EMC.TSX

Nyngan Scandium Project

Request for Director General's Requirements – Supporting Documentation

February 2012

R.W. CORKERY & CO. PTY. LIMITED

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Prepared for:	
EMC Metals Corp Suite 501, 1430 Greg Street Sparkes NEVADA USA 89431	Telephone: +1 775 355 9500 Facsimile: +1 775 355 9506 www.emcmetals.com Mobile: +61 418 799 856 Email: johndth@bigpond.net.au

Prepared by:

R.W. Corkery & Co. Pty. Limited
Geological & Environmental Consultants
ABN: 31 002 033 712

Brooklyn Office:	**Orange Office:**	**Brisbane Office:**
1st Floor, 12 Dangar Road PO Box 239 BROOKLYN NSW 2083	62 Hill Street ORANGE NSW 2800	Level 19, 1 Eagle Street BRISBANE QLD 4000
Telephone: (02) 9985 8511 Facsimile: (02) 9985 8208 Email: brooklyn@rwcorkery.com	Telephone: (02) 6362 5411 Facsimile: (02) 6361 3622 Email: orange@rwcorkery.com	Telephone: (07) 3360 0217 Facsimile: (07) 3360 0222 Email: brisbane@rwcorkery.com

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1. INTRODUCTION

1.1 SCOPE

EMC Metals Corp (the Applicant) proposes to construct and operate the Nyngan Scandium Project (the Proposal) as a joint venture between The Applicant and Jervois Mining Limited (Jervois). The project is located 18km west-south west of Nyngan in the Bogan Local Government Area (**Figure 1**). The Proposal would comprise an open cut, processing plant, waste rock emplacement, tailings storage facility, as well as ancillary activities and associated infrastructure.

The Proposal is classified as a State Significant Development in accordance with Paragraph 5 of Schedule 1 of *State Environmental Planning Policy (State and Regional Development) 2011* (State and Regional Development SEPP) because the capital investment value would be more than $30 million (see Section 2.13). This report has been prepared by R.W Corkery & Co. Pty. Limited in support of a request for Director-General's Requirements (DGRs) in order to apply for approval for the Proposal.

This report introduces the Applicant and provides the supporting documentation for the request for DGRs. It provides the following information.

1. Site details
2. Description of the Proposal
3. Permissibility and Strategic Planning
4. Preliminary environmental impact assessment
5. Justification
6. Consultation

Also required for the application is an estimate of capital investment value. This has been prepared separately to this report and is included as **Appendix A**.

The information provided in this document will ultimately be incorporated into a comprehensive *Environmental Impact Statement*, to be prepared in accordance with the requirements of Section 79C of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the DGRs being requested.

This document has been prepared for circulation to the Department of Planning and Infrastructure, other relevant State government agencies, Bogan Shire Council and the local community.

1.2 THE APPLICANT

EMC Metals is a specialty metals and alloys company focusing on Scandium, tungsten, molybdenum, vanadium, and other specialty metals. It was formed in 2006 under the name Golden Predator Mines Inc. and, as part of a reorganisation and spin-out of the Company's precious metals portfolio, in March 2009 the Company changed its name to EMC Metals Corp.

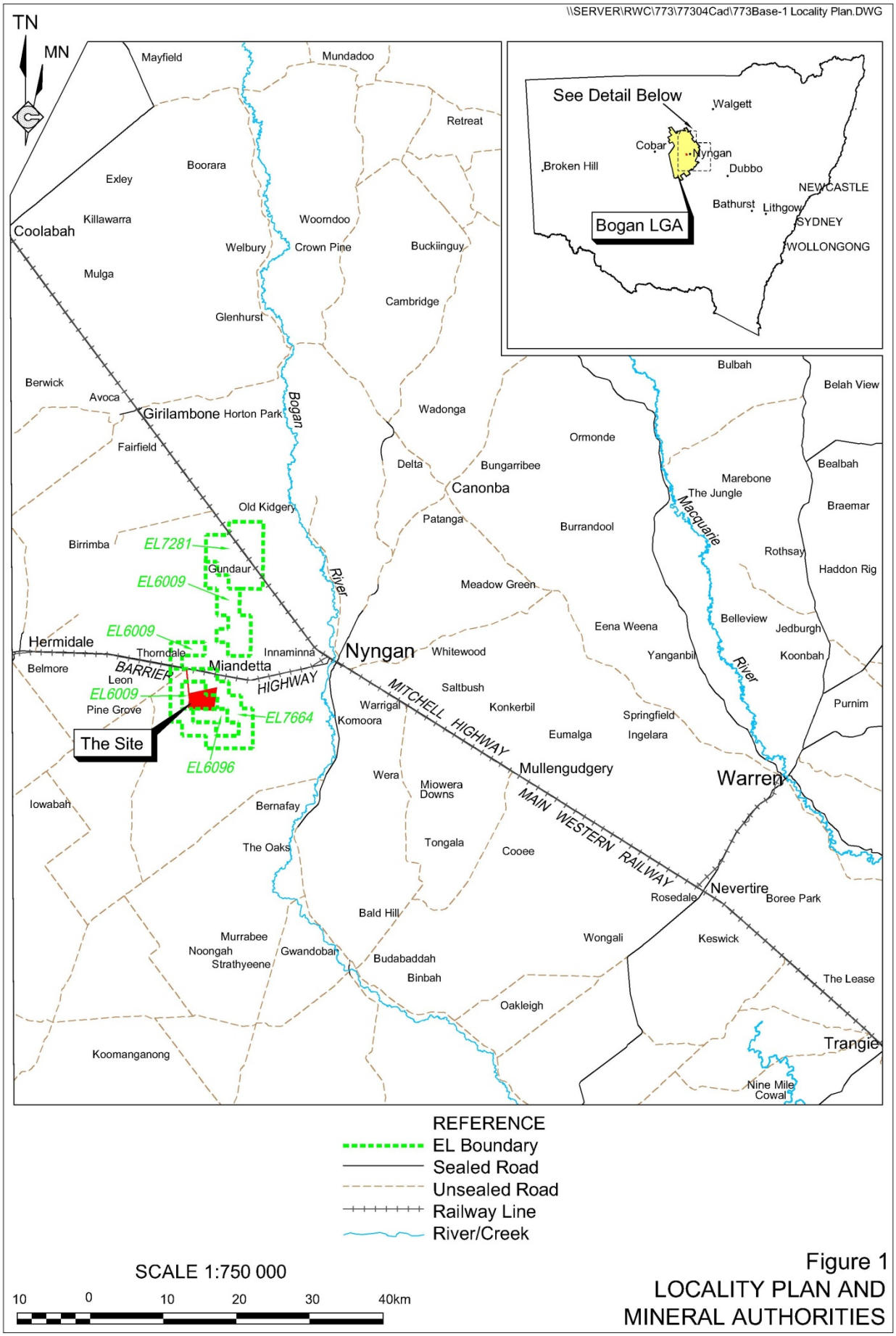


Figure 1
LOCALITY PLAN AND
MINERAL AUTHORITIES

EMC Metals is managed by Mr George F Putnam, MBA (Finance) (CEO and President), and Mr Edward H. Dickinson, CPA (CFO). The Company also has five directors, namely

- Mr William B Harris, BA, MBA (Chairman);
- Mr George F Putnam, MBA (Finance) (President, CEO and Director);
- Mr Willem P C Duyvesteyn, MSc, Suma cum Laude (Director);
- Mr Daniel Wolfus (Director); and
- Mr Barry Davies.

