QUOYA ZONALIS TARGETED FLORA SURVEY

IRON BRIDGE

PREPARED FOR: IRON BRIDGE OPERATIONS

Spectrum ECOLOGY

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EXECUTIVE SUMMARY

Iron Bridge Operations Pty Ltd (IBO) continue to develop iron ore mining operations located at Iron Bridge in the Pilbara region of Western Australia (WA). IBO is a majority-owned subsidiary of Fortescue Metals Group Ltd (Fortescue), which owns and operates mining and infrastructure projects in the Pilbara.

The Iron Bridge project is located approximately 110 km south of Port Hedland and approximately 20 km to the east of the Fortescue rail line. The Iron Bridge (Stage 2 – magnetite) project is approved under Ministerial Statement 993 and comprises a mining area, slurry pipeline, infrastructure corridor, and the Canning Basin borefield and water corridor.

In order to assist in the design of access tracks and drill pads for mining exploration, and to support potential clearing applications, a targeted survey for the Threatened flora taxon, *Quoya zonalis* was undertaken at three areas across the Iron Bridge project (Map 1.1):

- Shooting Star – LUC 6213 (298 ha);
- South Star – LUC 6213 (2,233 ha); and
- Priority One Area – LUC 6523 (133 ha).

The survey was undertaken from 22 to 28 July 2021 (28 person days), during which approximately 179 km of traverses were surveyed.

Two significant flora taxa were recorded during the field assessment:

- Threatened: *Quoya zonalis;* and
- Priority 4: *Ptilotus mollis.*

Quoya zonalis (Threatened) was often recorded as groups of plants and was recorded in all Survey Areas, however, it was only commonly recorded throughout Shooting Star and the Priority One Area. It was recorded on rocky hillslopes high in the landscape, especially on mesa edges and gullies, and on granite outcrops. There were 1,825 new individuals of *Quoya zonalis* recorded within the three Survey Areas.

Ptilotus mollis (Priority 4) was recorded as large clumps of individuals, particularly along ridgelines, crests, and steep slopes. There were 1,141 individuals of *Ptilotus mollis* recorded in total, all within the South Star Survey Area.

No other significant flora taxa were recorded during the assessment.

