

Environmental Impact Statement (EIS) Assessment Report for the Paradise South Phosphate Project

August 2012



Prepared by: Statewide Environmental Assessments, Department of Environment and Heritage Protection

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1 Introduction

This report is an assessment of the environmental impact statement (EIS) process pursuant to Chapter 3 of the *Environmental Protection Act 1994* (EP Act) for the Paradise South Phosphate Project proposed by Paradise Phosphate International Holdings Incorporated (Legend). In April 2012 the mining lease applications held by Legend were transferred to Paradise Phosphate Pty Ltd, a company wholly owned by Legend International Holdings. Hence, from that date, the project proponent is Paradise Phosphate Pty Ltd (Paradise Phosphate).

Chapter 3 Environmental Impact Statements of the EP Act establishes procedures for the Queensland Government, industry and infrastructure providers to carry out environmental impact assessments for major development projects. Under section 57 (EIS assessment report) of the EP Act, the Department of Environment and Heritage Protection (EHP) is required to prepare an assessment report for an EIS process and provide it to the proponent. Sections 58 criteria for preparing report of the EP Act lists the criteria that must be applied to the assessment process, including:

- the final terms of reference for the EIS
- the submitted EIS
- all properly made submissions and any other submissions accepted by the chief executive
- the standard criteria
- another matter prescribed under a regulation.

Section 59 required content of report lists the matters that must be addressed in the report including:

- address the adequacy of the EIS in addressing the final terms of reference
- address the adequacy of any environmental management plan for the project
- make recommendations about the suitability of the project
- recommend any conditions on which any approval required for the project may be given; and
- contain another matter prescribed under a regulation.

This assessment report summarises key issues associated with the potentially adverse and beneficial environmental, economic and social impacts of the project. It outlines management, monitoring, planning and other measures proposed to avoid or minimise any adverse impacts. Where relevant, the report also highlights issues of particular ongoing concern that were either not resolved in the EIS process or require specific conditions attached to the final environmental authority for the project in order for it to proceed.

Section 2 of this report presents details of the project to provide context for the findings of the report. Section 3 outlines the EIS process that has been followed for the project and the approvals that will be necessary for its commencement. Section 4 addresses the adequacy of the EIS, discusses the main issues with regard to the environmental management of the project, and outlines the environmental protection commitments made in the EIS. Section 5 assesses environmental protection commitments in the environmental management plan (EM plan) and how well they meet the content requirements of section 203 content requirements for submitted EM plan of the EP Act. Section 6 discusses the suitability of the project and Section 7 makes recommendations for conditions to be included in the draft environmental authority.

The EIS process under the EP Act is completed for the Paradise South Phosphate Project when this assessment report is given to the Paradise Phosphate.

2 Project details

Paradise Phosphate is a publicly listed company involved in the phosphate and fertiliser industry. Paradise Phosphate's current interests are in the Georgina Basin, Queensland, with combined deposits across several projects of more than 1.2 billion tonnes averaging 16 per cent phosphorus oxide (P_2O_5). On 28 August 2009, the company was granted an Exploration Permit for Paradise South (EPM 16942) by the former Department of Environment and Resource Management (DERM) (now Department of Natural Resources and Mines (DNRM)). In November 2009, Legend submitted a Mine Lease Application (MLA) for the Paradise South Beneficiation Plant, together with an application to prepare a voluntary EIS under the *Environmental Protection Act 1994*. The application was approved on 7 December 2009.

The project involves development of phosphate resources for export markets and possibly domestic markets with an open-cut phosphate mine and related infrastructure. The ore deposit is located on MLA 90197, approximately 135 km north-north-west of Mt Isa.

The project would involve use of a truck and shovel mining method, an on-site phosphate beneficiation process and transport by either road or slurry pipeline to Mt Isa, depending on production volume.

The project comprises:

- an open-cut phosphate mine producing seven million tonnes per annum (Mtpa) (average run of mine (ROM))
- a two Mtpa ore concentrate production Beneficiation Plant on MLA 90197
- a start-up tailings storage facility
- a 2500 megalitre per annum (MLpa) yield water supply dam and raw water pipeline
- a 20 km long access road/haul road from the proposed mine to McNamara Road
- a 45 km long water pipeline from the Thornton Borefield to the Beneficiation Plant
- an electricity transmission line approximately 20 km long from the Mica Creek – Century Zinc transmission line, including a substation/transformer (if required)
- pipeline infrastructure approximately 142 km long consisting of a slurry pipeline from the project beneficiation plant to Mt Isa and a return water pipeline
- a slurry dewatering and rail load out facility in Mt Isa
- accommodation facilities at existing mine camps or at a purpose built accommodation facility near the mine.

The mine area is surrounded by large lease-hold pastoral activities and a number of other existing and proposed mining activities, including the Lady Annie copper mine, the proposed Paradise North DSO Phosphate mine, the proposed D-Tree North phosphate mine and the proposed Lady Loretta zinc mine.

The concentrated phosphate ore is proposed to be transported to the rail load out facility south of Mt Isa by either slurry pipeline or road transport (depending on production levels). It is anticipated that, subject to further commercial considerations, the concentrated ore will be dewatered at Mt Isa and then loaded directly onto trains at a Paradise Phosphate owned facility for transport to the Port of Townsville. No upgrade to the existing Mt Isa to Townsville railway line or Port of Townsville storage and load out facilities is proposed.

2.1 Mine operations

The Paradise South phosphorite ore has relatively thin overburden. The thickness of overburden to the top of phosphorite ore varies between about 1 m and 40 m across the deposit. The average strip ratio of overburden to ore is 1.5:1. The thickness of overburden and low strip ratio makes the deposit ideal for open-cut mining using excavators and trucks. No blasting of overburden or ore is required due to the friable nature of mining material, which allows it to be excavated directly from undisturbed mining faces.

An average of 7 Mtpa of ore will be transported from mining faces to the ROM pad using mine haulage trucks. The main waste products from the beneficiation process will include tailings and also coarse rejects consisting mainly of chert. Coarse rejects will be disposed of in out-of-pit dumps or backfilled in-pit. Tailings will initially be stored within the start-up tailings storage facility before being stored within tailings cells located in-pit.

The total proven and probable minerals reserves on MLA 90197 are estimated at 55.5 Mt of ore concentrate (33 per cent P₂O₅). The EIS was developed for two production scenarios: 2 Mtpa or 1 Mtpa ore concentrate. The life of mine plan is 20 years for the 2 Mtpa scenario. If the production rate is halved the mine life is doubled.

Key features of the mine sequence are outlined below:

- Box cuts are planned for the first two years of mining. Material from boxcuts will be transported to nearby out-of-pit waste rock dumps.
- Out-of-pit and in-pit waste rock dumps are anticipated to be similar to existing topography.
- Waste rock dumps will be shaped to their final landform with a 1 in 6 gradient (17 per cent) from dump crest to dump toe.
- Land disturbance is minimised by in-pit dumping from approximately Year 2.
- Progressive in-pit tailings storage occurs early in the mine life from about Year 2.
- Coarse rejects will be used as an erosion resistant surface layer on waste rock dump batters.
- The mining sequence allows progressive rehabilitation of disturbed areas.
- Topsoil and vegetation will be cleared and stockpiled from all areas to be disturbed using scrapers or bulldozers and rear dump trucks. If rehabilitation material is not used immediately it will be stockpiled for later use.
- Topsoil stockpiles will be located at the base of waste rock dumps to facilitate later spreading over disturbed areas.
- Waste rock dumps will be topsoiled and revegetated.
- At the completion of mining there will be two final voids.

2.2 Production and waste

Approximately 116 million bank cubic metres (Mbcm) of overburden will be removed over the life of the mine and disposed of as waste rock. The majority of this material (approximately 108 Mbcm) will be progressively backfilled in-pit. The remaining 8 Mbcm will be placed in out-of-pit waste rock (spoil) dumps during the first two years of mining.

Approximately 77 Mbcm of ROM ore will be mined to produce an estimated 22 Mbcm (40 Mt) of ore concentrate and approximately 11 Mbcm and 43 Mbcm of coarse rejects and tailings respectively.

2.3 Processing

The project processing plant will be located at the site of the former Lady Annie phosphate pilot plant. The key operational criteria for the processing plant are:

- treating an average 7 Mtpa ROM phosphate ore over 21 years which provides an average of 5.9 Mtpa of feed to the 2 Mtpa concentrate beneficiation plant
- operating the plant 24 hours per day, seven days per week, 300 days per year which is equivalent to 7200 operating hours per year
- standby equipment in critical areas within the circuit
- sufficiently automated plant control to minimise the need for continuous operator attention, with provision for manual override and control if required.

The process is comprised of the following unit operations:

- the phosphate ore will be blended and processed from three stockpiles on the ROM pad
- rotary screening
- the mill feed will be split into two identical trains that will include rod milling
- particle classification
- dewatering via filtration

- flotation
- concentrate and tailings dewatering
- concentrate handling and load-out.

The concentrators will use Jameson Cells because they recover more ultrafine phosphate (<20 µm) compared to conventional flotation cells. Jameson cells also use a smaller plant footprint and have lower energy consumption than standard flotation cells.

Phosphate concentrate will be recovered from the ore using froth flotation. The concentrates will be transported to the Mt Isa Load out facility via a slurry pipeline for the 2 Mtpa concentrate operation or road transport for the 1 Mtpa concentrate operation.

2.4 Tailings storage facility

Thickened tailings slurry from the processing plant will be pumped to the tailings storage facility, located on MLA 90221, for further settling and water reclamation.

For a 2 Mtpa ore concentrate output mine, beneficiation plant tailings will be discharged into the tailings storage facility for two years before being directed to a series of staged cells in-pit. For a 1 Mtpa ore concentrate output, tailings will be discharged into the tailings storage facility for about four years before being stored in-pit.

2.5 Water supply

Water will be supplied by a dam constructed on Battle Creek, to the south of the mine on MLA 90222. The proposed dam will have a catchment area of 153 km² and a storage capacity of 10 000 ML. The dam will supply water for the life of the mine to the beneficiation plant, mine and accommodation village via a 2 km raw water supply pipeline. The dam will be managed in accordance with Queensland Dam Safety Management Guidelines (2002) and meet the requirement of the Water Regulations (2002), Water Resources (Gulf) Plan (2007) and the Gulf Resource Operations Plan (2010).

2.6 Slurry pipeline

The 2 Mtpa ore concentrate transport scenario will involve transporting the ore concentrate via slurry pipeline from the beneficiation plant to the Mt Isa rail load out facility. After dewatering at the rail load out facility, the concentrate will then be loaded on open top rail wagon containers and which will be covered and railed to the Port of Townsville for shipment.

The slurry pipeline is designed to operate continuously to achieve an annual throughput of up to 2 Mtpa. At a lower throughput in the early stages of mine operation, the pipeline will be operated by pumping intermittent water batches in the place of concentrate slurry. The pipeline will operate within a specified volumetric flow range, above the minimum safe operating velocity limits and below the maximum pressure rating and speed capability of the mainline pump and pipeline.

2.7 Power supply and transmission line

Power supply for the mine will be use a proposed 20 km 220 kV electricity transmission line that will connect the mine to Ergon Energy's Century Zinc 220 kV single circuit transmission line. The Century Zinc transmission line supplies electricity from the gas-fired Mica Creek Power Station at Mt Isa to the Century Zinc mine approximately 100 km north-west of the project. In the event of power outages, emergency diesel generators will be maintained at the mine allowing the mine to continue operating lighting, slurry agitation, floodwater pumping and essential accommodation village services.

Operation of the transmission line will involve routine maintenance of the switching substations, poles, conductors and transformers. Due the risk of bushfires the power line corridor will be kept free of upper canopy vegetation.

Ergon Energy's Century Zinc 220 kV single circuit transmission line is connected to the Mt Isa region electricity network. This network has a load shedding agreement between connected customers at time of power shortage or fault. Paradise Phosphate will be a party to this load shedding agreement if serviced by this network.

3 The EIS process

On 3 April 2012, Administrative Arrangements Order (No. 3) 2012 transferred administration of the *Environmental Protection Act 1994* from the former Department of Environment and Resource Management (DERM) to the Department of Environment and Heritage Protection (EHP). All references to DERM in this section relate to the time before the new administrative arrangements took effect.

3.1 Timeline of the EIS process

On 4 December 2009 Legend submitted an application under section 70 of the *Environmental Protection Act (1994)* to prepare a voluntary EIS for the Paradise South Phosphate Project. DERM approved the application on 7 December 2009.

Terms of reference

Legend submitted draft terms of reference (TOR) for the project and an initial advice statement (IAS) to DERM on 8 June 2010. The department published the draft TOR notice under section 42 of the EP Act on 3 July 2010 in the *Brisbane Courier Mail* and *The North West Star* in Mt Isa. The period for public submissions on the draft TOR was from 5 July 2010 to 16 August 2010.

DERM provided all comments on the draft TOR to the proponent on 30 August 2010. The proponent submitted the final TOR to the department on 30 October 2010, after requesting an extension to the statutory 20 business day response time. The department published the final TOR notice under section 46 of the EP Act on 26 November 2010. Under section 47 of the Act, Legend had two years from the date of receipt of the final TOR to prepare the EIS.

Environmental impact statement

DERM received a draft EIS for the Paradise South Phosphate Project from Legend on 4 August 2011. On 7 October 2011, DERM made a decision under section 49 of the EP Act to allow the EIS to proceed to the public notification stage. In accordance with sections 51 and 52 of the EP Act, Legend was required to publish a written notice about the EIS in newspapers circulating in the project area and to give a copy of the notice to each affected and interested person for the project. The EIS was put on public display between 24 October 2011 and 2 December 2011.

DERM gave all submissions on the EIS to the proponent on 16 December 2011 and advised that the company had 20 business days to respond to comments. The proponent applied for two extensions and submitted the supplementary EIS, responses to EIS submissions, revised Environmental Management Plan and the required section 66 EIS amendment notice to EHP on 1 June 2012.

On 2 July 2012, EHP decided under section 56A of the EP Act that the submitted EIS could proceed under Chapter 3, Division 5 (EIS assessment report) and Division 6 (Completion of process) of the EP Act. A notice of the decision to allow the submitted EIS to proceed was given to the proponent on 13 July 2012.

3.2 Approvals

Approvals for this project fall under two broad categories:

- On lease—activities that are contained within the mining tenure and are approved under the provisions of the *Minerals Resources Act 1989* (MR Act).
- Off lease—activities that are not on the mining tenure and are approved under a combination of other legislation, including the *Sustainable Planning Act 2009* (SP Act).

Mineral Resources Act 1989

The project will require seven separate mining lease applications for the following project components:

- open-cut phosphate mine, beneficiation plant and accommodation village

- transmission line (northern section)
- transmission line (southern section)
- slurry pipeline (upper section, from the mine site to the southern boundary of CST Lady Annie Operations mine lease), including a private access road from north of CST Lady Annie Operations mine lease to the Paradise South mine lease (ML90197)
- slurry pipeline (lower section from the southern boundary of CST Lady Annie Operations mine lease to the Barkly Highway)
- water supply dam
- start-up tailings storage facility.

Environmental Protection Act 1994

The project requires an Environmental Authority under Chapter 5 of the EP Act. This approval will cover mining and the following activities that are directly associated with, or facilitate or support, the mining activities. These activities would be approved under the EP Act as environmentally relevant activities (ERA), listed under Schedule 2 of the Environmental Protection Regulation 2008, if the project was not a mining project.

- ERA 8 Chemical storage
- ERA 16 Extractive and screening activities
- ERA 21 Motor vehicle workshop operation
- ERA 43 Concrete batching
- ERA 50 Bulk material handling
- ERA 57 Regulated waste transport
- ERA 63 Sewage treatment
- ERA 64 Water treatment.

Water Act 2000

The proposed water supply dam on Battle Creek, while located on the mining lease, will need the following approvals:

- a water allocation for the proposed take of up to 2500 MLpa; and
- a permit for construction of the dam in a water course to access the water.

Paradise Phosphate undertook a preliminary risk assessment of the dam under the requirements of the *Water Supply (Safety and Reliability) Act 2008* (EIS Appendix O Battle Creek Dam Failure Impact Assessment) which concluded that the population at risk in the event of a dam failure was zero. Hence, a dam safety management program would not be required.

Other legislation

The project has off mine lease areas where approvals for activities will be required under other Queensland legislation, including:

- slurry pipeline in the Barkly Highway and Diamantina Developmental Road (Dajarra–Mt Isa section) easement
- rail load out facility incorporating a slurry de-watering plant and located on proposed Lot 2 SP222005 (currently part of Lot 14 RD217), approximately 10 km south of Mt Isa.

Approval for the slurry pipeline in the Barkly Highway and Diamantina Development Road (Dajarra–Mt Isa section) requires approval of tenure for the pipeline corridor under the *Land Act 1994* (Land Act) through a permit to occupy. This could later be converted to a term lease. The slurry pipeline will also trigger other approvals or agreements from agencies with a tenure interest in the road corridor, e.g. power entities, Telstra, road, rail and other pipeline operators. Riverine protection approvals and possibly waterway barrier approvals under the *Water Act 2000* (Water Act) will be required to construct waterway crossings, and a wayleave permit under the *Transport Infrastructure Act 1994* (TI Act) is required for works in the rail corridor land (crossings). Design endorsement for infrastructure in a road is likely to be required and would be obtained under the SP Act through a material change of use development application (code assessment). This development application would be separate to the current development application for Paradise Phosphate’s Mt Isa Fertiliser Plant which is not part of this EIS assessment process.

Environmental approval of the slurry pipeline (outside the mining lease) and the slurry de-watering facility may be captured under a single ERA 50 bulk material handling through a development approval process under the SP Act.

Currently, Paradise Phosphate had commenced the ‘Right to Negotiate’ process under Section 29 of the Commonwealth *Native Title Act 1993*, with the intention to work with the Kalkadoon People #4 in good faith towards a Section 31 agreement under this legislation.

3.3 Consultation program

3.3.1 Public consultation

In addition to the statutory requirements for advertising the draft TOR and the EIS notices and the mailing of notices to interested and affected parties, Legend undertook community consultation with members of the public and other interested groups during the public submission period of the EIS. Details of this consultation are provided in Chapter 6 and Appendix G Community Consultation Summary Report of the EIS.

Paradise Phosphate state that they are committed to continue consultation with interested groups and the community at key project milestones during the approval, construction and operation of the project. A range of methods will be used to maintain this consultation including:

- maintaining a project telephone number for inquiries, complaints and feedback
- producing regular correspondence on project updates; and
- scheduling meetings with interested groups and community contacts, including consulting about end of mine life on matters relating to mine closure, land rehabilitation and post closure monitoring.

Ongoing environmental monitoring is a requirement of the project’s environmental approval. When requested, the results of ongoing monitoring will be made available to the public.

3.3.2 Advisory body

DERM invited the following organisations to participate in the assessment process for the TOR and EIS as part of an advisory body:

- Department of Communities
- Department of Community Safety
- Department of Education and Training
- Department of Employment, Economic Development and Innovation
- Department of Infrastructure and Planning
- Department of Transport and Main Roads
- Mt Isa City Council
- Queensland South Native Title Searches
- Queensland Conservation Council
- Queensland Police Service

- Queensland Rail
- Queensland Treasury
- Southern Gulf Catchments Group
- Tropical Public Health Unit
- Wildlife Preservation Society Queensland.

In April 2012, machinery of government changes created new departments in the Queensland government (see Administrative Arrangements Order (No.3) 2012). Table 1 provides an indication of how departmental responsibilities relevant to this EIS assessment report were redistributed between old and new organisations.

Table 1 – Changes to Queensland Government departments

Departments as of 26 March 2009	New departments (as of August 2012)
Department of Employment, Economic Development and Innovation (DEEDI) Queensland Treasury	Department of State Development, Infrastructure and Planning (DSIP) Queensland Treasury and Trade Department of Agriculture, Fisheries and Forestry (DAFF)
Department of Environment and Resource Management (DERM)	Department of Environment and Heritage Protection (EHP) Department of Natural Resources and Mines Department of Energy and Water Supply Department of Science, Information Technology, Innovation and the Arts Department of National Parks, Recreation, Sport and Racing
Department of Infrastructure and Planning (DIP)	Department of Local Government
Department of Transport and Main Roads (DTMR)	Department of Transport and Main Roads (DTMR)
Department of Community Safety (DCS) Queensland Police Service (QPS) Queensland Health	Department of Community Safety Queensland Police Service Queensland Health
Department of Communities (DoC)	Department of Education, Training and Employment Department of Communities, Child Safety and Disability Services Department of Housing and Public Works Department of Aboriginal and Torres Strait Islander and Multicultural Affairs

3.3.3 Public notification

Notices were published in *The Courier-Mail* and *The North West Star* (Mt Isa) to advertise the availability of the draft TOR and EIS for public review. The draft TOR and EIS were placed on public display at the following locations during the public comment and submission periods:

- DERM website (draft TOR only)
- DERM office, 400 George Street, Brisbane
- DERM office, Cnr Camooweal and Mary streets, Mt Isa
- Legend International Holdings Inc. website.

