To: Mr Matt Blacklow, Senior Environmental Advisor

From: Shenade Findlay, Botanist

Date: 15 June 2022

Scope: Determination of potential impacts to flora, vegetation and fauna to support a Native Vegetation Clearing Permit amendment application.

Dear Mr Matthew Blacklow,

Phoenix Environmental Sciences (Phoenix) is pleased to present this report summarising results of the field surveys and desktop assessments conducted for the Wonmunna Iron Ore Project (WIOP), that will be used to support a Native Vegetation Clearing Permit amendment application.

1 INTRODUCTION

Mineral Resources Limited (MRL) is seeking to expand the WIOP, located approximately 70 km WNW of the town of Newman, Western Australia (Figure 1). WIOP has an already approved mining operation under the following Department of Mines, Industry Regulation and Safety (DMIRS) Mining Proposals (MPs); Registration ID: 53252, Registration ID: 82535 and the most recent MP Addendum, Registration ID: 94408 (Figure 1).

A current Native Vegetation Clearing permit (purpose permit) is in effect for WIOP, CPS 6216/2 (DMIRS 2014), that allows for the clearing of up to 555 ha within the approved permit area (Figure 1).

MRL is seeking an amendment to CPS 6216/2 to clear up to an additional 300.5 ha of native vegetation on top of the approved 555 ha. There have also been some revisions to the proposed WIOP layout. The current and revised disturbance footprints are shown in Figure 1. The revised WIOP disturbance footprint is 818.5 ha; however, MRL is seeking approval to clear up to 850 ha to allow for the additional installation of non-key mine activities within the permit area. The revised disturbed footprint is located entirely within the original permit area.

Phoenix was engaged by MRL in February 2022 to undertake a review of the potential impacts to flora, vegetation and fauna from the proposed increase in clearing (555 ha to 850 ha) and WIOP layout changes. The review was required to support an amendment application for CPS 6216/2.

2 SCOPE

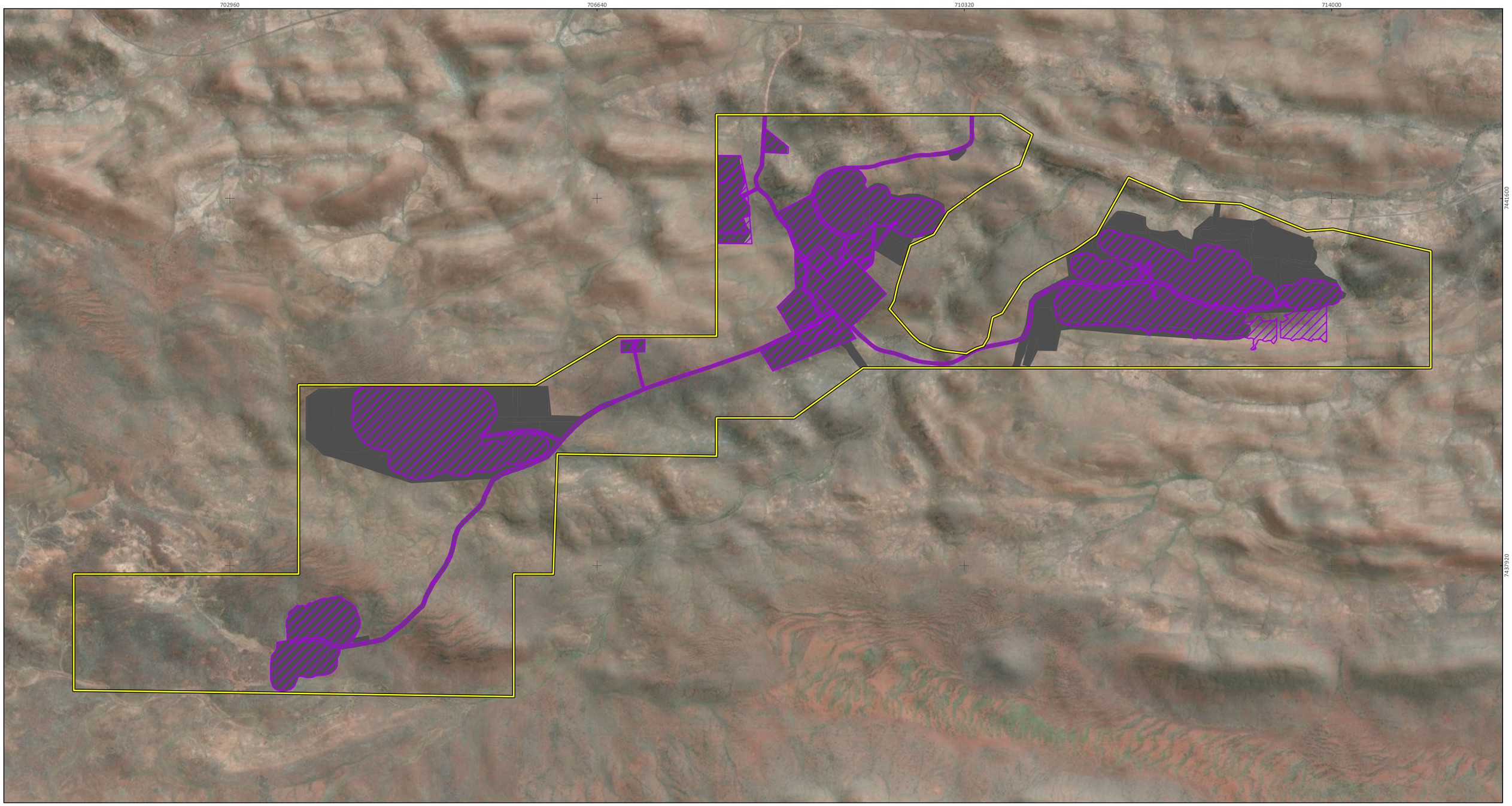
The specific scope of works was:

- complete an assessment against the ten clearing principles
- provide a table of impacts to populations significant fauna, fauna habitat, flora and vegetation
- prepare figures showing locations of any significant flora, fauna, vegetation or fauna habitat and other environmentally significant aspects (e.g., riparian vegetation, conservation reserves and Weeli Wolli Spring priority ecological community).
- provide a consolidated index of biodiversity surveys for assessments (IBSA) data pack.

3 SUMMARY OF SURVEYS CONDUCTED FOR WIOP

Previously conducted field surveys and desktop assessments for WIOP include:

- Level 2 short-range endemic (SRE) invertebrate survey (Phoenix 2011, 2014a)
- Level 2 flora and vegetation survey (G&G Environmental 2011)
- Level 2 vertebrate fauna survey (Phoenix 2012a, 2014b)
- Troglofauna survey (Phoenix 2014c)
- Targeted fauna survey (Phoenix 2012b)
- Flora and fauna desktop review (Phoenix 2021b)
- Targeted flora survey (Phoenix 2021c).
- Reconnaissance survey for southern haul road (Phoenix 2022, in prep).



