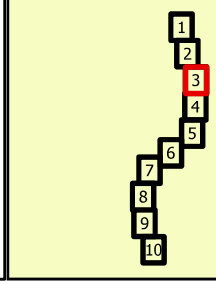

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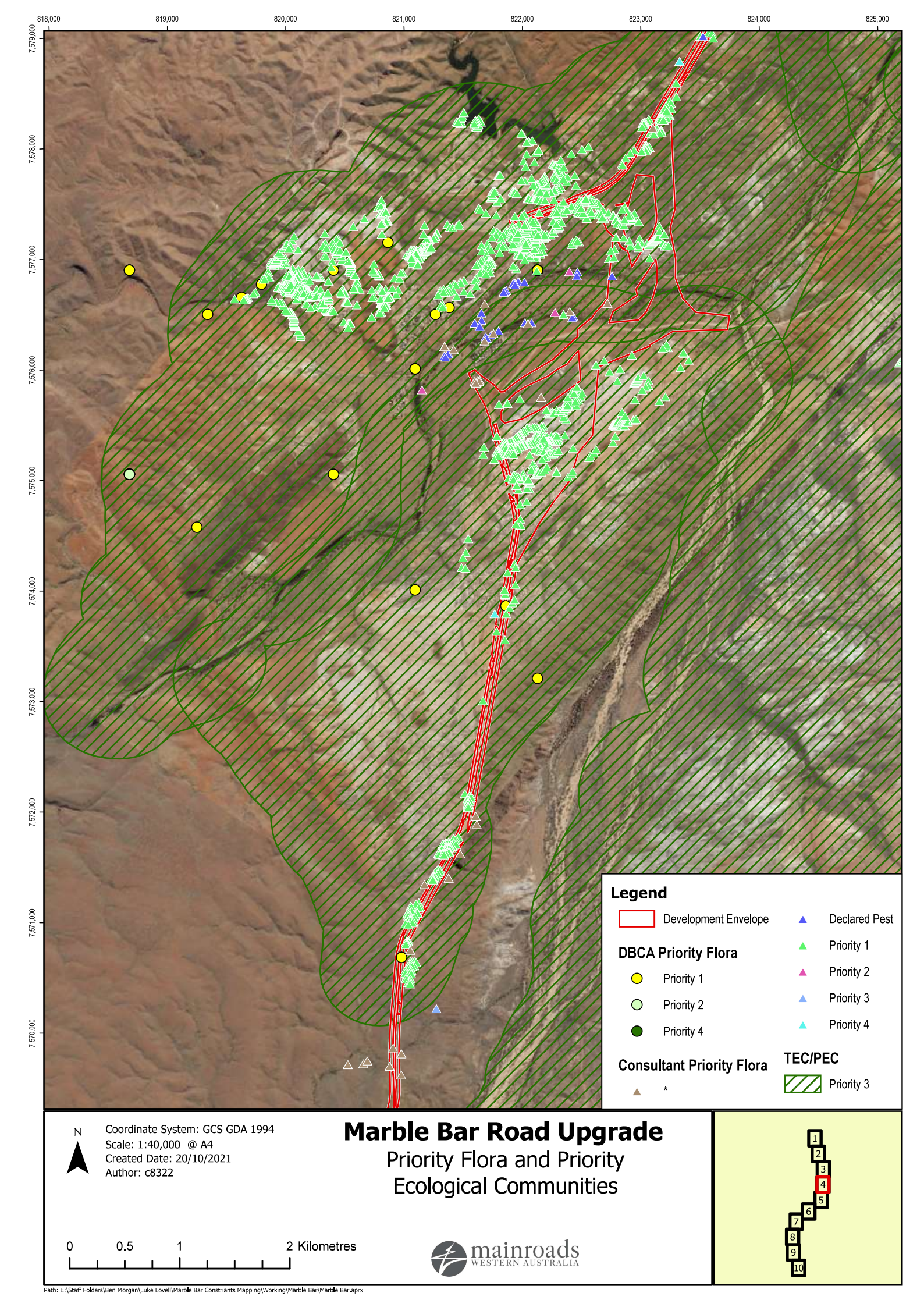
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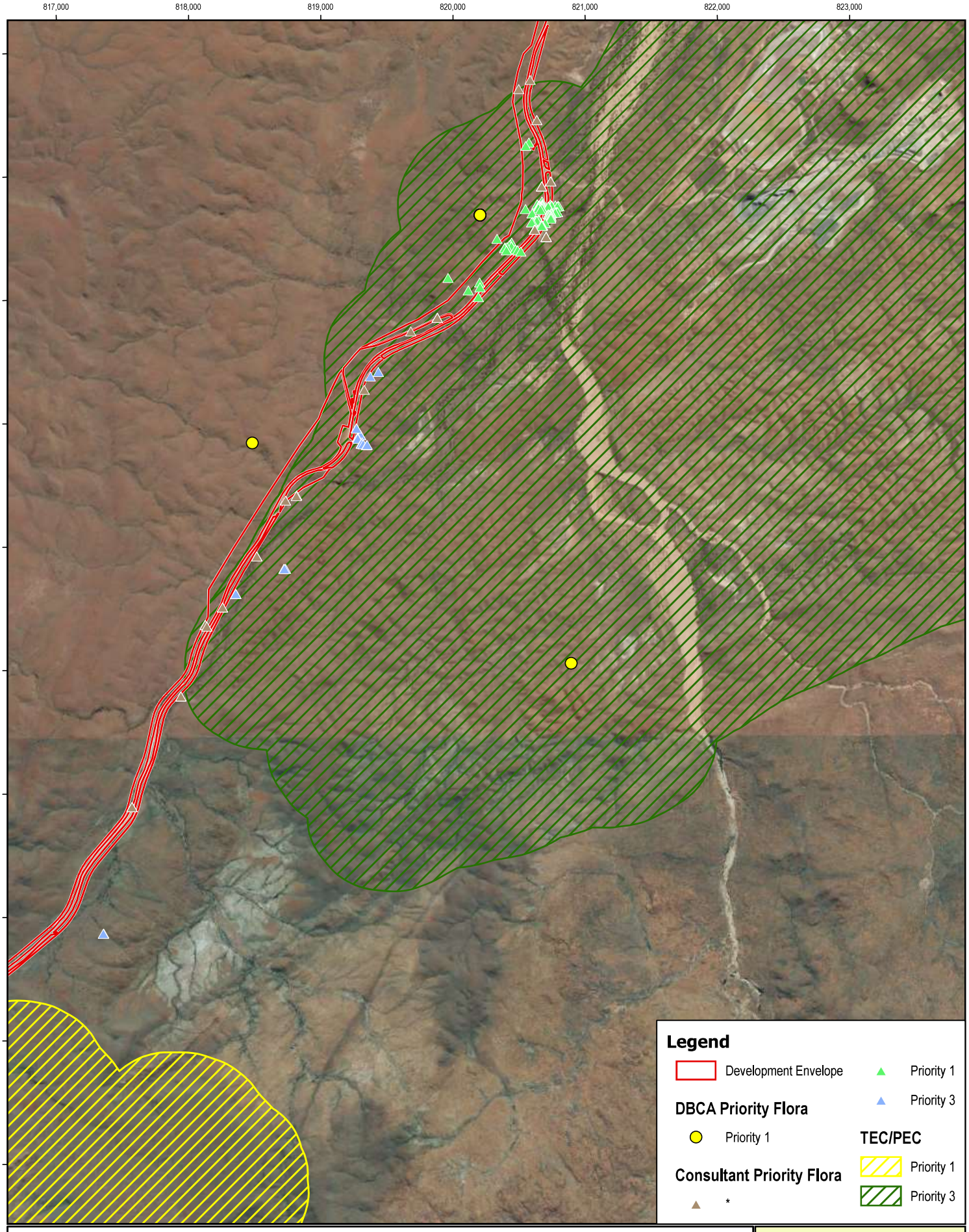

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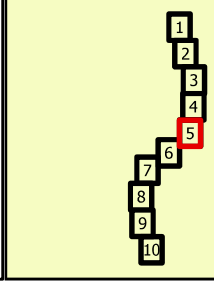

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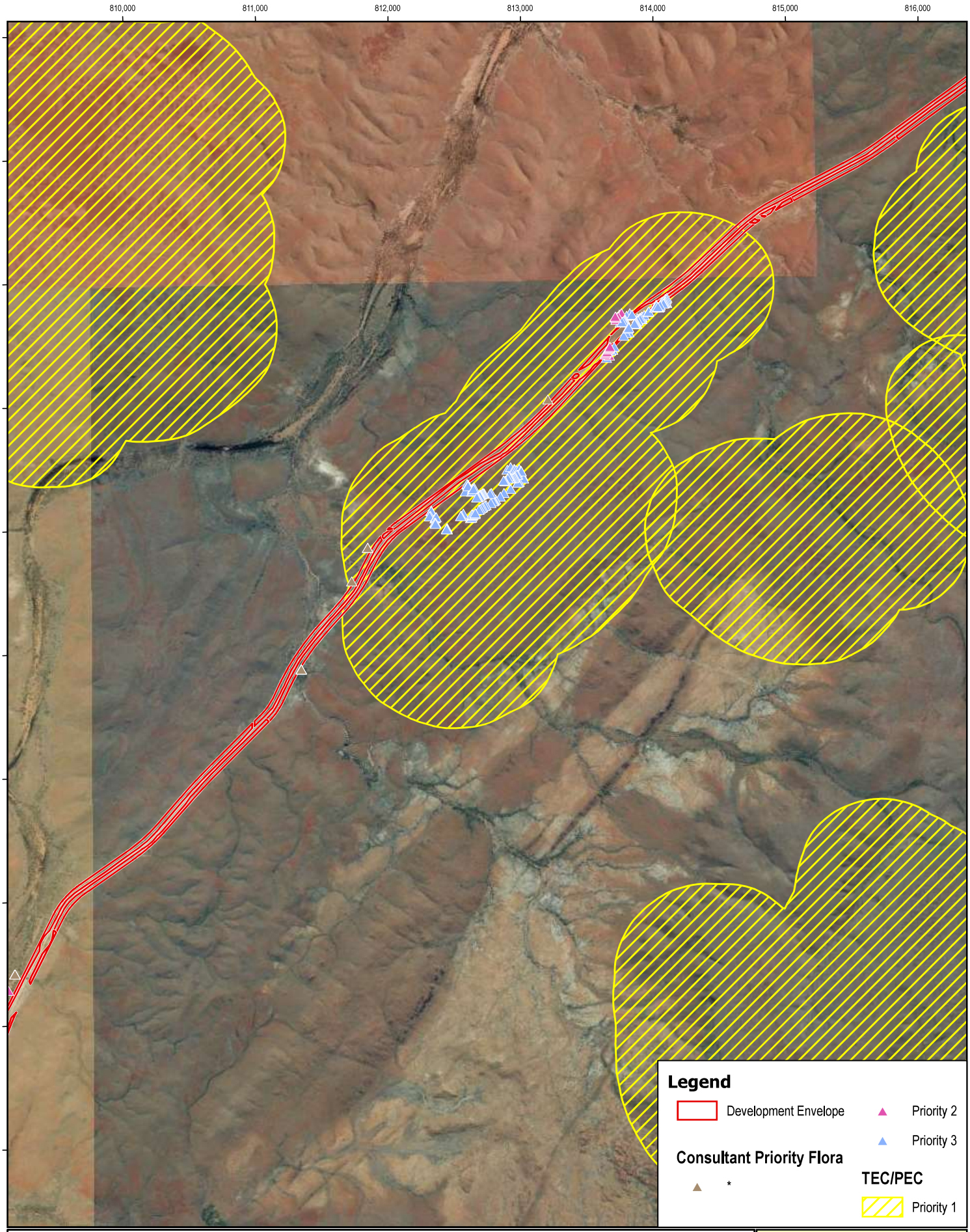

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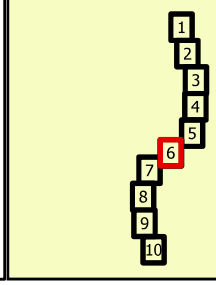

