





AUDALIA RESOURCES LIMITED

MEDCALF PROJECT Section 38 Referral - Attachments

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CONTACT DETAILS

Proponent:

AUDALIA RESOURCES LIMITED

Contact Person: Email: Phone: Address: Geoffrey Han – Project Director <u>geoffrey.han@audalia.com.au</u> +61 8 9481 2600 Level 1, Office F, 1139 Hay Street, West Perth, WA, 6005

Document developed by:

PRESTON CONSULTING PTY LTD

Contact Person:	Phil Scott - Director
Email:	pscott@prestonconsulting.com.au
Website:	www.prestonconsulting.com.au
Phone:	+61 8 9221 0011
Fax:	+61 8 9221 4783
Street Address:	Level 3, 201 Adelaide Terrace, East Perth, WA, 6004
Postal Address:	PO Box 3093, East Perth, WA, 6892





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PART A: PROPOSAL DESCRIPTION

GENERAL PROPOSAL DESCRIPTION

The Proposal is to develop the Medcalf Project, located in the Bremer Range, Lake Johnston region of Western Australia (WA), approximately 470 kilometres (km) east south-east of Perth (Figure 1).



Figure 1: Regional location of the proposal

Mining and Processing

The Proposal is a vanadium, titanium and iron deposit with a JORC (2012) compliant Indicated and Inferred Mineral Resource of 31.8 Million tonnes (Mt) at 0.45% V₂O₅ and 8.34% TiO₂. Audalia intends to continue exploration drilling to further understand the resource, this drilling does not form part of the Proposal.

Shallow (above the groundwater table) open pit mining is planned in three separate open pits; the Vesuvius, Fuji and Egmont deposits (Figure 3). The combined ore tonnage inventory is for 18.3 Mt, with a very low total strip ratio (waste / ore tonnes), of only 0.6. The mine schedule indicates a minimum annual ore production of 1.5 Million tonnes per annum (Mtpa).

The run of mine (ROM) ore will be processed onsite at a beneficiation plant, which incorporates a comminution circuit and a magnetic separation circuit, upgrading the ROM ore to a primary





concentrate. The comminution circuit includes both crushing and milling processes and the magnetic separation circuit consists of two different types of magnetic separation plants. No chemical reagents are required for this process other than a non-toxic flocculent product.

The primary concentrate is dewatered by thickening and filtration, with the filter cake stacked and prepared for transport. The tailings generated from the magnetic separation circuit will be thickened and stored in an unlined tailings storage facility (TSF). Based on the current mining rate of 1.5 Mtpa, approximately 1.2 Mtpa of concentrate will be produced from the beneficiation plant.

Haul Road Development and Transport

As there are no major roads available in this area west of Norseman, a 74 km unsealed private haul road is proposed to be designed and constructed from the mine site to the Coolgardie-Esperance Highway (Figure 2) The road will have a running surface width of approximately 11 metres (m) and requires an average disturbance width of approximately 40 m. This average disturbance width allows for wider areas where drainage features are installed. The haul road will follow the path of an approved exploration track along most of its length (where suitable) to minimise vegetation disturbance.

The primary concentrate is proposed to be hauled by heavy duty off-highway road trains east along the private haul road from the mine to a dedicated road train transfer area adjacent to the Coolgardie-Esperance Highway. The primary concentrate will be stockpiled at this transfer area, and then loaded onto highway-approved road trains for the remainder of the journey. The proposal includes road widening near the Coolgardie-Esperance Highway to accommodate the transfer area.

Approximately 34 road trains per day will transport the concentrate to Esperance Port. Only minor works are required to be conducted at Esperance Port. These works do not form part of this Proposal as they are managed under approval from the Southern Ports Authority. The ore concentrate will be stored within an existing enclosed storage area before being exported via an existing export berth.

Supporting Infrastructure

The Proposal requires fresh water for processing, accommodation and workshop facilities. This will be pumped via surface pipelines from a series of new bores targeting sources just east of the mining area, and along the haul road.

Power will be supplied initially by a series of diesel fuelled generators with local power lines for distribution. Accommodation for up to 150 people is required to operate and maintain the site. The accommodation village will be located within Mine Development Envelope (Figure 3).

Other supporting infrastructure may include workshops, laydown, fuel storage and communications.





DEVELOPMENT ENVELOPES

The Proposal consists of two distinct development envelopes shown in Figure 2:

- 1. Mine Development Envelope (additional detail provided in Figure 3); and
- 2. Haul Road Development Envelope.

The proposed development envelopes highlight the boundary for the Proposal, within which all ground disturbance and indicative key proposal elements listed below are proposed to occur. The shapefiles for the development envelopes have been provided with the Section 38 Referral form.

The Mine Development Envelope is proposed to be located within Audalia's mining tenement and will require up to 300 hectare (ha) of vegetation disturbance in order to develop the following (Figure 3):

- Three surface open mine pits, over an area of approximately 100 ha;
- Ore beneficiation plant;
- Tailings Storage Facility;
- Waste Rock Landform; and
- Associated onsite supporting infrastructure including accommodation village, laydown areas, workshops and offices.

The Haul Road Development Envelope aligns with the boundary of L63/75 and will require up to 350 ha of vegetation disturbance in order to develop the following:

- A private haul road approximately 74 km in length running east from the mine site to the Coolgardie-Esperance Highway;
- Associated borrow and gravel pits;
- A groundwater borefield that will supply water to the mine and transport infrastructure;
- A road train transfer area located close to the Coolgardie-Esperance Highway;
- Acceleration and turning lanes on the Coolgardie-Esperance Highway; and
- Associated infrastructure including laydown areas, offices and workshops.







Figure 3: Mine Development Envelope (shown in blue) and indicative site layout



Key Characteristics of the Proposal

Audalia has referred to the EPA's *Instructions on how to define the key characteristics of a proposal* (EPA, 2016d) - which focuses on how to define the key characteristics of proposals for the purposes of Environmental Impact Assessment under Part IV of the *Environmental Protection Act 1986* (EP Act). In accordance with these instructions, a summary of the Proposal is provided in Table 1 and the key proposal elements (e.g. development, action, activities or processes) which are likely to cause an impact on the environment are summarised in Table 2.

Table 1: Summary of the Proposal

Summary of the Proposal		
Proposal Title	Medcalf Project	
Proponent Name	Audalia Resources Limited	
Short Description	The Proposal is to develop a vanadium, titanium and iron mining operation, approximately 100 km west of Norseman, WA.	
	The proposal includes the development of three open mine pits, beneficiation plant, tailings storage facility, waste rock landform, private haul road, road train transfer area and associated infrastructure such as laydown areas, borrow and gravel pits, borefield, workshops and accommodation camp.	

