



BUSINESS BLUEPRINT

SOUTH32 WORSLEY ALUMINA

Exploration Environmental Management Plan

Business Blueprint



Worsley Alumina

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1 CONTEXT SCOPE AND RATIONALE

1.1 PROPOSAL BACKGROUND

South32 Worsley Alumina Propriety Limited (Worsley) operates the Worsley Bauxite Alumina Project (**Project**). The Project consists of mining and development envelopes at the Boddington Bauxite Mine (**BBM**), transport corridors (which are inclusive of conveyors), the Worsley Alumina Refinery (**Refinery**) and port operations at the Bunbury Port. Mining and alumina production are currently permitted at a rate of 18.8 Million tonnes and 4.7 Million tonnes per annum, respectively. This Exploration Management Plan (**EMP**) addresses the exploration activities that Worsley is required to undertake for the definition of bauxite resources for the Project. These exploration activities are inherently low impact and this EMP sets out the parameters that will ensure this is the case.

Through its Worsley Mine Expansion - Revised Proposal (**Revised Proposal**), Worsley is seeking approval under Part IV of the Environmental Protection Act 1986 (WA) (**EP Act**) and under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (**EPBC Act**) to enable the continued operation and the expansion of the bauxite mining areas.

This expansion will increase the existing mining envelope at the BBM (previously referred to as the Primary Bauxite Area (**PBA**)) to an area which will now encompass and expand the PBA and be referred to as the Worsley Mining Development Envelope (**WMDE**). The scope of the Revised Proposal includes exploration activities that Worsley proposes to conduct at various locations across current and future tenure held or leased by Worsley inside and outside of the WMDE.

Worsley's current exploration activities are subject to Ministerial Statement No. 719 (**MS719**) issued pursuant to Part IV of the EP Act. MS719 contains a number of environmental conditions relating to the extension of mining activities into new areas (**Extended Mining Areas**). It also consolidates and replaces environmental management commitments set out in previous approval documents. Ministerial Statement No 751 (**MS751**) inserted a footnote into MS719 that excluded exploration from the meaning of the term "ground disturbing activities". This change allowed (and continues to allow) Worsley to conduct exploration without breaching conditions 8-6, 10-1, 11-5 and 12-2 of MS719. The EPA later confirmed that condition 13 was also included within this exemption (letter dated 29 April 2011 oEPA ref A37241).

Worsley's exploration activities are also regulated by a number of additional sources, including Mining Act tenement conditions and the Alumina Refinery (Worsley) Agreement Act 1973 (WA) (**Worsley State Agreement**).

Exploration has been included within the Revised Proposal to enable it to be considered holistically, both spatially and temporally (as intended by the Worsley State Agreement) and to ensure its cumulative impacts are properly assessed and approved with consistently high standards of environmental impact management measures, under both the EP Act and the EPBC Act. The inclusion of exploration in the Revised Proposal also meets the requirements imposed by the State Agreement, as explained further in section **Error! Reference source not found.**, and will ensure that exploration is subject to rigorous, modern, best practice and consistent regulation in environmental management.

Exploration may be required within any or all tenure currently held or acquired in the future by Worsley. Necessary tenure is secured prior to conducting any drilling activities including Mining Act tenure, Worsley State Agreement tenure or tenure from third parties.

1.2 PROJECT AREA

The Project is located on the Darling Plateau within the Jarrah Forest bioregion and the Northern Jarrah Forest subregion, as described by the Interim Biogeographic Regionalisation for Australia. The principle landscape feature of the Project area is an undulating topography with uplands ranging from 280–400 m above AHD (Australian Height Datum) and valley floors with gentle to moderately steep slopes, 50–100 m below this. In general, there is lateritic duricrust on the broad crests and upper slopes, either outcropping or obscured by shallow red or yellow gravelly soils. The slopes are characterised by a mottled clay subsoil or ferruginous duricrust with a surface gravel soil. Closer to the valley floor, the clay becomes deeper and the gravel less dominant. Red and yellow earths or duplex soils are common in the major valley systems. Bauxite ore has developed in the upper part of the weathered lateritic profile in the upland areas.

Shallow throughflow in the upper gravelly sand horizon is considered to be the major source of streamflow in the jarrah forest, as opposed to overland flow and groundwater flow (Mauger et al. 1998). Rainfall that infiltrates the soil tends to perch on the clay subsoil and flow down-slope to discharge to streams. Stokes and Loh (1982) estimated that more than 90% of streamflow may be generated by this shallow throughflow. However more conservative estimates indicate that on an average annual basis about 25% of rainfall in the high rainfall zones becomes streamflow, and in the low rainfall zones about 1% (Bari & Ruprecht 2003).

1.3 OVERVIEW OF WORSLEY'S REGIONAL EXPLORATION PROGRAMME

Exploration typically involves remote sensing, field mapping and the taking of geological samples (surface samples, drill cuttings and bulk samples). Worsley's regional exploration programme (i.e. outside of the WMDE) involves a geological drilling methodology that is inherently a low impact activity. It typically involves the use of vacuum mounted drill rigs on rubber tyres which can move through vegetated areas with minimal disturbance and without any need to prepare access. 'Minimal disturbance' is considered to predominantly include tracking over vegetation and the occasional removal of bushes or small trees.