EMC Metals is focussed on developing high-value and specialty metal and mineral projects by applying world-class extraction and recovery techniques. Scandium is the Company's principal target product.

The Applicant's joint venture partner, Jervois was originally formed in 1963 to mine and produce copper from the Jervois Ranges in the Northern Territory. Since 1987 the Company has acquired a suite of mineral leases, with tenements around Australia including those related to the Nyngan Scandium Project.

In February of 2010 The Applicant entered into a joint venture agreement with Jervois to develop the Nyngan Scandium Project. The terms of the joint venture provide EMC Metals a 50% interest earn-in right and it is advancing the Proposal as the manager.

1.3 OVERVIEW OF THE PROPOSAL

The Applicant proposes to develop and operate an open cut mine and processing plant to produce approximately 28t per year of Scandium oxide product. The Proposal comprises the following principal components.

- Construction of a site access road and intersection with Gilgai Road.
- Construction of bunding and flood protection structures to protect the operational components of the Proposal.
- Storage of waste rock in a Waste Rock Emplacement.
- Extraction of up to 90 000t per year using open cut mining methods.
- On-site processing of ore material.
- Storage of tailings in a tailings storage facility.
- Transportation of the processed product offsite.
- Progressive and final rehabilitation with for a final land use of agriculture, with some areas of nature conservation.

1.4 THE SITE

The Site comprises an area of approximately 875ha and incorporates all areas of Proposal-related activities (**Figure 2**). **Table 1** presents land titles within the Site.

Table 1
Site Land Titles

Lot	DP	Lot	DP
6	752879	7	752879
1	752879	2	250872
Unnamed, unformed road reserves (see **Figure 2**)			
Source: Sixviewer Online Search- July 2011			

1.5 BACKGROUND TO THE PROPOSAL

1.5.1 Introduction

This sub-section provides an overview of the mineral authorities, a description of the geology and mineralisation within the surrounding the Site and an overview of the resources and reserves that underpin the Proposal.

1.5.2 Existing Mineral Authorities

Table 2 and **Figure 1** present the Mineral Authorities held by the Applicant's joint venture partner, Jervois.

Table 2
Mineral Authorities

Authority	Act Year	Date Granted	Expiry Date	Minerals Group[1]
EL 6009	1992	21 October 2002	20 October 2012	1
EL 6096	1992	9 July 2003	8 July 2013	1
EL 7281	1992	29 January 2009	29 January 2011[2]	1
EL 7664	1992	10 December 2010	10 December 2012	1
Note 1: Mineral groups as defined under the *Mining Act 1992* Note 2: Renewal sought				
Source: MinView search, 27/11/2011				

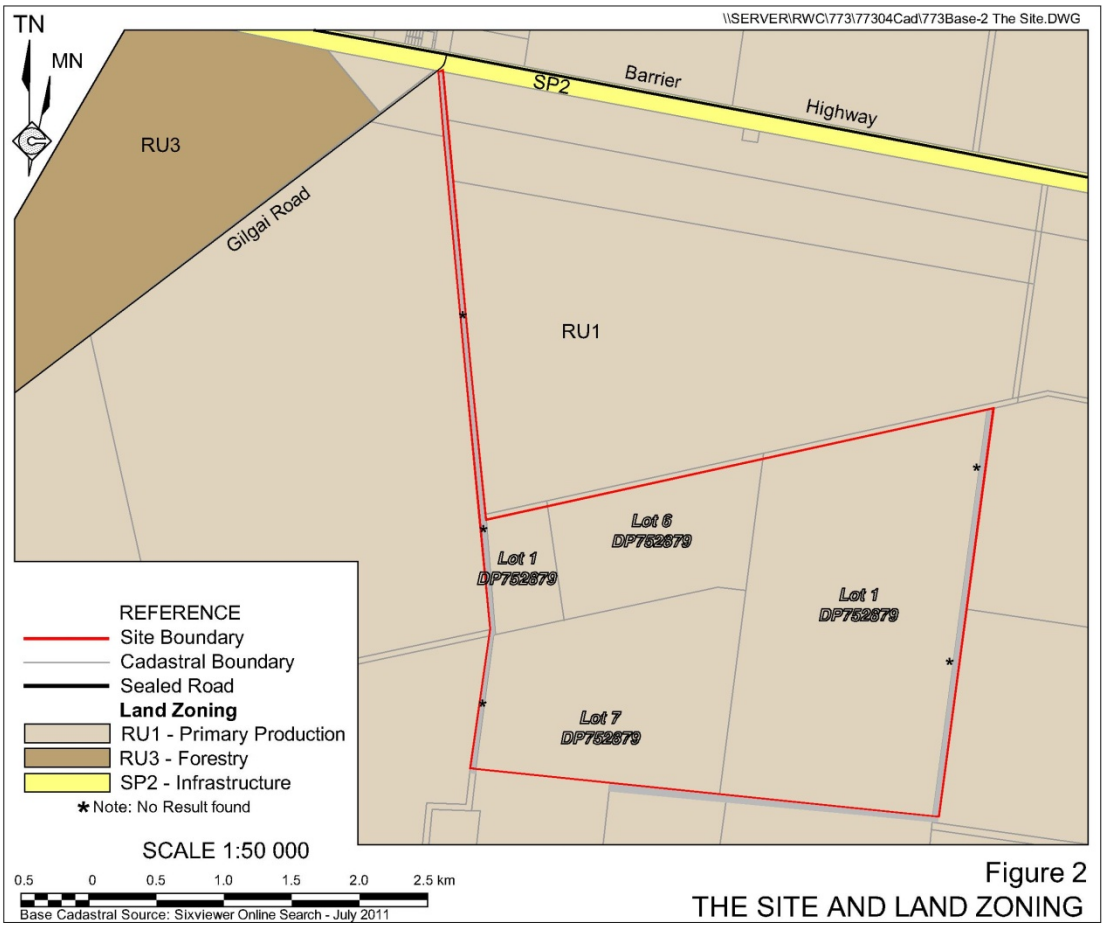


Figure 2
THE SITE AND LAND ZONING

1.5.3 Geology, Previous Exploration and Reserves

1.5.3.1 Geological Overview

The area surrounding the site is dominated by Cainozoic alluvial plains derived from the Darling River Basin with minor colluvium and outcrop (**Figure 3)**. The site is located within the western-most structural zone of the Lachlan Fold Belt, namely, the Girilambone Structural Zone, which includes, Cambrian-Ordovician metasediments and minor basic volcanics of the Girilambone Group, intruded by numerous mafic and ultramafic bodies of similar age and by middle Silurian granite and volcanics.

The exploration licences held by Jervois cover the south-west limb of a north-south trending arcuate belt of serpentinised ultramafics known as the West Lynn Serpentinite and a small block of ultramafics to the south-west called the Miandetta intrusion. Thin section analysis has interpreted the West Lynn Serpentinite as being derived from the alteration of a medium grained dunite. The linear nature of the West Lynn ultramafic unit suggests an Alpine-type origin, supported by the low levels of platinum-group elements determined by assays. The Miandetta intrusion may be a dismembered portion of the West Lynn Serpentinite.

Within the immediate vicinity of the Site, the Gilgai and Honeybugle intrusive complexes are Alaskan-type complexes made up of a range from hornblende monzonite, hornblendite, pyroxenite and olivine pyroxenite to dunite-peridotites. The intrusives are included within the 'Fifield Platinum Province'. The Gilgai complex is covered by 8 to 50 metres of Tertiary to Recent age alluvial material, with alluvium detected to 85m depth near the northern margin of the complex.

