ATLAS-CAMPASPE
Mineral Sands Project
ENVIRONMENTAL IMPACT STATEMENT

SECTION 6 〉 PLANNING FRAMEWORK AND PROJECT JUSTIFICATION

CRISTAL Resource Strategies

TABLE OF CONTENTS

LIST OF TABLES

6 PLANNING FRAMEWORK AND PROJECT JUSTIFICATION

6.1 EXISTING APPROVALS AND REGULATORY CONTROLS

A general description of the approvals history is provided in Section 2.1. Key approvals and documentation relating to the existing Cristal Mining operations and the Project are discussed below.

Ginkgo Mine:

- Ginkgo Mine Development Consent (DA 251-09-01) issued under Part 4 of the EP&A Act and approved by the NSW Minister for Planning on 30 January 2002, as modified.
- Environmental Protection Licence (EPL) 12264 issued 23 December 2004 under the PoEO Act.

Snapper Mine:

- Snapper Mine PA 06_0168 issued under Part 3A of the EP&A Act and approved by the NSW Minister for Planning in August 2007, as modified.
- EPL 12799 issued 21 December 2007 under the PoEO Act.

Broken Hill MSP:

- The MSP Development Consent (DA 345-11-01) issued under Part 4 of the EP&A Act and approved by the NSW Minister for Planning on 27 May 2002, as modified.
- EPL 12314 issued 2 May 2005 under the PoEO Act.

The Project*:*

- Exploration activities at the Atlas and Campaspe deposits are undertaken in accordance with EL 5359 granted under the NSW *Mining Act, 1992* on 9 October 1997.

Cristal Mining also conducts exploration activities in the region in accordance with relevant ELs (i.e. ELs 5362, 5664, 5665, 6001, 6430, 6638, 6744, 6967, 7161, 7448, and 7449) and associated environmental approvals from the DRE.

6.2 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979

The EP&A Act and EP&A Regulation provide the planning and environmental assessment framework for NSW. Development Consent for the Project will be sought under the State Significant Development provisions (Division 4.1) of Part 4 of the EP&A Act.

6.2.1 Permissibility and Requirement for Development Consent

Section 89E of the EP&A Act provides that Development Consent may not be granted under Division 4.1 of Part 4, if the development is wholly prohibited by an environmental planning instrument.

The Atlas-Campaspe Mine and proposed roadworks on the mineral concentrate transport route are located within the Balranald LGA. Under the Balranald LEP the relevant lands are zoned RU1 (Primary Production). The Project may be carried out in Zone RU1 (Primary Production) with Development Consent (Attachment 6).

The Ivanhoe Rail Facility and associated infrastructure is located within the Central Darling LGA. Under the Central Darling LEP the relevant lands are zoned 1(a) (Rural). The Project may be carried out zone 1(a) Rural with Development Consent (Attachment 6).

6.2.2 Application of State Significant Development (Division 4.1) of Part 4 of the Environmental Planning and Assessment Act, 1979

Section 89C of the EP&A Act outlines the requirements for development to be considered State Significant Development:

> *(1) For the purposes of this Act, **State significant development** is development that is declared under this section to be State significant development.*
>
> *(2) A State environmental planning policy may declare any development, or any class or description of development, to be State significant development.*
>
> *...*

Clause 8 of the *State Environmental Planning Policy (State and Regional Development) 2011* (State and Regional Development SEPP) provides:

> *(1) Development is declared to be State significant development for the purposes of the Act if:*
>
> *(a) the development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act, and*
>
> *(b) the development is specified in Schedule 1 or 2.*

The Project would not be permissible without Development Consent (Section 6.2.1). Clause 5 of Schedule 1 of the State and Regional Development SEPP states:

> *(1) Development for the purpose of mining that:*
>
> *(a) is coal or mineral sands mining, or...*
>
> *...*
>
> *(3) Development for the purpose of mining related works (including primary processing plants or facilities for storage, loading or transporting any mineral, ore or waste material) that:*
>
> *(a) is ancillary to or an extension of another State significant development project, or*
>
> *...*

The Atlas-Campaspe Mine represents development for the purpose of mineral sands mining (Section 2), and the Ivanhoe Rail Facility comprises development for the purpose of mining related works. As the Project requires Development Consent, it therefore comprises State Significant Development for the purposes of the EP&A Act.

In accordance with section 89D of the EP&A Act, the NSW Minister for Planning and Infrastructure (the Minister) is the consent authority for the Project.

The Minister will determine the Development Application under section 89E(1) of the EP&A Act by granting consent to the application with such modifications of the proposed development or on such conditions as the Minister may determine, or refusing consent to the application.

6.2.3 Approvals and Authorisations that are not Required for State Significant Development

Section 89J(1) of the EP&A Act provides the authorisations that are not required for a State Significant Development under Division 4.1 of Part 4 of the Act. These authorisations are those ordinarily required under the following provisions:

- The concurrence under Part 3 of the *Coastal Protection Act, 1979* of the Minister administering that Part of that Act.
- A permit under section 201, 205 or 219 of the FM Act.
- Division 8 of Part 6, an approval under Part 4, or an excavation permit under section 139, of the *Heritage Act, 1977*.
- An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act, 1974*.
- An authorisation referred to in section 12 of the *Native Vegetation Act, 2003* (or under any Act repealed by that Act) to clear native vegetation or State protected land.
- A bush fire safety authority under section 100B of the *Rural Fires Act, 1997*.
- A water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act, 2000*.

6.2.4 Other Approvals and Legislation that must be Applied Consistently for State Significant Development

Section 89K of the EP&A Act outlines the authorisations that cannot be refused if they are necessary for the carrying out of State Significant Development under Division 4.1. Section 89K further provides that these authorisations must be substantially consistent with the Division 4.1 Development Consent. These authorisations are of the following kind:

- An aquaculture permit under section 144 of the FM Act.
- An approval under section 15 of the *Mine Subsidence Compensation Act, 1961*.
- A mining lease under the *Mining Act, 1992*.
- A production lease under the *Petroleum (Onshore) Act, 1991*.

- An EPL under Chapter 3 of the PoEO Act) (for any of the purposes referred to in section 43 of that Act).
- A consent under section 138 of the *Roads Act, 1993*.
- A licence under the *Pipelines Act, 1967*.

6.2.5 Environmental Impact Statement Required for State Significant Development

Section 78A(8)(a) of the EP&A Act requires that a Development Application for State Significant Development is to be accompanied by an EIS, prepared by or on behalf of the applicant in the form prescribed by the regulations.

Clause 6 of Schedule 2 of the EP&A Regulation describes the required form of an EIS:

> *An environmental impact statement must contain the following information:*
>
> *(a) the name, address and professional qualifications of the person by whom the statement is prepared,*
>
> *(b) the name and address of the responsible person,*
>
> *(c) the address of the land:*
>
> *(i) in respect of which the development application is to be made, or*
>
> *(ii) on which the activity or infrastructure to which the statement relates is to be carried out,*
>
> *(d) a description of the development, activity or infrastructure to which the statement relates,*
>
> *(e) an assessment by the person by whom the statement is prepared of the environmental impact of the development, activity or infrastructure to which the statement relates, dealing with the matters referred to in this Schedule,*
>
> *(f) a declaration by the person by whom the statement is prepared to the effect that:*
>
> *(i) the statement has been prepared in accordance with this Schedule, and*
>
> *(ii) the statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which the statement relates, and*
>
> *(iii) that the information contained in the statement is neither false nor misleading.*

This EIS contains the information outlined above including the address of relevant lands (Attachment 2) and the name, address, professional qualifications and declaration of the person by whom the EIS has been prepared in consideration of the requirements of Schedule 2 of the EP&A Regulation (refer inside front cover of Volume 1).

Clause 7(1) of Schedule 2 of the EP&A Regulation outlines the required content of the EIS. A reconciliation of each requirement outlined in clause 7(1) with the relevant section in this EIS has been provided in Table 1-4.

Clause 7(2) of Schedule 2 of the EP&A Regulation provides that the requirements outlined in subclause (1) (Table 1-4) are subject to the environmental assessment requirements that relate to the EIS.

The Project DGRs setting out the environmental assessment requirements in accordance with clause 3, Schedule 2 of the EP&A Regulation are provided in Attachment 1 and summarised in Table 1-3.