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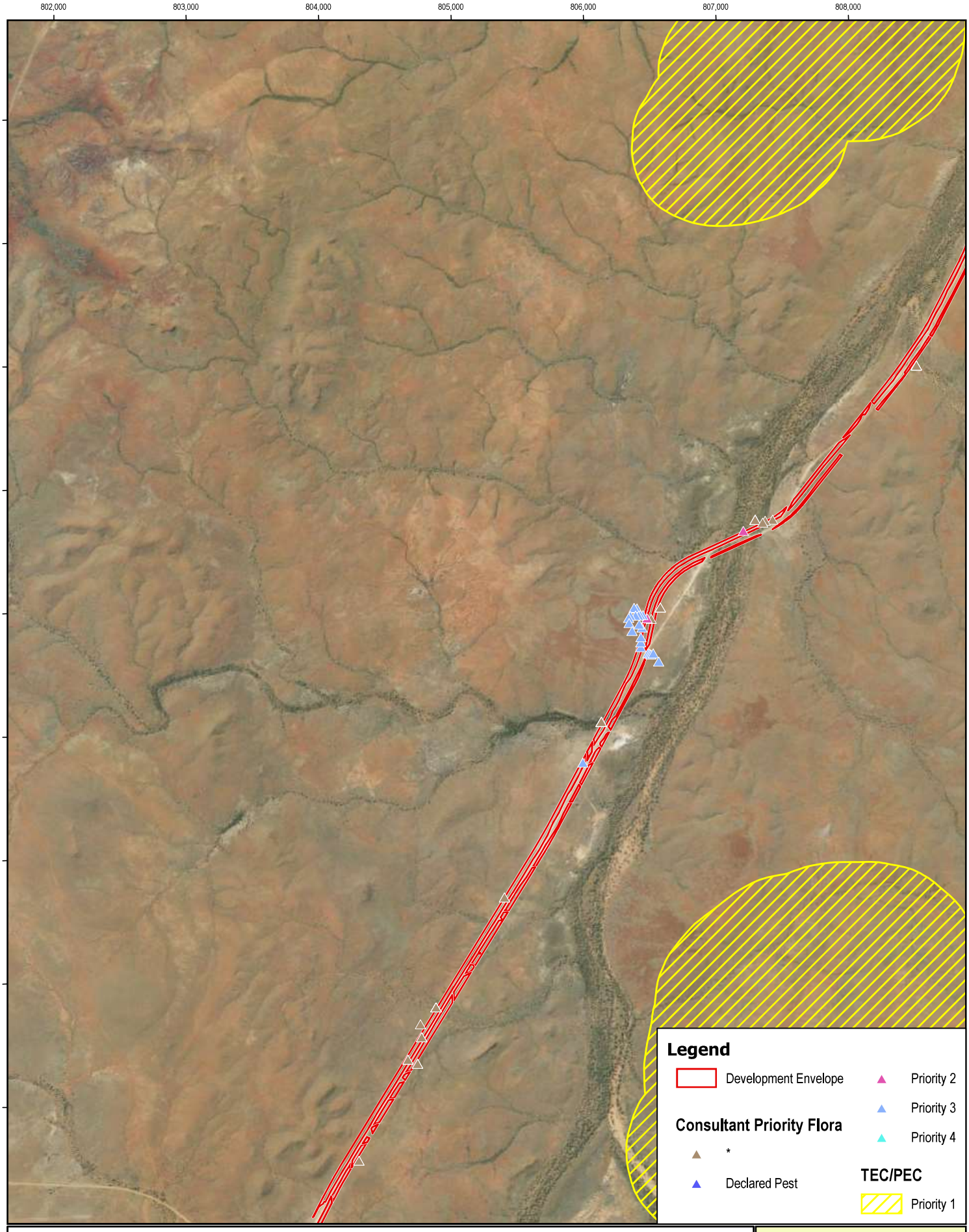

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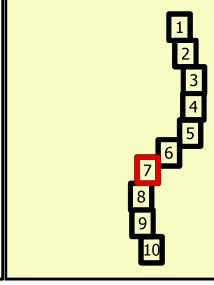

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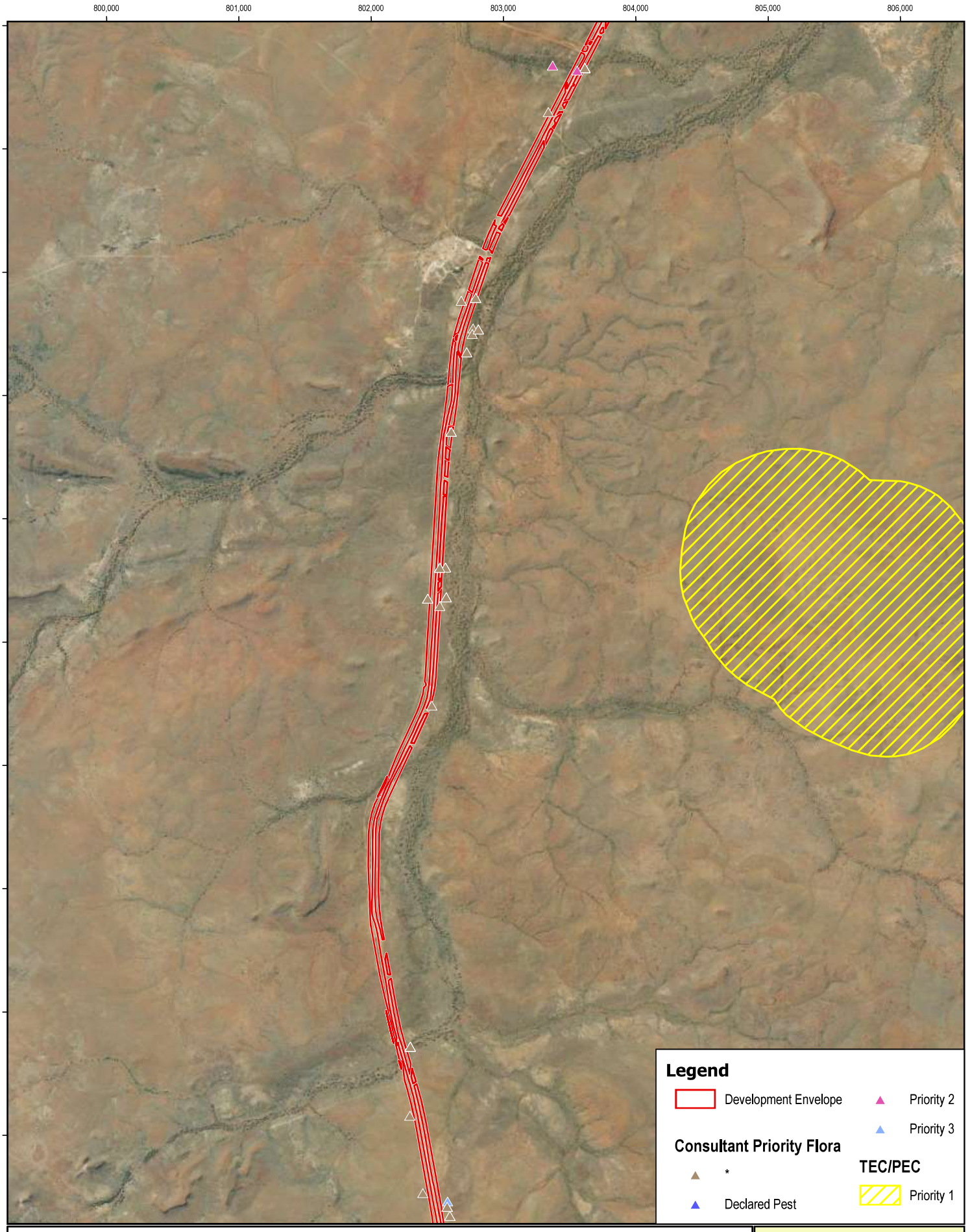

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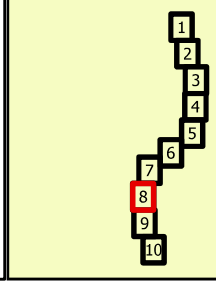

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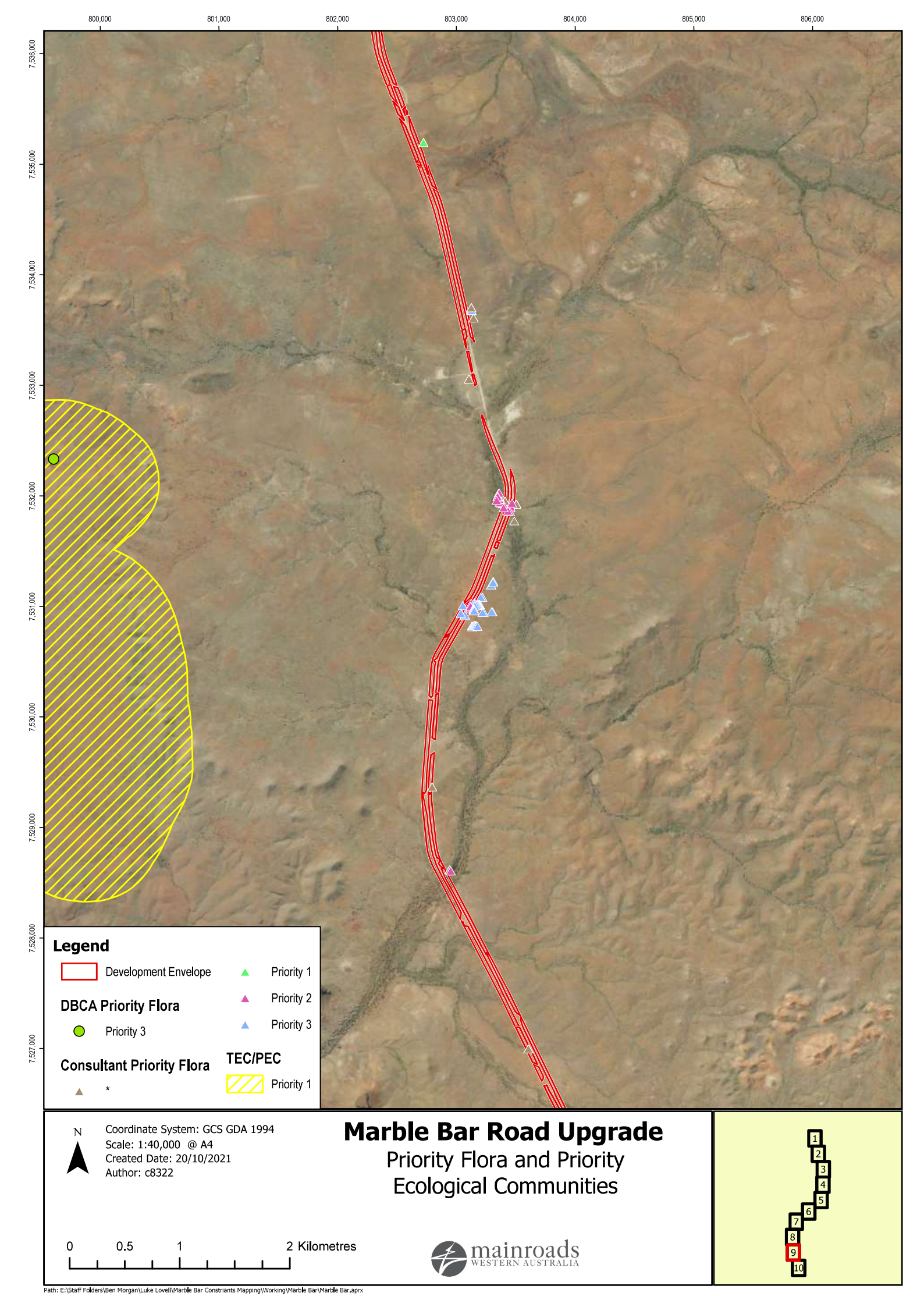

Marble Bar Road Upgrade

Priority Flora and Priority Ecological Communities

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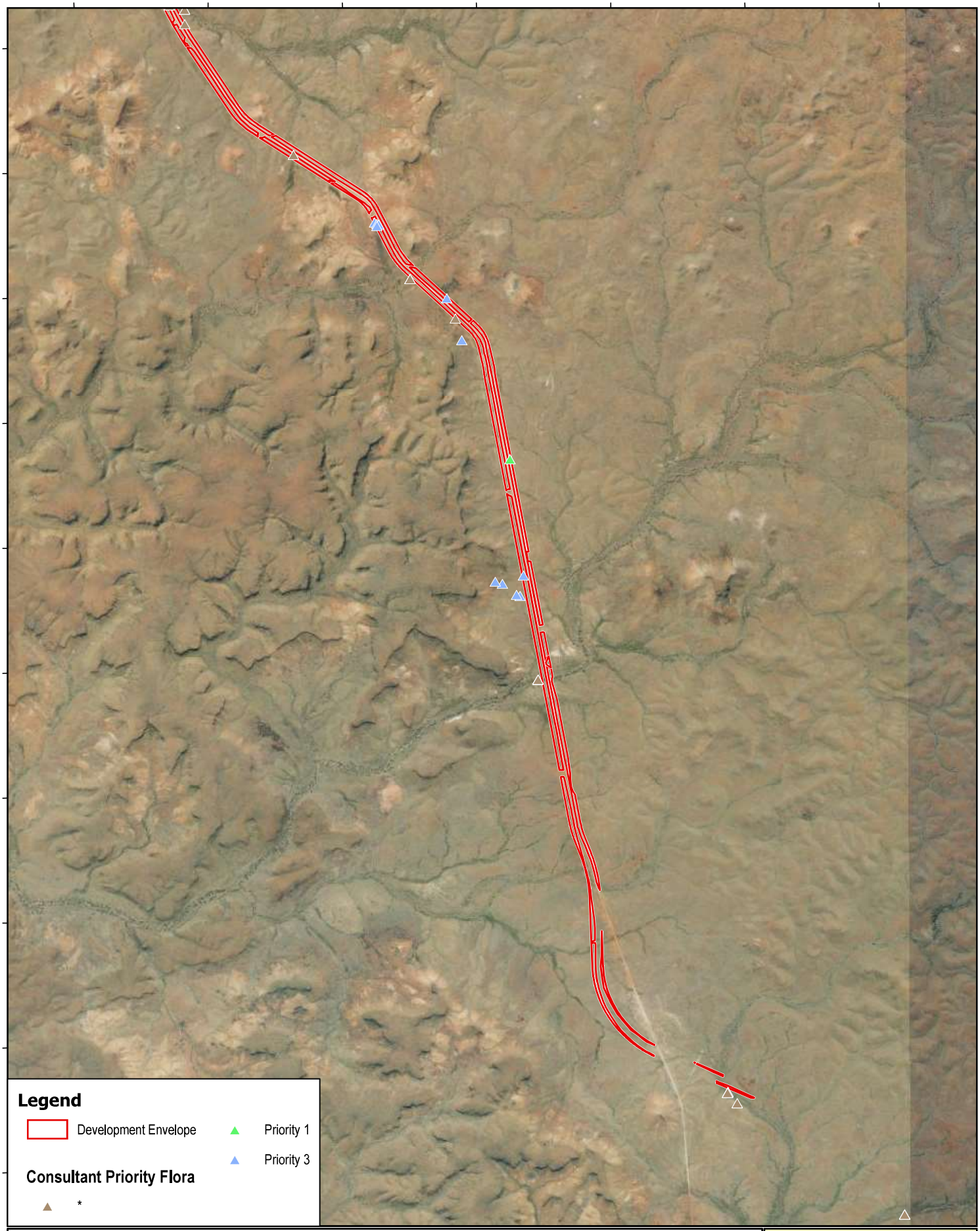