Geology within the Site is located within a limonitic and saprolitic Tertiary laterite which has a fairly typical laterite profile as follows:

- Haematitic clay.
- Limonitic clay.
- Saprolitic clay.
- Weathered bedrock.
- Fresh bedrock.

The resource is centred over the more mafic phases of the zoned Gilgai ultramafic complex. Weathering persists to 60m depth in the northern flanks of the complex. **Figure 4** presents an overview the basement geology within the Site.

1.5.3.2 Previous Exploration Operations

In the 1980s, 134 rotary air blast holes and two diamond drill holes (each 250 meters deep) were drilled in the area exploring several of these Alaskan-type pyroxenite bodies for platinum group. Between 1999 and 2001, two traverses of reverse circulation drill holes exploring for nickel were drilled across the Gilgai Intrusion. Jervois obtained the sample pulps from these RC holes and analysed them for Scandium; the results indicated there was a significant enrichment of Scandium in the Gilgai laterite. In 2006, Jervois completed a drill program consisting of 64 reverse circulation holes and 5 air core holes within the site. From this drilling, Douglas McKenna and Partners produced a Joint Ore Reserve Committee - compliant resource estimation for Jervois, and in 2010 EMC completed a Canadian NI43-101 compliant technical report (see Section 1.5.3.5).

1.5.3.3 Nyngan Scandium Mineralisation

The Nyngan Scandium Deposit is a near-surface (at less than 65m depth) Scandium-rich zone of laterite mineralisation associated with the Gilgai Intrusion. The laterite zone is locally up to 40m thick and layered as described in Section 1.5.3.1. The Scandium mineralization is concentrated within the hematitic, limonitic and saprolitic zones with values up to 350ppm Scandium.

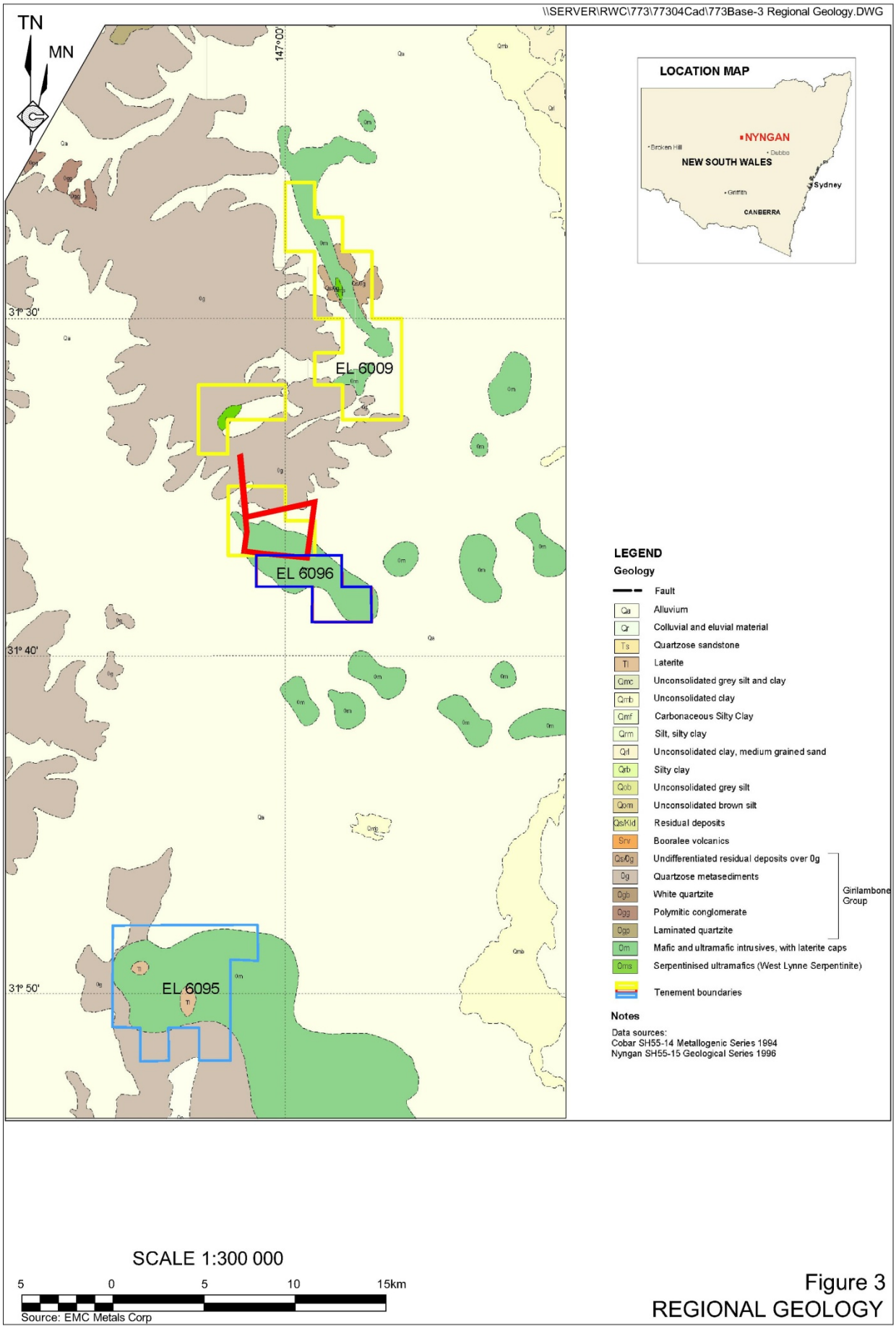
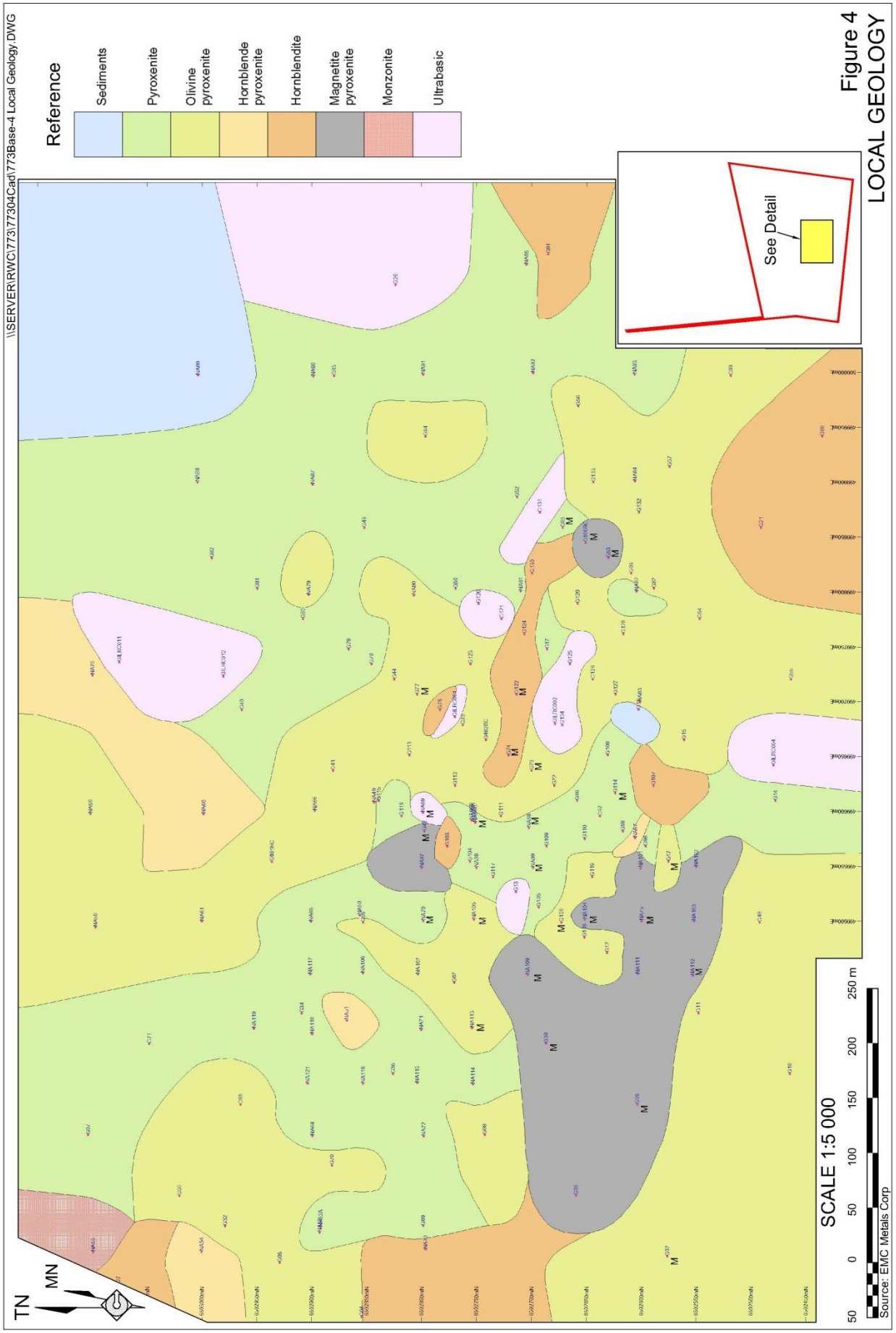


