# NOWA NOWA IRON PROJECT

## ATTACHMENT 4 :

## EVALUATION OF PROJECT ALTERNATIVES

Prepared for Eastern Iron Limited by Earth Systems

**REVISION 1**

EARTH SYSTEMS
Environment | Water | Sustainability

EASTERN IRON LIMITED

October 2013

**NOWA NOWA IRON PROJECT**

Victoria, Australia

# Evaluation of Project Alternatives

Prepared for

EASTERN IRON LIMITED

By

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Environment | Water | Sustainability

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# DOCUMENT REVISION LIST

| Revision Status / Number | Revision Date | Description of Revision | Approved By |
|---|---|---|---|
| Rev0 | October 2013 | Draft | Nigel Murphy |
| Rev1 | October 2013 | Final | Nigel Murphy |
| | | | |

# Contents

# 1 Introduction

Eastern Iron Limited ('Eastern Iron'), through its wholly owned subsidiary Gippsland Iron Pty Ltd, proposes to develop the Nowa Nowa Iron Project ('the Project'). The Project is a greenfield development of a high grade magnetite/hematite deposit generally referred to as '5 Mile'. It is located approximately 7 km north of the township of Nowa Nowa, which is situated on the Princes Highway between Bairnsdale and Orbost in East Gippsland, Victoria.

Earth Systems has been commissioned by Eastern Iron to prepare this *Evaluation of Project Alternatives* to support a referral to the Minister for Planning for advice as to whether an Environment Effects Statement is required for the Project pursuant to the *Environment Effects Act* 1978 ('EES Referral').

This report describes and evaluates the Project alternatives considered in the scoping and feasibility process for the proposed Nowa Nowa Iron Project. Based on the outcomes of the evaluation of alternatives, the preferred Project design and layout is described in the ***Project Description and Proposed Mine Plan*** (EES Referral Attachment 1).

## 1.1 Objectives and Scope

The objectives of the Evaluation of Project Alternatives report are to:

- Describe alternatives considered in the Project scoping and feasibility process;
- Evaluate the alternatives and identify the justification for the selection of the preferred alternative.

Given that the purpose of this report is to support the EES Referral, the scope of the report is limited to the consideration of alternatives for components of the Project located in Victoria. Project components and activities proposed in NSW are not considered.

# 2 Approach to Assessment of Alternatives

The proposal is a greenfield development and must therefore be considered in the context of ‘Project’ or ‘No Project’. In the ‘No Project’ scenario, the longstanding identification of iron ore resources at Nowa Nowa (being the largest in the State) will remain undeveloped. In the ‘Project’ scenario, a variety of alternatives have been considered for the Project including the layout of Project components, processing methods, and product transport options.

The key elements/activities of the Project that may potentially result in threats and/or opportunities in Victoria include:

- Project employment;
- Construction activities, including land clearance;
- Mining activities including excavation of the host rock and ore;
- Ore processing;
- Management of waste rock and low grade ore;
- Water supply and management;
- Power supply;
- Transport of product to the Port of Eden;
- Transport of other materials and supplies;
- Economic benefits and flow on effects; and
- Rehabilitation and closure activities.

Potential Project alternatives were first screened to assess whether they have the capacity to meet the technical requirements of the Project. Options that were technically feasible were then considered in terms of the following criteria:

- Economic feasibility;
- Potential environmental impact;
- Potential social and economic costs / benefits;
- Likely stakeholder perception; and
- Potential impact on public health and safety.

A risk based approach was used to guide the evaluation of alternatives in relation to the issues identified above. Key Project risks and controls emerging from the assessment of alternatives are documented in the risk assessment (refer EES Referral Attachment 2).

Key factors which influenced the selection of the preferred alternatives are outlined for each key Project component/activity.

# 3 Mining Alternatives

## 3.1 Mining Area Location

Eastern Iron has conducted exploration activities at the '5 Mile' and '7 Mile' prospects within their Nowa Nowa Mineral Licence Area (EL4509). As part of the Scoping Study, both prospects were evaluated for inclusion within the Project. However, based on the results of the exploration program to date, 5 Mile is the only deposit currently identified as being able to support a viable mining project. The Company has therefore decided to pursue the development of 5 Mile in its own right.

Drilling has not yet commenced at the '6 Mile' Prospect which also occurs within the Company's Exploration Licence Area (Figure 3.1). Separate mining licence applications would be made by the Company for the '6 Mile' and/or '7 Mile' areas should a formal decision be made to proceed with a feasibility study for these prospects.

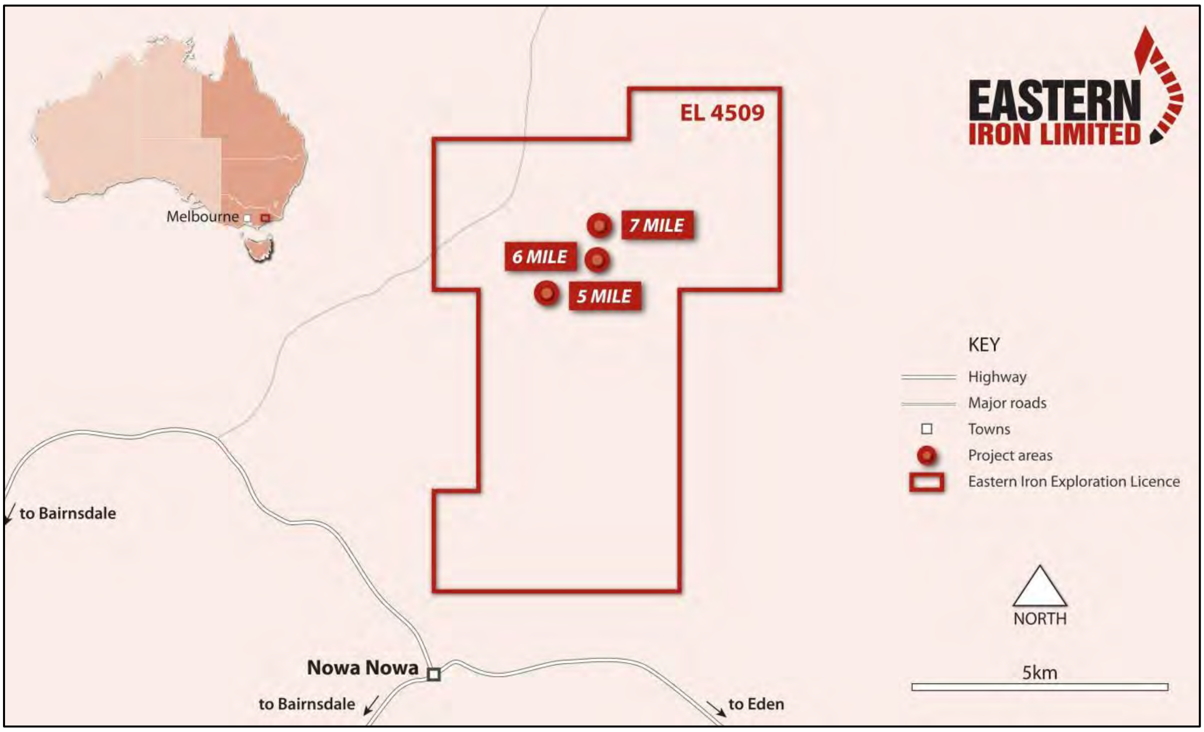


**Figure 3.1 Prospect Locations within EL4509**

## 3.2 Mining Method

Either underground or open pit mining methods can be used to extract ore from the geological terrain. Underground mining is generally favoured for the mining of narrow and deep high grade ore bodies hosted in certain conducive rock conditions. Open pit mining is usually undertaken where the ore body is broad and/or of a lower grade. Open pit mining is the primary choice when the ore body is close to the surface.

Technically, the shape and orientation of the 5 Mile deposit lends itself well to open pit mining. Open pit mining is widely considered to be a safer and more economic extraction method compared to underground mining.

The conventional open pit mining method has been selected as the only economically feasible alternative for the mining of the 5 Mile resource.

# 4 Ore Processing Alternatives

Ore processing alternatives considered in the scoping and feasibility process included:

- No processing – Export mined ore as a Direct Shipping Ore (DSO) product
- Wet Low Intensity Magnetic Separation (wet LIMS); and
- Dry Low Intensity Magnetic Separation (dry LIMS).

These alternatives were evaluated in consideration of operational and post-closure environmental impact, economic feasibility, and operational and water supply requirements. On balance of these considerations, Dry LIMS was selected as the preferred processing option for the Project. These alternatives are broadly summarised below.

## 4.1 DSO Product

The initial pit optimisation indicated that a DSO product, whilst potentially viable, would require considerable effort in grade management to ensure that the shipped product is always +52%Fe in order to meet minimum market requirements.