1. INTRODUCTION

1.1. Project Background

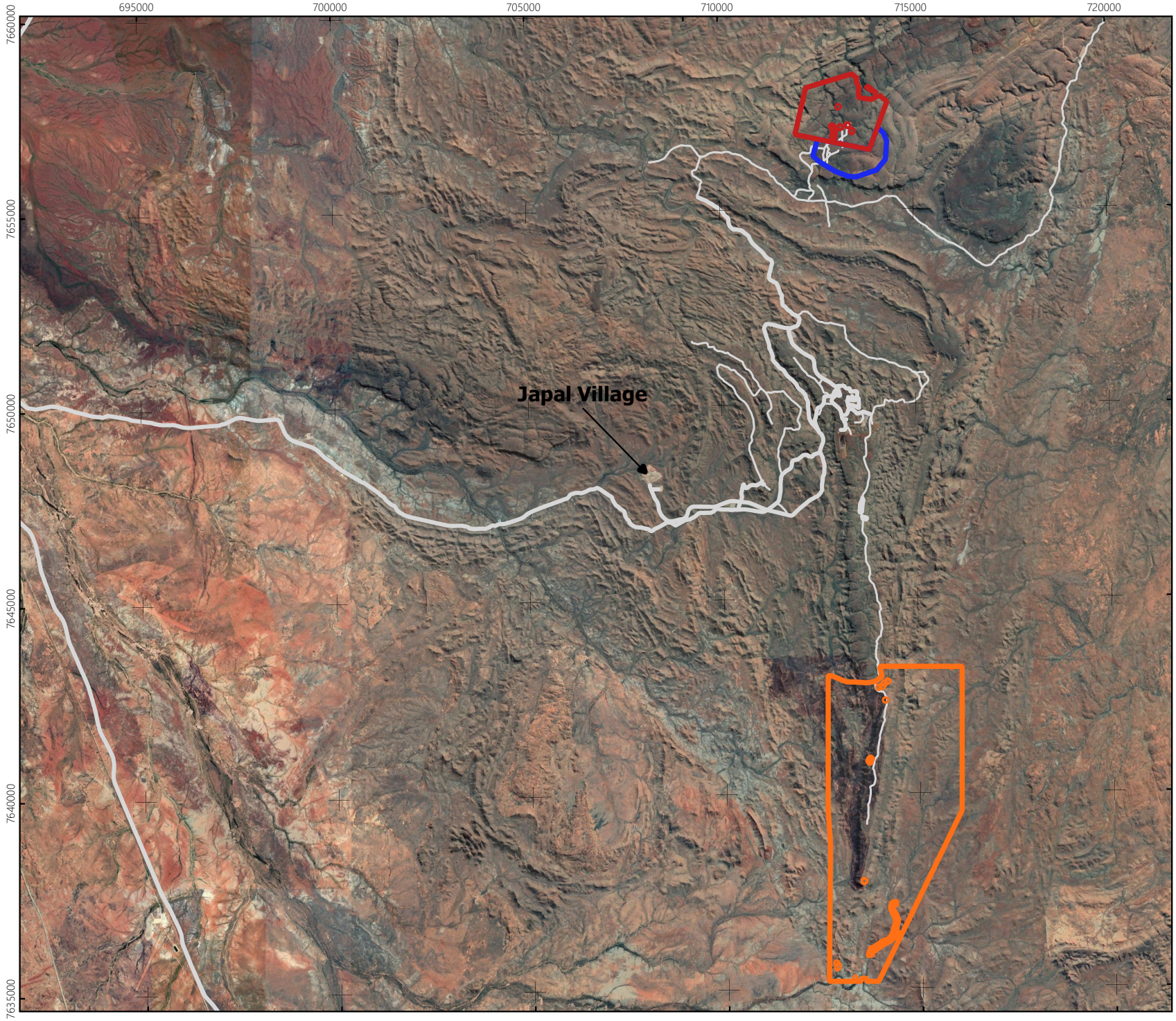
Iron Bridge Operations Pty Ltd (IBO) continue to develop iron ore mining operations located at Iron Bridge in the Pilbara region of Western Australia (WA). IBO is a majority-owned subsidiary of Fortescue Metals Group Ltd (Fortescue), which owns and operates mining and infrastructure projects in the Pilbara.

The Iron Bridge project is located approximately 110 km south of Port Hedland and approximately 20 km to the east of the Fortescue rail line. The Iron Bridge (Stage 2 – magnetite) project is approved under Ministerial Statement 993 and comprises a mining area, slurry pipeline, infrastructure corridor, and the Canning Basin borefield and water corridor.

1.2. Objectives

In order to assist in the design of access tracks and drill pads for mining exploration, and to support potential clearing applications, a targeted survey for the Threatened flora taxon, *Quoya zonalis* was undertaken at three areas across the Iron Bridge project (Map 1.1):

- Shooting Star – LUC 6213 (298 ha);
- South Star – LUC 6213 (2,233 ha); and
- Priority One Area – LUC 6523 (133 ha).



Legend

Survey Areas

- Priority One Area
- Shooting Star
- South Star

FMG Tracks

- Minor Track
- Road

N

0 1 2 3 4 km

Scale 1:145,000 @ A4

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Units: Meter

Spectrum ECOLOGY • SPATIAL

Author: Chris Shaw

Date: 27-08-2021

Quoya zonalis Targeted Survey Location

MAP

Prepared for
Iron Bridge

1.1

2. METHODS

2.1. Legislation & Guidelines

Flora and vegetation in Western Australia are protected by various legislation, including:

- The State *Biodiversity Conservation Act 2016* (BC Act);
- The Commonwealth *Environmental Protection Act 1986* (EP Act); and
- The Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This assessment is compliant with the appropriate guidelines as outlined in:

- The EPA Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (Environmental Protection Authority, 2016b).

