



# Report and recommendations of the Environmental Protection Authority



## Blue Hills Mungada East Expansion

Sinosteel Midwest Corporation Limited

Report 1598

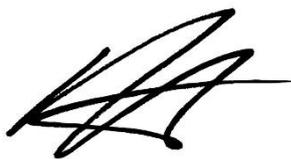
June 2017

## Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (weeks)
22/04/2015	Minister remitted the proposal to the EPA for re-assessment	
27/07/2015	EPA approved Environmental Scoping Document	13
08/08/2016	EPA accepted Environmental Review Document	54
15/08/2016	Environmental Review Document released for public review	1
27/09/2016	Public review period for Environmental Review Document closed	6
02/03/2017	EPA accepted Proponent Response to Submissions	22
28/04/2017	EPA received final information for assessment	10
18/05/2017	EPA completed its assessment	3
22/06/2017	EPA provided report to the Minister for Environment	5
28/06/2017	EPA report published	4 days
12/07/2017	Close of appeals period	2

Timelines for an assessment may vary according to the complexity of the proposal and are usually agreed with the proponent soon after the Environmental Protection Authority (EPA) decides to assess the proposal and records the level of assessment.

In this case, the EPA met its timeline objective to complete its assessment and provide a report to the Minister.



Dr Tom Hatton  
Chairman

22 June 2017

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## Summary

This report provides the Minister for Environment with the outcomes of the Environmental Protection Authority's (EPA's) environmental impact assessment of the proposal by Sinosteel Midwest Corporation Limited (the proponent) to expand the existing iron ore (hematite) mining operations on the Mungada Ridge.

### Proposal

The proposal is located on and adjacent to the Mungada Ridge portion of the Blue Hills Range, located 220 kilometres south-east of Geraldton. The proposal is for the development of a new mine pit, referred to as the Mungada East Expansion pit, and associated waste rock dump, ore processing infrastructure, haul roads and access road. Mining would not extend below the groundwater level.

The development envelope for the proposal is 172.5 hectares (ha), within which the disturbance footprint is 44.3 ha. The expected life of the proposal is three years.

### Background and context

The proponent referred the proposal, which also included an expansion to the Mungada West pit, to the EPA on 2 September 2013. On 10 April 2014, the EPA informed SMC of its preliminary view that the proposal was environmentally unacceptable in its current form. In response, SMC amended the proposal to include only the expansion of the Mungada East pit.

On 10 November 2014, the EPA decided to assess the proposal at a level of assessment of Assessment on Proponent Information – Category B (environmentally unacceptable) and published its report and recommendations.

The then Minister for Environment considered the appeals against the EPA's report and recommendations and remitted the proposal back to the EPA on 22 April 2015 to be assessed more fully and more publicly.

The Environmental Scoping Document for the proposal was approved by the EPA on 27 July 2015. The proponent's Environmental Review Document was released for public review for six weeks, from 15 August 2016 to 27 September 2016. Seven submissions were received.

### Submissions on the Environmental Review Document

Key issues raised in the submissions included:

- direct, indirect and cumulative impacts on Threatened Flora, Priority Flora and vegetation;
- concern regarding impacts on the Mungada Ridge landform;
- that the integrity of the unique Mungada Ridge be maintained;

- impacts on the gilled slender blue-tongue skink and the shield-backed trapdoor spider;
- potential impacts to groundwater;
- lack of recognition of the role of the Karara Complex ex-pastoral leases in the development of sustainable regional tourism activities;
- concern regarding the proposed offset;
- concern that the proposed rehabilitation would not be compatible with the surrounding landscape; and
- potential for the Mungada Ridge to be protected in a class A nature reserve.

In response, the proponent amended the design of the proposal to reduce the disturbance footprint, thereby reducing the impact on significant flora and vegetation and the landform. The remaining issues raised were addressed by the proponent in the Response to Submissions document (SMC, 2017).

The EPA considers that the consultation undertaken was appropriate, and has taken into account relevant significant environmental issues raised in this process during its assessment of the proposal.

### **Key environmental factors and relevant principles**

The EPA identified the following key environmental factors (see Section 4) during the course of its assessment:

1. **Landforms** – direct impact from the excavation of the mine pit and construction of the pit abandonment bund and haul road;
2. **Flora and Vegetation** – direct impact from the clearing of flora and vegetation and indirect impact from mining related activities;
3. **Terrestrial Fauna** – direct impact from the loss of fauna habitat as a result of vegetation clearing; and
4. **Social Surroundings** – impact to visual amenity from the mine pit, waste rock dump, ore processing infrastructure area and roads, and impact to Aboriginal heritage.

In identifying the key environmental factors, the EPA had regard for the object and principles set out in section 4A of the *Environmental Protection Act 1986*. The EPA considered that the following principles were particularly relevant to this assessment (see Section 4):

- 1 the principle of intergenerational equity; and
- 2 the principle of the conservation of biological diversity and ecological integrity.

## **Assessment**

### Landforms

The proposed mine pit is located on the Banded Ironstone Formation (BIF) landform known as the Mungada Ridge. The EPA considers that Mungada Ridge is a significant landform in the Blue Hills area because of the aggregation of its distinct physical features, the important environmental and social aesthetic values it supports, and the majority of the landform having not been impacted by mining.

The EPA assessed the impact of the proposal on the Mungada Ridge and has paid particular attention to:

- principles of intergenerational equity and the principle of the conservation of biological diversity and ecological integrity;
- relevant EPA policy and guidance pertaining to Landforms;
- the proponent's proposed impact avoidance, minimisation and rehabilitation measures;
- Mungada Ridge's importance as the last significant and distinctive landform in the local area that supports biodiversity and visual amenity values and is largely intact;
- the significant residual impact of the proposal on Mungada Ridge, being a permanent impact to the physical structure of the landform that cannot be mitigated;
- the increase from 4.9% to 6.1% in the permanent cumulative impact to Mungada Ridge, resulting in a significant loss of the integrity of the landform; and
- Mungada Ridge's regional importance as a landform with the highest conservation value of any BIF in the Karara Complex.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for landforms, that the impacts to this factor are not manageable and would remain significant. The additional 1.2% permanent impact on Mungada Ridge is irreversible and would further compromise the integrity of the only largely intact distinctive BIF landform in the Blue Hills area that supports important biodiversity and social values.

### Flora and Vegetation

The proposal would result in the clearing of 44.3 ha of native vegetation, of which 13.3 ha is on Mungada Ridge.

The EPA assessed the impact of the proposal on flora and vegetation and has paid particular attention to the:

- principle of conservation of biological diversity and ecological integrity;
- relevant EPA guidance pertaining to Flora and Vegetation;

- proponent's proposed impact avoidance, minimisation and rehabilitation measures;
- significant residual impact on Threatened Flora, *Acacia woodmaniorum* (loss of 1,739 individuals, contributing to a cumulative impact of 18.43% of the known populations of the species);
- cumulative significant residual impacts to Priority Flora; *Lepidosperma* sp. Blue Hills, *Drummondita fulva* and *Micromyrtus trudgenii*; the Blue Hills (Mount Karara/Mungada Ridge/Blue Hills vegetation complexes (banded ironstone formation) Priority Ecological Community) and Floristic Community Types 13 and 14; and
- the lack of sufficient scientific evidence that translocation of *A. woodmaniorum* to achieve a self-sustaining population would be successful.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Flora and Vegetation, that the impacts to this factor are not manageable and would remain significant, because of the high cumulative impact on restricted vegetation communities and significant flora and uncertainty that translocation of *A. woodmaniorum* would be successful.

### Terrestrial Fauna

The proposal would result in the clearing of 44.3 ha of potential fauna habitat.

The EPA assessed the impacts of the proposal on terrestrial fauna and has paid particular attention to the:

- principle of conservation of biological diversity and ecological integrity;
- relevant EPA guidance pertaining to Terrestrial Fauna;
- proponent's proposed impact avoidance, minimisation and rehabilitation measures;
- habitat types for the significant fauna species within the development envelope being well represented in the local and regional areas; and
- small-scale loss of fauna habitat, small extent of impact on significant fauna species.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Terrestrial Fauna, that the impacts to this factor are manageable and would no longer be significant, if pre-clearance surveys for malleefowl and the gilled slender blue-tongue skink were implemented.

### Social Surroundings

The proposal is located on a landform and surrounding plains which have important social and aesthetic values.

The EPA assessed the impacts of the proposal on Aboriginal heritage and visual amenity and has paid particular attention to the:

- principle of intergenerational equity;

- relevant EPA guidance pertaining to Social Surroundings;
- proponent's proposed impact avoidance, minimisation and rehabilitation measures;
- Mungada Ridge being a distinctive landform in a predominately natural landscape with significant aesthetic values;
- permanent impacts on the scenic quality of the Mungada Ridge and the surrounding landscape from the construction of the mine void and the waste rock dump; and
- Mungada Ridge being part of the Karara Complex, which is managed by the Department of Parks and Wildlife for conservation and recreation.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Social Surroundings, that the impacts to this factor are not manageable and would remain significant, because of the impacts on the amenity values of the Mungada Ridge and surrounding area.

### **Conclusion and recommendations**

Having assessed the proposal, the EPA has concluded that the proposal is environmentally unacceptable because it would result in significant loss to the environmental values and integrity of the Mungada Ridge landform.

The EPA recommends that the Minister for Environment notes:

1. The key environmental factors identified by the EPA in the course of its assessment are Landforms, Flora and Vegetation, Terrestrial Fauna and Social Surroundings, set out in Section 4.
2. That the EPA concluded that for the key environmental factor of Terrestrial Fauna, that the impacts are manageable.
3. That the EPA concluded for the key environmental factors of Landforms, Flora and Vegetation and Social Surroundings, that the impacts are not manageable and remain significant.
4. That the EPA has concluded that the proposal should not be implemented.
5. That the EPA has not included conditions and procedures to which the proposal should be subject in this report, because the EPA has concluded that the proposal should not be implemented.
6. Other information, advice and recommendations provided by the EPA set out in Section 6.

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# 1. Introduction

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for Environment on the outcome of the EPA's environmental impact assessment (EIA) of the proposal by Sinosteel Midwest Corporation Limited (SMC). The proposal is to expand its existing iron ore (hematite) mining operations at the Mungada East pit by constructing and operating a new mine pit, a waste rock dump, ore processing infrastructure, haul roads and an access road.

The EPA has prepared this report in accordance with section 44 of the *Environmental Protection Act 1986* (EP Act), which requires that the EPA prepare a report on the outcome of its assessment of a proposal and provide this assessment report to the Minister for Environment. The report must set out:

- what the EPA considers to be the key environmental factors identified in the course of the assessment; and
- the EPA's recommendations as to whether or not the proposal may be implemented, and, if the EPA recommends that implementation be allowed, the conditions and procedures to which implementation should be subject.

The EPA may also include any other information, advice and recommendations in the assessment report as it thinks fit.

The proponent referred the proposal to expand its existing hematite mining operations at the Mungada East pit and the Mungada West pit to the EPA on 2 September 2013. On 10 April 2014, the EPA informed the proponent of its preliminary view that the proposal in its current form was environmentally unacceptable. In response, the proponent amended the proposal to include only the expansion to the Mungada East pit<sup>1</sup>.

On 10 November 2014, the EPA decided to assess the proposal and set the level of assessment at Assessment on Proponent Information – Category B (environmentally unacceptable)<sup>2</sup> and published its report and recommendations (EPA 2014). The then Minister for Environment considered the appeals against the EPA's report and recommendations and remitted the proposal back to the EPA on 22 April 2015, to be assessed more fully and more publicly.

The EPA approved the Environmental Scoping Document (ESD) for the proposal on 27 July 2015. The proponent's Environmental Review Document (ERD) was released for public review for six weeks, from 15 August 2016 to 27 September 2016.

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<sup>1</sup> The proposal to expand mining operations at the Mungada West pit was assessed separately through a change to the original proposal under Ministerial Statement No. 811 (Koolanooka/Blue Hills Direct Shipping Ore Mining Project).

<sup>2</sup> This was one of the levels of assessment available under the previous *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2012*.

## **1.1 EPA procedures**

The EPA followed the procedures in the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2012*.

The EPA introduced a new suite of EIA procedures on 13 December 2016. The EPA followed the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual 2016* to the extent that it was appropriate and practicable. The EPA consulted with the proponent on the application of the current procedures to its assessment of the proposal.

## 2. The proposal

### 2.1 Proposal summary

The proponent, Sinosteel Midwest Corporation Limited, proposes to expand its existing hematite mining operations located on the Mungada Ridge portion of the Blue Hills Range. The proponent has approval for the existing operations as part of the Blue Hills mine component of the Koolanooka/Blue Hills Direct Shipping Ore Mining Project (DSO Project) (Ministerial Statement No. 811).

The Blue Hills Mungada East Expansion (the proposal) is located approximately 220 kilometres (km) south-east of Geraldton, in the Midwest region of Western Australia (Figure 1).

The development envelope for the proposal is 172.5 hectares (ha), within which the disturbance footprint is 44.3 ha (Figure 2). The proposal includes the development of a new mine pit, referred to as the Mungada East Expansion pit. Mining would not extend below the groundwater table. The majority of the waste rock from the mine pit would be used to backfill the existing Mungada East pit (DSO Project). Once the Mungada East pit has been backfilled, the waste rock would be disposed of at the existing waste rock dump (DSO Project) until it reaches capacity, and the remaining waste rock would be stored in a new waste rock dump. The ore from the Mungada East Expansion pit would be processed at a new ore processing area, located next to the new waste rock dump. Two haul roads would be constructed: one to connect the new mine pit with the existing Mungada East pit and waste dump, and the other to connect the new mine pit with the new waste dump and processing area. An access road would also be constructed to transport the processed ore to the existing DSO Project.

The camp at the Karara mine site would be used for the workforce, and other support infrastructure at the existing DSO Project would be used for the proposal. The expected life of the proposal is three years.

The key characteristics of the proposal are summarised in Tables 1 and 2, below. A detailed description of the proposal is provided in Sections 3 and 4 of the ERD (SMC 2016) and Table 3 of the Response to Submissions document (SMC 2017).

**Table 1: Summary of the proposal**

<b>Proposal title</b>	Blue Hills Mungada East Expansion
<b>Short description</b>	The proposal is to construct and operate one hematite mine pit, waste rock dump, ore processing infrastructure, two haul roads and an access road.  The proposal is located in the Blue Hills Range, approximately 220 km south-east of Geraldton.

**Table 2: Location and proposed extent of physical elements**

<b>Element</b>	<b>Location</b>	<b>Proposed extent</b>
Mine pit	Figure 2	Clearing of no more than 7.3 ha within a 172.5 ha development envelope.
Pit abandonment bund	Figure 2	Clearing of no more than 0.8 ha within a 172.5 ha development envelope.
Waste rock dump	Figure 2	Clearing of no more than 11 ha within a 172.5 ha development envelope.
Ore processing area	Figure 2	Clearing of no more than 11.3 ha within a 172.5 ha development envelope.
Haul roads	Figure 2	Clearing of no more than 8.2 ha within a 172.5 ha development envelope.
Access road	Figure 2	Clearing of no more than 5.7 ha within a 172.5 ha development envelope.

## 2.2 Changes to the proposal during assessment

The proponent submitted a request for the EPA to consent to changes to the proposal during the assessment on 18 January 2017. The nature of the changes were modifications to the size and location of the pit abandonment bund and a reduction in the size of the mine pit. These changes resulted in an overall reduction to the disturbance footprint by approximately 17% from 53.5 ha to 44.3 ha. The area of the development envelope remained unchanged. Tables 1 and 2, above, include these changes.

