BHP

Jimblebar Flora and Vegetation Management Plan

DRAFT

August 2019

Authorisation

Version	Description of Version	Name	Position	Date
DRAFT	Draft submitted with referral of Jimblebar Optimisation Project			

Abbreviations

Term	Meaning
BHP	BHP Billiton Iron Ore Pty Ltd, as manager and agent for and on behalf of BHP Billiton Minerals Pty Ltd, BHP Iron Ore (Jimblebar) Pty Ltd, United Iron Pty Ltd, the participants of the Mount Goldsworthy Joint Venture, Mount Newman Joint Venture and Yandi Joint Venture.
CAR	Compliance Assessment Report
CEO	Chief Executive Officer
DCP	Digital Canopy Photography
DWER	Department of Water and Environmental Regulation
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986*
EPWRMP	East Pilbara Water Resource Management Plan
FVMP	Flora and Vegetation Management Plan
MAR	Managed Aquifer Recharge
mbgl	metres below ground level
MS	Ministerial Statement
OSA	Overburden Storage Area
PEAHR	Project Environmental Aboriginal Heritage Review
TBC	To be confirmed
TDS	Total dissolved solids
UAV	Unmanned Aerial Vehicle
WMP	Water Management Plan

Contents

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Summary

Jimblebar Water Management Plan	
Proposal title	Jimblebar Iron Ore Mine
Proponent name	BHP Billiton Iron Ore Pty Ltd
Ministerial Statement	XXXX
Purpose of the EMP	To meet the requirements of implementation conditions 5 and 6 of Ministerial Statement XXXX.
Key Environmental Factor and Objectives	Flora and Vegetation – *To protect flora and vegetation so that biological diversity and ecological integrity are maintained.*
Conditions	Condition 5 Condition Environmental Management Plan(s) Condition 6 Environmental Management Plan
Key provisions in the EMP	Management-based provisions to: • avoid where possible, or minimise direct impacts to priority flora, including *Eremophila capricornica*; • minimise the introduction of new weed species and the spread of existing weeds; and • minimise the impact to the health of riparian vegetation of Caramulla Creek from surplus water discharge.

1 Context, scope and rationale

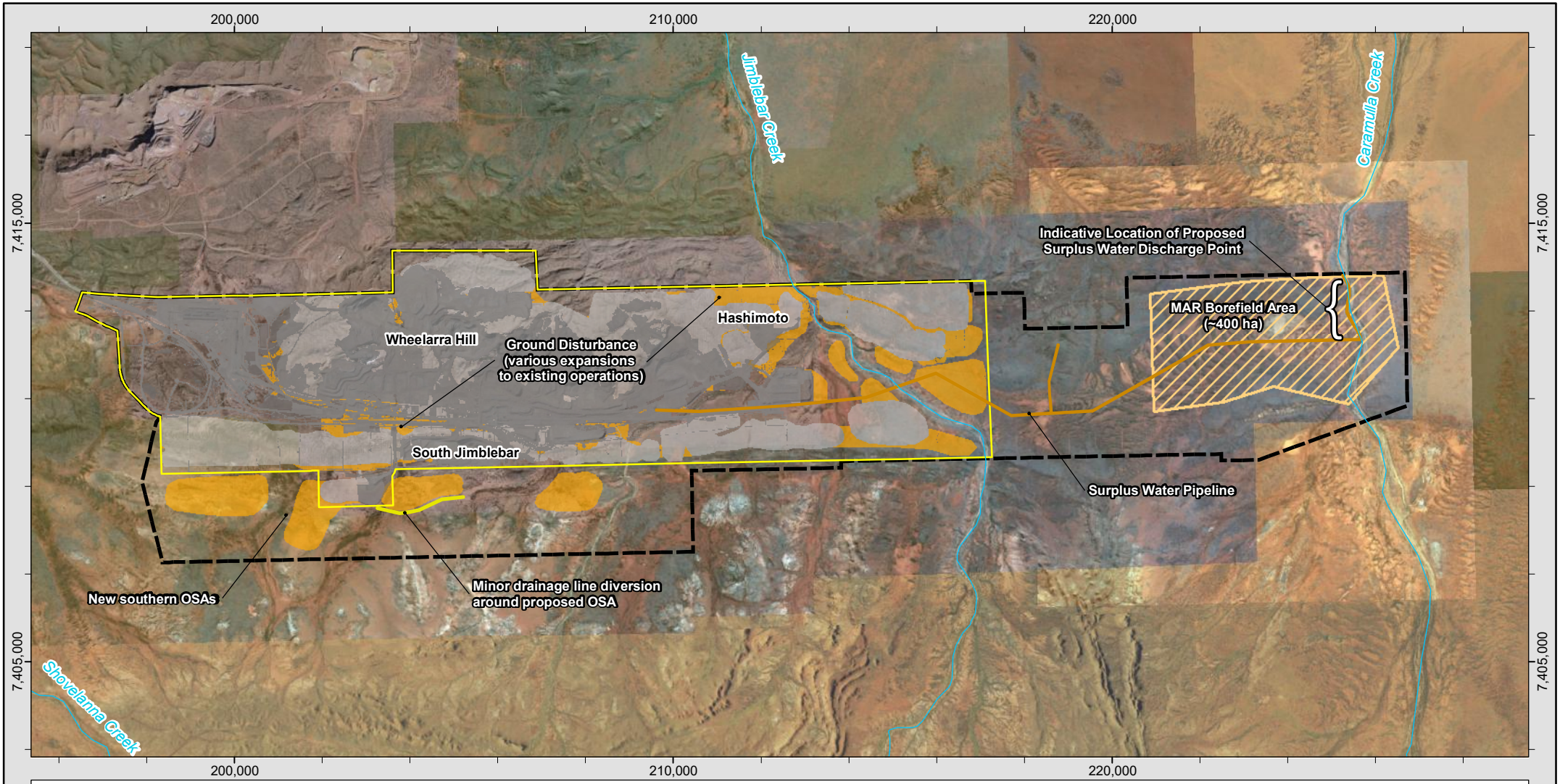
BHP Billiton Iron Ore Pty Ltd (BHP) has prepared the Jimblebar Flora and Vegetation Management Plan (FVMP) to meet requirements under Part IV of the *Environmental Protection Act 1986* (EP Act). The plan is submitted as a draft with the referral documentation for the Jimblebar Optimisation Project. The intent is for the WMP to meet the requirements of MSXXXX Condition 6 Flora and Vegetation Environmental Management Plan, should the Revised Proposal for the Jimblebar Iron Ore Mine be approved for implementation.