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Marble Bar Road Upgrade

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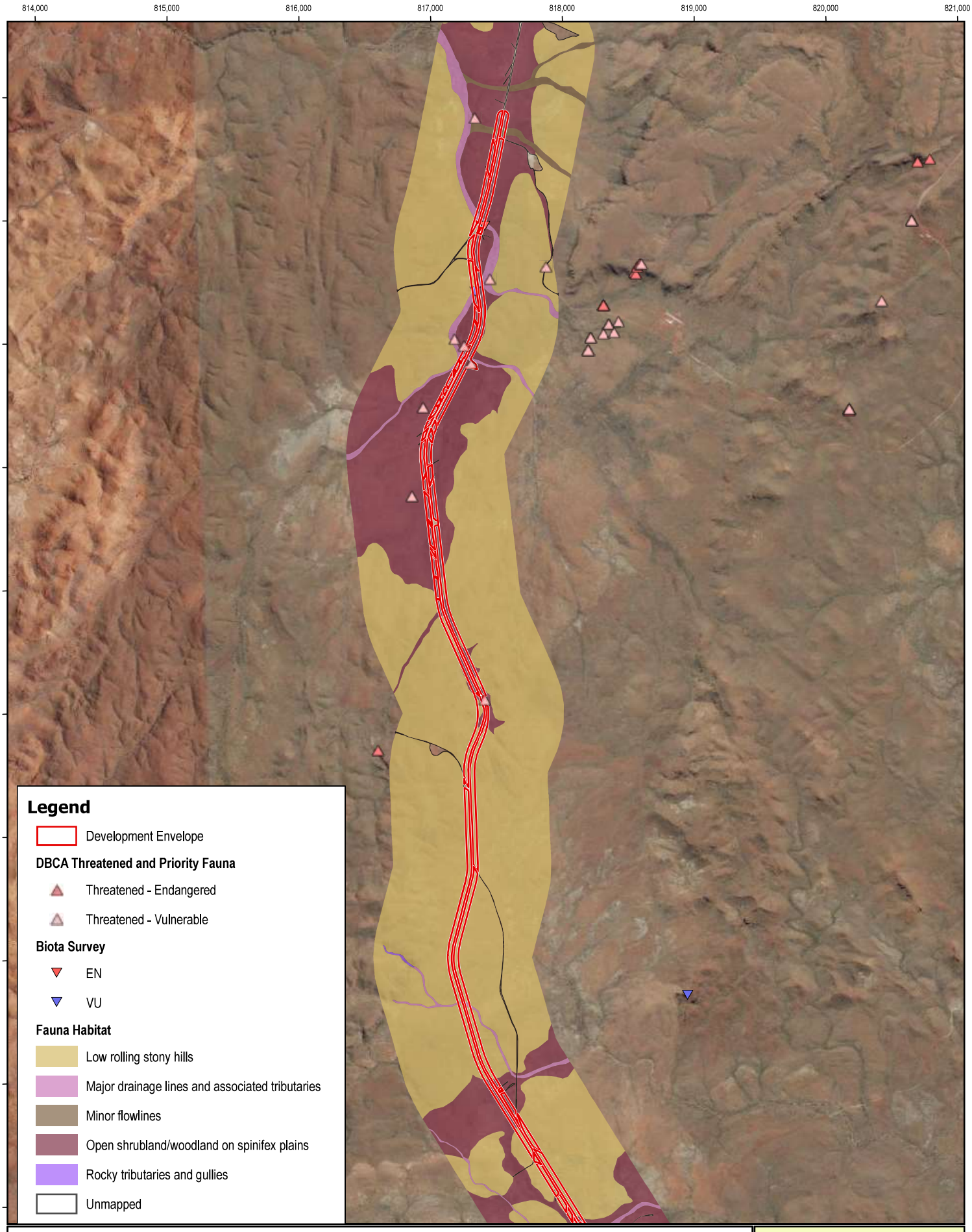

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Marble Bar Road Upgrade

Fauna Habitat and Fauna Locations

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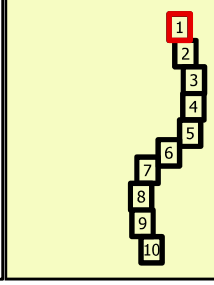

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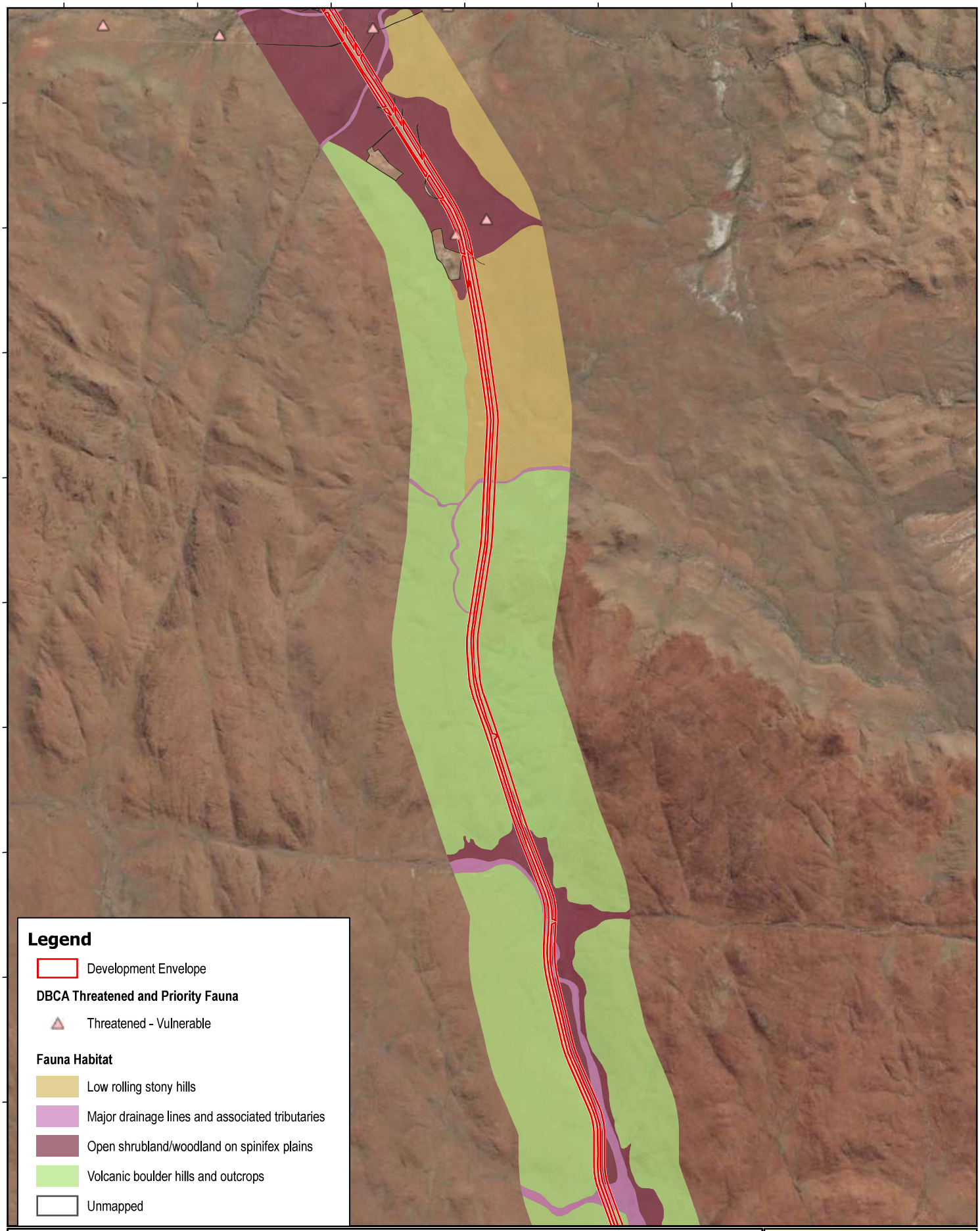

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Marble Bar Road Upgrade

Fauna Habitat and Fauna Locations

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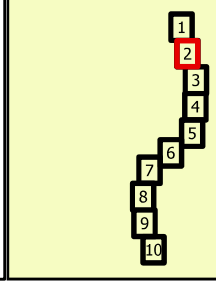

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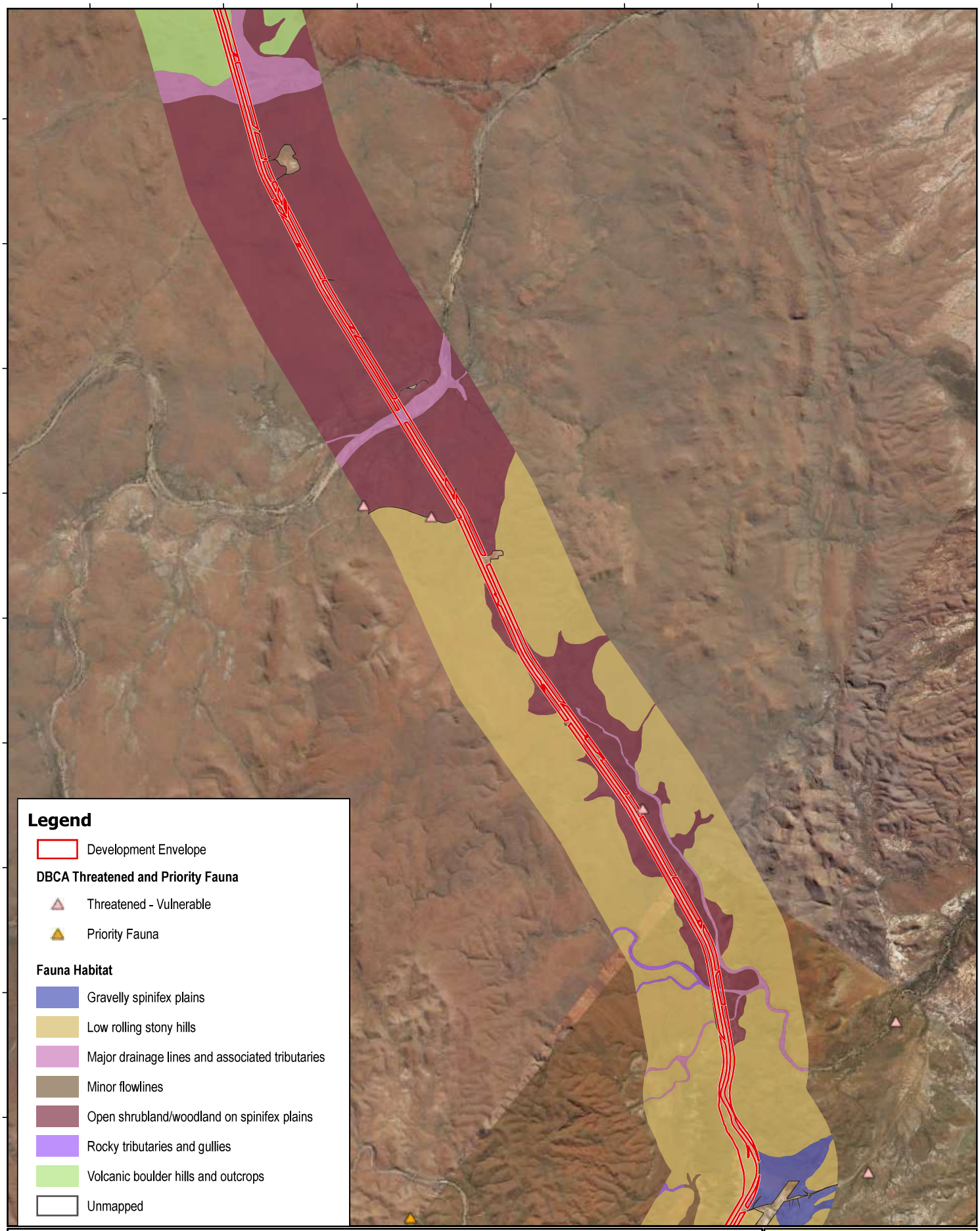

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Marble Bar Road Upgrade

Fauna Habitat and Fauna Locations

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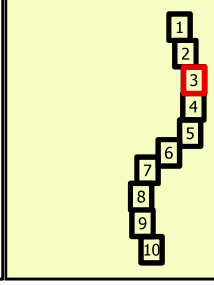