The Chairman, as a delegate of the EPA, concluded that the changes were unlikely to significantly increase any impact that the proposal may have on the environment and gave consent under section 43A of the EP Act to the changes on 15 February 2017.

## 2.3 Context

On a regional scale, the proposal is located in the Interim Biogeographic Regionalisation for Australia (IBRA) bioregion of Yalgoo and the sub-region of Tallering. On a local scale, it is located in the Blue Hills Range, a series of Banded Iron Formation (BIF) landforms, including the Mungada Ridge BIF landform, where the proposed mine pit is located.

The Blue Hills Range was identified in the *Strategic Review of the Banded Iron Formation Ranges of the Midwest and Goldfields* (DEC and DoIR 2007) (BIF Review) as containing endemic and restricted plant communities, and one of the highest levels of flora numbers and flora of conservation interest (including species with their distributions centred on BIF habitat). It is also listed in the set of BIF ranges with the highest biodiversity and landscape values.

The BIF Review was prepared to provide information to Government to allow for a strategic approach to resource utilisation and biodiversity conservation decision making, with a specific focus on the BIF landforms of the Midwest and the Goldfields regions. The BIF landforms in these regions have significant biodiversity value as a consequence of their unique geology, soils and relative isolation (DEC and DoIR 2007).

The Mungada Ridge is part of the Karara Complex of ex-pastoral leases which have been purchased by government for future inclusion in the conservation estate, and are managed by the Department of Parks and Wildlife (Parks and Wildlife). The EPA notes the Parks and Wildlife view that the Mungada Ridge has the highest conservation value of any BIF landform in the Karara Complex of ex-pastoral leases for biodiversity, BIF species specialisation and visual amenity, making it a focal point for recreational tourism. Figure 1 shows the location of the Karara Complex of ex-pastoral leases.

Notwithstanding the above, mining tenements occur over the entire Mungada Ridge, which allows for proposed mineral exploration and mining development. Within the local area of the Blue Hills Range (also located in the Karara Complex of ex-pastoral leases), there have been extensive cumulative impacts from approved exploration and mining development. Figure 4 shows the approved developments within the Blue Hills Range. The BIF Review recognised the Blue Hills Range's combined high mineral prospectivity and high biodiversity and landscape values.

Environmental investigations have been completed for numerous mineral exploration and mining development projects on BIF landforms in the Midwest region. In addition to regional biological surveys conducted by Parks and Wildlife, these have contributed to growing knowledge of the environmental values of the BIF landforms. An analysis of regional surveys has confirmed that the Koolanooka Hills and Blue Hills Range together comprise one of two concentrations of BIF specialists, known as 'hotspots', in the Midwest and Goldfields regions<sup>3</sup> (Gibson *et al* 2012). BIF specialists are flora species that have their main distribution centred on a BIF range.

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<sup>3</sup> The other hot spot is the Mt Manning region.

The EPA notes that any impact on the Mungada Ridge landform will have associated impacts on an additional three key environmental factors: Flora and Vegetation, Terrestrial Fauna, and Social Surroundings. This is due to the interrelatedness of the processes and impacts across the key environmental factors for the proposal. The proponent's studies and investigations in the ERD have increased understanding of the environmental processes and interactions between these factors. The proponent's mitigation of impacts of the proposal on the Mungada Ridge and the environmental values that it supports is central to the assessment of this proposal.



Figure 1: Regional location

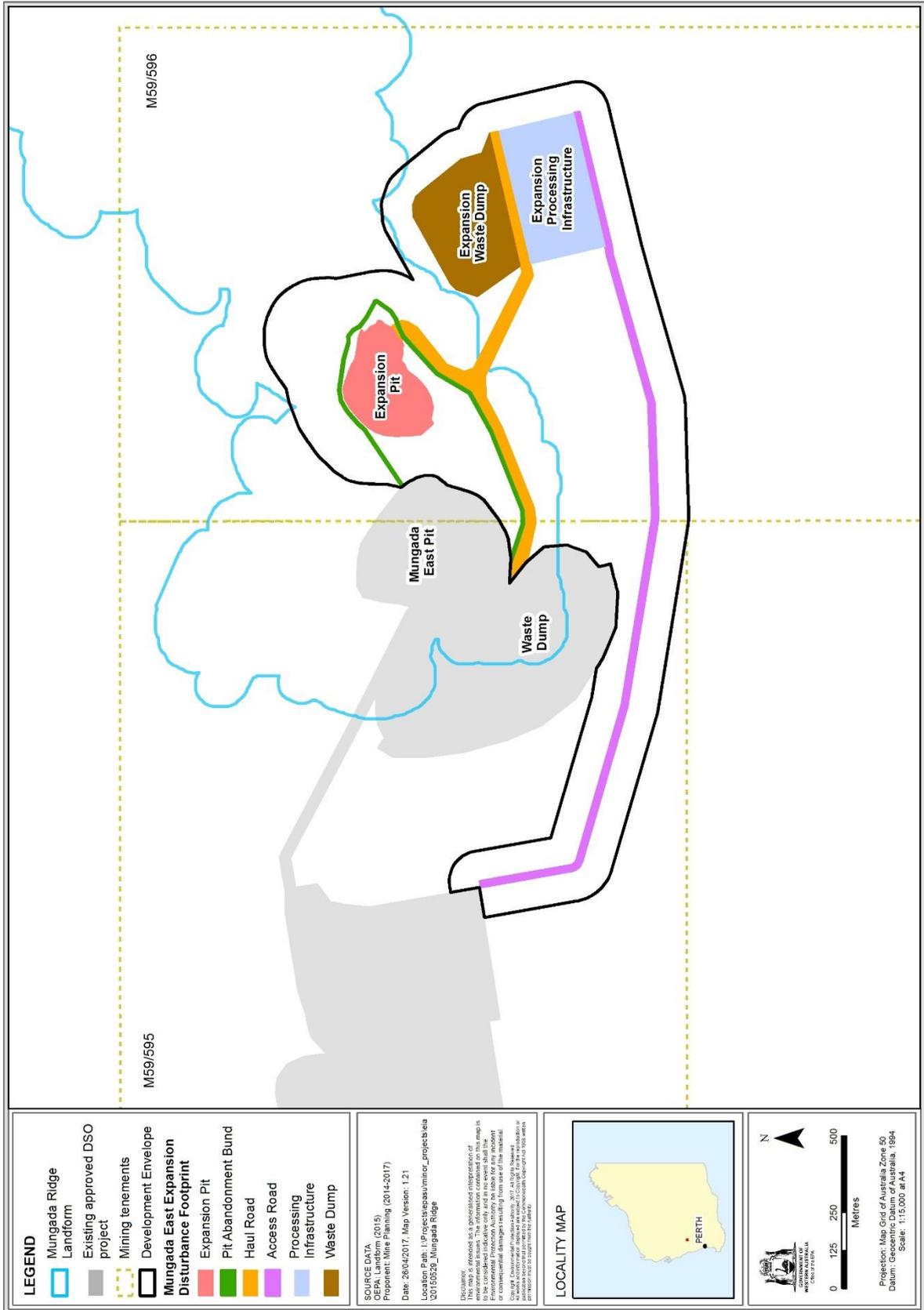


Figure 2: Proposal development envelope and disturbance footprint

### 3. Consultation

The proponent consulted with government agencies and key stakeholders during the preparation of the ERD. The agencies and stakeholders consulted, the issues raised, and the proponent's response are detailed in Table 3 of the ERD (SMC 2016).

Four agency submissions and three public submissions received during the public review period. The key issues raised relate to:

- direct, indirect and cumulative impact on Threatened Flora, Priority Flora and vegetation;
- confirmation of the total numbers of *Lepidosperma* sp. Blue Hills;
- impact on the gilled slender blue-tongue skink and the shield-backed trapdoor spider;
- potential impacts to groundwater;
- concern regarding the impact on the Mungada Ridge landform;
- the need to maintain the integrity of the Mungada Ridge, which is a unique feature of the landscape;
- lack of recognition that the Karara Complex ex-pastoral leases have a role in the development of sustainable regional tourism activities;
- concern regarding the proposed offset; and
- concern that the proposed rehabilitation would not be compatible with the surrounding landscape.

The issues raised were addressed by the proponent in the Response to Submissions document (SMC, 2017).

The EPA considers that the consultation process has been appropriate and that reasonable steps have been taken to inform the community and stakeholders on the proposed development. Relevant significant environmental issues identified from this process were taken into account by the EPA during its assessment of the proposal.

## 4. Key environmental factors

In undertaking its assessment of this proposal and preparing this assessment report, the EPA had regard for the object and principles contained in section 4A of the EP Act to the extent relevant to the particular matters that were considered.

The EPA considered the following information during its assessment:

- the proponent's ERD and further information provided during the EPA's assessment;
- stakeholder comments received during the preparation of proponent documentation and public and agency comments received on the ERD;
- the proponent's Response to Submissions document and agency comments on the document;
- the EPA's own inquiries;
- the EPA's *Statement of environmental principles, factors and objectives*; and
- the relevant principles, policy and guidance referred to in the assessment of each key environmental factor in sections 4.1 to 4.4.

Having regard to the above information, the EPA identified the following key environmental factors during the course of its assessment of the proposal:

1. **Landforms** – direct impact from the excavation of the mine pit and construction of the pit abandonment bund and haul road;
2. **Flora and Vegetation** – direct impact from the clearing of flora and vegetation and indirect impact from mining related activities;
3. **Terrestrial Fauna** – direct impact from the loss of fauna habitat as a result of vegetation clearing; and
4. **Social Surroundings** – impacts to visual amenity from the mine pit, waste rock dump, ore processing infrastructure area and roads, and impacts to Aboriginal heritage.

The EPA considered other environmental factors during the course of its assessment of the proposal. These factors, which were not identified as key environmental factors, are discussed in the ERD (SMC 2016). Appendix 4 contains an evaluation of why these other environmental factors were not identified as key environmental factors.

Having regard to the EP Act principles, the EPA considered that the following principles were particularly relevant to its assessment of the proposal:

- 1 principle of intergenerational equity; and
- 2 principle of the conservation of biological diversity and ecological integrity.

Appendix 3 provides a summary of the principles and how the EPA considered these principles in its assessment.

The EPA's assessment of the impacts of the proposal on the key environmental factors is provided in Sections 4.1 – 4.4. These sections outline whether or not the EPA considers that the impacts to each factor are manageable. Section 5 provides the EPA's conclusion as to whether or not the proposal as a whole is environmentally acceptable.

## **Changes to EPA environmental policy and guidance**

The EPA introduced a new suite of environmental guidance for EIA on 13 December 2016. This replaced EPA policy and guidance that were current at the time of preparation of the ERD for the proposal.

In its assessment of the proposal, the EPA considered and gave due regard to, where relevant, its current environmental impact assessment policy and guidance documents, unless otherwise stated. The EPA consulted the proponent on the application of the current environmental impact assessment policy and guidance documents relevant to the EPA's assessment of the proposal.

## **4.1 Landforms**

### **EPA objective**

The EPA's environmental objective for this factor is *to maintain the variety and integrity of distinctive physical landforms so that environmental values are protected.*

### **Relevant policy and guidance**

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- Environmental Factor Guideline: *Landforms* (EPA 2016b).

The considerations for EIA for this factor are outlined in Environmental Factor Guideline: *Landforms* (EPA 2016b).

### **EPA assessment**

The EPA recognises the inherent links between landforms and other key environmental factors, as the landform supports biodiversity values and forms part of the landscape setting, which has visual aesthetic values.

For the purpose of characterising the significance of the landforms and assessing the potential impacts of this proposal on landforms, including cumulative impacts, the EPA identified in the ESD the:

- affected landform as the Mungada Ridge (Figure 3);
- Local Assessment Unit (LAU) as the Blue Hills Range (Figure 4); and
- regional context as the Mungada/Karara/Koolanooka Region (Figure 5).

The EPA considers that the information provided in the ERD (SMC 2016) and the Response to Submissions document (SMC 2017) is adequate to enable the EPA to undertake its assessment of landforms for this proposal.

### **Environmental values**

The proposal is located on the BIF landform known as the Mungada Ridge. The proponent has undertaken an analysis of the significance of the Mungada Ridge against the considerations in the previous Environmental Protection Bulletin No. 23: Guidance on the EPA Landforms factor (EPA 2015) (EPB No. 23). The EPA considers that this is appropriate as EPB No. 23 was the applicable guidance at the time of the ERD’s preparation. The EPA notes that the new Environmental Factor Guideline: Landforms (EPA 2016b) now includes ‘social importance’ as a consideration in determining the significance of landforms and that this was not included in EPB No. 23. The proponent has addressed this consideration in its ERD under the ‘amenity’ factor and as part of the Response to Submissions (SMC 2017).

The proponent also commissioned a peer review of the landforms section of the draft ERD. The peer reviewer concluded that further investigation of the landform geomorphology was required. The proponent considered that the level of information was adequate. The EPA notes that there is a lack of geomorphological information on BIF landforms in the local and regional areas for direct comparisons to be made with the Mungada Ridge. The EPA considers that the level of information in the ERD is adequate to enable the EPA to undertake its assessment of landforms for this proposal.

The EPA took into account the latest proposal-specific information provided by the proponent, information from its own enquiries, and the considerations described in the Environmental Factor Guideline: *Landforms* (EPA 2016b) to determine the significance of the Mungada Ridge landform (Table 3).

**Table 3: Information against the considerations in determining the significance of the Mungada Ridge landform**

<b>Significance consideration (EPA 2016b)</b>	<b>Information on the Mungada Ridge landform</b>
Variety	<p>Within the LAU, the Mungada Ridge landform is the largest at 685 ha, the highest at 512 m Australian Height Datum (mAHD), and the steepest, and it has a unique ‘crescent-shape’.</p> <p>Within the region, the Mungada Ridge landform is the fifth largest, second highest<sup>4</sup>, third steepest and has a unique ‘crescent-shape’.</p> <p>The combined physical features and environmental values of the Mungada Ridge are not well represented on the local or regional scale.</p>

<sup>4</sup> The proponent identified Canning Hill as the second highest landform in the region, however the EPA considers there is some uncertainty about whether this landform is probable BIF and excluded it from the regional assessment.

Significance consideration (EPA 2016b)	Information on the Mungada Ridge landform
Integrity	<p>The Mungada Ridge landform is currently subject to mining on the western edge via the Mungada East pit, and the eastern portion has been subject to mineral exploration. About 92% of the landform remains largely intact (that is, not impacted by mining or exploration). The extent of disturbance on the Mungada Ridge is shown in Figure 3.</p>
Ecological importance	<p>The Mungada Ridge landform supports the following environmental values:</p> <ul style="list-style-type: none"> <li>• two Threatened Flora species and 15 Priority Flora species;</li> <li>• flora species that have their main distribution centred on a BIF range (these are known as BIF specialist species);</li> <li>• Blue Hills (Mount Karara/Mungada Ridge/Blue Hills) vegetation complexes (banded ironstone formation) Priority Ecological Community (PEC) – Priority 1;</li> <li>• restricted Floristic Community Types (FCTs); and</li> <li>• significant fauna species.</li> </ul> <p>These environmental values are discussed further in section 4.2 on Flora and Vegetation and section 4.3 on Terrestrial Fauna.</p>
Scientific importance	<p>As a BIF landform, the Mungada Ridge is an example of geological processes linked to the environmental and geochemical evolution of the earth, undisturbed by seas or glaciers for more than 250 million years.</p> <p>However, the Mungada Ridge landform does not provide any known scientific importance that is considered to be different or unique to any other BIF landform in the region.</p>
Rarity	<p>The Mungada Ridge landform is the only discrete landform within the LAU, and possibly the region, with an aggregate of physical features that has a largely intact, contiguous habitat for significant flora and restricted vegetation, and is part of a larger area of the Karrara Complex ex-pastoral leases that is managed for conservation and recreation.</p>
Social importance	<p>Public access to the Mungada Ridge is currently limited due to restrictions relating to exploration and mining activities.</p> <p>The Mungada Ridge is part of the Karara Complex ex-pastoral leases, which are managed by Parks and Wildlife for conservation and recreation. This is discussed further in section 4.4 on Social Surroundings.</p>

The EPA considers that the Mungada Ridge landform is a significant landform in the Blue Hills area because of the aggregation of:

- distinct physical features (i.e. large size, high elevation, steepness and unique shape);
- important environmental values it supports (i.e. significant flora and fauna and restricted vegetation);
- the social aesthetic values it supports (i.e. significant aesthetic values and is part of the Karara Complex ex-pastoral leases); and
- the majority of the landform having not been impacted by mining.