6.2.6 Documents to Accompany Development Application

Subclauses 2(1) to 2(3) of Schedule 1 of the EP&A Regulation outline the documentation that is required to accompany a Development Application. This EIS satisfies relevant documentation requirements outlined by these subclauses.

6.2.7 Public Notification of the Development Application

Part 6 of the EP&A Regulation outlines procedures relating to Development Applications. In accordance with clause 49(1) of the EP&A Regulation, a Development Application may be made by the owner of the land to which the Development Application relates, or by any other person, with the consent in writing of the owner of that land. Alternatively, clause 49(2) of the EP&A Regulation provides:

> *Subclause (1) (b) does not require the consent in writing of the owner of the land for a development application made by a public authority or for a development application for public notification development if the applicant instead gives notice of the application:*
>
> *(a) by written notice to the owner of the land before the application is made, or*
>
> *(b) by advertisement published in a newspaper circulating in the area in which the development is to be carried out no later than 14 days after the application is made.*

For the purposes of clause 49, clause 49(5) defines public notification development as:

> ***public notification development*** *means:*
>
> *(i) State significant development set out in clause 5 (Mining) or 6 (Petroleum (oil and gas)) of Schedule 1 to State Environmental Planning Policy (State and Regional Development) 2011 but it does not include development to the extent that it is carried out on land that is a state conservation area reserved under the National Parks and Wildlife Act 1974, or*
>
> *…*

As the Project falls within clause 5 of Schedule 1 of the State and Regional Development SEPP (Section 6.2.2), the Project is a public notification development. Therefore, the Development Application will be notified in accordance with clause 49(2) of the EP&A Regulation.

6.2.8 Part 4, Division 6 Development Contributions

Planning Agreements

Part 4, Division 6, Subdivision 2, section 93F of the EP&A Act outlines provisions relating to voluntary agreements between a planning authority and a proponent/developer (including a proponent who has made, or proposes to make, a Development Application) under which the developer is required to dedicate land free of cost, pay a monetary contribution, or provide any other material public benefit, or combination of them, to be used for or applied towards a public purpose.

Section 93F(2) indicates that a public purpose includes any of the following:

- the provision of (or the recoupment of the cost of providing) public amenities or public services, affordable housing, transport or other infrastructure relating to land;
- the funding of recurrent expenditure relating to the provision of public amenities or public services, affordable housing or transport or other infrastructure;
- the monitoring of the planning impacts of development; and
- the conservation or enhancement of the natural environment.

Section 93F(3) indicates the required content of a planning agreement including:

- a description of the land to which the agreement applies;
- a description of the development to which the agreement applies;
- the nature and extent of the provision to be made, the time or times by which the provision is to be made and the manner by which the provision is to be made;
- whether the agreement excludes (wholly or in part) or does not exclude the application of section 94, 94A or 94EF to the development;
- if the agreement does not exclude the application of section 94 to the development, whether benefits under the agreement are or are not to be taken into consideration in determining a development contribution under section 94;
- a mechanism for the resolution of disputes under the agreement; and
- the enforcement of the agreement by a suitable means, such as the provision of a bond or guarantee, in the event of a breach of the agreement by the developer.

Section 93G indicates the public notice requirements and outlines that the period for inspection by the public must be a period of not less than 28 days. Section 93G further indicates that the regulations may provide further public notice requirements.

Clause 25D of the EP&A Regulation provides additional detail relating to the public notice of planning agreements as follows:

> *(1) If a planning authority proposes to enter into a planning agreement, or an agreement to amend or revoke a planning agreement, in connection with a development application or a project application, the planning authority is to ensure that public notice of the proposed agreement, amendment or revocation is given:*
>
> *(a) in the case of an agreement in connection with a development application:*
>
> *(i) if practicable, as part of and contemporaneously with, and in the same manner as, any notice of the development application that is required to be given by a consent authority for a development application by or under the Act, or*

(ii) if it is not practicable for notice to be given contemporaneously, as soon as possible after any notice of the development application that is required to be given by a consent authority for a development application by or under the Act and in the manner determined by the planning authorities that are parties to the agreement, or

...

It is expected that voluntary planning agreements would either be negotiated prior to determination of the Project, or would be required by the Project Development Consent. Any such planning agreements would be negotiated by the DP&I, Cristal Mining, the BSC and the CDSC.

Local Infrastructure Contributions

Subject to any exclusions or inclusions with respect to section 94 in any Project voluntary planning agreement (refer to above discussion), the Minister may grant Development Consent to the Project subject to a condition requiring contributions under either section 94 or section 94A of the EP&A Act.

Contributions under section 94 can only be required in circumstances where the development will or is likely to require the provision of, or increase the demand for, public amenities or services within the area.

Section 94B(2) provides that where the consent authority is not a council (as is the case for the Project), the consent authority may impose a condition under section 94 or section 94A that is not authorised by or determined in accordance with an applicable contributions plan, as long as the consent authority has regard to the contributions plan that applies to the whole or part of the area in which the development is to be carried out.

The Atlas-Campaspe Mine is located within the Balranald LGA, and the Ivanhoe Rail Facility is located within the Central Darling LGA. The BSC and the CDSC do not have section 94 Development Contributions Plans currently in effect.

In accordance with section 94C of the EP&A Act, a condition may be imposed under section 94 or section 94A for the benefit (or partly for the benefit) of an area that adjoins the Balranald or Central Darling LGAs.

6.3 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT, 1999

Under the EPBC Act, a "controlled action" is defined as a proposal that is likely to have an impact on a matter of national environmental significance. Proposals that are, or may be, a controlled action, are required to be referred to the Commonwealth Minister for a determination as to whether or not the action is a controlled action.

The proposed action to commence mineral sands mining and associated operations at the Atlas-Campaspe Mine was referred to the Commonwealth Minister in June 2012.

A delegate of the Commonwealth Minister decided on 14 September 2012, that the proposed development is a "controlled action" for the purposes of the EPBC Act, as a result of potential impacts on the following controlling provisions under Chapter 2, Part 3 of the EPBC Act:

- World Heritage properties (sections 12 and 15A).
- National Heritage places (sections 15B and 15C).
- Listed threatened species and communities (sections 18 and 18A).
- Listed migratory species (sections 20 and 20A).

6.4 OTHER APPLICABLE STATUTORY APPROVALS

6.4.1 NSW Approvals

In addition to the EP&A Act, the following NSW Acts may be applicable to the Project:

- *Contaminated Land Management Act, 1997;*
- *Crown Lands Act, 1989;*
- *Dangerous Goods (Road and Rail Transport) Act, 2008;*
- *Electricity Supply Act, 1995*;
- *Heritage Act, 1977;*
- *Mining Act, 1992;*
- *National Parks and Wildlife Act, 1974;*
- *Native Vegetation Act, 2003;*
- *Noxious Weeds Act, 1993;*
- PoEO Act;

- *Rail Safety Act, 2008;*
- *Roads Act, 1993;*
- TSC Act;
- *Water Act, 1912;*
- *Water Management Act, 2000;*
- *Western Lands Act, 1901; and*
- *Work Health and Safety Act, 2011*.

Relevant approvals and licences required for the Project under these Acts would be obtained for the Project as required.

For example, the Project would require a mining lease under the *Mining Act, 1992* and EPL(s) under the PoEO Act.

Further detail on the likely Project requirements under the *Crown Lands Act, 1989, Mining Act, 1992*, PoEO Act, *Roads Act, 1993,* and the *Western Lands Act, 1901* are provided in the sub-sections below.

Water use and water management works and appropriate licences under the *Water Management Act, 2000* and the *Water Act, 1912* would be sought and obtained for the Project in consultation with the NOW (Attachment 5).

Crown Lands Act, 1989

The majority of the Atlas-Campaspe Mine infrastructure would be located within MLA 1 (Figures 2-4 to 2-8).

Subject to the written consent of the affected lessee, under the *Crown Lands Act, 1989* Crown Lands Licences from the DP&I Catchment and Lands Division may be required to authorise occupation over any ancillary Project infrastructure that is not located within MLA 1.

Crown Lands Licences may also be required to authorise occupation on crown land outside of Western Lands Leases (e.g. unformed roads or 'paper roads').

Mining Act, 1992

Under the *Mining Act, 1992*, environmental protection and rehabilitation are regulated by conditions of mining leases, including requirements for the submission of a MOP prior to the commencement of operations, and subsequent Annual Environmental Management Reports (AEMRs) (or Annual Reviews).