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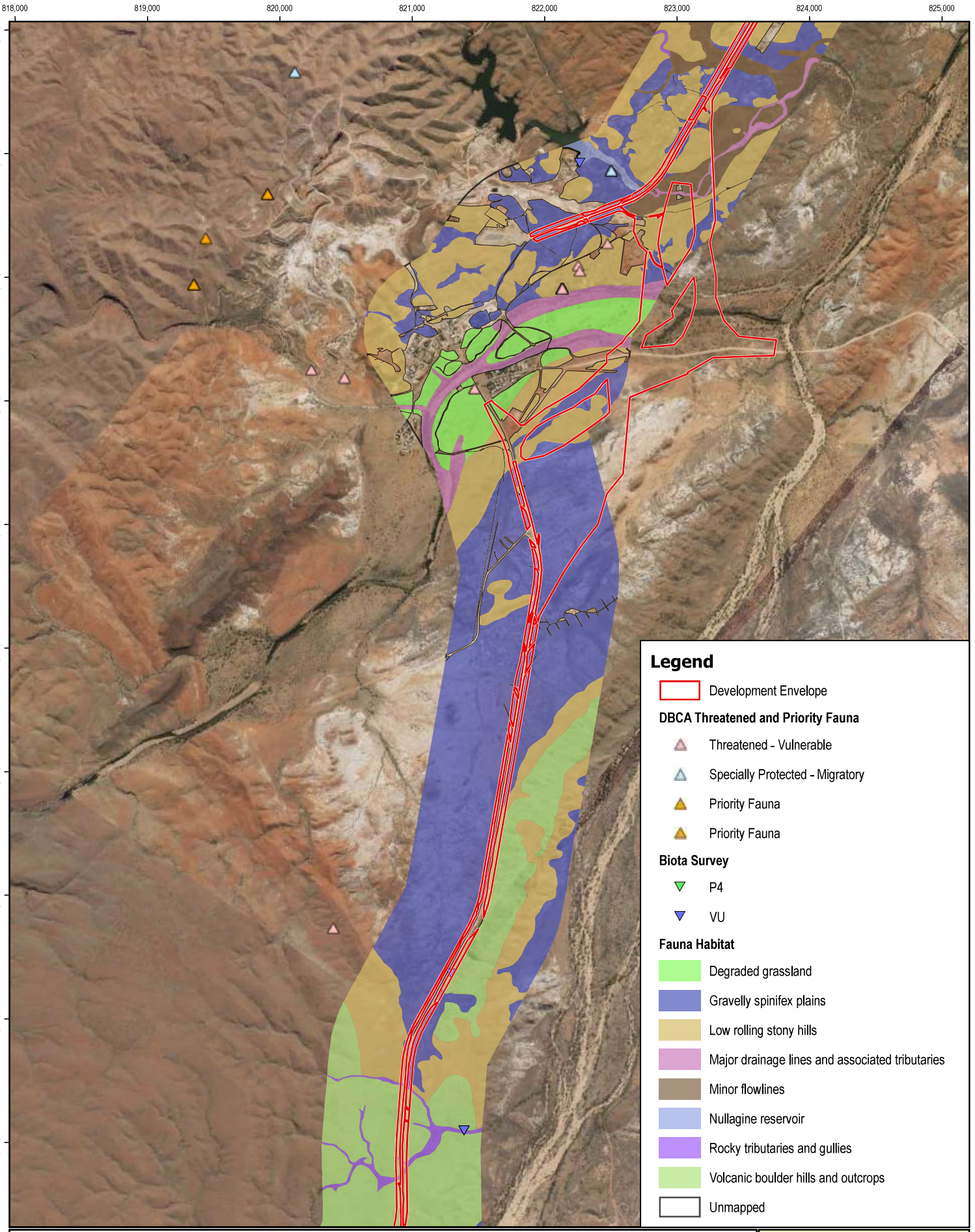

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Marble Bar Road Upgrade

Fauna Habitat and Fauna Locations

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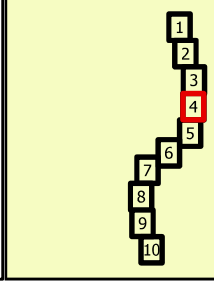

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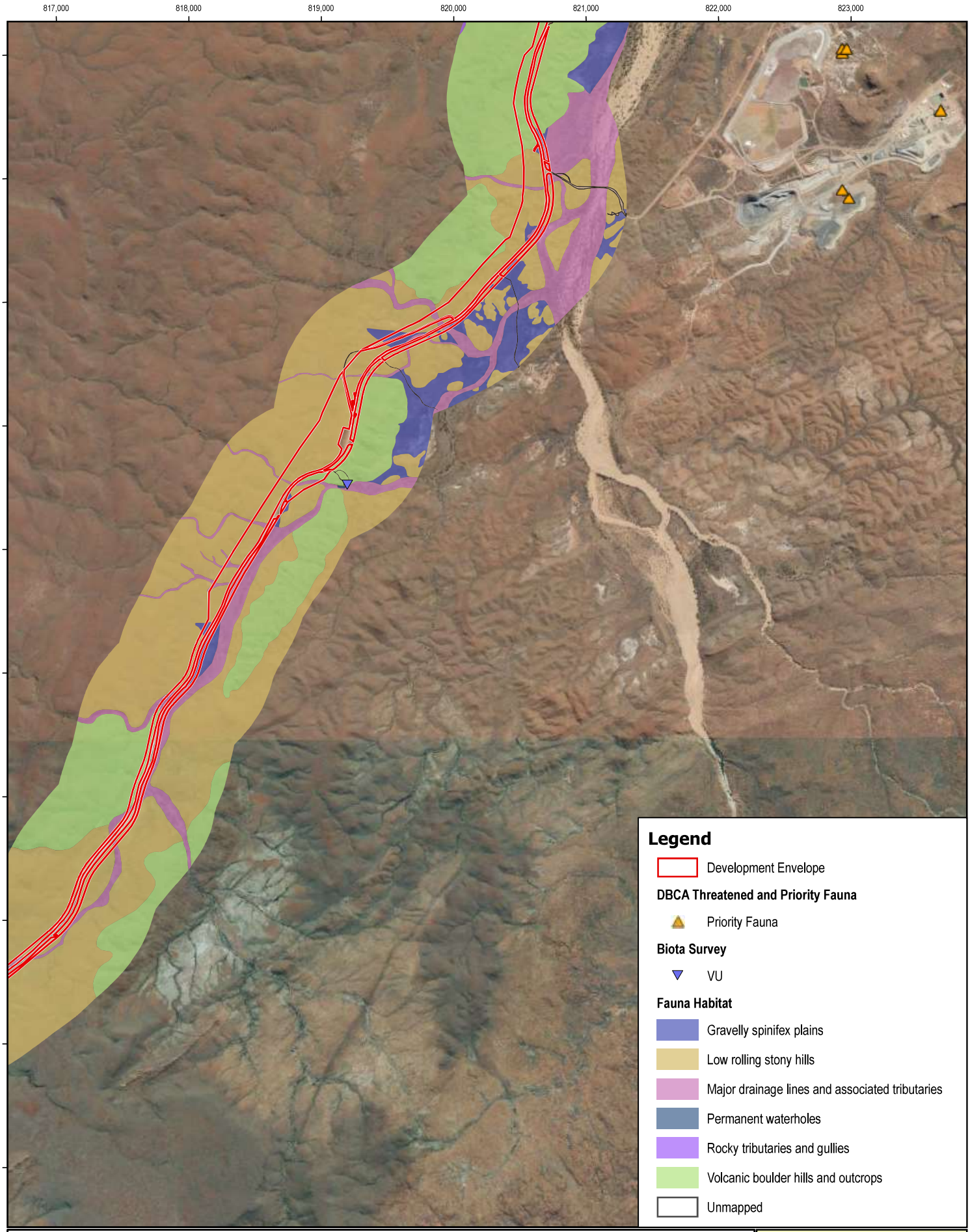

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Marble Bar Road Upgrade

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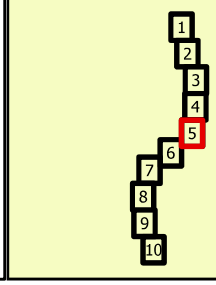

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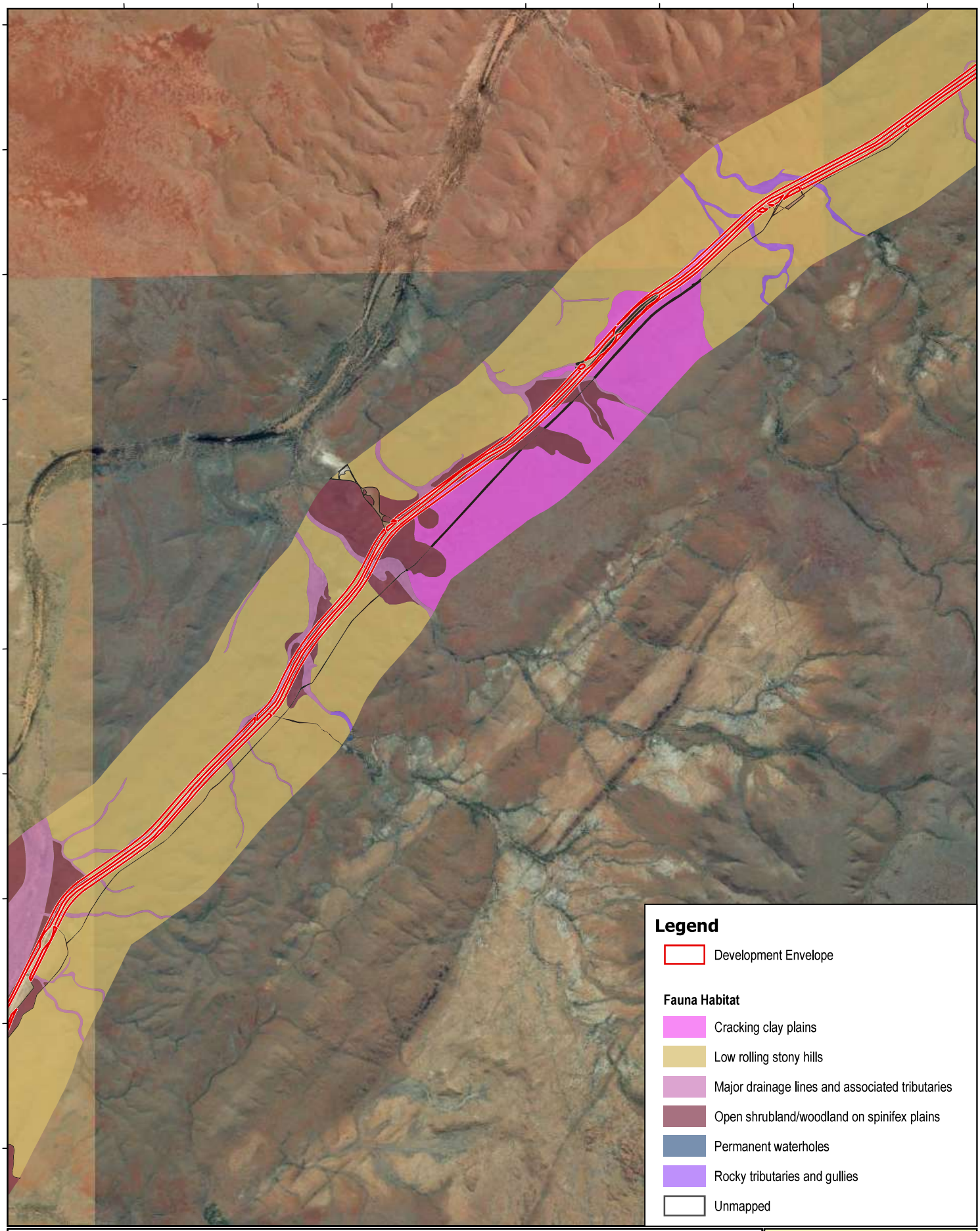

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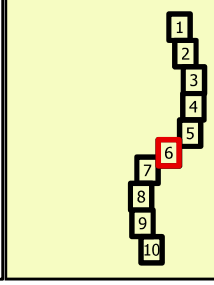

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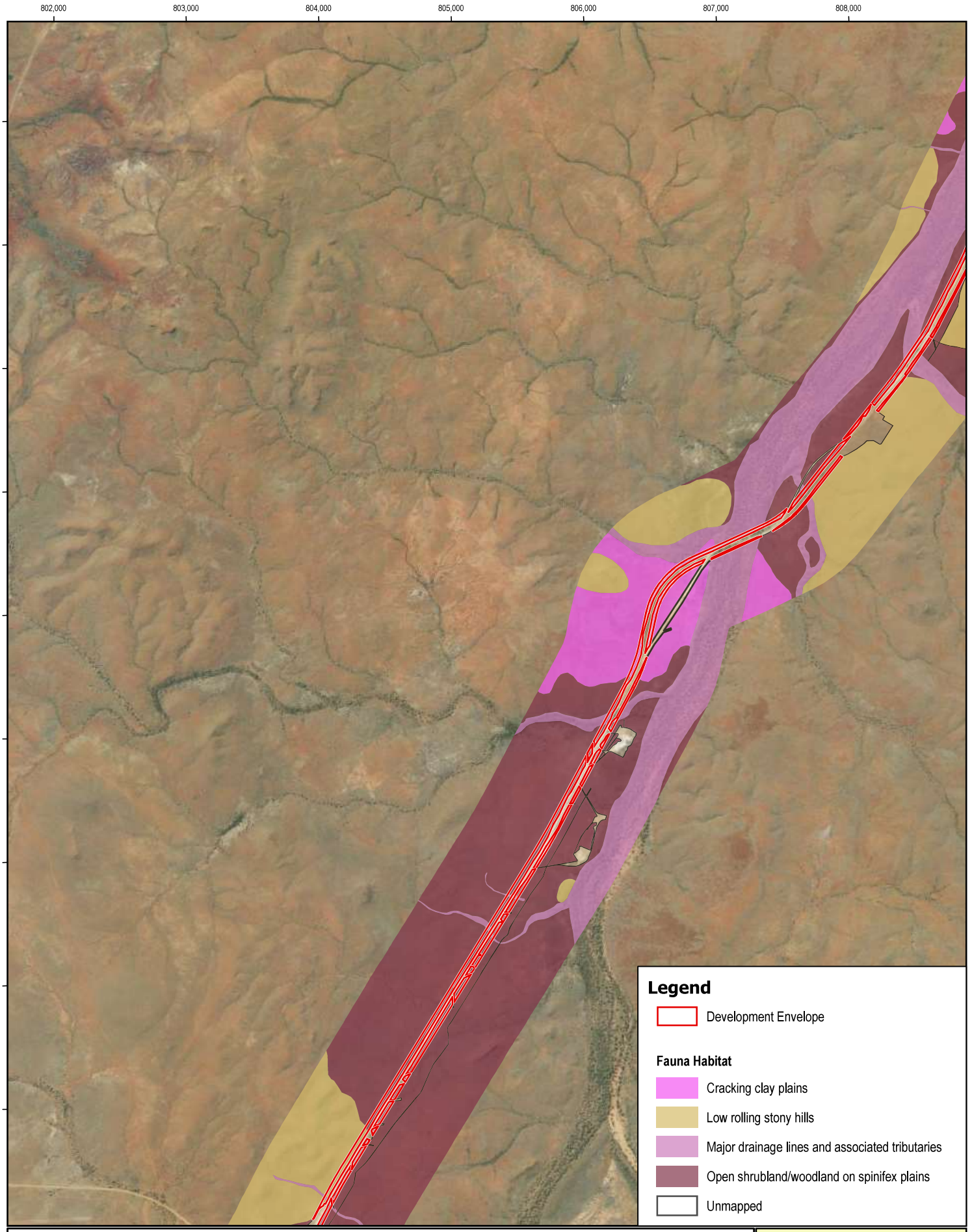