Figure 3
REGIONAL GEOLOGY


\\SERVER\RWC\773\773304Cad\773Base-4 Local Geology.DWG
Reference
Sediments
Pyroxenite
Olivine pyroxenite
Hornblende pyroxenite
Hornblendite
Magnetite pyroxenite
Monzonite
Ultrabasic
See Detail
Figure 4
LOCAL GEOLOGY
TN
MN
SCALE 1:5 000
50 0 50 100 150 200 250 m
Source: EMC Metals Corp

1.5.3.4 Resources and Reserves

In 2010, EMC Metals received an independent Canadian National Instrument 43-101 ("NI 43-101") compliant technical report outlining a measured and indicated resource for the Nyngan Scandium Deposit. The NI 43-101 compliant resource estimation is approximately 12 million tonnes of Scandium rich laterite, grading an average 261ppm Scandium, with a 100ppm cut-off.

Table 3 summarises the resource estimate prepared to comply with NI 43-101 and JORC requirements.

Table 3
Resource Estimate

Resource Category	Cut-off Sc (ppm)	Total Tonnes (kt)	Grade Sc (ppm)	Stripping Ratio
Measured	100	2 718	274	0.81:1
Indicated	100	9 294	258	1.40:1
Total	100	12 012	261	1.10:1
Source: EMC Metals				

It is noted that the identified measured and indicated resource would permit operation at the Proposal rate for over 180 years. As a result, the Proposal at this stage, would not extract all of the identified reserve. Rather, as the global market for Scandium expands, modifications would be sought to the development consent, should it be granted, to permit extraction of ore material of a greater rate from a larger area. Such expansions are contemplated within the general infrastructure and boundaries of the Proposal, although the processing plant footprint will be larger.

The mineralized resource likely extends beyond the limit of the current defined resource, and therefore beyond the dimensions of the proposed mining area. During the life of the Proposal, the Applicant proposes to undertake additional exploration drilling to define additional mineralisation. Mining of any resources additional to those currently defined does not form a part of this application. Expansions of mineral resource, and subsequent expansions of mining and processing capacity that may be contemplated, will be covered under subsequent applications, when timing and size are known.

1.6 MANAGEMENT OF INVESTIGATIONS

The preparation of this document has involved a study team managed by Mr Mitchell Bland (B.Sc (Hons), MEcon Geol, LLB (Hons)), Principal Environmental Consultant with R.W. Corkery & Co Pty. Limited with the assistance of Ms Christy Hill (BEnvMan, Grad Dip Design of Buildings in Bushfire Prone Areas) Environmental Consultant with the same company. Mr Bland and Ms Hillwill also manage the preparation of the *Environmental Impact Statement* for the Proposal.

Several professional staff within EMC Metals assisted with the preparation of this document including, but not limited to:

- John Thompson – Vice President – Project Development; B.E.Mining, FAusIMM.
- George Putman – CEO & President; MBA (Finance).
- Sanja Van Huet – Director, Exploration Manager – Jervois Mining; PhD, MSc, MAusIMM

Strong emphasis has been and will continue to be placed upon a multi-disciplinary team approach to the design of the Proposal, the description of the existing environment, identification of key issues, development of appropriate safeguards and assessment of impacts. The following specialist consultancies have been commissioned to undertake an initial assessment of the existing environment and identify potential constraints posed by the Proposal. A summary of the results of those initial assessments are presented in Section 4 of this document.

- Air Quality and Greenhouse Gas- ENVIRON Australia Pty Ltd
  - Scott Fishwick- BSc.
- Fauna- Biodiversity Monitoring Services
  - Martin Denny – BSc (Hons), PhD
- Flora- Natural Resource Consultants
  - Geoff Cunningham - B.ScAgriculture (Hons II)
- Heritage- Artefact Heritage Services
  - Sandra Wallis – BA (Hons), PhD, MAACAI
  - Grant Warner – BBus (Hons), BA
- Noise- Spectrum Acoustics
  - Neil Pennington – PhD, B.Sc (Physics), B.Math (Hons)
- Soils and Surface Water- SEEC
  - Mark Passfield –B.Sc (Hons) Eng. Geology & Geotechnics, CPESC
- Traffic- Traffic Solutions
  - Craig Hazell – Assoc. Dip. Eng
- Groundwater- The Impax Group
  - James Morrow - BEngEnv (Hons)

Once confirmation of the key issues to be assessed is established through receipt of DGRs, these consultancies will complete their respective assessments of impacts and provide recommendations for necessary design and operational safeguards.

2. DESCRIPTIONOF THE PROPOSAL

2.1 INTRODUCTION

This section provides an overview of the Proposal. It is noted that the information provided in this section is, by necessity, preliminary and is provided to a level of detail that reflects the Applicant's current understanding of the Proposal. It is acknowledged that details in relation to aspects of the Proposal have yet to be determined and that as additional studies are completed, including the environmental studies already commenced, that aspects of the Proposal may be amended. As a result, the following information is provided for the information of the relevant government agencies and interested members of the community surrounding the Site. This information may, however, vary from the final description of the Proposal provided in the *Environmental Impact Statement.*

2.2 OBJECTIVES

The Applicant's objectives in constructing and operating the Nyngan Scandium Project would be as follows.

- To safely mine the identified Scandium reserves.
- To operate the Proposal in a manner that would minimise surface disturbance and impacts on surrounding residents and the local environment.
- To implement a level of management control and mitigation measures that ensures compliance with appropriate environmental criteria and reasonable community expectations.
- To develop and operate the Proposal in compliance with all relevant statutory requirements.
- To create a final landform that is suitable for a post-mining land use that would be determined in consultation with the local community and may include a mixture of agriculture and/or nature conservation.
- To continue to maintain an open and honest relationship with the surrounding community.
- To achieve the above objectives in a cost-effective manner to ensure security of employment and the continued economic viability of the Applicant.