The proponent used available geological survey data and digital elevation models to characterise the physical features of the landforms within the region and concluded that the Mungada Ridge represents one of a small number of very large, high and steep BIF landforms in the region and has a crescent shape. The proponent notes that there have been no extensive and conclusive ecological surveys on all of the landforms within the region to confirm their environmental values. However, the EPA notes that where botanical information for the landforms within the region exists, often from surveys undertaken as a result of mining assessments or regional surveys undertaken by Parks and Wildlife, comparisons can be made.

For example, the Mt Gibson Range landform has similar physical features to the Mungada Ridge landform and has significant environmental values (Threatened Flora and the Mount Gibson Range Vegetation Complexes PEC) but has been significantly impacted by mining. The Pinyalling Hill landform also has similar physical features to the Mungada Ridge landform, but does not contain the same range of BIF specialist species as Mungada Ridge. The Koolanooka Hills landform has a large area, significant environmental values (Threatened Ecological Community), and is largely intact, but does not have the same high elevation and steepness as Mungada Ridge.

### ***Impacts to Landforms***

The proposal has the potential to directly impact the landform through the excavation and extraction of hematite, which forms part of the physical structure of the landform, and construction of the abandonment bund. Indirect impacts may also occur as a result of erosion and instability. The EPA notes that the impacts on the landform are interconnected with other factors such as flora and vegetation, terrestrial fauna and social surroundings, which are discussed in further detail in sections 4.2, 4.3 and 4.4.

The elements of the proposal that would directly impact on the Mungada Ridge landform are:

- the mine pit (7.3 ha);
- the pit abandonment bund (0.8 ha); and
- part of the haul road (5.2 ha).

The area of the Mungada Ridge landform is 685 ha and the proposal would disturb 13.3 ha or 1.9% of this landform. This includes clearing of significant flora, restricted vegetation and fauna habitat.

The EPA understands that the proposal would bring the cumulative disturbance on the Mungada Ridge to 9.1%. This includes mine pits, abandonment bunds, waste dump, roads and exploration. Of these impacts the EPA considers the proposed mine pit and the pit abandonment bund would have a permanent impact on 1.2% of the landform. Existing permanent impacts on the Mungada Ridge from the DSO Project (Mungada East pit, waste dump, haul road and abandonment bund) is 3.5%. Therefore the cumulative impact (permanent) on the Mungada Ridge would be 4.7% (32.2 ha).

The proponent considers that the permanent impact on the Mungada Ridge from this proposal is the mine pit (1%) and the permanent impact from the existing DSO project is the Mungada East Pit (1%). The EPA's consideration of what is considered to be a permanent impact is discussed further below.

The area of the discrete landforms within the Blue Hills area equates to 1,968 ha and the proposal would impact on 0.3% of this. Therefore the cumulative disturbance to the landforms within the Blue Hills area would remain at 28%. The extent of disturbance from previously approved mining projects within the LAU is shown in Figure 4.

The EPA considers that the proponent has identified the potential impacts of the proposal on the landform consistent with the Environmental Factor Guideline: Landforms (EPA 2016b).

### ***Proponent's application of the mitigation hierarchy***

The proponent has applied the mitigation hierarchy (avoid, minimise and rehabilitate) to reduce the impacts of the proposal on the Mungada Ridge landform. Impact on the landform cannot be avoided due to the location of the mineral resource.

The proponent has designed the proposal to minimise impacts on the Mungada Ridge landform by locating the waste dump and processing infrastructure area off the Mungada Ridge, and using the waste rock from the mine pit to backfill the existing Mungada East pit (DSO Project), to reduce the visual impact of the existing pit.

In response to concerns raised in the submissions about the impact of the proposal on the Mungada Ridge landform, the proponent made further modifications, as described in the Response to Submissions document (SMC 2017), by:

- reducing the size of the mine pit from 10.6 ha to 7.3 ha; and
- reducing the size of the pit abandonment bund from 8 ha to 0.8 ha.

These modifications have:

- reduced the impact of the proposal at its highest point on the Mungada Ridge (within the 440 to 450 mAHD) from 1.6 ha to 0.14 ha;
- avoided 0.75 ha impact of the proposal at its steepest point on the Mungada Ridge (within the 10 to 15 degree slope bracket). The steepest slopes to be affected by the proposal are now between 5 to 10 degrees;

- reduced the overall impact on significant flora and fauna and restricted vegetation; and
- reduced the visual impact of the proposal by excluding mining from part of the top of the ridgeline.

The proponent has sought to manage the indirect impacts on the Mungada Ridge landform by ensuring stability of the pit walls via geotechnical design measures, implementing drainage management measures and rehabilitating the haul road. The mine pit would remain as an open void, and the pit abandonment bund would also remain as a permanent impact on the landform.

The proponent considers that the residual impact on the landform is not significant. However, during the EPA's assessment the proponent has proposed as an offset the relinquishment of the north-east section of mining lease 59/596 for placement in a conservation reserve. The offset area is 36 ha of the Mungada Ridge landform, which is higher and steeper than the area proposed to be impacted, and includes 2,194 plants of the Threatened Flora species *Acacia woodmaniorum* (which is greater than the amount to be impacted by the proposal). The proponent has advised that if this offset is implemented, then the proposed offset for research and re-establishment of *A. woodmaniorum*, described in section 4.2 would not apply.

### **Assessment of impacts**

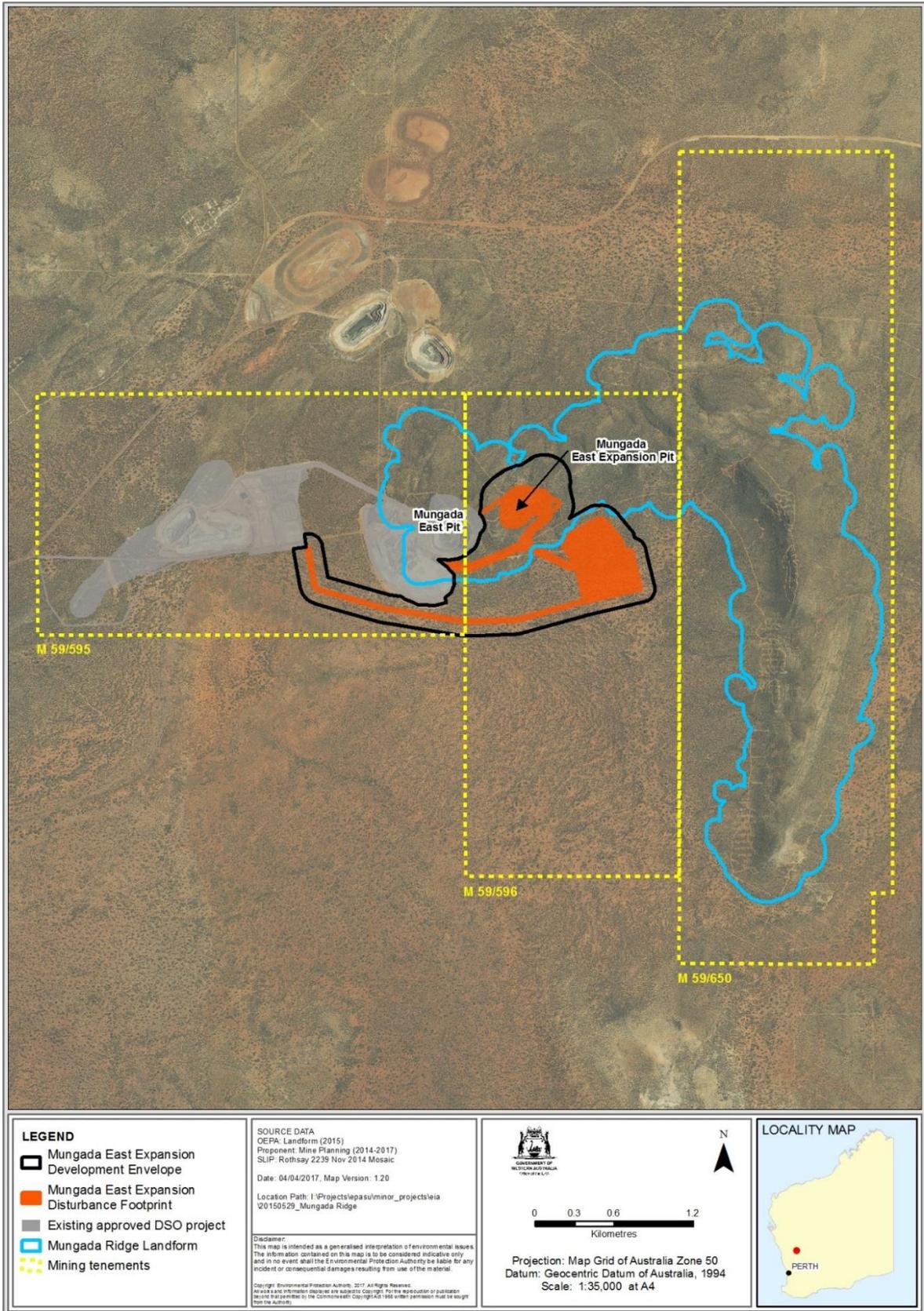
In considering the current proposal, the EPA notes that the Mungada Ridge is the largest, highest and steepest landform the Blue Hills area and has a unique crescent-shape. In addition to these distinct physical features it supports important biodiversity values, including significant flora and fauna species, and restricted vegetation communities. These physical features and biodiversity values are represented in the largely intact landform, which also has significant aesthetic values. The EPA considers that the Mungada Ridge is a significant landform.

Although there have been impacts to the Mungada Ridge landform from the Mungada East pit and historic exploration activities, the majority of the landform remains largely intact, with around 92% not impacted by mining or exploration.

The EPA notes that the Mungada Ridge is one of a few large, steep and high BIF landforms within the region. However, the crescent shape of the landform and the Mungada Ridge's aggregation of physical features and significant biodiversity, aesthetic values and intactness are considered unique and make it important in the region. The EPA also notes Parks and Wildlife advice that the Mungada Ridge has the highest conservation value of any BIF landform within the Karara Complex for biodiversity, BIF specialisation and visual amenity.

The EPA has considered the proponent's mitigation measures to minimise impacts to the landform. The EPA notes that the proponent has modified the proposal during the course of the assessment, resulting in a reduction in the direct impact on the landform from 24.3 ha to 13.3 ha. The location of the mine pit on the western edge and lower portion of the Mungada Ridge landform means that the highest and steepest areas of the landform located to the north-east, would not be affected by the proposal.

Of the 13.3 ha of the Mungada Ridge to be impacted by the proposal, the EPA notes that the proponent proposes to rehabilitate the haul roads (5.2 ha). The EPA considers that construction of the haul roads for this proposal would result in minimal disturbance of the subsoil and substrate, and as such could be rehabilitated.



**Figure 3: Mungada Ridge landform and proposal development envelope**

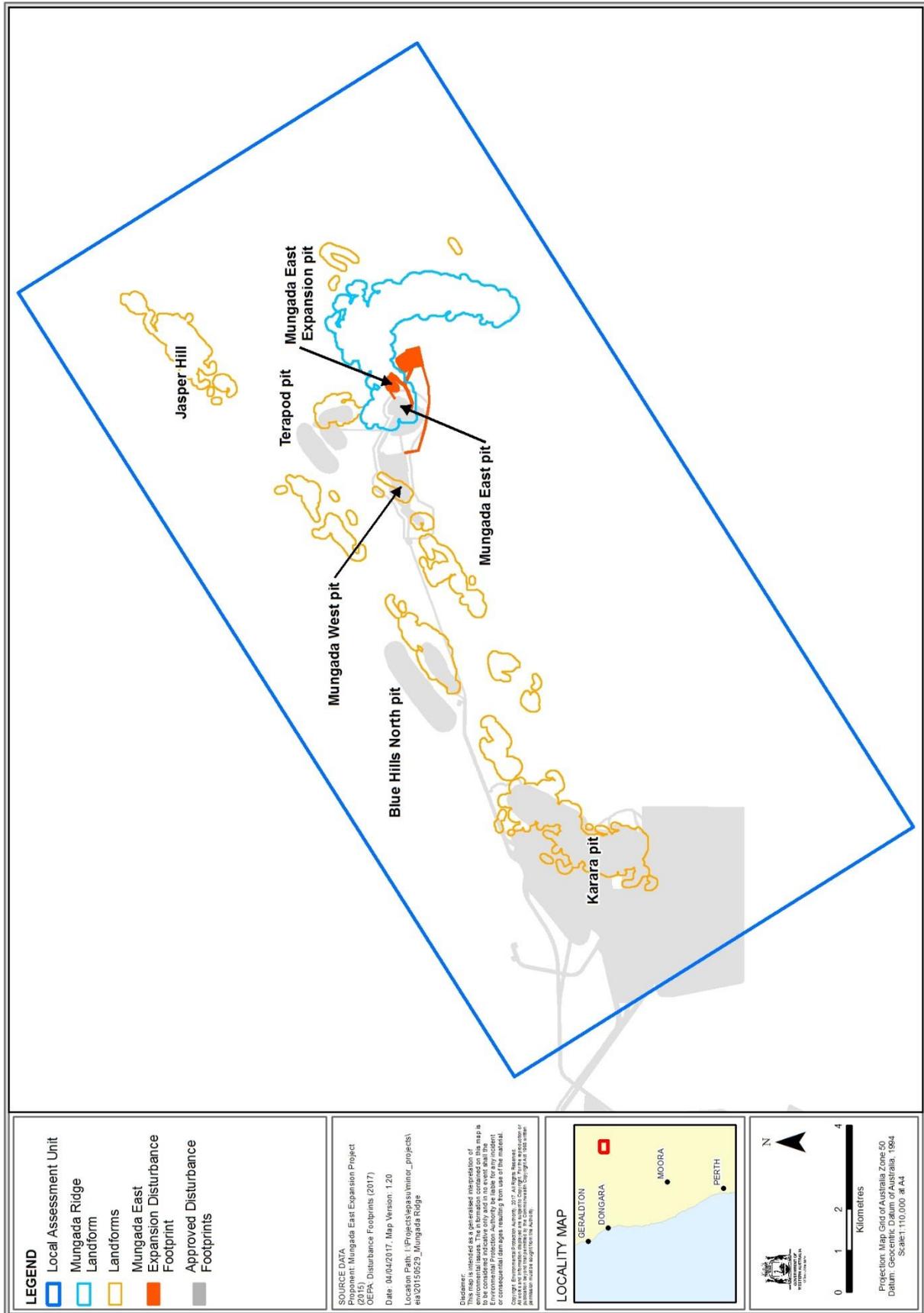


Figure 4: Local Assessment Unit (Blue Hills Range)