Accordingly, the Proponent found that this option presents an unreasonable commercial risk for the Project and therefore cannot be pursued. It was determined that some form of processing would be required at the mine site to upgrade the material to a consistently saleable product.

## 4.2 Wet LIMS

Initial metallurgy test work indicated that the Wet LIMS process will produce the highest grade product at up to 64%Fe. However, during operations, the Project would require in excess of 300ML of water per annum, with uncertainty surrounding the supply of the required volume.

Furthermore, the Wet LIMS process would also produce a tailing that would need to be stored within an engineered Tailings Storage Facility (TSF). The TSF would either need to be decommissioned on mine closure or permanently saturated to prevent oxidation.

The economic cost of constructing an engineered TSF in the sites terrain was found to be significant, whilst the environmental risks associated with the increased water use and long-term management of tailings dictates that this option is not to be preferred at this stage.

## 4.3 Dry LIMS

The Dry LIMS process was found to strike the most appropriate balance between environmental and commercial considerations, on the following basis:

- The shipped product is always +52%Fe;
- There is no requirement for a TSF;

- The process does not require water other than for dust suppression, therefore reducing the overall Project water demand by 45% (when compared to the wet LIMS process);
- The capital and operating costs associated with the process are appropriate to the life of the mine; and
- Post-closure, the site will be able to be rehabilitated without significant long-term environmental risk.

# 5 Mine Material Management Alternatives

A range of management strategies for mine materials, including waste rock and ore, were considered throughout the development of the mine plan. The selection of Dry LIMS as the processing method eliminates tailings as a waste stream (see Section 4). The two materials requiring management under the selected processing method are waste rock and low grade haematite ore.

## 5.1 Waste Rock and Low Grade Ore Management

Waste rock was geochemically assessed to determine its characteristics when exposed from a non-oxidising environment (below the water table) to an oxidising environment (surface) – refer EES Referral Attachment 6. This determined the method of handling of waste rock to ensure a safe and stable environment.

It was determined that waste rock with the potential to generate problematic water quality upon exposure to an oxidising environment would need to be stored in a stable low-oxidising environment in the long term. The most suitable location identified was storage in the open pit on closure to ensure a permanent water cover of at least 2 m. During operations, all such waste rock will be stockpiled with the low grade ore (refer below) in a temporary location. Other waste rock that does not have the potential to generate problematic water quality was identified as being suitable for surface storage.

The selection of Dry LIMS as the ore processing method (see Section 4), eliminates the need for a Tailings Storage Facility (TSF). The process will produce a low grade ore stream that may be suitable for subsequent sale or reprocessing. This low grade ore will therefore be temporarily stockpiled during operations. Any low grade ore remaining at the end of the mine life will need to be stored in the open pit below a permanent water cover.

The potential alternatives considered for operational and post-closure management of the low grade ore include:

- Establishing a permanent low grade ore stockpile;
- Encapsulating low grade ore within the WRD; and/or
- Establishing a temporary low grade ore stockpile (during operations) and moving any remaining material into the open pit on mine closure for disposal under a permanent water cover.

Geochemical assessment of the low grade ore (refer EES Referral Attachment 6) showed the material to be potentially acid forming due to its elevated sulfide content. Permanent disposal at the surface under unsaturated conditions was determined to be undesirable due to the potential for long-term water quality impacts. It was therefore decided that low grade ore should be stockpiled in a temporary location (i.e. the Low Grade Ore Stockpile) during operations and, on mine closure, disposed of in the open pit with a permanent water cover to prevent acid generation.

Three potential configurations of the WRD and temporary Low Grade Ore Stockpile were considered, as shown in Figures 5.1, 5.2 and 5.3. Each arrangement has various advantages in terms of distance from excavation (haul distances), available surface area for expansion, height requirements and drainage requirements.

