1. Introduction

1.1 The Proposal
Moly Metals Australia Pty Ltd (Moly Mines) proposes to construct and operate the Spinifex Ridge Molybdenum Project (Spinifex Ridge), which is located approximately 50 km north east of Marble Bar in Western Australia (53° 0.79"S, 7° 5.84"E).

The project will involve the open pit mining and processing of 20 Million tonnes per annum (Mtpa) of ore to produce 23,000 tpa of molybdenum concentrate and 48,000 tpa of copper concentrate (co-product). Spinifex Ridge has a nominal ten year life of mine and will be a significant contributor to the world molybdenum market, ranking Moly Mines in the top ten molybdenum producers in the world.

1.2 The Proponent
Moly Metals Australia Pty Ltd, the proponent for the project, is a wholly owned subsidiary of Moly Mines Ltd. Moly Mines is responsible for preparing this Public Environmental Review (PER) document.

Moly Mines Ltd is an independent Australian resource company focussed on the exploration and development of major specialty, base and precious metals projects. Moly Mines Ltd is a public company, dual listed on the Australian Stock Exchange and Toronto Stock Exchange, and has its head office in Perth, Western Australia.

Proponent details are:

Moly Metals Australia Pty Ltd
46-50 Kings Park Road
WEST PERTH WA 6005
ABN: 19 108 503 331
Telephone: (08) 9429 3300
Fax: (08) 9429 3399
Email: info@molymines.com
Website: www.molymines.com
Company Contact: Graeme Kininmonth, Health, Safety and Environment Manager

1.3 Purpose of this Document
This document constitutes the Public Environmental Review for Spinifex Ridge, as required under Part IV of the WA Environmental Protection Act 1986 (EP Act). The Environmental Protection Authority (EPA) requires project information to be made publicly available for comment through a formal public review period of six weeks.
This PER document identifies and evaluates the environmental and social effects of the project. A considerable amount of environmental and social baseline data has been collected by Moly Mines since July 2005. This information, together with details of the project characteristics and stakeholder feedback, has been utilised to determine the potential environmental and socio-economic impacts. Detailed evaluation of potential impacts has allowed Moly Mines to develop best practicable management measures to avoid or minimise such impacts and demonstrate that the project encompasses the principles of sustainability. The management measures that Moly Mines will adopt to minimise and manage potential impacts are outlined in this PER document.

Several proponent commitments are made in the document to further address or manage potential impacts. These commitments will become a legal requirement for implementation under the EP Act. Furthermore, the PER document also provides the basis for the Minister for Environment to set environmental conditions under Part IV of the EP Act to ensure the project is implemented and managed in an environmentally acceptable manner.

The purpose of this PER document is to:

- place the project in the context of the local and regional environments (natural and social surroundings);
- provide sufficient information concerning the project to allow Decision Making Authorities (DMAs), interested parties, the community and the Minister for Environment to review and assess a well-defined project;
- provide the basis of Moly Mines management measures and project commitments, outlining how potential environmental and socio-economic impacts will be minimised and acceptably managed;
- provide for clear communication with stakeholders so that the EPA can obtain informed comment to assist in providing advice to government; and
- demonstrate the reasons why Spinifex Ridge should be judged by the EPA, the Minister for Environment and other stakeholders to be environmentally acceptable (EPA, 2006).

This document is structured as follows:

Section 1 Introduction
Section 2 Project Justification and Alternatives
Section 3 Project Description
Section 4 Existing Biophysical Environment
Section 5 Existing Social and Economic Environment
Section 6 Stakeholder and Community Consultation
Section 7 Environmental Principles, Sustainability and Management
Section 8 Environmental Impact Assessment and Management
1.4 Location
Spinifex Ridge tenements occupy an area of approximately 235 km² in the Pilbara region of Western Australia (Figure 1-1). Only a small percentage of these tenements will be impacted by the project, as described in Chapter 3. The nearest township is Marble Bar, approximately 50 km south-west of the project area. Port Hedland is approximately 200 km to the north-west. The project area is located within the local government boundaries of the Shire of East Pilbara and the pastoral lease boundaries of the Yarrie Pastoral Station.

Access to the area is currently via the sealed Marble Bar Road and then either Bamboo Creek Road, or Warrawagine Road, both of which are unsealed.

1.5 Land Tenure
The Spinifex Ridge Project is located primarily on the Yarrie Pastoral Lease. Access to this land for the proposed operation will be in accordance with a compensation agreement to be negotiated with the leaseholder.

The following reserves exist within the project area and are shown in relation to the main mine components and the mining tenements in Figure 1-2:

- ‘A Class Reserve’ No. 31047 (Preservation of Natural Formations) encompassing Coppin Gap and its immediate environs, vested with the Shire of East Pilbara;
- Timber reserve No 13649; and
- Water reserve No. 12757.

In addition, Moly Mines tenements overlap a small section of Timber Reserve 13648. This reserve will not be impacted by the proposed operation.

Mining and processing activities will be set back from the A-Class Reserve, although some environmental monitoring is likely to be undertaken. The timber and water reserves are typical of similar reserves established throughout the Pilbara as part of the historical opening of the region. These reserves were a set size and shape rather than with a size and shape that reflects site specific characteristics. A section of the timber reserve is proposed to be used for stockpiles and for part of the creek diversion channel. There is no differentiation in the current management of these reserves from
the surrounding pastoral land and no flora, vegetation, or hydrological difference between the reserves and adjacent land.