All mining operations must be carried out in accordance with the MOP which has been prepared to the satisfaction of DRE. The MOP describes site activities and the progress toward environmental and rehabilitation outcomes required under mining lease conditions and Development Consent under the EP&A Act and other approvals (DoP, 2008).

The MOP, in addition to the environmental conditions of other approvals, forms the basis for ongoing adaptive management of mining operations and their environmental impacts (DoP, 2008). The MOP must apply best available practice and technology to mine operations and include strategies to control identified environmental risks (DoP, 2008).

AEMRs must contain a review and forecast of performance for the preceding and ensuing 12 months in relation to the following (DoP, 2008):

- compliance with the accepted MOP;
- Development Consent under the EP&A Act requirements and conditions;
- licences and approvals from the OEH and NOW;
- any other statutory environmental requirements;
- details of any variations to environmental approvals applicable to the lease area; and
- where relevant, progress towards final rehabilitation objectives.

Collectively, the MOP and AEMR constitute the MREMP (NSW Department of Primary Industries-Mineral Resources [DPI-MR], 2006) which has been developed by the DRE. The MREMP is a framework that aims to facilitate the development of mining in NSW in a manner such that the environment is protected, the resources are efficiently extracted, operations are safe and rehabilitation is designed to promote a satisfactory outcome (DPI-MR, 2006).

There are provisions of the *Mining Amendment Act, 2008* which would amend the *Mining Act, 1992* such that the MREMP would be replaced by the submission of a REMP.

Until the commencement of the REMP provisions, the structure and content of the Project MOP and AEMR would be developed in accordance with the *Guidelines to the Mining, Rehabilitation and Environmental Management Process* (DPI-MR, 2006) and through consultation with various regulatory and advisory agencies including the DRE, EPA, OEH, DP&I, the BSC and the CDSC.

Mining Tenements

Cristal Mining will apply for a mining lease with the DRE (MLA 1) (Figure 1-1), for the mining of mineral sands as required.

Protection of the Environment Operations Act, 1997

Consistent with the Ginkgo and Snapper Mines it is anticipated that the Atlas-Campaspe Mine would require an EPL for the following scheduled activities 'Crushing, Grinding or Separating' 'Metallurgical activities' and 'Mining for Minerals'.

In addition, it is anticipated that the Ivanhoe Rail Facility would require licensing for the following scheduled activities 'waste storage' as from approximately Year 12 of the Project, MSP process waste containers containing 'restricted solid waste' (transported via the Orange – Broken Hill railway) would be unloaded from trains at the Ivanhoe Rail Facility, and temporarily held in a designated area prior to loading onto haulage vehicles for the return trip to the Atlas-Campaspe Mine, where it would be disposed with sand residues (Section 2.8.3).

Clause 45 of the PoEO Act outlines matters to be taken into consideration (as are of relevance) by the relevant regulatory authority with respect to licensing functions.

Cristal Mining would apply for EPL(s) for the Atlas-Campaspe Mine and the Ivanhoe Rail Facility. Under section 89K(1)(e) of the EP&A Act, if the Project is approved, an EPL cannot be refused and is to be substantially consistent with the Development Consent (Section 6.2.4).

Roads Act, 1993

The Project involves the following public road related construction activities (Section 2 and Figures 2-9 and 2-10):

- upgrade of the intersection at Hatfield-The Vale Road and Balranald-Ivanhoe Road;
- road widening and associated drainage works (up to approximately 23 m total width) along a 14.5 km section of Hatfield-The Vale Road to accommodate an unsealed two-lane road;
- new intersections at Hatfield-The Vale Road and Magenta Road;
- a new unsealed two-lane road formation (approximately 2 km long and up to approximately 23 m total width) between the new intersections at Hatfield-The Vale Road and Magenta Road;
- road widening and associated drainage works (up to approximately 23 m total width) along two sections (approximately 2 km and 1 km, respectively) of Magenta Road to accommodate an unsealed two-lane road;
- sealing and associated drainage works (up to approximately 21 m total width) along a 2 km section of Magenta Road to accommodate a two-lane road;
- new intersections at Magenta Road and Boree Plains-Gol Gol Road;
- a new unsealed two-lane road formation (approximately 2 km and up to approximately 23 m total width) between the new intersections at Magenta Road and Boree Plains-Gol Gol Road;
- road widening and associated drainage works (up to approximately 23 m total width) along a 5.5 km section of Boree Plains-Gol Gol Road to accommodate an unsealed two-lane road;
- road widening and associated drainage works (up to approximately 23 m total width) along a 8 km section of Link Road to accommodate an unsealed two-lane road;
- a new intersection at Link Road and the Atlas-Campaspe Mine site access road; and
- a new intersection with Balranald-Ivanhoe Road for the Ivanhoe Rail Facility site access road.

If the Project is approved, Cristal Mining would apply for the necessary consents under section 138 of the *Roads Act, 1993* for these works. In accordance with section 89K(1)(f) of the EP&A Act, if the Project is approved, consent under section 138 of the *Roads Act, 1993* cannot be refused and is to be substantially consistent with the Development Consent (Section 6.2.4).

Western Lands Act, 1901

The primary purpose of the *Western Lands Act, 1901* is the appropriate administration and management of the environment of the Western Division of NSW. The Project is located on a number of Western Lands Leases (Table 1-2). These Western Lands Leases would continue to be administered by the DPI - CLD.

6.4.2 Commonwealth Approvals

The relevance of the EPBC Act to the Project is discussed in Section 6.3. In addition to the EPBC Act, the following Commonwealth Acts may be applicable to the Project:

- *Clean Energy Act, 2011;*
- *Energy Efficiency Opportunities Act, 2006* (EEO Act)*;*
- *National Greenhouse and Energy Reporting Act, 2007* (NGER Act)*;* and
- *Water Act, 2007.*

The potential relevance of these Acts to the Project is described in the sub-sections below.

Clean Energy Act, 2011

The *Clean Energy Act, 2011* establishes a mechanism to deal with climate change by encouraging the use of clean energy, where corporations must purchase carbon units for their direct greenhouse gas emissions (i.e. per tonne of CO_2-e emitted). The Act commenced on 2 April 2012.

The *Clean Energy Act, 2011* makes the purchase of carbon units mandatory for corporations that control facilities with greenhouse emissions above specific thresholds. The thresholds would only be applicable to greenhouse gas emissions from sources covered under the *Clean Energy Act, 2011*.

The objects of the *Clean Energy Act, 2011* are outlines in clause 3 as follows:

(a) to give effect to Australia's obligations under:

(i) the Climate Change Convention; and

(ii) the Kyoto Protocol;

(b) to support the development of an effective global response to climate change, consistent with Australia's national interest in ensuring that average global temperatures increase by not more than 2 degrees Celsius above pre-industrial levels;

(c) to:

(i) take action directed towards meeting Australia's long-term target of reducing Australia's net greenhouse gas emissions to 80% below 2000 levels by 2050; and

(ii) take that action in a flexible and cost-effective way;

(d) to put a price on greenhouse gas emissions in a way that:

(i) encourages investment in clean energy; and

(ii) supports jobs and competitiveness in the economy; and

(iii) supports Australia's economic growth while reducing pollution.

It is not expected that the Project would trigger the facility threshold for the pricing mechanisms detailed in the *Clean Energy Act, 2011*.

Energy Efficiency Opportunities Act, 2006

The EEO Act requires large energy using corporations to assess and improve their energy efficiency, and publicly report the results of their energy efficiency assessment. Corporations that exceed mandatory participation thresholds must register and prepare assessment plans that meet the requirements specified in the *Energy Efficiency Opportunities Regulation, 2006*.

Clause 3 of the EEO Act outlines the object of the Act follows:

(1) The object of this Act is to improve the identification and evaluation of energy efficiency opportunities by large energy using businesses and, as a result, to encourage implementation of cost effective energy efficiency opportunities.

(2) In order to achieve its object, this Act requires large energy using businesses:

(a) to undertake an assessment of their energy efficiency opportunities to a minimum standard in order to improve the way in which those opportunities are identified and evaluated; and

(b) to report publicly on the outcomes of that assessment in order to demonstrate to the community that those businesses are effectively managing their energy.

Cristal Mining is a wholly owned subsidiary of Cristal Australia Pty Ltd and is a registered participant under the EEO Act. As such, Cristal Mining will assess energy usage from all aspects of its operations, and publically report the results of energy efficiency assessments.