Table 2: Indicative location and proposed extent of physical and operational elements

Element Indicative Location		Proposed Extent	
Physical Elements			
Mine and associated infrastructure	Figure 2	Clearing of no more than 300 ha within the 1,736 ha Mine Development Envelope	
Haul Road and associated Figure 2		Clearing of no more than 350 ha within the 1,633 ha Haul Road Development Envelope	
Operational Elements			
Tailings disposal Figure 3		Disposal of no more than 7.5 Million m ³ of tailings into the TSF	
Groundwater supply	Figure 2	Abstraction of no more than 800 Mega-litres per annum	





PART B: ENVIRONMENTAL IMPACTS

The *Statement of Environmental Principles, Factors and Objectives* (EPA, 2016a) provides a list of potential Key Environmental Factors that need to be assessed. To identify key environmental factors for the Project, Audalia has considered relevant Environmental Protection Authority (EPA) Guidance (noting that it has changed in some aspects since some baseline surveys were completed), and consulted widely with major Project stakeholders, including key agencies, Traditional Owners and local government.

The following sections list the preliminary key environmental factors that have been identified from baseline survey, project planning and consultation processes. These sections also identify the relevant baseline environmental information for the receiving environment, Proposal activities, mitigation measures, impacts and underlying assumptions.

The Preliminary Key Environmental Factors and specific aspects identified are expected to be:

- Flora and Vegetation specifically Threatened and Priority Flora species; and
- **Terrestrial Fauna** conservation-significant fauna [including *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and *Wildlife Conservation Act* 1950 (WC Act) listed species].

Note that many avoidance mitigation measures have already been achieved by completing a significant amount of baseline environmental survey early in the Project planning phase and avoiding significant impacts on areas of potentially higher environmental values wherever practicable. This is reflected in the development envelopes being configured to exclude areas known to contain Threatened and Priority Flora, salt lakes, and Nature Reserves. Where impacts are unavoidable, areas have been minimised.

Audalia has assessed the remaining Key Environmental Factors listed in EPA (2016a) and provide the following comments:

- Subterranean Fauna is not expected to be a Key Environmental Factor as the proposal does not require dewatering, and troglofauna are unlikely to be present within the proposed mine pit. The occurrence of significant subterranean fauna populations in the South-West is likely to be associated with discrete geological features, particularly limestone formations (EPA, 2016b), which are absent from the mining areas. The results of a pilot study and previous reviews support a conclusion that suitable habitat for troglofauna is unlikely to be present (Harewood, 2017c).
- Terrestrial Environmental Quality and Inland Waters Environmental Quality are not expected be Key Environmental Factors as the proposal does not require the discharge of waste or present significant pollution risks to the terrestrial environment. Tailings will be disposed of onsite however tailings characterisation has shown that the tailings are not expected to result in any leachate of concern (Golder Associates, 2016);
- Hydrological Processes is not expected to be a Key Environmental Factor as the proposal does not require the diversion or alteration of any significant watercourses, and only modest groundwater abstraction is required. Culverts or floodways will be installed across ephemeral creek crossings for engineering and maintenance purposes, and groundwater abstraction will be conducted in accordance with a 5C Licence to be granted under the *Rights in Water and Irrigation Act 1914* (RIWI Act); and





• Air Quality, Social Surroundings and Human Health are not expected to be Key Environmental Factors as the proposal will use covered trucks, enclosed stockpiles at Esperance Port and export via existing facilities. The transfer area adjacent to the Coolgardie – Esperance Highway has been located away from residential properties. The ore concentrate is non-toxic and dust can be managed via water and chemical dust suppression, and regulated under Part V of the EP Act. While no significant heritage or reliance on the land for cultural, bush tucker or bush medicine purposes has been identified from consultation and surveys to-date, if any are located during future surveys or consultation then infrastructure locations will generally be able to be moved to avoid these areas. Based on this the Proposal is expected to be able to be managed under the *Aboriginal Heritage Act 1972.*

FLORA AND VEGETATION

EPA Policy and Guidance

Relevant EPA guidance documents that were considered for this factor are detailed in Table 3.

Table 3: Flora and vegetation policy and guidance

Policy / guidance	Application		
Statement of Environmental Principles, Factors and Objectives (EPA, 2016a)	This statement was considered to determine whether Flora and Vegetation was likely to be a Key Environmental Factor. The statement describes 'significance' with regards to potential impacts.		
Environmental Factor Guideline for Flora and Vegetation (EPA, 2016e)	This guideline was referred to when assessing the environmental values and significance of flora and vegetation.		
Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016f)	This guidance was referred to during the 2017 flora and vegetation survey of the haul road study area (Figure 4) completed by Botanica (2017a). Flora and vegetation surveys for the mine study area (Figure 4) were completed prior to the release of this guidance (refer below).		
Guidance Statement No. 51 Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA, 2004a) (now superseded).	The mine study area flora and vegetation surveys were planned and implemented as far as practicable according to the EPA Guidance Statement No. 51 (Botanica, 2017a).		

Consultation

There has been significant stakeholder consultation regarding the flora and vegetation surrounding the Proposal since 2013. A summary of this consultation is provided in Table 4. Note that consultation that is not specifically relevant to this Referral (e.g. general project briefings) are not included.

Stakeholder (current				
Table 4: Flora and vegetation consultation				

Stakeholder (current department names)	Date	Relevant issues / topics raised	Proponent response / outcome
Department of Biodiversity, Conservation and Attractions (DBCA)	July 2013	Medcalf Project Exploration Program Conservation Management Plan submitted for comment.	DBCA acceptance of management plan.
DBCA (Chris Bishop)	4 March 2014	Audalia informed DBCA that they were moving into a mining phase.	Audalia has considered DBCA concerns in the project design





Stakeholder (current department names)	Date	Relevant issues / topics raised	Proponent response / outcome
		DBCA noted concerns with threatened flora species and the Maggie Hills environmental legacy.	and environmental mitigation planning.
DBCA, Department of Mines, Industry Regulation and Safety (DMIRS)	22 May 2015	DBCA requested that Botanica provided information about they developed their ecological community boundary around the Threatened Flora.	Botanica provided the requested information to DBCA.
DBCA, DMIRS	1 July 2015	Identification of <i>Philotheca</i> sp. Bremer Range (E. Adams EA 659) as a distinct taxon.	Identification issue has now been resolved. Not a distinct taxon and removed from DBCA Priority Flora listing.
DBCA, Department of Water and Environmental Regulation (DWER) – EPA Services	26 October 2010	DBCA had concerns about impacts to <i>Marianthus aquilonaris</i> during exploration. Noted that the proposed haul road will require flora and vegetation survey.	Flora and vegetation survey conducted for the proposed haul road.
DBCA, DMIRS	14 March 2016	Geology surrounding the Threatened Flora <i>Marianthus aquilonaris.</i> Sharing of information between DBCA and Audalia.	Information provided to DBCA.
DWER – EPA Services	31 August 2017	Key issue likely to be impacts to the Threatened Flora <i>Marianthus</i> <i>aquilonaris</i> . Offsets likely to be required.	Comments considered in the preparation of this Referral.