BHP has prepared this environmental management plan (EMP) to be consistent with the *Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA 2018) (Instructions).

1.1 Proposal

The scope of the FVMP is the operations at the Jimblebar Iron Ore Mine (Jimblebar mine) that are approved under the EP Act.

The Jimblebar mine is located approximately 40 km east of Newman (Figure 1). Mining of iron ore deposits is undertaken above and below the water table. Mining operations include open pits, overburden storage areas and the construction and operation of associated mine, processing and rail infrastructure. Groundwater is abstracted for water supply and to dewater the orebodies. Surplus water management includes transfer to Ophthalmia Dam, controlled creek discharge and managed aquifer recharge.



BHP

Spatial Data - Studies Planning & Access
BHP IRON ORE

FLORA AND VEGETATION MANAGEMENT PLAN
Jimblebar Mine

Scale @ A4: 1:125,000	Prepared: J. VIS	Project No: A949/002 REV 0
Date: 23/08/2019	Checked:	Figure: 1
Revision: REV 0	Reviewed: ENVIRO. A&I	

- Watercourse
- Existing Project Boundary
- Proposed Development Envelope
- Indicative Previously Assessed Area
- Indicative Cleared Area as at FY2019

Indicative Footprint

- Drainage Line Diversion
- Surplus Water Pipeline
- MAR Borefield Area
- Ground disturbance (OSA, various expansions and associated activities)

N

0 1 2 3
Kilometres

Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

Document Path: Y:\Jobs\A501_A1000\A949\3Project\A949_002_E_ProposedDevelopmentEnvelope_Rev0.mxd

1.2 Key environmental factors

The key environmental factor relevant to this EMP is Flora and Vegetation. Table 1 describes the activities, values and actual or potential impacts on Flora and Vegetation addressed by this EMP.

Table 1: Key environmental factors, activities and values

Key environmental factor	Activities	Environmental values	Actual/Potential Impacts
Flora and Vegetation	Clearing of native vegetation	Priority flora, specifically *Eremophila capricornica* (Priority 1)	**Direct impacts** Loss of *Eremophila capricornica* individuals and populations from direct disturbance.
	Surplus water discharge	Caramulla Creek riparian vegetation	**Indirect impacts** Decline in health of riparian vegetation health decline from surplus water discharge.
	Mining activities, including surplus water discharge	Vegetation condition	**Indirect impacts** Increased spread or introduction of weeds (introduced species) from mining activities.

1.3 Condition requirements

BHP's strategic approach is to manage the environment at the subregional or hub level. As future expansions to the Jimblebar Hub are identified in the Pilbara Expansion Strategic Proposal, BHP has proposed relevant conditions from the Strategic Proposal Ministerial Statement (MS) 1105, amended only to allow for existing operations at Jimblebar. This will allow for consistency of conditions (and management) at Jimblebar, for the Revised Proposal and any future proposals that may be declared as Derived Proposals.

BHP has identified that the following conditions from MS1105 apply in relation to flora and vegetation management at Jimblebar:

- Condition Environmental Management Plan/s (entire condition)
- Flora and Vegetation Environmental Management Plan (part and amended)

The relevant objective sub-clauses that apply to the Jimblebar mine are:

Table 2: Relevant condition objective sub-clauses

Flora and Vegetation Environmental Management Plan Condition sub-clause	Applicable to Jimblebar	Environmental value/s
The proponent shall manage the implementation of the proposal to meet the following environmental objective: (1) protect flora and vegetation so that biological diversity and ecological integrity are maintained, and in particular:	Yes	Caramulla Creek riparian vegetation Vegetation condition
(a) maintain the local and regional populations of flora taxa declared as threatened flora under the relevant legislation.	No	

Flora and Vegetation Environmental Management Plan Condition sub-clause	Applicable to Jimblebar	Environmental value/s
(b) avoid and minimise direct and indirect impacts on flora taxa that is specially protected under the relevant legislation.	No	
(c) avoid and minimise direct and indirect impacts on flora taxa listed as priority flora.	Yes	Priority flora, specifically *Eremophila capricornica* (Priority 1)
(d) avoid and minimise direct and indirect impacts on the occurrences of threatened and priority ecological communities, and their habitat.	No	

BHP has provided the condition requirements in the provisions table (see Section 2), which the Instructions allow for, if there are multiple conditions and/or condition clauses.

1.4 Rationale and approach

As required by the Instructions, this section provides a concise description of the rationale and approach for the provisions in this EMP.

1.4.1 Management approach

BHP applied a risk-based approach to identify and prioritise provisions in this EMP. The purpose of the provisions is to protect the environmental values in Table 1. In developing the provisions, BHP has used available scientific information from recent investigations and studies, and has applied learnings from the management of Flora and Vegetation at other mine sites in the Pilbara.

This EMP relates to the *Jimblebar Water Management Plan* (BHP 2019a), which contains water-based provisions relating to surplus water discharge.

At the site level, BHP has a Project Environmental Aboriginal Heritage Review (PEAHR) process to manage the implementation of its environmental, Aboriginal heritage, land tenure and legal obligations prior to and during land disturbance activities. All ground disturbance activities will be required to meet the requirements of the PEAHR process, in addition to relevant legislative and regulatory requirements and BHP's Sustainable Development Policy. The PEAHR process also provides a mechanism whereby technical and professional advice can be provided to the business regarding environmental aspects, land access and Aboriginal heritage planning and management issues. The PEAHR system consists of an electronic workflow process linked to a geographical information system.

1.4.2 Rationale

Table 3 provides a concise description (in tabular format) of the rationale for the EMP provisions in Section 2, including:

- survey and study findings;
- key assumptions and uncertainties; and
- rationale for choice of provisions.