2.3 PROPOSED SITE LAYOUT AND ACTIVITIES

The Proposal would incorporate the following activities to be undertaken within the Site (**Figure 5**).

- Extraction of waste rock and ore material using conventional free dig open cut mining methods. There will be no blasting operations.

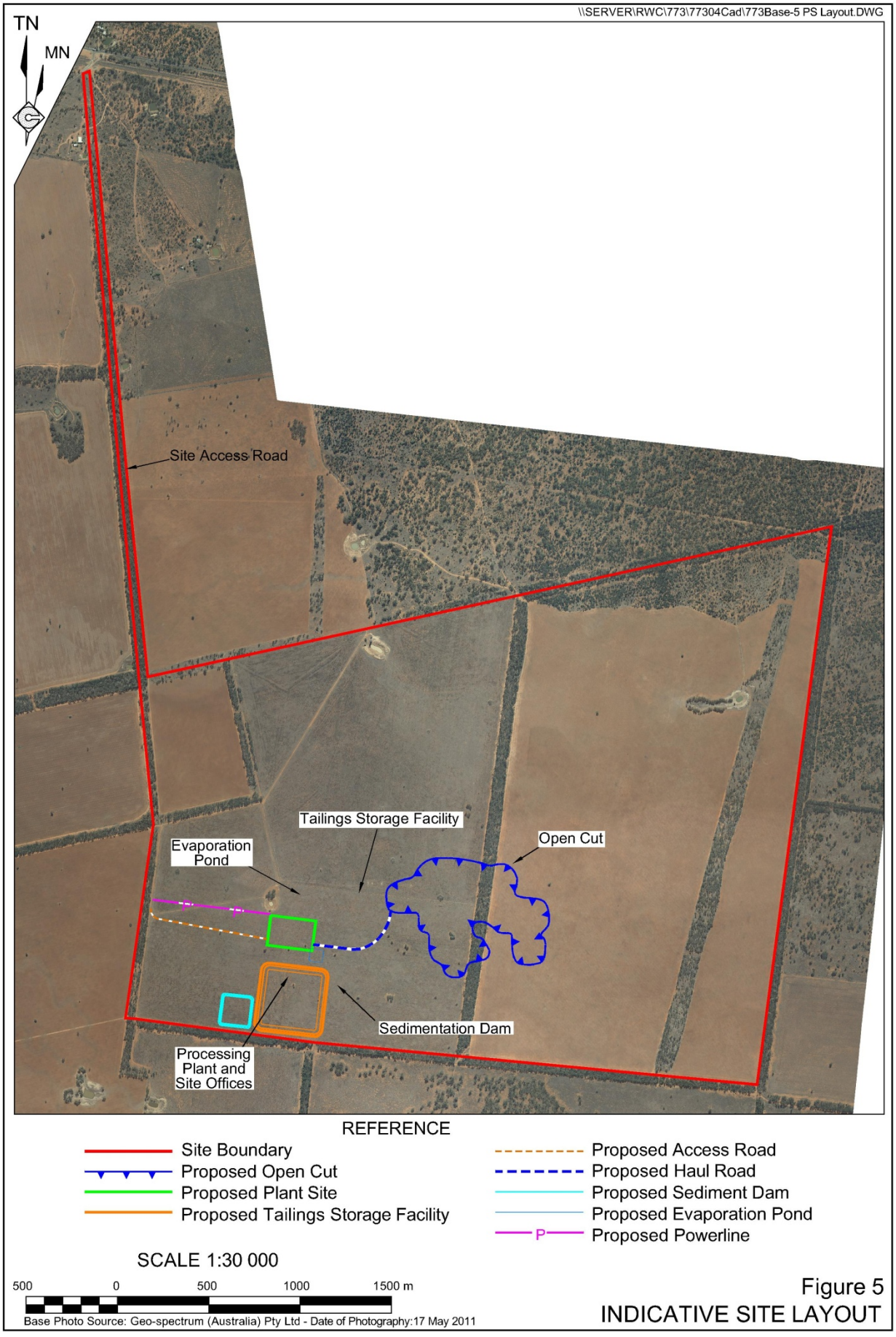


Figure 5
INDICATIVE SITE LAYOUT

- Construction and operation of a Processing Plant, incorporating a crushing agglomeration and drying circuit, an acid mixing and curing circuit, a hearth roaster, multiple leaching circuits, filtration circuits, solvent extraction circuits, product recovery circuits and a sulphuric acid production and recycling facility.
- Construction of an office and workshop facility composed of site offices, workshops, ablutions facilities, stores warehouse, equipment and vehicle parking, and associated infrastructure.
- Construction of a waste rock emplacement and partial backfilling of the open-cut with previously removed waste rock.
- Construction and use of a tailings storage facility.
- Construction and use of various haul roads linking the open cut, waste rock emplacement and processing plant.
- Construction of a site access road between the processing and administration area and Gilgai Road ("the Site Access Road").
- Transportation of up to 28t/year of Scandium oxide by private and public roads to the Applicant's customers.
- Construction of soil stockpiles (for use in rehabilitation works) and surface water management structures (to control surface water flows with the Site).
- Construction and rehabilitation of a final landform that would be geotechnically stable and suitable for a final land use of agriculture and/or nature conservation.

The Proposal would require the establishment or upgrade of external infrastructure required for the Proposal, including water and electrical supply infrastructure.

2.4 INFRASTRUCTURE ESTABLISHMENT

2.4.1 Introduction

This sub-section provides an overview of the infrastructure that would be required to be constructed during the establishment phase of the Proposal. This would include the following.

- An approximate 4km Site Access Road and intersection with Gilgai Road.
- Surface water management structures.
- Process water supply and management infrastructure.
- A 22kV electricity transmission line, substation and distribution network.

2.4.2 Site Access Road and Intersection

The Applicant would construct the Site Access Road to permit access the Site. The road would require construction of an intersection between the Site Access Road and Gilgai Road (**Figure 5**).

The Site Access Road would be an all-weather, unsealed two lane road suitable for use by light and heavy vehicles and sufficiently wide that two loaded semitrailer trucks could pass safely.

Appropriate road-side drainage would be installed in accordance with the requirements of *Managing Urban Stormwater – Soils and Construction – Volume 2C Unsealed Roads* published by the then Department of Environment and Climate Change in 2008.

2.4.3 Water Management Structures

A range of water management structures would be constructed to ensure:

- that the active sections of the Site are not subjected to flooding;
- that surface water flowing from areas of proposed disturbance is of an appropriate quality to be discharged; and
- that any water that is not of an appropriate quality to be discharged is retained within the Site.

The *Environmental Impact Statement* will include further information in relation to the proposed water management structures.

2.4.4 Processing Water Infrastructure

The Applicant proposes to obtain water required for operational purposes from the Bogan River using a combination of existing and proposed infrastructure. The *Environmental Impact Statement* will include further information in relation to the licencing and infrastructure aspects of the supply of this water.

2.4.5 Transmission Line, Substation and Transformers

A 33kV electricity transmission line would be constructed to provide power for the processing plant, offices, workshop and other sections of the Site (**Figure 5**).The transmission line would be connected to the existing 33kV transmission line located3.5km from the project. This line is owned and operated by Essential Energy.

The transmission line would be constructed during the site establishment phase of the Proposal and would be constructed entirely on Proposal-related land. It is expected that when the transmission line is located on land currently subject to a Mining Lease Application it will therefore be subject to NSW mining regulations for power line construction and maintenance. Where the line is constructed on land not subject to a mining lease the line would be constructed in accordance with Essential Energy's *High Voltage Connection Requirements* (CEPG8079 Issue 2). Maintenance and ownership of the transmission line would remain with the Applicant.