Receiving Environment

A number of flora and vegetation surveys have been conducted over the development envelopes and greater Bremer Range:

- The Biological Survey of the Eastern Goldfields of Western Australia: Part 4 lake Johnston-Hyden study area (How *et al.*, 1988);
- Flora and vegetation of the Eastern Goldfields Ranges: Part 2. Bremer Range (Gibson & Lyons, 1998);
- Level 1 Flora and Vegetation survey of the Vesuvius Prospect Medcalf Project (Armstrong, 2012);
- Medcalf Exploration Project Targeted Flora search (Botanica Consulting, 2013);
- Detailed Flora & Vegetation Survey, Medcalf Vanadium Mining Project & Proposed Haul Road (Botanica Consulting, 2017a), provided in Appendix 1; and
- Memorandum: *Marianthus aquilonaris* (Botanica Consulting, 2017b), provided in Appendix 2.

The entire Mine and Haul Road Development Envelopes have been surveyed to a Level 2 (detailed) standard over two seasons (Figure 4), with the exception of a very small portion of the Haul Road Development Envelope where the southern Coolgardie – Esperance Highway intersection works are to be developed (within the Main Roads road corridor).

The following sections summarise the findings of the above surveys, as relevant to the Proposal.





Figure 4: Survey extent



<u>Flora</u>

Two flora species listed as Threatened under the WC Act were identified by Botanica (2017a) as potentially occurring within the study area; *Banksia sphaerocarpa var. dolichostyla* and *Roycea pycnophylloides*. These species were listed as possibly occurring, however only in the mine study area and far western portion of the haul road study area. Given that these areas have been extensively surveyed the likelihood of these species being found within the development envelopes is expected to be low.

One flora species listed as Threatened under the WC Act was identified by Botanica within the mine study area; *Marianthus aquilonaris* (Botanica, 2017a). *Marianthus aquilonaris* is described as an erect, straggly shrub growing up to 1.6 m high with hairy stems, alternate, elliptic to oblong leaves, a glabrous calyx and a pale blue and white corolla. Flowers appear between September and October. It is found in the Bremer Range, growing on orange to grey-brown sandy loam, rocky red-orange clay loam, laterite and quartzite, on rock outcrops and slopes (DEC, 2010).

Habitat critical to the survival of this species includes the area of occupancy of populations, areas of similar habitat surrounding and linking populations (these providing potential habitat for population expansion and for pollinators), additional occurrences of similar habitat that may contain undiscovered populations of the species or be suitable for future translocations, and the local catchment for the surface and/or groundwater that maintains the habitat of the species (DBCA, 2010).

Marianthus aquilonaris was declared as Threatened under the WC Act in 2002 and is currently listed as 'critically endangered' under the World Conservation Union (IUCN) criteria due to its extent of occurrence being less than 100 km² and its area of occupancy being less than 10 km² (DEC, 2010). This species is however not currently listed under the EPBC Act.

Marianthus aquilonaris is currently known from six subpopulations which all occur within the Bremer Range and cover a combined area of 7.5 ha (Figure 5). Population estimates vary greatly between surveys however the last count by DBCA in 2015 identified 5,712 plants across four of the subpopulations (1a, 1b, 1c and 1f – 1d and 1e were not surveyed). The remaining two subpopulations (1d and 1e) were last surveyed in 2014 by Botanica which recorded 3,119 plants within these two subpopulations. The total population is therefore 8,831 plants based on last available survey information. This number may currently be lower than last recorded as plant numbers are expected to continue to decline following the last mass germination in 2010 (Botanica, 2017b).

Ten Priority Flora species were recorded within the mine and haul road study areas, described in Table 5. The locations of these Priority Flora records are shown on Figure 6.

Seven introduced taxa were identified within the study areas.





Table 5: Priority Flora recorded

Species	Priority	Study area record	Recorded population in Botanica (2017a), and Armstrong (2012) study areas
Teucrium sp. Dwarf (R. Davis 8813)	P1	Mine	12,140
Acacia hystrix subsp. continua	P1	Haul Road	100
Brachyloma stenolobum	P1	Haul Road	500
Acacia mutabilis subsp. stipulifera	Р3	Mine, Haul Road	348,332
Hakea pendens	Р3	Mine, Haul Road	2,370
Bossiaea flexuosa	Р3	Haul Road	100
Microcybe sp. Windy Hill (G.F Craig 6583)	Р3	Mine	620
Eucalyptus pterocarpa	P4	Haul Road	100
Eucalyptus rhomboidea	P4	Mine, Haul Road	5,962
Stenanthemum bremerense	P4	Mine, Haul Road	34,761



Figure 5: Location of Marianthus aquilonaris records and subpopulations





Figure 6: Location of conservation significant flora records



Vegetation

Thirteen Pre-European vegetation associations intersect with the study areas. All of these have at least 97.9% of their pre-European extent remaining. The majority of the vegetation associations are widespread, with only three covering an area of less than 10,000 ha. These three associations (Cave Hill 1413, Dundas 128 and Dundas 551) occur within the haul road study area only (Figure 9; Botanica, 2017a).

A total of 14 floristic communities were identified within the mine and haul road study areas. These communities were represented by a total of 58 Families, 162 Genera and 411 Taxa (including sub-species and variants) (Botanica, 2017a; Appendix 1).

Eight of the 14 floristic communities were identified within the mine study area. Twelve of the 14 floristic communities were identified within the haul road study area.