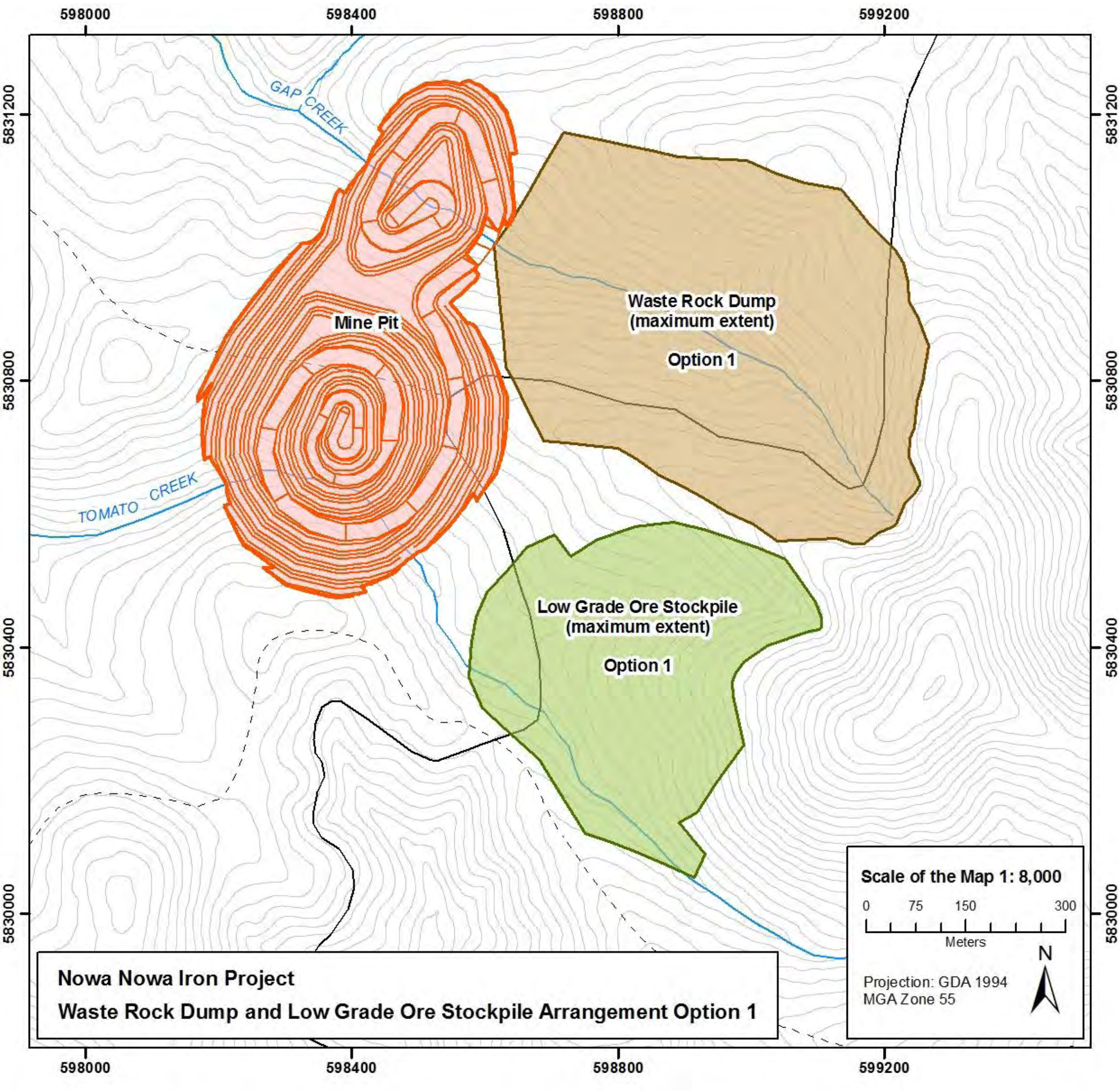


**Figure 5.1 Waste Rock Dump and Low Grade Ore Stockpile Arrangement Option 1.**

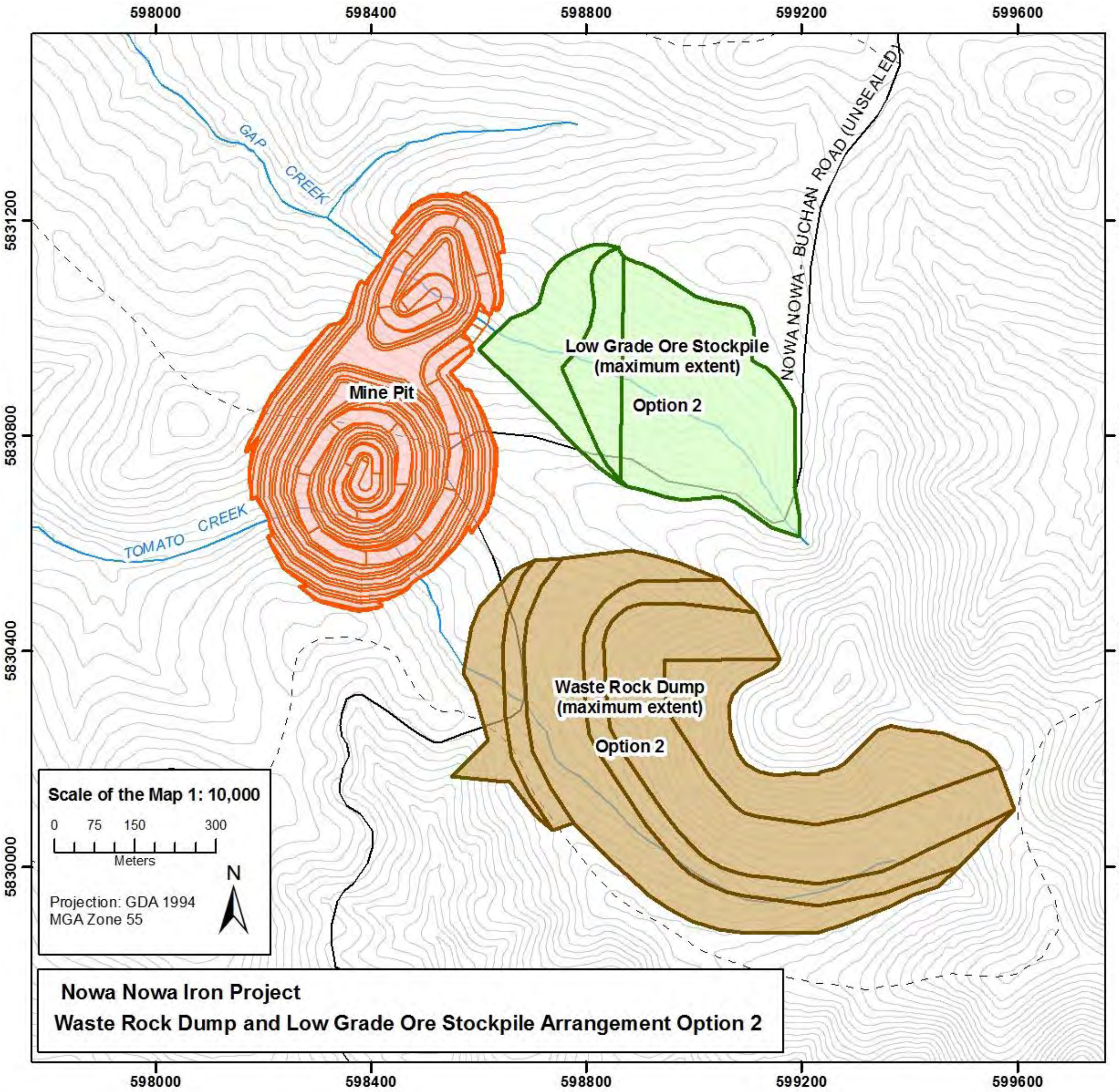


**Figure 5.2 Waste Rock Dump and Low Grade Ore Stockpile Arrangement Option 2**

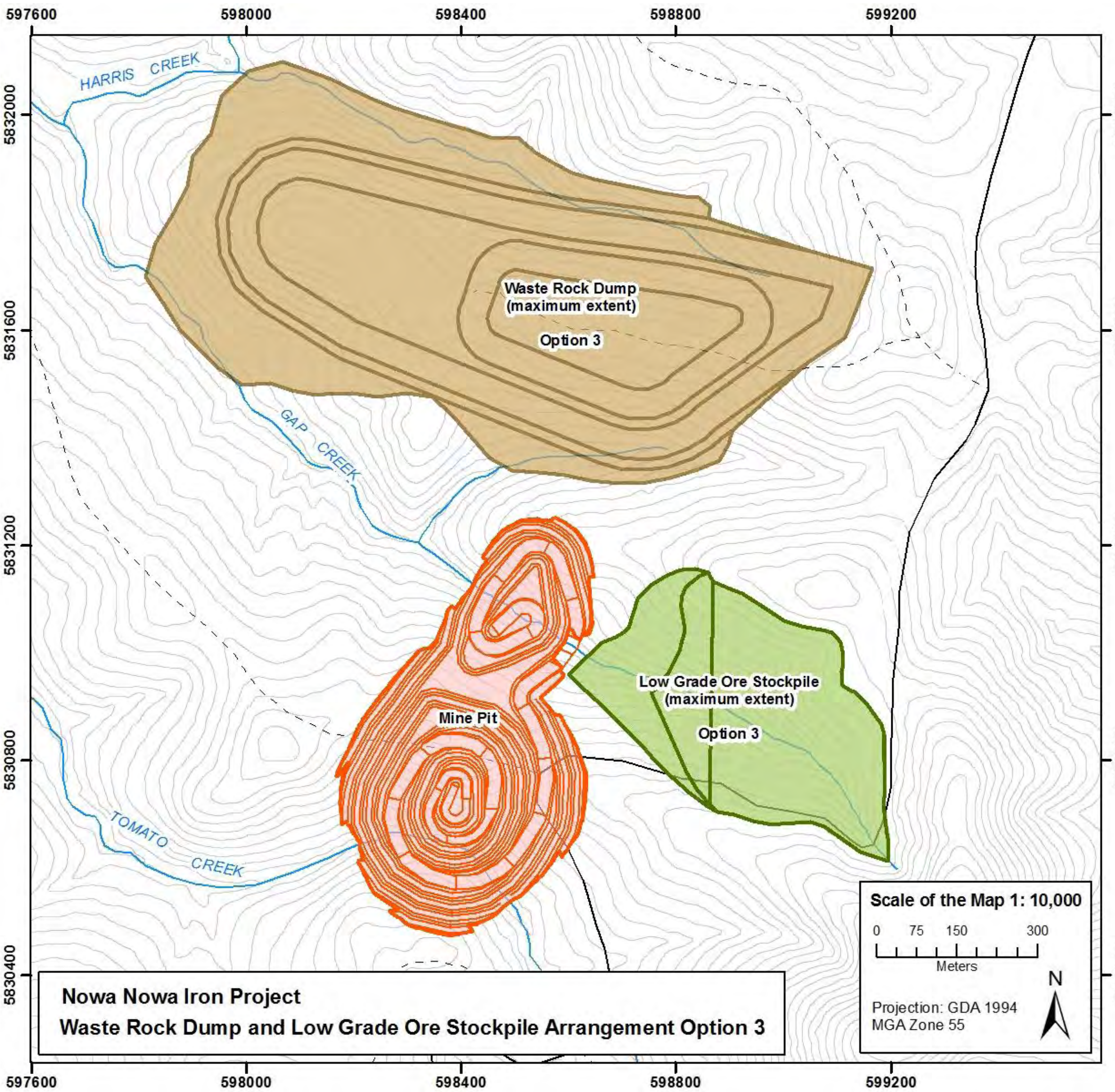


**Figure 5.3 Waste Rock Dump and Low Grade Ore Stockpile Arrangement Option 3**

**Table 5.1. Waste Rock Dump and Low Grade Ore Stockpile Option Specifications**

| Component | Option 1 | | Option 2 | | Option 3 | |
|---|---|---|---|---|---|---|
| | Volume (Mbcm) | Area (ha) | Volume (Mbcm) | Area (ha) | Volume (Mbcm) | Area (ha) |
| Waste Rock Dump | 9.9 | 25.6 | 10.28 | 39.16 | 10.6 | 63.67 |
| Low Grade Ore Stockpile | 3 | 16.89 | 3.5 | 20.43 | 3.5 | 20.43 |

Option 3 was excluded on environmental grounds as both the dump and stockpile should be located upstream of the open pit to ensure that water quality risks are minimised both during operation and post-closure, as follows:

- During operations, runoff from the WRD and temporary Low Grade Ore Stockpile should passively report to the pit in the absence, failure or lack of capacity of other runoff management measures.
- Post-closure, runoff and seepage from any mine materials not backfilled into the pit on mine closure should passively report to the pit lake.

Option 1 was considered preferable to Option 2 based on the following:

- Due to the topography, utilising the southern catchment (Tomato Creek) east of the pit as a Waste Rock Dump would present significant difficulties for encapsulation of PAF material within the Waste Rock Dump.
- A key design principle is to maximise surface runoff into the pit post-closure to ensure a stable water cover over PAF material. The southern catchment east of the pit has a larger area. Locating the temporary Low Grade Ore Stockpile in this larger catchment minimises the Project footprint post-closure, thus maximising runoff into the pit post closure.
- The location of the temporary Low Grade Ore Stockpile at the base of a valley adjacent to the pit (and topographically higher) will also minimise energy requirements for transfer of any material remaining in the stockpile to the pit post-closure.