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Wonmunna Iron Ore Project

Project No	1489-MRL-NVCP-BOT
Date	14/06/2022
Drawn by	BK
Map author	SF

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Kilometers

1:36,800 (at A3) GDA 1994 MGA Zone 50

6216/2 Permit area

Currently approved DMIRS footprint

Revised clearing footprint

Figure 1

Permit area and revised clearing footprint

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4 DETERMINATION OF POTENTIAL IMPACTS TO FLORA, VEGETATION AND FAUNA

Impacts to flora, vegetation and fauna in the revised disturbance footprint are expected to be the clearing of up to 850 ha of land (Figure 1) containing:

- up to 850 ha of native vegetation
- up to 268 native flora species
- three significant priority species
    - *Seringia exastia* (CR)
    - *Eremophila pusilliflora* (P2)
    - *Acacia subtiliformis* (P3)
- a total of 13 vegetation communities, ranging in condition from Excellent to Pristine
- five vegetation communities considered significant due to a high species diversity, restricted occurrence within the survey area or as habitat for significant flora
    - AW1 – A low to mid *Acacia aptaneura*, *A. distans* and *A. pruinocarpa* woodland over isolated mid to tall *Eremophila forrestii* subsp. *forrestii*, *E. fraseri* and *Anthobolus leptomerioides* shrubs to open shrubland over a low mixed *Triodia melvillei*, *T. pungens* and *T. wiseana* open grassland to grassland with *T. melvillei* frequently dominant.
    - C1 – Isolated mid *Eucalyptus camaldulensis* trees to mid *E. camaldulensis* woodland over isolated low trees to low *Acacia citrinoviridis* and *Eucalyptus xerothermica* woodland over isolated mixed tall shrubs to tall shrubland frequently with *Gossypium sturtianum* and *Petalostylis labicheoides* shrubs over a mixed low to mid grassland of *Eulalia aurea, Themeda triandra* and *Triodia* spp.
    - M4 – Isolated low *Eucalyptus leucophloia* trees and *E. gamophylla* mallee to low open woodland over isolated tall mixed *Acacia* spp. And *Petalostylis labicheoides* shrubs to open shrubland over isolated low mixed shrubs to low open shrubland with *Gompholobium polyzygum, Dampiera candicans* and *Goodenia scaevolina* common over a *Triodia pungens* and *T. wiseana* hummock grassland with pockets of a low *Acacia distans* and *Eucalyptus leucophloia* woodland over isolated tall mixed shrubs and isolated clumps of *Triodia pungens* hummocks on steep rocky slopes near the crest of plateaus and isolated mid *Eucalyptus leucophloia* trees over a low *E. repullulans* mallee and tall *Petalostylis labicheoides* shrubland over *Triodia longiceps* and *T. pungens* mid hummock grassland in drainage lines.
    - S1 – Isolated low *Acacia aptaneura* trees over isolated mid to tall *Acacia tetragonophylla* shrubs to open shrubland over isolated low to mid *Eremophila lachnocalyx* shrubs to mid shrubland over a low to mid mixed tussock grassland, frequently with *Aristida latifolia, Eragrostis xerophila* and *Astrebla pectinata*.
    - SS1 – Isolated low trees, frequently *Corymbia hamersleyana* and *Acacia inaequilatera* over isolated low to tall mixed shrubs with *Acacia* spp., *Grevillea wickhamii* and *Hakea chordophylla* common over isolated low *Indigofera rugosa* shrubs in a low *Triodia brizoides* hummock grassland with isolated clumps of *Themeda triandra* in drainage foci.

- one Priority fauna species, Western Pebble-mound Mouse (*Pseudomys chapmani*; Priority 4)
- two significant fauna habitats (463.7 ha), for the Western Pebble-mound Mouse (*Pseudomys chapmani*; Priority 4).
    - Mallee woodland
    - Spinifex steppe.