No Threatened Ecological Communities pursuant to the EPBC Act or as listed by DBCA occur within the study areas; however, the Mine Development Envelope and approximately 4 km of the Haul Road Development Envelope lie within the *Bremer Range vegetation complexes* Priority 1 Ecological Community (PEC) and its buffer (Figure 7). This PEC (including the 500 m buffer zone) encompasses an area of 88,150 ha and is centred on Mt Day, Round Top Hill and Honman Ridge, all of which lie outside of the study areas. A description of the *Bremer Range vegetation complexes* PEC provided by DBCA (Gibson & Lyons, 1988) is provided below:

Eucalyptus rhomboidea ms and *E. eremophila* woodland on the side slopes of low ridges; *E. flocktoniae* woodland (with *E. salubris, E. salmonophloia, E. dundasii* and *E. tenuis*) on broad flat ridges and side slopes; *E. flocktoniae* and/or *E. longicornis* woodland on saline soils on ridges and flats adjacent to large salt lake systems; *E. longicornis* and/or *E. salmonophloia* or, *E. georgei* subsp. *georgei* or, *E. dundasii* woodland, on low areas; *E. livida* woodland on lateritic tops or Allocasuarina thickets on greenstone ridges of lateritic breakaways; *Acacia duriuscula, Allocasuarina globosa, E. georgei* subsp. *georgei* and *E. oleosa* thickets on greenstone ridges with skeletal soils.

All of the vegetation within the study areas was recorded to be in 'Good' or 'Very Good' condition. The entire study areas were subjected to a major fire in 2010, with some areas subjected to multiple fires in 2010. In February 2015, the area was again subjected to fire (observed by Audalia staff in the area). Vegetation within the area is in various stages of regrowth.





Figure 7: Extent of the Bremer Range Vegetation Complexes PEC





Proposal Activities

The following proposal activities have the potential to impact flora and vegetation:

- Vegetation clearing;
- Mining and construction activities;
- Alteration of surface water flow regimes; and
- Haulage of product.

No dewatering is required as the ore body lies above the groundwater table, and water supply bores will target sustainable yield sources, therefore there are no expected significant impacts to groundwater-dependent vegetation.

Mitigation

The key measures proposed to manage and mitigate potential impacts on flora and vegetation are:

- Exclude all avoidable sub-populations of Threatened Flora *Marianthus aquilonaris* from the Mine Development Envelope (Figure 3);
- Restrict access to these avoidable sub-populations of Threatened Flora *Marianthus aquilonaris* by blocking existing access roads through these areas and installing alternative access roads;
- Exclude all recorded locations of *Acacia hystrix* subsp. *continua* (P1) and *Brachyloma stenolobum* (P1) from the development envelopes;
- Exclude areas of other recorded Priority Flora from the development envelopes where practicable;
- Exclude the un-named Nature Reserve close to the Coolgardie Esperance Highway from the Haul Road Development Envelope;
- Exclude the majority of salt lake and surface water features from the Haul Road Development Envelope;
- Avoid the disturbance of recorded Priority Flora wherever practicable;
- Obtain and comply with licences to disturb Threatened and Priority Flora;
- Ensure creek crossings do not significantly impede the flow of surface water by installing floodways or culverted crossings;
- Implement industry-standard controls such as:
 - Ground Disturbance Permit system and conduct clearing only within authorised areas;
 - Retain topsoil (and sub-soil if required) for use in rehabilitation;
 - Rehabilitate any cleared areas not required during operations;
 - Implement dust suppression;
 - Maintain fire control equipment and practices; and
 - Conduct weed control (e.g. equipment cleaning prior to use, weed hygiene stations, weed inspections).

Impacts

The Proposal may result in the following potential impacts to flora and vegetation:

• Direct disturbance of native vegetation associations as a result of vegetation clearing activities;





- Direct disturbance of vegetation within the proposed Bremer Range Nature Reserve. Conservation of endemics such as *E. rhomboidea* (Priority 4 species) was included as part of the justification for the proposed nature reserve;
- Direct disturbance within the *Bremer Range vegetation complexes* PEC;
- Direct disturbance of conservation significant flora. Seven species have been recorded within the development envelopes:
 - *Marianthus aquilonaris* (T);
 - *Teucrium* sp. Dwarf (R. Davis 8813) (P1);
 - Acacia mutabilis subsp. stipulifera (P3);
 - Hakea pendens (P3);
 - *Microcybe* sp. Windy Hill (G.F Craig 6583) (P3);
 - Eucalyptus pterocarpa (P4);
 - Eucalyptus rhomboidea (P4); and
 - Stenanthemum bremerense (P4);
- Indirect impacts to vegetation and / or conservation significant flora as a result of:
 - Weed introduction or spread;
 - Dust emissions; and
 - Increased fire risks.

The extent of these potential impacts are detailed in Table 6. There are no other major developments in the vicinity of the Proposal, therefore cumulative impacts are not expected to be significant.

Potential impact	Known extent	Direct or indirect impacts	Relative impact
Disturbance of native vegetation	All vegetation is relatively undisturbed in the region, with all vegetation associations having more than 97% of their pre-European extent remaining (Botanica, 2017a).	Direct impact - up to 650 ha of native vegetation clearing will be required to develop the Proposal.	The relative impact to any vegetation association is unlikely to result in a significant reduction in its extent, and is unlikely to affect the conservation status of any impacted vegetation associations.
Disturbance within the proposed Bremer Range Nature Reserve	The proposed Bremer Range Nature Reserve has a total area of 50,920 ha (Figure 7).	Direct impact - approximately 350 ha of native vegetation clearing will be required within the proposed Nature Reserve to develop the Proposal.	350 ha of vegetation disturbance equates to 0.7% of the total extent of the proposed Nature Reserve.
Disturbance within the Bremer Range vegetation complexes PEC	This PEC covers an area of 88,150 ha. The key features of Mt Day, Round Top Hill and Honman Ridge all lie at least 20 km from the development envelopes.	Direct impact - up to 310 ha of disturbance will be required within the PEC boundary to develop the Proposal.	310 ha of vegetation disturbance equates to less than 0.4% of the total extent of the PEC. No impacts to Mt Day, Round Top Hill and Honman Ridge are expected.
Disturbance of Marianthus aquilonaris (T)	Known from six sub- populations which all occur within the Bremer Range (Figure 5). Latest records indicate 8,831 plants	Direct impact – the Proposal may result in disturbance within three subpopulations (1b, 1c & 1f). Indirect impact – There may be some indirect impacts on the remainder of the three impacted	Direct and indirect impacts to this species will occur within three recorded sub-populations. One of these sub-populations (1f) however has only one plant record.