The approval for Mining Lease M45/1096 includes allowance for mining activities on these reserves following discussion between DOIR and the Department of Conservation and Environment (DEC) for the timber reserve and DOIR and the Department of Water (DoW) for the water reserve. However, this allowance is subject to other conditions including approval under Part IV of the **Environmental Protection Act, 1986**.

Miscellaneous Leases or other tenements will be obtained to cover areas for infrastructure to support the project (e.g. pipelines, borefields, airstrip).

### 1.6 Project Scope
The Spinifex Ridge project, as outlined in this PER, involves the development of an open pit mine, transport tunnel, processing plant and associated utilities, services and infrastructure to support a nominal 10 year life of mine. The project description in **Section 3** of this PER provides the details of this proposal.

Mining of overburden and ore will be by simple open pit methods using conventional mining equipment and techniques such as drill and blast, and load and haul. To facilitate mining, the diversion of Coppin Creek around the pit will be required. Ore from the open pit will be crushed and conveyed through a transport tunnel to secondary crushing facilities. Crushed ore will be drawn from stockpiles and fed to a mill circuit to prepare it for processing by flotation, followed by thickening, leaching and filtration.

Overburden will be stockpiled to form three large waste rock landforms, covering a total area of approximately 400 ha. The waste rock landforms will be located to the south, southwest and west of the open pit (**Figure 3.1**).

All concentrate products will be transported to nearby ports for export to international customers. The molybdenum concentrate will be trucked in containers for export through either Dampier or Port Hedland. Copper concentrate will be transported as a bulk product to Port Hedland for export.

The processing of ore will produce tailings as a waste product. Tailings will be stored in a large circular tailings storage facility (TSF) approximately 2.9 km in diameter and occupying an area of approximately 660 ha.

Total power requirements for the project are approximately 600 GWh/a and average annual water requirements are approximately 15 GL. Power will be supplied by onsite generation comprising multiple, natural gas fuelled, reciprocating engines. Water will be mainly sourced from the Canning Basin and pumped 70km to the site. A water supply to meet both the initial and peak demand will be sourced from a borefield near the De Grey River. This supply will provide water at a maximum annualised rate of 4 GL.
Figure 1-2
Land Tenure
Spinifex Ridge will be supported by a predominantly fly-in fly-out (FIFO) workforce, with approximately 400 personnel accommodated on site. A small component of the workforce will consist of locally based employees who will drive in and drive out (DIDO).

Other project activities that are assessed in this PER document include:

- clearing of land for mining, processing and associated infrastructure and activities;
- sourcing of construction materials for infrastructure (e.g. roads, airstrip and concreting);
- installation and operation of communication towers;
- transportation of chemical reagents, equipment and other materials to site;
- waste generation and disposal;
- establishment of support infrastructure such as warehouses, storage areas, lay down yards, water supply pipelines, internal roads, access ways, administration buildings and accommodation village; and
- establishment of an airstrip for the transport of personnel, equipment and emergency response.

Based upon the proposed activities the following environmental and social factors have been identified for this project:

- geology, soils and landforms;
- surface water (quality and hydrological regimes);
- groundwater (quality and water levels);
- terrestrial flora and vegetation;
- terrestrial fauna;
- subterranean fauna;
- aquatic ecology;
- air quality;
- noise, blasting and vibration;
- waste management;
- dangerous goods and hazardous materials;
- greenhouse gases;
- mine closure;
- communities;
- land use;
- cultural heritage;
- visual amenity;
- public health and safety.
1.6.1 Project Exclusions
The scope of the project that is assessed in this document is detailed in the previous section. Specifically, it does not include:

- extension to the 10 year life of mine. Moly Mines may consider at a later date the possible extension of the life of mine to 20 years or greater. While there are indications that the orebody will support a longer life of mine, this will be dependent on the world market demand for molybdenum. If in the future Moly Mines proposes to extend the life of mine, the necessary environmental approvals, licences and permits will be sought at that time;

- downstream processing of either the molybdenum or copper concentrate products. It is possible that Moly Mines will establish a downstream processing facility to treat concentrate produced by Spinifex Ridge. Possible sites near to existing port facilities would be investigated locally within the Pilbara and also offshore. Should the preferred location for a downstream processing facility reside within Western Australia, detailed environmental and other investigations will be completed and the necessary approvals, licences and permits will be sought;

- impacts associated with the management of product at the port and shipping, discussed in Section 3.5 which will be handled through separate approvals processes; and

- end use of the products, in any form.

1.7 Timing and Staging of Project
The current project schedule is shown in Table 1-1 and is based upon the need for Spinifex Ridge to commence production in June 2009 to meet market demands. The scheduled timing is indicative and is subject to various risks from external factors, including:

- timeframe for obtaining all necessary regulatory approvals;

- timeframe for obtaining appropriate land tenure;

- access to a skilled workforce, particularly during construction; and

- sourcing and procurement of plant, infrastructure and construction materials.