4.1 FIELD SURVEY RESULTS

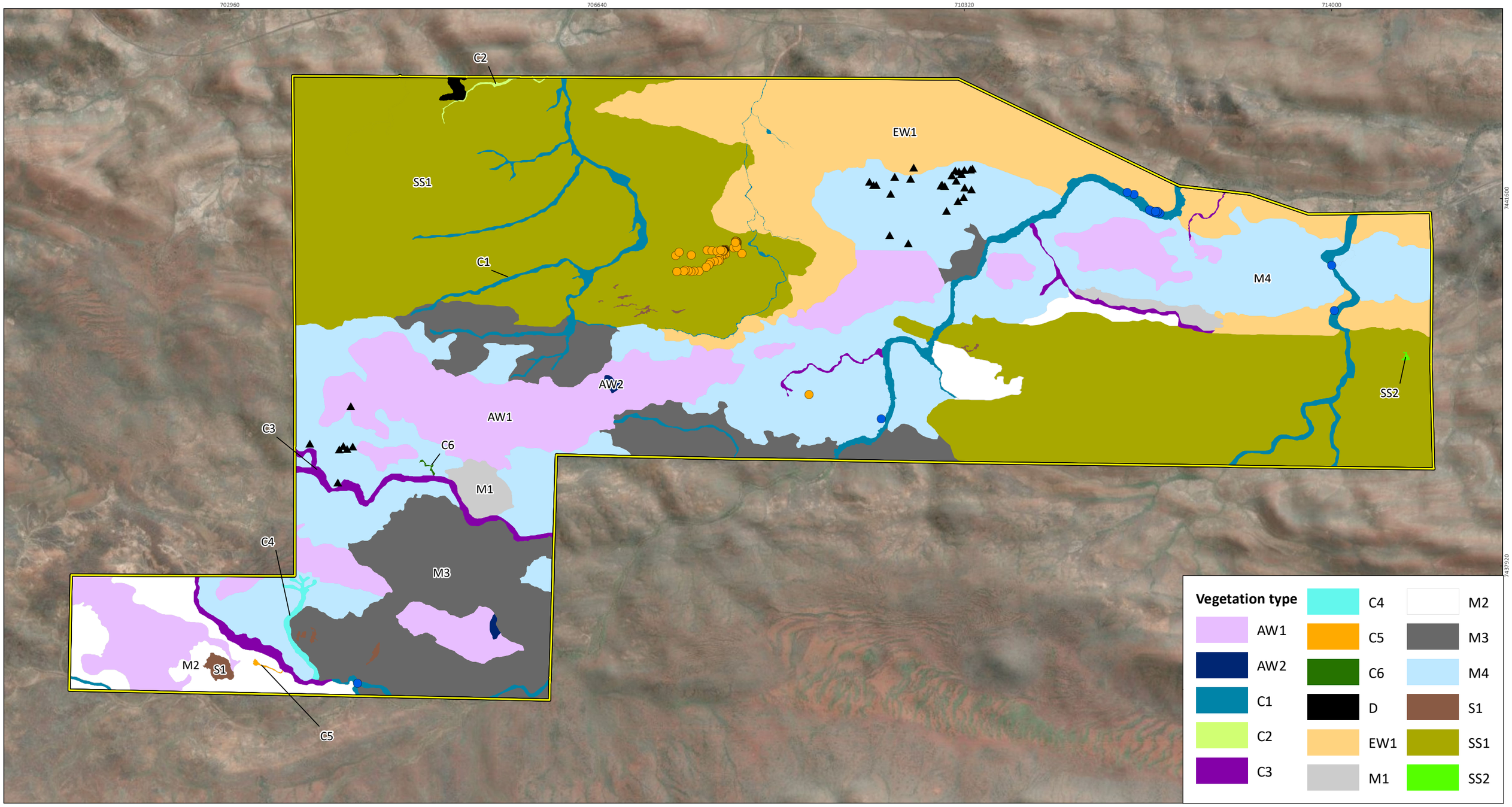
4.1.1 Vegetation types

A total of 17vegetation types were mapped by G&G Environmental (2011); of these, 15 occur within the permit area. No vegetation type is restricted to the permit area or the revised disturbance footprint (Table 1; Figure 2).

Table 1 Proportional impacts of vegetation types recorded for the WIOP

Vegetation type[1]	Survey area	Permit area	Portion within the revised disturbance footprint[2]	
			ha	%
AW1	580.0	248.0	118.5	20.4
AW2	3.7	1.9	-	-
C1	119.8	17.2	0.3	0.3
C2	1.9	-	-	-
C3	48.5	3.3	6.8	14.0
C4	7.1	3.5	1.9	27.0
C5	0.5	0.3	0.1	9.6
C6	0.4	0.2	0.2	52.5
D	4.0	-	-	-
EW1	598.8	174.9	46.8	7.8
M1	41.8	21.2	13.4	31.9
M2	153.2	63.2	11.9	7.8
M3	526.6	167.5	18.5	3.5
M4	1,054.7	372.9	164.4	15.6
S1	9.1	3.7	0.6	6.6
SS1	1,676.3	132.6	28.8	1.7
SS2	0.4	0.2	-	-
Total	**4,826.3**	**1,230.3**	**813.0**	NA

[1]Vegetation mapping completed by G&G Environmental (2011).
[2]Proportion to be disturbed within the total area of the current revised disturbance footprint (includes some areas within the already approved footprint).



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Survey area

Status

- CR (BC Act)
- P2 (DBCA list)
- P3 (DBCA list)

Figure 2

Vegetation mapping (G&G Environmental) and significant flora records from the field surveys

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4.1.2 Significant flora

Phoenix (2021c) recorded five significant flora species for the WIOP: one Threatened species, three Priority 2 species and 1 Priority 3 species. Of these, three species occur within the revised disturbance footprint: *Seringia exastia* (CR), *Eremophila pusilliflora* (P2) and *Acacia subtiliformis* (P3). Florabase records provide regional context for each of the significant species found during the Phoenix survey; however, exact population numbers are not always recorded (DBCA 2021a). While exact regional population and plant numbers are not available, it is worth noting that the number of individual plants within the revised disturbance footprint is minimal, and each species is well represented outside of the disturbed footprint (Table 2; Figure 2).

Table 2 Regional context for significant flora records of the WIOP

Species	Habitat	Phoenix survey records		Florabase records		No. of plants to be disturbed
		No. plants	Veg. types	No. records	Population records	
Seringia exastia (CR) [1]	Plains in open woodlands and shrublands over hummock grasses.	2,234	M4 366.4 ha	289	2,000 1,000 6-20 Abundant Common	691 plants
Aristida lazaridis (P2)	Plains and floodplains in sand to loam soils in *Acacia* woodlands and hummock grasslands.	2	C1 14.6 ha	22	500 25 6 1-5 Occasional Common	none
Eremophila pusilliflora (P2)	Plains in sandy loam to loamy clay soils in *Acacia* woodlands and hummock grasslands.	1	AW1 47.5 ha	20	100's 50+ 50 10 3 1 Infrequent Common	1
Oxalis sp. Pilbara (P2)	Rocky hillslopes, gorges and drainage lines in woodlands and hummock grasslands.	35	C1 12.0 ha	15	5 2-5 Common	none
Acacia subtiliformis (P3)	Rocky hills, plains frequently associated with calcrete in woodlands and shrublands over hummock grasslands.	108	SS1 82.7 ha	23	4,000 1,000 1,000 50	15

[1] It is worth noting that the threatened status of *Seringia exastia* is expected to be removed (Michael Hislop, WA Herbarium, pers. comm. via email to Dr Grant Wells 17/12/2020) as a result of a common taxon, formerly *Seringia elliptica*, being now considered to represent *S. exastia* (WA Herbarium 1998).

4.1.3 Priority ecological communities and environmentally sensitive areas

Updated Desktop searches identified no Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) within the permit area (DBCA 2021b; Phoenix 2021b). The closest TEC is the *Themeda* grasslands on cracking clays located approximately 160 km north-west of the survey area (G&G Environmental 2014) (Figure 3).

Flora and vegetation surveys identified no TECs within the survey area (G&G Environmental 2014).

4.1.4 Significant fauna

One Priority fauna species, Western Pebble-mound Mouse (*Pseudomys chapmani*; Priority 4) was recorded for the WIOP (Phoenix 2012a) (Figure 4).

Seven fauna habitats were identified for the WIOP during the Phoenix (2012a) vertebrate surveys (Table 3)Figure 4).

Table 3 Of these, two are considered significant as habitat for the Priority 4 Western Pebble-mound Mouse (*Pseudomys chapmani*), Mallee woodland and Spinifex steppe (Figure 4).