2.2. Personnel & Licences

Spectrum Ecology staff involved with this assessment are listed in Table 2.1, along with their project involvement, years of experience, and relevant licenses.

Table 2.1: Personnel & Licences

Personnel	Role	Project Involvement	Experience	Flora & Threatened Flora Licences
Melissa Hay	Principal Botanist	Project management and report review.	12 years	FB62000006-2
Dr Chris Shaw	Botanist	Field assessment lead and reporting.	6	FB62000241 & TFL 197-2021
Dr Roberta Dayrell	Botanist	Field assessment.	8	FB2000314
Jordan Whitmore	Senior Botanist	Field assessment.	6	FB62000352
Tamara Green	Botanist	Field assessment.	1	FB62000343

2.3. Survey Timing

The targeted survey was undertaken from 22 to 28 July 2021 over 28 person days. The ideal timing for undertaking a flora survey in the Pilbara IBRA region is six to eight weeks following summer rainfall (March to May). The field survey therefore occurred in less optimal conditions for plant growth and flowering times for the region, however as the assessment was a targeted survey, appropriate survey timing is associated with being able to detect and identify the target species. *Quoya zonalis* is a perennial shrub that is present and identifiable regardless of season and was therefore detectable during the survey.

2.4. Field Methods

2.4.1. Sampling Effort

The field assessment was undertaken by conducting traverses across the three Survey Areas. A total of 179 km of traverses were undertaken. The traverses have been mapped on Map 3.1 and Map 3.2.

2.4.2. Traverses

Traverses were linear where the terrain allowed (i.e. flat areas), with the botanist detouring from a straight line in order to investigate plants or areas of habitat of particular interest, before returning, in a forward trajectory. Where the terrain was difficult to traverse (i.e. steep hills, cliffs, and gullies), the traverses generally followed the safest path which was often the ridge top, or the gully base.

Traverse spacing was undertaken at an appropriate distance for each area (i.e. areas with a higher likelihood of recording *Quoya zonalis* were traversed at a spacing in order to record all individuals present). The maximum spacing between traverses was approximately 200 m and this was only undertaken in areas

considered to have a low likelihood of recording *Quoya zonalis*. Areas not considered appropriate habitat were not walked.

2.4.3. Recording Significant Flora & Vegetation

When *Quoya zonalis* was encountered, the survey intensity surrounding that point was increased to search for additional individuals and to delineate the population. When other significant flora taxa were encountered, (i.e. P1 to P4, and other significant flora as defined by EPA (2016a), they were opportunistically recorded along the traverse.

Quoya zonalis (Threatened) was recorded at an individual plant level where possible (i.e. a GPS co-ordinate for each plant). Other significant flora taxa were recorded as a population estimate and extent, with every sub-population, (i.e. discrete group of plants), recorded as a GPS co-ordinate and a count or estimation of individual plants. When significant flora taxa were encountered sufficient information was collected to be compliant with the requirements of the Threatened and Priority flora report form, and included:

- Taxon, conservation status;
- Observation date;
- Observer, role, organisation;
- Description of location, land tenure;
- GPS coordinates;
- Abundance count; count method;
- Reproductive state (of collected specimens);
- Condition of population;
- Habitat information;
- Vegetation classification; and
- Condition of habitat, fire history etc.

2.4.4. *Quoya zonalis*

Quoya zonalis (Threatened) was recorded on steep upper slopes, ridges, and gullies. Due to its light white/grey appearance and growth on bare rocky outcrops, it was clearly seen from a distance of up to 100 to 150 m in most areas (Plate 2.1). Traverses conducted in areas targeting *Quoya zonalis* were restricted to where the botanists could safely walk and therefore the spacing was approximately 200 m.