Table 1-1 Key Project Milestones

<table>
<thead>
<tr>
<th>Key Project Milestone</th>
<th>Schedule Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental surveys commenced</td>
<td>July 2005</td>
</tr>
<tr>
<td>Indigenous studies commenced</td>
<td>July 2005</td>
</tr>
<tr>
<td>Project Definition Document submitted to Office of Development Approvals Coordination</td>
<td>August 2006</td>
</tr>
<tr>
<td>Mining tenure granted</td>
<td>Q1 2007</td>
</tr>
<tr>
<td>PER document published</td>
<td>mid 2007</td>
</tr>
<tr>
<td>Public submission period closes</td>
<td>Q3 2007</td>
</tr>
<tr>
<td>Decision by the Minister for the Environment (State)</td>
<td>Q4 2007</td>
</tr>
<tr>
<td>Submission to the Department of Environment and Water Resources (DEW)</td>
<td>Q4 2007</td>
</tr>
<tr>
<td>Decision by the Minister for the Environment and Water Resources (Commonwealth)</td>
<td>Q4 2007</td>
</tr>
<tr>
<td>Construction commences</td>
<td>Q1 2008</td>
</tr>
<tr>
<td>First production</td>
<td>June 2009</td>
</tr>
</tbody>
</table>
1.8 **Environmental Approvals Process**

Environmental Impact Assessment (EIA) is a formalised process designed to provide information to the EPA, regulatory authorities and the community regarding proposed developments having the potential to impact on natural and social environments. The EP Act is the principle statute relevant to environmental protection in Western Australia. As a part of Western Australia’s environmental approval process, Part IV of the EP Act provides the primary process for the EPA to carry out an EIA of development proposals that it considers are likely to have significant effects on the surrounding environment. The EPA states that:

‘where a proposal is subject to a formal EIA process, the proponent holds all responsibility to demonstrate through the EIA process that:

- Best practicable measures have been taken in planning and designing the proposal to avoid, and where this is not possible, to minimise impacts on the environment; and
- The unavoidable impacts of the proposal should be found to be environmentally acceptable, taking into account cumulative impacts, which have already occurred in the region and encompass the principles of sustainability (EPA, 2002).’

In conjunction with State Government approval, the project has been referred to DEW (Moly Mines, 2006a). A decision has been made that the project constitutes a “controlled action” under the EPBC Act. For more information detailing the relevance of the EPBC Act to the project refer to **Section 1.8.4.**

The subsections below provide information relating to the relevant environmental legislation that applies to the project, the DMAs involved, and an outline of the State and Commonwealth environmental approvals processes.

1.8.1 **Relevant Legislation**

In addition to gaining environmental approval from the Minister for Environment, Moly Mines is required to comply with other legislation and regulations. A summary of key environmental legislation and regulations is listed in (Table 1-2).
Table 1-2 Key Environmental Legislation

<table>
<thead>
<tr>
<th>Legislation/Regulation</th>
<th>Application</th>
<th>Administrator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aboriginal Heritage Act 1972 (WA)</td>
<td>Protects Aboriginal sites from disturbance</td>
<td>Department of Indigenous Affairs</td>
</tr>
<tr>
<td>Agriculture and Related Resources Protection Act 1976 (WA)</td>
<td>Provides for the management, control and prevention of certain plants and animals, for the prohibition and regulation of the introduction and spread of certain plants and animals.</td>
<td>Department of Agriculture</td>
</tr>
<tr>
<td>Australian Heritage Council Act 2003 (WA)</td>
<td>Identifies areas of national heritage significance.</td>
<td>Australian Heritage Council</td>
</tr>
<tr>
<td>Clean Air Regulations 1967 (WA)</td>
<td>Regulates air borne emissions.</td>
<td>Department of Environment and Conservation</td>
</tr>
<tr>
<td>Conservation and Land Management Act 1984 (WA)</td>
<td>Protection and management of the conservation estate (nature reserves, state forests, marine parks, etc).</td>
<td>Department of Environment and Conservation</td>
</tr>
<tr>
<td>Contaminated Sites Act 2003 (WA)</td>
<td>Provides for the identification, recording, management and remediation of contaminated sites.</td>
<td>Department of Environment and Conservation</td>
</tr>
<tr>
<td>Civil Aviation Act 1988 (Commonwealth)</td>
<td>Conduct and operation of the airstrip</td>
<td>Civil Aviation Safety Authority</td>
</tr>
<tr>
<td>Environmental Protection Act 1986 (WA)</td>
<td>Protection, control and abatement of pollution and conservation protection and enhancement of environment.</td>
<td>Department of Environment and Conservation</td>
</tr>
<tr>
<td>Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (WA)</td>
<td>Regulates the level of clearing and disturbance of land related to any development.</td>
<td>Department of Environment and Conservation</td>
</tr>
<tr>
<td>Environmental Protection (Controlled Waste) Regulations 2004 (WA)</td>
<td>Provides a tracking system for controlled wastes to prevent pollution.</td>
<td>Department of Environment and Conservation</td>
</tr>
<tr>
<td>Explosives and Dangerous Goods Act 1961-1986 (WA)</td>
<td>Regulates the manufacture, use and storage of explosives and dangerous goods.</td>
<td>Department of Consumer and Employer Protection</td>
</tr>
<tr>
<td>Health Act 1911 (WA)</td>
<td>Provides regulation for the protection of public health. For example, sewage treatment and disposal.</td>
<td>Department of Health</td>
</tr>
<tr>
<td>Land Administration Act 1997 (WA)</td>
<td>Provides regulation for the protection of parcels of crown land.</td>
<td>Department for Planning and Infrastructure</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Legislation/Regulation</th>
<th>Application</th>
<th>Administrator</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Local Government Act 1995 (WA)</em></td>
<td>The Act regulates and aims to achieve greater community participation in the decisions and affairs of local governments, and accountability of local governments.</td>
<td>Local Government Authorities</td>
</tr>
<tr>
<td><em>Mining Act 1978 (WA)</em></td>
<td>Compliance of tenement holders to meet certain conditions and covenants of the particular mining tenement.</td>
<td>Department of Industry and Resources</td>
</tr>
<tr>
<td><em>Native Title Act 1993 (Commonwealth)</em></td>
<td>Handles Aboriginal claims for land ownership.</td>
<td>National Native Title Tribunal</td>
</tr>
<tr>
<td><em>Planning and Development Act 2005 (WA)</em></td>
<td>Controls land development in the state.</td>
<td>Department for Planning and Infrastructure</td>
</tr>
<tr>
<td><em>Rights in Water Irrigation Act 1914 (WA)</em></td>
<td>Manages water resource allocation, usage and protection.</td>
<td>Department of Water</td>
</tr>
</tbody>
</table>