3.4 Matters considered in the EIS assessment report

Section 58 of the EP Act requires that the department consider the following matters when preparing an EIS assessment report:

- the final TOR for the EIS
- the submitted EIS (including the response to submissions on the EIS and Supplementary Report)

- all properly made submissions and any other submissions accepted by the chief executive
- the standard criteria
- another matter prescribed under a regulation.

3.4.1 The final TOR

While the TOR document was written to include all the major issues associated with the project that were required to be addressed in the EIS, they were not exhaustive, nor were they intended to exclude all other matters from consideration. Where matters outside of those listed in the final TOR were addressed in the EIS, those matters have been considered when preparing this EIS assessment report.

3.4.2 The submitted EIS

The 'submitted EIS' comprised:

- the EIS that was made available for public review on 24 October 2011
- the response to submissions and supplementary EIS (including further appendices) and an amended draft Environmental Management Plan received by EHP on 1 June 2012.

3.4.3 Properly made submissions

DERM received 24 properly made submissions on the draft EIS and four submissions after the submission period ended. All 28 submissions were accepted under section 55 of the EP Act. Submissions were received from the following groups or people:

Owen Ahnfelt	Leah Atkinson
Kelly Barnes	Suzanne Burton
Ben Burton	Marianna Campbell
Michelle Cislowski	Craig and Katreana Cunningham
Duncan and Anne Cunningham	Glynne Cunningham
Jason Cunningham	Stephen Cunningham
Department of Communities	Department of Community Safety
Department of Employment, Economic Development and Innovation	Department of Transport and Main Roads
Shaun Kalsbeek	Jan Montgomery
Mt Isa City Council	Gilles Perinet
Queensland Police Service	Queensland Treasury
James Taylor	Selina Taylor
Rex Whitehead	D Wright
Xstrata Zinc – North Queensland	Allison Yates

DERM also provided a submission.

3.4.4 The standard criteria

The standard criteria under the EP Act are:

- the principles of ecologically sustainable development as set out in the National Strategy for Ecologically Sustainable Development
- any applicable environmental protection policy

- any applicable Commonwealth, State or local government plans, standards, agreements or requirements
- any applicable environmental impact study, assessment or report
- the character, resilience and values of the receiving environment
- all submissions made by the applicant and submitters
- the best practice environmental management for activities under any relevant instrument, or proposed instrument, as follows—
 - i. an environmental authority
 - ii. a transitional environmental program
 - iii. an environmental protection order
 - iv. a disposal permit
 - v. a development approval; and
- the financial implications of the requirements under an instrument, or proposed instrument, mentioned in paragraph (g) as they would relate to the type of activity or industry carried out, or proposed to be carried out, under the instrument
- the public interest
- any applicable site management plan
- any relevant integrated environmental management system or proposed integrated environmental management system; and
- any other matter prescribed under a regulation.

3.4.5 Prescribed matters

The following prescribed matters, under the Environmental Protection Regulation 2008 (EP Regulation), were considered when making an environmental management decision for this project:

- Section 51, matters to be considered for environmental management decisions
- Section 52, conditions to be considered for environmental management decisions
- Section 53, matters to be considered for decisions imposing monitoring conditions
- Section 55, release of water or waste to land
- Section 56, release of water, other than stormwater, to surface water
- Section 57, release of stormwater
- Section 60, activity involving storing or moving bulk material
- Section 62, activity involving acid-producing rock
- Section 64, activity involving indirect release of contaminants to groundwater.

Environment Protection and Biodiversity Conservation Act 1999

Using impact assessments conducted for the project and proposed design and impact mitigation measures, Legend decided that the project would be unlikely to impact on matters of National Environmental Significance (as described in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)). Consequently, Legend did not refer the project to the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) for possible assessment under the EPBC Act.

As the EIS process for the project was not accredited under the Bilateral Agreement between the Commonwealth and the State of Queensland, there is no requirement for this report to specifically address matters of national environmental significance.

4 Adequacy of the EIS in addressing the final TOR

This section of the EIS assessment report details how the EIS addressed the TOR, the specific comments provided during the public consultation process on the EIS and the departmental comments arising from Paradise Phosphate's supplementary EIS responses. The sections below refer to both previous and current Queensland government departments, depending on the particular stage of the EIS process being discussed. The previous departments commented on the draft EIS. Current departments created in 2012 either accepted Paradise Phosphate's responses to comments on the draft EIS, or provided further recommendations or requirements based on the supplementary EIS.

Table 2 lists the main subject headings of the EIS, notes whether the submitted EIS adequately addressed the matters described in the final TOR and highlights any remaining issues. This section of the report describes these significant issues, discusses the findings of the EIS and outlines the environmental protection commitments made by the proponent.

Table 2 - Summary of the adequacy of the submitted EIS in addressing the final TOR

Matters included in the final TOR	Significant issues	Were issues adequately addressed in the submitted EIS?
Introduction	Overview of the project, its objectives and scope.	Adequate
	Outline of the necessary approvals and their assessment processes.	Adequate
Project need and alternatives	Project justification and discussion of alternatives.	Adequate
Project description	Location of the project in the regional and local contexts.	Adequate
	Description of the construction phase of the project.	Adequate
	Description of the operational phase of the project.	Adequate
Climate	Climatic conditions at the site	Adequate
Land	Topography and geomorphology	Adequate
	Geology	Adequate
	Mineral resources	Adequate
	Soils	Adequate
	Land contamination	Adequate
	Land use	Adequate
	Existing infrastructure	Adequate
	Sensitive environmental values	Adequate
	Landscape character and visual amenity.	Adequate
Transport	Road transport—intersection design and construction	Adequate—further information required including detailed design of road works. To be undertaken in consultation with DTMR
	Slurry pipeline	Adequate
Waste	Waste	Adequate
	Waste rock characterisation	Adequate
	Regulated and other waste	Adequate
Water resources	Surface watercourses and overland flow	Adequate—water allocation and detailed design of the proposed water storage dam required
	Groundwater	Adequate
Air quality	Dust	Adequate
	Greenhouse gases	Adequate
	Other air emissions	Adequate

Matters included in the final TOR	Significant issues	Were issues adequately addressed in the submitted EIS?
Noise and vibration	Noise at sensitive receptors Noise impacts on wildlife Vibration due to blasting	Adequate Adequate Adequate
Nature conservation	Terrestrial plants Terrestrial animals Aquatic ecology Groundwater dependent ecosystems	Adequate Adequate—a Biodiversity Offset Strategy is required prior to construction Adequate—consultation required with DAFF on fish passage and detailed design of the dam and water crossing infrastructure Adequate
Cultural heritage	Indigenous cultural heritage Non-indigenous cultural heritage	Adequate Adequate
Social issues	Impacts on local community, housing and services Impacts due to fly-in, fly-out workforce	Adequate Adequate
Health and safety	Air and water emissions. Road haulage, and traffic regimes	Adequate Adequate—consultation with DTMR and detailed design of the intersection required
Economy	Alienation of grazing land Effects on the local and regional economy Effects on the State economy	Adequate Adequate Adequate
Hazard and risk	Unplanned discharges to air, water or land Transportation, storage and use of hazardous substances Emergency response	Adequate Adequate Adequate
Rehabilitation	Rehabilitation of areas affected by mining activities	Adequate

4.1 Introduction

Chapter 1 Introduction of the EIS provided an overview of the project, its objectives and scope. It adequately identified the regulatory approvals for the project and outlined the assessment and approval processes.

4.2 Project need and alternatives

Chapter 2 Project need and alternatives of the EIS describes the need for the project and outlined the social, economic and environmental benefits and costs of the project. The positive and negative impacts, mitigation measures and environmental commitments were outlined in detail in later sections of the EIS.

In summary, the EIS stated that about 90 per cent of the global demand for phosphorus is for the manufacture of fertilisers. Currently there is no alternative to phosphate for fertiliser production. Other current and historic sources of phosphate *viz.* guano, human waste and manure, are now either gone or contribute a relatively small amount to global phosphate production. The EIS identified that the existing land use in the mine project area is marginal pastoral use. The area has low rainfall and low primary productivity. If the mine did not proceed the phosphate rock resource would remain unused and the principal land use in the relatively small area occupied by the mine operation would remain marginal pastoralism.

The mining method proposed is a truck and shovel mining operation with the potential for a continuous miner or scraper in future operations. The thickness of the Paradise South phosphorite ore body varies from about 1 m to

40 m across the deposit with a relatively thin layer of overburden. The average strip ratio of overburden to ore is 1.5:1. The thickness of overburden and low strip ratio makes the deposit ideal for open-cut mining using excavators and trucks. No blasting of overburden or ore is required due to the friable nature of the overburden and mining material. Ore will be transported from mining faces to the ROM pad via trucks for processing in the beneficiation plant.

The EIS canvassed seawater desalination, groundwater, existing dams and new dams as potential water sources for the project. The preferred option for project water supply is the construction of a new water supply dam on Battle Creek close to the project area. Three potential sites for a new dam that could service the project were identified by the Queensland Department of Primary Industries in 1994. Battle Creek was considered to be the least constrained site.

The EIS considered a range of on-site and off-site power generation and supply options including diesel, gas, solar, geothermal, wind and connection to existing or future (e.g. the APA Group project) regional power stations. The preferred option for power supply is from the existing Mica Creek gas-fired power station near Mt Isa. The proposed APA Group gas-fired power station was also identified as a preferred option. Electricity is currently supplied from Mica Creek to the Century Zinc mine, Mount Gordon Copper mine and Lady Annie Copper mine through Ergon Energy's single circuit 220 kV transmission line. The Paradise South project is located approximately 35 km from Ergon Energy's 220 kV transmission line.

The Mt Isa City Council (MICC) commented that there is already high demand for power generation at the Mica Creek Power Station. MICC requested confirmation that CS Energy (Mica Creek Power Station) has sufficient power generation and distribution capabilities (regardless of whether the APA Group power station is commissioned or not) to carry the additional load required by the project and not affect the ongoing power supply of the Mt Isa Local Government area.

In the supplementary EIS, Paradise Phosphate outlined means by which the total generating capacity of the Mt Isa region would increase to 580 MW, including new power projects and current on-site power generation by mining operations. This figure exceeds the 500 MW, high demand scenario that was proposed in an independent review of the north west Queensland energy delivery commissioned by the Queensland Government and Queensland Resources Council. MICC considered that the response adequately addressed their concern.

4.3 Project construction

Chapter 3 Project construction provided details about construction methods and staging to deliver the project in approximately three years, with commencement in mid-2015. The project will be constructed in six distinct stages with concurrent staging occurring where appropriate:

- Stage 1 – Site establishment
- Stage 2 – Water supply dam and raw water pipeline construction
- Stage 3 – Beneficiation plant construction
- Stage 4 – Slurry and return water pipeline and power transmission line construction
- Stage 5 – Tailing storage facility construction
- Stage 6 – Mine establishment and rail loadout facility

4.3.1 Slurry pipeline route description

Section 3.5.2 Route description described the route of the slurry pipeline proposed to transport ore between the mine and Mt Isa in the 2 Mtpa production scenario.

In comments on the EIS the Department of Transport and Main Roads (DTMR) advised that the section does not adequately describe the route and potential impacts on existing road, rail and other major infrastructure. DTMR requested that Legend provide maps at a suitable scale that would enable the identification of the preferred route and impacts on interfaces with existing transport infrastructure, including rail. In the supplementary EIS Paradise Phosphate responded that the company had provided 185 plans showing the proposed slurry pipeline alignment between McNamara's Road and Spears Creek and a further 56 plans showing the proposed slurry pipeline

alignment between Spears Creek and proposed rail load out facility at Lot 2 SP 222005 (both sets at a typical scale of 1:1000). DTMR had no further comment on this matter.

4.3.2 Slurry pipeline technical specifications

Section 3.5.4 Slurry pipeline technical specifications provided technical information on the proposed slurry pipeline, including pipe and trench characteristics. DTMR raised two issues about this section of the EIS.

Issue 1

DTMR commented that the EIS does not provide detail on the volume of materials, such as pipe sections and aggregates, required for pipeline construction and did not consider the impact of slurry pipeline construction on the State-controlled transport network, including the road network in Mt Isa. In the supplementary EIS Paradise Phosphate provided detailed information about materials required for the slurry pipeline, and transport requirements including referencing Appendix L Road Impact Assessment in the EIS. The information provided on the type and volume of material required for construction of the pipeline was considered adequate by DTMR. However, DTMR considered that the supplementary EIS did not provide adequate details on the following matters:

- the location/source of material proposed to be transported to the slurry pipe line construction site
- the proposed haulage route and frequency of haulage movements from source to slurry pipe line construction site.

Further, the Roads Ports and Freight Division of DTMR commented that Paradise Phosphate had not fully provided the requested information concerning significant freight tasks associated with the project, particularly the transportation of pipe sections and diesel to Mt Isa. DTMR noted that existing information suggested that Paradise Phosphate was intending to transport these materials to Mt Isa by rail. DTMR encouraged this approach but commented that if road transportation is being considered then approvals may be required depending on the load configurations and vehicles used.

DTMR considered that Paradise Phosphate had not adequately addressed these transport issues in the EIS documents. DTMR outlined several general requirements that Paradise Phosphate should comply with prior to construction (see section 4.8 Transport of this assessment report for DTMRs itemised requirements).

Issue 2

DTMR also commented that based on the route description for the slurry pipeline (section 3.5.2 of the EIS) it was unclear if there would be any impacts on rail corridors. If the slurry pipeline crosses the rail corridor, DTMR requested that Paradise Phosphate provide details on the method and standards to be used. In the supplementary EIS Paradise Phosphate reiterated that it proposes horizontal directional drilling and thrust boring as construction techniques for installing the slurry pipeline underneath the existing rail line near the intersection of Railway Avenue and Twenty Third Avenue. Construction would be undertaken in accordance with Queensland Rail's technical requirement specification MCE-SR-016 Revision A. In addition, boring activities would be undertaken outside railway boundaries and therefore cause no interruption to rail activities. In responding to the SEIS, DTMR did not provide any further comments on this matter.

4.3.3 Transmission line

In the EIS Section 3.5.9 Transmission line described the construction of the transmission line easement, which will roughly follow the existing light vehicle tracks and require the clearing of an 80 m wide corridor.

DERM requested that Paradise Phosphate justify the need for clearing an 80 m wide transmission line corridor, given smaller corridor widths used in other projects in Queensland and other states, and requested further information about mitigation of impacts on vegetation through the use of different power pole configurations. DERM also requested further information concerning the potential impacts of the easement on the Gregory Wild River area.

In the supplementary EIS, Paradise Phosphate responded that they had reviewed the width needed for the transmission line and that the corridor width had been reduced from 80 m to a maximum of 50 m (minimum 40 m). Paradise Phosphate stated that the actual width would depend on the nature of the vegetation. Paradise Phosphate also provided details on the 34 m high power poles selected for the project and argued that these were the most

suitable design to minimise corridor width. Paradise Phosphate also stated that the easement crosses a very small, outer-most part of the declared Gregory Wild River Area but does not cross any mapped watercourses or high preservation areas. EHP considered that Paradise Phosphate's response on concerns with the width of the transmission line was adequate.

4.4 Project operation

Chapter 4 Project operation of the EIS described the operation of the project including mine life, mining method and sequencing, the beneficiation plant and process, tailings storage facility and in-pit tailing cells, transport logistics (road, rail and shipping), slurry pipeline and power and water supplies.

In the review of the EIS, comments were received on fuel storage, chemical inputs into the beneficiation process and aspects of transport logistics.

4.4.1 Fuel management

Section 4.2.7 Fuel storage and consumption described the diesel storage location and capacity at the mine site.

DTMR noted that the EIS proposes that diesel will be delivered in B-Triple road trains with a capacity of approximately 160 tonnes. DTMR stated that Paradise Phosphate would need to consult with them about proposed transport routes and the suitability of using vehicle combinations with a Gross Vehicle Mass (GVM) of 160 tonnes operating on State controlled roads. DTMR also commented that Legend should consult with local governments about operating these vehicles on locally controlled roads.

DTMR commented that the EIS did not provide enough information to determine if their proposed vehicles comply with the requirements for operation on State controlled roads as outlined in the DTMR Guideline for multi-combination vehicles.

Paradise Phosphate stated in the supplementary EIS that the transport route from the McNamara Road-Barkly Highway intersection to the rail load out facility (RLOF) is on State controlled roads that are designated as High Mass Limit (HML) and multi-combination Type 2 road train routes. Also that McNamara Road from Paradise South mine to the Barkly Highway is a private road. Vehicle combinations with a GVM of 160 tonnes will not be operating on locally controlled roads.

In response to the supplementary EIS, DTMR commented that that the proposed 160 tonne capacity B-Triple road trains exceed the maximum allowable mass for a B-triple operating on Type 2 Road Train and HML routes. Further, DTMR stated that the specific requirements will need to be addressed for heavy vehicle combinations that do not fall within the conditions described in the DTMR Guideline for multi-combination vehicles in Queensland and that Paradise Phosphate should consult with DTMR regarding options, assessment and permits for access to State controlled roads.

DTMR noted that the source of the diesel fuel and the proposed method for its transport to Mt Isa was not identified.

DTMR considered that Paradise Phosphate had not adequately addressed these transport issues in the EIS. DTMR outlined general requirements that Paradise Phosphate should comply with prior to construction (see section 4.8 Transport of this assessment report for DTMRs itemised requirements).

4.4.2 Beneficiation process

In the EIS Section 4.3.9 Major inputs described the major chemical inputs into the beneficiation process, including what they are used for, storage, fate and amounts required.

DTMR commented that the EIS covered output volumes from the mine, and their transport implications, but did not adequately detail the input volumes of materials required to operate the mine, particularly the beneficiation process. DTMR noted that there is a limited source of acid based chemicals for the beneficiation process available in the Mt Isa region to support production of an additional 2 Mtpa of concentrated phosphate.

The supplementary EIS provided details on the types, volume, location or source, and frequency of haulage of chemicals to the mine site. DTMR reported that the additional information adequately described the details of chemical haulage to the mine site. However, DTMR considered that the supplementary EIS had not addressed the

environmental impacts and road safety hazards relevant to the transportation of these chemicals to the mine. DTMR stated that the EIS should identify and outline appropriate mitigation measures to address potential environmental impacts and safety hazards. It was recommended that this should be done through a revised Road Impact Assessment (RIA) submitted to DTMR for review (see RIA requirement in section 4.8 Transport).

4.4.3 Rail transport logistics

In the EIS, Section 4.6.4.2 Mount Isa rail network described the existing rail infrastructure in the project area and discussed the capacity of the system and other features. DTMR raised two issues about this section of the EIS.

1. DTMR commented that the claimed available rail network capacity for product transport is not definite available because while \$28M in capital improvements in the Queensland Rail (QR) Network 2009 Master Plan has been allocated, it may not be sufficient to deliver the increase in capacity by 1.5 Mtpa to 7.5 Mtpa as suggested. DTMR highlighted that the rail network has increased demands from other clients/sectors. DTMR requested that Legend seek further written advice from QR about the security of the rail capacity being sought within the planned timeframes. In the supplementary EIS Paradise Phosphate confirmed that the company had been negotiating with QR for 3 years and a draft agreement (commercial-in-confidence) was in place to meet the requirements of the proposed operation. DTMR provided no further comment on this issue.

2. DTMR commented that this section did not refer to the proposed Eastern Access Rail Corridor to service the Port of Townsville. DTMR requested Paradise Phosphate outline how it intends to participate in the feasibility study for the Eastern Access Rail Corridor and what arrangements may be required with QR to help fund or gain access to this rail corridor.

In the supplementary EIS Paradise Phosphate stated that the company 'has been an active supporter of the proposed Townsville Eastern Access Rail Corridor (TEARC) and has worked closely with the Queensland Rail, Port of Townsville and Mt Isa to Townsville Economic Zone (MITEZ) since 2009 in seeking State and Federal support for this infrastructure link'. Paradise Phosphate stated that QR was aware of their future transport requirements and had confirmed provision of access to the TEARC. DTMR provided no further comment on this issue.