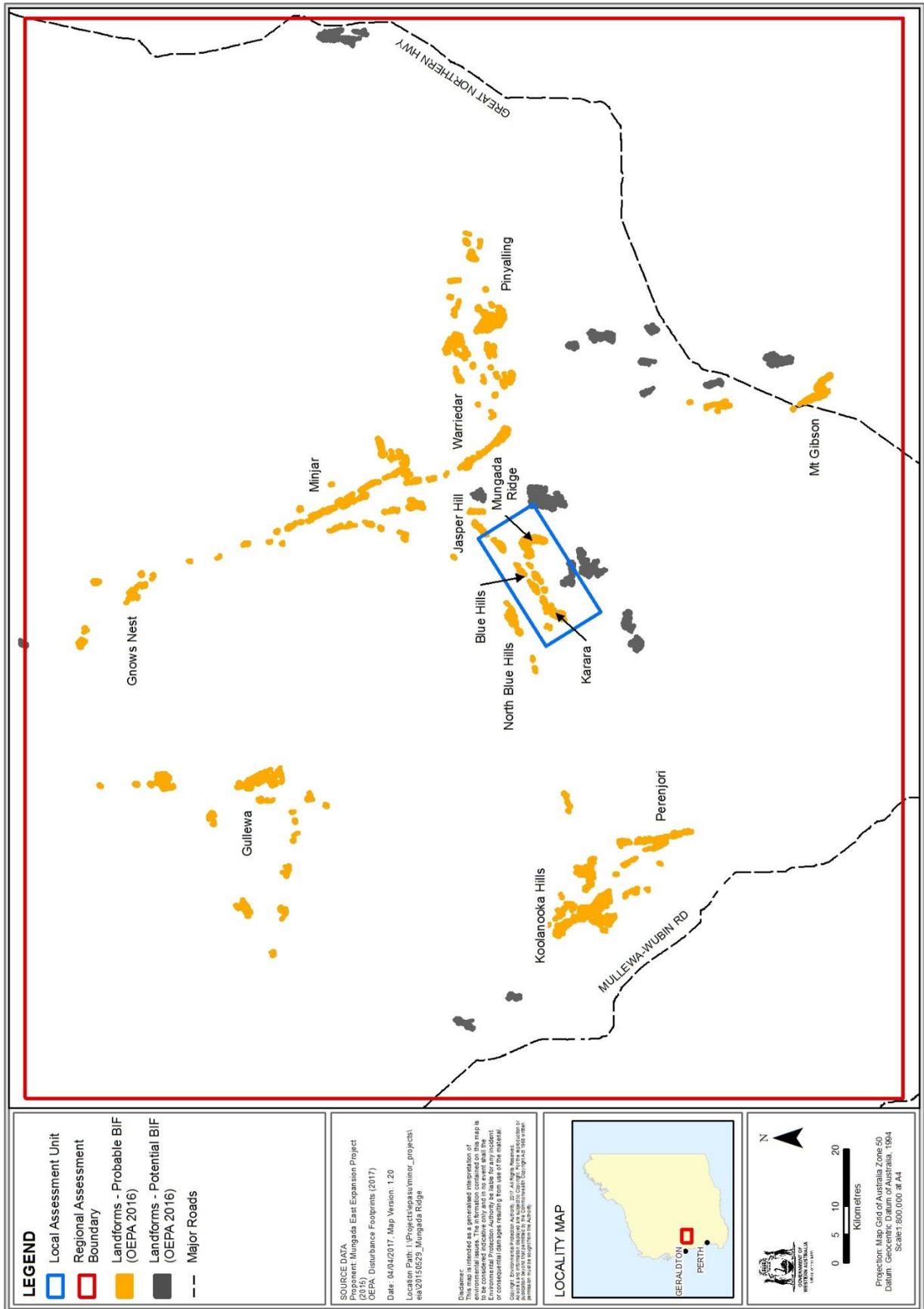


Figure 5: Karara/Mungada/Koolanooka region

However, the EPA considers that the excavation of the mine pit and construction of the abandonment bund would result in permanent impacts to the physical structure of 8.1 ha (or 1.2%) of the landform through the removal and alteration of the Mungada Ridge landform's defining geology and morphology. This would also impact on the significant biodiversity and aesthetic values that the landform supports.

The loss of 1.2% of the landform may be considered by some to be a small incremental impact. However the EPA considers it significant given that Mungada Ridge is the only large BIF landform in the local area which is largely intact and supports significant biodiversity and aesthetic values.

The EPA also notes the existing impact on the Mungada Ridge from the DSO Project (Mungada East pit, waste dump, haul road and abandonment bund) is 24 ha or 3.5%. The EPA is of the view that the permanent cumulative impact on the landform of 4.7% (32.2 ha) would result in a significant and unacceptable loss of the integrity of the Mungada Ridge landform.

The EPA is of the view that this significant residual impact cannot be readily offset. The EPA notes that the proponent has, however, proposed as an offset the relinquishment of part of mining lease 59/596 for placement in a conservation reserve. However, relinquishment would not necessarily see the area secured in a conservation reserve, which would require further decisions and actions by third parties. Furthermore, the EPA would need an assurance that the remaining Ridge would also be included in a conservation reserve before considering this further. Therefore the EPA does not consider this commitment on its own to be an appropriate offset. The EPA has provided advice regarding the protection of the Mungada Ridge in the conservation estate in Section 6 Other advice.

The EPA has considered the principle of the conservation of biological diversity and ecological integrity and is of the view that the proposal would have significant impacts to the biological diversity and ecological integrity of the environment through localised and permanent alteration to its contours, loss of integrity of the Mungada Ridge landform and the loss of biodiversity values supported by the landform (as discussed in Section 4.2). The EPA has also considered the principle of intergenerational equity and is of the view that the proposal would result in a decline in the diversity of the aesthetic and social resource base and reduce opportunities for future generations in terms of environmental diversity.

## **Summary**

The EPA has paid particular attention to:

- the principle of intergenerational equity and the principle of the conservation of biological diversity and ecological integrity;
- relevant EPA policy and guidance pertaining to Landforms;
- the proponent's proposed impact avoidance, minimisation and rehabilitation measures;
- the Mungada Ridge's importance as the last significant and distinctive landform in the local area that supports biodiversity and visual amenity values and is largely intact;

- the significant residual impact of the proposal on Mungada Ridge being a permanent impact to the physical structure of the landform that cannot be mitigated;
- the increase from 4.9% to 6.1% to the permanent cumulative impact to Mungada Ridge resulting in a significant loss of the integrity of the landform; and
- the Mungada Ridge's regional importance as a landform with the highest conservation value of any BIF landform in the Karara Complex.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Landforms, that the impacts to this factor are not manageable and would remain significant. This is because the additional 1.2% permanent impact on the Mungada Ridge landform is irreversible and would further compromise the integrity of the only largely intact distinctive BIF landform in the Blue Hills area that supports important biodiversity and social values.

## 4.2 Flora and Vegetation

### EPA objective

The EPA's environmental objective for this factor is *to protect flora and vegetation so that biological diversity and ecological integrity are maintained.*

### Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- Environmental Factor Guideline: *Flora and Vegetation* (EPA 2016c);
- Technical Guidance: *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016d);
- WA Environmental Offsets Policy (Government of Western Australia, 2011); and
- WA Environmental Offsets Guidelines (Government of Western Australia, 2014).

The considerations for EIA for this factor are outlined in Environmental Factor Guideline: *Flora and Vegetation* (EPA 2016c).

### EPA assessment

The EPA recognises the inherent links between flora and vegetation and other key environmental factors, since flora and vegetation provide habitat and ecological conditions for terrestrial fauna and forms a dominant visual characteristic of the landscape.

The EPA considers that the information provided in the ERD (SMC 2016) and the Response to Submissions document (SMC 2017) is adequate to enable the EPA to undertake its assessment of flora and vegetation for this proposal.

### ***Environmental values***

Flora and vegetation surveys have been undertaken in the Blue Hills area and in the vicinity of the development envelope. The proponent has collated the information from the previous surveys and undertaken a Level 2 Flora and Vegetation Survey and Targeted Flora Surveys.

The proponent also commissioned a peer review of the flora and vegetation surveys, which concluded that the surveys largely fulfilled the requirements of a level 2 flora and vegetation survey as defined in Guidance Statement No. 51 (EPA 2004a).

The flora and vegetation surveys for this proposal were undertaken in 2015, in accordance with the requirements of Guidance Statement No. 51 (EPA 2004a), which was the relevant guidance at the time. The EPA's guidance on flora and vegetation surveys was updated into a new Technical Guideline in 2015, and revised for the EPA's new guidelines and procedures framework in 2016. While the terminology and hierarchy of surveys have been clarified, the standards and information required for each survey are unchanged. The EPA considers that the proponent's surveys met the minimum requirements of the Technical Guidance: *Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016d).

### ***Vegetation***

Most of the vegetation in the development envelope (88%) is in excellent condition, with 10% in good condition and the remaining 2% has previously been cleared.

The development envelope is located within the Blue Hills (Mount Karara/Mungada Ridge/Blue Hills) vegetation complexes (banded ironstone formation) PEC – Priority 1, referred to in this report as the 'Blue Hills PEC'.

Maia (2016) identified seven vegetation associations within the development envelope and aligned these with Floristic Community Types (FCTs) previously mapped across Mt Karara and Mungada Ridge by Woodman (2008). For this assessment, the EPA has used the Woodman FCTs to enable the impacts to be placed in a regional context. The FCTs that occur within the development envelope are:

- FCT 1a/2 (mosaic) – Open Woodland on flats and drainage depressions and Open Woodland on flats and rocky lower slopes with ironstone gravels;
- FCT 3 – Open Woodland on flats to mid-slopes with ironstone gravels and rarely BIF;
- FCT 12 – Shrubland of *Acacia* species on flats to mid-upper slopes with ironstone gravels;
- FCT 13 – Dense Shrubland on mid-upper slopes on BIF; and
- FCT 14 – Shrubland of *Acacia* species on slopes and ridges.

Of these, the EPA considers FCTs 13 and 14 are significant because they provide habitat for Threatened and Priority Flora, and their distribution is restricted to the BIF ridges.

### *Flora*

Seventy three flora species from 30 families and 50 genera were recorded in the development envelope (SMC 2016).

*Acacia woodmaniorum* occurs within the development envelope. This species is listed as Threatened Flora<sup>5</sup> under the *Wildlife Conservation Act 1950* (WC Act) and has an International Union for Conservation of Nature (IUCN) Threat Category ranking of 'vulnerable'. *A. woodmaniorum* is a long-lived shrub and is endemic to the Blue Hills Range. The species is known from two populations of 26,990 individuals and grows in the specific habitat of soils on the steep slopes, and in the rock crevices and gullies of the Mungada Ridge and Jasper Hill BIF landforms.

There is potentially suitable habitat for the Threatened Flora species *Stylidium scintillans* within the development envelope, but no individuals have been recorded.

Figure 6 shows the distribution of Threatened Flora on the Mungada Ridge.

Ten flora species below are listed as priority flora<sup>6</sup> by Parks and Wildlife and are located in the development envelope:

- *Acacia karina* (Priority 1);
- *Lepidosperma* sp. Blue Hills (Priority 1);
- *Acacia subsessilis* (Priority 3);
- *Calotis* sp. Perrinvale Station
- *Drummondita fulva* (Priority 3);
- *Gunniopsis divisa* (Priority 3);
- *Micromyrtus acuta* (Priority 3);
- *Micromyrtus trudgenii* (Priority 3);
- *Persoonia pentasticha* (Priority 3); and
- *Rhodanthe collina* (Priority 3);

Records of a further two flora species *Acacia minyura* and *Goodenia corynocarpa* in the development envelope represent potential range extensions for these species.

Three weed species were recorded in the development envelope, none of which are declared plants or are listed on the national weed list.

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<sup>5</sup> Threatened Flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the WC Act (DPAW 2017).

<sup>6</sup> Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Flora Lists under Priority 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora (DPAW 2017).

### **Impacts to Flora and Vegetation**

The proposal would directly impact on flora and vegetation through the clearing of 44.3 ha of vegetation and fragmentation of populations and communities. The elements of the proposal that would require clearing include:

- mine pit (7.3 ha);
- pit abandonment bund (0.8 ha);
- waste rock dump (11 ha);
- ore processing infrastructure area (11.3 ha); and
- haul roads and access roads (13.9 ha).

The proposal has the potential to indirectly impact flora and vegetation through the introduction of weeds and disease, dust, changes in microclimate or hydrology, changes to pollination and reduced genetic diversity. The proponent has calculated the indirect impacts as occurring to up to 10% of plants within a 50 m buffer zone around the mine pit, 10 m buffer zone around the haul roads and 25 m buffer zone around the waste dump, processing infrastructure area and access road. The EPA notes that this approach is based on evidence from the proponent’s existing mining operations in the Blue Hills area and considers this to be a suitable approach for this assessment.

The EPA considers that the proponent has identified the potential impacts of the proposal consistent with the Environmental Factor Guideline: *Flora and Vegetation* (EPA 2016c).

The impacts of the proposal (direct and indirect) and cumulative impact on significant vegetation and flora are shown in Tables 4 and 5 respectively.

**Table 4: Impact on the Blue Hills PEC and FCTs (Maia 2017)**

<b>Vegetation</b>	<b>Total pre-disturbance mapped area (ha)</b>	<b>Area (ha) impacted by the proposal (direct and indirect)</b>	<b>% of total mapped area impacted by the proposal</b>	<b>Cumulative impact</b>
Blue Hills PEC	7,098	20.68	0.29%	13.25%
FCT 12	643	9.14	1.42%	17.02%
FCT 13	258	5.23	2.03%	60.23%
FCT 14	324	0.18	0.06%	67.87%

The EPA notes that the proponent has used the boundary of the Blue Hills PEC as mapped by Parks and Wildlife, which is based on geology and broad scale vegetation mapping. Detailed vegetation mapping would likely reduce the confirmed extent of the Blue Hills PEC, thereby increasing the proportional impacts on the PEC.

**Table 5: Impact on significant flora (Maia 2016 and 2017)**

Species	Conservation	Number of individuals impacted	% of total impacted by the proposal	Cumulative impact
<i>Acacia woodmaniorum</i>	Threatened Flora BIF specialist Local endemic	1,739 (1,683 direct, 56 indirect)	5.6%	18.43%
<i>Lepidosperma</i> sp. Blue Hills	Priority 1 BIF specialist Regional endemic	350 (340 direct, 10 indirect)	0.39%	43.76%
<i>Acacia karina</i>	Priority 1 BIF specialist Regional endemic	2 (2 direct)	0.39%	13.40%
<i>Drummondita fulva</i>	Priority 3 BIF specialist Regional endemic	508 (482 direct, 26 indirect)	2.65%	20.61%
<i>Micromyrtus acuta</i>	Priority 3 BIF specialist Regional endemic	43 (20 direct, 23 indirect)	0.29%	7.93%
<i>Micromyrtus trudgenii</i>	Priority 3 BIF specialist Regional endemic	2,011 (1,924 direct, 87 indirect)	9.63%	35.75%
<i>Persoonia pentasticha</i>	Priority 3	31 (29 direct, 2 indirect)	5.45%	14.41%
<i>Rhodanthe collina</i>	Priority 3 BIF specialist Regional endemic	342 (331 direct, 11 indirect)	0.86%	9.55%

The EPA notes advice from Parks and Wildlife that, as a result of the proposal, a change of category under IUCN criteria from 'vulnerable' to 'endangered' for *A. woodmaniorum* is likely on the basis of continued decline in populations (impacts from the Terapod pit, Blue Hills pit, Mungada West pit and Mungada East pit), and a decline of individuals and area and quality of habitat.