Figure 1 below is an example of the type and size of drill rig typically used for exploration drilling at Worsley.



Figure 1 Example of a Rubber Tyre drill rig

Figure 2 **Error! Reference source not found.** shows an example of the extent of potential impact to the native vegetation following drilling activities.



Figure 2 Forest after drilling with a rubber tyre rig

Impacts that may result from Worsley's exploration programme are extremely limited due to the nature of the activity, but may include:

- loss of native vegetation cover; (*unlikely to not relevant*)
- decline in populations of Threatened and/ or Priority Flora; (*unlikely to not relevant*)
- decrease in extent of PECs; (*unlikely to not relevant*)
- introduction and spread of dieback (or other forest diseases) and/ or weeds; (*unlikely*)
- increase in dust loads on vegetation; (*unlikely to not relevant*)
- mortality, injury or displacement of Threatened Fauna (individuals or populations); (*unlikely to not relevant*)
- fauna habitat loss, degradation and fragmentation; (*unlikely to not relevant*)
- introduction or promotion of introduced fauna or pests; (*unlikely to not relevant*)
- changes to groundwater systems supporting groundwater dependent ecosystems; (*unlikely to not relevant*)
- alteration of surface water flows; (*not relevant*)
- localised flooding and waterlogging of vegetation; (*not relevant*)
- indirect impacts on fauna from noise and vibration; (*unlikely to not relevant*)
- altered fire regimes and intensities; and (*unlikely to not relevant*)
- riverbank erosion, sedimentation, scouring of streams or release of excessively turbid water as a result of clearing riparian vegetation and alteration of surface water drainage patterns; (*not relevant*)
- decline of aquatic fauna from changes in flow regime and water quality, potentially leading to impediment of upstream pre-spawning migrations of freshwater fishes; (*not relevant*)
- contamination of surface water as a result of spills or stormwater run-off; (*unlikely to not relevant*)
- contamination of groundwater as a result of seepage of stored chemicals; (*unlikely to not relevant*)
- changes to groundwater levels in the shallow aquifer as a result of clearing of native vegetation, disturbance to soil profile and rehabilitation; and (*not relevant*)
- changes to vegetation structure in Groundwater Dependent Ecosystems as a result of groundwater level rise (*unlikely to not relevant*).

Impact to habitat, including for species of National Environmental Significance, will be minimised as:

- prior to approval of the Revised Proposal, no clearing will occur outside of the Pre-existing Approval Area for exploration activities; and
- after approval of the Revised Proposal, no clearing will occur outside of the WMDE or the Extended Mining Areas for exploration activities.

On occasion, larger drill rigs such as diamond drilling and aircore rigs, may be utilised for exploration activities. On these occasions drilling will only occur if it can be guaranteed no clearing of native vegetation will occur. In these circumstances, drilling activities will be restricted to existing tracks or within areas where there is no native vegetation, such as paddocks. Any drilling fluids used for these types of drilling will only include plant based, biodegradable fluids. Where practicable, drilling fluids will be contained and removed from the area but should an in-ground sump be required, it shall be no larger than 1m by 1m by 0.5 m deep. Disturbance from this type of drilling will be rectified including back filling of sumps and capping or grouting of drill holes. Importantly, Worsley's exploration campaigns do not involve grade control drilling (which is part of Worsley's mining activities, occurring within the WMDE and subject to approval conditions).

Following vacuum drilling, the completed drill hole is plugged using a solid object (e.g. a rock or wooden peg) and backfilled to prevent erosion, collapse of the hole or fauna entry. The activity related to hole completion is documented and managed via the internal Bauxite Sample Drilling Procedure (00100897). Rehabilitation per-se is not required as the impact is limited to a hole that is approximately 10cm in diameter and average hole depth is less than 10m. Drill cuttings are collected on a mat and mounded over the plugged hole upon completion to ensure backfill prevents the establishment of a void.

1.4 PURPOSE AND SCOPE

The purpose of this EMP is to ensure Worsley's exploration activities are low impact by identifying and managing any potential impacts (direct and indirect). The EMP will also ensure that relevant decision-making authorities are consulted and that the

existing processes which have been part of the successful environmental management of exploration by Worsley to date are applied.

In particular, this EMP:

- identifies the controls in place to achieve the following management objectives:
 - protection of flora and fauna;
 - compliance with legal obligations;
 - protection of Public Drinking Water Source Areas (PDWSAs); and
 - ongoing review to ensure and improve the effectiveness of current controls;
- addresses the following key environmental factors:
 - Flora and Vegetation, in which the EPA's objective is "To protect flora and vegetation so that biological diversity and ecological integrity are maintained";
 - Terrestrial Fauna, in which the EPA's objective is "To protect terrestrial fauna so that biological diversity and ecological integrity are maintained";
 - Terrestrial Environmental Quality, in which the EPA's objective is "To maintain quality of land and soils so that environmental values are protected"; and
 - Inland Waters, in which the EPA's objective is "To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected";
- includes all current and future tenements held by Worsley.

A summary of the current tenure is provided in Figure 3 and considers all relevant legislative requirements and guidance.