Arrangement Option 1 was selected as it meets all environmental and operational objectives. PAF waste rock will be temporarily stockpiled around the low grade ore as a retention structure to contain runoff and limit erosion or slumping of the low grade ore.

# 5.2 Tailings Storage Facility - Options Originally Considered for Wet LIMS Process

As discussed in Section 4, several processing options have been considered for the Project. The Wet LIMS processing option originally considered would have required the construction of a Tailings Storage Facility (TSF).

In the process of considering the Wet LIMS processing option, several potential locations were considered for the construction of a TSF as shown in Figure 5.4.

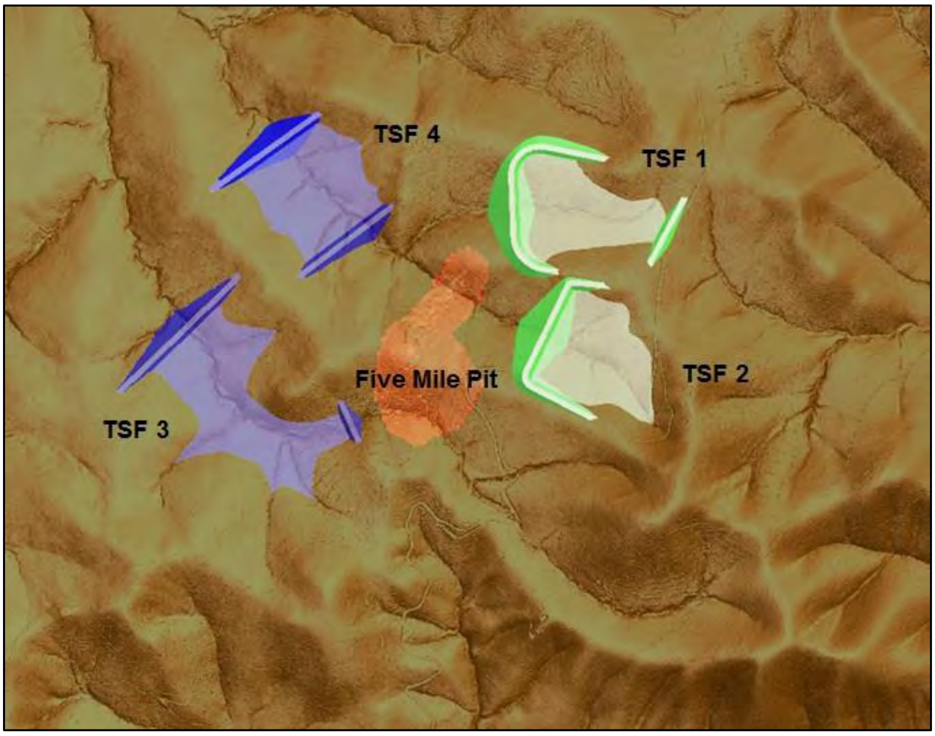


**Figure 5.4 TSF Location Options Considered**

Characteristics of each option considered are listed in Table 5.2.

**Table 5.2. TSF Characteristics**

| TSF Option | Surface Area ($m^2$) | Capacity ($m^3$) | Capacity (tonnes) | Embankment Volume ($m^3$) |
|---|---|---|---|---|
| 1 | 193,928 | 1,611,207 | 2,900,173 | 1,199,825 |
| 2 | 176,678 | 1,953,257 | 3,515,863 | 1,241,346 |
| 3 | 232,090 | 1,861,293 | 3,350,327 | 641,916 |
| 4 | 188,874 | 1,711,836 | 3,081,305 | 931,117 |

As the processing option selected was Dry LIMS (refer Section 4), this negated the requirement for a TSF and therefore no further evaluation of TSF alternatives was undertaken.

# 6 Water Supply and Drainage Management Alternatives

Several water supply options for the Project have been considered. These options, in order of priority, include:

- Surface water intercepted by the mine pit;
- Groundwater from pit dewatering;
- Surface water from catchments downstream of the mine pit;
- Groundwater from a bore field;
- Pumping of surface water from catchments outside the Project footprint; and
- Trucked in water.

Additionally, various ore processing and water management options affect the operational water demand for the Project, including:

- Use of Wet LIMS vs Dry LIMS for ore processing; and
- Recycling or re-use of water onsite.

Drainage management for protection of the downstream environment forms an integral part of the decision-making process for selection of water supply and other mine management strategies. The drainage management options include:

- Containing all drainage from potentially impacted areas of the mine site (eg. ROM pad, waste rock dump, stockpiles, open pit) to prevent any discharge; and
- Treating and releasing drainage from potentially impacted areas of the mine site.

These options are discussed in detail in the following sections.

## 6.1 Drainage Management

To maximise protection of beneficial values in the downstream environment, it was decided that all drainage from potentially impacted areas of the mine site, including the open pit, the waste rock dump, the temporary low grade ore stockpile and the ROM pad, will be contained and no Project affected drainage will be released downstream during the operational phase of the Project.

Water runoff from unaffected areas including the mine operations centre and haul roads will be directed to the sediment control dam to allow any suspended sediments to settle. The sediment control dam and the clean water supply dam will be designed to release environmental flows in high rainfall periods.

# 6.2 Operational Water Demand

The selection of Dry LIMS as the processing method reduces the operational water demand by ~45% when compared with the use of Wet LIMS. The use of Dry LIMS was therefore the preferred option from the perspective of minimising the operational water demand (cf. Section 4).

Primary water demand is calculated to be ~174 ML/y. By recycling waste water and vehicle wash-down water for re-use where appropriate, this water demand is reduced to ~164 ML/y.

# 6.3 Surface Water Intercepted by the Mine Pit

To minimise potential water quality impacts on downstream environments, all surface water potentially impacted by mining operations, such as runoff from the waste rock dump and temporary stockpiles, will be contained to prevent any offsite discharge of such drainage. Therefore, all surface water from catchments intercepted by the mine pit and any runoff produced within the pit needs to be contained and consumed by operations.

Hydrological modelling suggests that pit runoff will be 50–150 ML/y, and runoff from the Tomato Creek and Gap Creek catchments upstream of the pit will be 30–90 ML/y.

The total capture of surface drainage is estimated to be 80–240 ML/y, and is therefore likely to account for the bulk of operational water demand.

# 6.4 Groundwater from Pit Dewatering

In order to mine by open cut methods, rock within the pit volume needs to be dewatered. Groundwater extraction for the purpose of pit dewatering is commenced well in advance of mining to ensure that the mined materials have been dewatered by the time mining of the affected material commences.

Dewatering assessments are ongoing. Preliminary evaluations suggest that groundwater extraction at a rate of 1–5 L/s from the commencement of operations is likely to be sufficient to dewater the pit volume.

The minimum annual volume of groundwater requiring extraction in order to allow mining to proceed and continue is calculated to be 30–150 ML/y.

Groundwater extracted for pit dewatering is therefore likely to exceed any shortfall between surface water supply and operational demand during mining operations. It was therefore decided that groundwater from pit dewatering should be used to supplement surface water intercepted by the mine pit and, where possible, blended with water in the clean water storage to provide environmental flows to offset the interception of surface water by the open pit.

# 6.5 Surface Water from Catchments Downstream of the Mine Pit

As the operational water demand is likely to be met by surface water intercepted by the open pit and groundwater extracted for pit dewatering, additional storages of surface water from undeveloped catchments downstream of the pit were determined not to be necessary for water supply purposes.

However, for the purposes of managing sedimentation loads from roads and other mine infrastructure and providing additional protection for the downstream environment, water storage structures on Tomato Creek and Gap Creek downstream of the mine infrastructure were considered desirable.

In addition to their environmental role, these water storages provide a mechanism to capture additional surface water in the unlikely event that surface water intercepted by the open pit and groundwater extracted for pit dewatering do not meet operational water demands.

# 6.6 Groundwater from a Bore Field

With the use of the three water sources/storages above (Sections 6.3, 6.4, 6.5), sourcing additional groundwater from a bore field was determined not to be necessary.

# 6.7 Pumping of Surface Water from Catchments Outside the Project Footprint

With the use of the three water sources/storages above (Sections 6.3, 6.4, 6.5), it was determined not to be necessary to pump in additional water from outside the Project area. This approach ensures that any impacts associated with surface water catchment are localised.

# 6.8 Trucked Water

With the use of the three water sources/storages above (Sections 6.3, 6.4, 6.5), it was determined not to be necessary to include trucked water as an essential Project component. However, trucked water remains a contingency option in the event that the proposed water storages are exhausted.