Table 6: Potential impacts to flora and vegetation





Potential impact	Known extent	Direct or indirect impacts	Relative impact
	lie within these six subpopulations.	subpopulations due to dust emissions. The remaining three sub- populations are not expected to be directly or indirectly impacted as they lie at least 50 m outside of the Mine Development Envelope boundary and away from significant potential dust sources.	The three sub-populations that may be impacted contain approximately 39% of total recorded plant numbers.
Disturbance of <i>Teucrium</i> sp. Dwarf (R. Davis 8813) (P1)	12,140 plants were recorded in 21 locations within the mine study area only. DBCA also has additional plant records, equating to a total of 15,593 plants recorded within 100 km of the Proposal.	Direct impact – The Mine Development Envelope contains 1,240 recorded plants, of which some may be impacted by the Proposal. No plants recorded within the Haul Road Development Envelope. Indirect impact – There may be some indirect impacts due to dust emissions.	90% of the plant numbers recorded within the mine study area were able to be excluded from the Mine Development Envelope. A proportion of the remaining plants may be impacted by the Proposal.
Disturbance of P3 and P4 flora species	Three P3 and three P4 flora species were recorded within the development envelopes. Five of the listed plants have been recorded within the Mine Development Envelope. Two species were recorded within the Haul Road Development Envelope.	Direct impact – Priority flora recorded locations will be avoided during the Project planning phase where practicable, however some impacts will be unavoidable, particularly within the Mine Development Envelope. The current haul road design does not intersect with any Priority Flora locations, however design revisions may result in some minor disturbance. Indirect impact – There may be some indirect impacts due to dust emissions or drainage alterations.	It is expected that some of the six recorded P3 and P4 flora species will be directly or indirectly impacted by the Proposal, particularly within the Mine Development Envelope. Audalia will avoid recorded locations of these species during the Project planning phase where practicable. Given the small scale of the Proposal, indirect impacts are not expected to be significant. The significance of impacts to P3 and P4 species is difficult to quantify as the most significant survey effort has been undertaken within the development envelopes and immediate surrounds and as such there was high numbers of some P3 and P4 flora species recorded. It is assumed that surveys of similar features in the surrounding area may return additional records however this cannot be verified at this stage.
Introduction or spread of weeds	Seven introduced taxa were identified within the study areas. All vegetation was recorded to be in 'Good' or 'Very Good' condition.	Indirect impact – if effective weed control is not implemented, the Proposal may result in the establishment of new weed populations or spread existing populations. This may lead to degradation of existing vegetation and increased competition with native species.	The relatively small scale of the project and the implementation of industry-standard weed control measures is not expected to result in the spread of weeds such that it significantly impacts fauna habitat.
Dust emissions	Dust emissions in the vicinity of the Proposal would currently be limited to	Indirect impact – if effective dust control is not implemented, dust emissions may impact the health of surrounding vegetation by reducing	The mine footprint and throughput are relatively small (300 ha) in comparison to other WA mining operations. This,





Potential impact	Known extent	Direct or indirect impacts	Relative impact
	dust lift from access roads and exploration activities.	the amount of light reaching the leaves.	combined with the low number of truck movements along the haul road (<1 per hour), and dust suppression, means that dust emissions will be moderate and unlikely to result in significant impacts.
Increased fire risk	The entire study areas were subjected to a major fire in 2010, with some areas subjected to multiple fires in 2010. In February 2015, the area was again subjected to fire. Vegetation within the area is in various stages of regrowth.	Indirect impact – The Proposal may result in greater fire risks as a result of machinery, sparks, cigarettes and other sources.	The increased risk of new fires is expected to be offset by an improved ability to fight fire outbreaks and prevent them from spreading. This impact is therefore expected to not be significant.

Based on the potential impacts detailed in Table 6, the EPA objective to 'protect flora and vegetation so that biological diversity and ecological integrity are maintained' is able to be met, with the exception of potential impacts to Threatened and Priority Flora, particularly *Marianthus aquilonaris*. An appropriate offset is expected to be required to meet the EPA objective in this case. This will be investigated further during the preparation of the Environmental Review Document.

Assumptions

There are several assumptions that had to be made with regards to Priority Flora in the assessment of impacts in Table 6. When combined, these assumptions mean that the assessment represents a 'worst case' scenario and the actual impact will be lower in most if not all cases. These assumptions are:

- 1. A 'regional population' of a conservation significant flora species in Table 6 was generally defined as recorded locations within 100 km of the Proposal. The extent of flora and vegetation survey effort within 100 km of the Proposal is relatively low to-date and therefore regional population numbers may be significantly higher than referenced in the assessment; and
- 2. The regional DBCA Priority Flora records sourced for the Proposal often did not contain population estimates. In those cases the assessment has assumed that the record was a single plant, which is unlikely. It is expected that regional Priority Flora plant numbers are higher than used in the assessment.

The plant counts for *Marianthis aquilonaris* used in the assessment was the most up to date records as listed in Botanica (2017b). This species is reactive to disturbance (Botanica, 2017b) and as such the actual current population estimates may be higher or lower than listed. For the assessment it was assumed that any changes in population numbers would be relatively similar across each sub-population, and therefore the percentage impact would remain close to what was stated.





TERRESTRIAL FAUNA

Policy and Guidance

Relevant EPA guidance documents for terrestrial fauna that were considered for this factor are detailed in Table 7.

Table 7: Terrestrial fauna policy and guidance

Policy / guidance	Application
Statement of Environmental Principles, Factors and Objectives (EPA, 2016b)	This statement was considered to determine whether terrestrial fauna was likely to be a Key Environmental Factor. The statement describes 'significance' with regards to potential impacts.
Environmental Factor Guideline for Terrestrial Fauna (EPA, 2016g)	This guideline was refer to when assessing the environmental values and significance of terrestrial fauna.
Technical Guidance: Sampling Methods for Terrestrial Vertebrate Fauna (EPA, 2016h)	This guidance was referred to during the 2017 terrestrial fauna survey of the haul road study area (Figure 4) completed by Harewood (2017b). Terrestrial fauna surveys for the mine study area were completed prior to the release of this guidance however it was noted that only minimal changes were made during the 2016 update (refer below).
Technical Guidance: Sampling of Short Range Endemic (SRE) Invertebrate Fauna (EPA, 2016i).	SRE invertebrate fauna surveys of the mine study area (Harewood, 2017a) were completed prior to the release of this guidance, however the sampling conducted did not differ from the methods proposed as there was only minimal changes made during the 2016 update.
 Now superseded: Guidance for the Assessment of Environmental Factors No 56: Terrestrial Surveys for Environmental Impact Assessment (EPA, 2004b) General Requirements for Terrestrial Biological Surveys. Position Statement No. 3 (EPA, 2002) Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA, 2010) EPA guidance statement No. 20 - Sampling of short-range invertebrate fauna for environmental impact assessment in WA (EPA, 2009) 	The mine study area terrestrial fauna surveys (Harewood, 2017a) were planned and implemented as far as practicable according to these now superseded guidance documents. Note that some guidance documents have only had minimal changes during the 2016 update.