Table 3 Fauna habitat for the WIOP

Habitat	Permit area (ha)	Revised disturbance footprint	
		ha	%
Mallee woodland	1,777.1	413.9	23.3
Spinifex steppe	1,673.9	54.9	3.3
Eucalyptus woodland	596.7	93.6	15.7
Acacia woodland	583.7	237.0	40.6
Creek or drainage line	180.9	18.1	9.9
Shrubland in brown clay	9.1	1.2	13.0
Disturbed area	4.0	0.0	0.0

649000 687600 726200 764800

7463200

7424600

Weeli Wolli Spring Community

Weeli Wolli Spring Community

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- 6216/2 Permit Area
- Environmentally senstive areas
- Priority ecological communities
- Revised clearing footprint

Figure 3

Study area in relation to Priority Ecological Communities (PECs) and Environmentally Sensitive Areas (ESAs)

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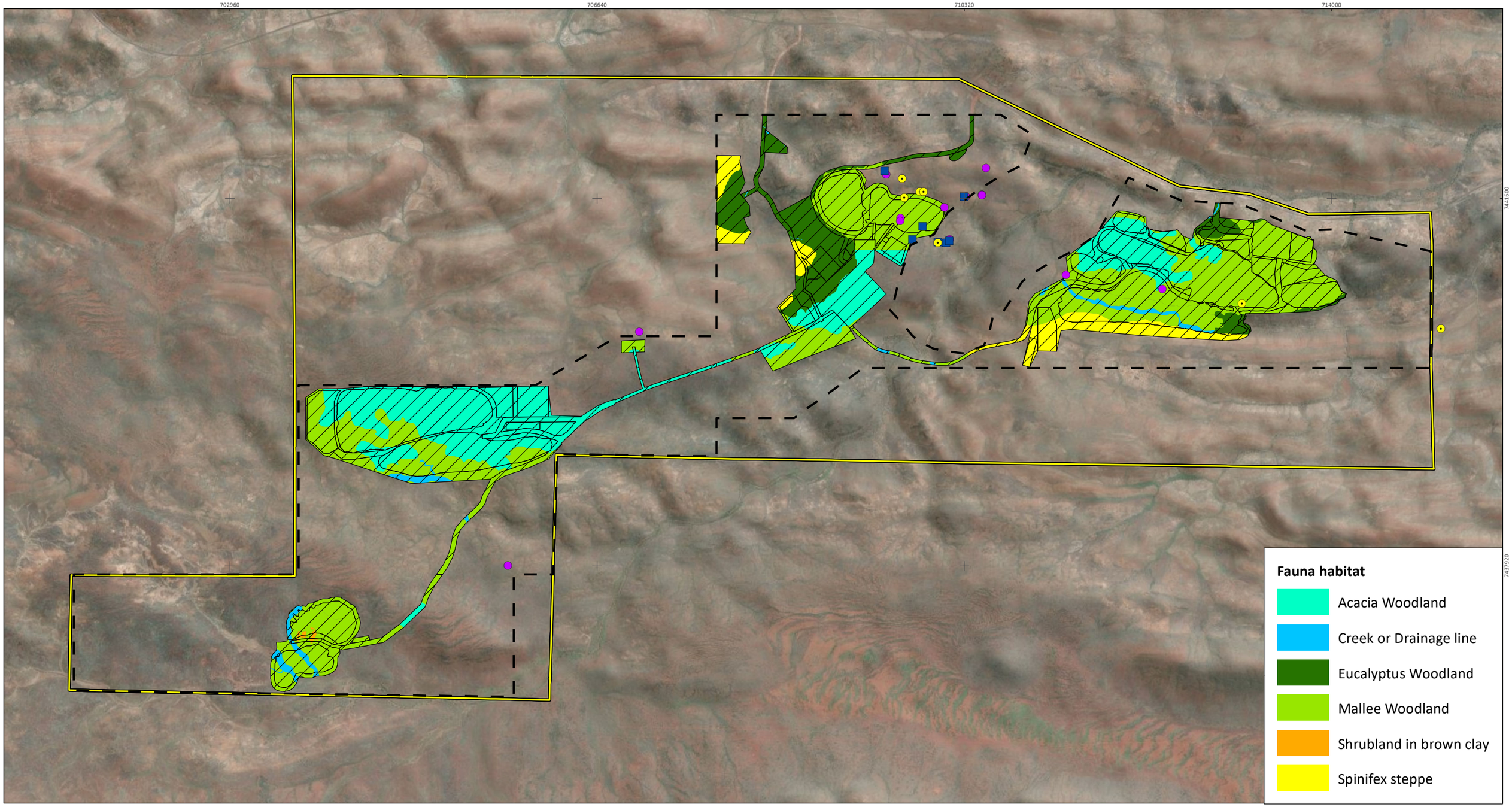

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Survey area
Permit area
Revised clearing footprint

Species, mound status

- *Pseudomys chapmani* - Active
- *Pseudomys chapmani* - Inactive
- *Pseudomys chapmani* - N/A

Figure 4

Fauna habitats and significant species records relative to proposed area of disturbance

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4.2 ASSESSMENT AGAINST THE TEN CLEAR ING PRINCIPLES

Table 4 Revised assessment against the ten clearing principles for the disturbance footprint

6216/1 application assessment (DMIRS 2015)	Revised assessment
Principle (a) - Native vegetation should not be cleared if it comprises a high level of biological diversity	
Vegetation associations: The application is located within the Pilbara Interim Biogeographic Regionalisation of Australia (IBRA) region and the Hamersley subregion (GIS Database). The Pilbara region represents a transitional zone between semiarid and tropical climates (Kendrick, 2001). The Hamersley IBRA subregion comprises Proterozoic ranges, plateaus, and gorges of basalt, shale and dolerite (Kendrick, 2001). The vegetation within the application area is mapped as belonging to Beard associations 18, 29 and 82 (GIS Database).	The revised disturbed footprint is within the original permit area. The permit area is located within the Pilbara bioregion and Hamersley subregion. The vegetation within the revised disturbed footprint is mapped as Beard associations 18, 29 and 82 (Government of Western Australia 2011).
Vegetation types and condition: A Level 2 flora and vegetation assessment of the Wonmunna project area was conducted in 2011 and 2014 by G&G Environmental Pty Ltd (G&G, 2014). A total of 16 vegetation associations were recorded within the application area, which ranged from Excellent to Pristine condition (Keighery, 1994; G&G, 2014).	The revised disturbed footprint is within the area surveyed by G&G Environmental in 2014. The values therefore remain the same; a total of 15 vegetation types were recorded within the permit area, ranging from Excellent to Pristine condition (Table 1; Figure 2) (G&G Environmental 2011; Keighery 1994). Updated Desktop searches identified no Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) within the permit area (DBCA 2021b) (Figure 3). The revised disturbed footprint is within the area surveyed by G&G Environmental in 2014. None of the vegetation types mapped for the survey area match any known TECs. Both S1 and C1 remain significant due to high flora diversity (G&G Environmental 2011).