### 1.8.2 Decision Making Authorities and Involved Agencies

The key DMAs involved in the environmental assessment of Spinifex Ridge includes the EPA, DEC and DEW. Consultation with the DEC will be ongoing for the life of the project.

The project is also subject to the provisions of the *Mining Act 1978*, therefore approvals from the DoIR will be required in addition to formal approvals under the EP Act being obtained.

Other authorities involved in the project approvals include:

- Department of Consumer and Employment Protection (DoCEP);
- Department of Land Information (DLI);
- Department of Water (DoW);
- Department for Planning and Infrastructure (DPI);
- Department of Health (DoH);
- Main Roads WA (MRWA);
- Department of Indigenous Affairs (DIA); and
- Shire of East Pilbara (SoEP).

### 1.8.3 State Assessment Process

To initiate the EIA process, Moly Mines submitted a referral document (in the form of a Project Definition Document (PDD)) (Moly Mines, 2006b) to the Office of Development Approvals Coordination (ODAC) on 26 July 2006. The PDD was reviewed by the Inter-Agency Implementation Group, which comprises representatives from the EPA Services Unit (representing the EPA), the DEC,
DoCEP, DoH, DIA, DoIR, and DPI. The amended PDD was formally referred to the EPA on 22 August 2006.

The EPA determined the level of assessment for this project at the PER level. This is a formal approval process that requires community consultation and a public review period of the environmental impact assessment document. This level of assessment also requires Moly Mines to prepare an Environmental Scoping Document. This was undertaken to outline the project characteristics; the environmental setting of the project area; potential environmental impacts; the environmental studies proposed to investigate the significance of the impacts; and, preliminary management strategies (Moly Mines, 2007).

This PER document has been prepared in accordance with: (i) the EPA’s decision to assess the Spinifex Ridge Molybdenum Copper Project as a PER; and (ii) the scope of works outlined in the Environmental Scoping Document (Moly Mines, 2007) that has been agreed with regulatory authorities.

The EPA will assess this project with consideration of:

- Technical investigations undertaken by Moly Mines;
- Issues raised by the public;
- Moly Mines’ response to raised issues;
- Specialist advice from government bodies;
- EPA’s own investigations and research; and
- Research undertaken by other expert agencies, if required.

The EPA will then provide its report and recommendations to the Minister for the Environment on the environmental acceptability of the project and the environmental conditions which should apply if the project is to proceed. The EPA’s report is published and the community has the opportunity to appeal against the content of the report or its recommendations. The final decision as to whether the project should proceed will be made by the Minister with consideration of any appeals.

The PER approval process and indicative timeline is illustrated in Figure 1-3.

Following the Minister’s approval under Part IV of the EP Act, the company is required to obtain approval to commence construction under Part V of the EP Act, administered by the DEC. In parallel with this Works Approval process, Moly Mines will also seek other permits and approvals that are required prior to ground disturbance activities commencing.

### 1.8.4 Commonwealth Assessment Process

The Department of Environment and Water Resources (DEW) is the Commonwealth Department that administers the EPBC Act. In summary, the EPBC Act enables the Commonwealth to join with States and Territories of Australia in providing a national scheme of environmental protection and biodiversity conservation. The EPBC Act focuses on Commonwealth interests of matters of ‘national...
environmental significance’ and puts in place streamlined environmental assessment and approval processes.

Matters of national environmental significance identified in the EPBC Act that trigger the Commonwealth assessment and approval regime include:

- World Heritage Areas;
- National heritage places;
- Ramsar wetlands;
- Nationally threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

The EPBC Act assessment process is illustrated in Figure 1-4.

In 2006, Moly Mines referred the Spinifex Ridge Molybdenum Copper Project to the DEW under the provisions of the EPBC Act due to the presence of protected fauna within the project area (Moly Mines, 2006a). The fauna species protected under the EPBC Act that have been identified within the project area include:

- Northern Quoll (*Dasyurus hallucatus*) – endangered;
- Orange Leaf-nosed Bat (Pilbara Form) (*Rhinonicteris aurantius*) – vulnerable\(^1\); and
- Rainbow Bee-eater (*Merops ornatus*) – migratory species listed under international agreements.