Section 4.6.4.6 Rail haul Mount Isa to Townsville Port and the associated Appendix L Road impact assessment in the EIS described the transport of ore product by rail between the Mt Isa Load Out Facility and Townsville Port. DTMR raised a number of issues about project impacts on the road network between Mt Isa and Townsville and in Townsville.

Road network between Mt Isa and Townsville

DTMR noted that at its peak, the project will produce 2 Mtpa of phosphate which will require 25 round trips by rail from Mt Isa every 14 days. DTMR commented that the EIS did not consider the impact of rail operations on the State controlled road network between Mt Isa and Townsville.

Paradise Phosphate provided Figure 14 in the supplementary EIS which showed the rail route from Mt Isa to Townsville, complete with State controlled road crossings as requested. Paradise Phosphate stated that the company had a draft agreement (commercial-in-confidence) in place for QR to meet the rail transport requirements of the project. DTMR provided no further comment on this issue.

Road network within Townsville

DTMR commented that the increase in round trips between Mt Isa and Townsville will generate 7.2 additional train movements (i.e. 3.6 movements each way) through Townsville each day, representing a 13.5 per cent increase on the current 52 daily train movements along this rail line within Townsville. DTMR commented that the EIS did not consider the impact of the project on the State controlled road network within Townsville.

Paradise Phosphate provided Figure 18 in the supplementary EIS that identifies the rail line within Townsville that will be used to transport the phosphate to the Port of Townsville, and crossings of the State controlled road network. Paradise Phosphate stated that QR had confirmed that train paths were available for the proposed operation. Paradise Phosphate noted that the proposed operation was in accordance with QRs operating charter with respect to the State controlled road network.

DTMR responded to the supplementary EIS that Paradise Phosphate had not addressed the safety of rail crossings of the road network taking into account the increased rail traffic. DTMR stated that the EIS should address the rail operations and its impacts on the efficiency and safety of the road network at the rail crossings in the region as a result of increased number of train trips. DTMR also stated that it cannot fund safety improvements that may be necessary as a result of increased train movements. Once further information is available on the final design of the project, DTMR stated that Paradise Phosphate will need to update their road impact assessment, with clearly identified safety improvements, and rehabilitation and maintenance costs to mitigate the impacts of project traffic prior to undertaking any construction works.

Paradise Phosphate will need to address these issues in consultation with DTMR. DTMR outlined several general requirements that Paradise Phosphate should provide prior to construction (see section 4.8 Transport of this assessment report for itemised requirements), including a requirement to provide a revised Road Impact Assessment.

In relation to rail transport from Mt Isa to Townsville, in comments on the EIS, the Department of Employment, Economic Development and Innovation (DEEDI) requested that Paradise Phosphate confirm that the company had approval from QR for the transportation requirements of the project. In the supplementary EIS, Paradise Phosphate responded that QR had confirmed that the rail network can meet transport requirements of the project concentrate volumes. As mentioned above in the DTMR responses, Paradise Phosphate has a draft access agreement with QR which has been developed over the past three years.

4.4.4 Harbour master

Section 4.6.8 Harbour Master of the EIS described the potential impacts of the project on shipping in the region.

Paradise Phosphate reported that they had consulted with the Queensland Government Harbour Master at Townsville Port who confirmed that additional shipment windows of less than 200 vessels per year would not impact on the port or surrounding shipping region. In comments on the EIS, Maritime Safety Queensland (MSQ) requested that Paradise Phosphate engage with them through the Regional Harbour Master (Townsville) if changes to the project were likely to result in increased impacts on maritime safety or ship sourced pollution. In the supplementary EIS Paradise Phosphate committed to engage with MSQ.

4.4.5 Slurry pipeline operation

Appendix F Slurry pipeline operation and emergency response of the EIS provided detailed information on the slurry pipeline design, construction, operation and emergency response procedures during operation.

DERM raised the following concerns regarding the potential for discharges from the slurry pipeline:

- Pipeline Systems International (PSI) Australia was concerned with the use of one pump station for the slurry pipeline because the 250 bar peak pressure required is 'at or exceeds the industry experience'
- There appeared to be only three pressure monitoring stations, at undocumented locations, and it was not clear exactly what capacity there is to isolate sections of pipe if needed
- Leak detection will be on the basis of either pressure variations or physical observation along the route—which suggests that smaller leaks may not be readily detected
- There is the potential for segregation of water in the pipe in the short term once pumping is stopped—with potential release of unspecified volumes and no current provision to catch such waters at strategic points along the easement
- The hazards associated with potential pipe breakages, and methods to detect and mitigate those hazards, have not been fully addressed.

DERM also recommended that the EIS should:

- provide greater detail regarding the design and specifications of the proposed pipelines, particularly the slurry pipeline
- provide a full risk analysis identifying the potential hazards and providing design concepts to mitigate those hazards (address potential scenarios and issues set out above).

In the supplementary EIS Paradise Phosphate referred EHP to Appendix D Slurry pipeline report of the supplementary EIS which provides the requested detail regarding the design concepts and specifications of the proposed slurry pipeline. The report also identifies the potential hazards and provides risk mitigation measures to mitigate those hazards including those raised by DERM. EHP reviewed the report and considers that it adequately addressed the concerns raised.

4.5 Approvals

Chapter 5 Project approvals of the EIS outlined the approvals that would apply to the project under State legislation and supporting policies and listed the likely approvals required for the project. Relevant local government planning instruments and land use requirements, such as those in planning schemes, local laws and policies, were also described. Approvals for the project fall under two broad categories: activities on mining tenure and requiring approvals under the *Mineral Resources Act 1989* (MR Act), and activities that are not on mining tenure.

DTMR, the Department of Community Safety (DCS) and the Department of Communities (DoC) raised concerns about various aspects of the approvals needed by the project. They are described below.

Section 5.2 Overview of regime for project approvals

DTMR commented that information 'is required about the process for assessment and approval of the slurry pipeline within the State controlled road network and whether this process requires a separate approval as a stand alone development application'.

In the supplementary EIS Paradise Phosphate advised that approvals for the slurry pipeline under the MR Act (the mine lease sections) and the *Sustainable Planning Act 2009* (SP Act) had not been submitted at the time of the original EIS submission. Paradise Phosphate provided DTMR with 185 plans showing the proposed slurry pipeline alignment between McNamara's Road and Spears Creek and a further 56 plans showing the proposed slurry pipeline alignment between Spears Creek and proposed rail load out facility at Lot 2 SP 222005 (all at a typical scale of 1:1000). DTMR is reviewing these plans to assess road impacts with the understanding that the plans will form part of the relevant development application for the pipeline.

Section 5.4.7 Transport Infrastructure Act 1994 (TI Act)

Legend has not finalised its transport option for the product phosphate. The EIS reported that in the event that road product transportation is adopted, the slurry pipeline de-watering facility will not be required. Instead, product from the mine would be transported by truck to the Mt Isa rail load out facility.

DTMR commented that the EIS did not acknowledge that approvals would be necessary should the proposed slurry pipeline not be constructed and the transport of 1Mtpa of mine product is undertaken by road. DTMR advised that if the slurry pipeline is unnecessary then the transport of mine product by road will require approvals under Part 7A of the MR Act and consultation with DTMR would be necessary.

In the supplementary EIS, Paradise Phosphate restated that approval was being sought for both the 1Mtpa and 2Mtpa mine output scenarios presented in the EIS. Paradise Phosphate stated that they were aware of the 'notifiable road use' provision of Part 7A of the TI Act. Paradise Phosphate stated that the road impact assessment in the EIS provided a pavement impact analysis to give background to the notifiable road use and inform future negotiations with DTMR. DTMR provided no further response to this issue, although DTMR listed several requirements that Paradise Phosphate should fulfil prior to construction, including a revised road impact assessment, in their supplementary EIS response (see section 4.8 Transport of this report).

DTMR commented that the EIS did not acknowledge that the construction and operation of any facilities associated with the slurry pipeline to the Mt Isa rail load out facility that may interfere with existing rail corridors would require approvals. DTMR advised that approvals and tenure amendments are likely to be required for the construction and operation of the rail load out facility and potentially for the construction of the slurry pipeline under the *Transport Infrastructure Act 1994* and consultation with DTMR and QR would be necessary.

In the supplementary EIS Paradise Phosphate stated that the company recognised its responsibilities under the transport legislation and that the company had commenced discussions with DTMR regarding the slurry pipeline including the provision of 241 plans showing the proposed alignment. DTMR provided no further comment on this matter.

Section 5.4.21 Aboriginal Cultural Heritage Act 2003

The Aboriginal and Torres Strait Islander Services (ATSIS) unit of DoC noted that under section 86 (b) of the *Aboriginal Cultural Heritage Act 2003* (ACH Act) Paradise Phosphate is exempt from preparing a Cultural Heritage Management Plan (CHMP). A section 31(1) (b) agreement under the *Native Title Act 1993* (NT Act) constitutes ‘a native title agreement’ for the purposes ACH Act and as such satisfies the requirements of section 86 (b). ATSIS anticipated that the processes and details for the management of Aboriginal cultural heritage for the project would be incorporated into the terms of the native title agreement between Paradise Phosphate and the Kalkadoon People. ATSIS commented that, pending progression of the EIS, Paradise Phosphate should confirm how cultural heritage is agreed to and managed with the Kalkadoon People.

In the supplementary EIS Paradise Phosphate stated that the company agreed to work with the Department of Aboriginal and Torres Strait Islander and Multicultural Affairs (DATSIMA) to confirm how cultural heritage would be managed with the Kalkadoon People. A working group was formed by Paradise Phosphate and the Kalkadoon People during the native title negotiations, including two Kalkadoon People native title claimants together with their external advisors and representation from the proponent. A similar model would be encouraged during the construction and operation phases of the project. The Social Impact Management Plan was revised to include the continuation of the Kalkadoon People #4 Working Group as a key mitigation strategy. DATSIMA considered the response to this issue to be adequate.

Section 5.5.7 SPP 1/03: Mitigating the adverse impact of flood, bushfire and landslide

In comments on the EIS, the Department of Community Safety (DCS) was not satisfied that the Fire and Introduced Plant and Animal Plan component of the Draft Environmental Management Plan adequately addressed bushfire impacts. DCS stated that while the plan identified the impacts of controlled burns on the environment, it did not identify how a bushfire would impact on the operation of the development, safety of the staff and the community and the storage or manufacturing of any hazardous goods and materials which may be used. In order for the development to comply with the requirements of the SPP 1/03, DCS stated that a hazard and risk assessment must be undertaken to identify all parts of the development that may be affected by a bushfire. This may be accompanied by the appropriate strategies for mitigation and identify the frequency, duration and intensity of potential bushfires.

In the supplementary EIS Paradise Phosphate referred DCS to Appendix A Bushfire Hazard Assessment of the supplementary EIS which provide a revised bushfire assessment in accordance with SPP 1/03. DCS considered that the Paradise Phosphate response was adequate.

4.6 Climate

Chapter 7 Climate of the EIS described the local climate and how it may affect the potential for project related environmental impacts and the management of operations at the site.

Natural hazards that may impact the project include cyclones, severe storms and flooding. Because Mt Isa is inland, few cyclones have been recorded in the area and the risk of cyclone damage to the project area was considered low. Similarly, the risk of severe storm damage was considered low because the impact area of storms is relatively small. Flooding may occur in high rainfall periods (associated with cyclones or storms) in the Leichhardt River catchment. However, flood modelling using proposed creek diversion designs indicated that flood risk was low.

4.7 Land

The EIS estimates the combined total proven and probable ore reserves in MLA 90197 to be 196.1 million tonnes of phosphorite at 13.9 per cent P₂O₅. Proven and probable mineral reserves of recoverable, commercially useable and internationally marketable phosphate rock concentrate are estimated to be 55.5 Mt at 33 per cent P₂O₅. The phosphate deposit is confined to an area of low relief, approximately 25 km long and 5 km wide. The overburden has low levels of sulfur in respect to acid generation and the waste rock was characterised as 'unreactive' or 'inert'. Analyses of waste rock also indicated a significant acid neutralising capacity. Similar results were found for tailings testing. In regard to mining, the EIS stated that it is not expected that sterilisation of any economical resource within the area would occur as a result of proposed infrastructure or other construction and operational developments considering the nature and characteristics of the open-pit resource area.

The main rural land use in the study area is low intensity cattle grazing on native and improved pastures and the mine lease area and transmission and pipeline easements overlap with a number of pastoral leases. The area also has a long history of mining development. The EIS concluded that the project did not impact on any parcels of land that would be considered future conflicting land uses or proposed developments.

In its submission on the EIS, DERM recommended changes in concerning Stock Route management, including a recommendation that the proponent consult with DERM and local government to ensure there was no disruption to the stock route network. In the supplementary EIS, Paradise Phosphate included all the recommended changes and committed to ongoing consultation in relation to Stock route management.

The land suitability of the mine, tailings storage facility and water supply dam inundation areas have been assessed as suitable for low density beef cattle grazing, which is the current land use in the area and is anticipated to be the dominant land use post-mining. The EIS concluded that the area is considered to have limited development potential other than mining and the existing low density cattle grazing.

The project area is not within an area where strategic cropping land may exist (with reference to 'Strategic Cropping Land in Queensland Trigger Map') and is therefore not considered to impact on any strategic cropping land.

4.7.1 Land disturbance

The EIS reported that approximately 1870 ha of vegetated land in the project area is likely to be disturbed by construction and operational phases of the project. The following impacts may result from land disturbance within the project area:

- reduction in flora and fauna habitat
- disturbance to the values of areas of cultural heritage or nature conservation
- topsoil removal, loss, compaction or diminished soil viability
- increased soil erosion via wind and water
- a reduction in pre-mine land suitability.

Chapter 24 Rehabilitation and decommissioning and the draft Environmental Management Plan Land outline strategies for rehabilitation of mine disturbances. To reduce the impacts on land Paradise Phosphate committed to implementing a number of management strategies including the following:

- The minimum amount of land required for safe working of the project will be cleared at any one time to reduce the risk of dust emissions, soil erosion and impacts to flora and fauna.
- The Plan of Operations will outline the relative amount of land that has been disturbed and rehabilitated on a progressive basis with the schedule updated consistently.
- Progressive rehabilitation of the project area will be undertaken to restore disturbed areas to reduce water erosion and dust emissions and return those disturbed areas to a post-mine land use that will be stable, self-sustaining and require minimal maintenance.
- All plant equipment, roads and infrastructure including the slurry pipeline and transmission line will be decommissioned and either removed, abandoned or beneficially re-used by the subsequent owner after negotiation of infrastructure acquisition agreements between land holder and regulator.
- Topsoils will be stripped separate from subsoils and stockpiled during clearing activities.

An Erosion and Sediment Management Plan will be implemented as part of the Environmental Management Plan to ensure that the appropriate soil erosion control strategies are implemented for all land disturbance impacts created by the project.

4.8 Transport

Chapter 9 Transport of the EIS assessed the impacts of the construction and operation of the mine, including product transport from the mine to Mt Isa, on local and regional road networks. The transport assessment was supported by Appendix L Road Impact Assessment.

The road transport assessment (traffic and pavement) was based on two transport scenarios for moving ore from the mine to Mt Isa:

- slurry pipeline
- road transport.

The EIS concluded the following concerning ore transport from the mine to Mt Isa:

- Impacts on the road network under the first scenario were negligible and below the threshold for significant impact on the state controlled road network.
- Impacts on pavement under the second scenario were significant and that contributions to road maintenance would be considered in consultation with Department of Transport and Main Roads (DTMR).

In relation to these different transport scenarios, the Mt Isa City Council (MICC) requested that Paradise Phosphate provide a traffic study considering a bypass which would require either the slurry pipeline to be completed and commissioned or a bypass fully developed and constructed. The study was requested because of the potential impact of the increase in transport movements between the mine and Mt Isa and the lack of certainty about if, and when, the slurry pipeline option would commence and alleviate that traffic impact.

In the supplementary EIS, Paradise Phosphate responded that the EIS sought approval for road transport of up to 1 Mtpa of ore concentrate. Paradise Phosphate regarded the request for a traffic study for a bypass by MICC to be outside the TOR for the project. MICC considered the response to be adequate.

DTMR commented that Paradise Phosphate had not adequately addressed the requirements of the TOR (section 3.5.1 Transport) in relation to the transport task associated with the construction and operational phases of the project, including rail load-out construction and operation. DTMR provided the following recommendations to assist Paradise Phosphate to address outstanding transport issues:

- Review and finalise (subject to DTMR approval) the road impact assessment (RIA) to include details of the latest project traffic generation and all project transport impacts on the safety, efficiency and condition of State controlled roads, in accordance with Guidelines for Assessment of Road impacts of Development (2006).
- Prepare a road-use management plan (RMP) for all use of State controlled roads for each phase of the project, in accordance with DTMR's Guide to Preparing a Road Use Management Plan. DTMR stated that the RMP must be approved prior to its implementation and must summarise:
 - latest traffic generation (vehicle numbers, etc)
 - finalised assessment of impacts on safety, efficiency and condition at intersections, on road links and on pavements, etc
 - updated impact mitigation strategies, such as any road maintenance, any necessary improvements or road-use management strategies.
- Present finalised detailed drawings of any required road works for review and approval by DTMR and take account of the reviews.
- Three months prior to the commencement of any project construction works, prepare a traffic management plan (TMP) for all construction and other activities in State controlled road corridors to demonstrate how these road works will be safely undertaken.
- Undertake any required road works and road-use management strategies detailed in the RIA and summarised in the RMP.
- Liaise with northern region DTMR offices after receiving approvals under the EP Act.

In the supplementary EIS Paradise Phosphate considered that information provided in the EIS and supplementary EIS did meet the requirements of the TOR and referred to the TOR compliance section of the draft EIS Appendix L Road Impact Assessment as well as providing a detailed list of the transport related information in the EIS and supplementary EIS. Paradise Phosphate and DTMR will need to continue consultation to resolve project related transport issues.

The following sections detail the specific transport issues that were raised in submissions on the draft EIS.

4.8.1 Project scenarios

DTMR noted that there are two possible mine output scenarios (1 Mtpa and 2 Mtpa) under which the project will operate. DTMR commented that Paradise Phosphate should identify the preferred scenario and provide more information regarding the conditions for the decision concerning which scenario will be pursued and when this decision is likely to be made.

Paradise Phosphate responded in the supplementary EIS that approval was being sought for both the 1 Mtpa and 2 Mtpa scenarios presented in the EIS. Paradise Phosphate stated that Appendix L Road Impact Assessment of the EIS provided a pavement impact analysis which provided background to the notifiable road use and would inform future negotiations with DTMR. DTMR commented that the RIA did not follow DTMR methodology and did not address the pavement impacts adequately. DTMR requested that Paradise Phosphate submit a revised road impact assessment.

4.8.2 Intersection design

In the EIS Section 9.3 Existing roadwork described existing transport values (roads, intersections, stock routes) in the project and surrounding areas. The EIS concluded that the existing major roads are in generally good condition and well maintained.

DTMR commented that the EIS did not consider impacts on all intersections that may be affected by project traffic. DTMR stated that the supplementary EIS should assess impacts on safety, capacity and geometric issues at the following state controlled road intersections:

- Diamantina Development Road / Barkley Highway Intersection.
- Diamantina Development Road / Mica Creek Power Station Road Intersection.
- Diamantina Development Road rail crossing and the intersection with Twenty Third Avenue in the function area of the rail crossing

Paradise Phosphate responded in the supplementary EIS that it had consulted with DTMR regarding this matter and has provided independent advice including proposed treatments that addressed the safety, capacity and geometric issues of these intersections. Further information was provided in Appendix J Preliminary Traffic Engineering Design Review of the supplementary EIS. Paradise Phosphate commented that the proposed vehicle route currently operates as a DTMR approved High Mass Limit and multi-combination route for Type 2 Road Trains and that the company would continue to work with DTMR to obtain approvals under the 'notifiable road use' provision of Part 7A of the TI Act.

DTMR commented that the supplementary EIS had not addressed the impact on safety, capacity and geometry issues at the intersections. As such, Paradise Phosphate is required to undertake an operational and safety analysis for these intersections with appropriate mitigation treatments to meet DTMR standards. Design sketches that Paradise Phosphate provided to DTMR were not approved as they did not meet DTMR requirements.

DTMR has requested that Paradise Phosphate submit a revised road use management plan with a finalised assessment of impacts on safety, efficiency and condition at intersections, as well as detailed drawings of any required roadworks.