6216/1 application assessment (DMIRS 2015)	Revised assessment
Principle (a) cont. - Native vegetation should not be cleared if it comprises a high level of biological diversity	
Significant vegetation: None of the vegetation communities represented a Threatened Ecological Community (TEC) or Priority Ecological Community (PEC), which is consistent with available databases (GIS Database). Almost one third of the taxa recorded within vegetation community S1 and approximately 40.6% of taxa recorded in vegetation community C1 were not recorded elsewhere. As a result, both vegetation communities are considered to be potentially significant on a local scale (Ascot Resources, 2014a; G&G, 2014). However, approximately 31% of the mapped area of vegetation community S1 occurs outside the application boundary (G&G, 2014), and given its naturally patchy distribution it is unlikely to be susceptible to the impacts of fragmentation which may occur following the proposed clearing. A total of 71.5% of vegetation community C1 occurs outside the application boundary (G&G, 2014), and it is unlikely to be significantly impacted by the proposed clearing.	Recent targeted flora searches conducted by Phoenix (2021b) identified four Priority flora and one Threatened flora species within the permit area; *Seringia exastia* (Critically Endangered), *Oxalis* sp. Pilbara (Priority 2), *Acacia subtiliformis* (Priority 2), *Aristida lazaridis* (Priority 2) and *Eremophila pusilliflora* (Priority 2) (Table 2; Figure 2). Vegetation types AW1, C1, M4 and SS1 are considered significant as they provide habitat for these significant flora species. Neither vegetation type is restricted to the permit area, over 50% of the vegetation types occur outside of the permit area (Table 2,Figure 2) (G&G Environmental 2011). It is worth noting that the Threatened status of *Seringia exastia* is expected to be removed (Michael Hislop, WA Herbarium, pers. comm. via email to Dr Grant Wells 17/12/2020) as a result of a common taxon, formerly *Seringia elliptica*, being now considered to represent *S. exastia* (WA Herbarium 1998). The delisting of the species is expected once the Threatened Species Scientific Committee reviews the recommended changes to the Threatened Flora List (Steve Dillon, WA Herbarium, pers. comm. via email to Dr Grant Wells 11/01/2021).
Flora assemblages: A total of 270 flora taxa comprising 42 families and 124 genera were recorded by G&G Environmental (2014). Floristic diversity within the Wonmunna area is not considered to be unusually high and is within the range of floristic diversity recorded by other surveys conducted in the surrounding region (G&G, 2014).	Recent targeted flora searches conducted by Phoenix (2021b) identified additional flora taxa for the permit area. A total of 274 flora taxa are now known for the permit area (G&G Environmental 2011; Phoenix 2021b). Floristic diversity within the Wonmunna area remains within the range of floristic diversity recorded by other surveys conducted in the surrounding region.

6216/1 application assessment (DMIRS 2015)	Revised assessment
Principle (a) cont. - Native vegetation should not be cleared if it comprises a high level of biological diversity	
Significant flora: Using the Naturemap database (DPaW, 2014), a total of one Declared Rare Flora (DRF) and 25 Priority flora species are known to occur within 20 km of the application area. While suitable habitat for the DRF species *Lepidium catapycnon* and several Priority flora exists within the application area, no DRF or Priority flora were recorded during the flora and vegetation assessment (G&G, 2014).	Recent targeted flora searches conducted by Phoenix (2021b) identified Threatened flora species, *Seringia exastia* (Critically Endangered), and four Priority flora within the permit area, *Oxalis* sp. Pilbara (Priority 2), *Acacia subtiliformis* (Priority 2), *Aristida lazaridis* (Priority 2) and *Eremophila pusilliflora* (Priority 2) (Table 2,Figure 2). It is worth noting that the threatened status of *Seringia exastia* is expected to be removed (Michael Hislop, WA Herbarium, pers. comm. via email to Dr Grant Wells 17/12/2020) as a result of a common taxon, formerly *Seringia elliptica*, being now considered to represent *S. exastia* (WA Herbarium 1998). The delisting of the species is expected once the Threatened Species Scientific Committee reviews the recommended changes to the Threatened Flora List (Steve Dillon, WA Herbarium, pers. comm. via email to Dr Grant Wells 11/01/2021). *Note, DRF species protected under the Wildlife Conservation Act 1950 (WC Act) have transitioned to Threatened species protected under the Biodiversity Conservation Act 2016 (BC Act).*
Introduced flora: A total of eight introduced flora species were recorded within the application area; however, none of these are a Declared Weed (G&G, 2014). All weed species were recorded in riparian habitat. Buffel Grass (*Cenchrus ciliaris*) was the most abundant weed recorded and dominated the grass layer at one location (G&G, 2014). Weeds have the potential to significantly change the dynamics of a natural ecosystem and lower the biodiversity of an area (DEC, 2011). Potential impacts to biodiversity as a result of the proposed clearing may be minimised by the implementation of a weed management condition.	No additional weeds have been identified within the permit area. No declared weeds were recorded within the permit area. A total of eight introduced flora species are known to occur within the permit area (G&G Environmental 2011).