National Greenhouse and Energy Reporting Act, 2007

The NGER Act introduced a single national reporting framework for the reporting and dissemination of corporations' greenhouse gas emissions and energy use. The NGER Act makes registration and reporting mandatory for corporations whose energy production, energy use or greenhouse gas emissions meet specified thresholds.

Clause 3 of the NGER Act defines the object of the Act:

> *(1) The first object of this Act is to introduce a single national reporting framework for the reporting and dissemination of information related to greenhouse gas emissions, greenhouse gas projects, energy consumption and energy production of corporations to:*
>
> *(a) underpin the introduction of an emissions trading scheme in the future; and*
>
> *(b) inform government policy formulation and the Australian public; and*
>
> *(c) meet Australia's international reporting obligations; and*
>
> *(d) assist Commonwealth, State and Territory government programs and activities; and*
>
> *(e) avoid the duplication of similar reporting requirements in the States and Territories.*
>
> *(2) The second object of this Act is to underpin the Clean Energy Act 2011 by imposing various registration reporting and record-keeping requirements.*

Cristal Mining as a subsidiary of Cristal Australia Pty Ltd triggers the NGER Act reporting threshold, and accordingly, reports all energy use and greenhouse gas emissions from its activities.

Water Act, 2007

The NSW *Water (Commonwealth Powers) Act, 2008* referred a number of powers, functions and duties in relation to the management of water within the Murray-Darling basin to the Commonwealth, amended the NSW *Water Management Act, 2000* and repealed the NSW *Murray-Darling Basin Act, 1992*.

An object of the Commonwealth *Water Act, 2007* (among others) is to enable the Commonwealth, in conjunction with the Murray-Darling basin States, to manage the Murray-Darling basin water resources in the national interest.

As provided in section 250B of the Commonwealth *Water Act, 2007*:

> *(1) The Commonwealth water legislation is not intended to exclude or limit the concurrent operation of any law of a State.*

Part 9 of the Commonwealth *Water Act, 2007* establishes the Murray-Darling Basin Authority. The role of the Murray-Darling Basin Authority includes (but is not limited to) (Murray-Darling Basin Authority, 2011):

- preparing the Basin Plan for adoption by the Commonwealth Minister for Water, including setting sustainable limits on water that can be taken from surface water and groundwater systems across the Murray-Darling basin;
- advising the minister on the accreditation of State water resource plans (including water sharing plans developed under the NSW *Water Management Act, 2000*); and
- managing water sharing between the States.

The proposed Basin Plan was released on 28 November 2011. Submissions on the Basin Plan closed April 16 2012, and the final Basin Plan will be considered by Parliament later this year (SEWPaC, 2012e).

Following implementation of the Basin Plan, water sharing plans under the NSW *Water Management Act, 2000* will be amended to be consistent with the Basin Plan.

In addition, the Commonwealth Minister may make water charge and water market rules pursuant to Part 4 of the Commonwealth *Water Act, 2007.*

As described in Attachment 5, the Project would be operated in accordance with the relevant provisions of applicable NSW water sharing plans.

6.5 ENVIRONMENTAL PLANNING INSTRUMENTS

Section 79C(1)(a) of the EP&A Act requires the Minister to take into consideration the provisions of any environmental planning instrument in determination of the Project.

6.5.1 State Environmental Planning Policies

The following State Environmental Planning Policies (SEPPs) may be potentially relevant to the Project:

- State and Regional Development SEPP;
- *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007;*
- *State Environmental Planning Policy (Infrastructure) 2007*;
- SEPP 33*;*
- SEPP 44; and
- SEPP 55*.*

A discussion of relevant SEPPs is provided in Attachment 6.

6.5.2 Local Environmental Plans

The Development Application area falls within the Balranald and Central Darling LGAs (Figure 1-1). The permissibility of the Project under the relevant Local Environmental Plans and consideration of relevant objectives and special provisions is provided in Attachment 6.

6.6 STRATEGIC PLANNING DOCUMENTS

Consideration of the applicability of Development Control Plans and other BSC and CDSC strategic planning documents is provided in Attachment 6.

6.7 PROVISIONS FOR THE PREVENTION, MINIMISATION AND MANAGEMENT OF RELEVANT IMPACTS

This sub-section discusses how the NSW planning framework provides for the prevention, minimisation and management of relevant impacts, in accordance with the Commonwealth requirements in the DGRs (Attachment 1).

This EIS includes consideration of the Project's consistency with the objectives of the EP&A Act (Section 6.9.5) and relevant environmental planning instruments (Attachment 6).

If the Minister grants Development Consent for the Project, it would include conditions and requirements for the operation of the Project in order to prevent, minimise and manage potential impacts. Cristal Mining would be required to ensure the Project is operated in accordance with the environmental monitoring and management commitments outlined in this EIS.

Environmental management and monitoring plans through the life of the Project are envisaged to be included as conditions for the Development Consent. Relevant government authorities would review the Project operations, as part of the management plan development and approvals process.

It is anticipated that, consistent with contemporary major mining projects under the EP&A Act, the Minister may include a condition in the Development Consent (under section 89E of the EP&A Act) with a requirement for regular independent environmental audits of the Project, with the results of the audit being provided to the Director-General of the DP&I.

In addition, as described in Section 6.4.1, under the *Mining Act, 1992*, environmental protection and rehabilitation are regulated by conditions included in all mining leases, including requirements for the submission of a MOP and subsequent AEMR/Annual Review (or REMP following the commencement of relevant provisions of the *Mining Amendment Act, 2008*).

6.8 MONITORING, ENFORCEMENT AND REVIEW PROCEDURES

In accordance with the Commonwealth requirements in the DGRs (Attachment 1), this sub-section provides a description of the monitoring, enforcement and review procedures that may apply to the Project.

At the commencement of Part 3A of the EP&A Act, the monitoring, compliance and enforcement provisions of the EP&A Act were strengthened, including additional powers to gather evidence, issue orders or notices to remedy or restrain breaches of Project Approvals or the EP&A Act, and to require monitoring and environmental audits and the provision of evidence of compliance (NSW Department of Infrastructure, Planning and Natural Resources, 2005). While Part 3A of the EP&A Act has been repealed, these strengthened monitoring, compliance and enforcement provisions continue to be in force and now apply to approved State Significant Development projects where relevant.

The DP&I's compliance teams conduct inspections and audits of approved projects, respond to reports and complaints received from other NSW government agencies, local councils and members of the public, investigate potential breaches and carry out enforcement action where breaches are confirmed (DP&I, 2012).

Enforcement action may include negotiated outcomes, warning letters, penalty notices and criminal prosecutions. DP&I has published a compliance policy and associated Breach Management, Prosecution and Penalty Notice guidelines to assist authorised officers in exercising their powers (DP&I, 2012).

As discussed above, it is anticipated that the Minister may include a condition in the Development Consent with a requirement for regular independent environmental audits of the Project (Section 6.7).

Cristal Mining would prepare AEMRs/Annual Reviews for the Project in accordance with the conditions of the mining lease (Section 6.4.1), which would be provided for review by relevant government agencies. DRE also monitors mine sites through audits and inspections to ensure compliance with title conditions and MOPs (DoP, 2008). These audits and inspections may be conducted in conjunction and co-operation with other NSW government agencies (DoP, 2008).

The rehabilitation and decommissioning of the Project would be completed to the satisfaction of the DRE in accordance with the REMP framework under the *Mining Act, 1992* (Section 5).

6.9 PROJECT JUSTIFICATION

In accordance with the DGRs (Attachment 1), a description of the need for and objectives of the Project and a justification of the carrying out of the Project in the manner proposed is provided below. This is provided having regard to biophysical, economic and social considerations, including consideration of alternatives, the principles of ESD and the consistency of the Project with the objects of the EP&A Act.

6.9.1 Need For and Objectives of the Project

The Project involves the construction and operation of a mineral sands mine and processing activities at the Atlas-Campaspe Mine, and the construction and operation of the Ivanhoe Rail Facility. The proposed life of the Project is approximately 20 years, commencing approximately 1 July 2013 or upon grant of all required approvals.

At full development, the proposed Project operational workforce would be approximately 200 people, including a mixture of Cristal Mining employees and contractors. An additional construction workforce would be required, averaging approximately 150 personnel during the initial construction phase, with a short-term peak construction workforce of up to 300 personnel for approximately 2 to 3 months.

A summary of the Project environmental mitigation, management, monitoring and reporting measures is provided in Section 7.