Consultation

There has been stakeholder consultation regarding terrestrial fauna surrounding the Proposal since 2013. A summary of this consultation is provided in Table 8. Note that consultation that is not relevant to this Referral (e.g. general project briefings) are not included.

Stakeholder (current department names)	Date	Relevant issues / topics raised	Proponent response / outcome
DBCA	July 2013	Medcalf Project Exploration Program Conservation Management Plan submitted for comment.	DBCA acceptance of management plan.

Table 8: Terrestrial fauna consultation





Receiving Environment

Terrestrial vertebrate fauna surveys were conducted in two stages. The first survey stage was conducted in 2014 and included the mining area (Harewood, 2017a). The second survey stage was conducted in 2017 (Harewood, 2017b) along the proposed haul road (Figure 4).

<u>Mine Study Area – Survey Results</u>

A two-phase, Level 2 fauna survey was conducted by Greg Harewood (2017a), with the report provided in Appendix 3. Phase 1 was undertaken in November 2013 and Phase 2 in March 2014.

The field survey recorded 119 native and five introduced vertebrate fauna species. The identified assemblage included one species of frog, 32 species of reptiles, 68 species of birds, and 18 native mammals (including 8 species of bat).

Haul Road and Final Mine Study Area – Survey Results

A Level 1 Fauna Survey was conducted by Greg Harewood (2017b) in April 2017 in accordance with EPA (2016h), with the report provided in Appendix 4.

A total of 51 native fauna species were observed (or positively identified from foraging evidence, scats, tracks, skeletons, calls or photographs) within the survey area during the field reconnaissance survey (or on camera traps between April and September 2017). Four introduced species were also recorded.

<u>Fauna Habitats</u>

Broad-scale terrestrial fauna habitats were based primarily on landforms identified by Botanica (2017a) with further often subtle subdivisions possible using vegetation structure. Broad-scale fauna habitats were mapped within the haul road survey area, shown in Figure 8 and listed below (Harewood, 2017a):

- **Closed Depressions** Low samphire shrubland over low open forbland on playa / bare playa. Total Area = ~209 ha (~0.6%);
- Clay-Loam Plains Eucalypt woodlands or Mallee woodlands over shrublands. Total Area = ~13,599 ha (~77.8%);
- **Granite Outcrops** Heathland over sparse tussock grassland on granite outcrops. Total Area = ~265 ha (~1.5%);
- **Hillslopes** Eucalypt woodlands or Mallee woodlands over shrublands or shrublands. Total Area = ~349 ha (~2.0%); and
- Sand-Loam Plains Eucalypt woodlands or shrublands. Total Area = ~3,058 ha (~17.5%).





Figure 8: Fauna habitat within the haul road study area



Conservation Significant Fauna

Four conservation significant fauna species were recorded (Harewood, 2017a & b), and six additional species were noted as potentially occurring within the study areas (Table 9).

Species	Listing	Study Area	Likelihood			
Recorded						
Malleefowl - <i>Leipoa</i> ocellata	Vulnerable (EPBC Act) Schedule 3* (WC Act)	Haul Road	Known to occur only in haul road study area. An individual was recorded during the field survey along with some recent tracks (outside the survey area) and an extinct, very old nest mound. No evidence of Malleefowl within the mine study area and no evidence of breeding (i.e. nest mounds recent or old) was observed despite a high density of traverses (by both fauna and botanical teams) over the entire study area.			
Rainbow Bee-eater - Merops ornatus	Schedule 5* (WC Act)	Mine, also potential within Haul Road	Known to occur, recorded on 4 occasions during the mine fauna survey.			
Western Rosella - Platycercus Icterotis xanthogenys	Priority 4 (DBCA)	Mine, also potential within Haul Road	Known to occur, recorded on 5 occasions in small groups (2 - 7 individuals) during the mine fauna survey.			
Central Long-eared Bat - Nyctophilus major tor	Priority 4 (DBCA)	Mine	Known to occur, recorded during the haul road fauna survey and on 3 occasions during the mine fauna survey.			
Potential						
Carnaby's Black- Cockatoo - Calyptorhynchus latirostris	Endangered (EPBC Act) Schedule 2* (WC Act)	Mine	Possible, however the site is at the edge of the species' range and there is no evidence of current use.			
Chuditch - Dasyurus geoffroii	Vulnerable (EPBC Act) Schedule 3* (WC Act)	Mine	Possible, however despite a target search no individuals were located. The presence of feral predators would make it difficult for a population to persist in the area.			
Fork-tailed Swift - <i>Apus pacificus</i>	Migratory (EPBC Act) Schedule 5* (WC Act)	Mine	Flyover only, the Fork-tailed swift is generally a coastal species however has a large distribution and may flyover the area.			
Peregrine Falcon - Falco peregrinus	Schedule 7* (WC Act)	Mine and Haul Road	Possible, the Peregrine Falcon have a large home range so individuals may forage in the area at times even if they do not reside in the area.			
Lake Cronin Snake - Paroplocephalus atriceps	Priority 3 (DBCA)	Mine and Haul Road	Possible, the species occurs in very low density which can make detection difficult. As the area has been burnt repeatedly in recent times the available habitat may be unsuitable for the species.			
Western Brush Wallaby - <i>Macropus</i> <i>irma</i>	Priority 4 (DBCA)	Mine and Haul Road	Possible, the site is at the eastern edge of the species' documented range, coupled with the diminished quality of suitable habitat results in a low probability of occurrence.			

Table 9:	Conservation	significant	fauna	potentially	occurring	within t	the study	areas
		0			0			

*Note:

Schedule 2: Fauna that is rare or is likely to become extinct as endangered fauna

Schedule 3: Fauna that is rare or is likely to become extinct as vulnerable fauna

Schedule 5: Migratory birds protected under an international agreement

Schedule 7: Other specially protected fauna



Short Range Endemic Invertebrate Fauna

An invertebrate survey was conducted by Greg Harewood (2017a) during the course of the Level 2 fauna survey of the initial mine area in November 2013 and March 2014. Five invertebrate species collected during this survey were identified by taxonomic experts as being potential SREs (Phoenix Environmental Sciences, 2014).

Four of these potential SRE species were represented by specimens collected outside of the proposed works footprint confirming they were not confined to the current mining area.

Proposal Activities

The following proposal activities have the potential to impact terrestrial fauna:

- Clearing of fauna habitat;
- Mining and construction activities;
- Alteration of surface water flow regimes; and
- Haulage of product and other road traffic.