6216/1 application assessment (DMIRS 2015)	Revised assessment
Principle (a) cont. - Native vegetation should not be cleared if it comprises a high level of biological diversity	
Fauna values: A Level 2 Fauna assessment was conducted over the Wonmunna area in 2011 and 2012 by Phoenix Environmental sciences Pty Ltd, and updated in 2014 (Phoenix, 2014). Of the 275 vertebrate fauna species identified to potentially occur within the application area following a desktop assessment, a total of 169 fauna species were recorded during a field survey (Phoenix, 2014). Of the 23 conservation significant fauna species advised to potentially occur within the project area, a total of five were recorded, including the Western Pebble-mound Mouse (*Pseudomys chapmani*; Priority 4), Australian Bustard (*Ardeotis australis*; Priority 4), Bush Stone-curlew (*Burhinus grallarius*; Priority 4), Star Finch (*Neochimia ruficauda subclarescens*; Priority 4), and Rainbow Bee-eater (*Merops ornatus*; Migratory) (Phoenix, 2014). Targeted searches were carried out for the Northern Quoll (*Dasyurus hallucatus*; Schedule 1); however, none were recorded (Ascot Resources, 2014a; Phoenix, 2014). Suitable habitat for this species exists within an exclusion boundary placed around Weeli Wolli creek by the proponent (Ascot Resources, 2014a). Similarly, habitat within the exclusion zone provides suitable habitat for the Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*; Schedule 1), Ghost Bat (*Macroderma gigas*; Priority 4), and Pilbara Olive Python (*Liasis olivaceous barroni*; Schedule 1). Limited suitable habitat for these species exists within the application boundary; however, they may use the application area for foraging and dispersal activities. **Proposal is not at variance to this Principle**	A recent desktop review by Phoenix (2021a) identified creeks or drainage lines as the most restricted habitats, containing the highest value for most significant vertebrate species and are also important for SREs. However, the additional disturbance footprint intersects a very small area of such habitat, and it is unlikely that any significant species are restricted to this habitat. Of the five significant fauna species recorded during the field surveys (Phoenix 2012a, 2014b), four of these no longer hold a conservation status (DBCA 2019); the Australian Bustard (*Ardeotis australis*), Bush Stone-curlew (*Burhinus grallarius*) and Star Finch (*Neochimia ruficauda subclarescens*) are no longer listed as Priority species, and the Rainbow Bee-eater (*Merops ornatus*) is no longer listed as Migratory. Therefore, only one Priority fauna species occurs within the permit area, the Priority 4 Western Pebble-mound Mouse (*Pseudomys chapmani*). The Weeli Wolli creek provides suitable habitat for the Northern Quoll (*Dasyurus hallucatus*; Threatened - Endangered), Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*; Threatened - Vulnerable), Ghost Bat (*Macroderma gigas*; Threatened - Vulnerable), and Pilbara Olive Python (*Liasis olivaceous barroni*; Threatened - Vulnerable). The revised disturbed footprint does not change the one-kilometre-wide exclusion zone centred on the Weeli Wolli Gorge that will be established during the disturbed operations, and during the operation of the WIOP. *Note, DRF species protected under the WC Act have transitioned to Threatened species protected under the BC Act.* **The proposed clearing is not considered to be at variance with this principle**

6216/1 application assessment (DMIRS 2015)	Revised assessment
Principle (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.	
The Level 2 Fauna assessment was conducted over the Wonmunna area in 2011 and 2012 by Phoenix (2014) recorded seven habitat types within the application area, including: Mallee woodland (36.5% of the project area) Spinifex steppe (34.5%) Eucalypt woodland (12.3%) Acacia woodland (12.1%) Major drainage line (2.2%) Minor drainage line (2.2%) Shrubland in brown clay (0.2%). All habitat types, with the exception of shrubland on brown clay, are well represented outside the application area (Ascot Resources, 2014a). Shrubland in brown clay was not advised to represent important habitat for fauna (Ascot Resources, 2014a; Phoenix, 2014). The proponent has placed an exclusion boundary of approximately 1 km x 2.2 km over Weeli Wolli Creek, which occurs within the north-west region of the application area (Ascot Resources, 2014a). Weeli Wolli Creek is the most important habitat type within the Wonmunna project area (Phoenix, 2014), and the exclusion boundary greatly reduces the potential impact to habitat-specific fauna such as the Northern Quoll, Pilbara Leaf-nosed Bat, Pilbara Olive Python, and Ghost Bat. While these species may occur within the application area, it will most likely be during nocturnal foraging which is unlikely to coincide with clearing activity. In general, the number of recorded bird species was highest within drainage line habitat (Phoenix, 2014). Four hectares of major drainage line habitat occurs within the application area and provides habitat for the Star Finch and Rainbow Bee-eater (Phoenix, 2014). Both the Rainbow Bee-eater and Star Finch were recorded within the major drainage line connected to Weeli Wolli Creek (Phoenix, 2014), in an area that provides suitable nesting habitat for the Rainbow Bee-eater.	The revised disturbed footprint remains within the previously approved permit area. The values from the 2011 Level 2 fauna assessment (Phoenix 2014b) remain relevant. Phoenix (2014b) recorded seven habitat types within the permit area. All habitat types, except for shrubland on brown clay, are well represented outside the permit area. Shrubland on brown clay vegetation type was not identified as important habitat for fauna (Figure 4) (Phoenix 2014b). A recent desktop review by Phoenix (2021a) was undertaken to assess the ecological values of the additional disturbed footprint and the compliance of the previous fauna surveys with current EPA Technical Guidance (EPA 2020). The review has found all previous surveys be in line with the requirements of the current EPA Technical Guidance. Within the revised disturbed footprint, creek or drainage lines are the most restricted habitat and have the highest value for most significant vertebrate species and are also important for SREs. However, the additional disturbed footprint intersects a very small area of such habitat, and it is unlikely that any significant species are restricted to this habitat. The Weeli Wolli creak provides suitable habitat for the Northern Quoll (*Dasyurus hallucatus*; Threatened - Endangered), Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*; Threatened - Vulnerable), Ghost Bat (*Macroderma gigas*; Threatened - Vulnerable), and Pilbara Olive Python (*Liasis olivaceous barroni*; Threatened - Vulnerable). The revised disturbed footprint does not change the one-kilometre-wide exclusion zone centred on the Weeli Wolli Gorge that will be established during the disturbed operations, and during the operation of the WIOP.

6216/1 application assessment (DMIRS 2015)	Revised assessment
Principle (b) cont. - 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.	
However, disturbance within this area is restricted to one access road crossing, and further suitable habitat occurs outside the application area and within the Weeli Wolli exclusion boundary (Ascot Resources, 2014a; Phoenix, 2014). Mallee woodland and spinifex steppe is inhabited by the Western Pebble-mound Mouse (Phoenix, 2014). A total of 37 pebble mounds were recorded during the fauna survey, 17 of which were currently active, suggesting a moderate abundance of this species (Phoenix, 2014). The proposed clearing will remove areas of Western Pebble-mound Mouse habitat, which may impact species abundance on a local scale. However, this species has a wide distribution across the Pilbara region (Phoenix, 2014), and the proposed clearing is not likely to impact the conservation of this species on a local or regional scale. The proponent has advised that liaison with DPaW will occur to minimise impacts to the Western Pebble-mound Mouse on site. The Australian Bustard and Bush Stone-curlew were recorded within spinifex steppe and *Acacia* woodland but are unlikely to be significantly dependent on habitat within the application area based on the widespread distribution of these habitat types outside the application boundary. **Proposal is not at variance to this Principle**	Of the five significant fauna species recorded during the 2011/2014 field surveys (Phoenix 2014b), four of these no longer hold a conservation status (DBCA 2019): • Australian Bustard (*Ardeotis australis*), • Bush Stone-curlew (*Burhinus grallarius*), • Star Finch (*Neochimia ruficauda subclarescens*) and • Rainbow Bee-eater (*Merops ornatus*). Therefore, only one Priority fauna species occurs within the permit area, the Western Pebble-mound Mouse (*Pseudomys chapmani*; Priority 4). As with the original disturbed footprint, the additional disturbance will remove areas of Western Pebble-mound Mouse habitat (Mallee woodland and spinifex steppe), which may impact species abundance on a local scale (Table 3, Figure 4). A combined total of 468.8 ha of Mallee woodland and spinifex steppe occur within the revised disturbance footprint, representing 13.5% of the total area mapped for these habitats for the WIOP. However, the Western Pebble-mound Mouse has a wide distribution across the Pilbara region (Phoenix 2014b), with an additional 2932.4 ha mapped outside of the revised disturbance footprint. The proposed disturbance is not likely to impact the conservation of this species on a local or regional scale. **The proposed clearing is not considered to be at variance with this principle**