# 6.9 Locations and Size of Water Storages

Various water storage configurations were considered under the above water management strategy, including:

- A single large dam on Harris Creek downstream of the confluence of Tomato and Gap Creeks;
- Two large dams on Tomato Creek and Gap Creek, upstream of their confluence; and

- Three small dams; one on Tomato Creek immediately downstream of the open pit, and one each on Tomato Creek and Gap Creek downstream of mine infrastructure.

Configurations involving one or two large dams were discarded for the following reasons:

- To maximise downstream environmental flows;
- To minimise direct catchment areas for each dam;
- To minimise risks associated with dam exceedance and/or failure; and
- To minimise dam construction costs.

The selection of three small dams also has the benefit that management strategies can be specified for each particular type of drainage contained.

# 7 Power Supply Alternatives

Power is required at a number of locations at the mine site including:

- Administration Area;
- MIA;
- Processing Plant;
- Mining Contractor's Go Line Facilities; and
- At various bore locations.

This section describes the investigations completed to date surrounding determination of a suitable power source.

## 7.1 Mains Connection

Initial consultation with SP Ausnet commenced in June 2012. The purpose was to determine whether mains connection was a possibility with three potential options explored:

- Connection to an existing 22 kV overhead power line that runs past the Mine entrance;
- Connection to an existing 66 kV overhead power line near the Nowa Nowa township by installing a new 22 kV underground power cable to the Mine; and
- Connection to the same 66 kV overhead power line utilising the existing 22 kV infrastructure.

Each of the options is discussed individually below.

### 7.1.1 Option 1

There is an existing 22 kV circuit that runs next to Bruthen-Buchan Road past the Mine entrance. SP Ausnet provided the following in response to utilising this line:

*BDL5 feeder is current nearing rated capacity, any additional load to be placed on this feeder will require the equivalent augmentation works to offset this increased demand.*

*Initial advice is that we would require extensive re-conductoring and a new voltage regulator to support a maximum of 1MW.*

RIPEN Utility Services was contacted to investigate this option further. However the initial advice was that drives greater than 30 kW would not be able to be started given the inherently weak network and low fault levels in the area. Additionally the steady state and voltage flicker findings, may yield that there are no economically viable solutions for connection on the 22 kV network.

It is important to note the following requirements:

- Primary crusher motor rating is 120 kW;
- There are two secondary crushers with individual motor ratings of 130 kW;
- The main office complex requires approximately 50 kW; and
- The mining contractor's office requires approximately 30 kW.

### 7.1.2 Option 2

Option 2 suggests supplying the mine directly with a 66 kV supply through the use of a 66 kV tee off located near the intersection of Nowa Nowa Road and Bruthen-Buchan Road. The existing line is the 66 kV Bairnsdale to Newmerella to Cann River line.

The new 66 kV overhead line would need to be built on top of the existing 22 kV circuit that runs along an easement next to Bruthen-Buchan Road. This would also require replacing all the poles along that route.

One new small switching station would need to be installed as part of these works. This would include two new 66 kV circuit breakers and associated hardware to protect the lines from any faults that might occur. Utilising two circuit breakers would provide a higher degree of reliability for the supply.

### 7.1.3 Option 3

Option 3 assumed a new 66kV/22kV substation to supply the mine directly with a 22 kV supply. It would utilise the existing Bairnsdale to Newmerella to Cann River line to tee-off into a new substation. The substation would be located adjacent to Nowa Nowa Road near the actual township and would transform the voltage from 66kV to 22kV and then run a dedicated underground 22 kV feeder cable up Nowa Nowa - Buchan Road to directly supply the mine site. To increase reliability of supply, this station would utilise two 66 kV circuit breakers. An underground feeder cable would be preferred due to the location, terrain and bush fire risk in the area.

This option is SP Ausnet’s preferred option for supplying electricity to the mine site as it results in a safer network.

### 7.1.4 Summary of Options

SP AusNet provided budget costs for the Options 2 and 3, both of which were in excess of $10 million. Considering these costs represent approximately one third of the total Project capital costs, these options are not considered economically feasible for the Project given the proposed 8-10 year mine life.

Accordingly, Eastern Iron has decided against mains power supply and has determined that power requirements will need to be sourced from on-site generation.

## 7.2 Preferred Solution

The base case for the Project is to utilise diesel fuelled generator sets. The engineering design is progressing as part of the feasibility study, however it is assumed that the following will be required:

- A pair of generators powering the Administration Area and MIA;
- A generator at the fuel farm (if the generator at the Administration Area and MIA can’t be used);
- A set of generators at the processing plant; and
- Individual generators at ground water bore and surface water pump locations.

The Proponent is also investigating alternative fuel sources for on-site generation including Compressed Natural Gas (CNG) and biofuels. The results of these investigations are not yet available.

# 8 Magazine Storage Facility

## 8.1 Location and Design Criteria

Design and location criteria for the Magazine Storage Facility were identified based on relevant Australian legislation, standards and guidelines, as well as consultation with WorkSafe Victoria. Relevant legislation and standards include:

- Dangerous Goods (Explosives) Regulations (2011)
- AS 2187.1 Explosives - Storage, transport and use – Storage (1998, Amended 2000)

The following criteria were used to determine the potential location options:

- A 600 metre offset distance of the facilities from public access areas (e.g. public roads).
- A 300 metre offset distance of the facilities from active on site work areas (e.g. mine site buildings and other active mining areas).
- Minimisation of length of access road required.
- The access road commences past the security gate to control access.

The separation distances as provided above are based on required separation distances from explosives storage to Protected Works and Associated Works as per AS 2187. The amount of explosive storage was based on a minimum of 1 weeks blasting needs. It is assumed that minimal ANFO would be stored on site. Ammonium Nitrate would be stored as a component for mixing of ANFO directly prior to blasting. Ammonium Nitrate is an oxidising agent rather than explosive and hence is not required to be included in total amount of explosives stored on site as used for calculation of separation distances.

Based on the associated design criteria, the initial focus for the location of the Magazine Storage Facility was on the ridge between Harris and Gap Creeks. Considerations for the location of the facility options included:

- The 300 metre offset excluded the southern side of the ridge.
- The north side of the ridge offers protection to the administration area and MIA by acting as a natural barrier if an explosion were to occur.
- Consideration was given to the saddle on top of the ridge as an alternative to the north side. However several issues precluded further consideration of this option, including:
  1. The gradient of the access road would have been too steep for a semi-trailer. This option would have involved designing switchbacks in the road alignment which adds to the road length.
  2. Locating the facility on top of a hill is not ideal considering there is no natural protection offered when compared to building into the ridge.

# 8.2 Assessment of Location Options

Based on the criteria and considerations discussed in the section above, two potential options were considered for the location of the Magazine Storage Facility, as illustrated in Figure 8.1.

Both options comply with the 300 m offset required from the administration area and MIA. Therefore, there is no significant difference between the two options in terms of potential health and safety risks.

The southern option on front of the ridge was selected as the preferred option due to:

- The access road required is shorter, which reduces economic costs and reduces the amount of native vegetation clearance required.
- The terrain is flatter. The dimensions of the pad (90m x 70m) for the alternative option meant the earthworks would be extensive.
- The location enables the access road to use the wall of the sediment control dam to cross Gap Creek, minimising the infrastructure within the existing waterway.

An added benefit of selecting the preferred option is that it results in an overall tighter Project Footprint, as it is located closer to the other Project components.