As part of the response to submissions, the proponent commissioned an IUCN Assessment (Ecological 2016) for *A. woodmaniorum*, which concluded that the species would not increase in threat category because "remedial measures have been and will continue to be implemented for the species and no other projected future decline is anticipated for the species". This assessment assumes that the proposed translocation of individuals will mitigate the loss of area of occupancy and extent of occurrence (used by IUCN to define whether a species is subject to 'continuing decline') and improve the conservation status of the species, and that there is no further threat to the species from future mining proposals.

Parks and Wildlife has advised that it is considered unlikely that the proponent will be able to demonstrate that a material and sustainable improvement in the area of occupancy and extent of occurrence and overall conservation status can be achieved in the short to medium term.

The EPA notes that the current threat category for this species is vulnerable. The EPA is of the view that a resolution as to whether the threat category is likely to change is not required for the purpose of the assessment. The EPA's view on the success of the proposed translocation and significance of the impacts to the species are discussed below.

### ***Proponent's application of the mitigation hierarchy***

The EPA notes that the proponent has applied the mitigation hierarchy (avoid, minimise and rehabilitate) to reduce the impacts of the proposal on flora and vegetation.

The proponent has designed the proposal to minimise impacts on significant flora and vegetation by locating the waste dump and processing infrastructure area off the Mungada Ridge, and using the waste rock from the mine pit to backfill the existing Mungada East open pit (DSO Project) to reduce clearing associated with the requirement for a new waste dump.

In response to concerns raised in the submissions about the impact of the proposal on significant flora and vegetation, the proponent modified the disturbance footprint as described in the Response to Submissions document (SMC 2017) by:

- reducing the size of the mine pit from 10.6 ha to 7.3 ha; and
- reducing the size of the pit abandonment bund from 8 ha to 0.8 ha and changing the location of the bund.

These modifications have resulted in a reduction to the clearing of flora and vegetation from 52 ha to 44.3 ha, and has reduced the impacts to *A. woodmaniorum* by 951 plants (or 36%), *Lepidosperma* sp. Blue Hills by 329 plants (or 50%), the Blue Hills PEC, FCTs and all other Priority flora (except for *Rhodanthe collina*) as described in Tables 4 and 5.

The proponent has sought to mitigate impacts on flora and vegetation through implementation of an environmental management plan, which includes the following measures:

- weed hygiene and weed control;
- dust suppression;
- scheduling blasting to coincide with low wind conditions, whenever possible to minimise the distribution of dust;
- monitoring dust and vegetation health in the indirect impact areas and considering spraying vegetation with water when monitoring shows dust readings above trigger levels;

- developing a fire prevention and management strategy to minimise potential impact from altered fire regimes;
- stockpiling topsoil to be used in revegetation; and
- rehabilitating the waste dump, processing infrastructure area and roads so that the area reflects the environmental values of the surrounding landscape.

The EPA notes that the proponent has prepared a Mungada East Expansion Iron Ore Project Mine Closure Plan (SMC 2016) and proposes to undertake a monitoring program during operations and post closure, until yet-to-be-determined completion criteria are met. The EPA notes that this would be subject to regulation under the *Mining Act 1978* and that the proponent would prepare a fully updated Mine Closure Plan as part of its mining proposal application.

The proponent has concluded that significant residual impacts remain on *A. woodmaniorum* and has proposed the following offset:

- the re-establishment/translocation of 1,739 *A. woodmaniorum* plants which would be underpinned by research already undertaken by the Botanic Gardens and Parks Authority (BGPA) and studies to be conducted under the Australian Research Council (ARC) Centre of Mine Site Restoration project; and
- a Biodiversity Conservation Management Program involving on-ground management of approximately 133 ha within the proponent's mining tenements outside the existing mining operations, which includes habitat for *A. woodmaniorum* (and *Lepidosperma* sp. Blue Hills) plants. The on-ground management is proposed to address threats such as weeds, fire and feral animals.

The EPA notes that the proponent has also proposed to further refine habitat assessment for *A. woodmaniorum* to model the extent of the species potential habitat in the local area, as part of the offset.

### **Assessment of impacts**

The EPA has assessed the potential impacts to flora and vegetation in the context of the considerations for EIA as outlined in the Environmental Factor Guideline: *Flora and Vegetation* (EPA 2016c).

#### *Vegetation*

Implementation of the proposal would result in the loss of 20.68 ha or 0.29% of the known extent of the Blue Hills PEC. The EPA notes that the Blue Hills PEC is restricted to the Blue Hills Range and is not represented in the conservation estate, and considers that while this may constitute a small incremental loss to the Blue Hills PEC, the cumulative impact as a result of this and other proposals of 13.25% is significant.

Implementation of the proposal would also result in a small incremental loss of the FCT's present in the development envelope, as shown in Table 4. However, the EPA considers that the cumulative impact as a result of this and other existing proposals

to FCT 13 (60.23% of the known extent) and FCT 14 (67.87% of the known extent) is significant.

#### *Threatened Flora*

Implementation of the proposal would result in the loss of 1,739 individuals of *A. woodmaniorum* which equates to 5.6% of known individuals of this species. The cumulative impacts of this and other existing proposals is 18.43%. The EPA notes there would be some fragmentation to the distribution of *A. woodmaniorum* as an isolated population would remain between the existing Mungada East pit and the proposed Expansion pit (Figure 6). The EPA considers that the impact to this species is significant.

The EPA notes that the remaining occurrence of the species is not protected in a conservation reserve and is on an area that is highly prospective and, as such, could be considered at risk from future mining.

#### *Priority Flora*

The EPA notes that the proposal would impact on seven species of Priority Flora (Table 5) most of which are BIF specialists and endemic to the region. For the majority of these species, the proposal would result in a small incremental loss of individuals which the EPA considers is unlikely to significantly impact on these species. However, the EPA considers that the cumulative impacts as a result of this and other proposals, on *Lepidosperma* sp. Blue Hills (Priority 1) (43.76%), *Drummondita fulva* (Priority 3) (20.61%), and *Micromyrtus trudgenii* (Priority 3) (35.75%), are significant.

#### *Rehabilitation*

The EPA notes that the proponent has proposed to progressively rehabilitate all disturbed areas, with the exception of the mine pit void which would remain open.

The proponent has committed to a further five years of research in conjunction with the Australian Research Council (ARC) Centre of Mine Site Restoration. This would focus on the restoration of all species impacted by the proposal with a particular focus on *A. woodmaniorum*, *Lepidosperma* sp. Blue Hills and other significant species. This is proposed to include specific research into the restoration of *A. woodmaniorum*, including translocation and seed germination trials (SMC 2017).

The EPA also notes that the proponent has implemented a rehabilitation and research project at its existing operations at the Koolanooka mine and Blue Hills mine (Mungada East and West) in collaboration with the BGPA. As part of the requirements for Ministerial Statement No. 811 for the Koolanooka mine, SMC has demonstrated that it can establish at least 70% of the reference species richness within five years of disturbance, and collectively these species are considered to represent the original vegetation communities of the Koolanooka TEC and adjacent natural areas (BGPA 2017). The EPA notes that this does not include conservation significant species such as Threatened Flora and Priority Flora.

The research program has allowed BGPA to prepare a restoration manual for the proponent and the EPA notes that management techniques from the rehabilitation

trials could be transferred to this proposal, in addition to the outcomes of the ARC research. However, the EPA considers that uncertainty remains about the continued persistence of species with specific habitat requirements as well as the ability for Threatened and Priority species to be established and be competitive in the rehabilitated area, noting that rehabilitated areas should result in a self-sustaining population<sup>7</sup>. The EPA also considers that it is not possible to restore FCTs 13 and 14 in the landscape because they occur in geographically restricted locations, being BIF ridges.

### *Significant Residual Impacts*

The EPA has considered the proponent's mitigation measures to minimise impacts to flora and vegetation. In particular, the EPA notes that the proponent has modified the proposal in order to further reduce impacts to conservation significant flora and vegetation. Despite these measures the EPA considers that the significant residual impacts remain:

- 1,739 individuals (or 5.6%) of *A. woodmaniorum* (Threatened Flora), with a cumulative impact of 18.43%;
- cumulative impact of 43.76% of *Lepidosperma* sp. Blue Hills (Priority 1);
- cumulative impact of 35.75% of *Micromyrtus trudgenii* (Priority 3);
- cumulative impact of 20.61% of *Drummondita fulva* (Priority 3);
- cumulative impact of 13.24% of the Blue Hills PEC;
- cumulative impact of 60.23% of FCT 13; and
- cumulative impact of 67.87% of FCT 14.

The EPA has considered the proponent's proposed offset to counterbalance the significant residual impacts to *A. woodmaniorum* and considers that, consistent with Principle 3 of the WA Environmental Offset Policy<sup>8</sup> (Government of Western Australia 2011), the re-establishment of 1,739 mature, viable and self-sustaining individuals would be considered a relevant and proportionate offset for *A. woodmaniorum*.

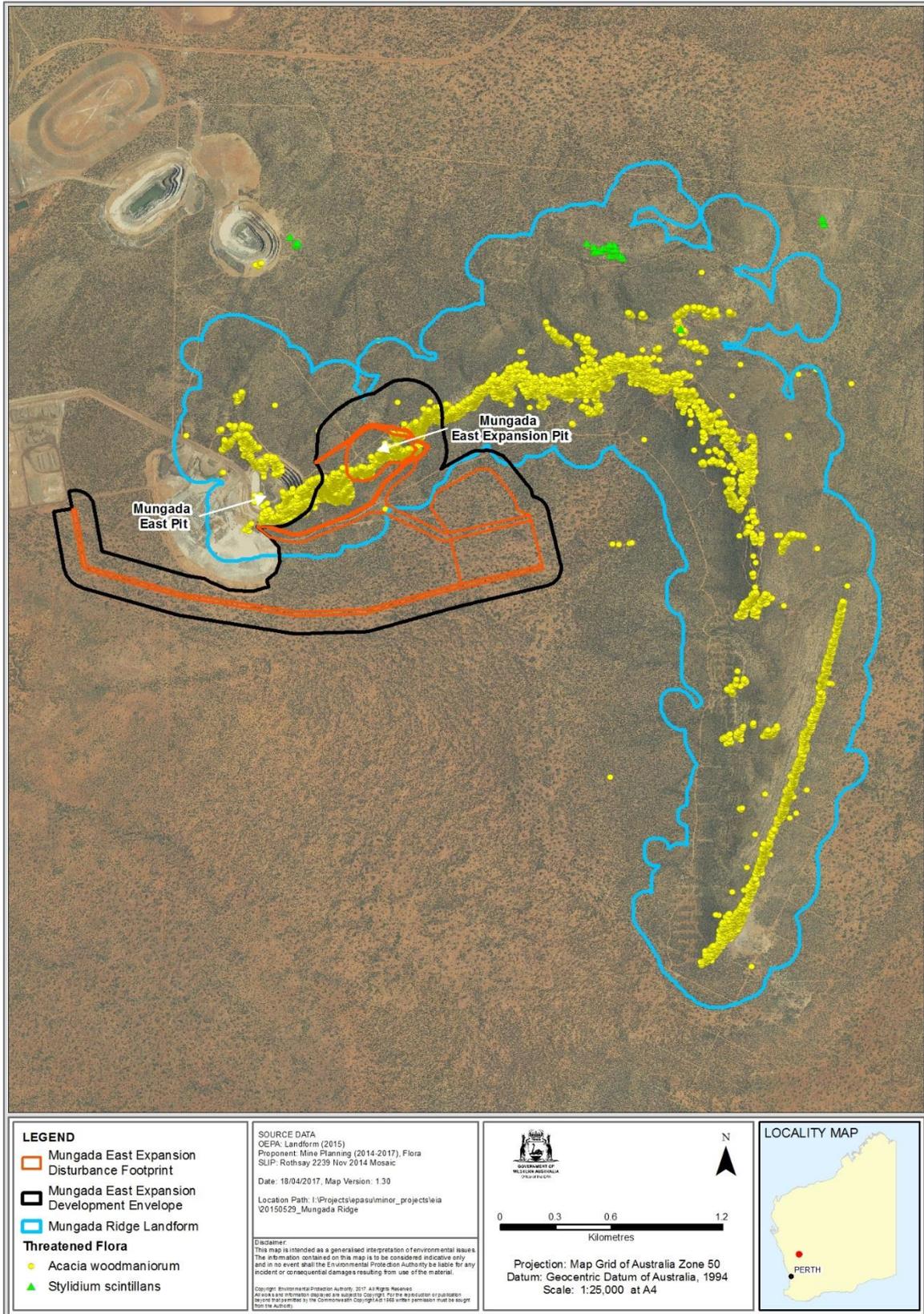
The EPA notes that *A. woodmaniorum* can grow opportunistically in disturbed areas (Maia 2017), and the species has been observed growing on disturbed areas including drill pads and pit areas with evidence of seeding and juveniles. The EPA also notes that Karara Mining Limited and Parks and Wildlife prepared an Interim Recovery Plan for *A. woodmaniorum* in December 2015, and a translocation proposal, as required by the Recovery Plan, was developed in March 2017. However, no trials or translocations for this species have occurred to date.

Based on available information, there is currently a lack of evidence to support the view that translocation of the species would be successful in the long term.

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<sup>7</sup> A self-sustaining population is a population that is self-perpetuating (able to continue indefinitely) without external assistance.

<sup>8</sup> Principle 3: *Environmental offsets will be cost-effective, as well as relevant and proportionate to the significance of the environmental value being impacted* (Government of Western Australia, 2011).



**Figure 6: Distribution of Threatened Flora on the Mungada Ridge**

Therefore the offset does not meet Principles 4 and 6 in the WA Environmental Offset Policy<sup>9</sup> (Government of Western Australia 2011).

The EPA has had regard to the two reports (BGPA 2017; Maia 2017b) commissioned by the proponent to increase the confidence in the success of *A. woodmaniorum* translocation. The EPA considers that the reports provide more confidence that *A. woodmaniorum* is a disturbance opportunist and that the species is likely to have specific requirements for establishment, germination and persistence that are unknown. The research proposed may provide seed material and guidance on reproductive and soil/subsoil treatments to improve outcomes in rehabilitation or translocation. However, the information does not provide a high level of confidence that the proposed translocation would result in self-sustaining populations and that the further research could reliably offset this risk.

The EPA has also considered the proponent's Biodiversity Conservation Management Program offset, which is proposed to protect and manage undisturbed areas of habitat contributing to the long-term viability of *A. woodmaniorum* and *Lepidosperma* sp. Blue Hills through protection of habitat. However, the EPA does not consider the five-year management program would achieve these long-term outcomes and provide a tangible improvement to areas of the proponent's mining tenements that do not have conservation tenure.

The EPA is of the view that the offset does not readily or confidently counterbalance the significant residual impacts to this species.

The EPA has considered the principle of the conservation of biological diversity and ecological integrity and is of the view that the proposal would result in significant impacts to the biological diversity and ecological integrity of the environment through the loss of threatened flora individuals and critical habitat, and significant cumulative impacts to priority flora and restricted vegetation communities. The EPA has also considered the principle of intergenerational equity and is of the view that the proposal would result in a decline in the health, diversity and productivity of flora and vegetation into the future.