6216/1 application assessment (DMIRS 2015)	Revised assessment
Principle (c) - Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	
One Threatened flora (*Lepidium catapycnon*) has the potential to occur within the application area, with the nearest record for this species occurring 6 km from the project (DPaW, 2014). However, no Threatened flora species were recorded within the application area during the Level 2 flora and vegetation assessment conducted by G&G (2014). **Proposal is not likely to be at variance to this Principle**	The Threatened flora (*Lepidium catapycnon*) was not found within the survey area. Recent targeted flora searches conducted by Phoenix (2021b) identified one Threatened flora species within the permit area; *Seringia exastia* (Critically Endangered) Impacts to this species is presented in Table 2. It is worth noting that the Threatened status of *Seringia exastia* is expected to be removed (Michael Hislop, WA Herbarium, pers. comm. via email to Dr Grant Wells 17/12/2020) as a result of a common taxon, formerly *Seringia elliptica*, being now considered to represent *S. exastia* (WA Herbarium 1998). The delisting of the species is expected once the Threatened Species Scientific Committee reviews the recommended changes to the Threatened Flora List (Steve Dillon, WA Herbarium, pers. comm. via email to Dr Grant Wells 11/01/2021). **The proposed clearing is not considered to be at variance with this principle**
Principle (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.	
According to available databases, there are no known Threatened Ecological Communities (TECs) within the application area (GIS Database). Similarly, the vegetation survey conducted by G&G (2014) did not identify any of the vegetation recorded as being a TEC. **Proposal is not at variance to this Principle**	No Threatened Ecological Communities (TECs) were identified within the desktop search extent (G&G Environmental 2011; Phoenix 2021b). The closest TEC is the *Themeda* grasslands on cracking clays located approximately 160 km north-west of the survey area (G&G Environmental 2014) (Figure 3). Flora and vegetation surveys identified no TECs within the survey area (G&G Environmental 2014). **The proposed clearing is not considered to be at variance with this principle**

6216/1 application assessment (DMIRS 2015)	Revised assessment
Principle (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.	
The application area falls within the Pilbara Interim Biogeographic Regionalisation of Australia (IBRA) bioregion, in which approximately 99.6% of the pre-European vegetation remains (see table) (Government of Western Australia, 2013; GIS Database). The vegetation within the application area has been mapped as Beard vegetation associations 18, 29 and 82 (GIS Database). Over 90% of these Beard vegetation associations remain at both a state and bioregional level (Government of Western Australia, 2013). Based on aerial imagery, the vegetation within the application area is neither a remnant itself nor does it form part of any remnants within the local area (GIS Database). Methodology Department of Natural Resources and Environment (2002) Government of Western Australia (2013) GIS Database: - Governor 50cm Orthomosaic - Landgate 2004 - IBRA WA (Regions - Sub Regions) - Ophthalmia 50cm Orthomosaic - Landgate 2004 - Pre-European Vegetation **Proposal is not at variance to this Principle**	The revised disturbance footprint is within the approved permit area. There has been no change to the values relevant to this Principle. The vegetation associations within the revised disturbed footprint are Hammersley 18, 29 and 82. Over 90% of the pre-European extent of these Beard vegetation associations still remain at both a State and bioregional level (Government of Western Australia 2011). **The proposed clearing is not considered to be at variance with this principle**
Principle (f) - Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	
A total of five vegetation communities within the application area were recorded in association with drainage lines and are considered to be riparian in nature, including C1, C3, C4, C5 and C6. Vegetation community C1 had the highest level of species diversity with 101 taxa recorded (G&G, 2014). However, the proposed clearing is not likely to impact the conservation of this vegetation community, as a majority of the mapped area occurs outside the application boundary (G&G, 2014).	The revised disturbance footprint is within the approved permit area. A total of five vegetation communities within the permit area are in association with drainage lines: C1, C3, C4, C5 and C6. Riverine vegetation will be avoided wherever possible and the flow of surface water across the WIOP will be maintained to minimise impacts to riparian vegetation.

6216/1 application assessment (DMIRS 2015)	Revised assessment
Principle (f) cont. - Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	
The proponent has advised that the disturbance of riparian vegetation will be avoided wherever possible and that the flow of surface water across the project will be maintained to minimise impacts to riparian vegetation (Ascot Resources, 2014b). The application area occurs upstream of Weeli Wolli Creek. To minimise impacts to the Weeli Wolli Creek system and associated vegetation and reflect the commitments made by the proponent, a watercourse management condition is recommended. Methodology Ascot Resources (2014b) G&G (2014) **Proposal is not at variance to this Principle**	The approved Mining Proposals and Surface Water Management Plan (SWMP) will apply buffer zones between disturbance areas and natural drainage lines that are to be retained as well as prescribe management of surface water across the project site. The revised disturbance footprint does not change the one-kilometre-wide exclusion zone centred on the Weeli Wolli Gorge that has been established and maintained for the operation of the WIOP. **The proposed clearing is not considered to be at variance with this principle**
Principle (g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	
The application area lies over three land systems, including the Egerton land system, Newman land system and Rocklea land system (GIS Database). A majority of the application area (1250.54 ha) occurs within the Rocklea land system (Ascot Resources, 2014a). The Rocklea land system contains basalt hills, lower slopes and stony plains supporting spinifex grasslands (Van Vreeswyk *et al*., 2004). This land system has a typically hard, stony land cover which presents a low risk of erosion (Van Vreeswyk *et al*., 2004). A total of 874.9 ha of the application area occurs within the Newman land system (Ascot Resources, 2014a), which consists of mountains, ridges and plateaus (Van Vreeswyk *et al*., 2004). This land system is the second largest within the Pilbara, and is especially common within the Hamersley Range (Van Vreeswyk *et al*.,2004). A small proportion of this land system has been affected by erosion.	The revised disturbed footprint is within the approved permit area. A Surface Water Management Plan (SWMP) was developed in 2015 as a condition of the Mining Proposal. The purpose of the SWMP is to outline how specific risks related to surface water will be prevented or mitigated, and the monitoring protocols that will be put into place to demonstrate a successful management program (Soil Water Consultants 2015). Any further clearing within the permit area will be in accordance with this plan.