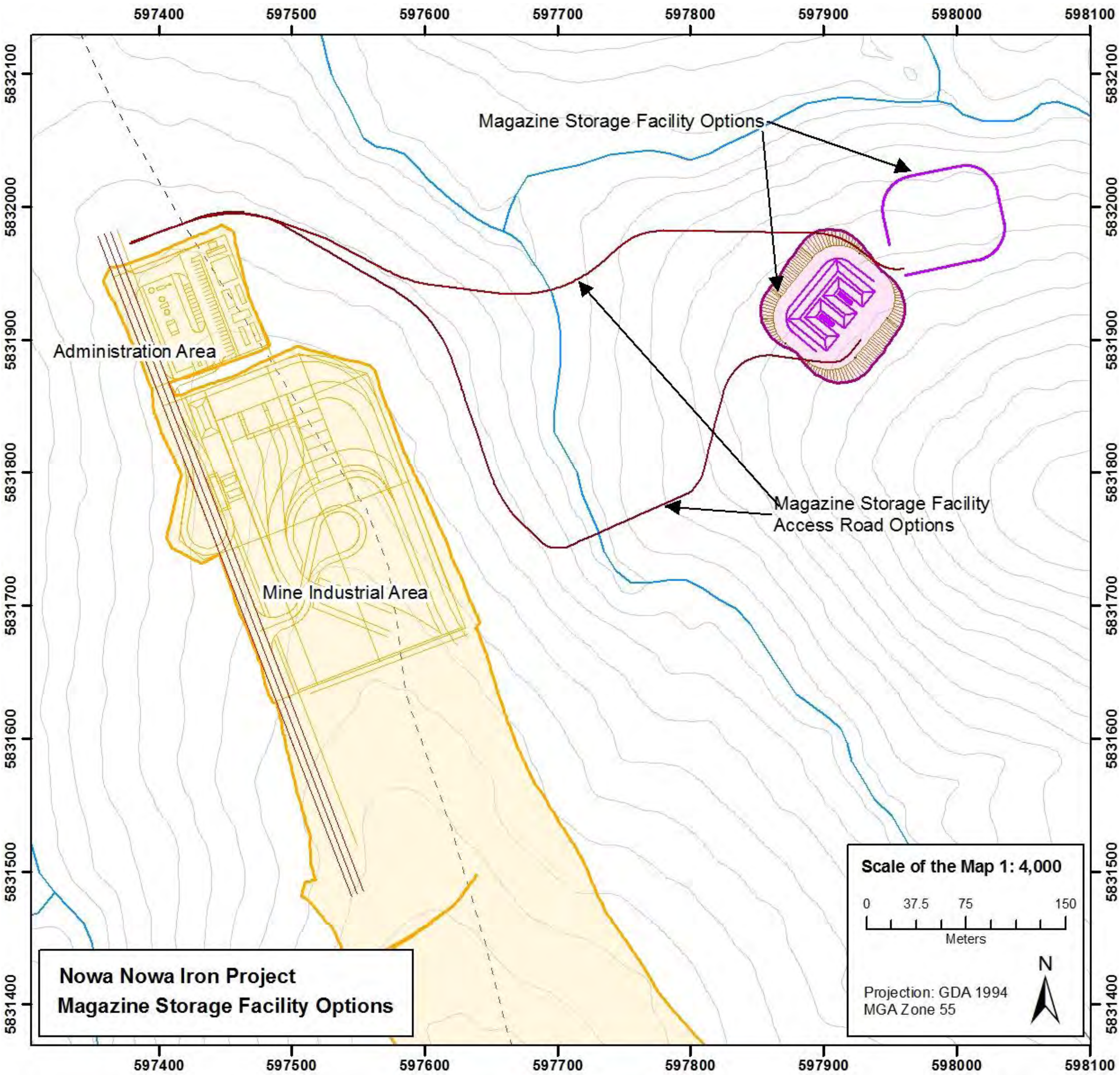


**Figure 8.1 Magazine Storage Facility Options**

# 9 Transport and Shipping Alternatives

There are three broad options that could be used to transport product from the mine to the port, being road, pipeline or rail. The options could be used as a single form of transport, or any combination of the three as multi-mode transport solutions.

# 9.1 Product Transport - Port Options

As part of the Scoping Study and ongoing Feasibility Study, the following port facilities have been considered for the export of product:

1. Port of Melbourne or Geelong;
2. Crib Point (Port of Hastings);
3. Port Anthony;
4. Multi-Purpose Wharf, Edrom, NSW; and
5. South East Fibre Exports (SEFE) Wharf, Edrom, NSW.

The key port options are illustrated in Figure 9.1.

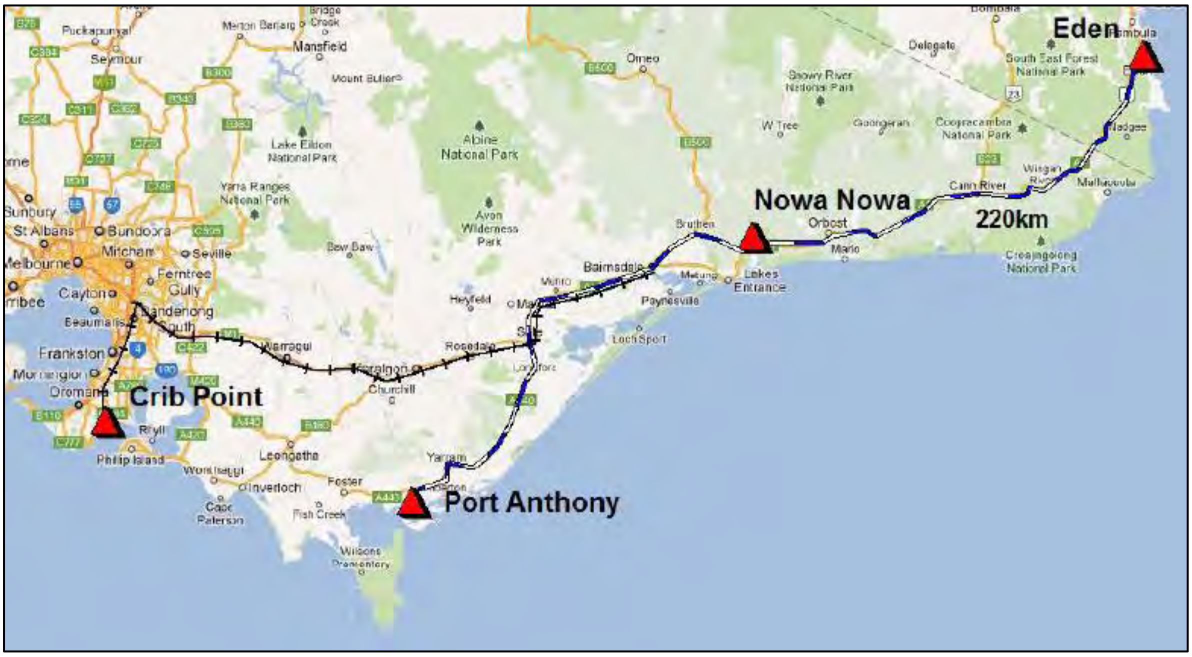


**Figure 9.1 Key Port Options Considered**

## 9.1.1 Port of Melbourne or Geelong

This option relies on loading the ore into shipping containers at the mine site and transporting by road to an intermodal or storage facility in Bairnsdale (or similar). Containers would then be transferred to rail and transported to the Port of Melbourne or Geelong before being loaded onto suitable size vessels and exported.

This option would however require additional material handling and require road transport through a number of towns and built up areas that are not otherwise impacted by the use of the SEFE wharf. Furthermore, preliminary investigations indicate that the rail line from Bairnsdale to Melbourne/Geelong would require significant upgrades to handle the freight loads envisaged.

### 9.1.2 Crib Point (Port of Hastings)

This option relies on transporting the ore by road to an intermodal or storage facility in Bairnsdale (or similar). The product would then be transferred to rail and transported to the Port of Hastings before being loaded onto suitable size vessels and exported.

Whilst the Port of Hastings provides deep water anchorage and existing rail facilities, it does not maintain a suitable ship loader for the bulk loading of product. Consistent with the option above, preliminary investigations indicate that the rail line from Bairnsdale to the Port of Hastings would require significant upgrades to handle the freight loads envisaged.

### 9.1.3 Port Anthony

This option relies on transporting the ore from the mine site to Port Anthony by road and stockpiled prior to shipping. Ore would then be loaded onto barge vessels and transhipped to vessels off-shore for export.

This option would however require additional material handling and require road transport through a number of towns and built up areas that are not otherwise impacted by the use of the SEFE wharf.

### 9.1.4 Multi-Purpose Wharf, Edrom, NSW

This option relies on transporting the ore from the mine site to the multi-purpose wharf and cargo storage area on the south side of Two Fold Bay, Edrom, NSW. Ore would be stockpiled in the cargo storage area and transported to the wharf once a ship was berthed.

This option would require significant additional material handling due to the absence of a ship loader at the wharf. Further, wharf restrictions dictate that 50-60,000t vessels are unable to berth at the wharf and, therefore, the number of shipments required per annum would increase when compared to those contemplated at the SEFE wharf.

### 9.1.5 South East Fibre Exports (SEFE) Wharf, Edrom, NSW

Eastern Iron entered into a Memorandum of Understanding with SEFE in 2012 for the co-sharing of their existing site in Edrom, NSW including the wharf side facilities. Under this scenario, being the proposed transport means for the Project, the material will be transported by road and stockpiled at the site before being loaded onto 50-60,000t size vessels.

The majority of the transport route between the mine and the SEFE site is via the Princes Highway, therefore avoiding towns and built up areas. Furthermore, the SEFE site has an existing wharf (bulk) loader with sufficient capacity to cater for Project demands, one of few on the eastern seaboard of Australia.

## 9.2 Product Transport – Land Based Transport Options

Due to the capital costs associated with the construction of a pipeline, this option was no longer pursued, and transport alternatives focused on road transport to the preferred SEFE wharf in Edrom, NSW, as no existing rail facilities are suitable.