The fauna species protected under the EPBC Act that have the potential to occur within the project area include:

- Mulgara (*Dasycercus cristicauda*);
- Pilbara Olive Python (*Liasis olivaceus barroni*);
- Fork-tailed Swift (*Apus pacificus*) – aerial flyover species;
- Common Sandpiper (*Tringa hypoleucos*) – migratory species listed under international agreements;
- Marsh Sandpiper (*Tringa stagnatilis*) – migratory species listed under international agreements;
- Common Greenshank (*Tringa nebularia*) – migratory species listed under international agreements;
- Snipe (*Gallinago* sp) – migratory species listed under international agreements; and
- Great Egret (*Ardea alba*) – migratory species listed under international agreements.

\(^1\) Suspected calls of the Orange Leaf-nosed Bat were recorded during a survey in 2006; however these are yet to be verified.
- Figure 1-3 Outline of Environmental Protection Act Procedure for PER Assessments
Figure 1-4 Outline of EPBC Act Assessment Process

Can the action be assessed using:

- A State/Territory process accredited under a bilateral agreement?
  - Bilateral agreements currently exist with Queensland, Western Australia, Tasmania, New South Wales and the Northern Territory.
- An Australian Government assessment process accredited under a Ministerial declaration?
  - There are currently no Ministerial declarations for Australian Government Processes

Action to be assessed by:

- An accredited State/Territory process; or

Accredited Assessment (Case by Case) -> Assessment on referral information

The Department must prepare a draft Recommendation Report

To be finalised within 30 days of assessment approach decision.

Recommended Report finalised and provided to the Minister

Draft Recommendation Report published for 10 business day public comment period

Proponent’s information is revised taking into account public comments. The proponent then provides the Minister with the revised information or a notice that no comments were received.

EIS/PER finalised taking into account public comments. The proponent then provides the finalised EIS/PER to the Minister.

Department for the Environment and Water Resources prepares Recommendation Report and provides it to the Minister.

Minister approves publication of draft EIS/PER

Public comment on draft EIS/PER

Preparation of draft EIS/PER

Minister approves publication of draft EIS/PER

Public comment on draft EIS/PER

Minister directs proponent to publish referral information for public comment

Minister requests further information from proponent

Minister provides either standard of tailored guidelines to proponent for draft EIS or PER

Minister directs proponent to publish referral and additional information for public comment

Minister requests further information from proponent

Minister provides either standard of tailored guidelines to proponent for draft EIS or PER

Commission conducts inquiry and provides an inquiry report to the Minister

Minister appoints commissioners and sets terms of reference

Assessment by Public Inquiry

Assessment by EIS/PER

Assessment on preliminary documentation

Australian Government Minister for the Environment and Water Resources makes decision to approve, approve with conditions or not approve the proposed action.

- For assessment by EIS/PER or preliminary documentation, a decision must be made within 40 business days of receiving finalised documentation from the proponent.
- For assessment by inquiry, a decision must be made within 40 business days of receiving an inquiry report.
- For assessment by a State/Territory process, a decision must be made within 30 business days of receiving an assessment report.
- For assessment on referral information, a decision must be made within 20 business days of receiving an Recommendation Report.

NO

YES

State/Territory or Australian Government agency prepares assessment report.
On 29 November 2006, the delegate for the Commonwealth Minister for Environment and Heritage determined that the project was a “controlled action” based on potential impacts to listed threatened species and communities and to listed migratory species. The Commonwealth agreed to assess the proposal under the bilateral agreement between the Australian Government and the Western Australian Government under section 45 of the EPBC Act. This effectively accredits the PER process to meet the Commonwealth assessment requirements.

Section 45 of the EPBC Act authorises the Commonwealth Minister for the Environment and Heritage, on behalf of the Commonwealth, to enter into a bilateral agreement with a State, that is expressed to be a bilateral agreement and that provides for one or more of the following:

- protecting the environment;
- promoting the conservation and ecologically sustainable use of natural resources;
- ensuring an efficient, timely and effective process for environmental assessment and approval of actions; and
- minimising duplication in the environmental assessment and approval process through Commonwealth accreditation of processes of the State or Territory (or vice versa).

The Western Australian bilateral agreement declares that actions that have been assessed in a specified manner need not be assessed under Part 8 of the EPBC Act. Ministerial approval under Part 9 of the Act is still required before such an action can proceed.

1.8.5 Approvals Required

Numerous other statutory approvals are required prior to the construction phase commencing. These approvals include:

- Works Approval (DEC);
- Mining Approval (DoIR);
- licence to construct or alter wells and licence to take groundwater (DoW);
- permit to interfere with bed and banks (DoW);
- approval of a project management plan (DoCEP);
- permit to use existing roads (MRWA);
- approval to construct and maintain an airstrip (DPI);
- approval and licences for sewage treatment facilities, potable water treatment and a swimming pool at the camp (DoH and SoEP);
- indigenous heritage approval (DIA); and
- development approval and building permits (SoEP).

Stakeholders

Moly Mines has developed a stakeholder consultation plan for Spinifex Ridge that identifies the key stakeholders and triggers for both scheduled and routine consultation, including quarterly community meetings in the town of Marble Bar. Consultations to date have included meetings, telephone and electronic mail communications, letter (mail-out) correspondence, site visits and on-ground surveys.
The key stakeholders identified in the consultation plan are listed below and the issues that have been raised are provided in Table 1-3 with reference to the relevant section of the PER document where they are discussed in further detail.