To ensure all individuals were recorded, the botanist undertook a visual inspection covering the area between the traverses being walked (i.e. the mid and upper slope of the hills across the gully were visually inspected from each side). Areas were more thoroughly searched that had a higher likelihood of occurrence, (i.e. gullies, mesa edges etc.), and in areas that could potentially be visually obscured. Visual inspections were also undertaken from all vehicle tracks. Previous records of *Quoya zonalis* within the Survey Areas were confirmed and checked for additional individuals.

Quoya zonalis was recorded to an individual plant level where safe to do so, however often it was recorded as a number of individuals per location (approximately a 5x5 m area) due to the high numbers of individuals and/or unsafe terrain. In some instances where the terrain was too dangerous to walk, records were taken by estimating the location based on the distance from the botanist and estimating the number of plants (see Plate 2.1). These estimated records have been noted in the electronic data provision.

Plate 2.1: *Quoya zonalis* on Steep Slope (Left & Mid) & Recorded from Across Gully (Right)

Table 2.2: Database Sources

Data Source	Custodian	Details
Australasian Virtual Herbarium	Council of Heads of Australasian Herbaria (CHAH)	Date: 14/10/2020
Commonwealth Protected Matter Search Tool (PMST)	Department of the Environment and Energy (DoEE)	Date: 15/10/2020 Buffer: 20 km
Threatened & Priority flora database (WAH/TPFL)	DBCA	Date: 15/10/2020; Buffer: 80 km; Reference: 35-01020FL
Index of Biodiversity Surveys of Assessments (IBSA) database.	Department of Water and Environmental Regulation (DWER)	Date: 14/10/2020, Buffer: 30 km
Fortescue Database	Fortescue Metals Group (Fortescue)	Date: 12/10/2020
Ecologia (Ecologia Environment, 2016) Water Corridor Targeted Flora Survey	Fortescue Metals Group (Fortescue)	Date: 08/07/2016
Spectrum Ecology (2020) Targeted Flora and Vegetation Survey, Iron Bridge	Fortescue Metals Group (Fortescue)	Date: 16/12/2020
Spectrum Ecology (2021) *Quoya zonalis* Targeted Flora Survey, Iron Bridge	Fortescue Metals Group (Fortescue)	Date: 01/02/2021

2.4.5. Spatial Data Provision

Any data collected and processed has been provided electronically as excel spreadsheets and shapefiles and are compliant with FMG/IBO data requirements. Data provided electronically include:

- Flora species location and information;
- Sampling locations and information (traverses); and
- Photographs taken during the field survey.

2.5. Survey Limitations

Survey specific limitations and constraints for the *Quoya zonalis* targeted flora assessment are discussed in Table 2.3.

Table 2.3: Limitations & Constraints

Limitation	Comment
Availability of contextual information at a regional and local scale.	Previous records of *Quoya zonalis* were provided to Spectrum Ecology prior to the field survey. These were re-visited and checked to ensure the number of individuals were accurate.
Competency/experience of the team carrying out the survey, including experience in the bioregion surveyed.	Field survey team leader Christopher Shaw has 6 years' experience in conducting botanical surveys throughout Western Australia including a previous targeted flora survey at Iron Bridge. Botanists Roberta Dayrell, Jordan Whitmore, and Tamara Green have sufficient experience in conducting targeted flora surveys.
Restrictions to, or functionality of survey equipment and tools to complete the flora and vegetation assessment.	Equipment supplied was sufficient for the survey and there were no functionality or access issues with equipment and tools used during the survey.
Survey effort and extent.	The Survey Area was comprehensively surveyed for *Quoya zonalis* except the areas described below that were restricted.
Access restrictions within the Survey Area.	There were several areas not included within the LUC (heritage sites) and these were not entered (Map 3.1 and Map 3.2). Only one area with potential habitat for *Quoya zonalis* could not be surveyed in the time available and is indicated in Map 3.1 (this area was added to the scope post commissioning).
Survey timing, rainfall, season of survey.	While the survey was undertaken at a period not optimal for flora and vegetation surveys undertaken in the Pilbara, *Quoya zonalis* is detectable throughout the year due to its perenniality and ability to be identified using vegetation material.
Disturbance that may have affected the results of survey such as fire, flood or clearing.	No disturbances, including fire, were recorded at the Survey Area that would have affected the survey results.