4.8.3 Potential impacts

Section 9.4 Potential impacts of the EIS described the impacts of the project (both slurry pipeline and road haulage scenarios) on the road network, including impacts of construction, operation, movement of the mine workforce and provision of routine services.

4.8.3.1 Roads

DTMR commented that the EIS and Appendix L Road impact assessment did not assess the safety and capacity issues created by increasing heavy vehicle truck movements along the narrow pavement on the Diamantina Development Road between the rail load out facility access and Mica Creek Power Station access.

Paradise Phosphate responded in the supplementary EIS that the company had consulted with DTMR regarding proposed treatments along the Diamantina Development Road. The vehicle route currently operates as a DTMR approved High Mass Limit and multi-combination route for Type 2 Road Trains and Paradise Phosphate committed

to continue to work with DTMR to obtain approvals under the 'notifiable road use' provision of Part 7A of the MR Act. DTMR responded that the pavement width of the above mentioned road section is 3.5–3.7 m and that the one-way generated traffic volume (commercial vehicles) of this section in the operation phase of the development would be 54 road trains. DTMR commented that this would be a significant increase in heavy vehicles movements in this section and Paradise Phosphate should address the road safety and capacity issues of the narrow pavement.

4.8.3.2 Intersections

DTMR raised concerns about the safety, capacity and geometry issues at the following intersections.

Diamantina Development Road / Mica Creek Power Station intersection

DTMR commented that both section 9.4 Potential impacts of the EIS and section 6 Safety of Appendix L did not assess the safety, capacity and geometric issues at this intersection and it was unable to support the current intersection design. This issue was also not addressed in section 9.5 Management of impacts of the EIS.

Diamantina Development Road rail crossing and the intersection with Twenty Third Avenue

DTMR commented that Section 9.5 Management of impacts of the EIS did not analyse the safety and capacity issues on the Diamantina Development Road rail crossing and the intersection with Twenty Third Avenue. The supplementary EIS should provide a capacity and design analysis of the rail crossing to determine the best appropriate design, and traffic on the Diamantina Development Road / Twenty Third Avenue will need to be incorporated into the analysis.

Paradise Phosphate responded in the supplementary EIS that it has consulted with DTMR regarding this matter and had since provided independent advice which addressed concerns regarding the safety, capacity and geometric issues this intersection. Further information is provided in Appendix J of the supplementary EIS. Paradise Phosphate commented that the vehicle route currently operates as a DTMR approved High Mass Limit and multi-combination route for Type 2 Road Trains and that the company would continue to work with DTMR to obtain approvals under the 'notifiable road use' provision of Part 7A of the MR Act.

DTMR responded that Paradise Phosphate had not fully addressed the road safety and capacity issues relating to these intersections and stated that Paradise Phosphate should complete a traffic and safety analysis to address the impacts on this intersection.

Barkly Highway and McNamara Road

DTMR commented that it did not accept the current design or location of the intersection provided in section 6.1.1 Intersection treatment for McNamara Road in Appendix L Road impact assessment. DTMR stated that the EIS did not include sight distance as part of the 'safety' analysis and the design proposed in the EIS did not meet the DTMR standards.

In the supplementary EIS Paradise Phosphate responded that it had undertaken a visual assessment which indicated that topography and geometry did not limit achieving Safe Intersection Sight Distance but that vegetation obstructed views. Paradise Phosphate recommended removing vegetation to improve safety.

DTMR responded that Paradise Phosphate should complete a traffic and safety analysis to address the project impacts on this intersection. DTMR stated that Paradise Phosphate should provide additional information in accordance with the Road Planning and Design Manual and the Guidelines for Assessment of Road Impact of Development relating to sight distance and satisfactory geometric design.

Rail load out facility access intersection

Section 6.1.2 Intersection treatment for access to the rail load out facility in Appendix L Road impact assessment of the EIS provided detailed drawings of the intersection of the Diamantina Development Road and access road to the rail load out facility.

DTMR did not accept the current design or location of the intersection. DTMR stated that the section did not include sight distance as part of the 'safety' analysis and the design proposed in the EIS did not meet DTMR standards.

Paradise Phosphate responded in the supplementary EIS that it had consulted with DTMR regarding this matter and provided independent advice which addressed concerns regarding the safety, capacity and geometric issues this intersection. Paradise Phosphate stated that further information was provided in Appendix J Preliminary Traffic Engineering Design Review of the supplementary EIS. Paradise Phosphate commented that the vehicle route currently operates as a DTMR approved High Mass Limit and multi-combination route for Type 2 Road Trains and that the company would continue to work with DTMR to obtain approvals under the 'notifiable road use' provision of Part 7A of the MR Act.

DTMR responded that the increase in the number of heavy vehicles entering the Diamantina Developmental Road would potentially create an unsafe situation and Paradise Phosphate should complete a traffic and safety analysis to address the project impacts on this intersection. DTMR stated that Paradise Phosphate should provide information in accordance with the Road Planning and Design Manual and the Guidelines for Assessment of Road Impact of Development relating to sight distance and satisfactory geometric design, as the increased number of Type 2 road trains from and to the rail load out access road would enter onto the Diamantina Developmental Road.

Paradise Phosphate has not adequately addressed the potential impacts issues outlined in this section. DTMR requested that Paradise Phosphate submit a revised road impact assessment and road use management plan with a finalised assessment of impacts on safety, efficiency and condition at intersections, as well as detailed drawings of any required road works.

4.8.3.3 Workforce

DTMR commented that the EIS did not adequately identify the potential impact of the fly-in fly-out (FIFO) workforce movements on the transport network between the mine site and Mt Isa Airport.

In the supplementary EIS Paradise Phosphate referred DTMR to Appendix L Road Impact Assessment of the draft EIS. Paradise Phosphate responded that the company assumed that operations would occur 7 days a week with a peak of 163 workers housed on site. Paradise Phosphate determined that three buses (Austroads Class 3 vehicle) per week would be required for changeover of personnel and stated that the Barkly Highway would not experience a significant increase in traffic.

DTMR responded that Paradise Phosphate had still not addressed traffic pavement impact issues as a result of the FIFO workforce movements. DTMR require that Paradise Phosphate address these issues as part of their revised road impact assessment, to be completed prior to construction.

4.8.4 Appendix L Road Impact Assessment

Appendix L Road impact assessment of the draft EIS provided a detailed road impact assessment covering the two possible product transport scenarios: slurry pipeline and road haulage.

Traffic analyses

DTMR commented on the detail of this report focusing on:

- methods used to calculate Equivalent Standard Axle values in some analyses
- the source and currency of Average Annual Daily Traffic data in some analyses

In the supplementary EIS Paradise Phosphate provided specific responses to the DTMR concerns. However, DTMR concerns remain about the use of methods and data in the Appendix.

As mentioned above, DTMR requires Paradise Phosphate to provide a revised road impact assessment (including pavement assessment) prior to beginning construction. DTMR advised that Paradise Phosphate's responses to these data issues should be incorporated in the revision of the impact assessment documents.

Rail load out facility construction

The traffic impact assessment sections of Appendix L, for both the road haulage and slurry pipeline ore transport scenarios, provided details on the construction workforce. In relation to the rail load out facility, the EIS states there will be a small team of staff based in Mt Isa that will construct the load out facility.

DTMR commented that the EIS provided no information about the traffic impacts of the rail load out construction workforce. Paradise Phosphate responded that in the traffic impact assessment a total of 2100 Equivalent Standard Axles (ESA) had been assumed for the transportation of 15 construction workers to and from the rail load out facility. To account for these ESAs two trips in total, of an Austroads Class 10 B Double, were included in the overall construction calculations and therefore accounted for in the assessment of traffic impacts. DTMR noted that they would consider the response when it was incorporated into Paradise Phosphate's revised pavement impact assessment.

Average Annual Daily Traffic (AADT) comparison during road haulage

DTMR questioned the conclusion that there would be no significant impacts, based on the data in tables 5.13 and 5.14. DTMR stated that AADT and ESA increase by more than five per cent so Paradise Phosphate should revise their pavement impact assessment accordingly. DTMR stated that Paradise Phosphate should prepare a traffic operational and safety analysis for all the intersections to the satisfaction of DTMR, using the department's Guidelines for Assessment of Road Impact of Development and Road Planning and Design Manual.

4.9 Waste

Chapter 10 Waste of the EIS described the key issues relating to waste generation and management during construction and operation, with the aim of protecting environmental values from the impacts of waste. Information was provided about proposed waste avoidance, reuse, recycling, treatment and disposal, having regard to best practice waste management strategies and the Queensland Environmental Protection (Waste) Policy.

In the EIS, section 10.6 Excavated waste and tailings geochemistry described the geochemical characterisation of overburden and tailings and their potential to impact on water quality predictions. Waste management strategies were also proposed.

DERM commented that slightly basic contact waters, with low salinity and some metals of concern for the general environment, are likely to be produced based on the results of the short duration leach testing of both spoil and tailings. Legend reported that further testing was in progress. DERM recommended that Legend complete more comprehensive contact testing of spoil and tailings prior to finalisation of designs for site infrastructure and mining. DERM also recommended that the EIS should provide the credentials and experience of professionals that prepared the report in Appendix I Overburden and tailings geochemical characterisation that supported this section of the EIS.

In the supplementary EIS, Paradise Phosphate provided the professional qualifications of those who did the geochemical characterisation requested by DERM. The company, Environmental Earth Sciences, considered that the existing geochemical testwork was comprehensive and additional tests were not required. Paradise Phosphate clarified that the short term leach tests mentioned in the DERM comment were designed to be screening tests to provide an indication of potential elements of interest that may be mobilised under near neutral conditions and that may normally prevail in a waste rock dump. Elements of interest may not necessarily be found at contaminant concentrations. As such the term Contaminants of Interest identified from short term leach tests has been rephrased as Elements of Interest. The screening tests were used to provide indication of potential Elements of Interest that may be mobilized in a waste rock dump rather than predicting contaminant loading in the field. Other suggested changes to the report included:

- expanded description of sampling distribution
- clarification that the Acid Neutralising Capacity test was the modified Sobek method as described in the Acid Rock Drainage Handbook by Ian Wark Research Institute and Environmental Geochemistry International (2002)
- change the Geochemical Abundance Index for Sn and Se to 'uncertain' because the trace element analysis assay was less than detection limit
- note that Pb may be an Element of Interest as it is slightly enriched in tailings solids and showed an increase in concentration in successive leachate tests, although at concentrations below water quality guidelines.

Paradise Phosphate incorporated the suggested changes into a revised report provided in Appendix H Paradise South Overburden and Tailings Geochemistry of the supplementary EIS. EHP considered that the EIS and EIS supplementary report adequately addressed the potential impacts of overburden and tailings on the mine site.

4.10 Water resources and water quality

Chapter 11 Water resources and water quality and Appendix N Surface water technical report of the EIS summarised the assessments of flooding, water management, water supply and surface water quality for the project area. The flooding assessment outlined measures required to achieve flood immunity for the site without causing adverse upstream or downstream impacts. Water management dealt with the aspects of the water supply, mine water management, contaminated water management and included a mine site water balance model. Water supply issues in this chapter focused on a Battle Creek Dam failure assessment, and the water quality assessment provided baseline water quality values for the study area. The chapter also provided detailed information on water quality criteria for controlled discharges from mine water containment structures as well as details on potential surface water impacts and mitigation measure to prevent or minimise those impacts.

The assessment of surface water values and potential impacts of the project on these values also required consideration of other EIS studies including, most importantly, those of climate, groundwater, aquatic ecology, start-up tailings storage facility feasibility, overburden and tailings geochemical characterisation and the Battle Creek Dam failure impact assessment.

In addition to issues raised by DERM on creek diversions and the water supply dam, discussed below, DERM raised a number of issues about water quality that are dealt with in section 4.21 Environmental Management Plan of this report.

4.10.1 Creek diversions

Section 11.3.4 Diversion design describes design objectives and criteria for creek diversions (which are provided in more detail in Appendix N Surface water technical report of the EIS).

DERM commented that concept designs for diversions and any necessary levees were not provided in the EIS and it was unclear if levees would be required. The receiving dam below the external tailings storage facility (Decant Water Dam) is close to a watercourse and may require erosion protection at rare annual exceedance probabilities (AEP) for the dam. It was mentioned that the hydraulic model was difficult to verify due to sharp variations in the natural surface. The soils in the area would appear to be susceptible to erosion in the short term, and this should be addressed. While the EIS suggested that drainage structures (other than diversions) would be constructed to relevant standards, the standards and concepts to be adopted were not provided. Similarly, drainage concepts for decommissioned and rehabilitated (capped) facilities were not specified.

DERM recommended that Legend include the following in the EIS:

- Reasons for the AEP of flood immunity to be accorded to the open-cut pits during operations and post closure.
- Concept designs for diversions and any necessary levees to protect the pits during operations (plan locations and typical cross sections). Specific design concepts to be adopted in routine drainage should be presented together with reasons why those concepts would be effective in the site context.
- Best estimate flood levels and velocities for the modified site to demonstrate how diversion, drainage, capping and dam concepts are feasible and sustainable—without erosion failure—both during operations and post closure.

In the supplementary EIS, Paradise Phosphate provided a report (Appendix E Flood management plan) which further describes the flood immunity strategy and provides concept designs for the diversions and levees. The report also provides flood levels and velocities for the mine plan area including diversions. The report describes how diversion, drainage, capping and dam concepts are feasible and sustainable without erosion failure both during operations and post closure. As stated in the EIS documentation, stream diversions are regulated under the *Water Act 2000*, administered by the Department of Natural Resources and Mines.

4.10.2 Appendix

Sections 6.1 and 6.2 of Appendix N provide background information and design methods for the Battle Creek dam. DERM commented that there could be substantial wash into the downstream areas from the unlined spillway section and return slopes of the proposed dam, even if infrequent overflows are considered. DERM recommended that Paradise Phosphate provide more detail about dam construction methods in relation to erosion prevention of the spillway and return slopes.

In response, Paradise Phosphate provided Appendix C Basis of Design Water Supply Dam in the supplementary EIS. Section 4.2 of this appendix provides a hydraulic assessment of the spillway and dam for various design flows and section 4.3 describes the construction methods for the assorted structures which make up the spillway and dam. Section 4.3.5 Erosion Control provides specific details in relation to erosion prevention of the spillway and return slopes.

While the supplementary EIS provided some additional information on the hydraulics of the spillway and dam, EHP considers that the water supply dam had been designed to a concept stage only. EHP recommends that Paradise Phosphate submit a detailed dam design plan, certified by a suitably qualified and experienced person. As the dam would be regulated under the *Water Act 2000*, Paradise Phosphate would need to submit the detailed design and other information to the Department of Natural Resources and Mines.

4.11 Groundwater

Chapter 12 Groundwater and Appendix P Groundwater assessment of the EIS reported on the existing hydrogeological environment of the groundwater study area, assessed the potential impacts of the project on groundwater and identified measures to avoid, mitigate and remediate any impacts on groundwater. The groundwater study area comprised MLA 90197 and nearby water supply dam area and tailings dam area. The groundwater study was a desktop assessment of published information of studies conducted in the area since 1970 supplemented by field surveys including a bore census survey and groundwater quality and level monitoring of 13 bores.

The chapter described the existing hydrogeological values including aquifer systems and hydraulic parameters, aquifer recharge, groundwater levels and flow direction and groundwater quality and use. The EIS reported that the primary groundwater resource in the study area occurs in fractured cherts and siltstones at the base of the Beetle Creek Formation, and in dissolution voids of the Thornton Limestone. The aquifer is confined by overlying low permeability shales, mudstones and siltstones.

4.11.1 Existing hydrogeological environment

Section 12.3.3 Aquifer recharge provides a brief description of the aquifer recharge processes in the study area.

DERM commented that the EIS provided no information on groundwater recharge relationships to rainfall or discharge relationships within the aquifer and recommended their inclusion. Requested information included where, when and how recharge of the aquifer occurs including its relationship to the overall water balance in the aquifer including potential imbalance or seasonal variation scenarios.

Paradise Phosphate responded that an additional report was provided in Appendix F Report on groundwater issues of the supplementary EIS to address groundwater issues. Section 4.1 of this report describes the aquifer recharge and discharge mechanisms. Aquifer recharge is considered to be via direct rainfall infiltration through overlying sediments and via lineaments. Greater recharge occurs in the proximity to creek lines and along the Western Fault due to increased fracturing. No discharge zones (e.g. springs etc) were found. The groundwater monitoring program in the Receiving Environment Management Program (attachment G of the Environmental Management Plan) has been designed to refine the groundwater recharge relationship to rainfall (if any) using Solinst data loggers/pressure transducers which will monitor groundwater levels continuously in selected boreholes.

EHP considered that the response provided by Paradise Phosphate adequately addressed the issues raised.

4.11.2 Impacts

Section 12.4 Potential impacts assessed the impacts of mining operations on groundwater resources.

DERM commented that there was conflicting information about the potential of water movement from elevated recharge sources through the Beetle Creek Formation. Also, DERM commented that the groundwater assessment assumed the groundwater level is static. There was no assessment of the potential for impacts on groundwater flow and/or the associated impacts upon the mining operation of fluctuating water levels in the aquifer. The final void and the water supply dam are elevated potential recharge sources and the justification that there would be no impact on these potential sources on groundwater resources was unclear and appeared to be focused on water quality.

DERM recommended the following:

- Justify the assumption that the groundwater level in the area is static.
- Provide an assessment of the impact of a potentially rising water table, including any potential impact on the mining operation.
- Provide information on the potential impacts of the final void on the groundwater resources, including potential volumes stored, location and distance to the groundwater table.
- Clarify the potential for impacts on groundwater levels of the water supply dam and any effects this may have on the mining operation.

Paradise Phosphate provided a detailed technical response to each EHP recommendation, and providing further information in Appendix F Report of groundwater issues of the Supplementary EIS. Paradise Phosphate considered that it is extremely unlikely that mining will impact on groundwater levels for the following reasons:

- The results of modelling showed groundwater levels have fluctuated over a range of only ~ 0.5 m from 1990 to 2012.
- Potential leakage of the Battle Creek water supply dam would have a negligible effect on rising groundwater levels.
- The final void is expected to be dry for most of the year and the Beetle Creek Formation that remains below the voids is expected to limit downward migration of water.
- A groundwater monitoring program has been designed to monitor fluctuations of groundwater levels and groundwater chemistry (attachment g of revised Environmental Management Plan).
- There will be at least 10 years of monitoring data available (including the construction period) and forward mine planning to ensure the mine does not intersect the groundwater table when the mine potentially nears the groundwater table after Year 8 (at the highest proposed production rate).

EHP considered that the response adequately addressed the issues.

In the EIS Section 12.4.2 Final void described potential impacts of the final void, principally in regards to surface and groundwater quality.

DERM requested the following specific information to assist with the EIS assessment:

- The location and extent of the planned final void relative to the recognised aquifer, and the properties of the material overlying the aquifer.
- The level of flood immunity for the final void.
- How the final void may be rendered sustainable for the foreseeable future following decommissioning and rehabilitation of the project.

DERM recommended that Legend should provide the preferred design concept option for sustainable decommissioning of the final void, including drainage of capped surfaces, and the reasons for selecting the preferred option.

In the supplementary EIS Paradise Phosphate provided a detailed response including a summary of Appendix F Report on groundwater issues. In summary, Paradise Phosphate noted the following key features of the final voids:

- Progressive in-pit waste rock dumping and in-pit tailings storage will start early in the mine life at approximately Year 2 minimising final void area.

- Final voids will be levied to shed a 1:2000 year ARI flood event allowing only incident rainfall to enter the void.
- The overall slope of the highwall is approximately 54 degrees (assuming competent highwall).
- The overall slope of the low wall is approximately 10 degrees (1m vertical to 6m horizontal).
- Coarse rejects including chert will be used as an erosion resistant rock mulch 2m thick on the surface of the low wall.
- Void areas will be topsoiled and revegetated with native vegetation.
- Progressive rehabilitation maintenance will occur post mine life to ensure sustainable long term landforms.
- Rehabilitation indicators have been set to demonstrate that decommissioning and rehabilitation strategies will be met.

As mentioned in the previous comment, modelling indicates that the final voids are not expected to contain significant water bodies and to be dry for most of the year. EHP considered that the response adequately addressed the above issues.

4.11.3 Mitigation of impacts

Section 12.5 Mitigation measures described a groundwater monitoring program that will be undertaken over the life of the mine that includes monitoring of groundwater levels, water quality and includes sampling for stygofauna.