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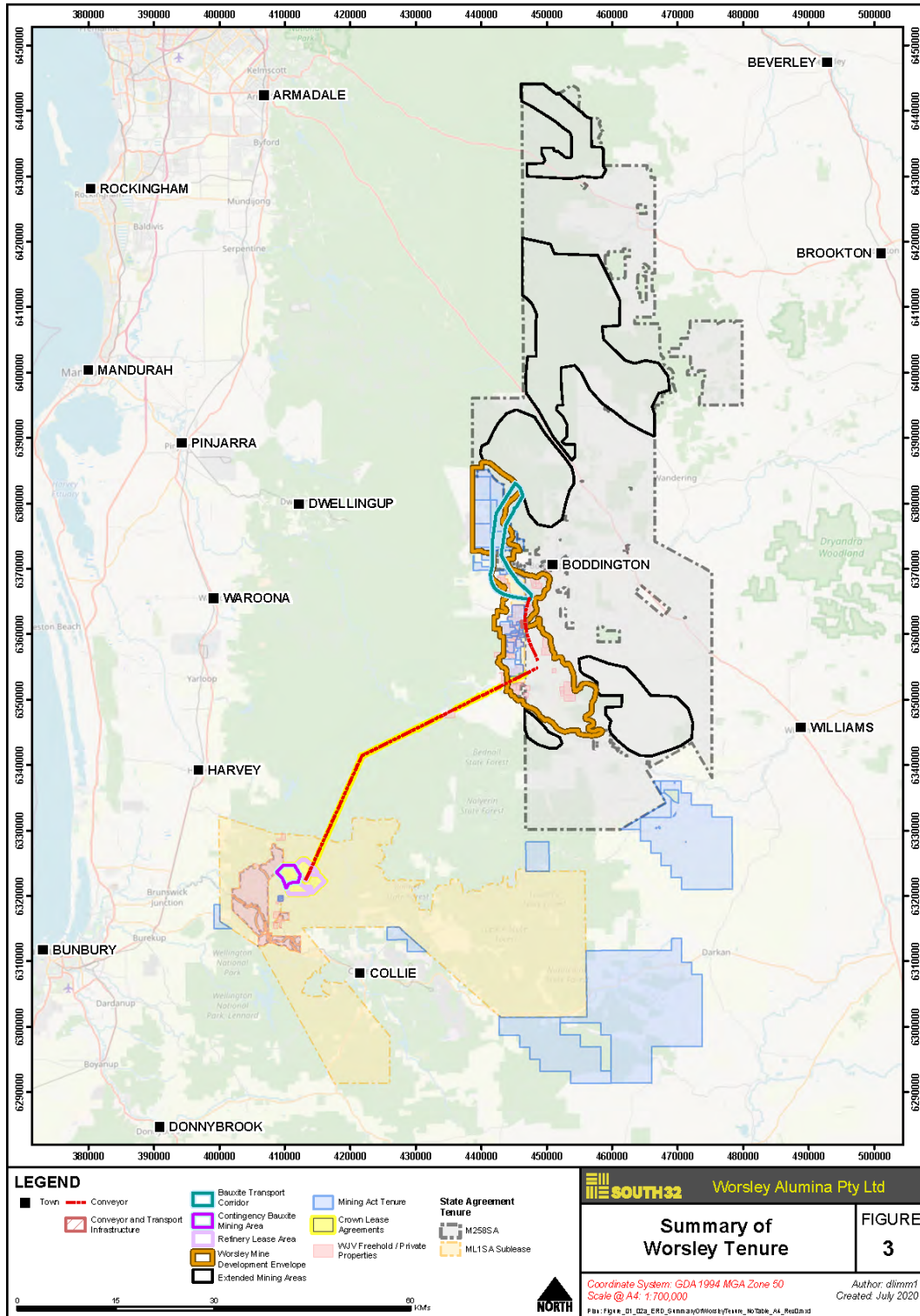


Figure 3 Worsley Tenure

1.5 APPROVALS AND REGULATION

1.5.1 Worsley State Agreement

The Worsley State Agreement imposes unique regulatory requirements on Worsley's operations. It requires Worsley:

- to have an approved Environmental Review and Management Programme (ERMP) which sets out all of its operations and the measures it will take to protect and manage environmental impacts. This is intended to adopt a holistic view of Worsley's operations and its environmental management and includes Worsley's exploration activities. The ERMP approval/amendment process has been combined with the EP Act Ministerial approval process, such that the 2005 ERMP meets both the Worsley State Agreement and Part IV of the EP Act. This is also intended for any future Ministerial Statement associated with the WME Proposal. This provides strong and consistent environmental management across Worsley's operations; and
- to have a 10-year rolling mine plan (10 Year Mine Plan) that provides detail of Worsley's operations, including its exploration programme. The 10 Year Mine Plan is produced and updated every year in consultation with the Environmental Management Liaison Group (EMLG) for submission to the State Government. Forest management and rehabilitation activities are a key consideration in the preparation of the plan. The requirements around the 10 Year Mine Plan are discussed further in section **Error! Reference source not found..**

1.5.2 Past Approvals (Ministerial Statement 423)

MS423 was supported by the 1995 Consultative Environmental Review (CER). The CER included the assessment of environmental impacts and identified management measures for exploration for example, see proposed management commitments 18, 22 and 23 of MS423).