Table 3: Rationale for provisions

Surveys and studies	Survey and studies findings	Key assumptions and uncertainties	Rationale for choice of provisions
Environmental value: *Eremophila capricornica* – Priority 1 flora **Proposed objective: Avoid where possible, or minimise direct impacts to *Eremophila capricornica***			
The key surveys and studies used to develop the provisions related to significant flora (*Eremophila capricornica*) include the following: • *Jimblebar Optimisation Project: Jimblebar Iron Ore Mine Revised Proposal - Environmental Review Document – referral supplementary report* (BHP 2019b) • *East Jimblebar and Caramulla Flora and Vegetation Survey* (Biologic 2019, in prep) • *Caramulla Creek Flora and Vegetation Survey* (Astron Environmental Services 2018) • *Vegetation Survey and Desktop Assessment Caramulla Creek* (Onshore Environmental 2018a) • *Reconnaissance Flora and Vegetation Survey Caramulla* (Onshore Environmental 2018b) • *Shearers West Detailed Vegetation and Flora Survey* (Onshore Environmental 2018c)	• No plant taxa gazetted as Threatened Flora under the WC Act or listed under EPBC Act were recorded. • Five Priority flora taxa were recorded: *Eremophila capricornica* (Priority 1), *Ipomoea racemigera* (Priority 2), *Crotalaria smithiana* (Priority 3), *Rhagodia* sp. Hamersley (M. Trudgen 17794) (Priority 3) and *Goodenia nuda* (Priority 4). • *Eremophila capricornica* is a newly described species (Buirchell and Brown, 2016) and was listed as a Priority flora taxa in 2017 (Onshore Environmental 2018b). • A desktop assessment was undertaken to identify additional possible records of this species as a result of the taxonomic review (i.e. identifying those records which may have been identified as another *Eremophila* species) (Onshore Environmental 2019d). • It is considered likely that there may be more occurrences of this *Eremophila capricornica* that have previously been misidentified as a closely aligned taxon. • Based on current confirmed locations of *Eremophila capricornica*, clearing of native vegetation within the Indicative Footprint has the potential to directly impact 17 or 11% of the known records (Figure 2). • All records of *Eremophila capricornica* are located in or adjacent to the MAR area.	**Assumptions** • There is flexibility in the location of the MAR infrastructure in the Caramulla area. • It is likely that the newly described *Eremophila capricornica* is present more widely in the vicinity of the Jimblebar Iron Ore Mine, however, it may have been misidentified or not targeted during searches for significant species. **Uncertainties** • The population size and distribution of *Eremophila capricornica* is uncertain.	**Type of provisions** BHP has chosen management-based provisions. It is difficult to set measureable provisions related to the disturbance of *Eremophila capricornica*, as the design of the Caramulla MAR has not been finalised, and the population size and distribution is uncertain. **Choice of Provisions** • BHP has proposed management actions and targets related to additional targeted survey, to improve certainty of the location and numbers of *Eremophila capricornica.* An additional detailed targeted survey within and/or outside the Development Envelope is proposed to ensure all locations of this species have been recorded. Other potential records of *Eremophila capricornica*, as identified through the desktop assessment, should be ground-truthed and species records updated if correct taxonomy where required. • BHP has proposed management actions and targets related to the design of the MAR infrastructure and implementation of the PEAHR process, to minimise disturbance to the species. Although 17 of the *Eremophila capricornica* records are within the Indicative Footprint, there is flexibility in the location of the MAR infrastructure, so it is likely that some records can be avoided.
Environmental value: Vegetation condition (weeds) **Proposed objective: Minimise the introduction of new weed species and the spread of existing weeds**			
The key surveys and studies used to develop the provisions related to vegetation condition (weeds) include the following: • *Jimblebar Optimisation Project: Jimblebar Iron Ore Mine Revised Proposal - Environmental Review Document – referral supplementary report* (BHP 2019b) • *East Jimblebar and Caramulla Flora and Vegetation Survey* (Biologic 2019, in prep) • *Caramulla Creek Flora and Vegetation Survey* (Astron Environmental Services 2018) • *Vegetation Survey and Desktop Assessment Caramulla Creek* (Onshore Environmental 2018a) • *Reconnaissance Flora and Vegetation Survey Caramulla* (Onshore Environmental 2018b) • *Shearers West Detailed Vegetation and Flora Survey* (Onshore Environmental 2018c) • *Mine, Port, Rail & NPI - Weed Mapping & Control – Jimblebar, May 2019* (Astron Environmental Services 2019) – and annual reports since 2012. • *Jimblebar weed monitoring May 2016* (Astron Environmental Services 2016)	• Vegetation condition ranged from Completely Degraded to Excellent. • A total of 23 introduced flora species have been recorded from within the Development Envelope (Figure 3). The most commonly recorded species during baseline and targeted weed surveys at Jimblebar Iron Ore Mine are, **Aerva javanica* (Kapok Bush), **Cenchrus ciliaris* (Buffel Grass) and **Rumex vesicarius* (Ruby Dock). • The introduced flora species largely occur along drainage channels or adjacent existing operations within the Development Envelope. • No introduced species (weeds) were listed as a Declared Pest under the *Biosecurity and Agriculture Management Act 2007* (BAM Act). • No new introduced species have been identified within the Development Envelope from recent weed monitoring and treatment surveys (Astron reports April 2018, May 2018, May 2019). • Changes in weed cover and type within the Development Envelope are comparable to changes outside the Development Envelope (Astron 2016).	**Assumptions** • None of the introduced flora species are listed as a Declared Pest under BAM Act.	**Type of provisions** BHP has chosen management-based provisions. It is difficult to set measureable provisions for weeds related to mining operations, as in some areas it is difficult to attribute the cause of new weeds or spread of weeds to mining or pastoral activities. **Choice of Provisions** Provisions are based on understanding the locations of weeds and minimising the spread of weeds, and avoiding the introduction of new weeds. BHP proposes to continue the weed management that has been implemented to meet previous approvals, which includes annual monitoring and treatment of introduced flora species and weed cover within the Development Envelope and monitoring of reference sites every two years to determine whether changes in weeds are attributable to the proposal. BHP will review the current reference sites and establish new sites if required (e.g. if the current sites are within areas that will be disturbed). If new sites are required, BHP will consult with DWER regarding the selection of sites.