In addition, the Applicant would construct and operate a substation and transformer (**Figure 5**). The substation and transformer would comply with Australian Standard AS 2067 - *Switch Gear Assemblies and Ancillary Equipment for Alternating Voltages above 1kV* and would be enclosed within a 2.5m high security fence and appropriate signage would be installed.

Power would be distributed to the processing plant, offices, workshops and other areas by a combination of overhead and underground power lines. The Applicant would also construct additional transformers within the Site to further reduce the voltage to 415V and 240V for use within various sections of the Site.

Finally, it is noted that during construction operations, until such time as the transmission network is commissioned, silenced diesel generators may be used to provide the required power for site operations.

2.5 SITE PREPARATION

2.5.1 Introduction

This sub-section describes the activities that would be undertaken in preparation for mining operations, namely removal of vegetation and soil stripping and stockpiling operations. Prior to the commencement of site establishment operations, areas to be disturbed would be surveyed and clearly marked to ensure that areas not required for the operation of the Proposal are not disturbed.

2.5.2 Vegetation Clearing

Those sections of the Site that would be disturbed by the Proposal have largely been previously cleared (**Figure 5**).

As there would be limited progressive establishment of the Project Site infrastructure, all vegetation clearing would occur in a single campaign. Prior to commencement of clearing of native vegetation, a pre-clearing fauna inspection would be undertaken by a suitably qualified and experienced expert to ensure that any roosting or nesting fauna are identified and relocated. Available seed from trees to be cleared would, wherever practicable, be harvested prior to their removal.

Larger vegetation, if present, would be removed using a bulldozer with its blade positioned just above the surface so as not to disturb the groundcover and topsoil. Ground cover vegetation would be removed with the topsoil to maximise the retention of the seed bank and nutrients within the soil, as well as to minimise opportunities for erosion and dust lift-off between removal of the larger vegetation and soil stripping.

Vegetation would not be mulched but would be stored for use during rehabilitation activities. Felled trees would be track-rolled to break up the larger trunk sections, and all vegetation would be relocated to stockpile locations adjacent to each individual area of disturbance. The stockpiling of vegetation close to the source would provide for minimal handling and for easy access to it for rehabilitation purposes. Where practicable, the vegetation stockpile would be located on the down-slope side of the infrastructure area to act as a natural sediment trap.

2.5.3 Soil Stripping

2.5.3.1 Introduction

Soil materials within those sections of the Site that would be disturbed will be assessed by SEEC. A description of the Site's soils and detailed soil management measures will be presented in the *Environmental Impact Statement*.

2.6 OPEN CUT MINING OPERATIONS

2.6.1 Introduction

Open cut mining operations would involve the staged removal of waste rock and ore material using standard free dig open cut mining methods. This sub-section presents preliminary information in relation to the proposed mining methods, mining rate, and equipment.

2.6.2 Open Cut Mining Methods

Waste rock and ore material would be extracted using a combination of excavate and load and rip, push and load mining methods. Drill and blast mining methods would not be required.

Following removal of soil, waste rock material (and ore material at greater depths) would be using an excavator and loaded directly into haul trucks for removal transportation to the ROM pad, Waste Rock Emplacement or elsewhere within the Site.

Once the material becomes too hard to be efficiently extracted using the above method, the material would initially be ripped using a bulldozer and pushed into piles from where it would be loaded using an excavator front-end loader into haul trucks.

Indicatively, the mine design criteria would be as follows:

- Operational face height – 2 metres.
- Final face height – 5 metres
- Final face angle – 35°

- Minimum Bench width – 5 metres
- Maximum depth of extraction below surface – 45 metres.

2.6.3 Mining Rate

It is anticipated that the mining would initially commence at approximately 30 000tpa of ore and 500000tpa of waste rock and progressively increase to a maximum rate of approximately 80000tpa of ore and between 25000tpa and 50000tpa of waste rock. Detailed extraction rated will be provided in the *Environmental Impact Statement.*

In light of the above, the Applicant anticipates that mining operations will be undertaken on a campaign basis, indicatively 4 months per year.

2.6.4 Mining Equipment

The following presents an indicative list of the typical types of items of earthmoving and related equipment which would be used throughout the life of the Proposal.

Further information will be provided in the *Environmental Impact Statement*.

- Excavator.
- Bulldozer.
- Front-end loader.
- Haul trucks.
- Water cart.
- Service vehicle.
- Grader.
- Assorted light vehicles.

2.7 PROCESSING OPERATIONS

2.7.1 Introduction

This sub-section provides a brief overview of the proposed processing operations and reagent management. It is acknowledged that processing operations for the Proposal are complex and are likely to represent the most significant risk for environmental harm in the event of an accident or inappropriate management. As a result, the *Environmental Impact Statement* will include a detailed description of the proposed processing operations and management measures that would be implemented.

2.7.2 Processing Plant Layout

Figure 6 presents an indicative layout of the processing plant area, including the following.

- ROM pad and associated crushing circuit and stockpiles.
- Curing and roasting area.
- Leaching and filtration area.
- Solvent extraction area.
- Scandium precipitation and purification area.
- Reagent storage area.
- Utilities area.
- Sulphuric Acid plant area.
- Sulphur stockpile area.
- Office and car park.

2.7.3 Overview of Processing Operations

2.7.3.1 Introduction

The following sub-section provides a brief overview of the processing operations. **Figure 7** provides a flow chart that graphically illustrates the process pathway. In summary, however, ore material would be crushed to <7mm, mixed with acid and agglomerated. The agglomerated ore would then then dried and roasted prior to leaching. The leachate would then be subjected to solvent extraction and the Scandium would be precipitated and filtered out as Scandium oxalate. The filter cake would then be calcined to form Scandium Oxide.

Further details will be provided in the *Environmental Impact Statement*.

2.7.3.2 Ore Preparation

Ore material would be reclaimed from the ROM stockpile by a front-end loader, fed into the primary crusher and transferred to the crushed ore stockpile.

2.7.3.3 Acid Mixing, Curing and Calcining

Crushed ore material would be mixed using an acid pug mixer with 98% sulphuric acid at a ratio of 2:1. Gasses potentially generated during the mixing process, namely gaseous hydrochloric acid and free chlorine gas would be captured and directed to a scrubber.

Once mixed, the ore material would be passed to an agglomerator, where the material would be allowed to cure and agglomerate or form balls or masses prior to being discharged to the rotary dryer.