## Summary

The EPA has paid particular attention to:

- the principle of conservation of biological diversity and ecological integrity;
- relevant EPA guidance pertaining to Flora and Vegetation;
- the proponent's proposed impact avoidance, minimisation and rehabilitation measures;
- the significant residual impact on Threatened Flora, *Acacia woodmaniorum* (loss of 1,739 individuals, contributing to a cumulative impact of 18.43% of the known population of the species);

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<sup>9</sup> Principle 4: *Environmental offsets will be based on sound environmental information and knowledge* (Government of Western Australia, 2011).

Principle 6: *Environmental offsets will be focussed on longer term strategic outcomes* (Government of Western Australia, 2011).

- the cumulative significant residual impacts to Priority Flora; *Lepidosperma* sp. Blue Hills, *Drummondita fulva* and *Micromyrtus trudgenii*; the Blue Hills PEC and FCTs 13 and 14; and
- the information showing that *A. woodmaniorum* is a disturbance opportunist, but the lack of sufficient scientific evidence that translocation of *A. woodmaniorum* to achieve a self-sustaining population would be successful.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Flora and Vegetation, that the impacts to this factor are not manageable and would remain significant, because of the high cumulative impacts on restricted vegetation communities and significant flora and the uncertainty that translocation of *Acacia woodmaniorum* would be successful.

## 4.3 Terrestrial Fauna

### EPA objective

The EPA's environmental objective for this factor is *to protect terrestrial fauna so that biological diversity and ecological integrity are maintained.*

### Relevant policy and guidance

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- Environmental Factor Guideline: *Terrestrial Fauna* (EPA 2016e);
- Technical Guidance: *Sampling methods for terrestrial vertebrate fauna* (EPA 2016f);
- Technical Guidance: *Terrestrial fauna surveys* (EPA 2016g); and
- Technical Guidance: *Sampling of short range endemic invertebrate fauna* (EPA 2016h).

The considerations for EIA for this factor are outlined in Environmental Factor Guideline: *Terrestrial Fauna* (EPA 2016e).

### EPA assessment

The EPA recognises the inherent links between the terrestrial fauna and other key environmental factors, since fauna rely on a range of habitats and ecological conditions in the terrestrial environment. As a result of the direct impacts to landforms and flora and vegetation, terrestrial fauna would be impacted due to their reliance on these environmental values as habitat.

The EPA considers that the information provided in the ERD (SMC 2016) and the Response to Submissions document (SMC 2017) is adequate to enable its assessment of terrestrial fauna for this proposal.

## ***Environmental values***

Fauna surveys have been undertaken in - and in the vicinity of - the development envelope. The proponent collated the information from previous surveys, and conducted further targeted surveys for malleefowl (*Leipoa ocellata*), western spiny-tailed skink (*Egernia stokesii badia*), gilled slender blue-tongue skink (*Cyclodomorphus branchialis*) and the shield-backed trapdoor spider (*Idiosoma nigrum*).

The EPA notes that targeted surveys for the gilled slender blue-tongue skink and western spiny-tailed skink were conducted in August 2015, which is outside the recommended September-to-April survey period for reptiles in the Ereman province (EPA 2016e).

The proponent advised that the targeted surveys for the gilled slender blue-tongue skink were undertaken in the slightly cooler month of August based on previous experience that this species uses spoil heaps on the sides of tracks and they bask in the top layer of these spoil heaps on cooler days in spots heated by sunlight. Surveying in warmer months increases the number of microhabitats this species occurs in (SMC 2017). The absence of the species from the surveys does not change the consideration that the species is likely to occur in the area.

The proponent also advised that the western spiny-tailed skink is generally confined to hollow logs. Therefore locating this species is not dependent on warmer weather (SMC 2017). This is in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) guidelines, which confirms that individuals are likely to be encountered sheltering and that the time of year the survey is conducted would not affect the success of the survey (DSEWPaC 2011). The targeted survey and previous surveys did not locate any suitable hollow logs or any evidence of this species (SMC 2017).

The EPA considers that the surveys conducted for the proposal met the minimum requirements of Guidance Statement 56 (EPA 2004b), Guidance Statement 20 (EPA 2009) and Technical Guidance: *Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (DEC and EPA 2010), which were the relevant guidance at the time. In December 2016, the EPA released a new suite of EIA policy and guidance documents, but the content of the abovementioned guidance documents have not yet been updated to reflect the EPA's framework for environmental considerations in EIA. The EPA considers that the surveys met the minimum requirements for the 2016 Technical Guidance documents for EIA.

### *Fauna habitat*

Surveys identified four terrestrial fauna habitats within the development envelope: rocky ridge with steep slopes; low slopes with dense *Acacia* shrubs; Eucalypt woodland plain with *Acacia* shrubs; and *Acacia* shrubland plain (SMC 2016).

### *Vertebrate fauna*

The vertebrate fauna within the development envelope is representative of the high diversity of vertebrate fauna in habitats associated with BIFs in the region. Nearly

300 vertebrate fauna species were recorded or have the potential to occur in the development envelope (Ecoscape 2016a).

Surveys identified 28 native mammal species, 181 bird species, 80 reptile species and eight amphibian species that have been recorded or have the potential to occur within the development envelope (Ecoscape 2016a). Of these, seven fauna species (listed below) are protected under the WC Act or listed by Parks and Wildlife as Priority Fauna:

- malleefowl (*Leipoa ocellata*) – Vulnerable under the WC Act;
- peregrine falcon (*Falco peregrinus*) – Schedule 7 (Other specially protected fauna) under the WC Act;
- gilled slender blue-tongue skink (*Cyclodomorphus branchialis*) – Vulnerable under the WC Act;
- rainbow bee-eater (*Merops ornatus*) – Schedule 5 (Migratory birds protected under an international agreement) under the WC Act;
- western spiny-tailed skink (*Egernia stokesii badia*) – Vulnerable under the WC Act;
- fork-tailed swift (*Apus pacificus*) – Schedule 5 (Migratory birds protected under an international agreement) under the WC Act; and
- western brush wallaby (*Macropus irma*) – Priority 4 species.

Although suitable habitat for malleefowl exists in the shrubland plains in the southern portion of the development envelope, no individuals or active malleefowl mounds were recorded during surveys. In the past decade, active mounds have been recorded in the vicinity of the proposal (SMC 2016).

Previous surveys have recorded the gilled slender blue-tongue skink at two locations, one individual within the development envelope and the other 9 km south of the proposal. However the proponent's targeted surveys did not find any individuals (SMC 2016).

#### *Invertebrate fauna*

Surveys identified one confirmed Short Range Endemic (SRE) fauna, two potential SRE species and one species of 'unknown' SRE status as recorded and likely to occur within the development envelope. These species are:

- shield-backed trapdoor spider (*Idiosoma nigrum*) (confirmed SRE) – Vulnerable under the WC Act;
- *Westralaoma aprica* (potential SRE);
- *Urodacus* sp. 'blue hills' (potential SRE); and
- *Beierolpium* 'sp. 8/2' (unknown).

The shield-backed trapdoor spider is currently undergoing taxonomic review by the WA Museum (Western Australian Museum 2016). This species is believed to be several biogeographically separate species, which have not yet been formally described. Parks and Wildlife have advised that *Idiosoma* 'MYG018' is the species

recorded at Mungada Ridge, however for the purposes of this assessment *Idiosoma* specimens recorded are considered to be *Idiosoma nigrum*.

### ***Impacts to Terrestrial Fauna***

The proposal has the potential to directly impact on terrestrial fauna through the clearing of 44.3 ha of potential fauna habitat, fragmentation of habitat and mortality or displacement of fauna. The proposal also has the potential to indirectly impact terrestrial fauna from increased risk of vehicle strikes, changes in the quality or condition of fauna habitat, attraction of fauna to storage areas of water and food wastes, changes to feral animal populations, introduction and spread of weeds, dust, noise and vibration, lighting and loss of habitat from altered fire regimes.

The EPA considers that the proponent has identified the potential impacts of the proposal consistent with the Environmental Factor Guideline: *Terrestrial Fauna* (EPA 2016e).

#### *Fauna habitat*

The proposal would result in the loss and fragmentation of fauna habitat through the clearing of 44.3 ha of native vegetation. Four terrestrial fauna habitats are located within the development envelope; rocky ridge with steep slopes; low slopes with dense *Acacia* shrubs; Eucalypt woodland plain with *Acacia* shrubs; and *Acacia* shrubland plain.

The *Acacia* shrubland plain habitat is unlikely to be fragmented as only a small portion of the northern boundary of this habitat type would be disturbed. The Eucalypt woodland plain with *Acacia* shrubs would be fragmented as a result of clearing for the waste rock dump, infrastructure and roads. The construction of the mine pit would also fragment the rocky ridge with steep slopes habitat creating a large eastern portion of this habitat type and a smaller western portion. The western portion has previously been fragmented by the proponent's approved Blue Hills component of the DSO Project. Post closure, the mine pit would not be rehabilitated and permanent fragmentation of this habitat would result. However, none of the fauna species recorded in the development envelope are restricted to this type of habitat. Pockets of the low slopes with dense *Acacia* shrubs would be fragmented as a result of the proposal. However, outside of the development envelope, broad and contiguous areas of this habitat type would remain intact (SMC 2016).

#### *Significant vertebrate fauna*

Of the significant vertebrate fauna known to occur or likely to occur within the development envelope, the EPA considers that the proposal may result in impacts to malleefowl and the gilled slender blue-tongue skink.

Implementation of the proposal would result in the removal of two inactive malleefowl mounds. The EPA notes the entire proposal disturbance footprint is potential malleefowl habitat, however also notes the occurrence of malleefowl in the surrounding area.

The EPA notes that although targeted surveys did not find any individuals of the gilled slender blue-tongue skink, the entire proposal disturbance footprint is considered to contain habitat for the species which is likely to occur in the area.

The EPA considers that the other significant vertebrate fauna identified as occurring or having potential to occur within the development envelope do not rely upon and have habitats that extend outside the development envelope, and are unlikely to be impacted by the proposal.

#### *Significant invertebrate fauna*

Surveys recorded 84 *Idiosoma nigrum* burrows within the development envelope, of which 13 are within the disturbance footprint. SMC would avoid impact on the remaining 71 burrows, where possible (SMC 2016). A further 45 burrows have been recorded within the proponent's Blue Hills tenements and a further 132 burrows have been recorded more broadly across the Blue Hills Range.

The EPA notes that the development envelope provides suitable habitat for *Idiosoma nigrum*, however that habitat extends beyond the development envelope with burrows being recorded outside. Additional taxonomic clarification of the potential SRE taxa (*Westralaoma aprica*, *Urodacus* sp. 'blue hills' and *Beierolpium* sp. '8/2') was not available due to data deficiencies (SMC 2016). These species were recorded within and beyond the development envelope (SMC 2016).

The microhabitats used by SREs that are associated with the broader terrestrial fauna habitat types extend beyond the development envelope.

#### ***Proponent's application of the mitigation hierarchy***

The EPA notes that the proponent has applied the mitigation hierarchy (avoid, minimise and rehabilitate) to reduce the impacts of the proposal on terrestrial fauna.

The proponent has modified the proposal by reducing the area required for the pit abandonment bund and reducing the size of the pit. This has resulted in a reduction in the clearing of potential fauna habitat from 53.5 ha to 44.3 ha, and has also reduced the number of *Idiosoma nigrum* burrows to be directly impacted by the proposal from 26 to 13.

The proponent proposes to further reduce the risks to malleefowl and the gilled slender blue-tongue skink from vehicle strikes by reducing vehicle speed limits at locations of known active malleefowl mounds and known gilled slender blue-tongue skink locations.

The proponent has proposed standard fauna management measures to minimise impacts on terrestrial fauna. The proponent has also prepared a Terrestrial Fauna Condition Environmental Management Plan and proposes to undertake annual monitoring of known malleefowl mounds within the development envelope.

With exception of the mine pit, the proponent proposes to rehabilitate the disturbance footprint to contain self-sustaining fauna habitats that reflect the pre-disturbed state. The EPA notes that the proposed rehabilitation includes re-creation

of elements of fauna habitat, including rock piles and small hollows, return of vegetation debris, logs and rocks and use of locally endemic species of known importance to fauna.

### **Assessment of impacts**

The EPA has assessed the potential impacts in the context of the considerations for EIA as outlined in the Environmental Factor Guideline: *Terrestrial Fauna* (EPA 2016e).

The EPA has considered the proponent's mitigation measures to minimise impacts to terrestrial fauna. Despite these measures, implementation of the proposal would result in the loss of 44.3 ha of fauna habitat and the loss of two inactive Malleefowl mounds and 13 *Idiosoma nigrum* burrows.

The EPA considers the habitat types within the development envelope to be well represented in the local and regional areas. The EPA also notes that while there will be some impacts to inactive Malleefowl mounds and *Idiosoma nigrum*, both of these species occur within the broader area. The EPA has considered the principle of the conservation of biological diversity and ecological integrity and considers that the proposal would not result in significant impacts to the biological diversity and ecological integrity of terrestrial fauna as a result of the implementation of the proposal.

The EPA notes the proposed measures to reduce the risks to malleefowl and the gilled slender blue-tongue skink from vehicle strikes, and the proposed annual monitoring of known malleefowl mounds within the development envelope. The EPA considers that additional management in the form of pre-clearance searches for the gilled slender blue-tongue skink and active malleefowl mounds should be undertaken to further reduce any direct impacts to these species.

The EPA considers that the impacts to terrestrial fauna as a result of the implementation of this proposal are manageable.

### **Summary**

The EPA has paid particular attention to:

- the principle of conservation of biological diversity and ecological integrity;
- relevant EPA guidance pertaining to Terrestrial Fauna;
- the proponent's proposed impact avoidance, minimisation and rehabilitation measures;
- the habitat types for the significant fauna species within the development envelope being well represented in the local and regional areas; and
- the small-scale loss of fauna habitat, small extent of impact on significant fauna species.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Terrestrial Fauna, that the impacts to this factor are

manageable and would no longer be significant, if pre-clearance surveys for malleefowl and the gilled slender blue-tongue skink were implemented.

## **4.4 Social Surroundings**

### **Objective**

The EPA's environmental objective for this factor is *to protect social surroundings from significant harm*.

### **Relevant policy and guidance**

The EPA considers that the following current environmental policy and guidance is relevant to its assessment of the proposal for this factor:

- Environmental Factor Guideline: *Social Surroundings* (EPA 2016i).

The considerations for EIA for this factor are outlined in Environmental Factor Guideline: *Social Surroundings* (EPA 2016i).

### **EPA assessment**

Consistent with the EPA's Environmental Factor Guideline: *Social Surroundings* (EPA 2016i), the EPA has set out the assessment of the potential direct and indirect impacts of the proposal below with respect to Aboriginal Heritage and Visual Amenity.

The EPA recognises that there are inherent links between social surroundings and other key environmental factors as impacts to the landform and flora and vegetation may result in impacts to social surroundings.

The EPA considers that the information provided in the ERD (SMC 2016) and the Response to Submissions document (SMC 2017) is adequate to enable the EPA to undertake its assessment of social surroundings for this proposal.

### **Aboriginal heritage**

Heritage was identified by the EPA in the ESD for this proposal as a relevant matter to be concisely discussed and described in the Environmental Review Document, but not considered to warrant further assessment by the EPA. Aboriginal heritage now forms part of the EPA's consideration of the factor Social Surroundings and as such the EPA's consideration of impacts to heritage are outlined below.

Consistent with the Environmental Factor Guideline: *Social Surroundings* (EPA 2016i), the EPA has considered the Aboriginal heritage values which may be impacted and the proponent's mitigation to avoid or minimise impacts on Aboriginal heritage places.