Surveys and studies	Survey and studies findings	Key assumptions and uncertainties	Rationale for choice of provisions
Environmental value: Riparian vegetation **Proposed objective: Minimise the impact to the health of riparian vegetation of Caramulla Creek as a result of surplus water discharge**			
The key surveys and studies used to develop the provisions related to vegetation condition (weeds) include the following: • *Jimblebar Optimisation Project: Jimblebar Iron Ore Mine Revised Proposal - Environmental Review Document – referral supplementary report* (BHP 2019b) • Caramulla Creek Flora and Vegetation Survey October 2018 (Astron Environmental Services 2018) • Vegetation Survey and Desktop Assessment Caramulla Creek (Onshore Environmental 2018b) • Jimblebar surplus water management: Caramulla Creek discharge modelling (BHP 2019c) • MacFarlane C., Arndt S. K., Livesley S., Edgar C., White D., Adams M. and Eamus D. (2007a) Estimation of leaf area index in eucalypt forest with vertical foliage using cover and fullframe fisheye photography. *Forest Ecology and Management* 242, 756-763 • Evaluation of a visual assessment method for tree condition of eucalypt floodplain forests. *Ecological Management & Restoration*. Vol 11-3, 210-214. (Souter et al, 2010) • *Method manual for the visual assessment of lower River Murray floodplain trees River Red Gum (Eucalyptus camaldulensis)*. DWLBC Report 2009/25. (Souter et al, 2009)	• The riparian vegetation along the main channel of Caramulla Creek (Figure 4) is characterised by *Eucalyptus camaldulensis* subsp. *refulgens* low open woodland over *Acacia coriacea* subsp. *pendens* and *Acacia citrinoviridis* shrubs with scattered tussock grassland of **Cenchrus ciliaris* (Buffel Grass). • The assessment indicated there is the potential for inundation from surface water discharge to occur up to 34 km downstream from the discharge point. This wetting extent has been modelled to occur within the main flow channel of the creek and is predicted to be 20 m in width, resulting in an estimated area of inundation of 71 ha, or 12% of mapped riparian vegetation. • The vegetation community throughout the main channel of Caramulla Creek largely comprised of scattered large trees and shrubs (vegetation coverage mapped as 20-40%) with very limited understory, therefore actual impacts to vegetation along the main channel will be less than the predicted 71 ha or 12%. • It is unlikely that the increased water supply will significantly change the vegetation composition of the adjacent banks, as the vegetation largely consists of tussock grasslands of **Cenchrus ciliaris* (Buffel Grass), which is known to dominate in high moisture areas. • Souter et al (2009 and 2010) discusses a visual tree health assessment tool which uses a conceptual model of the symptoms of decline from water stress, and indicators of recovery as conditions improve. Several aspects or factors of tree health (e.g. crown growth, epicormic growth, leaf die off etc.) are used to develop a "crown condition rating" score from 0-9.	**Assumptions** • Maximum extent of inundation is 71 ha, or 12% of riparian vegetation along Caramulla Creek. **Uncertainties** • How far flow will extend surface water discharge (estimated to be maximum 34 km long and 20 m wide). BHP has assumed a conservative low-loss scenario (low seepage rates) for the wetting front predictions (BHP 2019b and BHP 2019c).	**Type of provisions** BHP has chosen management-based provisions as there is uncertainty related to the extent of surplus discharge. **Choice of Provisions** The provisions for riparian vegetation were selected as it is acknowledged that the proposed creek discharge of surplus water from the Jimblebar Iron Ore Mine may have an impact on riparian vegetation. The Jimblebar Water Management Plan (BHP 2019a) contains outcome-based provisions relating to the extent of surface water discharge. BHP has proposed management actions for a vegetation health monitoring program. BHP is currently reviewing its approach to vegetation health monitoring as there are new technological methodologies available (e.g. Digital Canopy Photography (DCP), high resolution multispectral using unmanned aerial vehicles (UAV)). The review includes methodologies that BHP currently uses at other BHP sites and other methodologies suitable for the Pilbara. BHP considers that a combination of on-ground and remote methodologies will be appropriate, as the discharge is predicted to extend 34 km. BHP is considering methodologies including the following: • Crown Condition Score (Souter et al, 2010) – on-ground, visual tree health assessment methodology. • Digital Canopy Photography (DCP) – remote methodology that measures crown cover and foliage cover to determine tree health. • Remote sensing – remote methodology using Landsat and UAV multispectral at high resolution. The visual tree health assessment methodology was developed for eucalypts on the Murray River but can be adapted as required to use for trees experiencing both water deficit and water logging. As the crown condition rating is subjective, BHP is considering using the visual tree health assessment it in parallel with the DCP and/or remote sensing. BHP proposes to develop a target based on the level of assessed impact (71 ha of vegetation in the main channel based on a wetting front extent of 34 km long and 20 m wide), as there will be unavoidable impacts jn this section of the creek. However, based on the predicted wetting front width, there would be no impacts to vegetation health on the banks. BHP will also develop appropriate tree health target/s once the tree health monitoring approach is confirmed. The targets will also consider how to distinguish effects on vegetation health from natural flows compared to effects from surplus discharge. BHP will establish appropriate reference sites. This may include existing monitoring sites on Jimblebar Creek (downstream of the wetting front extent from Orebody 31 discharge, to Jinerabar Pool). The reference sites will link to water monitoring sites in the *Jimblebar Water Management Plan* (BHP, 2019b).that will be used to determine natural no-flow conditions. BHP will develop appropriate on-ground and/or remote monitoring along the predicted wetting front extent (34 km) (Figure 4) at an appropriate frequency, once the tree health monitoring approach is confirmed.

2 EMP Provisions

BHP has provided detail on the EMP provisions in a table (Table 4), as per the preferred approach outlined in the Instructions. BHP has not used the ‘Schedule’ approach (which the Instructions state may be used), as this EMP covers only one operation (and one proposed Ministerial Statement). BHP may adopt the ‘Schedule’ approach in future for this EMP.