Mitigation

The proposal has been optimised to minimise impacts on terrestrial fauna as much as practicable. Audalia developed two separate development envelopes; a Mine Development Envelope and Haul Road Development Envelope. The development envelope boundaries were developed by excluding the following environmental features to minimise potential impacts:

- Nature Reserve R42943 (adjacent to Coolgardie Esperance Highway); and
- Surface water features (such as salt lakes) where practicable.

Audalia proposes to implement appropriate management measures to mitigate the potential impacts of the proposal. The management measures have been divided into two types of controls; industry best-practice controls and additional proposal-specific controls. Industry best-practice controls to be implemented will be included in Project Construction and Operational Environmental Management Plans (EMPs). The objectives of these EMPs are to:

- Define the management structure of the proposed action and the environmental roles and responsibilities of Audalia and contractors on the proposed action;
- Identify environmental legal requirements relevant to the proposed action;
- Identify the environmental risks associated with the major activities that will be undertaken during the proposed action;
- Document project management controls, procedures and rules to manage the identified environmental risks and satisfy environmental requirements;
- Establish objectives and targets for environmental performance;
- Document monitoring, auditing and reporting requirements; and
- Capture commitments as specific and measurable actions.

These EMPs will contain detailed management actions, monitoring, reporting, corrective actions and responsibilities for direct disturbance of flora, vegetation or fauna habitat (ground disturbance). Key direct disturbance management actions to be included in the EMPs include:

• Internal ground disturbance procedures and a ground disturbance permit (GDP) system will be developed and will continue to be refined as required prior to the commencement of ground disturbance. Vegetation clearing will only occur if accompanied by an approved GDP;





- Boundaries of areas to be cleared or disturbed will be identified by GPS coordinates and maps of boundaries will be provided to dozer operator;
- Clearing will be undertaken in a progressive manner, as close as reasonably practicable prior to construction;
- Topsoil and vegetation will be pushed to the side of disturbance areas or corridors for use in rehabilitation;
- Raised blade disturbance will be conducted where practicable on temporary disturbance areas;
- The disturbance footprint will be developed to the minimum required to ensure safe and adequate construction and operation;
- Watercourse crossings will be constructed with floodways or culverts which will allow fauna to traverse over or under road corridors;
- Fauna egress mechanisms will be installed at all turkeys nest dams;
- Trenches and pits will be backfilled as soon as practicable and fauna escape measures will be installed as required for all excavations left open overnight;
- All open trenches and pits will be inspected daily before work begins to remove trapped or injured fauna;
- Introduced fauna will be controlled around camps and other work areas and training will be provided to ensure that native or introduced fauna are not fed by site personnel;
- Food wastes will be stored in bins that are not easily accessible to fauna;
- Borrow pits will be developed such that they are free-draining where practicable to avoid water pooling;
- All incidents resulting in fauna injury or death will be reported and recorded internally; and
- Vehicle speed limits will be set and enforced.

The EMPs will also address indirect impacts to terrestrial fauna. Key indirect disturbance management actions to be included in the EMPs include:

- Water or dust suppressants will be applied to haul road, disturbed areas and ore processing / transfer / storage areas to minimise dust generation;
- Low noise equipment will be used where practicable;
- Emergency response capabilities will be maintained to prevent or control fire outbreaks where possible;
- Surface water management and erosion protection will be incorporated into project planning and design to minimise disruption to watercourses and riparian vegetation;
- Measures to manage surface water flows along the length of the haul road alignment will be implemented to minimise downstream effects;
- Weed hygiene and management measures/procedures will be implemented to prevent spread of weeds and the introduction of new weed species as a result of construction and operation; and
- Vehicles will be cleaned prior to entering vegetated areas to prevent the introduction of new weed species.

The following proposed action-specific management measures will also be employed by Audalia to avoid, minimise and/or mitigate potential impacts to terrestrial fauna:

• Additional surveys of areas that are expected to be disturbed during construction will be conducted to confirm that they do not contain any active Malleefowl mounds;





- If active Malleefowl mounds are identified within proposed disturbance areas they will be avoided if practicable, or they will not be disturbed and a 50 m buffer will be applied until at least after incubation is completed;
- Flexible infrastructure (camps, access roads, borrow pits etc.) will not be located within 50 m of any active Malleefowl mounds;
- A Conservation Significant Fauna Management Plan (CSFMP) will be prepared and implemented prior to construction. The CSFMP will include specific design and management controls such as:
 - Pre-clearing surveys to determine the location of active mounds and/or Malleefowl activity;
 - Recording of active Malleefowl mounds on design and planning systems;
 - Consideration of measures to minimise vehicle strike impacts (speed limits, driver alert signage etc.);
 - Register of sightings;
 - Management of fire risks;
 - Off-road driving controls; and
 - Rehabilitation of habitat;
- Any conservation-significant fauna records will be compiled and summarised in an Annual Environmental Report (submitted to WA DWER upon request); and
- Training on the identification and reporting of conservation-significant fauna will be included in the environmental induction and toolbox training presentations.

Impacts

The Proposal may result in the following potential impacts to terrestrial fauna:

- Direct disturbance of general fauna habitat as a result of clearing activities;
- Direct disturbance of habitat utilised by conservation-significant fauna species;
- Fragmentation of habitat;
- Indirect impacts to fauna habitat as a result of:
 - Weed introduction or spread;
 - Dust or noise emissions;
 - Vehicle strike; and
 - Increased fire risks.

The extent of these potential impacts are detailed in Table 10. There are no other major developments in the vicinity of the Proposal, therefore cumulative impacts are not expected to be significant.

Potential impact	Known extent	Direct or indirect impacts	Relative impact
Disturbance of general fauna habitat	All habitat is relatively undisturbed in the region, with all vegetation associations having more than 97% of their pre-European extent remaining (Botanica, 2017a).	Direct impact - up to 650 ha of habitat clearing will be required to develop the Proposal.	Fauna habitat in the region is relatively undisturbed. The disturbance of 650 ha of habitat across more than 74 km is only a small proportion of the regional fauna habitat and is unlikely to be significant.
Fragmentation of habitat	All habitat is relatively undisturbed in the region, with all vegetation	Direct impact - up to 650 ha of habitat clearing will be required to develop the	The haul road will generally not be a significant barrier to the movement of fauna species.