3. RESULTS & DISCUSSION

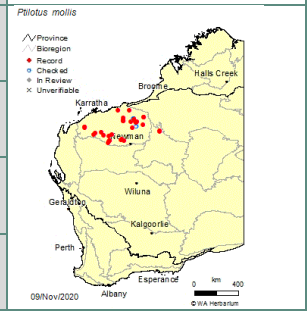
3.1. Significant Flora

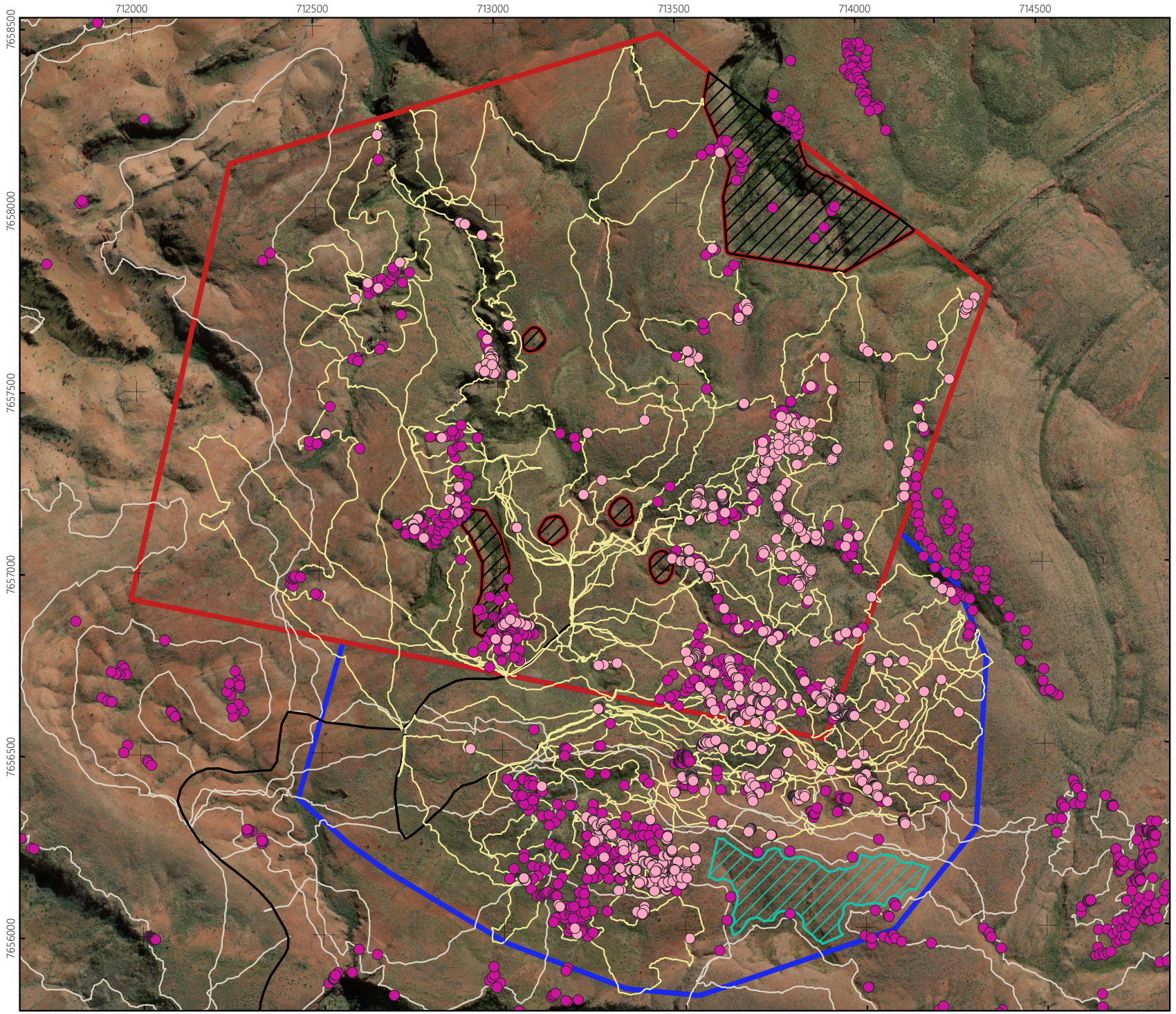
The Threatened taxon, *Quoya zonalis*, was often recorded as groups of plants and was recorded in all three Survey Areas, however, it was only common throughout Shooting Star and the Priority One Area. It was recorded on rocky hillslopes high in the landscape, especially on mesa edges and gullies, and on rocky granite outcrops. All of the previous records of *Quoya zonalis* that were accessible in the Survey Areas and not recorded by Spectrum Ecology (2020; 2021) were verified.