Marble Bar Road Upgrade

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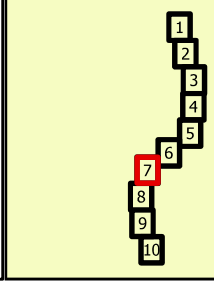

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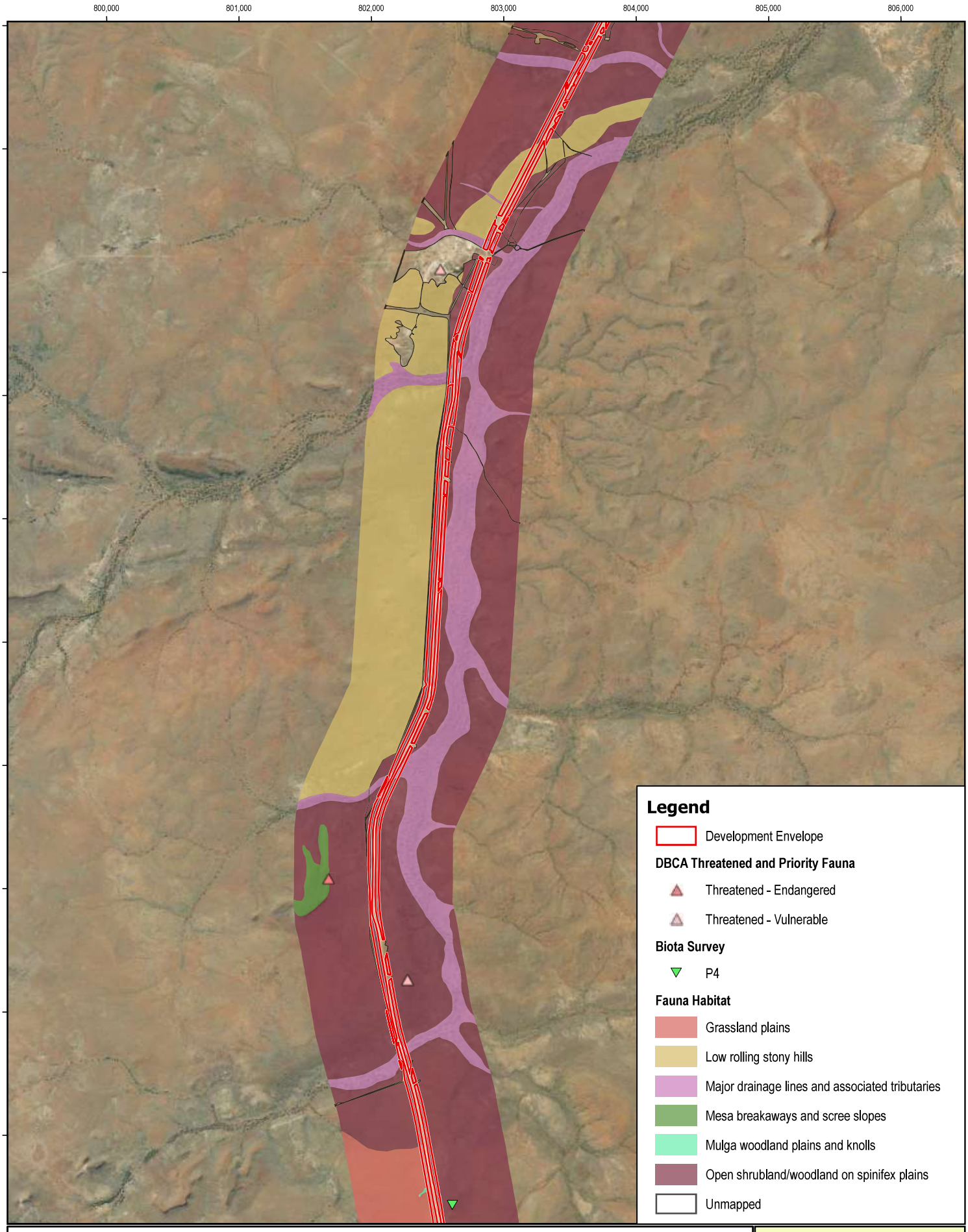

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Marble Bar Road Upgrade

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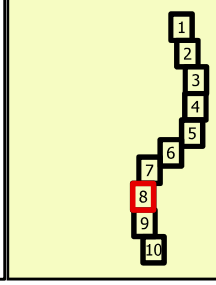

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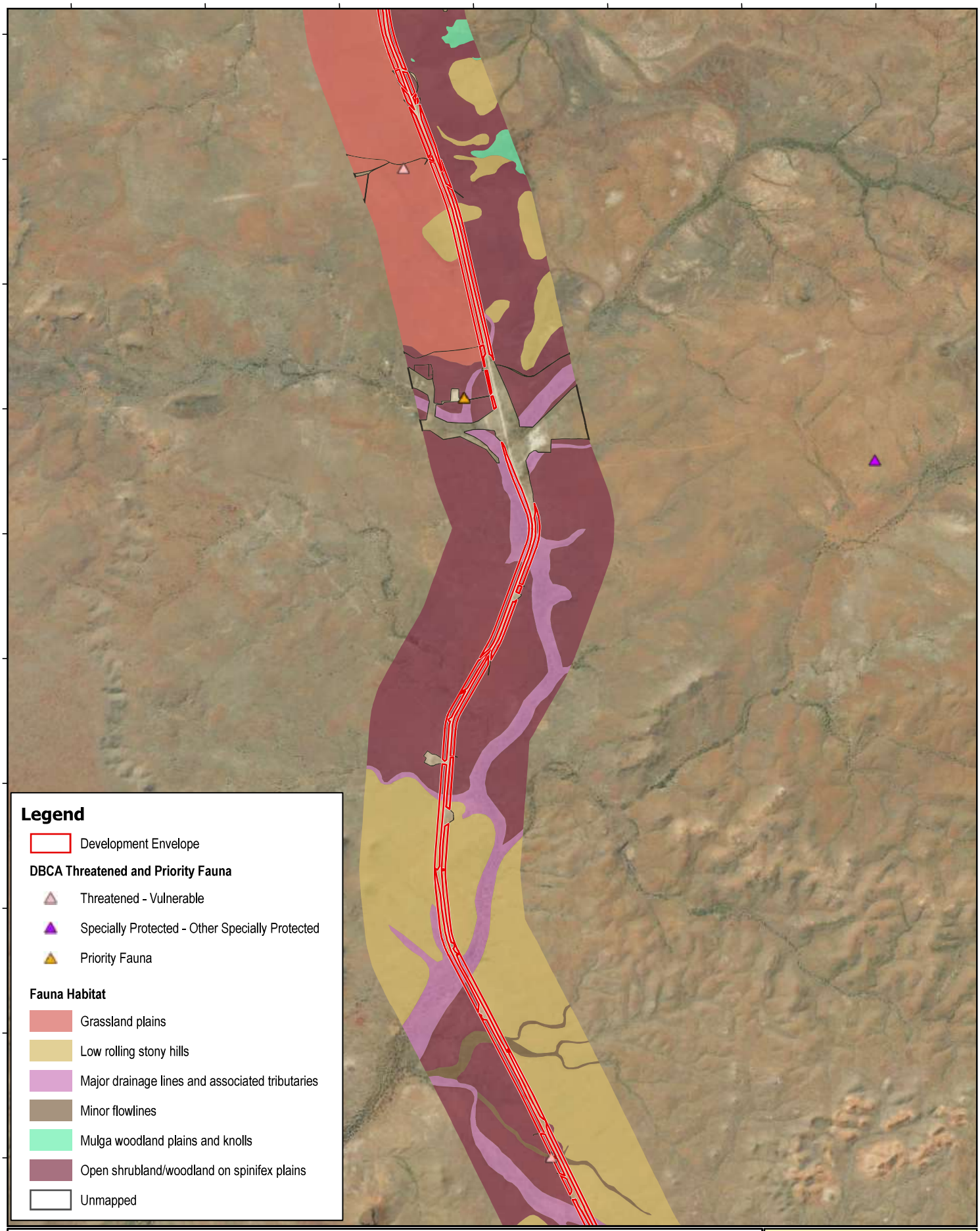

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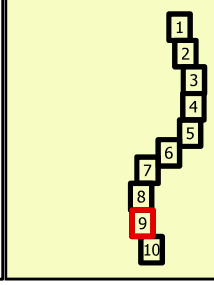

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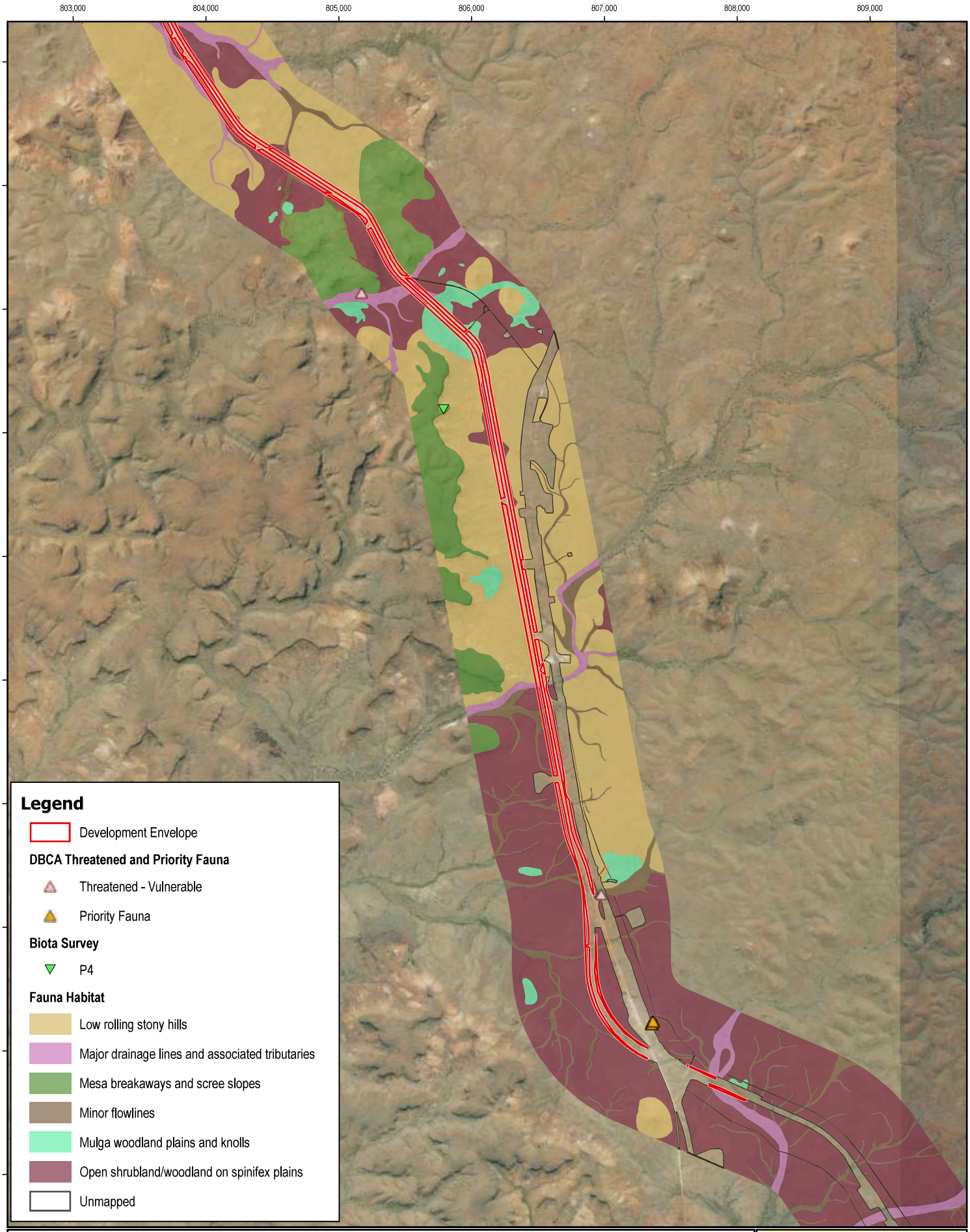

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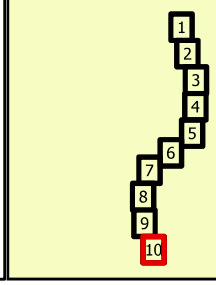
Coordinate System: GCS GDA 1994
Scale: 1:40,000 @ A4
Created Date: 19/10/2021
Author: C8322