1.5.3 Current Approvals

1.5.3.1 Ministerial Statement 719:

- MS719 continued to approve the Worsley operations originally subject to MS 423, as well as providing new approval for the Project relating to the extension of mining activities into the Extended Mining Areas. This proposal included exploration as described in the 2005 ERMP. Bauxite mining is defined in MS719 to include exploration activities.

1.5.3.2 Ministerial Statement 751:

Exploration processes in MS751 were accepted by the EPA as low impact and therefore were not included as "ground-disturbing activities".

1.6 LEGISLATION AND GUIDANCE

1.6.1 Legislation

Exploration undertaken by Worsley is subject to a range of State and Commonwealth legislation (refer to Table 1-1: Relevant State Legislation and Regulations), with the most relevant being the EP Act, the EPBC Act and the Biodiversity Conservation Act 2016 (**BC Act** – previously the Wildlife Conservation Act 1950).

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Table 1-1: Relevant State Legislation and Regulations

Legislation	Relevance	Regulatory Authority
Commonwealth Legislation		
EPBC Act	Protection of Matters of National Environmental Significance (MNES)	Department of Agriculture, Water and the Environment (DAWE)
State Legislation		
<i>Biosecurity and Agricultural Management Act 2007</i>	Addresses the obligations for control, destruction, and notification of gazetted noxious plants and animals	Department of Primary Industries and Regional Development (DPIRD)
<i>Conservation and Land Management Act 1984</i>	Protection and management of nature reserves, State Forest, National Parks, Timber Reserve, marine parks etc.	Department of Biodiversity, Conservation and Attractions (DBCA)
EP Act	Prevention, control and abatement of pollution; and, conservation, protection and enhancement of the environment	Department of Water and Environmental Regulation (DWER) Office of the Environmental Protection Authority (EPA)
<i>Soil and Land Conservation Act 1945</i>	The conservation of soil and land resources with the mitigation of the effects of erosion, salinity and flooding	DPIRD
BC Act	Enhances protection for threatened species, introduces protection for threatened ecological communities. Provides coverage of important matters including; habitats, communities, threatening processes, environmental pests and weeds.	DBCA
<i>Rights in Water and Irrigation Act 1914</i>	Regulation, management, use and protection of water resources, and for related purposes	DWER
<i>Metropolitan Water Supply Sewerage and Drainage Act 1909</i>	Identify management purposes and protection of water resources within PDWSA	DWER and Water Corporation
<i>Metropolitan Water Supply Sewerage and Drainage Bylaws 1957</i>	Identify management purposes and protection of water resources within PDWSA	DWER and Water Corporation
<i>Water Agencies Powers Act 1984</i>	Establish the Water Resources Ministerial Body and the Water Resources Council, for management of water for public supply from PDWSA.	DWER
<i>Water Corporation Act 1995</i>	Establishment and accountabilities of Water corporation. Management and supply of public water from PDWSA.	DWER and Water Corporation
<i>Mining Act 1978</i>	Regulation of mining operations, including exploration	Department of Mining Industry Regulation and Safety (DMIRS)
<i>Aboriginal Heritage Act 1972</i>	Protection of places and objects important to Aboriginal people	Department of Planning, Lands and Heritage

1.6.2 Worsley's Management Plans

To manage impacts to environmental values from exploration Worsley applies management plans that are in place for its broader operations under its existing approvals. For example (:

- impacts from exploration activities that may relate to biodiversity and forest management are managed by the Biodiversity and Forest Management Plan (01012523);

- impacts from exploration activities that may relate to water supply and quality are identified and controlled by the Water Management Plan (01027243);
- management of dust emissions is covered in the Dust Management Plan – Bauxite Mining and Transport (01012524); and
- any noise and vibration emissions are managed under the Noise Management Plan - Mining and Blasting (01012527)

Please note while the scope of the above Management plans may not specifically include activities outside of the PAA the principals will be applied to manage potential impacts related to Exploration activities.

1.6.3 Government Guidance

This EMP takes the guidance discussed below into account to ensure Worsley's exploration activities are managed holistically. Worsley will ensure that all areas of key environmental value identified in the guidance are appropriately managed during Worsley's exploration activities.

1.6.3.1 Forest Management Plan 2014-2023

The Forest Management Plan 2014 – 2023 (Conservation Commission of WA 2013) was developed to align with the principles of Ecologically Sustainable Forest Management.

The overall objectives of the Forest Management Plan are to:

- conserve biodiversity and self-sustaining populations of native species and communities and to allow for the recovery of biodiversity from disturbance operations;
- maintain ecosystem health and vitality;
- protect soil and water resources;
- adapt to climate change and sustain the contribution of the areas covered by the plan to global carbon cycles, consistent with relevant legislation and the achievement of other goals;
- sustain the productive capacity of native forest ecosystems and plantations as they progressively adapt to changing climatic conditions;
- protect and maintain Noongar and other Australian cultural heritage;
- sustain social and economic benefits, through the provision of a range of goods and services valued by the community; and
- ensure that management is undertaken in a systematic manner in accordance with the plan and is continually improved to achieve desired outcomes.