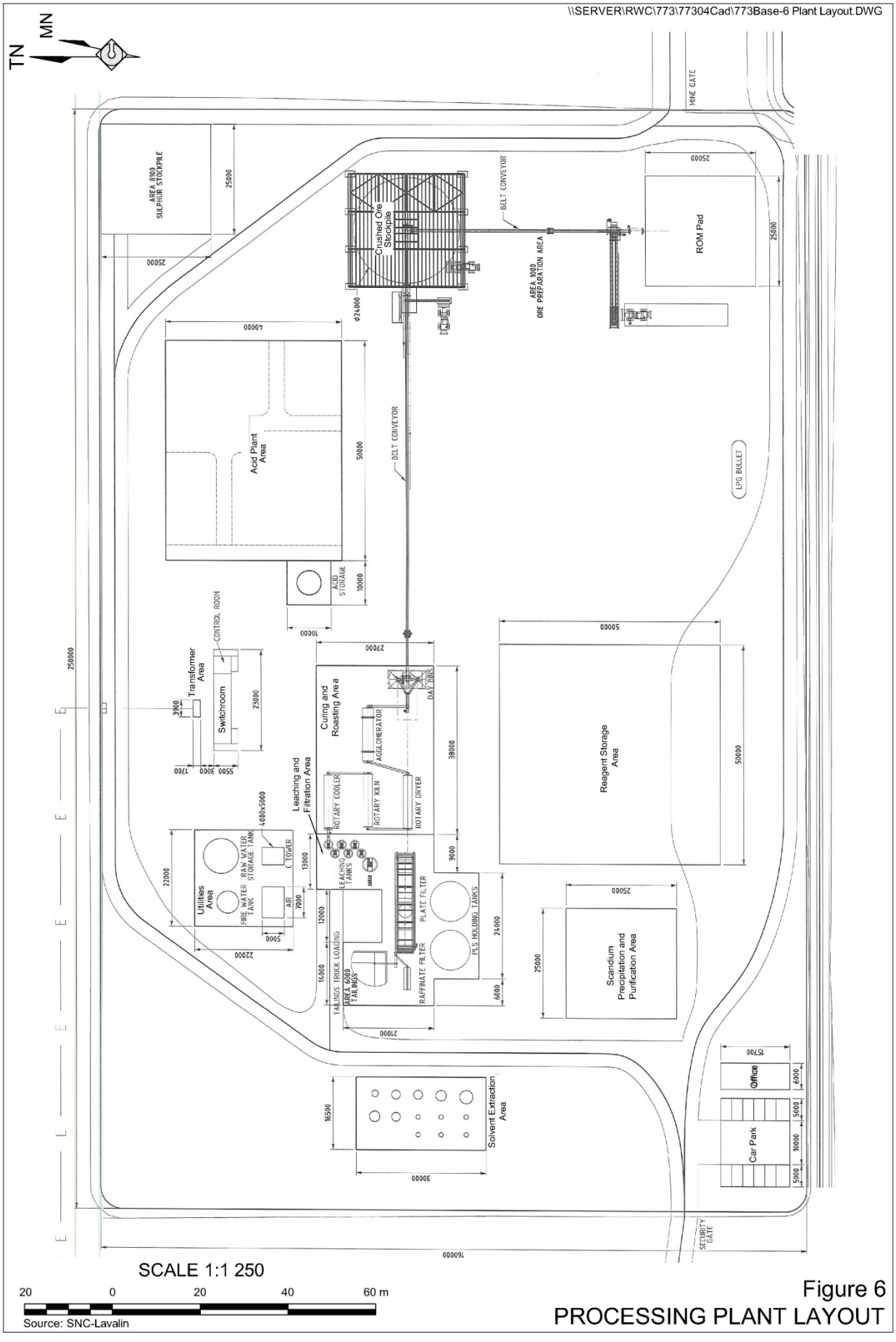
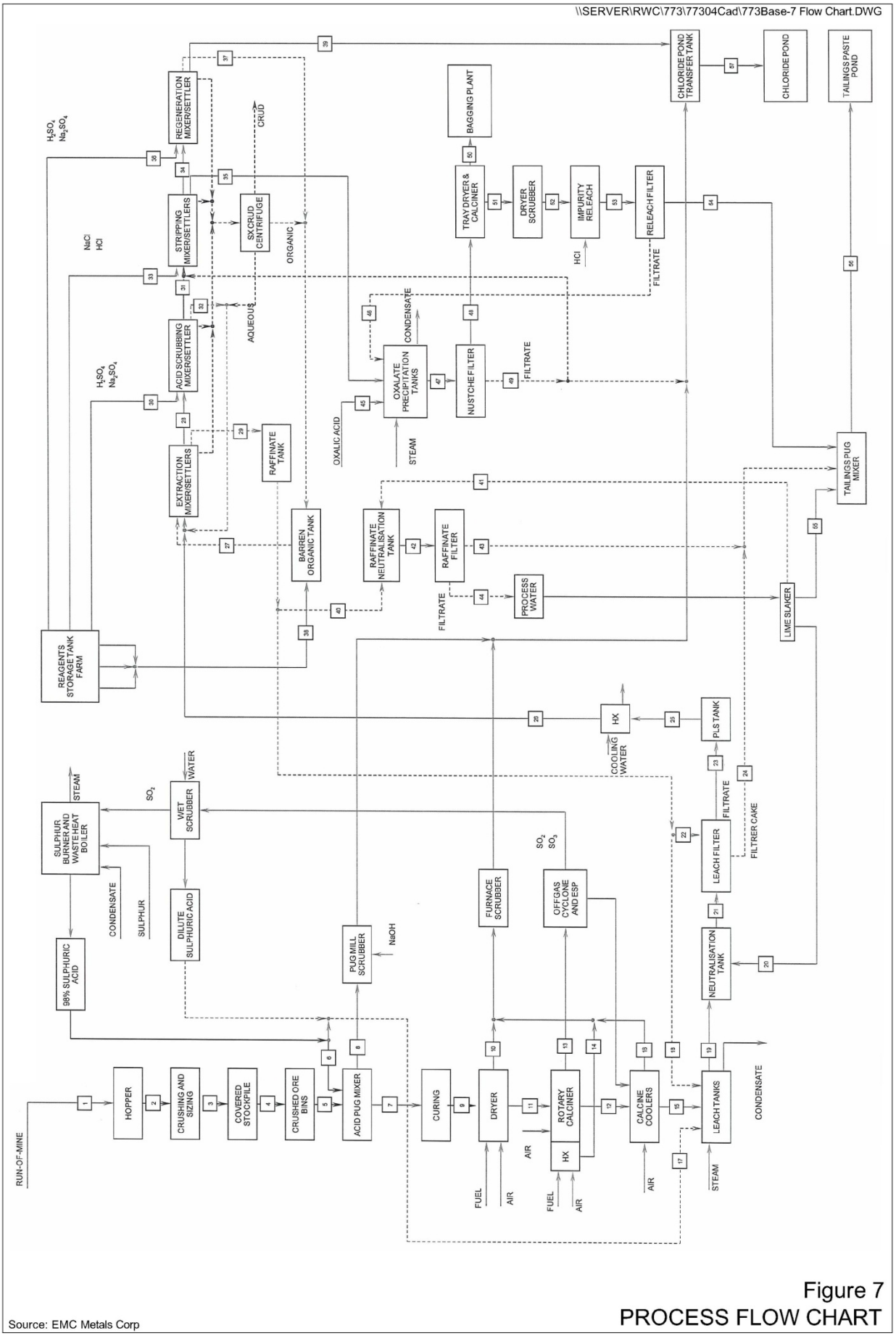


Figure 6
PROCESSING PLANT LAYOUT



Source: EMC Metals Corp

Figure 7
PROCESS FLOW CHART

The rotary dryer would operate at a temperature of 280°C to drive off moisture from the ore, and to convert the metals present in the ore, such as Scandium, Iron and Aluminium into a water-soluble sulphate form while avoiding the generation of H_2SO_4 and SOx gases. Any gasses generated during the drying stages would be captured and directed to a scrubber.

Dewatered ore discharging from the rotary dryer would be passed to a rotary calciner where the ore would be baked at 710°C. Calcining in a thermal process where the composition of selected components of the agglomerated material is changed at temperatures lower than the melting point of the materials. In the case of the Proposal, unwanted water soluble metals sulphates created during the drying stage, including those containing iron and aluminium, would decomposed to insoluble compounds at 710ºC, while Scandium sulphate, which decomposes at 820°C, would be unaffected and would remain water soluble.