The Project would involve the use of conventional mobile equipment to mine and place mineral sands ore into DMUs at a maximum ore production rate of up to 7.2 Mtpa, with approximately 109 Mt of mineral sands ore extracted over the life of the Project (Section 2.3.1).

The Project would produce ilmenite-rich, leucoxene-rich and non-magnetic (rutile-rich and zircon-rich) concentrates for further separation at the MSP to produce valuable minerals including ilmenite, leucoxene, rutile and zircon.

Ilmenite, leucoxene and rutile are sources of titanium dioxide. Demand for titanium dioxide is driven by the pigment, plastic, printing, inks, food colourings, fabric delustering agents, sunscreens, cosmetics and paper industries.

Rutile is used to make titanium metal which is used in the manufacture of aircraft components, golf clubs, sports equipment, surgical implants and water desalinisation plants.

Zircon is a key raw metal that is often used in the production of floor tiles, glass and steel refractories and metal castings.

Project mineral production would contribute to NSW export income, State royalties and State and Commonwealth tax revenue, as well as manufacturing in Australia and other countries that purchase these minerals.

The Socio-Economic Assessment (Appendix I) indicates that the operation of the Project is likely to result in an average annual stimulus of up to approximately 229 direct and indirect jobs in the local region, and some 643 direct and indirect jobs in NSW. The Project would also make contributions to regional and NSW output or business turnover and household income (Section 4.16 and Appendix I).

The benefit cost analysis in Appendix I indicates a net benefit of between $251M and $345M would be forgone if the Project is not implemented.

6.9.2 Consideration of Project Alternatives

A number of alternatives to the Project assessed in this EIS were considered by Cristal Mining in the development of the Project description. In accordance with clause 7 of Schedule 2 of the EP&A Regulation (Table 1-4), an analysis of the feasible alternatives to the Project considered by Cristal Mining is provided below.

Project Location

The location of the Project is determined by the presence of mineral sand deposits able to be economically mined. The Project involves mining of the Atlas and Campaspe mineral sands deposits.

Cristal has undertaken extensive exploration and resource assessment testwork in the region and the proposed biodiversity offset area is located in an area with limited or no resource potential.

The continued development of mineral sands resources in close proximity to Cristal Mining's existing operations and facilities allows for the maximisation of the use of existing infrastructure and associated returns on existing financial investments, particularly the beneficial use of the existing MSP (Section 2).

Mining Method

Mineral sands deposits are typically mined in one of two ways:

- dry mining with conventional mining equipment such as dozers, scrapers, front end loaders and haul trucks; or
- dredge (wet) mining where groundwater levels and site water supply are conducive to the formation of a dredge pond within the orebody.

The location of the Project mineral deposit relative to the water table means that the resource is amenable to conventional mining methods (i.e. excavators, dozers, front end loaders and haul trucks). A small section of the orebody is located below the existing groundwater table and would be amenable to dredge mining, however, the remainder of the orebody is not, and hence the capital cost of a dredge could not be justified.

The use of dragline dry mining methods is also not justified at the Atlas-Campaspe Mine given the scale of the operation and the thickness of overburden to be moved.

Mineral Processing

A component of the Project is the provision of WHIMS circuits to separate HMC into ilmenite-rich, leucoxene-rich and non-magnetic (containing rutile-rich and zircon-rich) mineral concentrates. The WHIMS circuit relies on magnetic separation and requires no chemical reagents.

There were a number of options with respect to the location of the Atlas-Campaspe Mine WHIMS, including on-site, off-site at the Snapper or Ginkgo Mines (i.e. requiring transport by road to those mines), or off-site at the MSP (requiring provision of WHIMS circuits at the MSP).

Following review of transport requirements, water demand and processing requirements, it was determined that on-site WHIMS circuits (i.e. consistent with the current approach at the Snapper and Ginkgo Mines) is the preferred option for the Project.

There were two potential options for the Atlas-Campaspe Mine with respect to downstream mineral processing:

- using the existing MSP; or
- use of alternative processing facilities located in Victoria or South Australia.

Based on an evaluation of the potential relative costs and risks associated with the option of transporting mineral concentrate to Victoria for processing by a third party compared to use of the Cristal Mining-owned MSP located in Broken Hill, the use of the existing MSP was selected as the preferred option.

Transport of Mineral Concentrate to the MSP

The Project would involve the transport of mineral concentrate via approximately 175 km on the road network from the Atlas-Campaspe Mine to the Ivanhoe Rail Facility for subsequent transport on the rail network to the MSP (Figure 1-1).

Initially a mineral concentrate transport route from the Atlas-Campaspe Mine to the MSP that involved trucking the mineral concentrate via the Ginkgo Mine was considered. However, due to the location of the Atlas and Campaspe deposits and the Mungo National Park (Figure 1-1), no direct haulage route was potentially available to the Ginkgo Mine and extensive road upgrade requirements would have been required.

In addition, this option would significantly increase the mineral concentrate haulage distance on the public road network, and the associated number of road trains units required relative to trucking to the Ivanhoe Rail Facility.

A number of potential road alignments were considered between the Atlas-Campaspe Mine and Balranald-Ivanhoe Road, including potential northern and southern alignment options. In consideration of the feedback from relevant local landholders and the BSC. Cristal Mining adopted the proposed route comprising sections of Link Road, Boree Plains-Gol Gol Road, Magenta Road, Hatfield-The Vale Road and Balranald-Ivanhoe Road.

The location of the mineral concentrate transport route is the preferred option with respect to minimisation of potential environmental impacts by maximising the use of existing local roads, however, would result in slightly longer haulage distances than some other options.

Handling of Mineral Processing Wastes

Up to approximately 50,000 tpa of MSP process waste would be produced from the processing of Project HMC and would require disposal.

As described in Section 2, the additional MSP process wastes produced by the processing of Project HMC would be transported to the Ginkgo and Snapper Mines in accordance with existing/approved operations up until cessation of those operations. From approximately Year 12 of the Project, MSP process waste containers (transported via the Orange – Broken Hill railway) would be unloaded from trains at the Ivanhoe Rail Facility, and temporarily held in a designated area prior to loading onto haulage vehicles for the return trip to Atlas-Campaspe Mine for disposal on-site (Section 2.8.3).

The proposed disposal of the MSP waste materials back into the mine paths of the Snapper, Ginkgo and Atlas-Campaspe Mines is consistent with returning the waste material to the geological host unit from which it came, and therefore is considered to be an environmentally superior option than an alternative such as disposing of the waste material to a licensed waste facility.

The use of the Orange – Broken Hill railway to backload MSP wastes and the use of same truck fleet from Ivanhoe Rail Facility to the Atlas-Campaspe Mine minimises the potential impacts of MSP waste transport on the rail and public road networks.

Production Scale and Rate

The scale and production rate of a mining operation is determined by the optimum recovery of the resource and the optimum production rate that maximises value to the proponent and ongoing viability in consideration of mine planning constraints. Cristal Mining has evaluated the Project at a range of scales. An optimum sized Project was selected with a total ore production of approximately 109 Mt and a mining rate of up to 7.2 Mtpa.

Location of the Ivanhoe Rail Facility

Initially the Ivanhoe Rail Facility was to be located at the existing rail siding in Ivanhoe, to make use of existing infrastructure. However, through the iterative environmental assessment process it was identified that the initial location would give rise to potential operational noise issues that could not be effectively mitigated.

Cristal Mining therefore evaluated a number of alternative rail siding locations that required more substantial development of rail siding infrastructure and associated signalling, but would materially reduce operational noise emissions in Ivanhoe.

As part of this process Cristal Mining evaluated potential locations both north and south of the Orange – Broken Hill railway that are proximal to the Balranald-Ivanhoe Road in consultation with the local landholder to minimise potential impacts on existing agricultural production. The optimal location was identified to the south of the railway, which also minimised the number of Project heavy vehicles crossing the Orange – Broken Hill railway (Figure 2-9).

Power Supply

Irrespective of the potential for construction of an ETL to the Atlas-Campaspe Mine in the future, the mine can be developed using diesel generators as described in Section 2.10.4.

Cristal Mining is evaluating potential power supply options for the Atlas-Campaspe Mine including the potential construction of a 66 kV ETL from Balranald. Engineering and feasibility studies for the ETL would be undertaken to identify a preferred route and, if viable, the ETL would be subject to separate environmental assessment and approvals.