### *Environmental Values*

The proponent has used existing information from archeological and ethnographic surveys from a 2011 mining proposal over the Blue Hills Tenements, and has undertaken consultation with relevant Traditional Owners.

The EPA considers that this is consistent with the type of information required for EIA in the Environmental Factor Guideline: *Social Surroundings* (EPA 2016i).

There are no Registered Aboriginal sites under section 5 of the *Aboriginal Heritage Act 1972* (AH Act) located within the development envelope.

Three 'Other Heritage Places', which have been considered by the Aboriginal Cultural Materials Committee but do not meet the criteria for a site under section 5 of the AH Act, are located within the development envelope. These are ID 24148 Midwest Artefact Scatter 1, ID 24149 Midwest Artefact Scatter 2 and ID 20859 Blue Hills (mythological site).

### *Impacts to Aboriginal heritage*

Clearing of native vegetation and excavation required for the proposal would disturb the three 'Other Heritage Places'. The two artefact scatters would be completely removed and the mythological site would be partially impacted.

The EPA considers that the proponent has identified the potential impacts of the proposal consistent with the Environmental Factor Guideline: *Social Surroundings* (EPA 2016i).

### *Proponent's application of the mitigation hierarchy*

The EPA notes that the proponent has applied the mitigation hierarchy to (avoid, minimise and rehabilitate) to reduce the impacts of the proposal on Aboriginal heritage.

Avoidance of the three 'Other Heritage Places' within the development envelope is not possible. However, the proponent has committed in the ERD (SMC 2016) to minimise impacts to heritage as far as practicable through the salvage and removal of two artefact scatters within the development envelope, in consultation with the relevant Traditional Owners.

### *Assessment of Impacts*

The EPA has assessed the impacts in the context of the considerations outlined in the Environmental Factor Guideline: *Social Surroundings* (EPA 2016i).

The EPA notes that the proposal would not impact on Aboriginal Sites that have been registered under section 5 of the AH Act. The EPA has considered the proponent's mitigation measures to minimise impacts to 'Other Heritage Places' as far as practicable. The EPA considers that the impacts to Aboriginal Heritage are manageable and would no longer be significant.

## ***Visual amenity***

The Environmental Factor Guideline: *Social Surroundings* (EPA 2016i) defines amenity as the qualities, attributes and characteristics of a place that make a positive contribution to quality of life. This includes both visual amenity and the ability for people to live and recreate in their surroundings without unreasonable interference with their health, welfare, convenience and comfort.

Consistent with the Environmental Factor Guideline: *Social Surroundings* (EPA 2016i), the EPA has considered the potential impacts of mining activities on the surrounding landscape with significant aesthetic values.

### *Environmental Values*

The proposed mine pit is located on the Mungada Ridge landform and the waste dump and associated infrastructure are on the surrounding plains. Currently, public visitation to Mungada Ridge is very limited as a result of restricted access due to mining activities.

The proponent has undertaken a Visual Landscape Evaluation (VLE) and a Visual Impact Assessment (VIA) (Ecoscape 2016b) to determine the landscape values of the proposal area and surrounds (within a 50 km radius) and determine the visibility, or contrast with the surrounding landscape of the proposal from various view locations. The EPA considers that this is consistent with the types of information required for EIA in the Environmental Factor Guideline: *Social Surroundings* (EPA 2016i).

The Mungada Ridge landform is a prominent and distinctive feature in a predominantly flat landscape. The broader natural landscape is densely vegetated scrub plain interspersed with woodland vegetation. Major features include rolling hills and peaks, and sandy plains with mulga shrubs and expansive salt lakes that are often dry (Ecoscape, 2016b).

Vegetation is a dominant visual characteristic which affects the view experience. *Acacia* species dominate and BIF are covered in scrub. The elevation in landscapes surrounding the proposal development envelope range from 250 m to 680 m above sea level. The Mungada Ridge forms a dominate component of the landscape as an expansive landform which provides topographic variety amongst the extensive scrub plains (Ecoscape, 2016b).

Land uses in the area include pastoral land for sheep and cattle, which in the vicinity of the development envelope are being progressively destocked in line with the intention of conservation estate gazettal. There is a history of mining for gold and iron ore in the area, including the Blue Hills mine (DSO Project), which is adjacent to the development envelope.

The proposal is located within the Karara complex, an area of former pastoral leases which have been purchased by Government for addition to the formal conservation reserve system. The area attracts a variety of recreation users for the purpose of 4WD exploration, camping, walking, prospecting and nature study. There are future plans to promote the area as a conservation/tourism/recreation destination. A

conservation area is proposed on the Mungada Ridge and would be a focal point for recreational tourism. The EPA notes that the establishment of this conservation area is subject to relinquishment of mining tenements and government processes.

#### *Impacts to visual amenity*

The proposal would result in the clearing of 44.3 ha of native vegetation on the landform and surrounding plains which is a dominant visual characteristic. This includes a permanent impact to 8.1 ha of the landform as a result of the mine pit and abandonment bund which would result in an alteration to the views of the natural landscape and visual amenity from various view locations.

The waste rock dump on the adjacent plain would extend 24 m from approximately 375 mAHD. By comparison, the height of the Mungada Ridge ranges from 492 m to 366 mAHD.

The EPA considers that the proponent has identified the potential impacts of the proposal consistent with the Environmental Factor Guideline: *Social Surroundings* (EPA 2016i).

For most view locations within 50 km of the development the proposal would not have a visual impact due to either vegetation screening, landform screening or distance to the proposal (Ecoscape, 2016b). However potential visual impacts were identified and simulated from the following four view locations:

- Lochada Road from 50 km (minor road);
- John Forrest Lookout from 24 km (formal lookout);
- Damperwah Hills (local camping recreation site); and
- Mungada Ridge (conceptual walk trail).

The VIA concluded that the proposal had a low visual impact from both the John Forrest Lookout and Lochada Road view locations due to: the distance resulting in the proposal area occupying a small proportion of the field of view; shared visual characteristics of the line and form of the proposal being similar to that of the surrounding landscapes; and the lower public sensitivity of the view locations. The EPA notes that the proponent commissioned a Peer Review (Urbis 2016) of the VIA and VLE and these conclusions were supported.

Following consultation with Parks and Wildlife, the VIA was expanded to include near field view locations from the conceptual walk trail on Mungada Ridge and Damperwah Hills. The VIA considered that the proposal had a low visual impact from the Damperwah Hills location, which is likely to be screened by vegetation.

The EPA notes that future plans for tourism and recreational facilities for the area, including the walk trail on the Mungada Ridge, are still conceptual (with no details available) and that master planning is still underway. The magnitude of the impacts and the extent to which the impacts could be mitigated on specific future recreation and tourism projects are unclear. As such the potential implication of the proposal on the walk trail do not form part of the EPA's considerations for this factor.

The mine pit is not proposed to be rehabilitated and would result in a permanent visual impact to the Mungada Ridge. The VIA concluded that after rehabilitation it is unlikely that the existing mining area would be noticeable, however some of the pit wall of the proposal may be visible where it extends above the bund. The VIA also concluded that the waste rock dump, haul roads and infrastructure are expected to blend with the surrounding landscape following rehabilitation.

The findings of the VIA that the proposal and existing mining would not be visible following rehabilitation are not supported by Parks and Wildlife. Parks and Wildlife consider it is highly likely that disturbed areas would be noticeable during both operations and after rehabilitation and, if implemented, the proposal would have a long term and permanent impact on the visual appeal of Mungada Ridge, and the surrounding area. The EPA's consideration of these impacts are discussed below.

### *Cumulative impacts*

The proposal is not expected to significantly contribute to the cumulative impacts to visual amenity in the region with the prominent landscape features and view experience likely to be retained if the proposal was to proceed. While the Karara mine is also visible from both the John Forrest Lookout and the Lochada Road view locations, the VIA concluded that the visual impact is likely to be low, due to the distance, the shared visual characteristics of the line and form of the proposal and the surrounding landscapes, and the sensitivity of the view locations.

### *Proponent's application of the mitigation hierarchy*

The proponent has applied the mitigation hierarchy (avoid, minimise and rehabilitate) to reduce the impacts to visual amenity from the proposal.

The proponent proposes to use waste from this proposal to backfill the existing Mungada East pit (DSO Project), to reduce the visual impact from the existing pit.

The proponent has modified the proposal by re-locating the pit abandonment bund and reducing its size from 8 ha to 0.8 ha, and has also reduced the size of the mine pit from 10.6 to 7.3 ha. These modifications would reduce the visual impacts of the proposal by excluding mining from part of the top of the ridgeline, reducing the size of the mine pit void, and reducing the clearing of vegetation, which is a dominant visual characteristic, from 53.5 ha to 44.3 ha.

The proponent also intends to mitigate impacts on visual amenity by rehabilitating the infrastructure area, haul roads and waste rock dump, which would be contoured to blend with the surrounding natural landscape to further minimise impacts.

After applying the mitigation hierarchy the proponent does not consider there to be any significant residual impacts.

### *Assessment of impacts*

The EPA has assessed the impacts in the context of the considerations outlined in the Environmental Factor Guideline: *Social Surroundings* (EPA 2016i).

The Mungada Ridge landform is a prominent and distinctive feature in a predominantly flat and natural landscape. The EPA considers that the Mungada Ridge and the surrounding landscape has significant aesthetic values.

The EPA has considered the proponent's mitigation measures to minimise impacts to visual amenity. Implementation of the proposal would result in a permanent pit void on the Mungada Ridge landform which would not be subject to rehabilitation, and the construction of a 24 m high waste rock dump on the surrounding plains.

The EPA notes that the extent to which the waste rock dump and ore processing infrastructure area would impact the aesthetic values of the area would be subject to the success of the proponent's proposed rehabilitation, and contouring of the waste rock dump to blend with the surrounding landscape.

However, the EPA considers that, despite these measures, implementation of the proposal would result in permanent visual impacts to the scenic quality of the Mungada Ridge and the surrounding landscape as a result of the construction of the mine pit void, and the waste rock dump.

The EPA also notes that the proposal is located within the Karara Complex ex-pastoral leases, which have been purchased by Government for inclusion in the Conservation Estate. The EPA considers that, based on the proposed land tenure of the Mungada Ridge and the surrounding area, there is a reasonable expectation that members of the public would utilise the area in the future for tourism and recreation.

The EPA has considered the principle of intergenerational equity and is of the view that implementation of the proposal would result in a decline in aesthetic and social resource base, and would reduce the value of the Karara Complex for tourism and recreation purposes for future generations.

### **Summary**

The EPA has paid particular attention to:

- the principle of intergenerational equity;
- relevant EPA guidance pertaining to *Social Surroundings*;
- the proponent's potential impact avoidance, minimisation and rehabilitation measures;
- the Mungada Ridge being a distinctive landform in a predominately natural landscape with significant aesthetic values;
- the permanent impacts on the scenic quality of the Mungada Ridge and the surrounding landscape from the construction of the mine void and the waste rock dump; and

- the Mungada Ridge being part of the Karara Complex, which is managed by Parks and Wildlife for conservation and recreation.

The EPA considers, having regard to the relevant EP Act principles and environmental objective for Social Surroundings, that the impacts to this factor are not manageable and would remain significant because of the impact on the amenity values of the Mungada Ridge and the surrounding area.

## 5. Conclusion

The EPA has considered the proposal by SMC to expand its hematite mining operations on the Mungada Ridge and construct and operate a waste rock dump, ore processing infrastructure and haul roads.

### **Context**

The EPA noted that the 2007 report *Strategic Review of the Banded Iron Ore Formation Ranges of the Midwest and Goldfields* (referred to as the BIF Review), identified that the Blue Hills area contains endemic and restricted plant communities, has one of the highest levels of flora numbers and number of flora of conservation interest (including species with their distributions centered on BIF habitat), and is listed in the highest group of BIF ranges for biodiversity and landscape value, and was thus a candidate priority area for reservation.

Since the BIF Review, considerable mining has been approved, but it is noted that little progress has been made on establishment of conservation reserves.

### **Environmental values**

During its assessment, the EPA identified the Key Environmental Factors relevant to the proposal as Landforms, Flora and Vegetation, Terrestrial Fauna, and Social Surroundings.

Given the inextricable link between the Key Environmental Factors, the EPA has considered the Mungada Ridge in its totality recognising that it:

- has physical attributes (i.e. slope, size, height and shape) which makes the landform distinctive and unique in a local context. In a regional context, the Mungada Ridge represents one of a small number of very large, high and steep BIF landforms that has a unique crescent shape. Furthermore, because of previously approved mining proposals in the Blue Hills area, the Mungada Ridge is the last large, substantively intact BIF landform in the area. Due to the permanent and irreversible impacts to the integrity of a significant and rare landform, the principle of the intergenerational equity was a relevant consideration in this assessment;
- supports significant biodiversity values such as populations of Threatened and Priority flora and vegetation communities that are largely restricted to the Mungada Ridge. Due to the biological values within the proposal area, the principle of the conservation of biological diversity and ecological integrity was a relevant consideration in this assessment; and
- is located in a landscape setting where the Mungada Ridge has visual appeal and aesthetic values and, because of these values, has the potential to support tourism and recreation developments in the future.

In relation to the tenure, it is also recognised that the proposal is located within the Karara Complex (group of former pastoral leases) which was purchased by Parks and Wildlife and is now managed as a proposed *Conservation and Land Management Act 1984* reserve. Reservation of these former pastoral leases is progressing, consistent with native title considerations and government priorities.

More recent environmental surveys and studies undertaken by the proponent, and set out in its ERD, further demonstrate that the area to be impacted by the proposal supports a high diversity of flora and fauna, threatened and priority flora species and significant vegetation communities that are largely restricted to the Ridge.

### ***Application of the mitigation hierarchy***

Consistent with relevant policies and guidance, the proponent has addressed the mitigation hierarchy by identifying measures to avoid, minimise and rehabilitate environmental impacts to the Mungada Ridge including:

- reducing the overall clearing of flora and vegetation for the proposal from 53.5 ha to 44.3 ha;
- reducing the size of the mine pit from 10.6 ha to 7.3 ha and avoiding the highest and steepest areas of the landform;
- reducing the size of the pit abandonment bund from 8 ha to 0.8 ha to minimise impact on the landform and avoid impact on significant flora and restricted vegetation;
- implementing measures to manage indirect impacts on the landform, and significant flora and fauna and restricted vegetation; and
- rehabilitating the waste rock dump, ore processing infrastructure area and roads.

The EPA also notes that the proponent has provided an offset to either:

1. undertake research and re-establishment/translocation of the threatened *Acacia woodmaniorum* and implement a Biodiversity Conservation Management Program on 133 ha within their mining tenements outside the development envelope; or
2. relinquish part of Mining Lease 59/596 (36 ha in the north-east corner) for placement in a conservation reserve.

The EPA also acknowledges the rehabilitation and research project at the proponent's existing operations, which is being conducted in collaboration with the BGPA, and the contributions to the ARC project, which will contribute to increased knowledge and improved practice in rehabilitation techniques throughout the Midwest and the State.

It is noted however that the information submitted to date has not yet provided sufficient evidence that the proposed translocation of the threatened *Acacia woodmaniorum* would result in self-sustaining populations and that further research could reliably offset this risk. As such the potential residual impacts cannot be assessed with sufficient certainty.