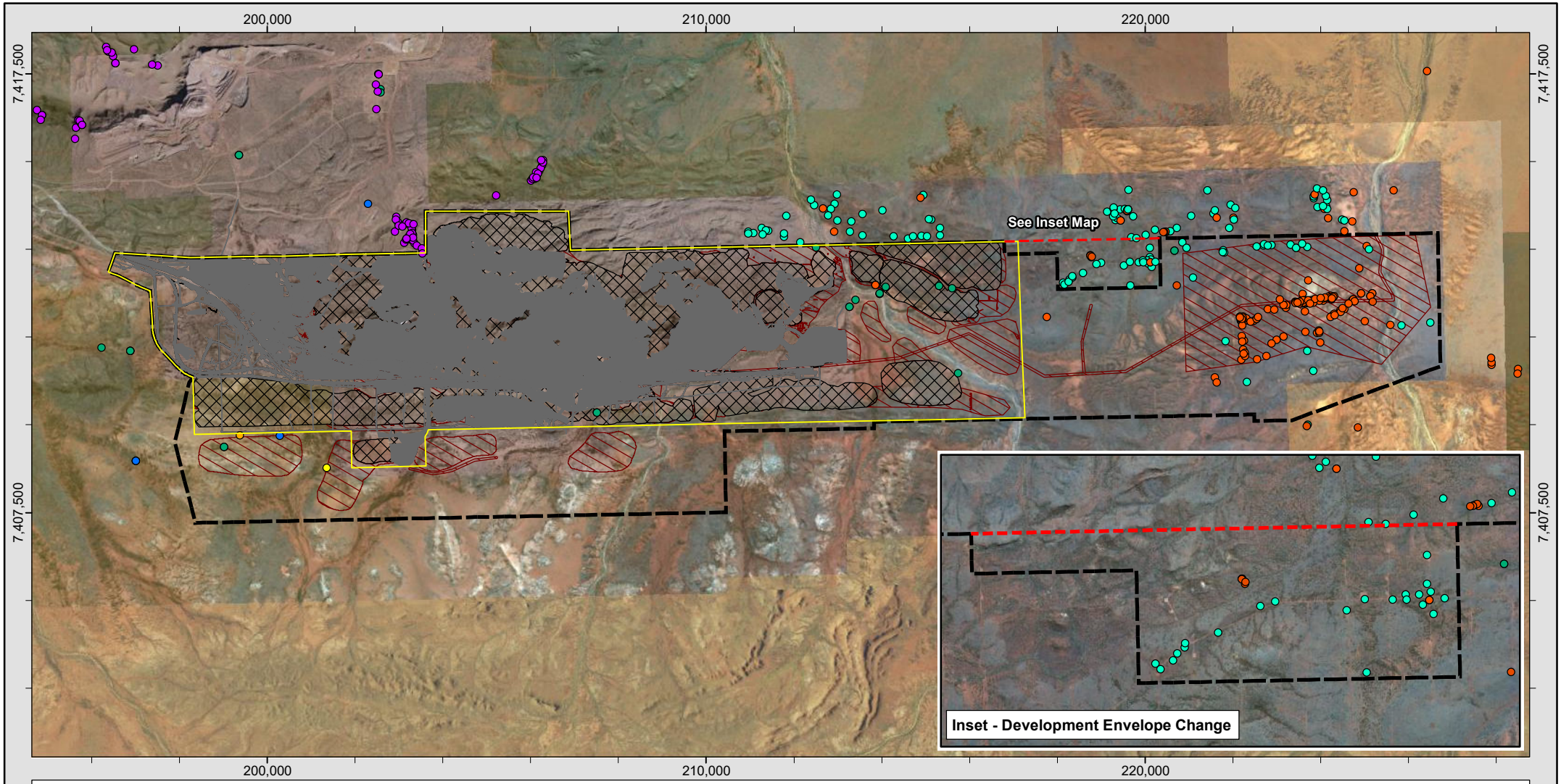
Table 4: Management-based provisions

EPA factor and objective	Flora and Vegetation – to protect flora and vegetation so that biological diversity and ecological integrity are maintained.
Key environmental value/s	*Eremophila capricornica* (Priority 1) flora species, vegetation condition, riparian vegetation.
Condition objective	6-1 The proponent shall manage the implementation of the proposal to meet the following environmental objective: (1) protect flora and vegetation so that biological diversity and ecological integrity are maintained, and in particular: (a) avoid and minimise direct and indirect impacts on flora taxa listed as priority flora.
EMP objectives **Condition 5-2(9)** ***specify the environmental objectives to be achieved, as specified in condition 6-1***	Avoid where possible, or minimise direct impacts to priority flora, including *Eremophila capricornica.* Minimise the introduction of new weed species and the spread of existing weeds. Minimise the impact to the health of riparian vegetation of Caramulla Creek as a result of surplus water discharge.
Key impacts and risks	Risk to biological diversity and/or ecological integrity of *Eremophila capricornica*, due to direct impacts from clearing of native vegetation. Significant impacts to native flora and vegetation from weeds. Significant impacts to health of riparian vegetation from surplus water discharge.

MSXXXX condition clauses - Management-based provisions			
Management actions	**Management targets**	**Monitoring**	**Reporting**
Condition 5-2 (10) specify risk-based management actions that will be implemented to demonstrate compliance with the environmental objectives specified in condition 6-1; (13) specify a process for revision of management actions and changes to proposal activities, in the event that the management targets are not achieved; The process shall include an investigation to determine the cause of the management target(s) not being achieved; **Condition 5-5** If monitoring, tests, surveys or investigations indicate non-achievement of management target(s) specified in a Condition Environmental Management Plan(s), the proponent shall: (2) investigate to determine the cause of the management target(s) not being achieved; **Condition 5-6** If monitoring, tests, surveys or investigations indicate that one or more management actions specified in a Condition Environmental Management Plan(s) has not been implemented, the proponent shall: 2) investigate to determine the cause of the management action(s) not being implemented (3) investigate to provide information for the CEO to determine potential environmental harm or alteration of the environment that occurred due to the failure to implement management action(s); and	**Condition 5-2** (11) specify measurable management target(s) to determine the effectiveness of the risk-based management actions;	**Condition 5-2** (12) specify monitoring to measure the effectiveness of management actions against management targets, including but not limited to, parameters to be measured, baseline data, monitoring locations, and frequency and timing of monitoring;	**Condition 5-2** (14) Provide the format and timing to demonstrate that the objective in Condition 6-1 have been met for the reporting period in the Compliance Assessment Report required by condition 3-6 including but not limited to: (a) verification of the implementation of management actions; and (b) reporting on the effectiveness of management actions against management target(s). **Condition 5-5** If monitoring, tests, surveys or investigations indicate non-achievement of management target(s) specified in a Condition Environmental Management Plan(s), the proponent shall: (1) report the non-achievement in writing to the CEO within twenty-one (21) days of the non-achievement being identified; (3) provide a report to the CEO within ninety (90) days of the non-achievement being reported as required by condition 5-5(1). The report shall include: (a) the cause(s) of the management targets not being achieved; (b) the findings of the investigation required by conditions 5-5(2) and 5-5(3); (c) details of revised and/or additional management actions to be implemented to prevent non-achievement of the management target(s); and relevant changes to proposal activities. **Condition 5-6** If monitoring, tests, surveys or investigations indicate that one or more management actions specified in a Condition Environmental Management Plan(s) has not been implemented, the proponent shall: (1) report the failure to implement the management action(s) in writing to the CEO within seven (7) days of identification (4) provide a report to the CEO within twenty-one (21) days of the reporting required by condition 5-6(1). The report shall include: (a) the cause of the failure to implement the management actions (b) the findings of the investigations required by conditions 5-6(2) and 5-6(3) (c) relevant changes to proposal activities (d) measures to prevent, control or abate the environmental harm which may have occurred.