Restricted Access Vehicles (RAV) mapping software on the Victorian and NSW Government websites was utilised to determine the most appropriate route from the mine to the port. For the majority of the journey there is only one arterial road to travel on, the Princes Highway. The Princes Highway passes through the Nowa Nowa township and across the state border to within 17 km of the port.

Considering there is one access road from the Princes Highway into the port, Edrom Road, the only decision to be made regarding the route analysis is how to access the Princes Highway from the mine site.

Two options were considered for access to the Princes Highway from the mine site as depicted in Figure 9.2 and Figure 9.3. Route 1 involves travelling west from the mine onto Bruthen-Buchan Road, south-west along Bruthen-Buchan Road to Nowa Nowa Road and south-east along Nowa Nowa Road to the Princes Highway. Route 2 involves travelling south from the mine along Nowa Nowa-Buchan Road onto the Princes Highway.

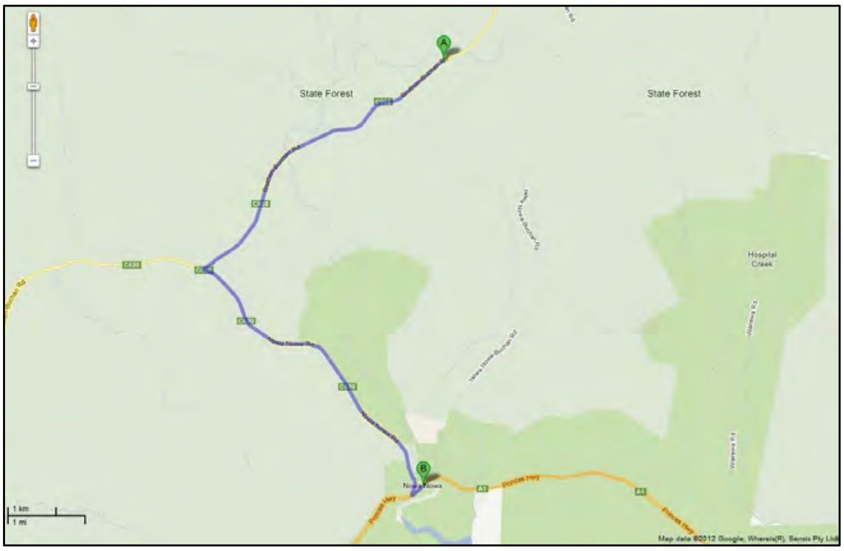


**Figure 9.2 Access to the Princes Highway from the mine site - Route Option 1**

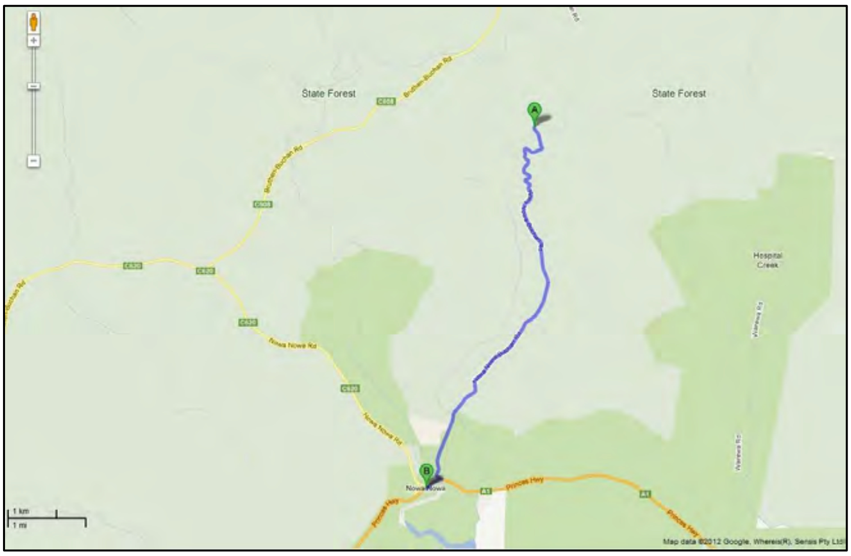


**Figure 9.3 Access to the Princes Highway from the mine site - Route Option 2**

Of the two options, only Route Option 1 is approved for B-Doubles and HML vehicles. Both Bruthen-Buchan and Nowa Nowa Roads are sealed roads with a single lane for both directions of traffic. No significant environmental or social risks were identified for the use of Route Option 1 and, therefore, this option is the preferred route for access to the Princes Highway from the mine site.

The only capital works required would be the construction of a mine site access road and resultant intersection at Bruthen-Buchan Road. Whilst the mine site access road would be a formed, unsealed gravel road the intersection would be sealed to limit the amount of gravel brought onto the road by the road trains and increase the life of the intersection.

The total distance travelled between the mine and the port is 234 km (Figure 9-4).

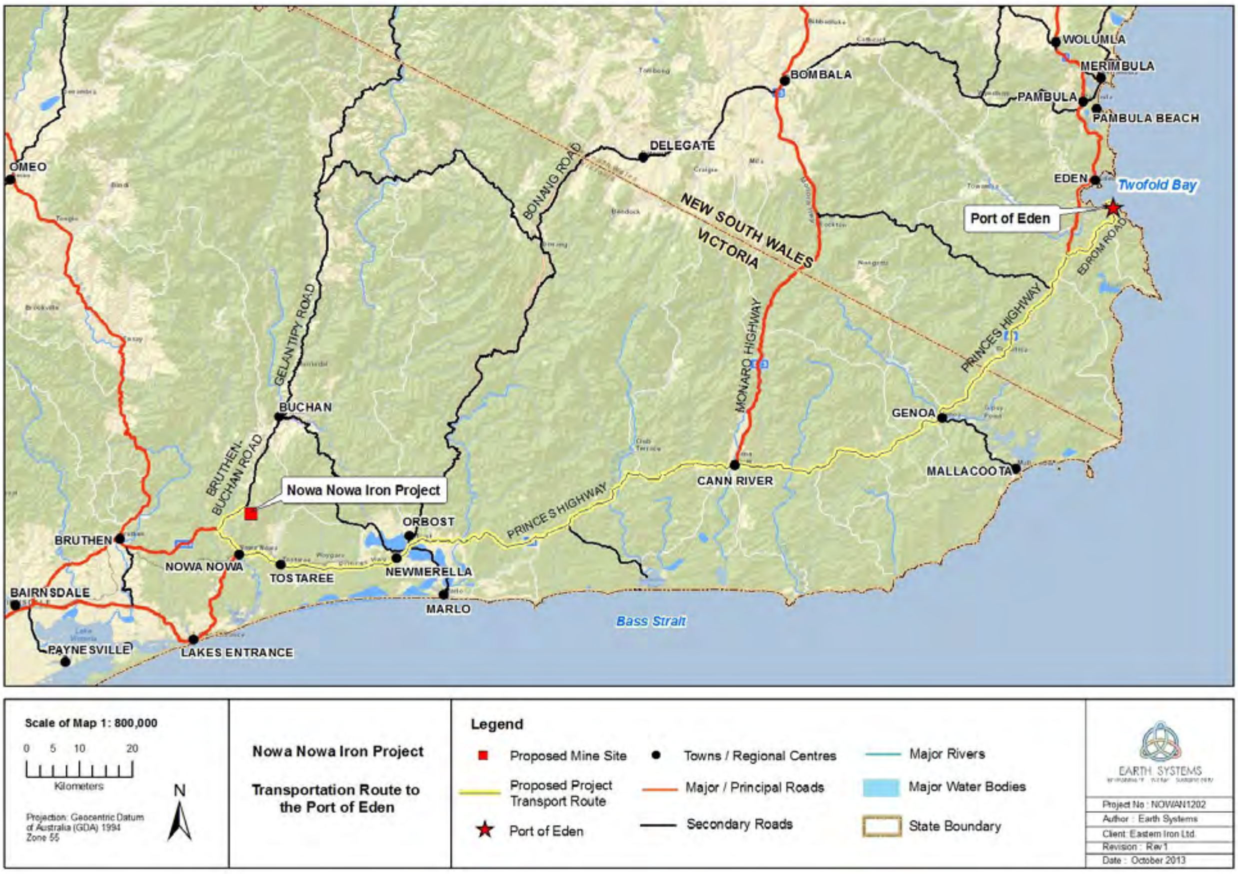


**Figure 9-4 Preferred transportation route**

# 9.3 Transport Depot Options

Options considered for the location of the depot included Orbost and Newmerella. The exact location of the depot will be the responsibility of the haulage contractor and has not been confirmed at this stage of the Project. The following sections describe and highlight the benefits and disadvantages of each option, as described in the ***Nowa Nowa Iron Project (5 Mile Deposit) Traffic Impact Assessment*** (EES Referral Attachment 7).