Water Management

During the life of the Project there may be periods when the Atlas-Campaspe Mine generates more water than required for processing and in excess of site storage capacity. A number of methods of disposal of this water are potentially available including evaporation ponds, injecting the water via a borefield or allowing the water to infiltrate from a temporary water storage constructed in the mine path.

Water disposal dams in the mine path (Section 2.9.1) were adopted as the preferred management measure for the disposal of excess extracted water to the groundwater table for the following reasons:

- a surface storage that allows gradual seepage to the water table is a low cost disposal option that does not require ongoing operation of infrastructure such as bores, pipelines and associated ongoing electricity supply that would be required with an injection borefield;
- water disposal dams reduce the potential for evapo-concentration of salts that would occur with evaporation basins; and
- water disposal dams have been operated effectively at the Ginkgo and Snapper Mines to return extracted water to the groundwater table.

Water licensing is described in Attachment 5.

Site Accommodation Camp and Associated Workforce Shifts/Arrangements

Cristal Mining considered having a workforce that came to and from the site each day, however, on evaluation of the relative distance to major regional centres (i.e. where the workforce would be likely to reside), it was considered that daily commuting may pose higher safety risks (i.e. due to driver fatigue). Therefore an on-site accommodation camp was adopted as the preferred option with staff attending at roster start and returning home at the end of the rostered period. Comparison of fly-in/fly-out and drive-in/drive-out costs and benefits by Cristal Mining indicated that drive-in/drive-out was the preferred option for the Project.

Siting of the accommodation camp considered the following:

- Proximity to both deposits and site access from Link Road – the accommodation camp is located between the ore deposits approximately 4 km from Link Road (Figure 2-3).
- Potential impacts to EEC and other vegetation – the location of the accommodation camp is not within any EEC, and no threatened species have been recorded within this area (Figures 13 to 19 of Appendix B of the EIS; Figures 8 and 9 of Appendix A of the EIS). The accommodation camp would disturb the Belah-Rosewood Woodland vegetation community, however, this is not a threatened community under the TSC Act or the EPBC Act (Section 5.1.2 in Appendix A of the EIS). Despite this, 2,560 ha of the Belah-Rosewood Woodland is well represented within the proposed offset area (Section 8.3 in Appendix A of the EIS).
- Ability to maintain wet weather access – the accommodation camp and associated access road is located on a ridgeline and therefore is not expected to experience flooding.
- Minimisation of potentially unsafe interaction with mining fleet – the accommodation camp can be accessed without entering the mining areas (Figure 2-3).

Final Voids

Cristal Mining has considered the option of completely backfilling the final voids to the natural surface level during the mine planning process and determined that the costs associated with this would be at least $120M.

In consideration of the associated costs and absence of long term detrimental environmental impacts associated with the final voids (described below) and the voids' compatibility with the surrounding landscape, Cristal Mining consider partially backfilling the final voids to be reasonable, however complete backfill of the final voids is not reasonable.

At the cessation of mining, a final void would remain at the north-western ends of both the Atlas and Campaspe mine paths (Figures 5-1 and 5-2). As shown on Figures 5-3 and 5-4, the base of the final voids would be up to approximately 10 to 15 m, and 15 to 20 m below natural surface for the Atlas and Campaspe deposits, respectively.

The final voids would be partially backfilled with overburden material pushed down from the void batters and adjacent overburden replacement areas within the mine path (Section 5.3.2). The relatively shallow final voids and batter slopes would result in a final landform that would be compatible with the undulating topography of the region (e.g. the topographical relief within the MLs is approximately 40 m). The final voids would be rehabilitated and revegetated as described in Section 5.

The final voids are predicted to have negligible long-term detrimental impacts to groundwater, surface water, fauna and visual amenity, as summarised below:

- The base of the final voids would remain above the groundwater table (i.e. a permanent water body would not be formed in the void) (Figure 5-4). This would prevent direct evaporation from the groundwater aquifer (Appendix F).
- There would be no detrimental impacts to the surface water drainage systems resulting from the excised catchment areas as there are no defined watercourses near the proposed final voids. The final voids would temporarily pond and therefore not spill as the water would evaporate or infiltrate to the groundwater table (Section 5.3.2).
- No significant impacts are expected to fauna interacting with the final voids as no permanent water source would form in the final voids which may otherwise attract fauna, and the embankments would be sloped so as not to entrap fauna (Section 4.7.2).
- Livestock would be excluded from the final voids until they have stabilised. The disturbance areas associated with the Project would be progressively rehabilitated and revegetated with species characteristic of the vegetation communities proposed to be cleared to provide compatibility with the vegetation of the surrounding landscape and the proposed final land use (i.e. light intensity grazing or nature conservation) (Section 5.3.1).
- The final voids would not be visible from public vantage points, due to their low elevation (i.e. below ground surface level) and the relatively flat topography between the voids and public vantage points (i.e. limited relief) (Section 4.13.2).

No Project

Consideration of the potential consequences of not proceeding with the development of the development of the Project is considered in Section 6.9.6.

6.9.3 Consideration of Climate Change Projections for Australia and NSW

Consideration of the potential implications of climate change involves complex interactions between biophysical, climatic, economic, social, institutional and technological processes.

The Centre for Climate and Energy Solutions (undated) states there is consensus amongst the scientific community that the world is warming largely due to emissions of carbon dioxide and other greenhouse gases from human activities including industrial processes, fossil fuel combustion, and changes in land use, such as deforestation.

Although understanding of climate change has improved markedly over the past several decades, climate change projections are still subject to uncertainties such as (Commonwealth Scientific and Industrial Research Organisation [CSIRO], 2007):

- *Socio-economic uncertainties associated with the current and future activities of humans, which affect the development of greenhouse gas and aerosol emission scenarios.*
- *Uncertainties associated with our understanding of how the Earth's major biophysical systems behave and how they are represented in climate models.*
- *Uncertainties regarding the assignment of probability distributions to regional climate change projections.*
- *Uncertainties associated with projecting climate change at small spatial scales, particularly for coastal and mountainous areas.*

Climate Change Projections for Australia

In Australia, the climate is projected to become warmer and drier. By 2030, warming (for mid-range global emission scenarios) is projected to be about 1°C over most of Australia, with slightly less warming in some coastal areas, and slightly more warming inland (CSIRO, 2007). By 2070, annual average temperatures are projected to increase by 1.8 to 3.4°C with spatial variations similar to those for 2030 (CSIRO, 2007) depending on the emission scenarios examined. Substantial increases in the frequency of days over 35^{o}C, fewer frosts and increased evaporation are likely (CSIRO, 2007).

Sea level is projected to rise by 18 to 59 cm by 2100, or 2 to 7 cm per decade, as a result of global warming (CSIRO, 2007). Sea-level rise will have impacts on soft sediment shorelines and intertidal ecosystems, which will be especially vulnerable to change with additional impacts from extreme events.

The interaction of severe weather events, such as tropical cyclones, with the coastal ocean has the potential to generate severe waves and storm surge, which in turn can have significant impacts on the coast. Warmer ocean waters and sediment transport following heavy rainfall will affect fisheries and coastal ecosystems (CSIRO, 2007).

Climate change may result in changes to rainfall patterns, runoff patterns and river flow. High global emission scenario projections for annual average rainfall in Australia for around 2050 and 2070, relative to 1990 include (CSIRO, 2007):

- in southern areas (-20% to +0% by 2050 and -30% to +5% by 2070);
- in central, eastern and northern areas (-20% to +10% by 2050 and -30% to +20% by 2070);
- decreases are most pronounced in winter and spring;
- some inland and eastern coastal areas may become wetter in summer, and some inland areas may become wetter in autumn; and
- where average rainfall increases, there are predicted to be more extremely wet years and where average rainfall decreases there would be more dry spells.

Climate Change Projections for NSW

Current climate trends indicate an accelerating increase in average annual temperature in NSW, with an annual average temperature rise of approximately 0.1°C per decade during the 1950s to 1980s and an annual average temperature rise of approximately 0.5°C per decade from 1990 to 2010 (DECCW, 2010c).