Management-based provisions			
Management actions	**Management targets**	**Monitoring**	**Reporting**
***Eremophila capricornica*:** 1. Undertake targeted survey undertaken within and/or outside the Development Envelope to confirm locations of *Eremophila capricornica* 2. Design the MAR infrastructure to minimise impacts to known records of *Eremophila capricornica*. 3. Implement the PEAHR process to minimise impacts to known records of *Eremophila capricornica*. 4. Specify a process for revision of management actions and changes to proposal activities, in the event that the management targets relating to *Eremophila capricornica* are not achieved.	***Eremophila capricornica*:** Complete *Eremophila capricornica* survey prior to ground disturbance activities. If new records of *Eremophila capricornica* are identified, update BHP's internal flora database within 60 days of the completion of the survey.	***Eremophila capricornica*:** Undertake a review of *Eremophila capricornica* survey outcomes against BHP's internal database by a suitable qualified environmental personal prior to commencement of ground disturbance authorisation, to ensure all records are captured on the database.	**Annual reporting** Report on the implementation of management actions and the effectiveness of management actions against management targets in the annual Compliance Assessment Report for MSXXXX. **Exception reporting** If a management target has not been achieved:

Management-based provisions			
Management actions	**Management targets**	**Monitoring**	**Reporting**
	Disturb less than x% (TBC) off the known *Eremophila capricornica* records within the Development Envelope. Undertake all ground disturbance in accordance with PEAHR authorisation.	Annual tracking of how many *Eremophila capricornica* records within the Development Envelope (Figure 2) have been disturbed.	• Notify Superintendent HSE within 7 days (to be confirmed (TBC)). • Notify the CEO of DWER in writing within 21 days of identifying the non-achievement of the target. • Provide a report to the CEO within 90 days of the non achievement of the target being reported to DWER, addressing the requirements of Condition 5-5(3). If a management action has not been implemented: • Notify General Manager (TBC) within 24 hours if a management action is not implemented. • Notify the CEO of the DWER in writing within 7 days of identifying the failure to implement a management action. • Provide a report to the CEO within 21 days of the failure being reported to DWER addressing the requirements of Condition 5-5(4).
Weeds: 5. Implement annual weed treatment within appropriate areas, including but not limited to: areas under rehabilitation, topsoil storage areas, drainage lines and main infrastructure. 6. Review project and reference data (biennially – TBC) to determine the presence of weeds and compare the cover of weeds within and outside the Development Envelope. 7. Specify a process for revision of management actions and changes to proposal activities, in the event that the management targets relating to weeds are not achieved.	**Weeds:** No new introduced flora species are introduced within the Development Envelope that are attributable to the proposal. The cover of weeds within the Development Envelope is comparable to the cover outside the Development Envelope.	**Weeds:** Annual monitoring of weed type (introduced species) and cover from treatment surveys and other relevant surveys. Biennial monitoring of 3 reference sites outside the impact area (Figure 3) for weed type (species) and cover.	
Riparian vegetation: 8. Review approach for vegetation health monitoring. 9. Develop semi-quantitative methodology for vegetation health considering the approaches including, but not limited to: • On-ground monitoring (e.g. Crown condition Score). • Digital Canopy Photography. • Remote sensing. 10. Implement appropriate tree health monitoring program. 11. Specify a process for revision of management actions and changes to proposal activities, in the event that the management targets related to riparian vegetation are not achieved.	**Riparian vegetation:** Develop target based on level above assessed impact. Develop appropriate tree health target/s once tree health monitoring approach is confirmed.	**Riparian vegetation:** Establish reference sites and appropriate baseline monitoring (including piezometer installation) at the reference sites (Figure 4). Develop appropriate on-ground and/or remote monitoring along predicted wetting front extent (34 km) (Figure 4) at appropriate frequency, once tree health monitoring approach is confirmed.	



Spatial Data - Studies Planning & Access
BHP IRON ORE

FLORA AND VEGETATION MANAGEMENT PLAN
Eremophila capricornia records

Scale @ A4: 1:125,000	Prepared: J.VIS	Project No: A949/045 REV 0
Date: 20/08/2019	Checked:	Figure: 2
Revision: REV 0	Reviewed: ENVIRO. A&I	

Priority Flora
- Aristida jerichoensis var. subspinulifera (Priority 3)
- Eremophila capricornica (Priority 1)
- Euphorbia inappendiculata var. inappendiculata (Priority 2)
- Goodenia nuda (Priority 4)
- Rhagodia sp. Hamersley (M. Trudgen 17794) (Priority 3)
- Triodia sp. Mt Ella (M.E. Trudgen 12739) (Priority 3)
- Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684) (Priority 1)

- Existing Project Boundary
- Proposed Development Envelope
- Initial Proposed Development Envelope
- Indicative Cleared Area as at FY2019
- Indicative Previously Assessed Area
- Indicative Footprint