DERM commented that this section, and relevant parts of Appendix P Groundwater assessment did not contain enough information to assess the recommendations and proposed mitigation measures identified in the EIS and in section 5.2.2 Groundwater impacts of the draft Environmental Management Plan. DERM recommended that the groundwater assessment be revised to clearly identify the potential recharge and discharge relationships within the aquifer (including a discussion on location and depth to the aquifer of elevated potential recharge sources such as the final void and the water supply dam) and how these may potentially impact upon heads and groundwater flow within the aquifer. Further evidence and/or justification for the statements that there will be no impact on groundwater should be included in the report and the report should identify how the design of the proposed groundwater monitoring program will achieve its goals.

In the supplementary EIS, Paradise Phosphate provided Appendix F Report on groundwater issues, and updated the Environmental Management Plan (section 5.2.2 Groundwater impacts, section 5.4.4 Groundwater management, section 5.4.6 Groundwater monitoring and the Receiving Environment Monitoring Program (Attachment g)). In summary, the appendix and amendments to the EM Plan addressed the following issues raised by DERM:

- Further information about aquifer recharge and discharge.
- Conflicting information about the permeability of the Beetle Creek Formation.
- Impact of the final void on groundwater resources.
- Impact of the water supply dam on groundwater resources.
- Impact of mining operations on rising water levels.
- Groundwater monitoring program design.

EHP considered that the updated appendix and EM Plan provided an adequate response to the issues.

DERM also commented that the purpose of the proposed monitoring program was unclear and recommended that Paradise Phosphate provide objectives for a monitoring program that is 'fit for purpose' with a justification for existing and proposed monitoring bores, including (but not limited to):

- monitoring design
- baseline information against which changes are compared
- actions to address significant changes.

In response Paradise Phosphate stated that the supplementary EIS includes a revised groundwater monitoring program with relevant objectives and actions provided in the Environmental Management Plan and the Receiving Environment Monitoring Program (attachment g of the EM Plan). Appendix F Report on groundwater issues of the supplementary EIS also contains more detail about the groundwater monitoring program that includes five additional groundwater monitoring bores. EHP considered that the response adequately addressed the issues.

4.12 Air quality

Chapter 13 Air quality in the EIS provided an overview of the potential air quality impacts from the proposed construction and operation of the project. Air quality issues were adequately dealt with in the EIS. DERM provided comments on the methodology and data used in air quality analyses described in Appendix Q Air quality report.

DERM commented that section 4.2.3 Adopted background air quality data of Appendix Q in the EIS used incorrect air quality data. The report stated incorrectly that PM₁₀ air quality monitoring data is not available from The Gap (an EHP air quality monitoring station located near Mt Isa). DERM recommended that Legend review The Gap air quality data and select appropriate PM₁₀ and PM_{2.5} background values that are the most representative of the site.

In response, Paradise Phosphate acknowledged that PM₁₀ and PM_{2.5} data was available at The Gap, but that the intent of the report was to convey that air quality data from The Gap was not representative of air quality at the mine site as it was significantly affected by mining and processing at Mt Isa. The air quality monitoring site at Targinie in Gladstone was adopted as being more representative of a 'rural' setting as classified by DERM. EHP considered that the response was adequate.

Section 6.2 Operations phase of Appendix Q detailed the main emission sources in the operation of the mine. Based on the detail provided in the appendix, DERM questioned whether all potential air emissions sources from the ROM stockpile and chert removal, ROM drop off point and beneficiation operations had been included in the air quality modelling, as tables 6.3 and 6.4 did not list all sources.

In the supplementary EIS Paradise Phosphate clarified where potential air emissions sources from these operations had been included in the modelling. EHP considered that the response adequately explained how the model considered all potential air emission sources.

Section 6.2.5 Modelling scenarios of Appendix Q outlined air quality modelling using the different construction and operation scenarios (1 Mtpa and 2 Mtpa outputs). DERM commented that constant air emissions factors were used in the modelling which is not accurate. DERM recommended that Legend select air emission factors based on best practice and justify their selection, modify the emissions inventory by selecting appropriate emissions factors and determine the impacts on the receiving environment.

In the supplementary EIS, Paradise Phosphate provided a detailed justification based on the substantial difference between coal and rock phosphate (particle size and specific gravity) for the approach taken in the air quality modelling, which EHP considered adequately dealt with the issue.

Section 7.5 Odour of Appendix Q outlined odour related air quality issues and concluded that impacts would be primarily associated with malodorous issues. DERM commented that odour emissions from volatile fatty acids in the beneficiation process were not modelled and recommended that Legend estimate the odour emissions from the beneficiation plant and determine the impacts on the receiving environment.

In the supplementary EIS, Paradise Phosphate responded that the Material Safety Data Sheet for the fatty acid Sylfat, which is proposed to be used in the flotation circuit of the beneficiation process, rates the odour as a 'mild fatty acid' with no odour threshold applicable. Paradise Phosphate stated that based on advice from the supplier, the company's metallurgist and their Air Specialist consultant, the odour from Sylfat was minor, and would be localised and contained in the processing plant. EHP considered that Paradise Phosphate's response adequately addressed the issue.

Section 8.1 Controls of the mitigation and management measures section of Appendix Q outlined the controls, or management actions, that will be used to minimise dust emissions of the project. DERM recommended that the EIS clarify how the 80 per cent control of dust from the unpaved haul road can be achieved at the proposed site and whether the amount of water required for dust control will be available. DERM noted that in the *NSW coal mining benchmark study (2011)* the most cost-effective dust control measure is the use of larger-capacity vehicles, which

can produce a significant cost saving due to the reduction in the number of vehicles required as well as the reduction in operating costs.

In the supplementary EIS, Paradise Phosphate responded that water for dust control would be sourced from the stormwater dams and the standpipe from the proposed Battle Creek dam (if required). The water balance modelling for the operation was based on 113 years of daily data without failure of water supply. The demand in the water balance modelling included dust suppression. The security of water supply is extremely high and water would be available for dust control. In reference to the NSW coal mining study, Paradise Phosphate stated that the largest capacity vehicles (55 tonne dump trucks) suitable for this type of operation have been adopted. EHP considered that the Paradise Phosphate response was adequate.

Appendix G Model and assessment specific assumptions of the EIS Appendix Q listed the air quality modelling assumptions used in the modelling analysis for the project. DERM commented that the air emissions from the mining site were modelled as a series of volume sources but the assumed heights of these volume sources were not provided. DERM recommended the following:

- Clarify how the volume sources were modelled.
- Provide a justification for the assumed heights of volume sources.
- Explain the sensitivity of this volume source height in the prediction of ground level concentrations.

In the supplementary EIS Paradise Phosphate responded that the air emissions from the mining site were modelled as nine volume sources spatially distributed across the proposed mining area. This was a conservative approach given that the total mine area would not be disturbed at any one time. The volume source elevations range from 309 m AHD to 336 m AHD. The assumed source height of the mining site emissions is 2.0 m with an initial vertical spread (σ_y) of 1 m. Paradise Phosphate stated that this approach was conservative and no sensitivity analysis is warranted. EHP considered that the response was adequate.

4.13 Noise

Chapter 16 Noise and vibration of the EIS outlined key noise and vibration issues relevant to construction and operation of the project. The mine is 16 km from the nearest noise sensitive receptors and the EIS concluded that noise and vibration emissions from the site were likely to be insignificant.

Section 16.5 Noise and vibration impacts described potential impacts from the mine and slurry pipeline operation, dam construction, transmission line construction, off site impacts and impacts from the rail load out facility.

DERM requested that the EIS describe how the overall sound power level for the mine site of 135 dB (A) was calculated from data in Table 16.11. Paradise Phosphate clarified that this figure was calculated from the power sources described in Tables 16.8 and 16.9 of the EIS. Table 16.11 provided the combined sound power of all vehicles and equipment. Conservatively the loudest spectrum (i.e. dump trucks) was adopted in Table 16.11 for the combined sound power. EHP provided no further comment on this issue.

4.14 Terrestrial ecology

Chapter 17 Terrestrial ecology summarised Appendix R Terrestrial ecology report of the EIS. The report identified the ecological values of the study area and assessed potential impacts of the development on those values. Existing values included vegetation communities, flora and fauna species (particularly conservation significant species), fauna habitat and connectivity. The report included an assessment of the values on the mine, water supply dam and tailings storage facility tenures, as well as the power and pipeline easements and the rail load out facility in Mt Isa.

4.14.1.1 Survey methods

Sections 17.2.2 and 17.2.3 described the flora and fauna survey methods used in the mine and linear infrastructure areas respectively. DERM requested that Legend justify why 'wet season' surveys were not conducted during the period specified in the TOR, and whether such surveys would have detected species that would be present in the wet season.

Paradise Phosphate responded in the supplementary EIS that access to the site in the 2010 wet seasons was difficult until April. Despite this, the percentage of possible (based on database records) mammal, reptile, amphibian and bird species that were recorded during surveys was relatively representative. It was argued that no conservation significant amphibians or reptiles are historically recorded for the locale so mid wet season surveys would not have improved information. In addition, Paradise Phosphate stated that EPBC Act listed migratory birds are associated with larger water bodies that do not occur in the project area. EHP considered that the response was adequate.

4.14.1.2 Impacts

Section 17.4 Potential impacts discussed impacts including clearing of vegetation communities and Environmentally Sensitive Areas and loss of habitat of species either recorded or likely to occur in the project area.

Fire and Introduced Plant and Animal Management Plan

DEEDI commented at the supplementary EIS stage that the EM Plan should note the declared species listed and prioritised in the Mt Isa Pest Management Plan. DEEDI recommended that the EM Plan outline what precautionary measures would be taken to prevent the entry, spread and establishment of these species and that staff should be trained in their identification and control. DEEDI recommended amendments to section 5 Management of introduced species (section 5.1 Existing requirements and section 5.2 Management strategies) in relation to:

- the role of DEEDI, local governments and regional Natural Resource Management groups in the existing management of introduced species
- environmental weed management including detail of wash down facilities and staff training
- targets for weed control/management
- inclusion of relevant pest management legislation
- control/management of wild dogs
- alignment of the feral animal strategy with the *Land Protection (Pest and Stock Route Management) Act 2002* and Mt Isa City council pest management programs.

In the supplementary EIS Paradise Phosphate provided a revised Fire and Introduced Plant and Animal Management Plan that addressed the DEEDI recommendations.

4.14.1.3 Biodiversity offsets

Section 17.6 Residual impacts and offsets provided a brief description of vegetation (regional ecosystems) that will be cleared as a result the project that is subject to offset requirements under the Queensland Biodiversity Offsets Policy 2011 (BOP) Oct 2011.

DERM commented that this section should provide detail about how the project will address the BOP, particularly in relation to impacted regional ecosystems and threatened species. Paradise Phosphate responded that the company had consulted with DERM botanists to identify offset requirements in relation to vegetation. Paradise Phosphate stated that the company was seeking to deliver offsets through an offset transfer and had sought tenders from several companies to develop a Biodiversity Offset Strategy for the project. The policy requires proponents to provide details about the impacted state significant biodiversity values that require offsetting, and about the offset transfer process, when an Environment Authority is issued. In the supplementary EIS Paradise Phosphate has given a commitment to address the BOP requirements prior to Environmental Authority approval.

Appendix R Terrestrial ecology report of the EIS provided a detailed assessment of vegetation communities, flora and fauna of the project area, including the mine site and transmission and slurry pipeline easements. DERM considered that incorrect land form classifications had been used to map the vegetation. Appendix R provided a comparison between DERM certified vegetation mapping (Biodiversity status) and mapping based on ground truthing by Legend in the project area. DERM noted that any changes to vegetation mapping may result in biodiversity offset implications for the project and recommended that discrepancies between DERM certified vegetation mapping and results of ground truthing of vegetation be resolved.

In the supplementary EIS Paradise Phosphate responded that their consultants had discussed the issue with DERM staff and resolved that while changes to landform would result in different vegetation community classifications, these would not have biodiversity offset implications. The different landform classifications do not significantly alter the vegetation mapping under the *Vegetation Management Act 1999*, on which the offset policy is based. EHP considers that the approach taken by Paradise Phosphate will not result in a significant difference in the offset requirements between the certified and field mapped regional ecosystems.

DERM also raised issues about the fauna survey effort described in Appendix R. DERM recommended that the EIS should provide search effort information for day, night and targeted searches and for the opportunistic data (estimate of number of hours). DERM also recommended that justification be provided on how the trapping effort meets the comprehensiveness criterion of the TOR.

In the supplementary EIS Paradise Phosphate responded that the field survey was designed to capture a representative sample of species assemblages for the project site and surrounds. Paradise Phosphate stated that the methods used were discussed with DERM regional staff, in light of the nature of the landscape and the habitats present, and the methods were understood to be appropriate. Paradise Phosphate stated that the two systematic surveys conducted on the project site were intended to identify the species that regularly use the area, taking into account logistical constraints of site accessibility (wet conditions precluding access), concerns over the welfare of any animals captured in traps (e.g. heat stress) and the health and safety of field staff. EHP considered that Paradise Phosphate's response adequately justified the approach taken in the assessment.

4.15 Aquatic ecology

Chapter 18 Aquatic ecology of the EIS provided an assessment of aquatic habitat and aquatic flora and fauna in the study area, potential direct and indirect effects of the project on these values and environmental protection objectives. The study area included Battle Creek and its tributaries, comparative sites on Gunpowder Creek and relevant areas of the Leichhardt River and Georgina River catchments.

4.15.1 Surveys

Section 18.2.2 Field surveys described the methods used to survey aquatic habitat and communities (flora and fauna).

DEEDI considered that the surveys:

- were not adequate to provide the data necessary to establish the aquatic habitat values of the area, and in particular to evaluate the fish habitat use upstream of the dam wall and at other proposed waterway barrier works,
- the EIS sampling effort (a single survey) in the ephemeral, variable systems would give insufficient data to properly evaluate the level of impact and identify the necessary mitigation and management measures needed to address the impacts, and
- survey methods may not have been able to detect fish at some sites.

In the supplementary EIS Paradise Phosphate directed DEEDI to Appendix B Supplementary Aquatic Ecology Report of the supplementary EIS for further information on the known movement and migration requirements of the fish species caught in the study area based on published information. Additional baseline studies are planned prior to construction. Paradise Phosphate responded that conducting surveys when there are flows in the system is logistically extremely difficult due to:

- limited opportunities to sample during flows (in the vicinity of the dam, as, for example, Battle Creek only flows with water depths >30 cm for less than three per cent of the year, or 11 days per year)
- safety and access considerations during high flows, as a result of the nature of the tracks in the area.

Paradise Phosphate acknowledged that the data collected during the EIS did not evaluate fish habitat use upstream of the dam site but provided insight into the fish species using these upper reaches of the catchment. Paradise Phosphate also stated the consultant used for the work had significant experience in the region and could draw on a database of information developed through other studies in the region to make conclusions about the project area.

Section 18.3.6 Turtle communities of the EIS (and section 4.5 of Appendix S Aquatic ecology report) described the turtle species that occur in the project area and their conservation significance.

DERM advised that detail information on turtles in the EIS was incorrect. Legend responded that amended information on turtles was included in Appendix B Aquatic ecology supplementary report of the supplementary EIS.

4.15.2 Potential impacts

In the EIS Section 18.4 Potential impacts described potential impacts on the aquatic environment from:

- the operation and maintenance of vehicles and equipment
- vegetation clearing and earthworks
- management of water resources
- loss of catchment area (including minor watercourses)
- loss of on-site dams and trenches
- construction of the water supply dam and tailings storage facility
- changes to flow regimes
- creek diversions
- construction of creek crossings, including roads, pipelines and transmission lines.

DEEDI raised a number of issues about the direct and indirect impacts of the construction of Battle Creek dam and the creek diversions on fish populations, through alteration of flow regimes and imposition of barriers to fish movement. The comments are addressed below in more detail.

4.15.2.1 Connectivity and barriers to fish movement

DEEDI raised a number of issues about the Battle Creek dam and creek diversions potentially creating barriers to fish movement into the upper catchment areas, as well as alterations to flow regimes due to the dam impacting ecological processes downstream of the dam.

DEEDI commented that Legend should provide additional information to support the contention in the draft EIS (section 18.4 and Appendix N section 6.2.7) that ephemeral creek systems do not need fish passages. DEEDI stated that ephemeral creeks, and associated floodplains, still have fish habitat values during flows and in refugia during non-flow periods.

In the supplementary EIS Paradise Phosphate acknowledged that ephemeral creeks can provide important fish habitat. More detail about the importance of fish passage in ephemeral systems was provided in Appendix B Aquatic Ecology Supplementary Report of the supplementary EIS including information on the fish habitat values during flows and in refugia during non-flow periods in the ephemeral creeks and highly connected floodplains of the project area.

A related comment by DEEDI requested the proponent to provide further evidence to support the rationale that a dam fishway would not be required. In the supplementary EIS Paradise Phosphate responded that a dam fishway was unlikely to benefit local and regional fish stocks because of the location of the dam high in the catchment, and because of the limited remaining opportunities for fish to access headwaters in the Battle Creek and Gunpowder Creek catchments. Paradise Phosphate stated that Appendix B provided further details about the rationale for not including a fishway in the dam design.

The Department of Agriculture, Fisheries and Forestry (DAFF) maintains that a fishway in the dam design is needed to benefit local and regional fish stocks and would result in minimal extra cost, given the low gradient of the spillway design.

DEEDI also commented that impacts of the Battle Creek dam in the EIS did not recognise changes in connectivity that would occur with the dam. DEEDI recommended that Legend assess instream and floodplain connectivity as it currently occurs and the changes to this with the proposed dam and water harvesting and release regimes.

In the supplementary EIS Paradise Phosphate responded that instream connectivity is only likely to occur during periods of flow in ephemeral streams (assessed as flows resulting in water depth of more than 10 cm for the

purposes of supporting fish passage). Paradise Phosphate considered that the important stream zone for fish breeding and growth is likely to be the upper and intermediate reaches of Battle Creek, and that the floodplain is unlikely to provide important fish breeding or dispersal habitat within the study area. Further details were provided by Paradise Phosphate in the supplementary EIS in the Appendix B Supplementary Aquatic Ecology Report.

In Section 18.5.7 Construction of the water supply dam in the EIS briefly described dam construction impacts on, and mitigation measures for, water quality and aquatic habitat, and recommended fish stocking as a compensation for the dam imposing a barrier to fish passage.

DEEDI commented that fish stocking of the proposed dam would need to be done under a stocking permit and that permits are generally only issued to community based stocking groups. In the supplementary EIS Paradise Phosphate acknowledged these restrictions and stated that if the option was pursued, Paradise Phosphate would work with community based stocking groups. However, DAFF stated that fish stocking is only permitted in the absence of an alternative (e.g. fish passage provisions) where there are compelling tourism or fishing benefits and not as a fishery creation tool in remote areas with limited access. In addition, DAFF commented that the Gulf catchment is considered of special conservation value and there are additional restrictions on stocking in these waters.

DEEDI requested detail on the potential waterway barrier works that may require approval under the *Fisheries Act 1994*; including location, proposed construction method and types of stream crossings (including pipeline crossings). DEEDI recommended prelodgement consultation, particularly in relation to fish passage design, so that if multiple structures are required they can be incorporated into a strategic approval under the Fisheries Act.

In the supplementary EIS Paradise Phosphate responded that on the mining lease construction would be done according to the Guideline – Activities in a watercourse, lake or spring associated with mining operations (DERM 2010). Outside the mining lease, activities may require a fisheries development approval under the *Sustainable Planning Act 2009*. DAFF responded that the DERM guideline does not provide guidance on fish passage issues for instream works, which can be provided by consultation with DAFF.

DEEDI also raised concerns that during construction of diversion channels a detailed consideration of fish biology is needed to develop diversion channel designs that will allow fish to move along the creek diversions. Diversions need to be designed to provide a range of water flow velocities to allow upstream passage for fish. Other features such as slope, turbulence, avoiding head drops, for example, should be considered. DEEDI recommended that Paradise Phosphate consult with the department to develop these designs.

In the Supplementary, EIS Paradise Phosphate provided detail on the proposed flow rates at different points in the diversion channel path and stated that velocities in more frequent flows (non flood flows) are less than 1 m/s in the lower reaches and potentially allow for fish passage. Paradise Phosphate committed to consult with DAFF to develop appropriate diversion channel designs prior to construction.

4.15.2.2 Fish mortality

DEEDI also had concerns that the design of the Battle Creek dam could result in fish entrainment in dam outlets and also potential fish mortality in downstream movement over the dam spillway.