**Federal Government**
- Department of Environment and Water Resources

**State Government**
- Department of Environment and Conservation
- Main Roads Western Australia
- Office of Development Approvals Co-ordination
- Department of Planning and Infrastructure
- Department of Industry and Resources
- Department of Health
- Department of Indigenous Affairs

**Local Government Authorities**
- Shire of East Pilbara
- Town of Port Hedland

**Non-Government Organisations**
- Care for Hedland Environmental Association
- Wildflower Society
- Conservation Council of Western Australia

**Indigenous Stakeholders**
- Pilbara Native Title Service
- Njamal People

**Other Stakeholders**
- Pilbara Development Commission
- Port Hedland Port Authority
- Yarrie/ Muccan Station
- Marble Bar Police
- Oakover Gold
- Marble Bar Community
- Dampier Port Authority
- Muccan Minerals
- Warrawagine Station
Consultation undertaken to date has included community meetings in Marble Bar, meetings with most other stakeholders, mail-outs, emails, website updates and telephone calls. While the preferred method of consultation is always face-to-face meetings, this is not always practicable or cost effective given the distance and time constraints associated with some stakeholders. A summary of the consultation undertaken is provided in Chapter 6.

The stakeholder consultation program aims to provide a framework to develop and maintain open dialogue and working relationships with the community and stakeholders. This proactive approach adopted by Moly Mines is critical to developing positive relationships, identifying opportunities to provide community benefits whilst maximising development synergies.

Moly Mines is committed to continuing consultation throughout the life of the project and into post-closure. Stakeholders will be inherently important in providing valuable input to develop and implement acceptable completion criteria for mine closure.

### Table 1-3 Key Issues Raised During Consultation

<table>
<thead>
<tr>
<th>Issue</th>
<th>Section in PER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fauna species of conservation significance</td>
<td>4.8.5, 8.6</td>
</tr>
<tr>
<td>Coppin Gap</td>
<td>4.3.2.1, 4.3.3.1, 4.6.3, 4.6.4, 4.9.1, 4.9.2, 6.2.2, 8.2.2, 8.3.1, 8.4, 8.5.3, 8.6.3, 8.7.1, 8.7.2, 10.7</td>
</tr>
<tr>
<td>Site closure</td>
<td>9</td>
</tr>
<tr>
<td>Road use</td>
<td>3.6.4, 6.2.5</td>
</tr>
<tr>
<td>Tourism and restricted access</td>
<td>5.2.3, 6.2.6, 10.2.3</td>
</tr>
<tr>
<td>Waste dump design and location</td>
<td>2.2.5, 4.3.4, 6.2.7, 8.12.1</td>
</tr>
<tr>
<td>Tailings</td>
<td>2.2.4, 3.4.1, 3.4.2, 6.2.8, 8.12.2</td>
</tr>
<tr>
<td>Water use efficiency</td>
<td>6.2.9</td>
</tr>
<tr>
<td>Location of the workforce</td>
<td>2.2.9, 6.2.10</td>
</tr>
<tr>
<td>Pit location</td>
<td>6.2.11</td>
</tr>
<tr>
<td>Acid mine drainage</td>
<td>6.2.12</td>
</tr>
<tr>
<td>Employment opportunities</td>
<td>6.2.13</td>
</tr>
</tbody>
</table>
2. Project Justification and Alternatives

2.1 Project Justification
Spinifex Ridge is a robust, nationally significant project that has many benefits at a local, regional and national level. It is well sited to service the international molybdenum market and will rank as one of the top ten molybdenum producers in the world.

The project will be the first world class molybdenum mine in Australia and will open up markets not currently exploited by Australian operations. The project aims to take advantage of increasing molybdenum demand in a period of tight supply.

Although considered as a co-product, the copper concentrate that will be produced will add significant revenue to the project.

2.1.1 History of Molybdenum
Molybdenum was discovered in the latter part of the 18th century. It does not occur in the metallic form in nature, however it does occur in a sulphide form that is fairly indistinguishable from other similar materials such as graphite. It is these substances that are generally known by the Greek word Molybdos, meaning “lead like” and that gave molybdenum its name.

In the late 19th century, a French company first used molybdenum as an alloying element to produce armour plate. During World War I, tungsten demand soared but supply was restricted, and as a result molybdenum was substituted for tungsten in many hard and impact resistant steels, resulting in increased demand.

By the end of the 1930s molybdenum was widely accepted as a technical material. The conclusion of World War II, in 1945, brought increased interest and investment to develop new civilian applications.

Since the mid 1940s, applications for molybdenum, its alloys and its compounds have dramatically expanded (IMOA, 1998).

2.1.2 Sources and Uses of Molybdenum
The majority of world molybdenum production comes from North America, South America and China. World mine production of molybdenum during 2004 was variously quoted at approximately 172,000 metric tonnes (IMOA, 1998), with the world’s top ten producers accounting for over 80% of world production. Recently, Chinese production has declined.

Molybdenum is regarded as an indispensable alloying element in high performance stainless steels and is present in 15% - 20% of stainless steel grades produced. It is also used in the production of alloy and high speed steels, catalysts, lubricants and pigments.

Molybdenum gives alloy steel and iron a combination of strength, toughness and wear resistance not possible with unalloyed steels. It has a melting point at over 2,500 °C and therefore provides critical temperature resistance to stainless steels.
Consumption of molybdenum products in 2004 was estimated at 170,000 tonnes. Nearly 80% is used to manufacture various types of steel and alloys (see Figure 2-1).