A number of these objectives are applicable to the successful rehabilitation of the timber reserves covered by the Worsley mining lease and to minimising the impact of exploration activities within the tenure managed by Worsley Alumina. The objectives relevant to this EMP will be achieved via formal requirements for impact mitigation and are discussed further in section **Error! Reference source not found.**

Worsley will use the Forest Management Plan to map and record all old growth forest areas, PECs and TEC's within planned exploration areas. Worsley will not conduct exploration activities in those areas.

1.6.3.2 South Dandalup Dam Catchment Area Protection Plan (2005)

This plan was developed to determine the protection status and management strategies for the South Dandalup (PDWSA) Catchment areas. Protection mechanisms are determined by the priority rating of locations within collection areas.

Priority 1 (P1) source protection areas are defined to ensure that there is no degradation of the water source. P1 areas are declared over land where the provision of high-quality public drinking water is the prime beneficial land use. P1 areas are managed in accordance with the principle of risk avoidance.

Priority 2 (P2) areas are defined to ensure that there is no increased risk of pollution to the water source. P2 areas are declared over land where low intensity development (such as rural) already exists. Protection of public water supply sources is a high priority relative to other land use values in these areas. P2 areas are managed in accordance with the principle of risk minimisation.

The requirements of Worsley's Water Management Plan (01027243) apply to exploration activities that may occur within PDWSAs.

1.6.3.3 Water Quality Protection Guidelines, Mining and Mineral Processing (Water & Rivers Commission 2000)

The document comprises a set of guidelines for protecting the quality of water resources in areas where mining and mineral processing occur. Detail related to Worsley Alumina's management of operations in relation to this Guideline is included in the Water Management Plan (01027243).

1.6.3.4 Water Quality Protection note series (Department of Water and Environment Regulation)

This series includes specific publications regarding management and monitoring methods for water supply. It is relevant for Worsley for areas that exist within PDWSA's. Detail related to Worsley's management of operations in relation to these Water Quality Protection notes is included in the Water Management Plan (01027243).

2 MANAGEMENT APPROACH

2.1 MINE PLANNING

As noted in section **Error! Reference source not found.**, the Worsley State Agreement requires Worsley to produce a Plan of Bauxite Mining Operations for the coming ten years, being the Ten Year Mine Plan. The Ten Year Mine Plan covers all mining activities, including exploration, and ensures a holistic approach is taken to the management of Worsley's operations. The Ten Year Mine Plan is produced and updated annually in consultation with the EMLG for submission to the State Government for approval.

The Ten Year Mine Plan:

includes the anticipated disturbance within the project area for the next two years for both mining and infrastructure development; maps and advises on areas deferred from disturbance. Areas deferred for biodiversity and water related values are identified in the Biodiversity and Forest Management Plan (01012523) and Protected Areas Procedure (01013619);

includes proposed drilling areas; and

- reports drilling that has occurred in the previous 12 months.
- In preparation of the Ten Year Mine Plan, the following aspects of forest management and rehabilitation are considered:
- the timing of exploration, mining and rehabilitation activities;
- planned drilling locations (including exploration and grade control drilling);
- access for mining and future management;
- location of mine facilities;
- dieback hygiene;
- water management systems and water course protection;
- land use priorities; and
- buffer zones for fire protection.

2.2 WORSLEY ALUMINA DRILL HOLE PLANNING PROCEDURE

Exploration will continue to be conducted in accordance with the Worsley Alumina Drill Hole Planning Procedure (01023960) which stipulates the process for:

- integration with the 10 Year Mine Plan;
- ensuring underlying tenure is in place (Mining Act tenure, Worsley State Agreement tenure, and/or subleased Mining Act or Worsley State Agreement tenure);
- identifying the requirements for additional surveys, such as:
 - Anthropologist/archaeologist considerations;
 - weed and forest disease status and management; and
 - specific requirements relating to conservation and protection of fauna, flora, water and heritage values.
- internal circulation of drill plans within the Worsley Planning, Land Management, Approvals (including Heritage) and Environment departments for approval;

- identify and implement the requirements for land access permits and other approval instruments in accordance with relevant legislation, tenure conditions and land access agreements, including but not limited to:
- programme of Works to DMIRS for Mining Act tenure;
- private land notifications and access agreements;
- development Applications to the shire on Minerals to Owner titles (if required);
- notifications to Worsley Joint Venture lease holders;
- obligations under the Worsley / DBCA Working Arrangements for exploration in State Forest areas; and
- notifications to DWER for exploration in water catchment areas.
- external consultation with the relevant indigenous groups, shire and community, private landholders, third party tenure ownership and state regulators; and
- auditing and reporting requirements.

2.3 WORKING ARRANGEMENTS

2.3.1 DBCA Working Arrangements

The DBCA – Worsley Working Arrangements (Working Arrangements; WAPL 2018) (**Working Arrangements**) outline the procedures mutually agreed upon by the DBCA and Worsley for bauxite/alumina activities undertaken by Worsley on State lands managed by DBCA, as outlined in the Worsley State Agreement. The document sets out the responsibilities of each party and provides a framework from which detailed working arrangements for specific aspects of mining and rehabilitation related activities can be prepared or reviewed.