N

0 1 2 3
Kilometres

Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

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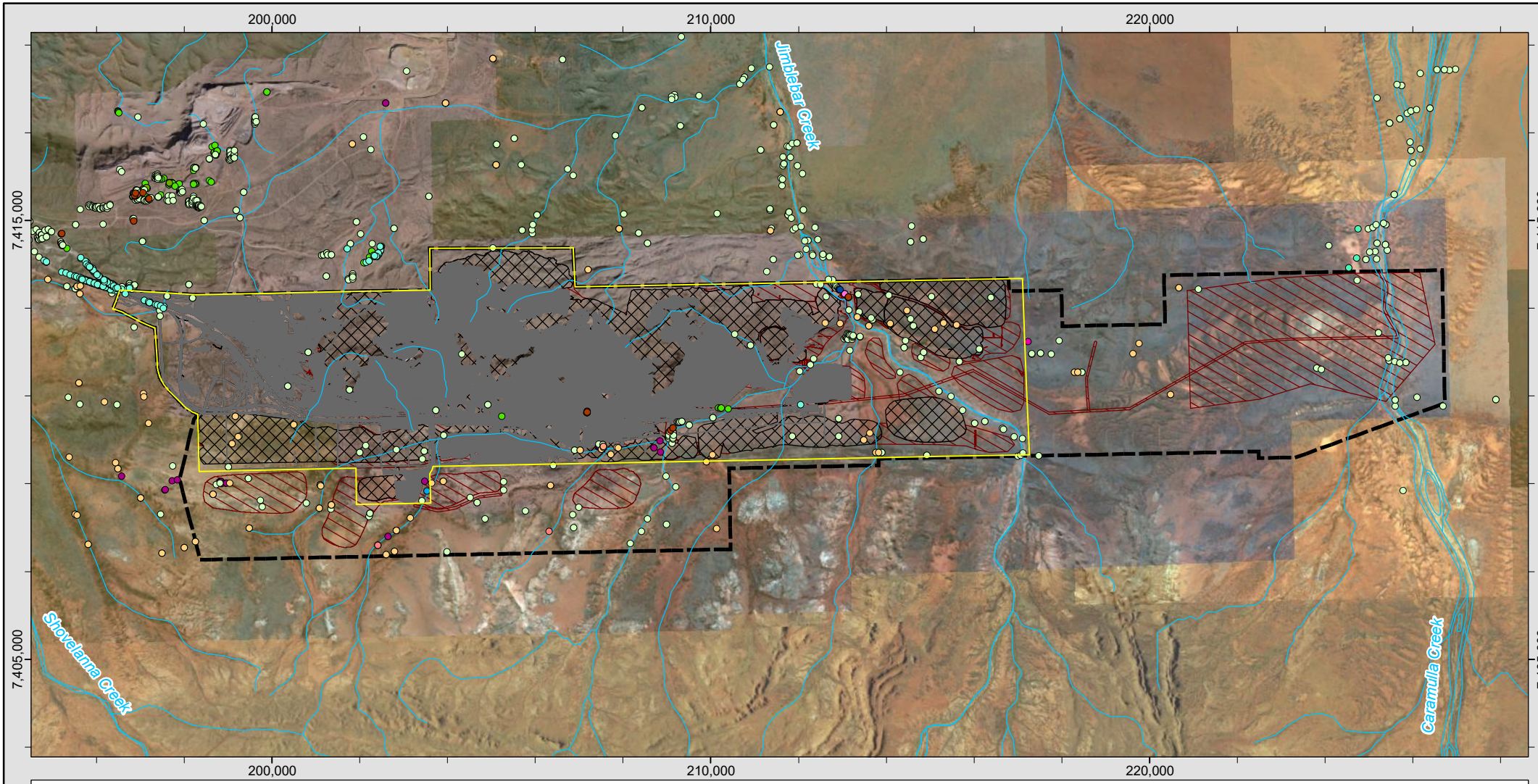


Spatial Data - Studies Planning & Access
BHP IRON ORE

JIMBLEBAR FLORA AND VEGETATION MANAGEMENT PLAN

Weed locations

Scale @ A4: 1:125,000	Prepared: J.VIS	Project No: A949/57 REV 0
Date: 21/08/2019	Checked:	Figure: 3
Revision: REV 0	Reviewed: ENVIRO. A&I	

- Existing Project Boundary
- Proposed Development Envelope
- Indicative Cleared Area as at FY2019
- Indicative Previously Assessed
- Indicative Footprint
- Watercourse

Weed Locations

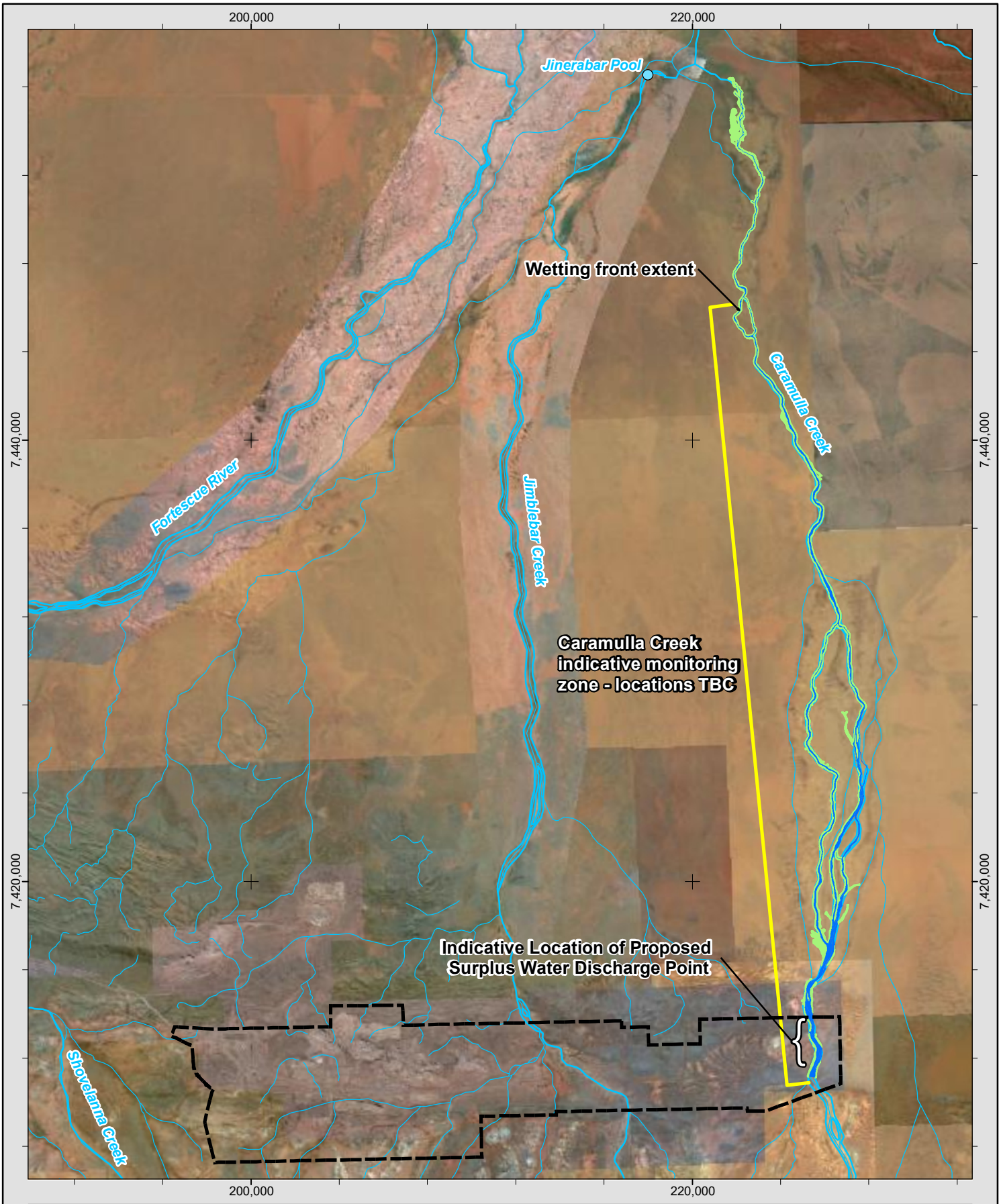
- Aerva javanica
- Bidens bipinnata
- Cenchrus ciliaris
- Cenchrus setiger
- Chloris barbata
- Chloris virgata
- Citrullus amarus
- Cynodon dactylon
- Echinochloa colona
- Eragrostis cilianensis
- Flaveria trinervia
- Lactuca serriola
- Malvastrum americanum
- Rumex vesicarius
- Solanum nigrum
- Sonchus oleraceus
- Tribulus terrestris
- Vachellia farnesiana