## **Conclusion**

The EPA has taken the following into account in its assessment of the proposal as a whole:

- The impacts to all the key environmental factors.
- The proponent's proposed mitigation measures.
- The relevant EP Act principles and the EPA's objectives for the key environmental factors.
- The relevant EPA guidance pertaining to the key environmental factors.
- The Mungada Ridge's significance as the last large, distinctive landform within the local area that supports biodiversity and visual amenity values and is largely intact.
- The significant residual impact of the proposal on the Mungada Ridge being a permanent impact to the physical structure of the landform which could not be mitigated.
- The increase of 4.9% to 6.1% in the permanent cumulative impact to the Mungada Ridge resulting in a significant loss of the integrity of the landform.
- The Mungada Ridge as a regionally important landform with the highest conservation value of any BIF landform within the Karara Complex.
- The significant residual impact on Threatened flora, *Acacia woodmaniorum* (1,739 individuals and cumulative impact of 18.43%).
- The cumulative significant residual impacts to Priority Flora; *Lepidosperma* sp. Blue Hills, *Drummondita fulva* and *Micromyrtus Trudgenii*; the Blue Hills PEC and FCTs 13 and 14.
- The permanent impacts on the scenic quality of the Mungada Ridge and the surrounding landscape from the construction of the mine void and the waste rock dump.
- The Mungada Ridge being part of the Karara Complex, which is managed by Parks and Wildlife for conservation and recreation.

When the separate significant residual impacts to the Mungada Ridge are considered together, the EPA formed a view that the cumulative impact on the landform itself would result in a significant loss to its integrity and the environmental values, in particular *A. woodmaniorum*.

Despite the proponent's best efforts to avoid and minimise impacts to the Mungada Ridge and its commitments to reduce the levels of scientific uncertainty about its proposed translocation and rehabilitation measures, the EPA concludes that:

- a significant residual irreversible impact on the Mungada Ridge will remain if this proposal proceeds;
- the environmental impacts are considered to be significant given the nature and rarity of the values of the Ridge; and
- the impacts cannot be readily or confidently counterbalanced through an offset.

Given the above, the EPA has concluded that the proposal is environmentally unacceptable and therefore recommends that the proposal should not be implemented.

## 6. Other advice

### Class A reserve on the Mungada Ridge

The EPA is of the view that the Mungada Ridge is a significant and distinctive BIF landform which supports high biodiversity and social aesthetic values, and is one of the few large largely intact BIF landforms in the region.

The EPA recommends that the remainder of the Mungada Ridge be protected in the conservation estate as a Class A nature reserve. This is particularly important given the environmental values which are worthy of protection, and the mining and exploration projects already underway in the area.

The EPA notes, as discussed in Section 4.1, that the proponent has offered to relinquish a portion of its tenement as an alternative offset for this proposal.

### Future tourism projects

The Mungada Ridge provides opportunities for conservation and promotion of the landscape features for tourism. The areas surrounding the proposal attract a variety of recreation uses such as 4WD exploration and camping, however some areas have limited access due to the absence of infrastructure and the presence of mining and exploration activities.

The Mungada Ridge is located within the Karara Complex, an area of former pastoral leases which have been purchased by government for addition to the formal conservation reserve system.

It is noted that the Midwest Regional Blueprint and the Midwest Tourism Development Strategy identify the Karara Complex of rangeland parks in the top five priorities in the Midwest Region for the development of tourism and recreation facilities and infrastructure.

Parks and Wildlife advise that Mungada Ridge will provide a focal point for recreational tourism and become a major destination for visitors to the Midwest region. Project development is underway with resources committed by Tourism Western Australia's *Caravan and Camping Action Plan* and Parks and Wildlife's *Parks for People Program* to the development of a recreation Master Plan for the investigation and development of a range of activities, including walking trails, lookouts, low-impact outback camping nodes, drive trails, scenic viewpoints, and interpretation and conservation programs.

The EPA takes this opportunity to highlight to government the advice of Parks and Wildlife that there be recognition:

- of the pivotal role of the Karara Complex of Rangelands in the development of regional tourism opportunities that provide long-term social, economic and environmental benefits to the region; and
- that the proposal would have an impact on the recreational tourism potential and value of the ridge as a conservation reserve and tourism destination.

## 7. Recommendations

That the Minister for Environment notes:

1. The key environmental factors identified by the EPA in the course of its assessment are Landforms, Flora and Vegetation, Terrestrial Fauna and Social Surroundings, set out in Section 4.
2. That the EPA concluded that for the key environmental factor of Terrestrial Fauna the impacts are manageable and would no longer be significant.
3. That the EPA concluded for the key environmental factors of Landforms, Flora and Vegetation, and Social Surroundings, that the impacts are not manageable and remain significant.
4. That the EPA has concluded that the proposal should not be implemented.
5. That the EPA has not included conditions and procedures to which the proposal should be subject in this report, because the EPA has concluded that the proposal should not be implemented.
6. Other information, advice and recommendations provided by the EPA set out in Section 6.



# Appendix 1

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## **Appendix 2**

**List of submitters**

**Organisations:**

1. Department of Aboriginal Affairs
2. Department of Environment Regulation
3. Department of Lands
4. Department of Parks and Wildlife
5. Wildflower Society

**Individuals:**

1. Private individual 1
2. Private individual 2

# **Appendix 3**

## **Consideration of principles**

<b>Environmental Protection Act 1986 Principle</b>	<b>If yes, consideration</b>
<p><b>1. The precautionary principle</b></p> <p><i>Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.</i></p> <p><i>In application of this precautionary principle, decisions should be guided by –</i></p> <p>a) <i>careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and</i></p> <p>b) <i>an assessment of the risk-weighted consequences of various options.</i></p>	<p>In considering this principle, the EPA notes that Landforms, Flora and Vegetation, Terrestrial Fauna and Social Surroundings could be significantly impacted by the proposal. The assessment of these impacts is provided in this report.</p> <p>Investigations into the biological and physical environment that have been undertaken by the proponent have provided sufficient certainty to assess risks and identify measures to avoid or minimise impacts. The EPA has considered these risks and measures during its assessment.</p> <p>From its assessment of the proposal the EPA has concluded that there is no threat of serious or irreversible harm.</p>
<p><b>2. The principle of intergenerational equity</b></p> <p><i>The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.</i></p>	<p>This principle is a relevant consideration for the EPA when assessing and considering the impacts of the proposal on the environmental factors of Landforms, Flora and Vegetation, and Social Surroundings.</p> <p>The EPA notes that the proponent has identified measures to avoid or minimise impacts. The EPA has considered these measures during its assessment.</p> <p>Despite these measures, the implementation of the proposal, would result in:</p> <ul style="list-style-type: none"> <li>• permanent loss of the diversity and integrity of the Mungada Ridge landform;</li> </ul>

	<ul style="list-style-type: none"> <li>• localised and permanent alteration to the contour of ridgeline, a significant landform within the local and regional area;</li> <li>• loss of 1739 individuals of <i>Acacia woodmaniorum</i> and contribute to significant cumulative impacts to vegetation communities and Priority flora; and</li> <li>• an alteration to the aesthetic values of the Mungada Ridge and the surrounding landscape.</li> </ul> <p>The EPA considers that the above impacts would:</p> <ul style="list-style-type: none"> <li>• result in a decline in the health, diversity and productivity of flora and vegetation into the future;</li> <li>• result in a decline in diversity of the aesthetic, social and cultural resource base; and</li> <li>• reduce future generations' options in terms of diversity of the natural and cultural resource base of the environment.</li> </ul>
<p><b>3. The principle of the conservation of biological diversity and ecological integrity</b></p> <p><i>Conservation of biological diversity and ecological integrity should be a fundamental consideration.</i></p>	<p>This principle is a fundamental and relevant consideration for the EPA when assessing and considering the impacts of the proposal on the environmental factors of Landforms, Flora and Vegetation, and Terrestrial Fauna. This principle is also relevant to the EPA consideration of the proposed offset package.</p> <p>The EPA notes:</p> <ul style="list-style-type: none"> <li>• that the proposal would result in the localised and permanent alteration to the contour of ridgelines of the Mungada Ridge; and</li> <li>• the loss of environmental values supported by the Mungada Ridge including; individuals of threatened flora and critical habitat, and</li> </ul>

	<p>significant cumulative impacts to vegetation communities and priority flora.</p> <p>The EPA concludes that the proposal would have significant impacts on biological diversity and ecological integrity of the environment given the permanent loss of the integrity of the Mungada Ridge landforms.</p> <p>The EPA has also considered to what extent the potential impacts from the proposal can be ameliorated by recommended conditions, including offsets. The EPA has concluded that given the nature of the impacts that the proposed offsets are unlikely to ameliorate the impacts of the loss of biological diversity and ecological integrity given the lack of evidence for successful translocation of threatened flora.</p>
<p><b>4. Principles relating to improved valuation, pricing and incentive mechanisms</b></p> <p><i>(1) Environmental factors should be included in the valuation of assets and services.</i></p> <p><i>(2) The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.</i></p> <p><i>(3) The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.</i></p> <p><i>(4) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structure, including market mechanisms, which enable those best</i></p>	<p>In considering this principle the EPA notes that the proponent would bear the cost relating to waste and pollution, including avoidance, containment.</p> <p>The EPA has had regard to this principle during the assessment of the proposal.</p>

<p><i>placed to maximise benefits and/or minimize costs to develop their own solution and responses to environmental problems.</i></p>	
<p><b>5. The principle of waste minimisation</b></p> <p><i>All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.</i></p>	<p>In considering this principle, the EPA notes that the proponent proposes to use the waste rock from this proposal to back fill the existing Mungada East pit and dispose of some of the waste rock from this proposal in the exiting Mungada East waste rock dump. The remaining waste rock would be disposed of in a newly constructed waste rock dump. The EPA notes that as a result of the recent changes to the proposal the amount of waste rock to be generated has reduced from 13 to 6.5 million tonnes.</p> <p>The EPA has had regard to this principle during the assessment of the proposal.</p>



# **Appendix 4**

## **Evaluation of other environmental factors**

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
<b>LAND</b>			
Subterranean Fauna	<p>Mining for the proposal is only proposed to be undertaken above the groundwater table. Therefore stygofauna are not likely to be impacted by the proposal.</p> <p>Excavation for the mine pit has the potential to impact on troglofauna through direct mortality and loss of habitat.</p>	There were no comments made on this factor.	<p>Subterranean Fauna was identified as a preliminary key environmental factor in the ESD.</p> <p>The subterranean fauna assessment by the proponent found there is no suitable habitat for stygofauna within the development envelope (SMC 2016).</p> <p>The BIF of the Mungada Ridge landform provides potential habitat for troglofauna. This habitat extends beyond the area of the proposed mine pit.</p> <p>The subterranean fauna surveys conducted for the ERD met the requirements of the guidance at the time, which are Environmental Assessment Guideline No. 12 <i>Consideration of subterranean fauna in environmental impact assessment in Western Australia</i> (EPA 2013) and Guidance Statement No. 54a <i>Sampling methods and survey considerations for subterranean fauna in Western Australia</i> (EPA 2007).</p> <p>Having regard to:</p> <ul style="list-style-type: none"> <li>• the low likelihood of suitable habitat for stygofauna in the development envelope;</li> <li>• mining taking place above the groundwater table;</li> </ul>

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
			<ul style="list-style-type: none"> <li>• suitable habitat for troglifauna being present, but the low abundance and diversity of troglifauna species recorded;</li> <li>• Environmental Factor Guideline <i>Subterranean Fauna</i> (EPA 2016j); and</li> <li>• the significance considerations in the <i>Statement of Principles, Factors and objectives</i>,</li> </ul> <p>the EPA considers that it is unlikely that the proposal would have a significant impact on Subterranean Fauna and that the impacts to this factor are manageable.</p> <p>Accordingly, the <b>EPA did not consider Subterranean Fauna to be a key environmental factor</b> at the conclusion of its assessment.</p>
<b>WATER</b>			
Hydrological Processes and Inland Waters Environmental Quality	<p>The location of the proposed mine pit and associated infrastructure may alter the surface water flows and quality.</p> <p>The surface water flows from the Blue Hills Range discharges southwards to a drainage depression.</p>	More detail and facts are required to support the statement that there would be no impacts to the groundwater.	<p>Hydrological Processes and Inland Waters Environmental Quality were identified as 'Other factors or matters' in the ESD.</p> <p>The proponent has identified in the ERD that groundwater abstraction for the proposal would be in accordance with the existing licence conditions.</p> <p>Having regard to:</p>

Environmental factor	Description of the proposal's likely impacts on the environmental factor	Government agency and public comments	Evaluation of why the factor is not a key environmental factor
	<p>This area was thought to be a gilgai formation, where the surrounding vegetation is potentially groundwater dependant. Investigations by Karara Mining Limited showed that the groundwater table was not sufficiently shallow for vegetation dependency. Therefore the area was considered not to be groundwater dependant and was reclassified as a "drainage depression".</p> <p>Mining for the proposal would be above the groundwater level. Therefore dewatering is not required.</p> <p>The change to the design of the mine pit has resulted in a reduction in the maximum pit depth from 112 metres to approximately 91 metres.</p>		<ul style="list-style-type: none"> <li>• what was thought to be a gilgai formation actually being a drainage depression that is not groundwater dependant;</li> <li>• mining taking place above the groundwater table;</li> <li>• the proponent's proposed management measures to ensure no contamination of the groundwater or surface water;</li> <li>• Environmental Factor Guidelines <i>Hydrological Processes and Inland Waters Environmental Quality</i>; and</li> <li>• the significance considerations in the <i>Statement of Principles, Factors and objectives</i>,</li> </ul> <p>the EPA considers that it is unlikely that the proposal would have a significant impact on Hydrological Processes or Inland Waters Environmental Quality and that the impacts to this factor are manageable.</p> <p>Accordingly, the <b>EPA did not consider Hydrological Processes or Inland Waters Environmental Quality to be a key environmental factor</b> at the conclusion of its assessment.</p> <p>The EPA also notes that Department of Water regulates the abstraction of groundwater under the provisions of the <i>Rights in Water and Irrigation Act 1914</i>.</p>

# **Appendix 5**

## **Identified Decision-Making Authorities**

## Identified Decision-making Authorities

Section 44(2) of *Environmental Protection Act 1986* specifies that the EPA's report must set out (if it recommends that implementation be allowed) the conditions and procedures, if any, to which implementation should be subject. This Appendix contains the EPA's recommended conditions and procedures.

Section 45(1) requires the Minister for Environment to consult with decision-making authorities, and if possible, agree on whether or not the proposal may be implemented, and if so, to what conditions and procedures, if any, that implementation should be subject.

The following decision-making authorities have been identified:

Decision-making Authority	Legislation (and Approval)
1. Minister for Environment	<i>Wildlife Conservation Act 1950</i> (permit to take Threatened Flora)
2. Minister for Water	<i>Rights in Water and Irrigation Act 1914</i> (licence to abstract groundwater)
3. Minister for Aboriginal Affairs	<i>Aboriginal Heritage Act 1972</i> (approval to impact Aboriginal sites)
4. Minister for Mines and Petroleum	<i>Mining Act 1978</i> (approval of Mining Proposal)
5. Director General, Department of Environment Regulation	<i>Environmental Protection Act 1986</i> (Part V Works approval and Licence)
6. Department of Mines and Petroleum	Director, Environment Division <i>Mining Act 1978</i> (approval of Mining Proposal) Chief Dangerous Goods Officer <i>Dangerous Goods Safety Act 2004</i> (storage and handling of hazardous materials) State Mining Engineer <i>Mine Safety and Inspection Act 1994</i> (stability of the mine pit and abandonment bund)

Note: In this instance, agreement is only required with DMAs 1-4, since these DMAs are Ministers.