2.1.3 Molybdenum Demand
Chinese consumption of molybdenum has almost tripled over 10 years and this rate of growth is forecast to remain in place for several years, in line with forecast Chinese Gross Domestic Product (GDP) growth of 8-9% per annum. Other consumption increases have been driven by India, Korea, south-east Asian countries and Russia.

In China, demand for molybdenum grew 13% in 2003 and 17% in 2004; mainly for use in low alloy steel pipelines and chemicals. Demand in China is expected to remain strong as industrialisation continues.

The worldwide petroleum industry also possesses a strong demand for molybdenum. The establishment of offshore drilling platforms and associated infrastructure (e.g. sub-sea and over-land pipelines, LNG and oil tankers) required for the extraction, transportation and refining of oil and gas requires large amounts of corrosion resistant molybdenum steels. Continued focus on petroleum exploration and production across the world will continue to stimulate demand for molybdenum.

![Figure 2-1 Molybdenum Consumption 2004](Source: modified from IMOA, 2006)

Demand for molybdenum products by region is shown in Figure 2-2.
2.1.4 Molybdenum Pricing

Historically, molybdenum prices have fluctuated significantly, however from 2004 to the present (refer Figure 2-3), molybdenum has attracted record prices as demand increases and supplies come under increasing pressure. The market price as at May 2007 was US$31/lb. The price of molybdenum has averaged above US$6.24/lb for the past 30 years. However, the average price over the past five years has been US$16.67/lb.

Figure 2-2 Molybdenum Consumption by Region
(Source: modified from IMOA, 2006)

Figure 2-3 Molybdenum Price from 1990 to Present
(Source: modified from IMOA, 2006)
2.1.5 Local, State, National and International Benefits
The development of the project will provide a number of substantial benefits including:

- direct and indirect employment opportunities, business and training opportunities;
- opportunities for indigenous employment;
- direct expenditure of approximately A$900M during the construction phase of the project;
- income for Government through the payment of rates, taxes and royalties;
- improved emergency response capabilities, community support and social network opportunities for the town of Marble Bar;
- identification and protection of Aboriginal sites of significance; and
- supply of key material to the steel industry required in the manufacture of pipelines, desalination plants, hydrocarbon industry, lighter / safer vehicles in the manufacture of Ultra Low Sulphur Diesel.

2.2 Evaluation of Alternatives
While the location of the ore body determines the location of the mine, a number of alternatives were considered for the various project aspects. These are described below.

2.2.1 Mining Methodology
Due to the orebody existing as a continuous mass approximately 1 km in width, open cut mining methods are the only viable mining techniques initially available. There is potential that the mining method could progress to underground mining methods as the mine gets deeper, after Phase 1, however this will be dependent on the future molybdenum market and the extent of the ore reserve.

2.2.2 Ore Conveyance
The Mine Plan developed for the project indicated that the space within the southern tenements would be required for the pit, waste rock landforms or other key infrastructure, thereby requiring the processing plant to be sited on the northern side of Spinifex Ridge. Further, the topography on the northern side of the ridge is very flat and well suited for the construction of the plant and tailings storage facility.

Options considered for ore conveyance from the mine to the processing plant include hauling around Spinifex Ridge, either through Kitty’s Gap or along a constructed haul road further to the west, or conveying ore through a tunnel. Based on environmental and economic constraints, the proposed method is to construct a tunnel and convey crushed ore through Spinifex Ridge to the mill area.

2.2.3 Treatment Rate
Economic modelling has confirmed that a treatment rate of 20 Mtpa is the most efficient.

2.2.4 Tailings Storage Facility
By necessity, the TSF is sited in close proximity to the processing plant. The actual location was chosen based on constraints from the locations of creeklines; location of ethnographic sites; and,
consideration of future potential TSF requirements as well as proximity to the plant. Moving the TSF east or west would place the facility in more substantial drainage lines, with resulting increased stability risks.

A typical TSF design used in Australia has been proposed. This design utilises sub-aerial discharge around the perimeter of the facility, beaching towards one or more decant towers. Due to the coarse nature of the tailings associated with Spinifex Ridge, sub-aerial discharge around the perimeter of the TSF by itself would result in overly steep beaches, leaving the middle of the facility underutilised. To ensure full utilisation and therefore minimise the TSF footprint, it is proposed to discharge tailings around the perimeter of the facility as well as into the centre via three towers. This will have the effect of filling the TSF from the centre and edges concurrently, resulting in more efficient use of the facility. A circular design is also proposed to further optimise storage.

Options for tailings disposal using filters, conveyors and stackers transferring dewatered tailings to a tailings facility have been investigated. Although there are potentially significant advantages in this filtered tailings approach, this type of system has not been utilised at a production scale in Australia.

2.2.5 Waste Rock Landforms
Commercially available software was used to evaluate waste dump designs, after applying numerous environmental and economic constraints. Constraints applied include the location of tenement boundaries, environmental considerations, creeklines including floodplains, fuel cost and haulage distance. The results of the evaluation are presented in Section 8.12.