DEEDI requested further information about design the dam spillway design to ensure safe passage of fish over the weir. In the supplementary EIS Paradise Phosphate directed DEEDI to Appendix C Basis of design water supply dam for a revised design, including apron and energy dissipation design to ensure safe fish passage over the spillway. DAFF responded that the current design risks fish entrapment and subsequent fish kills. DAFF requested more detail about the 1 m safe fish drop mentioned in Section 4.1 of Appendix C, stating that it was not aware of any drop structure being advocated as a safe drop. The safety of fish drops will depend on several factors including depth of receiving waters and fish size.

DEEDI requested details about the location and operation of the water supply dam outlet structure (for environmental flows), including how water quality will be provided in downstream releases and what steps will be taken to ensure fish are not entrained or injured in the outlet works.

In the supplementary EIS Paradise Phosphate directed DEEDI to Appendix C Basis of design water supply dam for details of outlet works structures, with 2.5 mm fish screen, that ensure fish are not entrained or injured in the outlet works. Similarly the intake of the floating pontoon water supply system will be fitted with a 2.5 mm mesh opening

fish screen. The dead storage allowance of the dam is such that it allows sediments to settle and improve water quality.

DAFF requested that Legend confirm the water supply intake and offtake pipe screen are designed to exclude fish and prevent fish entrainment on the screen. DAFF supported small aperture fish screens to maximise fish exclusion, but added that fish entrainment would need to be considered, as well as screen maintenance.

Conclusion

DEEDI/DAFF raised concerns about the Battle Creek dam and proposed creek diversion designs that impact on fish movement and fish mortality. Paradise Phosphate content that opportunities for fish passage upstream of the dam wall are not required. It is unclear if the design of the dam and outlet structures would limit the risk of potential injury and/or mortality during fish movement over the spillway, by entrapment in pools on the proposed low gradient spillway and on outlet pipe screens, and by increased predation resulting where fish may aggregate below the spillway if there is a barrier to movement. This report endorses the recommendation and commitment by DAFF and Paradise Phosphate to engage to address:

- the need for mitigating impacts on fish movement by providing for fish passage in the design of the Battle Creek dam and creek diversions
- an agreed dam spillway and outlet structure design and operation that minimises fish mortality.

As these matters are not regulated by the EP Act, and as the provisions of the *Fisheries Act 1994* regarding waterway barrier works also do not apply (as the dam is on a mining lease), it will be necessary for Paradise Phosphate and DAFF undertake further consultation to determine a resolution that satisfies both parties interests.

4.15.2.3 Flow regimes

In the EIS, Section 18.4.8 Changes to flow regime described compensatory flows from the Battle Creek dam that would mitigate alteration of the natural flow regime, including:

- no releases when there is no natural flow, i.e. no inflow to the dam
- releases that equate to the volume of inflow, when the inflow is less than or equal to 2 ML/day
- releases of 2 ML/day when the inflows are greater than 2 ML/day.

DEEDI commented that assessment requires proper consideration of the impacts of the dam on the flow regime and hence ecological processes of the system, including consideration of impacts on connectivity (along the river and in the floodplain), river processes and habitat maintenance particularly as they relate to fish. In this context, statistics like mean annual flow and median annual flow are not relevant. DEEDI recommended that the EIS should assess changes to the frequency and duration of flow events (and non flow periods), with and without the dam in place, in Battle Creek upstream of the confluence with Rufous Creek and downstream of the confluence.

Paradise Phosphate responded that additional modelling was done to determine the impacts of the dam on the frequency and duration of flows (and non-flow periods). The outcomes of this modelling are presented in detail in the Appendix B Supplementary Aquatic Ecology Report of the supplementary EIS.

DEEDI also requested a rationale for the claim that changes to moderate to high flows would have the least ecological impact. DEEDI noted that the EIS proposed a 2 ML/day compensatory flow for all inflows greater than 2 ML/day to the level of spillway release. This compensatory flow did not provide any compensation for higher flows and the ecological processes that they support. DEEDI requested that Legend clarify how quickly the dam will fill and spill and what the delay will be, as well as how many flow events will not reach beyond the dam wall. DEEDI recommended a compensatory flow release regime that mimics (proportionally) inflows.

In the supplementary EIS Paradise Phosphate responded that the proposed release regime was designed to protect water levels in the billabongs of Battle Creek downstream of the dam during the dry season, as these billabongs are considered to be important refuge habitat for fish in the dry season. As such, the flow duration and spell analysis modelling showed that there would be little impact to low flows and some impact to moderate flows and water depths, with the impact decreasing with distance downstream of the dam. Negligible impacts to high flows were expected based on the modelling, due to overtopping of the dam, which is predicted to occur (on average) 10 times per year. The impacts to flow would be restricted to Battle Creek. Flow modelling showed a decreasing impact to

flows and water depths with distance downstream of the dam and that no discernible impacts to flows and water depths in Gunpowder Creek were expected.

No other parties made comments on these matters. As there were no challenges to the validity of the flow modelling presented in the EIS, it can be considered that the modelling outputs are acceptable. Hence the predicted impacts of the dam on flows on Battle Creek are limited, as expected, to the reach immediately downstream of the dam but well upstream of the confluence with Gunpowder Creek. The significance of the impact of the changed flow regime on the instream ecology on the affected reach is, according to the EIS documents, minimal. It is recommended that should DAFF wish to pursue the matter that they engage with Paradise Phosphate with the aim of negotiating what changes they see as appropriate to the downstream flow regime that improves the instream environment.

4.15.3 Mitigation measures

4.15.3.1 Monitoring requirements

Section 18.5.11 Monitoring requirements provided detail on the Receiving Environment Monitoring Program that forms part of the draft Environmental Management Plan of the EIS. The Receiving Environment Monitoring Program is proposed to cover water quality, aquatic habitat and macroinvertebrates and would be implemented to:

- monitor impacts of the project
- inform continuous improvement
- trigger requirements for remedial action.

In comments on the EIS, DEEDI recommended that the aim of aquatic monitoring at the site needed clarification, in particular how the results could be used to better quantify and manage project impacts for the life of the mine.

In the supplementary EIS, Paradise Phosphate responded that the monitoring program will be designed to monitor and quantify the impacts of the mine (and associated water management) on the receiving environment, using water quality, sediment quality and macroinvertebrates as key indicators, and to monitor the impact of the dam on fish populations. The results of the monitoring program would provide feedback into the site's Environmental Management Plan. The monitoring program for fish populations will be designed prior to construction and Paradise Phosphate committed to submit it to the relevant Government agencies for approval. Monitoring will commence prior to construction in order to collect further baseline data.

In responding to the supplementary EIS, DAFF stated that monitoring should investigate:

- periods of flow to get meaningful data on barrier and flow reduction impacts
- fish mortality at the spillway during spill events and as the spillway dries up
- how the fish community changes over time in the dam
- fish aggregation, predation rates and mortality rates in the tailwater pool during flow releases
- fish passage at stream crossings over a range of flows to confirm that adequate provision for fish passage has been made in the crossing designs as committed to in the Environmental Management Plan.

DAFF requested that the monitoring program should be developed in consultation with the department and any results submitted to DAFF at intervals specified in the program.

4.15.3.2 Habitat mitigation

In responding to the EIS, DEEDI commented that more information was needed about all possible mitigation options for the loss of upstream riverine habitat and the impacts on downstream habitats (through loss of flows between 2 ML/day and overtopping flows). DEEDI noted that where there are residual impacts on fisheries resources and fish habitat, after all possible mitigation options are implemented; there are offset provisions under the Fisheries Act that may be applied.

Paradise Phosphate responded that Appendix B Supplementary Aquatic Ecology Report (sections 4.3 and 4.4) provided a more detailed discussion and evaluation of all possible mitigation options for the loss of upstream riverine habitat and proposed monitoring program of the fish communities of the study area.

4.15.4 Residual impacts

In comments on the EIS, DEEDI stated that there was no information in the EIS about how the water supply dam will be decommissioned, or how releases will be managed if the dam retained. DEEDI recommended that further information was required to support the conclusion that there will be no long term downstream impacts, as the impacts of removing all flows between 2 ML/day and spilling flows have not been quantified.

Paradise Phosphate responded that the dam may be decommissioned or it may remain as a water supply for a pastoral lease. Paradise Phosphate directed DEEDI to Chapter 24 Rehabilitation and decommissioning of the EIS for objectives, strategies, completion criteria and residual risks details associated with the water supply dam.

Creek crossings

DEEDI commented that on mine decommissioning, creek crossings should be removed, or provisions for the maintenance of crossings should be made for the life of the structures, to ensure that the barrier impact on fish is not increased e.g. through debris blockage, upstream and downstream streambed erosion.

In the supplementary EIS Paradise Phosphate acknowledged that creek crossings would need to be removed on decommissioning and outlined relevant rehabilitation objectives from Chapter 24 Rehabilitation and decommissioning of the EIS. The completion criteria for rehabilitation and decommissioning include:

- an audit of diversions and levee banks to confirm stability
- habitat assessment to show areas function as fauna habitat
- post closure monitoring demonstrates that surface water is of a suitable quality.

Recommendations

That the mine closure plan include consideration of the ongoing impacts of the Battle Creek dam on flows and as a water way barrier, should it remain post mining.

Completion criteria that should be met include:

- stable diversions and levee banks
- functional instream habitat
- surface water is of a suitable quality.

4.16 Cultural heritage

Section 19.3.1 Indigenous cultural heritage management process described required processes under state legislation in relation to Aboriginal and Torres Strait Islander cultural resources.

DERM commented that it had received verbal advice that no agreement under section 31 of the *Native Title Act 1993* (Aust Govt) had been made in relation to the mining lease, or was in the process of being made. DERM advised that unless a Native Title Agreement was made that expressly included processes for the management of Aboriginal Cultural Heritage, including the surveying of infrastructure corridors, a Cultural Heritage Management Plan (CHMP) would be necessary under section 87 of the *Aboriginal Cultural Heritage Act 2003* (ACH Act). DERM could not issue an approval for the project unless a CHMP for the project has been developed and approved under the ACH Act.

In the supplementary EIS Paradise Phosphate outlined the process that the company was taking in order to comply with the legislation, in consultation with the Kalkadoon People. Paradise Phosphate stated that the Kalkadoon People had given the company a CHMP that would be included in a pending Native Title Agreement under section 31 of the NT Act.

The Cultural Heritage unit in EHP acknowledged that Paradise Phosphate had adequately addressed the issues raised but noted that the CHMP would need to be signed and registered prior to commencement of construction.

4.17 Social

Chapter 20 Social of the EIS provided an assessment of the likely consequences of the construction and operation of the project on the local and regional community and provided strategies to mitigate adverse impacts and maximise potential benefits. The study area covered the local government areas (LGAs) of Mt Isa City Council and Cloncurry Shire Council, including the regional townships of Mt Isa, Cloncurry and Camooweal.

The EIS considered the social values of population, cultural diversity, housing availability and affordability, community infrastructure and services and the employment and skills base of the region. The EIS also included a draft social impact management plan (SIMP):

The former Department of Employment, Economic Development and Innovation (DEEDI) commented that the EIS addressed general skills development and employment components impacts but more details were required.

DEEDI recommended that the EIS:

- Identify partnerships with the Skilling Queenslanders for Work (SQW) initiative and Job Services Australia (JSA) to maximise local employment outcomes.
- Provide information on the indicative workforce for the construction phases of the project in addition to that for the operational workforce.
- Make direct links between the Social Impact Management Plan (SIMP) actions and the issues identified in the EIS documents.
- Consider and outline the skilling/workforce impacts on the areas from which non-local labour might be sourced (this could be addressed in the Section 5.3 of the SIMP).

In the supplementary EIS Paradise Phosphate acknowledged the support available from, and partnership opportunities with, the SQW initiative and JSA. The roles of these organisations have been noted in the SIMP for Construction, Operation and Decommissioning (C1 and C2 – Education & Training) phases of the project.

Paradise Phosphate also advised that the indicative workforce for the construction phases of the project was provided in the SIMP. In addition, Paradise Phosphate advised that the challenges facing the region identified in the EIS were re-iterated and addressed in the SIMP. These challenges together with project impacts have been addressed in the Construction, Operation and Decommissioning impact mitigation and management strategies of the SIMP. The relevant Identified Impact(s) described in these tables have been attributed to each 'regional challenge' identified and make a direct link between the issues raised in the EIS and the SIMP strategies. Also, Paradise Phosphate advised that the revised SIMP (provided with the supplementary EIS) includes strategies in relation to areas from which non-local labour may be sourced. DEEDI considered that Paradise Phosphate's response to its concerns was adequate.

In Referring to Section 20.10.3 Impacts on employment and skills of the EIS the Aboriginal and Torres Strait Islander Services unit (ATSIS) of the former Department of Communities (DoC) noted that where possible, Legend had committed to actively encouraging local employment and participation. ATSIS recommended the following actions:

- Inclusion of the requirement for a human resources management plan to increase skills levels in the workforce and local communities; and promote to Indigenous employment.
- Collaboration with the project, in a monitoring capacity, to review reports on any Indigenous employment and business activity resulting from the planning, construction and operational phases of the project.
- Specific reporting reflecting the project's employment of Indigenous persons in unskilled labour position for both the construction and operations periods. (One of many Queensland Government priorities is to address the gap in employment outcomes between Indigenous and non-Indigenous people).

Paradise Phosphate responded that the company had liaised with Skills Queensland and ATSIS regarding the development and implementation of a Workforce Management Plan incorporating an Indigenous Employment Plan. The plan would include human resource management that promotes Indigenous employment and increase skills levels in the local workforce. Paradise Phosphate committed to the preparation of this Workforce Management Plan to form part of the SIMP in accordance with Criteria 2 Supply Issues and Strategies as provided by Skills Queensland and endorsed by ATSIS. As requested the Workforce Management Plan will include

reporting to DoC of indigenous persons in unskilled labour positions for both the construction and operation phases.

The SIMP was revised to include the Workforce Management Plan as a key mitigation strategy, which will comprise the impact management and mitigations described in tables 5.2, 5.3 and 5.4 of the revised SIMP.

The Department of Aboriginal and Torres Strait Islander and Multicultural Affairs (DATSIMA) considered the response to be adequate, with a minor amendment to the supplementary EIS wording to expand the scope of reporting on Indigenous employment from unskilled labour positions to those in both skilled and unskilled positions. DATSIMA commented that the details needed to be finalised upon Final Investment Decision with key performance indicators for Indigenous employment.

Section 20.10.3.2 Skill development of the EIS broadly describes the skills required for the project and potential projects in the region to help develop those skills in the community. ATSIIS noted that Legend would increase the availability and diversity of skills at the local level during project planning, construction and operational phases by working with Kalkadoon People to identify opportunities to increase skills of Indigenous community members. ATSIIS commented that Legend should provide performance reporting and results from the engagement with, and investment in, Indigenous skills training.

In the supplementary EIS Paradise Phosphate responded that the company had liaised with Skills Queensland and ATSIIS regarding the development and implementation of a Workforce Management Plan incorporating an Indigenous Employment Plan. As requested, the Workforce Management Plan will include reporting to DATSIMA about engagement and investment in indigenous skills training. The SIMP was revised to include the Workforce Management Plan as a key strategy which includes reporting of engagement and investment in Indigenous skills training (see Table 5.1). DATSIMA considered that Paradise Phosphate's response was adequate.

In comments on the EIS, DEEDI encouraged the development of a Workforce Development Strategy through consultation with Skills Queensland. In the supplementary EIS Paradise Phosphate committed to develop a workforce management plan in accordance with Criterion 1 – data template indicating workforce demand and Criterion 2 – supply issues and strategies, as provided by Skills Queensland.

In relation to section 20.10.5 Social services and infrastructure, DEEDI noted that the social impact assessment recognised that some enhancement of existing social services would be required during the project, but it did not specify liaison with, and reporting to, the Queensland Government, which is the relevant body for services named in the document.

DEEDI recommended:

- that an efficient monitoring and reporting arrangement be developed in consultation with DEEDI on impacts/service requirements arising from project
- inclusion of state government regional departments (e.g. Health, Communities, Community Safety) on community consultation mechanisms, so data could be provided directly to relevant agencies for assessment and action.

In the supplementary EIS Paradise Phosphate considered that any potential impact to local social services and infrastructure arising from project development is expected to be minor as there will be very low workforce numbers in Mt Isa.

The construction workforce for the project will be accommodated in a purpose-built mine village at Paradise South. The peak construction workforces for the 1 Mtpa and 2 Mtpa production scenarios are 110 and 171 personnel respectively. The peak construction workforces in Mt Isa for the two production scenarios are 15 and 34 personnel respectively. For the two production scenarios the operational workforces are 177 and 326 full time personnel at the Paradise South mine. The mine camp accommodation capacities are 110 and 171 people respectively for the 1Mtpa and 2 Mtpa production scenarios. The rail load out facility for the project is located in Mt Isa. The full time workforces in Mt Isa for the 1 Mtpa and 2 Mtpa production scenarios are 12 and 8 personnel respectively.

Paradise Phosphate stated that given the low workforce numbers in Mt Isa, monitoring and reporting was limited to advising local and state governments of any changes in personnel projections and providing support to local service initiatives. As an existing and future small business in Mt Isa, Paradise Phosphate committed to continue to support the local community in addressing social and essential services. DEEDI considered that the Paradise Phosphate response was adequate.

Social Impact Management Plan

The SIMP outlines Legend's commitments to the community and local area, providing specific and measurable objectives to reduce and mitigate project impacts on the social environment. The SIMP will be reviewed and updated regularly in consultation with the community.

DEEDI recommended that Legend create a community reference group with a membership including a cross section of affected people. Paradise Phosphate responded that the majority of comments on the EIS were on project related road issues, and the company had formed a road users group. In addition, to facilitate public input, the company had attended the Mt Isa Mining Expo for several years, held town hall public meetings and maintained a feedback process through their website. This response was considered adequate.

Section 5.2 Key strategies of the SIMP provides an overview of key impact mitigation strategies. DEEDI recommended that Legend prepare a housing strategy that dealt with temporary and permanent worker housing, its impacts on affordable housing, and mitigation strategies for impacts on the market and consultation processes. In the supplementary EIS Paradise Phosphate responded that accommodation for the majority of their workforce, which was associated with the mine site, would be at the Paradise South mine. The rail load out facility in Mt Isa will require a small permanent workforce but Paradise Phosphate maintained that given the low workforce numbers domiciled in Mt Isa, a housing strategy was unnecessary. DEEDI considered that the response was adequate.

DEEDI commented that while this section stated that an Indigenous assistance strategy would be developed to address recruitment and retention strategies there was not enough detail in the strategy. DEEDI provided a number of recommendations about information that should be included in the SIMP. In the supplementary EIS Paradise Phosphate provided a revised SIMP that included the DEEDI recommendations (see section 6.1.1 of the revised SIMP).

DoC commented that the EIS did not sufficiently address issues in relation to people with a disability in the project area. DoC considered that the EIS required:

- an assessment of disability prevalence in the affected area, in order to allow assessment of potential social and cultural impacts of the project
- an assessment of policies for recruitment of people with a disability in the affected area.

DoC recommended that the SIMP should include data that are relevant to ensuring the access and inclusion needs of people with disabilities, and should address the TOR with regard to recruitment of people with a disability.

In the supplementary EIS Paradise Phosphate revised the SIMP to include an assessment of disability prevalence in the affected area (see Section 3.2.1) and an assessment of the Paradise Phosphate's equal employment policy and discrimination and harassment policy with regard to the recruitment of people with a disability. DoC considered that Paradise Phosphate's response was adequate.

Section 5.3 Impact mitigation and management action plans of the SIMP provides a tabulated assessment of the potential impacts, probability of occurrence, consequences and management strategies, with associated time frames and key performance indicators for each impact. DEEDI commented that the Employment, Industry and Incomes section could be strengthened and provided several recommendations including; addressing skills development strategies, mitigation strategies to address skills and labour shortages and consultation regarding training local residents for non-mining activities.

In the supplementary EIS Paradise Phosphate adopted the DEEDI recommendations in the SIMP and Workforce Management Plan.

DoC noted that the probability assessment in the impact mitigation and management action plan for the likelihood of increased demand and cost for local accommodation, particularly rental properties during project construction, was determined as 'unlikely' as the project is remote and most personnel would be accommodated in purpose-built facilities. DoC supported monitoring rental availability in Mt Isa and implementing appropriate strategies to control project induced demand but suggested this may also need to be applied to Townsville which will be a source community and is already subject to housing and construction workforce pressures from projects such as the Townsville Port Expansion Project.