Marble Bar Road Upgrade

Fauna Habitat and Fauna Locations

0 0.5 1 2 Kilometres

mainroads WESTERN AUSTRALIA



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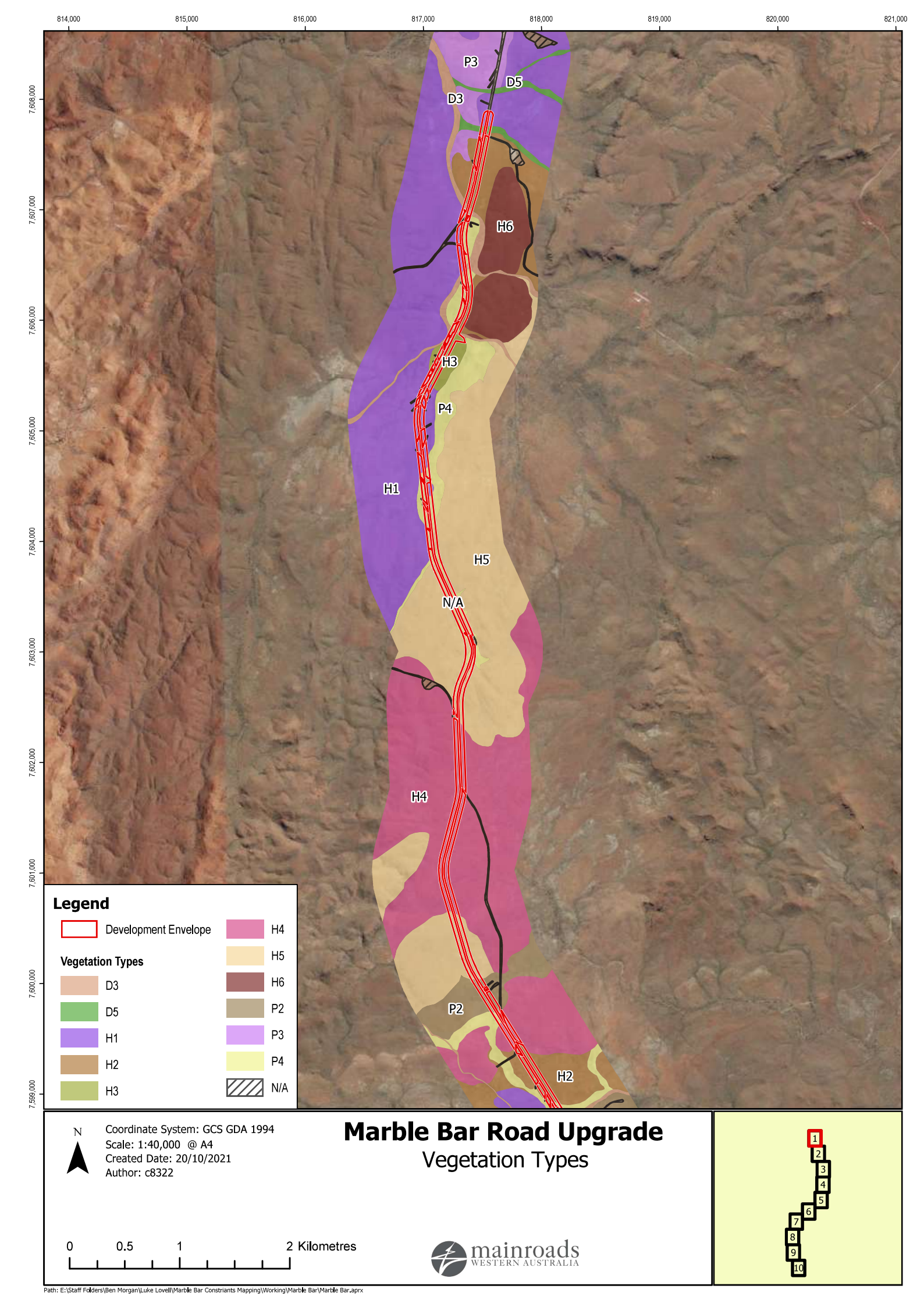

Marble Bar Road Upgrade

Vegetation Types

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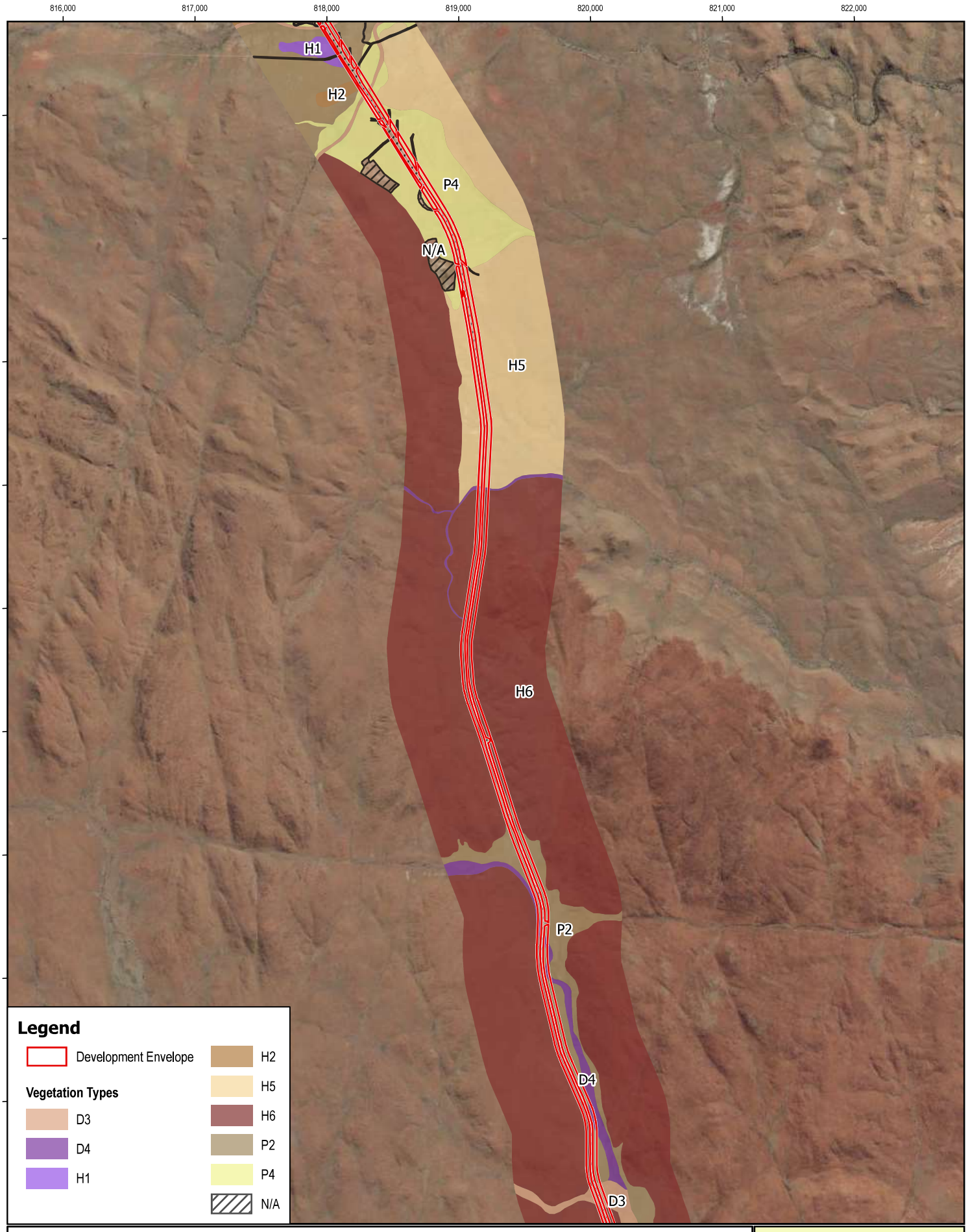


Marble Bar Road Upgrade

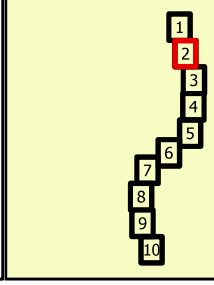
Vegetation Types

N

Coordinate System: GCS GDA 1994
Scale: 1:40,000 @ A4
Created Date: 20/10/2021
Author: c8322

0 0.5 1 2 Kilometres

mainroads WESTERN AUSTRALIA



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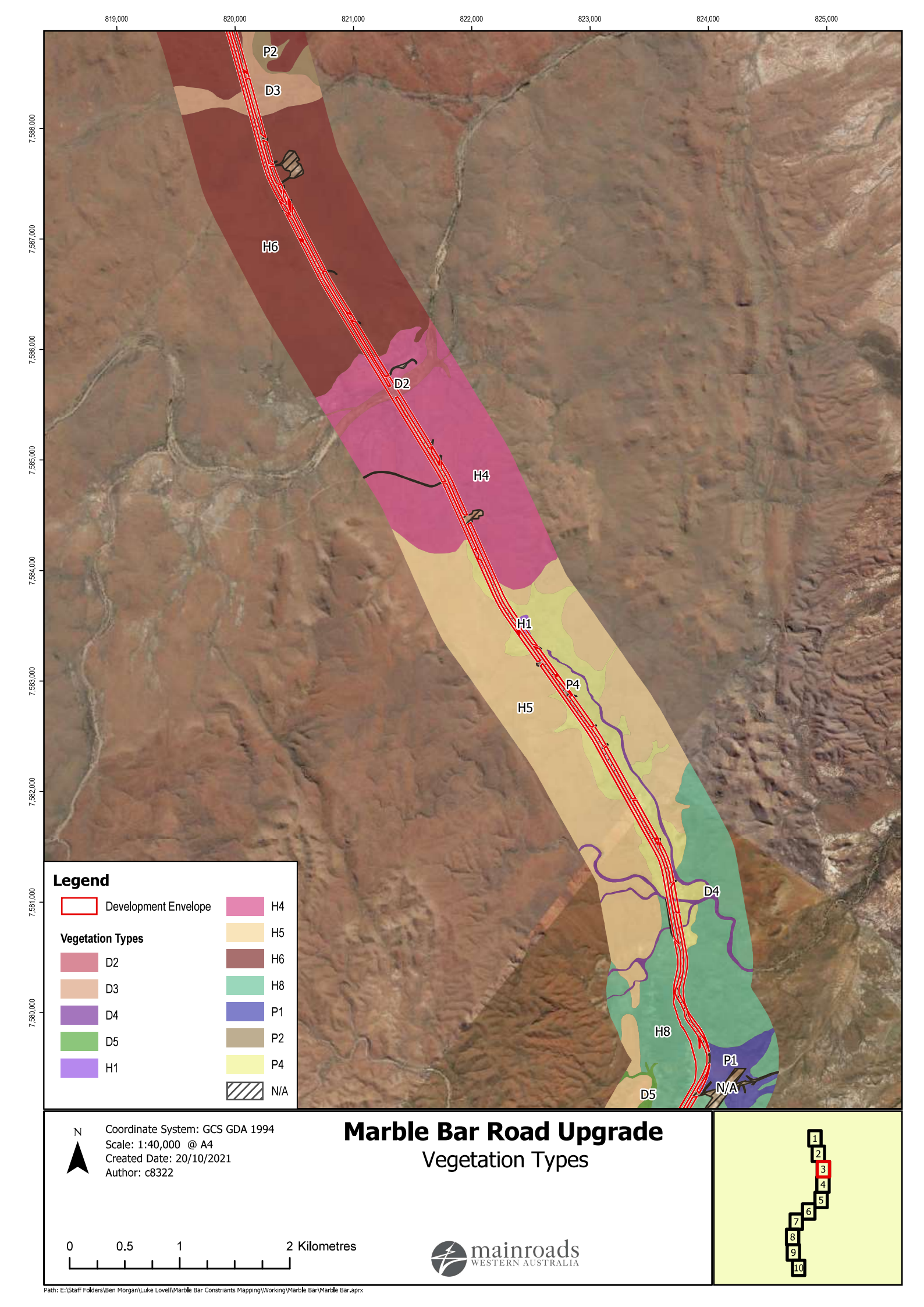