Exploration activities within forested areas are undertaken in accordance with these Working Arrangements, which determine appropriate management procedures to cover matters such as forest clearing (where required), occasional clearing of rehabilitated areas, weed control, forest disease, vegetation and flora, fire control, erosion control and site rehabilitation.

The framework intends that full advantage can be taken of the resources and experiences of both organisations and that the arrangements are responsive to new information from operational experience, trials and research.

2.3.2 Working Arrangements in Public Drinking Water Supply Areas

The northern extent of the Worsley State Agreement tenement intersects an area of the South Dandalup Dam Catchment Area P1 and P2 PDWSA, Canning River and the Mundaring Weir catchment area. In the southern area there is interaction with the Harris River catchment area. The South Dandalup Dam Catchment is managed by the DWER under the Water Resource Protection Series (WRP 55 – 2005) - '*South Dandalup Dam Catchment Area and South Dandalup Pipehead Dam Catchment Area – Drinking Water Source Protection Plan*' (DWER, 2005). Water Corporation also has obligations for management of risk within the South Dandalup dam Catchment area. Exploration and mining in PDWSAs require coordination and consultation with the DWER and Water Corporation. Agreed working arrangements will be required between DWER, Water Corporation and Worsley to be established prior to the commencement of activities in PDWSAs. Worsley will generate a dedicated Water Resource Management Plan for activities that may occur within PDWSA.

Although ultimate direction will be received from DWER, actions to be undertaken by Worsley in PDWSAs at the BBM will be based on the *Water and River Commission Water Quality Protection Note Extractive Industries within Public Drinking Water Source Areas (2000)* and considered risks will be assessed using the *Australian Drinking Water Quality Guidelines (2011)*.

The working arrangements for operating in PDWSA will include accountabilities of Worsley and stakeholders based on information to be generated and supplied, detailed information on baseline data, ongoing monitoring programs and management requirements. Proposed management practices are expected to be consistent with existing water management techniques employed at the BBM. The arrangements will be scheduled to commence when exploration drilling activity in the area is identified by the 10 Year Mine Plan or earlier.

In addition, exploration activities do not typically use any drilling fluids or use drilling fluids that have fluid capture systems (closed system) and create small holes (<150 mm) to an average depth of approximately 10 m. Impact to the PDWSA it is not expected due to the low impact activities which will not result in undue erosion or spills which may impact the water source.

2.4 FOREST HYGIENE MANAGEMENT

The EPBC Act lists dieback, caused by the root-rot fungus *Phytophthora cinnamomi*, as one of the key threats to Australian biodiversity. Disturbance and rehabilitation have the potential to facilitate the spread of this disease and others such as *Armillaria luteobubalina* (Australian honey fungus). Dieback is widespread in the Jarrah forest, with known locations within the Project area.

Several desktop and field assessments have been conducted for dieback and forest disease, which have identified a number of dieback infested areas. Dieback has been recorded in 10 areas within the WMDE (Glevan 2020). The Contingency Bauxite Mining Area has been identified as almost completely infested by dieback, with a small section declared unprotectable (Glevan 2020).

The DBCA requires Worsley to survey and map all proposed areas for forest disease such as *P. cinnamomi* and *A. luteobubalina* prior to disturbance. Areas of disease are recorded and considered in mining operation planning. Once disease risk has been determined, appropriate hygiene procedures are implemented as per the Forest Hygiene Management Procedure (00101046). Exploration areas are not mapped prior to access. The risk is managed by ensuring operations only occur during low risk seasonal times (i.e. during times when soil conditions are not likely to result in soil movement as mud in tyres etc).

Worsley has implemented a set of procedures and training to ensure forest hygiene standards are followed and maintained in order to avoid spreading forest weeds and disease through its mining activities. These procedures include guidelines for managing topsoil and overburden material, cleared remnant vegetation and measures to prevent the spread of forest disease.

Worsley will continue to manage weeds, feral animals and dieback (and other forest disease) in accordance with its procedures and Working Arrangements with the DBCA. Where appropriate, DBCA will be consulted to ensure the measures taken are consistent with DBCA objectives, and Worsley will review and update the procedures accordingly as required.

Working Arrangements with the DBCA recognise that Worsley's activities are undertaken in areas of Timber Reserve and on adjacent areas of private land supporting remnant bush and developed pastures. Many of Worsley's activities involving ground and vegetation disturbance have the potential to introduce and spread disease and/or weeds, including dieback and Australian honey fungus. Under the Working Arrangements, Worsley is responsible for maintaining hygiene management systems in its areas of operation and provides for DBCA input into the revision of the hygiene management systems.

Management actions to reduce the spread of forest disease to disease-free areas in association with exploration activities are specified in the Forest Hygiene Management Procedure (00101046) and included in training manuals for Vacuum Drillers (200000666) and Vacuum Drill Technicians (200000667).

3 MANAGEMENT ACTIONS

The objective of this EMP is to ensure exploration activities are low impact by providing a clear and measurable plan for managing impacts to biodiversity, forest resources and rehabilitation that may result from Worsley's operations. Worsley's management objectives are outlined in Table 2-1.