Opportunistically, the Priority 4 taxon, *Ptilotus mollis* was also recorded during the assessment as large clumps of individuals, particularly along ridgelines, crests, and steep slopes within the South Star Survey Area. No other significant flora as defined by EPA (2016a) were recorded in the survey.

These significant flora taxa are described in Table 3.1 and locations are presented in Map 3.1 and Map 3.2. Coordinates were provided electronically with the report.

Table 3.1: Significant Flora Recorded During the Assessment

Taxon		Description	Landforms in Survey Areas	Number of Plants Area	Inside	Outside	Total	Regional Distribution	Photograph
T	*Quoya zonalis*	Shrub to 1 m high. Densely hairy, light grey/white foliage. Flowers pink/white.	High in the landscape. Mesa edges, gullies, rocky outcrops, steep upper slopes.	Shooting Star	1,085	0	1,085		
				South Star	92	0	92		
				Priority One Area	648	0	648		
				Total:	1,825	0	1,825		
P4	*Ptilotus mollis*	Compact, perennial shrub, to 0.5 m high, soft grey foliage. Flowers white/pink.	Steep upper ironstone slopes and gullies.	Shooting Star	0	0	0		
				South Star	1,062	79	1,141		
				Priority One Area	0	0	0		
				Total:	1,062	79	1,141		



Legend

Survey Area

- Shooting Star
- Priority One Area

Areas Not Surveyed

- Excluded from LUC
- Under Surveyed

Tracks

- Current Foot Traverse
- Previous Foot Traverse
- Vehicle Tracks

Quoya Zonalis (T)

- Current Survey
- Previous Records

Other Significant Flora

- Ptilotus mollis (P4)