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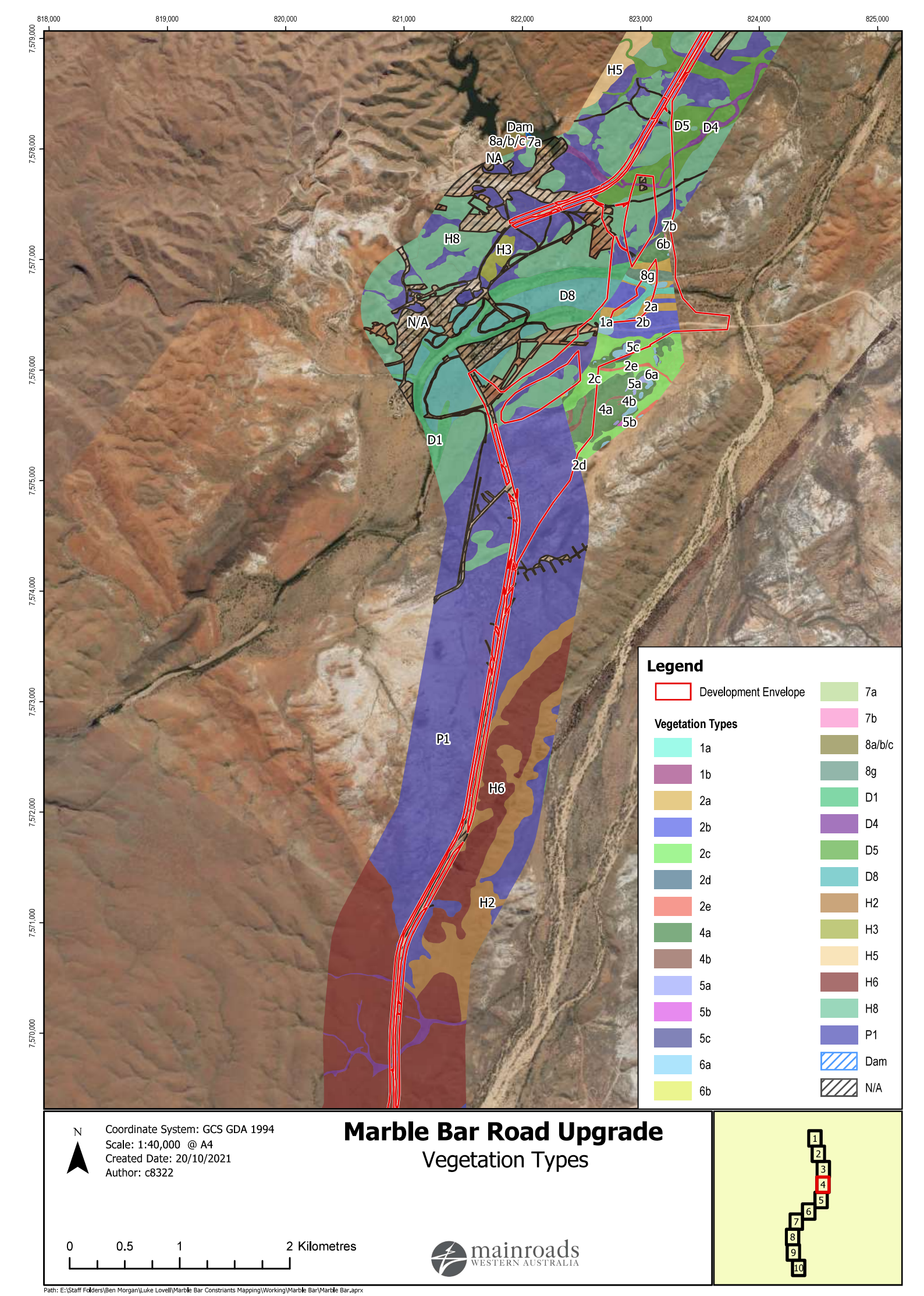

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Marble Bar Road Upgrade

Vegetation Types

0 0.5 1 2 Kilometres

mainroads WESTERN AUSTRALIA

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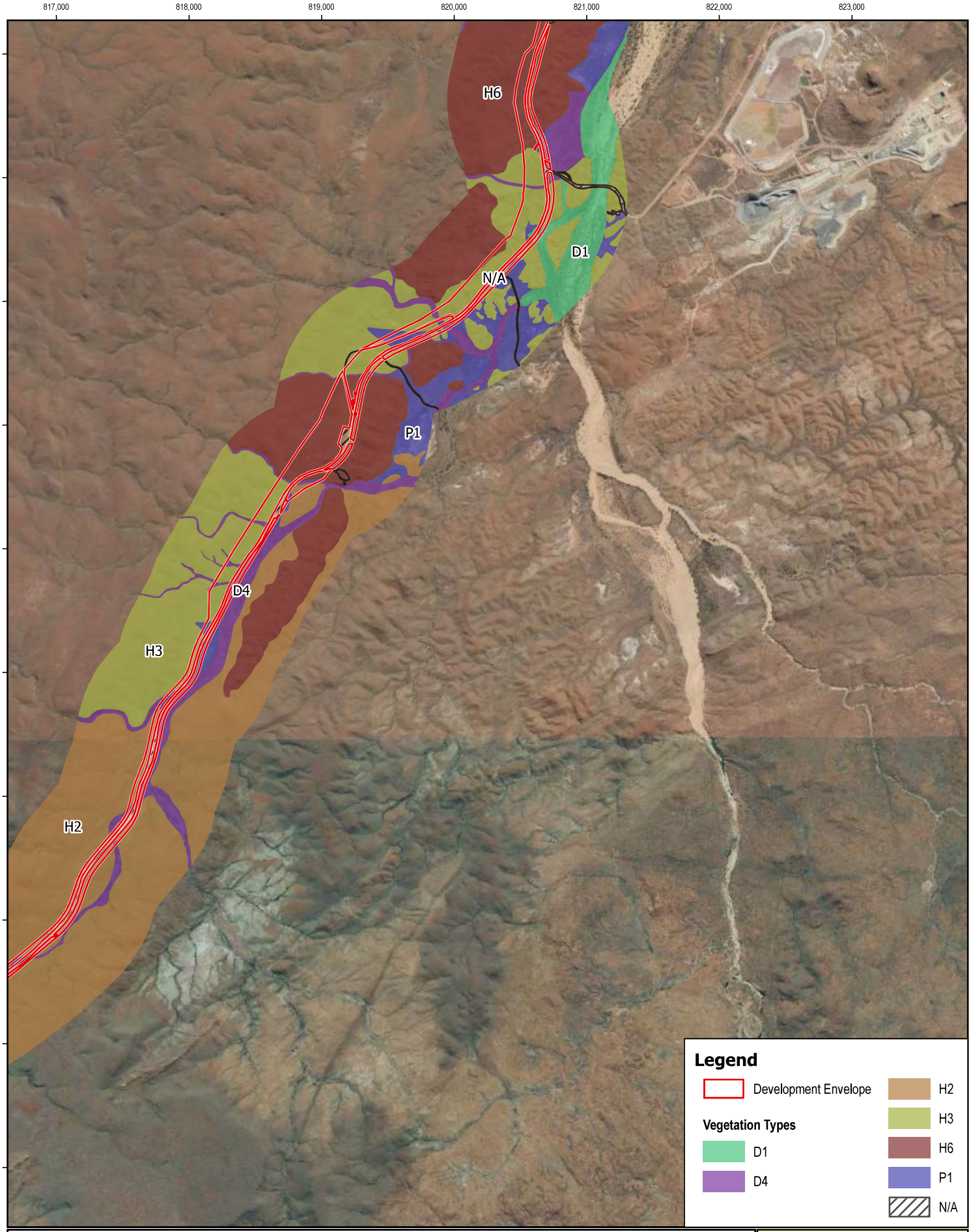

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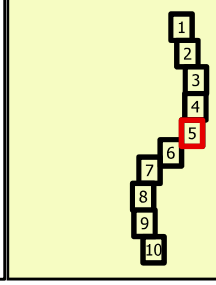
Author: c8322

Marble Bar Road Upgrade

Vegetation Types

0 0.5 1 2 Kilometres

mainroads WESTERN AUSTRALIA



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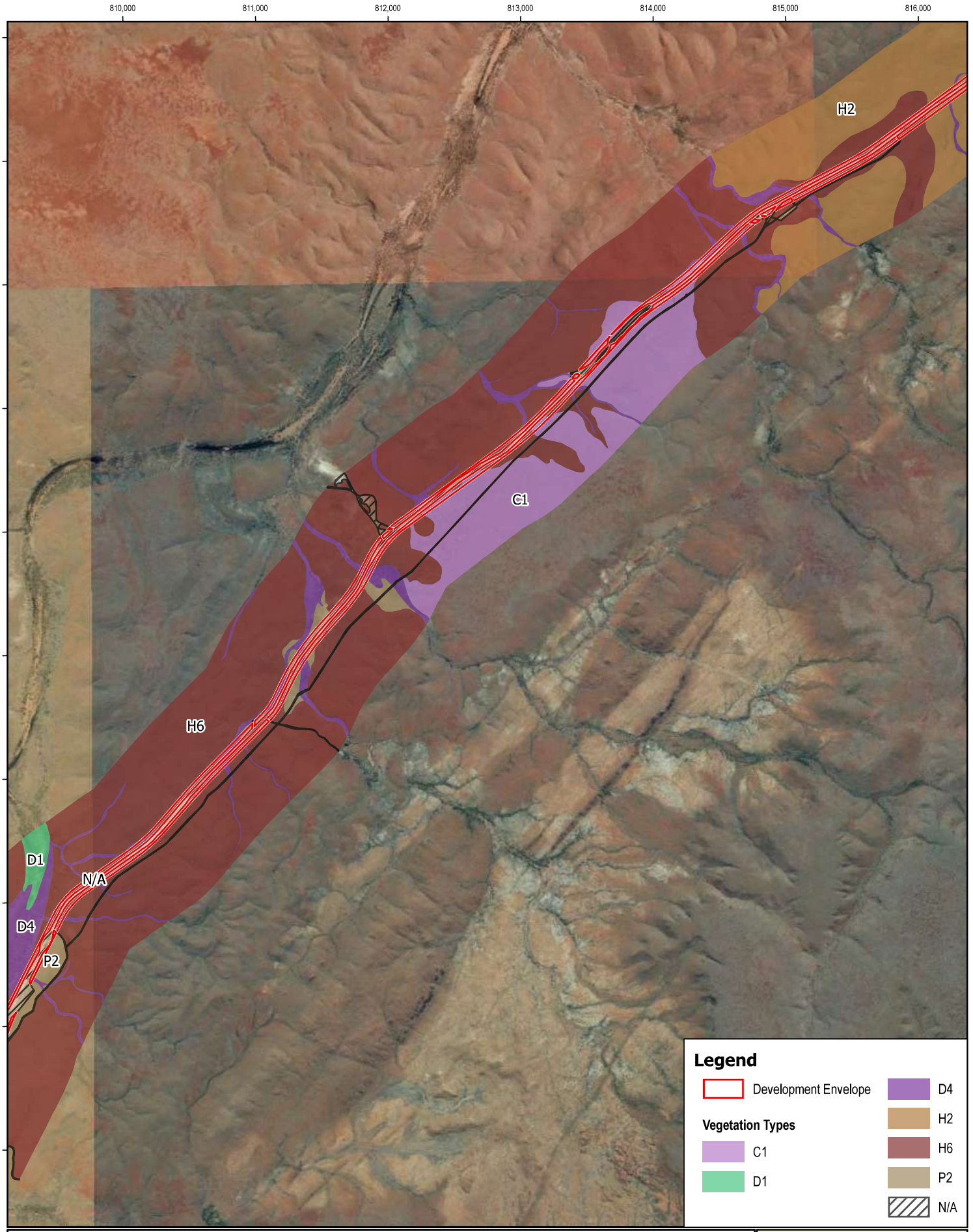

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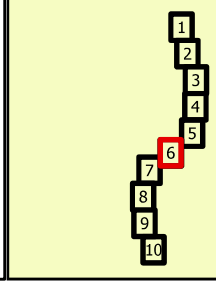
Marble Bar Road Upgrade

Vegetation Types

0 0.5 1 2 Kilometres

mainroads WESTERN AUSTRALIA



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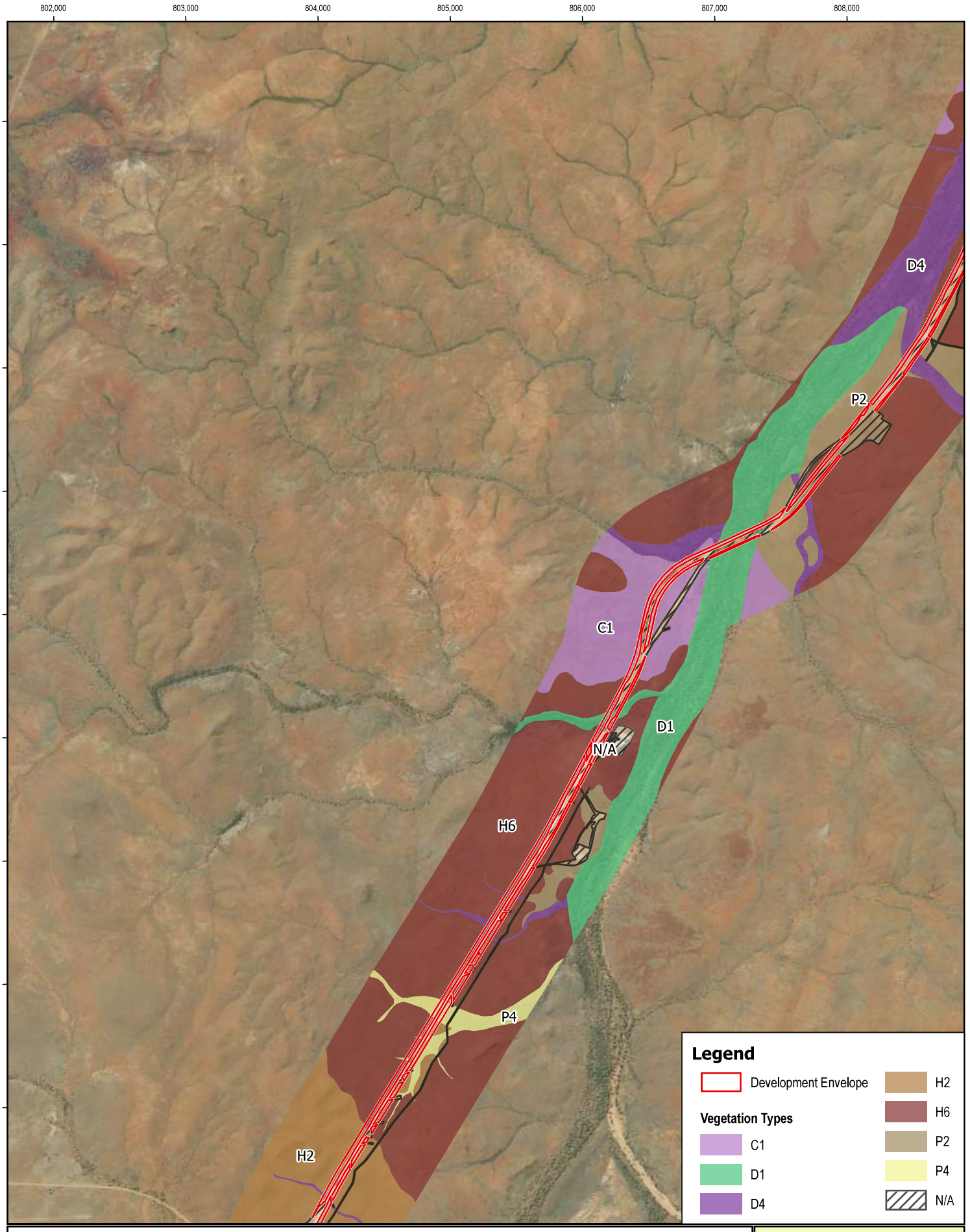