6216/1 application assessment (DMIRS 2015)	Revised assessment
Principle (g) cont. - Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	
The remainder of the application area (338.16 ha) lies within the Egerton land system (Ascot Resources, 2014a). The Egerton land system consists of hardpan plains supporting mulga shrublands and spinifex hummock grasslands, and is dissected by drainage systems (Van Vreeswyk *et al.*, 2004). This land system is not considered to be susceptible to erosion (Van Vreeswyk *et al.*, 2004). Although the land systems that occur within the application area are not naturally susceptible to erosion, the removal of vegetation on a large scale leads to an increased potential for topsoil erosion and water erosion following heavy rainfall. Land degradation as a result of wind or water erosion may be minimised by the implementation of a staged clearing condition. Methodology Ascot Resources (2014a) Van Vreeswyk *et al.* (2004) GIS Database: - Rangeland Land System Mapping **Proposal is not at variance to this Principle**	**The proposed clearing is not considered to be at variance with this principle**
Principle (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 areas.	
The application area does not lie within any conservation areas managed by the Department of Parks and Wildlife (GIS Database). The nearest conservation area is the Karijini National Park, which is an A Class Nature Reserve (GIS Database). It is located approximately 39 km west of the application area (GIS Database). From this distance, the proposed clearing is not likely to impact the environmental values of the Karijini National Park. Methodology GIS Database: - DEC Tenure **Proposal is not likely to be at variance to this Principle**	The revised disturbance footprint is within the approved permit area and the values remain the same. No conservation areas were identified within the permit area (Phoenix 2021b). The nearest conservation area is the Karijini National Park, which is an A Class Nature Reserve, located approximately 39 km west of the permit area (Figure 3). The proposed disturbance is not likely to impact the environmental values of the Karijini National Park. **The proposed clearing is not considered to be at variance with this principle**

6216/1 application assessment (DMIRS 2015)	Revised assessment
Principle (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.	
The application area does not occur within a Public Drinking Water Source Area (PDWSA), however it is located within the proclaimed Pilbara groundwater area under the Rights in Water and Irrigation Act 1914 (GIS Database). Any groundwater extraction and/or taking or diversion of surface water for the purposes other than domestic and/or stock watering is subject to licence by the Department of Water. The application area covers numerous minor, non-perennial watercourses, which are associated with Weeli Wolli Creek (GIS Database). The clearing of native vegetation has the potential to destabilise soils and cause temporary sedimentation to watercourses. However, the proponent has advised that clearing within drainage channels will occur only during the dry season, and that bed and bank disturbance will be minimised to decrease the risk of water erosion and sedimentation within drainage lines (Ascot Resources, 2014a; Ascot Resources, 2014b). Surface water flow within drainage lines will be maintained by use of culverts, and any runoff from cleared areas with high levels of sedimentation will be directed through sedimentation basins before being discharged into the environment (Ascot Resources, 2014a). One permanent rock pool occurs outside the application boundary, within Weeli Wolli creek (Ascot Resources, 2014a). To minimise impacts to the Weeli Wolli creek system, an exclusion boundary 1 km wide and 2.2 km long has been placed over this area (Ascot Resources, 2014a). The surface water management measures proposed within the application area are considered adequate to minimise impacts to surface water within and adjacent to the application area. A watercourse management condition is recommended to reflect these commitments. Groundwater salinity in the local area is slightly alkaline, reaching a maximum 600 milligrams/Litre Total Dissolved Solids (TDS) towards Weeli Wolli Springs (Ascot Resources, 2014a), which is considered marginal (GIS Database). On average, groundwater levels are 32 metres below surface water (Ascot Resources, 2014a). The proposed clearing activity is not likely to cause deterioration of groundwater within the project area.	The revised disturbance footprint will be up to an additional 300.5 ha of native vegetation. It is not anticipated that there will be any deterioration in the quality of surface or groundwater due to the vegetation disturbed, or the mine development. All proposed mining will be done above the water table. The collection, treatment and disposal of stormwater of different quality will be undertaken. Stormwater, such as roof runoff, runoff from roads, parking areas, ROM pads etc. (diffuse sources of pollutants), may be discharged directly to the environment via sedimentation basins. Stormwater runoff that has been degraded due to contact with soil, oils etc. from mechanical workshops, fuel storage areas, wash down areas or contaminated water that has been in contact with processing wastes of some description will be treated at source using separators and interceptors.

6216/1 application assessment (DMIRS 2015)	Revised assessment
Principle (i) cont. - 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.	
Methodology Ascot Resources (2014a) Ascot Resources (2014b) GIS Database: - Groundwater Salinity, Statewide **Proposal is not likely to be at variance to this Principle**	**The proposed clearing is not considered to be at variance with this principle**
Principle (j) - Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	
Mean annual rainfall in Newman is approximately 318 millimetres (BoM, 2014). The Pilbara region represents a transitional zone between semi-arid and tropical climates and receives a majority of its rainfall during the summer months (Kendrick, 2001; CALM, 2002). It is likely that during times of intense rainfall there may be some localised flooding. The proposed clearing is unlikely to significantly alter the intensity of flooding within the application area or surrounding areas. The application area is located within the Fortescue River Upper catchment area (GIS Database). However, given the size of the area to be cleared (555 ha) in relation to the size of the catchment area (2,975,192 ha), the proposed clearing is not likely to increase the potential for flooding in this region (GIS Database). Methodology BoM (2014) CALM (2002) Kendrick (2001) GIS Database: - Hydrographic Catchments – Catchments **Proposal is not likely to be at variance to this Principle**	The additional disturbed of up to 300.5 ha is not anticipated to cause, or exacerbate, the incidence or intensity of flooding any more so than the original disturbed area (555 ha). Natural surface water flows within the proposed development envelope will be affected by the mining landform modification. The removal of native vegetation will not impact the incidence but has the potential to increase the intensity of flooding in localised areas. The presence of diversion structures and infrastructure, and particularly the fact that all runoff must pass through sedimentation basins which will have the effect of reducing flow peaks, will tend to mitigate flood peaks corresponding to pre-mining levels. On a broader level, there will be no discernible difference in the intensity of flooding after the commencement of mining. Mean annual rainfall in Newman is approximately 324.4 millimetres (BoM 2021). **The proposed clearing is not considered to be at variance with this principle**

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