DoC also noted that annual monitoring (on SIMP review) of the rental market was proposed for the operation and decommissioning phases of the project. DoC recommended that monitoring should include the regional centres of Rockhampton and Gladstone (in terms of broad-level data) and that the Paradise Phosphate should liaise with

councils and state agencies in these areas in order to understand the wider context of cumulative impacts. DoC recommended the following requirements to facilitate successful implementation of appropriate mitigation strategies:

- accurate information on workforce numbers and profile during various phases of the project
- frequent liaison with local governments in the region
- collaboration with local government, local housing providers and other companies/proponents as part of a wider housing solution.

In the supplementary EIS Paradise Phosphate responded that it would include the monitoring of broad-level data for rental availability in Townsville, Rockhampton and Gladstone during the construction and operation phases of the project in order to understand any cumulative impact in these areas. In addition, Paradise Phosphate advised that the suggested requirements for successful implementation were included in the revised SIMP. DoC considered that Paradise Phosphate's response was adequate.

In section 5.3 of the SIMP Paradise Phosphate committed to support the Mt Isa City Council (MICC) and other local service providers to manage the potential cumulative social changes arising from this and other projects in the study area. DoC recommended that Legend be more specific about the nature of this support. In addition, DoC recommended that Legend include DoCs Regional Service Delivery Operations in consultation about the SIMP review, as well as advice regarding 'refined workforce and population projections directly associated with the project and any requirements for social services and infrastructure'.

Paradise Phosphate advised that the revised SIMP included impact management and mitigation involving collaboration with local government with regard to projections for social services and infrastructure (see Table 5.2 Impacts B1, D1 & G1; Table 5.3 Impacts B1 & D1; and Table 5.4 Impacts A1 & B1). Paradise Phosphate also noted that the company welcomed the SIMP review and additional advice by DoC regarding refined workforce and population projections directly associated with the project, and any requirements for social services and infrastructure. DoC considered the response to be adequate.

In response to the supplementary EIS, the Department of Housing and Public Works (DHPW) (formerly part of DoC) commented on construction and operation impact mitigation strategies dealing with increase in demand and cost for local accommodation, particularly rental properties and particularly during project construction and start up.

DHPW noted that the management and/or mitigation strategies for this impact included 'Monitor rental availability and control project induced demand where there is potential for adverse impacts.'

DHPW stressed the need for Legend to liaise jointly with at least the Townsville City Council, as it is a SIMP nominated key worker source area and has a much greater capacity to respond to project induced demand for accommodation. DHPW recommended that the SIMP should include:

- a commitment to liaise with both the Mt Isa and Townsville city councils on monitoring rental availability and controlling project induced demand where there is potential for adverse impacts
- a commitment to provide data to the Office of Economic and Statistical Research (OESR) to monitor the cumulative impacts of workforce numbers on the housing market and community services. The OESR collates data to monitor cumulative impacts in resource regions under agreements with project proponents which address data confidentiality issues.

As these issues were first raised in response to the supplementary EIS stage, these comments were forwarded to Paradise Phosphate for action. Paradise Phosphate should liaise with DHPW on their concerns and amend the SIMP accordingly.

ATSIS commented that as part of mitigation strategies to address recruitment and retention strategies specifically for Aboriginal and Torres Strait Islander workers, Paradise Phosphate should provide performance reporting and results from engagement with, and investment in, Indigenous employment recruitment and retention strategies. Paradise Phosphate responded that the SIMP had been revised to include the Workforce Management Plan as a key strategy, which included reporting to DATSIMA about engagement and investment in indigenous skills training. DATSIMA considered the response to be adequate.

4.18 Health and safety

Chapter 21 Health and Safety of the EIS provided an assessment of existing community values for health and safety and potential health and safety implications for the construction, operation and decommissioning of the project, including the mining and beneficiation of ore, its transport by either pipeline or road, and load out to rail in Mt Isa.

The Queensland Ambulance Service (QAS) and the Queensland Fire and Rescue Service (QFRS) provided general comments about their responsibilities and did not regard the project as having a major impact on their roles, provided (in the case of Fire and Rescue) statutory obligations in the construction and operation of the project were met. In the supplementary EIS Paradise Phosphate committed to comply with statutory responsibilities as outlined in the EIS, and to ongoing communication with both departments on issues that may impact on their areas of responsibility e.g. emergency response to an accident, illness or injury as a consequence of the development.

4.19 Economy

Chapter 22 Economy of the EIS reviewed the existing economic environment of the project area and identified likely direct and indirect economic impacts of the project activities. The study area included Mt Isa City, Cloncurry Shire, the North West Statistical Division (SD) and the Northern SD of Queensland. The chapter outlined the industry structure, employment structure, labour force and unemployment, incomes and earnings in the study area.

Local industry policy

The Office of Advanced Manufacturing (OAM) of the former DEEDI commented that the EIS did not sufficiently address the Local Industry Policy (LIP) – A Fair Go for Local Industry (Qld Gov, 2008).

OAM recommended that:

- a new section be created for the final draft of the EIS and titled: Local Industry Policy Implementation
- Paradise Phosphate should outline its objectives on how it intends to provide full, fair and reasonable opportunity for capable and competitive ‘local industry’ to tender for work on the project
- all interested groups should have access to relevant LIP information and documents so as to promote LIP implementation from the earliest time possible.

Paradise Phosphate responded in the supplementary EIS that the company had liaised with the Industry Capability Network (ICN) Queensland regarding the LIP and prepared and submitted a Local Industry Participation Plan to ICN. Paradise Phosphate advised that the project had been registered on the ICN Gateway online search platform. OAM considered that the Paradise Phosphate response was adequate.

4.20 Hazard and risk

Chapter 23 Hazard and risk of the EIS described the hazards and risks associated with the construction, operation and decommissioning of the project including the phosphate mine, beneficiation plant, tailings and water supply dams, transmission line, pipelines between the mine and Mt Isa and the mine site accommodation facilities.

The focus of the chapter was the identification of hazards affecting people and property, and the assessment of the risks arising from those hazards. It also included risks to the environment as a result of discrete events or incidents that are outside the normal mine operation, such as leaks, fires or equipment malfunction. The objective of the assessment was to identify those risks that might have the potential to adversely affect the project, its stakeholders, the environment and the local community.

The Department of Community Safety (DCS) commented that the EIS did not address the natural hazard issue of landslide. The comment also was relevant to Chapter 21 Health and Safety of the EIS. DCS recommended that Legend undertake a landslide natural hazard assessment that identified all areas on the site with a gradient of 15 per cent or greater and whether the proposed mining activities would increase the risk of landslides. For areas of increased risk, DCS advised that the assessment should identify the implications for operation of the mine, property, the safety of people and the storage of any hazardous goods on site over the life of the project.

In the supplementary EIS Paradise Phosphate responded that some parts of the mining area have gradients greater than 15 per cent but these steeper areas (rocky outcrops) have only slightly higher elevation compared to adjacent areas. The gently to moderately undulating lands of the mining area range in elevation from approximately 300–330 m AHD only. Therefore there was no landslide hazard for the operation of the mine, start-up tailings storage facility or water supply dam. Paradise Phosphate also indicated that the topography of the transmission line, rail load out facility and slurry pipeline was also either flat or gently undulating and presented no landslide hazard. At the end of mining, constructed landforms would be designed to reach a maximum height of 320 m AHD consistent with pre-mining elevation and designed to be stable and to sustain an agreed post mining landuse (see Chapter 24 of EIS). Paradise Phosphate also noted that an erosion and sediment control plan was provided in the Environmental Management Plan to inform development of necessary site specific erosion and sediment control plans. DCS considered that the supplementary EIS response was adequate.

4.21 Environmental Management Plan

The draft Environmental Management Plan (EM Plan) was prepared to support an application by Legend in relation to the mining leases covering the mine site, water supply dam, tailings storage facility and linear infrastructure. The EM Plan aims to assess the potential environmental impacts of the Paradise South Phosphate Project and associated mitigations and controls to be implemented during mining activities, and to propose Environmental Authority conditions that should be applied to the project.

4.21.1 General conditions

Section 3.2.1 Proposed general conditions of the EM Plan contains a number of general conditions that Legend has proposed for the project, under a range of subject headings, that will be included in the Environmental Authority issued by the Department of Environment and Heritage Protection (EHP).

In relation to conditions for monitoring and measurement, DERM commented that they were not specific enough about how monitoring records should be given to the department. DERM recommended that the condition(s) should require the holder of the Environmental Authority to provide automated water quality monitoring data to align with the department's WaTERs database which is being designed to store the Receiving Environment Monitoring Program.

Paradise Phosphate adopted the recommendation in the revised EM Plan, the monitoring condition including a requirement to provide data in a format requested by the administering authority.

4.21.2 Air quality

Section 4 Air quality of the draft EM Plan consists of an assessment of air quality values and potential impacts. DERM commented that the draft EM Plan did not include details of an ambient air monitoring program to detect and manage adverse air impacts. The EM Plan stated that PM₁₀ and fluoride ground level concentrations at the accommodation village may exceed the Environmental Protection (Air) Policy 2008 objectives. The results from a monitoring program could be integrated with the dust mitigation strategies to ensure the protection of environmental values. DERM recommended that the EM Plan include an ambient air monitoring program for the site that includes at least the following:

- sampling practices, procedures and parameters for contaminant testing
- selection of sampling locations to demonstrate that samples collected will be representative of the air quality of possible sensitive receptors
- frequency of sampling to be undertaken at each location including the number of samples to be taken, sampling period/duration, continuous or semi-continuous sampling
- meteorological data collection including at least the wind speed and wind direction during the air quality monitoring program at the monitoring locations.

In the supplementary EIS Paradise Phosphate reiterated the details of the Ambient Air Quality Monitoring Program in the draft EM Plan which include objectives, instrumentation, locations, methods, thresholds and corrective actions. The program was designed to monitor air quality at the project introduced accommodation village, the only

sensitive receptor that may be impacted by air quality. EHP considered that the response adequately addressed the original DERM issues.

4.21.3 Ground water

Section 5.2.2 Groundwater impacts of the EM Plan covers the impacts on groundwater resources of the open-cut mine, final void, water supply dam, storage of tailings and out-of-pit dumps and the beneficiation process.

DERM commented that the section did not propose mitigation measures for potential impacts on groundwater and recommended revising the section to include:

- a revised groundwater monitoring plan
- the establishment of strategically located groundwater monitoring points down gradient of the final void location, out-of-pit dumps and the pits
- a commitment to mitigate the impacts of mining operations on groundwater if monitoring indicates a potential impact, and set out how the mitigation could be achieved.

In the supplementary EIS Paradise Phosphate responded that the EM Plan had been updated to include the following:

- groundwater impacts updated in Section 5.2.2 to reflect additional information from Appendix F Report on groundwater issues, which was compiled to address EIS submissions relating to groundwater
- management strategies to mitigate any potential adverse environmental impact on groundwater included in Section 5.4.4
- a revised groundwater monitoring plan included in Section 5.4.5 Groundwater monitoring of the EM Plan and in the Receiving Environment Monitoring Program (attachment g of EM Plan).

In addition, the groundwater monitoring program included an additional five monitoring bores, including bores located down hydraulic gradient of the final void and other mining infrastructure. Reporting and corrective actions were included in the groundwater monitoring strategy. EHP considered that the response was adequate.

4.21.4 Discharge criteria

Section 5.4.1.3 Discharge criteria of the EM Plan describes methods for establishing discharge criteria for water discharges, and includes interim contaminant-release investigation trigger levels.

DERM commented that the discharge criteria included contaminant monitoring but did not include the monitoring and recording of the following criteria that are important for aquatic ecosystem risk assessment purposes, as well as demonstrating potential changes in water quality that are not contaminant related:

- Additional habitat condition e.g. flow rate and depth of water at the time of sampling, etc.
- Physicochemical water quality parameters e.g. pH, temp., DO, etc.
- Major ions (cations: Na⁺, K⁺, Mg²⁺, Ca²⁺, etc. and anions: Cl⁻, CO₃²⁻, HCO₃⁻, etc).

DERM recommended adopting Interim Trigger limits presented in Table 5.5 of the EM Plan in the proposed conditions in the environmental authority pending further revision to incorporate any additional data (specified above) that may be collected between the time the EIS was prepared and the actual drafting of the Environmental Authority.

In the supplementary EIS Paradise Phosphate responded that additional physicochemical water quality parameters and habitat condition monitoring criteria were included in Section 5.4.1.3 of the Environmental Management Plan and the receiving environment investigation trigger criteria were updated in the proposed Environmental Authority conditions in Section 5.5 of the Environmental Management Plan. A receiving environment monitoring program is provided in Attachment G of the revised Environmental Management Plan detailing all discharge and receiving environment monitoring requirements.

DERM also commented that a superseded version of the model water conditions for coal mines in the Fitzroy Basin was used to write several parts of the EM Plan. The revised version of this document has updates to the flow trigger condition. Legend was incorrectly advised at the EIS response stage that the version that was used was adequate. In response to the supplementary EIS DERM water scientists again raised the issue that flow triggers should be based

on the most up to date version of the model water conditions document. As a result of earlier advice Paradise Phosphate has not adequately addressed the water quality issues raised by DERM water scientists. Paradise Phosphate will continue dialogue with EHP regional staff and water scientists in the Department of Science, Information Technology, Innovation and the Arts (DSITIA) during pre-construction phases to address water quality issues and appropriate conditioning of the Environmental Authority.

4.21.5 Mine affected water storages

Section 5.4.1.4 Design criteria to limit uncontrolled discharges of the EM Plan describes the methods to ensure the probability of an overflow of mine affected water dams and the tailings storage facility is very low.

DERM made the following comments in relation to this issue:

- The hazard category of all regulated dams on site was assessed as 'significant' and that the contents of some dams were not considered fit for release to the general environment. Dams such as nominal sediment dams that receive waters from working waste rock dumps, can release to the general environment.
- The appendices to the EIS and supplementary EIS used water balance models that were not fully developed or calibrated.
- Of the mine-affected water dams, only the storage volumes for the main Environment Dam (4.765 GL) and the decant water dam (1.6 GL), have been nominated.
- There is no detail regarding access and contingency arrangements for monitoring and pumping. Monitoring and pumping, together with contingencies for wet weather access and power outages, are critical elements of the proposed site water management.
- Details of a proposed Receiving Environment Monitoring Program are not provided in either Section 5.4.4.2 or elsewhere in the draft EM Plan or in Appendix N. Bores for monitoring of groundwater are covered but not the means and frequency of recording

DERM recommended the following measures:

1. Develop the water balance modelling further to allow Legend to clarify and commit to:
 - storage volumes for construction of all significant dams at commencement
 - operational arrangements for monitoring and pumping.
2. Define the frequency of spills from all dams to the general environment and provide a quantitative assessment of likely concurrent environmental flows and dilution.
3. Provide details of a proposed Receiving Environment Monitoring Program and monitoring points for environmental surface water, as well as frequency and methods of recording for both surface water and groundwater monitoring.
4. Provide more detail regarding access and contingency arrangements for monitoring and pumping systems required for site water management of dams, together with contingency arrangements for wet weather access and power outages.

In the supplementary EIS Paradise Phosphate responded that the water balance model for the project was developed in the Integrated Quantity Quality Model, which assumed worst case disturbed mining catchments of 500 hectares at Year 15 of mining. The environmental dam and the decant water dam were sized based on this assumed worst case scenario. Paradise Phosphate committed to constructing the environment dam and decant water dam to maximum capacity when first commissioned.

Modelling showed that dams will generally have sufficient storage capacity to contain mine affected water and have an acceptable level of protection. Paradise Phosphate stated that during extended wet periods temporary water storage would be provided in inactive areas of the pit, so controlled discharges offsite would not be necessary. However, spillways for environmental dams and the decant water dam would be provided in the unlikely event of an emergency. The receiving environment monitoring program in Attachment g of the revised EM Plan recommends downstream receiving environment trigger limits for this scenario.

4.21.6 Surface water quality monitoring

Section 5.4.4.2 Receiving environment monitoring program of the draft EM Plan outlines aspects of the water and sediment quality monitoring program used to determine compliance with relevant water quality objectives.

DERM commented that the receiving environment monitoring program does not include a detailed method for monitoring ephemeral watercourses which comprise much of the receiving environment to be monitored. DERM recommended that Legend prepare a monitoring strategy for ephemeral ecosystems that will form part of the receiving environment monitoring program. DERM advised that the monitoring strategy should aim to obtain data representative of the range of water quality typically observed in ephemeral streams and should schedule sampling after flows occur and ensure ongoing sampling while significant bodies of water remain.

In the supplementary EIS Paradise Phosphate referred DERM to the receiving environment monitoring program in the revised EM Plan that details a monitoring strategy for ephemeral watercourses including sampling frequency and timing, sampling sites, water quality parameters, and sampling method. EHP considered that the responses were adequate.

4.21.7 Proposed conditions

Section 5.5 Proposed environmental authority conditions contain the conditions proposed by Legend to be included in the Environmental Authority for the project.

DERM commented that the trigger limits presented in Table C4 Interim on-site water storage contaminant limits were identical to the receiving environment trigger limits, and that it was unlikely that raw water kept in on-site storage would retain the same quality as natural flows from which it was harvested. DERM recommended revision of Table C4 using default water storage contaminant limits presented in the latest model water conditions for coal mines in the Fitzroy Basin, which is subject to review after two years of operation. In the supplementary EIS Paradise Phosphate revised the EM Plan conditions as recommended.

In response to the supplementary EIS DERM reiterated that the values in Table C4 will be subject to review after two years of operation, or until a sufficient amount of data is collected as the default limits were adopted from the model conditions. DERM recommended that the proposed condition be amended to:

‘Contaminant limits subject to review after two years of operation, if sufficient data is provided to satisfy the requirements of the administering authority’.

4.21.8 Control strategies

Section 9.4 Control strategies of the EM Plan outline management strategies to minimise impacts on flora and fauna during construction and operation of the project.

DERM commented that EIS did not include a detailed assessment of the watercourses that lie on the alignment of the transmission line and slurry pipeline, and methods of crossing those watercourses (particularly for the pipeline) that will help to minimise, rather than mitigate, impacts.

Paradise Phosphate responded that the company would undertake waterway works in accordance with the Guideline – activities in a watercourse, lake or spring associated with mining operations (DERM, Dec 2010), which may be used by the holder of a mining lease when removing native vegetation, excavating, or placing fill in a watercourse necessary for and associated with mining operations. Paradise Phosphate acknowledged that works off the mining lease would be subject to development approval under planning legislation. Pipeline crossings will be constructed in the dry season to minimise or negate the need for temporary waterway barrier works. EHP considered that the response was adequate.

4.21.9 Stygofauna management

DERM provided the following comment in relation to Attachment C Stygofauna management plan of the EM Plan. DERM supported the proposed stygofauna monitoring actions but recommended a firm commitment to carry them out. In the supplementary EIS Paradise Phosphate responded that a clear commitment to undertake the stygofauna management plan recommendations was included in Section 5.4.5.4 of the revised EM Plan and in the Receiving Environment Monitoring Program. It included a commitment to report the findings of stygofauna surveys to the administering authority within an annual groundwater report. EHP considered that the response was adequate.

5 Adequacy of the environmental management plan

The EM Plan submitted in June 2012 was revised based on input from DERM and other state government departments. EHP considers that the EM Plan is sufficiently detailed and contains suitable environmental protection commitments to provide a sound basis for the department to decide a range of conditions for a draft Environmental Authority for the project and for Paradise Phosphate to manage most potential impacts on the environment from project operation.

The EM Plan requires additional information in relation to water quality management, and more detail on delivering biodiversity offsets. Water quality information will be negotiated with DSITIA water scientists and EHP Northern Region staff and will inform further Environmental Authority conditions for the project. Hence, Paradise Phosphate will need to submit an amended EM Plan that further addresses water quality management issues.

It is recommended that Paradise Phosphate seek specific advice on the various aspects of the EM Plan and Receiving Environment Monitoring Program (REMP) and proposed conditions from the delegate responsible for the Environmental Authority located in the Mining and Heavy Industries Unit in the EHP Cairns office before submitting any amended documentation.

Further amendments to the EM Plan and the REMP are required in relation to:

- details of the offset requirements and delivery mechanisms over different stages of the project
- revision of the REMP to include more detail in the monitoring design with particular reference to:
 - water sampling frequencies, covering different stages of the hydrograph and water release times
 - frequency and parameters of sediment sampling
 - macroinvertebrate sampling to consider the nature of ephemeral waterways
 - additional physico-chemical water quality parameters
- revision of controlled release conditions
- incorporation of additional data for interim contaminant-release trigger limits when it becomes available from further monitoring.