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Created Date: 20/10/2021
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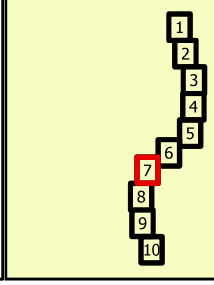
Marble Bar Road Upgrade

Vegetation Types

0 0.5 1 2 Kilometres

mainroads WESTERN AUSTRALIA



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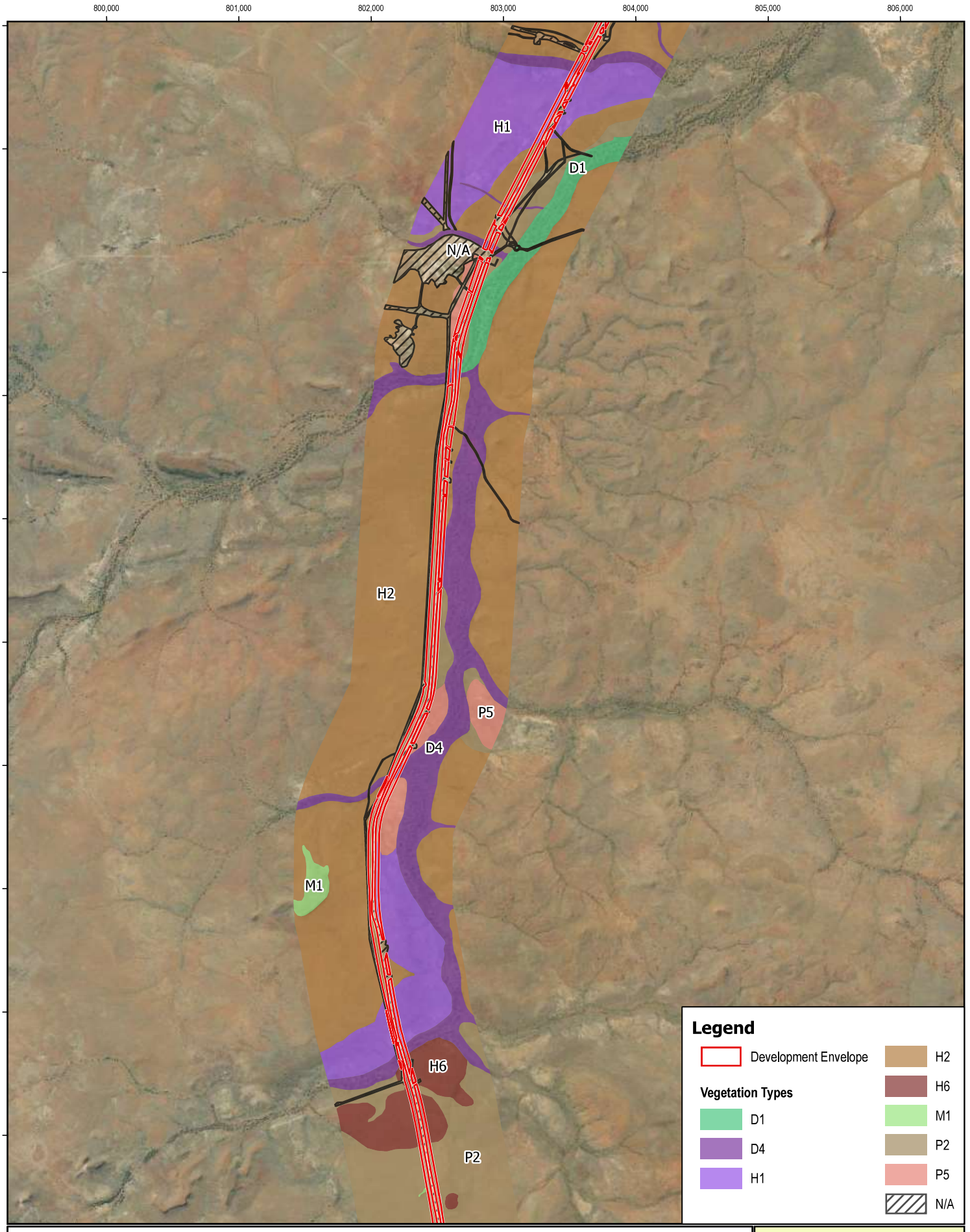

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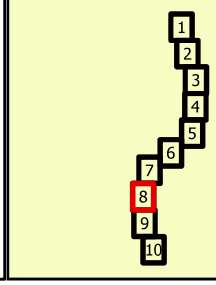
Marble Bar Road Upgrade

Vegetation Types

0 0.5 1 2 Kilometres

mainroads WESTERN AUSTRALIA



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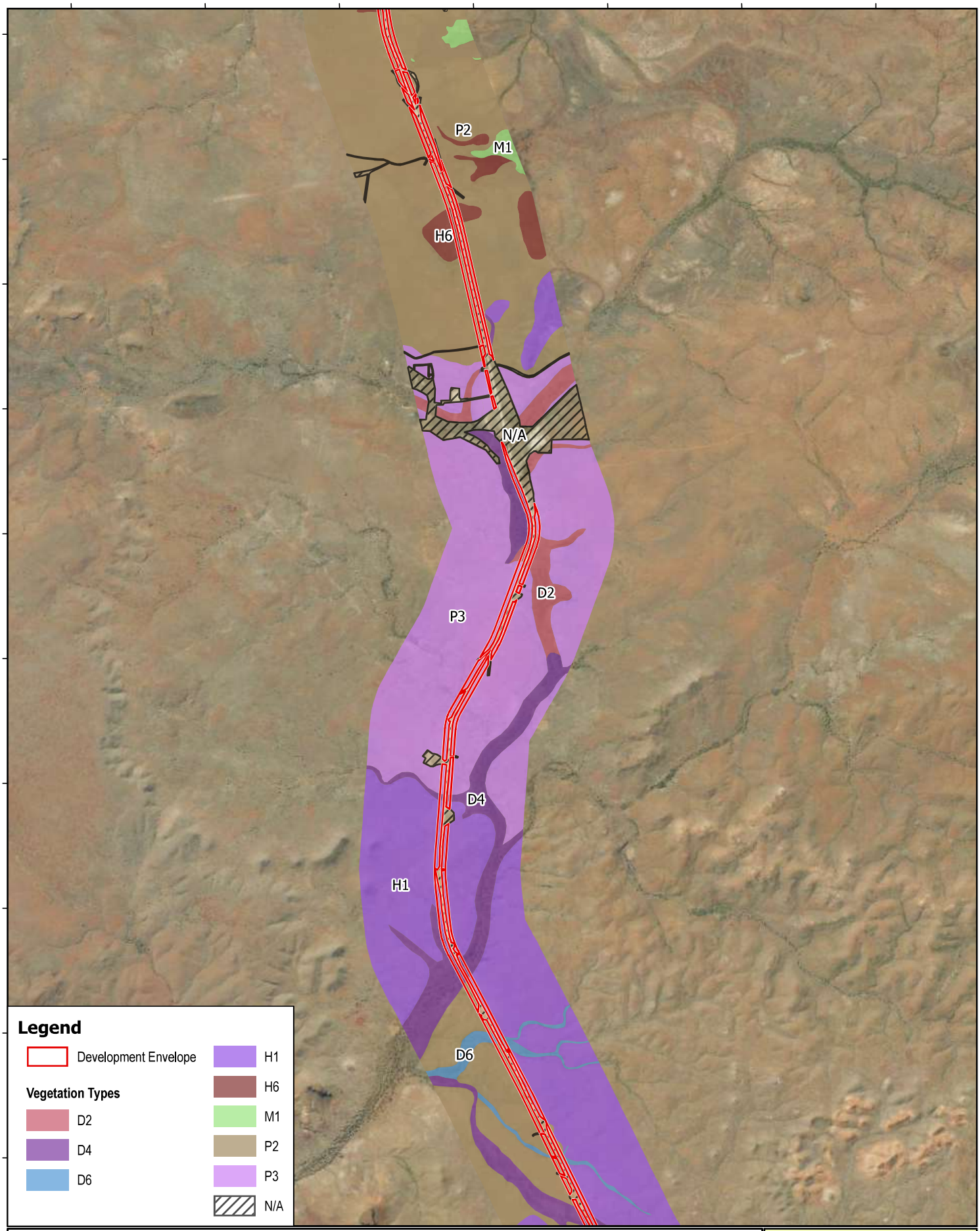

Legend

- Development Envelope

Vegetation Types

- D2
- D4
- D6
- H1
- H6
- M1
- P2
- P3
- N/A

N

Coordinate System: GCS GDA 1994
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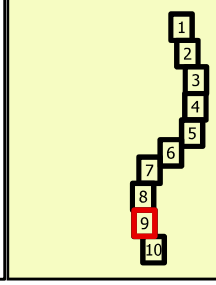
Created Date: 20/10/2021
Author: c8322

Marble Bar Road Upgrade

Vegetation Types

0 0.5 1 2 Kilometres

mainroads WESTERN AUSTRALIA



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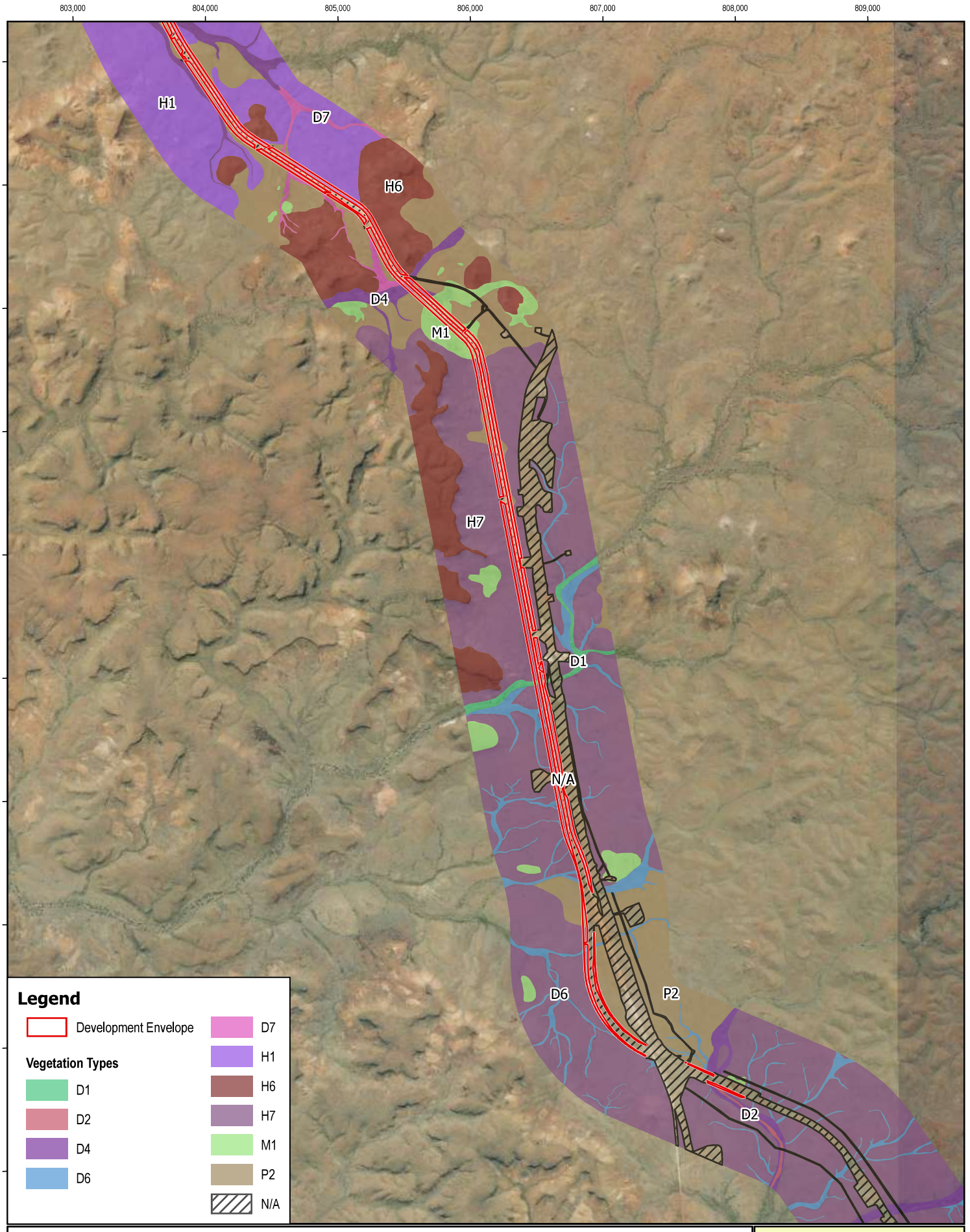

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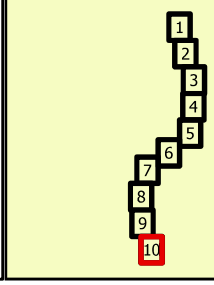
Marble Bar Road Upgrade

Vegetation Types

0 0.5 1 2 Kilometres

mainroads WESTERN AUSTRALIA



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