This section of the EMP describes the measures that Worsley implements to meet the requirements established by its Ministerial conditions and other requirements, as outlined in sections **Error! Reference source not found.** and **Error! Reference source not found.**

Table 2-1: Management Objectives for Exploration Activities at Worsley

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Management Objectives	Target	Performance Indicator
Confined to low impact activities	<ul style="list-style-type: none"> Exploration activities outside of the WMDE and the Extended Mining Areas will not involve any direct clearing. Exploration drilling activities which require overland traversing of vegetated areas must be limited to rubber tyred small drill rigs that do not require drill lines to be cleared and do not impact the soil profile when travelling. Larger drill rigs will only be used for exploration activities in areas where no clearing of native vegetation is required (e.g. on existing tracks or cleared areas outside the WMDE) or within the WMDE. Grade control drilling does not form part of the exploration programme and will be confined to inside the WMDE. Activities will be described in the Ten Year Mine Plan, including the type and location of activities. Drill holes will be plugged and backfilled to prevent creation of voids in accordance with the Bauxite Sample Drilling procedure. Training for all operators in the requirements for traversing vegetated areas. 	<ul style="list-style-type: none"> Audit of drilling locations to comply with Worsley Alumina Drill Hole Planning Procedure (01023960) All exploration is reported under the following processes: <ul style="list-style-type: none"> M258SA – 10Year Mine Plan Mining Act leases – S82(1) of the <i>Mining Act 1978</i> and section 32(1) of the <i>Mining Regulations 1981</i> Exploration leases - section 62 of the <i>Mining Act 1978</i>,
Seasonality – Hygiene Management	<ul style="list-style-type: none"> Training for the management of Dieback related diseases (and other relevant training) will be provided to all staff undertaking exploration activities. All exploration activities that have soil movement potential will be strictly managed to limit the spread of dieback related disease. All exploration vehicles will be approved for Forest Access as per DBCA requirements (Disease Risk Area Permit). Compliance with the Worsley Alumina Biodiversity and Forest Management Plan. Compliance with DBCA/Worsley Working Arrangements, including limiting of regional exploration within forest areas to seasonally appropriate times. 	<ul style="list-style-type: none"> Training records All vehicles have current Disease Risk Area Permit. Reporting of non-conformance activities within the Annual Environmental Report.
Water Management	<ul style="list-style-type: none"> Working arrangements will be established with DWER and Department of Water prior to any activities commencing in the PDWSA. Apply Water Resource Management Plan for activities which occur in PDWSAs. 	<ul style="list-style-type: none"> Working arrangements established and agreed by all parties No activity will occur without the establishment of agreed Working Arrangements Audit schedule as per the agreed Working Arrangements Report on exploration activities within the 10 Year Plan.

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Management Objectives	Target	Performance Indicator
Vegetation protection	<ul style="list-style-type: none"> • Exploration activities outside of the WMDE and Extended Mining Areas will not involve any direct clearing. • Any larger scale drilling activities must only occur on established tracks, in paddock areas and must contain all drilling fluids within discrete containers. • Using the Forest Management Plan, map and record all old growth forest areas and PEC / TEC's within the planned exploration areas. These areas will be avoided. • Regional exploration will be excluded in environmental exclusion areas by applying the principals of the Protected Areas Procedure for PEC/TEC and old grown forest identified in the Forest Management Plan. • Drilling activities are suspended during times of extreme fire danger. 	<ul style="list-style-type: none"> • Report on exploration activities within the 10 Year Plan • Training and relevant records (WAPL-Technical-CD-200000666 & 667; Training Manuals)
Habitat protection	<ul style="list-style-type: none"> • Exploration activities outside of the WMDE and the Extended Mining Areas will not involve any direct clearing • Black cockatoo habitat trees are protected as drill rigs are only permitted to push through vegetation less than 150mm in diameter. 	<ul style="list-style-type: none"> • Training and relevant records (WAPL-Technical-CD-200000666 & 667; Training Manuals)
Cultural heritage value protection	<ul style="list-style-type: none"> • In accordance with its tenure conditions, Worsley will have a NSHA in place before undertaking exploration activities. 	<ul style="list-style-type: none"> • Adherence to procedures and processes outlined in the Worsley Cultural Heritage Management Plan (CHMP)

4 REPORTING AND REVIEW

4.1 COMPLIANCE AUDITING

Worsley will report on implementation and compliance with the provisions set out in this EMP and with all requirements of EP Act and EPBC approvals in an Annual Compliance Report. The Annual Compliance Report, along with an Audit Compliance Report, will be included in the Annual Environmental Report produced at the end of each fiscal year for the preceding twelve-month period.

4.2 REPORTING

Activities related to this EMP plan will be reported in the Ten Year Mine Plan.

4.3 EMP REVIEW

This EMP will undergo an internal review and audit that is aligned with the recommendations schedule (3 yearly, Strategen, 2008) and the Environmental Audit Schedule specification (00113088). A review of this EMP will consider:

- Effectiveness of monitoring controls / systems;
- Monitoring report outcomes;
- Relevance to current monitoring and analysis systems and performance indicators;
- Technology improvements;
- Changes to operational activities leading to changes in the risk;
- Best practice monitoring processes;
- Actions from incident and audit outcomes;
- Changes to relevant legislation, policy, guidelines and guidance material; and
- Benchmarking against other similar operations.