6 Recommendations about the suitability of the project

In this EIS process the detailed information compiled by Paradise Phosphate about the environmental values of the proposed Paradise South Phosphate mine site and associated infrastructure, and the potential impacts on those values from project activities, has been scrutinised by representatives of State and local government, industry and members of the public through an open, public review process.

The EIS has largely complied with the terms of reference and has outlined a range of mitigation measures to avoid or minimise environmental impacts. While the majority of issues were covered satisfactorily in the EIS and in Paradise Phosphate's responses to the submissions and revised documents, a number of issues have not been fully resolved.

This report recommends that the following outstanding matters be addressed prior to the project proceeding:

- finalise detailed designs of the water containment structures – water supply dam, tailings storage facility and decant water dam
- resolve fish passage issues in relation to dam design and creek diversions with DAFF
- resolve traffic management and road and intersection design issues with DTMR
- finalise Aboriginal and Torres Strait Islander cultural heritage management processes.

7 Recommendations for conditions for any approval

Section 202 of the EP Act states that a purpose of the EM plan is to propose environmental protection commitments to help the administering authority prepare a draft Environmental Authority for a project. The submitted EM plan for the Paradise South project contains a number of general and specific commitments or conditions that are broadly acceptable to EHP. Some conditions were revised in the EIS assessment process and some additional conditions were recommended. Section 59 of Act requires that this EIS assessment report 'recommend conditions on which any approval required for the project may be given'. Conditions proposed for air quality and contaminated land are discussed in section 4.21.2 of this report. Matters for which either new or revised conditions should be developed include:

- controlled water discharges
- water quality monitoring – frequency, locations, sampling effort
- interim trigger limits for water quality monitoring
- biodiversity offsets management
- stygofauna management.

Additional or revised conditions relating to these matters will be developed once a finalised EM Plan has been submitted that substantially addresses the matters identified in Part 5 of this report. Conditions will be developed by the delegate in EHP northern region in consultation with Paradise Phosphate and EHP and other state government department technical staff.

8 Suitability of the project

EHP has considered the submitted EIS, all submissions and the EP Act standard criteria. The project is assessed as being suitable on the basis of the Environmental Management Plan being completed and any subsequent Environmental Authority, being conditioned suitably to implement the specific environmental protection commitments set out in the EIS and as described in this report. Consequently, the project is considered suitable to proceed to the next stage of the approval process noting that the recommendations of this EIS assessment report should be fully implemented.

9 Approved by

The EIS process is completed when this EIS assessment report is approved by the delegate for the chief executive and given to Paradise Phosphate.

Approved by

SIGNED

Signature

27 AUGUST 2012

Date

Lindsay Delzoppo
Director, Statewide Environmental Assessments
Department of Environment and Heritage Protection
Enquiries: phone 13 QGOV (13 74 68)

Appendix A Environmental Management Plan requirements

Issue 1

Discrepancy between Table C1 (Contaminant Release Points) and Table C3 (Water Storage Monitoring) – pages 100 and 105 of the Proposed Environmental Authority Conditions, EM Plan

Table C1 indicates three different mine affected water storages with release points. Table C3 only indicates two of these for Water Storage Monitoring.

Recommendation

Check and if necessary revise Table C1 and C2 on pages 100 and 105 of the EM Plan respectively to indicate all mine-affected water storages with release points which will be monitored under the conditions of the EA.

Issue 2

Water sampling not restricted to a specific phase of the hydrograph

The document ‘Additional REMP Advice V1.doc’ (DERM 2010) indicates that in the interests of providing robust statistical interpretation, the administering authority is not currently requiring proponents to limit sampling to any particular phase of the hydrograph. Sampling should be undertaken at multiple phases of the hydrograph within the one flow event (including falling hydrograph) and should target multiple flow events within the one wet season (if possible). The Receiving Environment Monitoring Program (REMP) specifically requires monitoring periodically under natural flow conditions and while mine affected water is being released. This should include monitoring during periods of natural flow irrespective of mine releases. Paradise Phosphate currently indicates the use of a falling-stage sampler and opportunistic grab sampling during the falling stage of a flow event. This would restrict sampling to one phase of the hydrograph and not allow the derivation of either high-flow or base-flow water quality objectives for parameters such as TSS, Turbidity and EC from the upstream control site (background reference site). The additional sampling frequency at the permanent waterhole (PS2) is commendable.

Recommendation

Update the sampling frequency of surface water grab samples and automated sampling in section 2.3.2.3 of the REMP (Page 10) to include monitoring during different stages of the hydrograph, during times of release (within a specific recommended time frame) and/or natural flow, including during times of high-flow and base-flow at the control site (PS6).

Issue 3

Macroinvertebrate sampling

Section 2.4.2.2 Macroinvertebrates. Paradise Phosphate should note that monitoring of macroinvertebrates should only be necessary when and where permanent or semi-permanent waterholes exist in the REMP area. Paradise Phosphate should specifically consider the requirements for sampling of aquatic macroinvertebrates in ephemeral systems such as:

- a. analysis of the minimum wetted time for individual semi-permanent waterholes to accept or reject them as a ecosystem that needs to be monitored, and
- b. timing of sampling in relation to wet and dry cycles so that ample time has been allowed for larval growth and recruitment of aquatic macroinvertebrates.

These considerations are outlined in Section 6.3 of the Draft REMP document for Fitzroy Mines v1.03.

Recommendation

Revise section 2.4.2.2 Macroinvertebrates (REMP, Page 12) to include consideration of the ephemeral nature of the waterways, such as the specific sites where macroinvertebrate sampling will occur, timing and frequency of sampling.

Issue 4

Proposed Release Conditions Report in the Proposed Environmental Authority Conditions; Page 101, EM Plan and Page 13 REMP

Controlled releases should be conditioned in the Environmental Authority in accordance with the principals outlined in the Model Water Conditions for Coal Mines not in a separate report.

Recommendation a

If controlled releases are planned the proponent should consult with EHP and DSITIA to assist with the revision of the proposed conditions in accordance with the principals outlined in the Model Water Conditions for Coal Mines in the Fitzroy (DERM 2012).

Recommendation b

EHP should review the relevant sections of the final conditions for the Environmental Authority prior to approval.

Issue 5

REMP Reporting, Section 2.5 Page 13 REMP (Attachment G of EM Plan)

The reporting requirements for the REMP should be updated prior to submission to the administering authority.

Recommendation

Insert the following underlined text.

‘A report outlining the findings of the REMP, including all monitoring results and interpretations will be prepared annually and made available on request to the administering authority. This report will include an assessment of background reference water quality, the conditions of downstream water quality compared against water quality objectives, and the suitability of current release limits (if any) and relevant management plans (water management, erosion and sediment control) to protect downstream environmental values.’

Issue 6

Sediment sampling

1. Metals in sediment

The trace metals and metalloids indicated for monitoring in sediment (Page 9) should be expanded to include copper, chromium, cobalt, antimony and selenium.

Recommendation

REMP Page 9; Insert underlined text:

‘Trace metals: Silver, Aluminium, Arsenic, Barium, Cadmium, Chromium, Iron, Mercury, Manganese, Nickel, Lead, Zinc, Vanadium, Copper, Chromium, Cobalt, Antimony, Selenium.’

2. Sediment sampling frequency

The REMP (Page 10) indicates sediment samples will be collected on a quarterly basis prior to and during mining operations. Quarterly sampling is unlikely to work in areas dominated by ephemeral flows. The draft REMP document for Fitzroy Mines v1-03 indicates that 'monitoring of sediment should only be required when water quality results indicate regular and sustained exceedances of downstream trigger values.'

Recommendation

REMP Page 10, Section 2.3.2.3 final dot point; Insert underlined text and delete struck-through text:

‘Sediment samples will be collected once per flow event and two weeks after the commencement of flow if water persists, on a quarterly basis prior to and during mining operations when downstream water quality results indicate regular and sustained exceedances of water quality objectives. More frequent sampling will be undertaken initially in order to derive baseline (pre-activity) data.’

3. Insufficient detail provided in the REMP

The draft REMP lacks sufficient detail regarding monitoring design (assessing variability using replication), the location of on-site water storages and release points (if any), the indicators measured at each site and the method for each indicator.

Recommendation

Revise the REMP prior to final submission to the Administering Authority in accordance with the requirements provided in draft procedural guides Draft REMP document for Fitzroy Mines v1.03 and Additional REMP Advice V1 (DERM 2010) including:

- monitoring design details including variability assessment (replication, etc)
- location of monitoring sites with respect to mine-affected water storages and release points (if any) by providing a detailed map and updating Table 5 similar to the format indicated below.

REMP monitoring point	Receiving water location description	Latitude	Longitude
Upstream background monitoring point			
MPX	xx creek, xx metres upstream of xx (or RPY)		
Downstream monitoring point			
MPY	xx creek, xx metres downstream of xx (or RPY)		

- use geocentric datum of Australia (GDA94) to indicate latitude and longitude for each monitoring site
- specify the indicators measured at each site
- specify the method used for each indicator.

Issue 7

Habitat Condition and Temperature Monitoring

Additional habitat condition parameters (e.g. flow rate and depth of water at the time of sampling) have been addressed on Page 84 of the EM Plan by the inclusion of the fourth dot point. However, monitoring of the depth of water at the time of sampling has not been included in the REMP. In addition, the temperature of the water at the sampling sites should be monitored alongside physico-chemical parameters and flow.

Recommendation

REMP Page 9 Section 2.3.2.2; Insert underlined text.

‘Gauge boards will be installed at the receiving environment monitoring sites so that flow rates can be estimated and recorded at the time of sampling.

The temperature of the water, depth of water and depth of sampling will be recorded for each sampling event.’

Issue 8

Physico-chemical water quality parameters

Physico-chemical parameters have been included in Table 5.5, Table 4 and Table C2. The parameters inserted into Table 5.5 EM Plan and Table 4 REMP (same Tables) include pH, EC, TSS, Sulfate, Dissolved Oxygen Saturation. Table C2 of the proposed Environmental Authority conditions includes these and also Total Phosphorous, Filterable Reactive Phosphorous, Total Nitrogen, NO_x, Ammonia as N. It should be noted that while we would require monitoring of these in the receiving environment, several of these parameters including pH, EC, turbidity, suspended solids and sulphate would be typically regulated under controlled releases in the model water conditions.

Recommendation

Update Table 5.5 pages 85–86 EM Plan and Table 4 pages 7–8 of the REMP to include the following parameters: Total Phosphorous, Filterable Reactive Phosphorous, Total Nitrogen, Oxides of nitrogen (NO_x) as N, Ammonia as N.

Issue 9**EC Limit**

The electrical conductivity trigger limit of 500 µS/cm included in Table 5.5, Table 4 and Table C2 is the 75th percentile for the Gulf Zone as described in Table G.1 of the Queensland Water Quality Guidelines (DERM 2009). As stated on page 88 of the QWQG (2009), these guidelines are representative of baseflow conditions. Since electrical conductivity is likely to vary markedly in response to flow, it is preferable that a highflow trigger limit is also adopted. An interim Water Quality Objective (WQO) has been derived for EC and presented in Table 5.1 Page 57 of the EM Plan. Since this WQO was derived during the wet season of 2010-2011 it is potentially the best estimate of a high flow EC trigger value until the proponent collects sufficient data to justify a different trigger limit.

Recommendation

- a) Both baseflow (500 µS/cm) and highflow (121 µS/cm) investigation levels for EC should be indicated in Table 5.5 Page 85 EM Plan and Table 4 Page 7 REMP. The receiving environment trigger value in Table C2 can remain as a single limit of 500 µS/cm until sufficient data from background reference sites un-impacted by the site activity is collected (preferably over 24 months).
- b) Paradise Phosphate should note that the baseflow WQO for EC would be considered as a suitable release limit under the Low Flow Receiving Water Flow Criteria under the Model Conditions, in the absence of the 75th percentile of long term background reference site data under baseflow conditions.

Issue 10**TSS Limit**

Total suspended solids (TSS) is another parameter that is likely to vary markedly in response to flow. The interim local WQO for TSS in Table 5.1 (page 57 of the EM Plan) for TSS is 240 mg/L, while a downstream target of 1500 mg/L has been proposed in Table 5.5 and on page 83 (final dot point). The rationale for this limit is that it is conservative with respect to the national default value of 4000 mg/L and the 95th percentile of site readings is 1416 mg/L. It is confounding that the WQO based on the 80th percentile would be that much lower than the 95th percentile. It is possible that Paradise Phosphate has confused Total Dissolved Solids (TDS) with TSS as the 4000 mg/L appears to be a stock based TDS limit in ANZECC and ARMCANZ (2000). It is also inconsistent with the relatively low trigger values for turbidity in tropical lowland and upland rivers provided in Table 3.3.5 in ANZECC and ARMCANZ (2000). The downstream target seems excessive and potentially biased by monitoring during the 2010–2011 wet season.

The control of TSS will be a primary mechanism for the control of phosphate releases to the environment. The relationship between TSS and TP in any on-site mine-affected water storage should be quantified.

It is likely that the proponent will want to convert from TSS to turbidity limits in the future. The measurement of both parameters over a sufficient time period in on-site water storages and in the receiving environment will be required to demonstrate correlation between the two.

Recommendation

- a) The source of the national default value of 4000 mg/L should be checked and this limit revised in Table 5.5 Page 85 EM Plan, Table 4 Page 7 of the REMP and Table C2 Page 100 of the EM Plan. Baseflow and highflow WQOs for TSS should be identified for the REMP. In the interim, the WQO of 240 mg/L + 1–2 standard deviations (depending on the level of variability in this estimate) would be a suitable receiving environment trigger level for Table C2 Page 100 until the data set for background reference sites un-impacted by the site activity is collected (preferably over 24 months).
- b) Until the relationship between TSS and Total phosphorous is quantified in mine-affected water storages the proponent should note that a TSS release limit of 50 mg/L is considered best-practice for sediment basin de-

watering (QWQG 2009) and would be applied to controlled releases in the interim. The proponent should indicate the need to quantify this relationship in on-site water storages in the EM Plan.

Issue 11

Sulfate

The interim local water quality objective for sulphate in Table 5.1 Page 57 of the EM Plan is 9 mg/L while a receiving environment trigger level of 400 mg/L is proposed in Table C2 Page 100 of the EM Plan. This default guideline is the ANZECC and ARMCANZ (2000) recreational guideline. In this instance given the 40-fold difference between this value and the interim WQO, a more conservative downstream trigger value is suggested for Table C2. Drinking water has not been identified as an environmental value for the site. However, the 'aesthetic' taste based limit of 250 mg/L under the Australian Drinking Water Guidelines (2011) is more conservative and we would recommend this limit in the interim given the discrepancy between the WQO and the default.

Recommendation

Both the interim WQO (9 mg/L) and the proposed default guideline of 250 mg/L should be used for assessment purposes in Table 5.5 Page 85 EM Plan and Table 4 Page 7 REMP. The proposed default guideline of 250 mg/L should be applied in Table C2. The proponent should obtain more representative data (preferably over 24 months) from background reference sites un-impacted by the site activity to derive a more reliable WQO to be used for assessment purposes.

Issue 12

Major Ions

The meaning of the original response was changed slightly in the Major Issue – Summary reported to the proponent. In general, major ions should be monitored and recorded in the receiving environment to record any potential changes in water quality. It is not required for the proponent to identify these in Table C2 specifically unless there is a valid guideline associated with a specific environmental value.

Recommendation

Remove calcium, magnesium, potassium, chloride and total alkalinity from Table C2. Retain fluoride, and sodium in Table C2 as these have valid guidelines to protect environmental values. The fluoride limit of 2 mg/L is appropriate in this Table. We suggest that the Australian Drinking Water Guideline of 180 mg/L for sodium is applied, or if a lower trigger value to protect foliar injury in relevant crops (115 mg/L for example) is identified it should be applied (refer Table 4.2.8 of ANZECC and ARMCANZ 2000).

Issue 13

Adoption of interim trigger limits presented in Table 5.5 in the proposed conditions in the environmental authority pending further revision to incorporate any additional data.

The monitoring program undertaken to derive interim water quality objectives was only undertaken in a single and somewhat extreme wet season (2010–2011). It is likely that several of these parameters have been biased by basing these interim water quality objective values on this data set. The requirement for the data to be collected preferably over two years in order to capture two complete annual cycles is therefore quite important, particularly in ephemeral systems where variability can be significant. It is likely that some of the metal and nutrient variation is real natural variation however the proponent has not incorporated more data to demonstrate the validity of adopting these as limits within the proposed EA. The nutrient indicators were not provided for comment previously in Table 5.5

Metals and metalloids	ANZECC & ARMCANZ (AA) (µg/L)	Proposed local interim (µg/L)	Recommendation 20-7a:
Aluminium	55	61	It is doubtful that the proposed local interim is significantly different to AA; more data is required to justify this increase
Arsenic	13	-	Fine

Metals and metalloids	ANZECC & ARMCANZ (AA) (µg/L)	Proposed local interim (µg/L)	Recommendation 20-7a:
Boron	370	-	Correct the boron limit in Table 5.5 EM Plan, Table 4 REMP and Table C2 EM Plan (currently 37 ug/L) to 370 ug/L
Cadmium	0.2	-	
Chromium	1	5.6	More data is required to justify this increase in trigger value. Suggest both are used in the interim.
Copper	1.4	10.4	More data is required to justify this increase in trigger value. Suggest both are used in the interim.
Cobalt	1.4 (SMD -low reliability)	90	More data is required to justify this increase in trigger value. Suggest both are used in the interim.
Iron	300 (SMD – low reliability)	43	More data is required to justify this decrease in trigger value
Lead	3.4	3.4	Table 5.5 EM Plan states that this value is a derived interim local WQO, however it is an AA trigger value—please correct the text in this table.
Manganese	1900	-	Fine
Mercury	0.06	0.1 (LOR)	Fine
Molybdenum	34 (SMD – low reliability)	1 (LOR)	Use AA
Nickel	11	-	Fine
Selenium	5	10 (LOR)	Fine
Silver	0.05	1 (LOR)	Fine
Zinc	8	-	Fine
Vanadium	6 (SMD-low reliability)	10 (LOR)	Fine
Uranium	0.5	1 (LOR)	Fine
Total Phosphorous (TP) as P	10	606	More data is required to justify this level of increase in trigger value. Suggest both are used in the interim until more data is collected.
Filterable Reactive Phosphate (FRP) as P	5	182	More data is required to justify this level of increase in trigger value. Suggest both are used in the interim until more data is collected.
Total Nitrogen (TN) as N	150	960	More data is required to justify this level of increase in trigger value. Suggest both are used in the interim until more data is collected.
Oxides of Nitrogen (NO _x) as N	30	212	More data is required to justify this level of increase in trigger value. Suggest both are used in the interim until more data is collected.

Recommendation

- a) The proponent should include Petroleum hydrocarbons (C6–C9) 20 µg/L and Petroleum hydrocarbons (C10–C36) 100 µg/L triggers in Table C2 pages 100–101. The basis for these triggers are limits of reporting (LOR).
- b) Amend footnote (1) to Table C2 on page 101 of the EM Plan; Delete text in italics and insert underlined text: ‘1 Dissolved concentrations All metals and metalloids must be measured as total (unfiltered) and dissolved (filtered). Trigger levels for metal/metalloids apply if dissolved results exceed trigger.
- c) Specify the monitoring frequency, monitoring locations, and number of samples at each site relevant to Table C2 in the proposed conditions in relevant Tables. The purpose of the REMP sampling (assessing ecosystem health

using water quality objectives) and the monitoring required determining compliance with the EA conditions (and in particular releases) are different. The details of the compliance monitoring should be clarified in the proposed EA conditions. EA Monitoring Points and REMP sites are not necessarily the same, although one may form a subset of the other.

d) The proposed EA conditions Page 101 EM Plan should specify the action required by the licence holder to determine exceedance and reporting requirements in accordance with Model Conditions W6 and W7. For example: ‘The environmental authority holder must compare the downstream results in the receiving waters to the trigger values specified in Table C2 and:

- where the trigger values are not exceeded then no action is to be taken; or
- where the downstream results exceed the trigger values specified in Table C2 for any water quality parameter, compare the results of the downstream site to the data from background monitoring sites and;
 - if the result is less than the background monitoring site data, then no action is to be taken; or
 - if the result is greater than the background monitoring site data, complete an investigation, in accordance with the ANZECC and ARMCANZ (2000) framework, into the potential for environmental harm and provide a written report to the administering authority in the next annual return, outlining:
 - details of the investigation carried out; and
 - actions taken to prevent environmental harm

If an exceedance in accordance with condition 2b is identified, the holder of the authority must notify the administering authority.’