N

0 0.1 0.2 0.3 km

Scale 1:15,500 @ A4

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Units: Meter

Spectrum ECOLOGY • SPATIAL

Author: Chris Shaw

Date: 27-08-2021

Significant Flora & Traverses – Shooting Star & Priority One Area

MAP

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Iron Bridge

3.1

Legend

Survey Area

South Star

Areas Not Surveyed

Excluded from LUC

Tracks

Current Foot Traverse

Vehicle Tracks

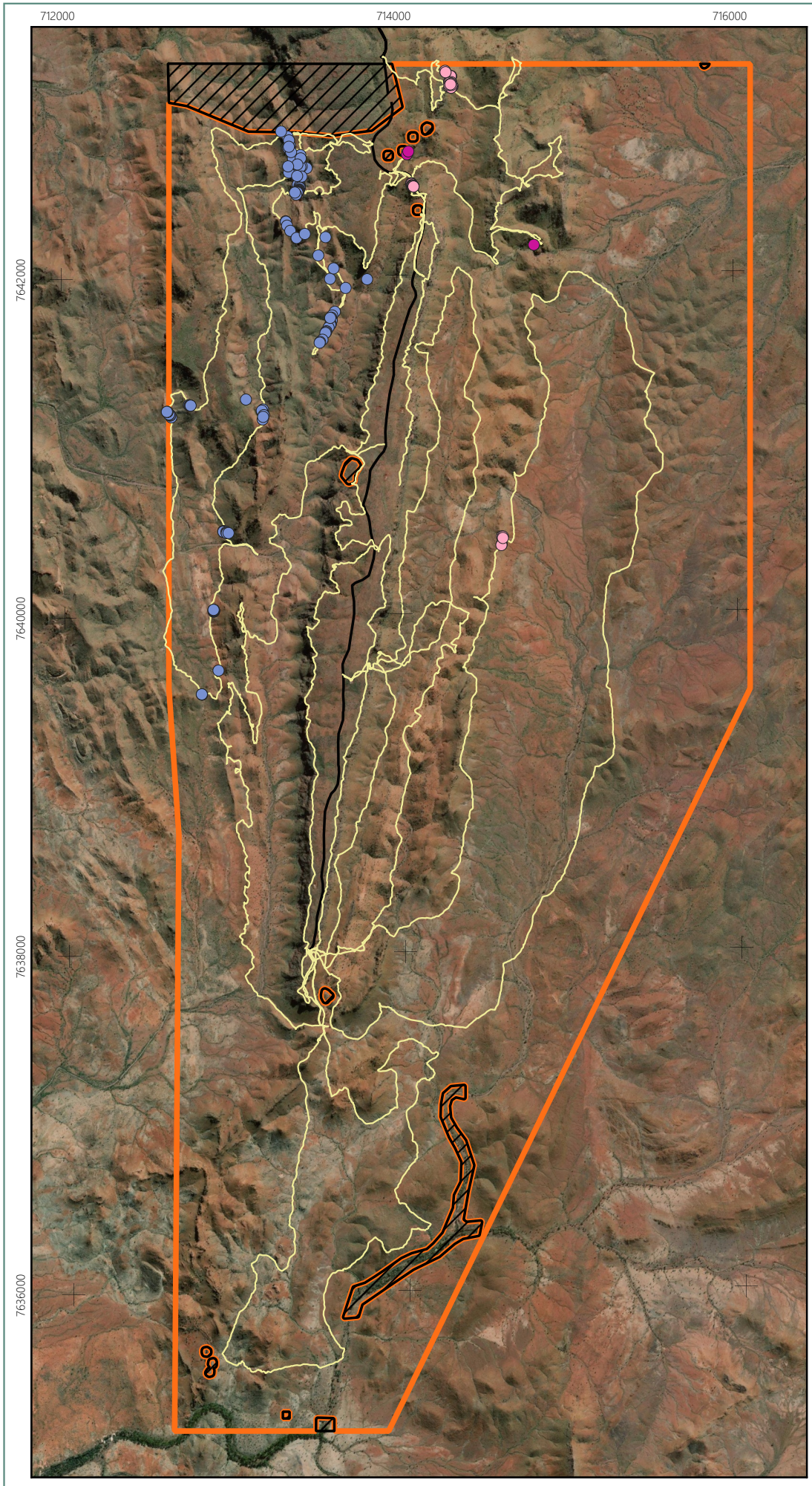
Quoya Zonalis (T)

Current Records

Previous Records

Other Significant Flora

Ptilotus mollis (P4)



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N

0 0.5 1 1.5 km

Scale 1:35,800

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Units: Meter

Author: Chris Shaw

Date: 27-08-2021

Significant Flora & Traverses – South Star

Prepared for Iron Bridge

MAP 3.2

4. CONCLUSION

A comprehensive targeted survey for the Threatened flora taxon *Quoya zonalis* was undertaken across all three survey areas.