Projections of climate change in NSW were undertaken by the DECCW (2010c) and are reported in the NSW Climate Impact Profile. Based on a global emissions scenario that assumes a low uptake of carbon alternative fuels, NSW is projected to experience the following changes to its climate by 2050 (DECCW, 2010c):

- NSW is expected to become hotter, with higher maximum and minimum temperatures very likely (i.e. greater than 90% probability) to be experienced across the state in all seasons.
- The greatest increases in maximum temperatures are projected to occur in the north and west of the state, with winter and spring maximum temperatures expected to rise by around 2 to 3°C across much of northern NSW.
- A slight increase in summer rainfall is projected for NSW, however, this is likely to be accompanied by a significant decrease in winter rainfall in the south-western regions.
- Many parts of the state will experience a shift from winter dominated to summer-dominated rainfall, which may have implications for the duration and severity of drought in these areas.
- Evaporation is expected to significantly increase across much of NSW, due to increased temperatures.

Projected changes to NSW's climate would have associated impacts on land, settlements and ecosystems (DECCW, 2010c).

The projected increases in evaporation are likely to counteract the expected increases in summer rainfall across NSW, and as such, dry soil conditions would be expected to be even more prevalent in the west of the state. Erosion of soils is also expected to increase across the state, due to increased runoff associated with higher intensity rainfall events and lower rainfall comparative to evaporation, and decreased vegetation cover (DECCW, 2010c).

Projected changes in rainfall and evaporation in all regions will also likely affect the soil salinity. An increase or decrease in soil salinity in a particular area will depend on local factors for each catchment (DECCW, 2010c).

Settlements would likely be affected by increased sea levels and increased frequency and intensity of flood-producing rainfall events. Changes in rainfall, runoff and evaporation are also likely to affect NSW water supplies (DECCW, 2010c).

The potential implications of climate change on biodiversity and integrity are discussed in Section 4.11.1.

6.9.4 Ecologically Sustainable Development Considerations

Background

The concept of sustainable development came to prominence at the World Commission on Environment and Development (1987), in the report titled *Our Common Future*, which defined sustainable development as:

> *development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

In recognition of the importance of sustainable development, the Commonwealth Government developed a *National Strategy for Ecologically Sustainable Development* (NSESD) (Commonwealth of Australia, 1992) that defines ESD as:

> *using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.*

The NSESD was developed with the following core objectives:

- enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;
- provide for equity within and between generations; and
- protect biological diversity and maintain essential processes and life support systems.

In addition, the NSESD contains the following goal:

> *Development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.*

In accordance with the core objectives and a view to achieving this goal, the NSESD presents private enterprise in Australia with the following role:

> *Private enterprise in Australia has a critical role to play in supporting the concept of ESD while taking decisions and actions which are aimed at helping to achieve the goal of this Strategy.*

As described in Section 6.3, the Project will require approval under both the EP&A Act and the EPBC Act.

In deciding whether or not to approve the Project, the Commonwealth Minister must take into account the principles of ESD pursuant to section 136(2) of the EPBC Act. The relevant definition of the principles of ESD is provided in section 3A of the EPBC Act.

Clause 7(4) of Schedule 2 of the EP&A Regulation provides a definition of ESD relevant to the preparation of environmental impact statements. Section 6(2) of the NSW *Protection of the Environment Administration Act, 1991* also provides the same definition.

The principles of ESD as outlined in section 3A of the EPBC Act and clause 7(4) of Schedule 2 of the EP&A Regulation are presented and compared in Table 6-1.

The design, planning and assessment of the Project have been carried out applying the principles of ESD, through:

- incorporation of risk assessment and analysis at various stages in the Project design, environmental assessment and decision-making;
- adoption of high standards for environmental and occupational health and safety performance;
- consultation with regulatory and community stakeholders; and
- optimisation of the economic benefits to the community arising from the development of the Project.

Table 6-1
Principles of ESD – EPBC Act and EP&A Act

Section 3A of the EPBC Act	Clause 7(4) of Schedule 2 of the EP&A Regulation
(a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;	–
(b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;	*(a) the precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:* *(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and* *(ii) an assessment of the risk-weighted consequences of various options,*
(c) the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;	*(b) inter-generational equity, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,*
(d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;	*(c) conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,*
(e) improved valuation, pricing and incentive mechanisms should be promoted.	*(d) improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:* *(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,* *(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,* *(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*

The Project design takes into account biophysical considerations, including the principles of ESD as defined in clause 7(4) of Schedule 2 of the EP&A Regulation.

In addition, it can be demonstrated that the Project can be undertaken in accordance with ESD principles through the application of measures to avoid, mitigate and offset the potential environmental impacts of the Project and where relevant adaptive management would be implemented.

The following sub-sections describe the consideration and application of the principles of ESD to the Project.

Precautionary Principle

Environmental assessment involves predicting what the environmental outcomes of a development are likely to be. The precautionary principle reinforces the need to take risk and uncertainty into account, especially in relation to threats of irreversible environmental damage.

A PHA (Appendix N) and ERA (Appendix O) were conducted to identify Project related risks and develop appropriate mitigation measures and strategies.

The PHA (Appendix N) considers off-site risks to people, property and the environment (in the presence of controls) arising from atypical and abnormal hazardous events and conditions (i.e. equipment failure, operator error and external events) from fixed installations. The PHA does not consider those risks that are not atypical or abnormal, or risks associated with transportation by pipeline, road, rail or sea.

The ERA (Appendix O) considers potential environmental impacts associated with the Project, including long-term effects. In addition, long-term risks are considered by the specialist studies conducted in support of this EIS (Section 1.3).

Findings of these specialist assessments are presented in Section 4 and relevant appendices. Measures designed to avoid, mitigate and offset potential environmental impacts arising from the Project are also described in Sections 4, 5 and 7.

The specialist assessments, the PHA and ERA, have evaluated the potential for harm to the environment associated with development of the Project. Assessment of potential short, medium and long-term impacts of the Project have been carried out during the preparation of this EIS on aspects of surface water and groundwater, transport movements, air quality emissions, noise, terrestrial flora and fauna, heritage, agricultural land uses and socio-economics.

A range of measures have been adopted as components of the Project design to minimise the potential for serious and/or irreversible damage to the environment, including operational controls and physical controls, the development of environmental management and monitoring programmes and biodiversity offsets (Section 4).

The implementation of an adaptive management approach (e.g. the proposed use of water disposal dams to manage excess water) is consistent with the precautionary principle as described by Chief Justice Preston in *Newcastle & Hunter Valley Speleological Society Inc v Upper Hunter Shire Council and Stoneco Pty Limited* [2010] NSWLEC 48 at [184]:

> *…In adaptive management the goal to be achieved is set, so there is no uncertainty as to the outcome and conditions requiring adaptive management do not lack certainty, but rather they establish a regime which would permit changes, within defined parameters, to the way the outcome is achieved.*

In addition, for key Project environmental assessment studies (e.g. Hydrogeological and Water Supply Assessment [Appendix F]), peer review by recognised experts was undertaken (Attachment 3).

Social Equity

Social equity is defined by inter-generational and intra-generational equity. Inter-generational equity is the concept that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations, while intra-generational equity is applied within the same generation.

The principles of social equity are addressed through:

- assessment of the socio-economic impacts of the Project, including the distribution of impacts between stakeholders and consideration of the potential socio-economic costs of climate change (Appendix I);
- management measures to be implemented in relation to the potential impacts of the Project on water resources, heritage, land resources, agriculture, noise, air quality, ecology, transport, hazards and risks and socio-economics (Section 4);
- implementation of environmental management and monitoring programmes (Section 4) to minimise potential environmental impacts (which include environmental management and monitoring programmes covering the Project life); and
- implementation of biodiversity offsets during the life of the Project to compensate for potential localised impacts that have been identified for the development (Sections 4 and 7).

The Project would benefit current and future generations through the creation of employment and generation of regional expenditure (Appendix I). It would also provide significant stimulus to local and regional economies and provide NSW export earnings and royalties, thus contributing to future generations through social welfare, amenity and infrastructure.

The Project incorporates a range of operational and physical controls and environmental management and mitigation measures to minimise potential impacts on the environment, and the costs of these measures would be met by Cristal Mining.

These costs have been included in the Socio-Economic Assessment (Appendix I), therefore, the potential benefits to current and future generations have been calculated in the context of the mitigated Project.

Conservation of Biological Diversity and Ecological Integrity

Biological diversity or 'biodiversity' is considered to be the number, relative abundance, and genetic diversity of organisms from all habitats (including terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are a part) and includes diversity within species and between species as well as diversity of ecosystems (Lindenmayer and Burgman, 2005).

For the purposes of this EIS, ecological integrity has been considered in terms of ecological health and ecological values.