### 9.3.1 Orbost

Potential depot sites in Orbost are located to the north of the town centre. Accessing potential depot sites in Orbost is likely to require trucks travelling through the town centre using either of Bonang Highway, Tennyson Street or Livingstone Street, as each is approved for use by B-Double trucks. Bonang Highway intersects the town's main activity centre and Tennyson Street and Livingstone Street pass through mainly residential areas. Each option has potential impacts on local amenity, considering 24 hour operation along the transport route.

The major benefit of locating the depot in Orbost is the close proximity to a potential workforce, supporting services and amenities. In circumstances where Orbost is to be preferred, a planning scheme amendment could be facilitated to rezone suitable land adjacent to the Princes Highway. Any application would be subject to approval under the *Planning and Environment Act* 1987 including mechanisms for public consultation.

### 9.3.2 Newmerella

The Princes Highway intersects the town of Newmerella, providing direct access to a number of potential depot sites. These are located in industrial or business zones that allow a permit to be granted for a road freight terminal.

During consultation, East Gippsland Shire Council nominated Newmerella as the preferred option for the following reasons:

- Direct access to appropriate land from the Princes Highway, removing the need for upgrade of local roads to B-Double approved route;
- Low number of nearby residential dwellings, reducing the potential impact on local amenity during 24 hour operation along the transport route; and
- Potential economic benefits to the Newmerella township.

Where this option is to be preferred, a planning permit is likely to be required pursuant to the *Planning and Environment Act* 1987, including mechanisms for public consultation.

## 9.4 Location of Site Access Road

The mine access road will commence at an intersection with the sealed Bruthen-Buchan Road (in the vicinity of Tomato Track) and extend to the processing plant hardstand.

A sealed asphalt intersection has been proposed to protect Bruthen-Buchan Road from potential damage from the turning movement of loaded B-Doubles and limit the amount of gravel brought onto the arterial road.

Three potential locations for the intersection have been identified, as described in the ***Nowa Nowa Iron Project (5 Mile Deposit) Traffic Impact Assessment*** (EES Referral Attachment 7). These are the blue, orange and red options illustrated in Figure 9.5. The location of these options is detailed in Table 9.1, including sight distances along Bruthen-Buchan Road.

The eastern most option (Red) is the only one which satisfies the Austroad requirements for sight distances in both directions along Bruthen-Buchan Road.  This road was therefore chosen as the preferred option for the Project.

**Table 9.1. Mine Site Access Location Properties (AECOM 2013)**

| Option | Chainage* (km) | Sight Distance (m) | |
|---|---|---|---|
| | | To South-West | To North-East |
| Blue | 7.1 | 148 | > 400 |
| Orange | 7.4 | > 450 | 240 |
| Red | 7.5 | > 480 | 255 |

*Measured from the intersection of Bruthen-Nowa Nowa Road and Bruthen-Buchan Road

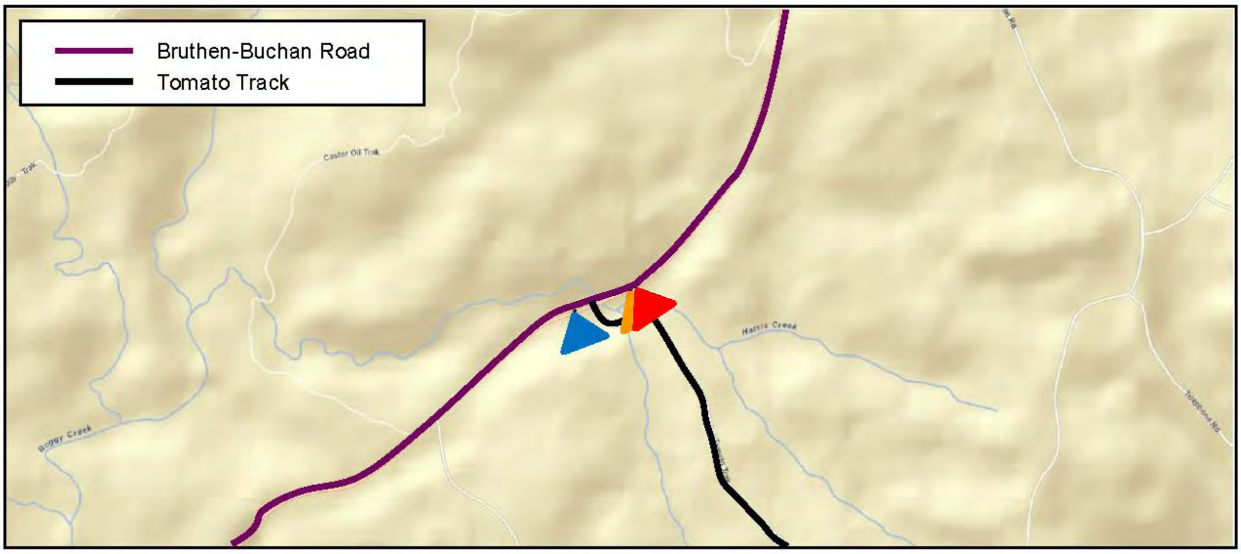


**Figure 9.5 Mine Access – Bruthen-Buchan Road Intersection Location Options (Aecom 2013)**

# 10 Workforce Accomodation

The Project is expected to provide approximately 120 FTE positions in the local and regional economy. The need for a workforce accommodation camp to be provided on-site was considered as part of the Scoping Study.

The proposed mine site is located close to a number of regional centres, including Lakes Entrance, Orbost and Bairnsdale which provide an appropriate supply of short and long term residential accommodation. It was therefore considered that a workforce accommodation camp would not be required and that the workforce will be drive-in/drive-out.

# 11 'Whole of Project' Alternatives - Not Proceeding with the Project

The primary 'Whole of Project' alternative is the option of not proceeding with the Project. The potential effects (both positive and negative) of the Project proceeding have been considered in the various attachments to the EES Referral (refer Attachment 2 and Attachments 5 to 13). Based on the preferred Project design outlined in EES Referral Attachment 1, the potential direct and indirect effects of not proceeding with the Project as a whole are summarised in the sections below.

## 11.1 Direct Impacts of Not Proceeding with the Project

From a socioeconomic perspective, the most significant impact of not proceeding with the Project is that the potential economic and employment benefits generated from the Project would not be realised. While primary industries have historically been significant employers in East Gippsland, the last decade has seen significant structural change in the drivers of the regional economy. Specifically, decline in the timber and agriculture sectors has led to economic hardship, particularly apparent in rural townships dependent on timber milling and associated services (refer EES Referral Attachment 12). In this context, the Project represents an opportunity to underpin the ongoing operation of the SEFE woodchip mill in Edrom, NSW; an industry that anecdotally supports up to 700 direct and indirect employees in the local and regional economy.

From an environmental perspective, any potential residual effects (after management and mitigation) associated with the development of the mine will not occur if the Project does not proceed.

Key direct consequences for Victoria of not proceeding with the Project can be summarised as follows:

- The iron ore resources at Nowa Nowa (being the largest known in the State) will remain undeveloped.
- Economic benefits generated from taxes and revenues from the Project will not be achieved. This would result in a loss of potential income for the State, region and local communities – spending associated with the Project has been estimated to be in the order of $700 million over the life of the mine.
- Employment opportunities stimulated by development of the mine would be lost. During the operational phase of the Project this equates to 120 full-time equivalent jobs and between 120 and 240 indirect jobs in the wider economy.
- No Aboriginal sites would be affected by the Project.
- Forestry activities in the vicinity of the proposed mine site would be able to continue in accordance with the current VicForests' latest Timber release Plan (2009-2014). Native vegetation offsets will not be required.

# 11.2 Indirect Impacts of Not Proceeding with the Project

At the State level, not proceeding with the Project would result in the loss of the potential indirect benefits that would have otherwise resulted from the Project occurring. While Australia recorded a trade surplus of $4.8 billion in 2012, the State of Victoria, with significantly more imports than exports, had a trade deficit (refer EES Referral Attachment 12).

Potential flow on benefits associated with the Project that would not be realised include local business development and the increase in household consumption in response to income changes resulting from both direct and indirect impacts of the Project.  External effects which would not occur include positive impacts on the State trade balance associated with export revenues from the Project as well as potential civic-infrastructure partnership programs to address critical regional-level infrastructure constraints.

Not proceeding with the Project would also reduce any cumulative impacts (both positive and negative) experienced as a result of other industrial activity occurring in the local, regional and State economy (i.e. downturn in forestry). This scenario would also result in a lost opportunity to improve Victoria's image in the mining industry, further discouraging exploration and mining investment in the State.

Any other residual indirect effects for the environment, health or socioeconomic conditions (after management and mitigation) associated with the development of the mine will not occur if the Project does not proceed.