Table 10: Potential impacts to terrestrial fauna







Potential impact	Known extent	Direct or indirect impacts	Relative impact
	associations having more than 97% of their pre-European extent remaining (Botanica, 2017a).	Proposal. A 74 km haul road will be developed which will fragment general fauna habitat.	The mine pit, waste rock landform and tailings storage facility may form a barrier however these are relatively small in size and most fauna species will be able to travel around these formations. The Proposal is not expected to fragment fauna habitat such that a species population is significantly affected.
Disturbance of habitat utilised by conservation- significant fauna species	The development envelopes may contain habitat for up to 12 conservation-significant fauna species. Surveys by Harewood (2017a & b) did not identify any constrained habitat for any of the listed species.	Direct impact - up to 650 ha of habitat clearing will be required to develop the Proposal. Conservation- significant fauna may inhabit part or all of this habitat.	The proposal is not expected to impact any constrained fauna habitat and fauna habitat in the region is relatively undisturbed. The disturbance of 650 ha of habitat across more than 74 km is only a small proportion of the regional fauna habitat and is unlikely to be significant to conservation-significant fauna species.
Introduction or spread of weeds	Seven introduced taxa were identified within the study areas. All vegetation was recorded to be in 'Good' or 'Very Good' condition.	Indirect impact – if effective weed control is not implemented, the Proposal may result in the establishment of new weed populations or spread existing populations. This may lead to degradation of existing fauna habitat.	The relatively small scale of the project and the implementation of industry-standard weed control measures is not expected to result in the spread of weeds such that it significantly impacts fauna habitat.
Dust and noise emissions	Dust and noise emissions in the vicinity of the Proposal would currently be limited to access roads and exploration activities.	Indirect impact – excessive dust or noise may lead to avoidance or changes in behaviour, feeding or breeding characteristics.	The mine footprint and throughput is relatively small (300 ha) in comparison to other WA mining operations. This, combined with the low number of truck movements along the haul road (<1 per hour), means that dust and noise emissions will be moderate and unlikely to result in significant impacts.
Vehicle strike	With the exception of the intersection with the Coolgardie – Esperance Highway the Proposal location is remote and any existing tracks are rarely used.	Direct impact – vehicle strike may occur via haul trucks and other vehicle movements along the haul road and on the mine site.	The mine is relatively small in comparison to other WA mining operations. This, combined with the low number of truck movements along the haul road (<1 per hour), means that vehicle strike risks will be moderate and unlikely to result in significant impacts to a fauna population.
Increased fire risk	The entire study areas were subjected to a major fire in 2010, with some areas subjected to multiple successional fires in 2010. In February 2015, the area was again subjected to fire. Vegetation within the area is in various stages of regrowth.	Indirect impact – The Proposal may result in greater fire risks as a result of machinery, sparks, cigarettes and other sources. Fire outbreaks may lead to fauna deaths.	The increased risk of new fires is expected to be offset by an improved ability to fight fire outbreaks and prevent them from spreading. This impact is therefore not expected to be significant.





Based on the potential impacts detailed in Table 10, the EPA objective to 'protect terrestrial fauna so that biological diversity and ecological integrity are maintained' is expected to be able to be met.

Assumptions

Some fauna species are reported as potentially occurring based on there being suitable habitat (quality and extent) within the survey area or immediately adjacent. The habitat requirements and ecology of many of the species known to occur in the wider area are often not well understood or documented. It can therefore be difficult to exclude species from the potential list based on a lack of a specific habitat or microhabitat within the survey area. As a consequence of this limitation the potential fauna list produced is most likely an overestimation of those species that actually utilise the survey area for some purpose. Some species may be present in the general area but may only use the survey area itself on rare occasions or as vagrants.

In recognition of survey limitations, a precautionary approach was adopted for the assessment.





PART C: OTHER APPROVALS AND REGULATION

STATE AND LOCAL GOVERNMENT APPROVALS

Table 11 identifies the other approvals and regulations that will apply to the Proposal. The relevant decision-making authorities have also been identified for each approval or regulation.

Table 11: Other approvals and regulation

Proposal Activities	Land Tenure/Access	Type of Approval	Legislation Regulating the Activity	Decision- making authority
Taking of listed flora and fauna	M63/656 & L63/75	Licence to take flora / fauna	WC Act, Wildlife Conservation Regulations 1970	DBCA
All proposed activities apart from road intersection	M63/656 & L63/75	Mining Proposal	Mining Act 1978	DMIRS
Closure of all proposed activities apart from road intersection	M63/656 & L63/75	Mine Closure Plan	Mining Act 1978	DMIRS
Exploration for groundwater	M63/656 &	Programme of Works	Mining Act 1978	DMIRS
sources	L63/75	26D Licence	RIWI Act	DWER
Groundwater abstraction	M63/656 & L63/75	5C Licence	RIWI Act	DWER
Ore processing, sewage treatment and disposal, crushing and screening	M63/656	Works Approval and Licence	Part V EP Act	DWER
Sewage treatment and disposal	M63/656	Approval to construct and operate an apparatus for the treatment of sewage	Health Act 1911	Department of Health
Accommodation camp	M63/656	Building Licence	Building Act 2011	Shire of Dundas
Disturbance of Aboriginal heritage sites (if sites are located and cannot be avoided). <i>Note that no sites are</i>	M63/656 & L63/75	Section 18 approval	Aboriginal Heritage Act 1972	Department of Aboriginal Affairs
expected to require Section 18 approval.				
Fuel and/or chemical storage (if above prescribed volumes)	M63/656 & L63/75	Dangerous Goods Licence	Dangerous Goods Safety Act 2004	DMIRS





GLOSSARY

Term	Definition
CSFMP	Conservation Significant Management Plan
DBCA	Department of Biodiversity, Conservation and Attractions
DMIRS	Department of Mines, Industrial Regulation and Safety
DWER	Department of Water and Environmental Regulation
EP Act	Environmental Protection Act 1986
EPA	Environmental Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EMP	Environmental Management Plan
GDP	Ground disturbance permit
На	Hectare
IUCN	World Conservation Union
Km	Kilometres
М	Metres
Mt	Million tonnes
Mtpa	Million tonnes per annum
PEC	Priority 1 Ecological Community
ROM	Run of mine
RIWI Act	Rights in Water and Irrigation Act 1914
SRE	Short Range Endemic
TSF	Tailings storage facility
WA	Western Australia
WC Act	Wildlife Conservation Act 1950





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APPENDICES

Appendix 1: Detailed Flora and Vegetation Survey, Medcalf Vanadium Mining Project & Proposed Haul Road (Botanica Consulting, 2017a)

Appendix 2: Memorandum: Marianthus aquilonaris (Botanica Consulting, 2017b)

Appendix 3: Fauna Survey, Medcalf Vanadium Mining Project (Harewood, 2017a)

Appendix 4: Fauna Survey, Medcalf Vanadium Mining Project Proposed Haul Road (Harewood, 2017b)