The Project area is located in the largely agricultural area of the Murray-Darling basin, characterised by irrigated and dry land agriculture to sheep production and river bound irrigated cropping. The land in the vicinity of the Ivanhoe Rail Facility is currently utilised for pastoral uses.

A total of 368 native flora species were recorded across the Atlas-Campaspe Mine and the mineral concentrate transport route study area, and a total of 75 native flora species were recorded in the Ivanhoe Rail Facility study area (Appendix A). A total of 228 native fauna species were recorded in the Atlas-Campaspe Mine area and surrounds (Appendix B).

Two threatened ecological communities have been recorded within the Project area and surrounds, including the *Acacia melvillei* Shrubland EEC and Sandhill Pine Woodland EEC (Section 4.6.1).

Three threatened flora species listed under the TSC Act and EPBC Act were recorded by the Project flora surveys, namely, Winged Peppercress (*Lepidium monoplocoides*), Mossgiel Daisy (*Brachyscome papillosa*) and Cobar Greenhood Orchid (*Pterostylis cobarensis*) (Appendix A).

A total of four threatened reptiles, 15 threatened birds species and nine threatened mammals listed under the TSC Act and/or EPBC Act were recorded by the Project fauna surveys (Appendix B).

Sections 4.6.2 and 4.7.2 and Appendices A and B describe the potential impacts of the Project on the biological and ecological environment.

In accordance with ESD principles, the Project addresses the conservation of biodiversity and ecological integrity by proposing an environmental management framework designed to conserve ecological values where practicable after consideration of potential Project impacts as described in the sub-sections below.

Greenhouse Gas Emissions and Biological Diversity and Ecological Integrity

Natural ecosystems are considered to be vulnerable to climate change. Patterns of temperature and precipitation are key factors affecting the distribution and abundance of species (Preston and Jones, 2005). Projected changes in climate will have diverse ecological implications. Habitat for some species will expand, contract and/or shift with the changing climate, resulting in habitat losses or gains, which could prove challenging, particularly for species that are threatened.

Human-caused Climate Change is listed as a key threatening process under the TSC Act.

In making its final determination to list anthropogenic climate change as a key threatening process, the NSW Scientific Committee (2000) found that:

1. The distribution of most species, populations and communities is determined, at least at some spatial scale, by climate.
2. Climate change has occurred throughout geological history and has been a major driving force for evolution.
3. There is evidence that modification of the environment by humans may result in future climate change. Such anthropogenic change to climate may occur at a faster rate than has previously occurred naturally. Climate change may involve both changes in average conditions and changes to the frequency of occurrence of extreme events.
4. Response of organisms to future climate change (however caused) is likely to differ from that in the past because it will occur in a highly modified landscape in which the distribution of natural communities is highly modified. This may limit the ability of organisms to survive climate change through dispersal (Brasher and Pittock, 1998; Australian Greenhouse Office, 1998). Species at risk include those with long generations, poor mobility, narrow ranges, specific host relationships, isolated and specialised species and those with large home ranges (Hughes and Westoby, 1994). Pest species may also be advantaged by climate change.

An Air Quality and Greenhouse Gas Assessment was undertaken by Katestone Environmental for the Project (Appendix K). Section 4.11 provides a description of the potential greenhouse gas emissions of the Project in accordance with the DGRs (Attachment 1). Valuation of potential impacts of greenhouse gas emissions has been incorporated in the Socio-Economic Assessment (Appendix I) for the Project.

Measures to Maintain or Improve the Biodiversity Values of the Surrounding Region

A range of impact avoidance, mitigation, offset and compensatory measures would be implemented for the Project to maintain or improve the biodiversity values of the surrounding region in the medium to long-term, as described below.

A range of vegetation management measures would be implemented for the Project to minimise impacts on flora, fauna, and their habitats (Sections 4.6.3 and 4.7.3).

High frequency fire has the potential to impact on biodiversity by reducing vegetation structure and resulting in a corresponding loss of animal species. High frequency fire is listed as a key threatening process under the TSC Act. A range of management measures would be implemented for the Project to minimise the risk of bushfire and in doing so, would maintain or improve the biodiversity values of the surrounding region. These measures are described in Section 4.3.3.

Section 5 presents Cristal Mining's rehabilitation strategy for the Project. The mine path would be progressively rehabilitated and infrastructure areas would be rehabilitated and revegetated to native bushland once the infrastructure facilities are no longer required.

Sections 4.6, 4.7 and 7 summarise a number of proposed biodiversity offset and compensatory measures for the Project that would assist in maintaining the biodiversity of the region. The proposed biodiversity offset and compensatory measures for the Project would comprise a combination of securing the long-term viability of existing woodland, revegetation of the mine path and ancillary surface disturbance areas (Section 7).

Valuation

One of the common broad underlying goals or concepts of sustainability is economic efficiency, including improved valuation of the environment. Resources should be carefully managed to maximise the welfare of society, both now and for future generations.

In the past, some natural resources have been misconstrued as being free or underpriced, leading to their wasteful use and consequent degradation. Consideration of economic efficiency, with improved valuation of the environment, aims to overcome the underpricing of natural resources and has the effect of integrating economic and environment considerations in decision making, as required by ESD.

While historically, environmental costs have been considered to be external to Project development costs, improved valuation and pricing methods attempt to internalise environmental costs and include them within Project costing.

The Socio-Economic Assessment (Appendix I) undertakes an analysis of the Project and incorporates environmental values via direct valuation where practicable (e.g. greenhouse gas emissions of the Project). Furthermore, wherever possible, direct environmental effects of the Project are internalised through the adoption and funding of mitigation measures by Cristal Mining to mitigate potential environmental impacts (e.g. implementation of biodiversity offset and compensatory measures).

The benefit cost analysis in Appendix I indicates a net production benefit of approximately $639M, and a net benefit of between $251M and $345M would be forgone if the Project is not implemented.

6.9.5 Consideration of the Project against the Objects of the EP&A Act

Section 5 of the EP&A Act describes the objects of the EP&A Act as follows:

(a) to encourage:

(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,

(ii) the promotion and co-ordination of the orderly and economic use and development of land,

(iii) the protection, provision and co-ordination of communication and utility services,

(iv) the provision of land for public purposes,

(v) the provision and co-ordination of community services and facilities, and

(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and

(vii) ecologically sustainable development, and

(viii) the provision and maintenance of affordable housing, and

(b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and

(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

The Project is considered to be generally consistent with the objects of the EP&A Act, because it is a Project which:

- incorporates:
  - measures for the management and conservation of resources including water, agricultural land and natural areas (Section 4);
  - development of the State's mineral resources (i.e. mineral sands) in a sustainable manner that minimises impacts (Section 2);
  - measures to minimise potential amenity impacts associated with noise and air quality impacts on surrounding land uses (Section 4); and
  - significant employment and other socio-economic benefits to the community (Section 4.16);
- includes measures to minimise potential impacts on surrounding Crown land and the Willandra Lakes Region World Heritage Area;
- would support the provision of community services and facilities through contributions to State royalties, State taxes, Commonwealth tax revenue and any applicable contributions to local councils (Appendix I and Section 6.2.8);
- incorporates a range of measures for the protection of the environment, including the protection of native plants and animals, threatened species, and their habitats (Sections 4 and 7);
- incorporates relevant ESD considerations (Section 6.9.4);
- is a State Significant Development project that would be determined by the Minister (or delegate) (Section 6.2.1), however, consultation with other levels of government and a range of stakeholders has been undertaken and issues raised have been considered and addressed where relevant (Section 3); and
- includes public involvement and participation through the Project EIS consultation programme (Section 3), the public exhibition of the EIS document and DP&I assessment of the Project in accordance with the requirements of the EP&A Act.

6.9.6 Consideration of the Consequences of Not Carrying out the Project

In accordance with clause 7 of Schedule 2 of the EP&A Regulation, an assessment of the consequences of not proceeding with the Project has been conducted. Were the Project not to proceed, the following consequences are inferred:

- a peak of up to 300 direct construction and 200 direct operational phase employment opportunities and associated flow-on effects would not be created;
- a net benefit of between approximately $251M and $345M would be forgone (Appendix I);
- tax revenue from the Project would not be generated (Appendix I);
- royalties to the State of NSW would not be generated (Appendix I);
- the potential environmental and social impacts described in this EIS for the Project would not occur; and
- the proposed biodiversity offset area for the Project and other revegetation areas would not be established.