5 DEFINITIONS, TERMS AND ABBREVIATIONS

Term	Description
BBM	Boddington Bauxite Mine
BC Act	Biodiversity Conservation Act 2016 (WA)
CER	1995 Consultative Environmental Review
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DMIRS	Department of Mines, Industry Regulation and Safety
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EMLG	Environmental Management Liaison Group
EMP	Exploration Management Plan
EP Act	Environmental Protection Act 1986 (WA)
EPA	Office of the Environmental Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cth)
Extended Mining Areas	The new mining areas approved under Part B of MS719
ERMP	Environmental Review and Management Programme
M258SA	Worsley mining tenement granted under the <i>Alumina Refinery (Worsley) Agreement Act 1973</i>
MNES	Matters of National Environmental Significance
MS423	Ministerial Statement No. 423
MS719	Ministerial Statement No. 719
MS751	Ministerial Statement No. 751
PBA	Primary Bauxite Area
PDWSA	Public Drinking Water Source Area
Project	Worsley Bauxite Alumina Project
Refinery	Worsley Alumina Refinery
Revised Proposal	Worsley Mine Expansion Proposal
TEC	Threatened Ecological Community
Working Arrangements	DBCA – Worsley Working Arrangements
Worsley	South32 Worsley Alumina Pty Ltd
WMDE	Worsley Mining Development Envelope
Worsley State Agreement	<i>Alumina Refinery (Worsley) Agreement Act 1973</i>
WRC	Water and Rivers Commission
10 Year Mine Plan	10-year rolling mine plan required under the Worsley State Agreement

6 REFERENCES

00100897	Bauxite Sample Drilling Procedure
00101046	Forest Hygiene Management Plan
00113088	Environmental Audit Schedule Specification
01012523	Biodiversity and Forest Management Plan
01012524	Dust Management Plan – Bauxite Mining and Transport
01012527	Noise Management Plan – Mining and Blasting
01023960	Drill Hole Planning Procedure
01027243	Water Management Plan
200000666	Vacuum Drill Operator Training Manual
200000667	Vacuum Drill Technician Training Manual
200000668	Vacuum Drilling Standard Work Instruction
	<i>Aboriginal Heritage Act 1972 (WA)</i>
	<i>Alumina Refinery (Worsley) Agreement Act 1973 (WA)</i>
	<i>Biosecurity and Agricultural Management Act 2007 (WA)</i>
	<i>Biodiversity Conservation Act 2016 (WA)</i>
	<i>Conservation and Land Management Act 1984 (WA)</i>
	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>
	<i>Environmental Protection Act 1986 (WA)</i>
	<i>Metropolitan Water Supply Sewerage and Drainage Act 1909 (WA)</i>
	<i>Metropolitan Water Supply Sewerage and Drainage Bylaws 1957 (WA)</i>
	<i>Mining Act 1978 (WA)</i>
	<i>Mining Regulations 1981 (WA)</i>
	<i>Ministerial Statement No. 423</i>
	<i>Ministerial Statement No. 719</i>
	<i>Ministerial Statement No. 751</i>
	<i>Rights in Water and Irrigation Act 1914 (WA)</i>
	<i>Water Agencies Powers Act 1984 (WA)</i>
	<i>Water Corporation Act 1995 (WA)</i>
	Conservation Commission of Western Australia 2013, <i>Forest Management Plan 2014-2023</i> , Government of Western Australia.
	DWER (2005) <i>South Dandalup Dam Catchment Area Protection Plan, South Dandalup Pipehead Dam catchment Area – Drinking Water Source Protection Plan</i> , Drinking Water Protection Plan – WRP 55.
	Mauger G W, Day J E & Croton J T 1998, <i>Hydrological and associated research related to bauxite mining in the Darling Range of Western Australia – 1997 Review</i> , Water and Rivers Commission, Water Resources Technical Series, Report No WRT 26

	Stokes, RA & Loh, IC 1982, <i>Streamflow and solute characteristics of a forested and deforested catchment pair in south-western Australia</i> , in: National Symposium on Forests, for Hydrol., Proc. Institution of Engineers, Australia, Melbourne
	Strategen (2005) Environmental Review and Management Programme - Worsley Alumina Pty Ltd Bauxite–Alumina Project Expansion
	Strategen (2008) Audit Program - Ministerial Statements No. 719 and 751. Unpublished Report for Worsley Alumina Pty Ltd, Jan 2008
	Water and Rivers Commission (2000), <i>Environmental Water Provisions Policy for Western Australia</i> , Water and Rivers Commission, Statewide Policy No. 5.
	Worsley (1995) Consultative Environmental Review – Worsley Bauxite – Alumina Operation Proposed Expansion to 3.5 million tonnes per annum Alumina Production.
	Worsley (2018) Worsley / DBCA Working Arrangements.

7 DOCUMENT CONTROL

Reviewer Circulation

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Approval Circulation

Role	Name	Approved	Date
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