2.2.6 Creek Diversion
Coppin Creek runs through the middle of the ore body. For the mine to proceed, there are no practicable alternatives but to divert the creek around the mining area. The selected route was chosen to follow the natural topography (Section 8.2.2) as far as practicable, therefore minimising the amount of earthworks and disturbance. A number of diversion channel profiles were considered. The chosen profile allows for safe containment of predicted extreme flows, whilst promoting ecological function similar to the existing creekline. Creek diversion details are provided in Section 8.4.2 and 8.4.3.

2.2.7 Water Supply
The project requires and average of approximately 15 GL/yr of water, of which 11 GL of this is for process water. Four water supply options were investigated for the project. These were:

- Canning Basin Groundwater Province: through a borefield accessing groundwater from the Wallal and possibly the Callawa aquifers, including a pipeline approximately 70 km long;
- Woodie Woodie aquifer: water abstraction from an abandoned mining void, including a pipeline approximately 170 km long;
- De Grey River alluvium; and
- any combination of the above.
Investigations into the Canning Basin indicated a large groundwater resource, with significant additional capacity for new users. This option is the preferred option subject to confirmation of the resource availability and identification of any environmental constraints for abstraction and pumping to site.

Studies on the De Grey alluvium suggested that the sustainable volumes present were inadequate for the full allotment for the full mine life, however the De Grey is considered suitable for a smaller abstraction rate.

Woodie Woodie is an operating manganese mine approximately 170 km from the project area. Groundwater modelling suggests that there is adequate capacity to provide a sustainable water source for the duration of the project.

After the completion of the investigations, the Canning option will be progressed for the bulk of the project water requirements, subject to completion of the outstanding investigations. In the event of the Canning failing to meet expectations, Woodie Woodie will be the main water source for the project. The Woodie Woodie option is fully discussed in this document.

In either case, a borefield will be established in the De Grey alluvium to supply between 4 – 8 GL/year. This supply will be pumped at the higher rate when used as the initial water source during construction and while the main source is commissioned and will also provide water during periods of peak water demand.

2.2.8 Power Supply
Options considered for power generation include reticulation from the Port Hedland Power Station operated by Alinta Energy, an on-site natural gas power station (using gas turbines or reciprocating engines), an LNG fired power station and a diesel fired power station. A power station on-site, using a series of large natural gas powered reciprocating engines was considered the most efficient method of power supply for the project, based on environmental and economic considerations.

2.2.9 Workforce Access to Site
Two main options were considered for the provision of an operational workforce: (i) residential; and (ii) fly in-fly out, or a combination of the two. The remote location of the mine, limited infrastructure at the nearest town being Marble Bar and the currently restricted labour market in Australia were considered prohibitive for a residential workforce. Also, the rivers and creeks between Marble Bar and the project area are impassable when in flood.

After considering the various issues and constraints pertaining to each alternative, a FIFO operation for the majority of the workforce was considered to be the most viable option. Notwithstanding this, the project will provide opportunities to employ locally based personnel. It is likely that there will be a small component of residential personnel based in Marble Bar and surrounding areas who will drive in and out of site.
2.2.10 Airstrip Location
A number of options were considered for location of the airstrip that is required to service the mining operation. The existing Bamboo Creek airstrip was deemed unsuitable. This was predominantly due to an inability to extend the airstrip to the necessary length for the required aircraft without impacting on adjacent creek systems. No other airstrips in the locality were suitable for upgrading to the required standard. With existing airstrips ruled out, the decision for selecting the proposed location was based on a suitable length (>2.2km) of relatively level ground; proximity to the campsite; and allowance for safe access during wet weather conditions. Distance from the Talga Ridge to allow for safe takeoff and landing precluded a site closer to the ridge.

2.2.11 Pit Closure
A number of closure options were considered for the pit. The options considered were:

- Leave open pit and allow water level to equilibrate well below the surface level.
- Leave open pit and return the creek to the original route, resulting in the pit filling and being part of the long term surface water catchment.
- Backfilling the pit.

Backfilling of the pit was discounted due to the high economic cost; the sterilisation of a potential future molybdenum resource; and the environmental costs associated with the backfilling process.

Incorporating the pit in the surface water catchment is considered the best long term option, though detailed scientific investigations will be required before the company would proceed with this approach. The development and ongoing review of the mine closure plan will lead to investigation of options for returning the creek to its original course.

The option selected for closure is to leave the pit open. This will provide a central sink and secure containment of any leachate from the waste landforms. Assessments and management strategies outlined in Section 8 are designed to ensure management during operations will be relevant and complementary to managing many of the closure environmental issues. As is normal practise for pit closure in Western Australia safety bunds will be installed, signage erected and other closure actions will be developed. More detail on developing the mine closure plan is outlined in Section 9 and a Conceptual Closure Management Plan (CCMP) is available in Appendix F as part of the Environmental Management Programme.

2.3 No Development Option
The “no development” option would result in the loss of opportunity for Australia to become a significant contributor to the world molybdenum market. The Spinifex Ridge Project will create employment opportunities and economic benefit, particularly within the region. There is also the possibility of future downstream processing of the molybdenum concentrate into molybdenum oxide and ferro-molybdenum products.
The molybdenum market is expected to continue to grow in the foreseeable future, and should this project not proceed, then the emerging gap will be filled by foreign producers, as the Spinifex Ridge project is the only major molybdenum project within Australia with the potential to become operational in the next 3 years.

Should the Spinifex Ridge Project not proceed, the economic benefits to the region, Western Australia and Australia would be lost.