Quoya zonalis (Threatened) was often recorded as groups of plants and was commonly recorded throughout Shooting Star and the Priority One Area. It was recorded on rocky hillslopes high in the landscape, especially on mesa edges and gullies, and on rocky granite outcrops. There were 1,825 individuals of *Quoya zonalis* recorded within the three Survey Areas.

Ptilotus mollis (Priority 4) was recorded as large clumps of individuals, particularly along ridgelines, crests, and steep slopes within South Star. There were 1,062 individuals of *Ptilotus mollis* recorded within the South Star Survey Area.

No other significant flora taxa were recorded during the assessment.

5. REFERENCES

Department of Biodiversity Conservation and Attractions (2017) 'Priority Ecological Communities for Western Australia Version 27'. Species and Communities Branch, Department of Biodiversity, Conservation and Attractions.

Department of Biodiversity Conservation and Attractions (2019) 'Conservation Codes for Western Australian Flora and Fauna'. Department of Parks and Wildlife.

Ecologia Environment (2016) *North Star Water Corridor Targeted Flora and Vegetation Assessment*. Unpublished Report for FMG Iron Bridge.

Environmental Protection Authority (2016a) 'EPA Environmental Factor Guideline: Flora and Vegetation'. Western Australia: EPA.

Environmental Protection Authority (2016b) 'EPA Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment'. Western Australia: EPA.

Spectrum Ecology (2020) *Targeted Flora and Vegetation Survey, Iron Bridge*.

Spectrum Ecology (2021) *Quoya zonalis Targeted Flora Survey, Iron Bridge*.

Appendix A: Conservation Codes & Significant Definitions

Appendix A1: Definitions of Conservation Categories under the EPBC Act

Category	Definition
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	A native species is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable	A native species is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered, or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Appendix A2: Definitions of Priority Species Classification (DBCA 2019)

Priority species: Possibly Threatened species that do not meet survey criteria or are otherwise data deficient, are added to the Priority flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as Threatened flora.
Species that are adequately known, are rare but not Threatened, or meet criteria for near Threatened, or that have been recently removed from the Threatened species, are placed in Priority 4. These species require regular monitoring.
Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Category	Definition
P1	**Priority 1: Poorly-known species** Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2	**Priority 2: Poorly-known species** Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
P3	**Priority 3: Poorly-known species** Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	**Priority 4: Rare, Near Threatened and other species in need of monitoring** (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently Threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of Threatened species during the past five years for reasons other than taxonomy

Appendix A3: Significant Flora & Vegetation Definitions

Significant flora can include (Environmental Protection Authority, 2016a):

- Being identified as Threatened: Critically Endangered, Endangered or Vulnerable (state listed BC Act and/or nationally listed EPBC Act);
- Being identified as Priority flora species: Priority 1 to 4 (Department of Biodiversity Conservation and Attractions, 2019);
- Locally endemic or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems);
- New species or anomalous features that indicate a potential new species;
- Representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- Unusual species, including restricted subspecies, varieties or naturally occurring hybrids; or
- Relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

Significant vegetation can include (Environmental Protection Authority, 2016a):

- Threatened Ecological Community (TEC): Critically Endangered, Endangered or Vulnerable (state listed BC Act and/or nationally listed EPBC Act);
- Priority Ecological Community (PEC): Priority 1 to 5 (Department of Biodiversity Conservation and Attractions, 2017);
- Restricted distribution;
- Degree of historical impact from threatening processes;
- A role as a refuge; or
- Providing an important function required to maintain ecological integrity of a significant ecosystem.