N

0 1 2 3
Kilometres

Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

Document Path: Y:\Jobs\A501_A1000\A949\3Project\A949_057_E_WeedLocations_Rev0.mxd



BHP

Spatial Data - Studies Planning & Access
BHP IRON ORE

FLORA AND VEGETATION MANAGEMENT PLAN
Caramulla Creek Riparian Vegetation

Scale @ A4: 1:230,000	Prepared: J.VIS	Project No: A949/070 Rev 0
Date: 28/08/2019	Checked:	Figure: 4
Revision: REV 0	Reviewed: ENVIRO. A&I	

- Watercourse
- Caramulla Creek indicative monitoring zone - locations TBC
- Proposed Development Envelope

Caramulla Creek Riparian Vegetation

- Main channel
- Adjacent banks

N

0 1 2 3
Kilometres

Coordinate System: GDA 1994 MGA Zone 51
Projection: Transverse Mercator
Datum: GDA 1994

Document Path: Y:\Jobs\A501_A1000\A949\3Project\A949_070_E_CaramullaRiparianVegetation_Rev0.mxd

3 Adaptive management and review of the EMP

3.1 Adaptive management approach

BHP applies an adaptive management framework for implementing management measures identified in this EMP, which is consistent with the Instructions. Adaptive management is a structured, iterative process to decision making. The framework embeds a cycle of monitoring, reporting and implementing change where required. It allows an evaluation of the management and mitigation measures so that they are progressively improved and refined, or alternative solutions adopted, to ensure that environmental objectives and outcomes in the plan are achieved. The key steps of the adaptive management approach are outlined in Figure 5.

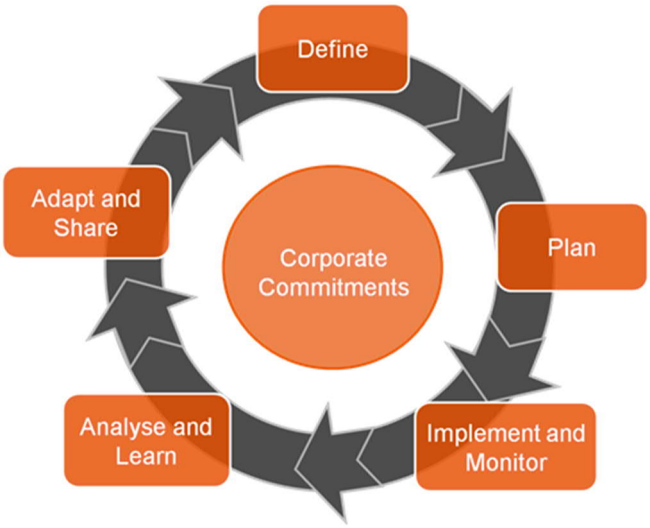


Figure 5: BHP's adaptive management approach

Where the EMP is a requirement of a Ministerial Statement (MS) condition, BHP notes that if it chooses to amend an EMP provision in Table 4 based on information gained through adaptive management, it must seek formal approval from the Department of Water and Environmental Regulation (DWER).

3.2 Review and update of this EMP

BHP will review this EMP (and update it if required), to ensure that it achieves the identified environmental objectives and meets MS conditions. A review may arise from the following:

- Where required by a MS condition.
- If initiated by BHP as part of the adaptive management process.
- If triggered by a MS condition (e.g. for exceedance of trigger and/or threshold criteria and/or non-achievement of management targets and/or failure to implement management actions).

Changes to the endorsed version of the EMP may arise from the following:

- BHP reviews the EMP if the EPA or relevant government agencies develop new, or amend existing guidance or policy.
- BHP adds provisions when a new operation (or change to an existing operation) is proposed.
- BHP adds or amends provisions when new proposals are approved and conditioned through Part IV of the EP Act or due to a change to MS conditions.
- The CEO of DWER directs BHP to revise the EMP.

- The CEO of DWER confirms by notice in writing that it has been demonstrated that the objective and/or outcome in the relevant condition is being and will continue to be met and therefore implementation of certain condition requirements addressed in the EMP are no longer required.

BHP may make minor and/or administrative changes to this EMP (i.e. excluding changes to provisions in Table 4) without seeking endorsement from DWER.

4 Stakeholder consultation

BHP will consult with relevant government agencies (including decision-making authorities), local authorities, groups and individuals in relation to the development and revision of this EMP.

BHP has discussed the Jimblebar Optimisation Project (BHP 2019b) with the Nyiyaparli Native Title Holders during biannual meetings in 2018-19 and BHP provided this draft EMP to the Nyiyaparli Native Title Holders as part of the referral package for the Project.

BHP has considered recent feedback from DWER-EPA Services and the Department of Biodiversity, Conservation and Attractions on EMPs for other operations in developing this draft EMP.

BHP will complete Table 5 providing details of specific consultation in relation to this EMP, as the EMP is further developed, prior to the finalisation of the EMP.

Table 5: Stakeholder engagement

Stakeholder	Date	Description	Topics Discussed	BHP Response/Outcome

5 References

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