During calcining, some of the sulphuric acid is consumed in the formation of sulphates and metal oxide compound. However, the bulk of the acid is decomposed to form a mixture of sulphur oxide gases. These gasses would be forced through an exhaust duct for dust extraction, followed by a through a cyclone separator and electrostatic precipitator prior to feeding the sulphuric acid plant.

The discharge from the rotary calciner would be cooled in a rotary cooler before being passed to the leach circuit. Air used during the cooling process would also be passed to a scrubber.

2.7.3.4 Leach Circuit

Acid agglomerated, cured, calcined and cooled material discharged from the calcine cooler would be passed to a series of six leach tanks for acid leaching. The calcined ore would diluted to 20% solids through mixing with leaching solution recycled from the solvent extraction circuit and dilute sulphuric acid. The resulting slurry would be agitated to prevent separation of the liquid and solid components and the pH would be maintained at 1.7. This material would flow progressively from tank to tank. During this process, scandium sulphate would be leached from the solid material and would pass into solution. Following completion of leaching operations, the slurry, including the scandium sulphate bearing solution (pregnant extraction solution), would be passed to a leach neutralisation tank.

In the leach neutralisation tank, lime slurry would be added to the leach slurry to raise the pH to 4.0, resulting in the precipitation of unwanted elements, including iron and aluminium as hydroxides. This material would then be passed to a vacuum filter to separate the pregnant extraction solution from the non-scandium bearing solids. The dewatered solids comprising precipitates, gangue (non-metal bearing minerals) and gypsum, would discharged to the a tailings pug mill from where it would be neutralised using lime before being transferred to the Tailings Storage Facility (see Section 2.8)

The pregnant extraction solution filtrate would be collected and passed to a holding tank before being passed to the solvent extraction circuit.

2.7.3.5 Solvent Extraction Circuit

The solvent extraction circuit would extract free Scandium from the pregnant extraction solution via a range of solvents. The circuit would comprise the following four stages. During each stage the concentration of scandium within the resulting solvent would be higher than during the previous stage, thereby reducing the volume of liquid to be treated by the Scandium Preparation and Purification Circuit.

Extraction

The pregnant extraction solution would be mixed with an organic solvent in a series of three mixer/settlers. The pregnant extraction solution would travel through the mixer settlers in a downstream direction, while the organic solvent would travel in the opposite direction. Initially, the pregnant extraction solution would be mixed with the immiscible organic solvent. Scandium would preferentially pass into the organic solvent. Following completion of this process, the liquids would be permitted to separate, with the less dense organic solvent rising to the surface to be passed to the next upstream mixer/settler while the more dense pregnant extraction solution would be permitted to settle to the bottom to be passed to the next downstream mixer/settler.

Each of the mixer/settlers would be covered to minimise organic evaporation losses and prevent contamination with external materials. In addition, a range of measures, including the following, would be implemented to manage fire risks associated with the use of a volatile organic solvent.

- Reduction in temperature of the pregnant extraction solution to 40º to reduce volatislation of the organic solvent.
- Elimination of static electricity through the use of fiberglass reinforced plastic pipes and vessels with conductive surfaces.
- Minimising free fall heights.
- Sufficient gaps between adjoining mixer-settlers.
- Use of aqueous film forming foam.
- Installation of automated fire suppression equipment.

Following the completion of extraction operations the barren extraction solution that has passed through all three mixer/settlers and had the Scandium removed would be returned to the leach circuit to repeat the leaching/extraction process. The Scandium-bearing organic solvent (pregnant organic solvent) would be passed to the acid scrub component of the solvent extraction circuit.

Acid Scrub Regeneration

Pregnant organic solvent would be mixed with an acidic scrubbing solution comprising sulphuric acid and sodium sulphate in deionised water within a mixer/settler to remove contaminants. The scrubbed pregnant organic solvent would then be passed to a stripping circuit and the used scrubbing solution would be recycled within the extraction circuit.

Stripping Circuit

The pregnant organic solvent would be mixed with an aqueous stripping solution comprising hydrochloric acid and sodium chloride in a series of three mixer/settlers, with the Scandium progressively stripped from the organic solvent into the aqueous stripping solution.

Following the completion of stripping operations the barren organic solvent would be returned via the regeneration circuit to the extraction circuit to repeat the leaching/extraction process. The Scandium-bearing aqueous stripping solution (pregnant aqueous stripping solution) would be passed to the Oxalate Precipitation Circuit.

Regeneration Circuit

The barren organic solvent would be mixed with a regeneration solution comprising sulphuric acid and sodium sulphate in deionised water. The regenerated organic solvent would then be passed back to the extraction circuit, while the used regeneration solution would be passed to the tailings transfer tank.

2.7.3.6 Scandium Preparation and Purification

The Scandium precipitation and purification circuit recovers Scandium from the aqueous strip solution in the form of precipitated Scandium oxalate and recovers and prepares the precipitate into a dry, calcined and marketable form. The key stages are as follows.

Oxalate Precipitation Circuit

The pregnant aqueous stripping solution from the stripping circuit would be passed through a series of heated and agitated tanks which would contain oxalic acid. The oxalic acid causes the aqueous Scandium to precipitate as Scandium oxalate.

Filtration

The resulting precipitate solution would be pumped from the oxalate precipitation tank to a pressure filter which would remove the Scandium oxalate for calcination and drying. The liquid filtrate would be collected and pumped to the tailings transfer tank.

Calcination and Drying

The filter cake comprising Scandium oxalate with some impurities would be calcined at 900°C to drive off any remaining water and convert the Scandium oxalate to Scandium oxide. Impurities and particulate material from the calcining oven would be captured and passed to the impurity re-leach and filtration circuit. The gaseous component of the calcining oven exhaust would be passed through a scrubber to remove any deleterious gasses prior to discharge.

Impurity Re-leach and Filtration

Captured impurities and particulate material from the calcining oven would be passed to a heated and agitated impurity re-leach tank and mixed with hydrochloric acid. Scandium dissolves readily in hydrochloric acid. The solution would be filtered and the resulting Scandium-bearing filtrate would be passed back to the oxalate precipitation circuit. Non-Scandium bearing filter cake would be passed to the tailings pug mixer.

Product packaging

The resulting Scandium oxide would be cooled and transferred to the packaging plant where it would be packaged into 5kg and 10kg stainless steel drums with plastic liners.

2.7.4 Reagent Management

Table 4 presents a list of all reagents that would be used during processing operations as well as an indicative indication of the annual consumption of each. A detailed description of the classification and management of each will be provided in the *Environmental Impact Statement*. This will include a hazardous and dangerous goods risk assessment under the *State Environmental Planning Policy No 33—Hazardous and Offensive Development.* This sub-section, however, provides preliminary information in relation to the storage and management of reagents within the Site.

Table 4
Reagents and Annual Consumption

Reagent	Unit	Consumption per Year
Sulphur	t	6515
Extractant (Primene JM-T)	m^3	7
Diluent (Exxsol D80)	m^3	138
Modifier (Exxal 10)	m^3	14
Oxalic Acid	t	94
Sodium Chloride (NaCL)	t	3719
Hydrochloric Acid (HCl) (33%) Strip	t	1 518
Hydrochloric Acid (HCl) (33%) Releach	t	75
Sodium Hydroxide (NaOH) (50%)	t	16
Sodium Meta Bi Sulphate (Na2SO4)	t	95
Hydrated Lime	t	13 682
Flocculant (WTP)	t	15
Source: EMC Metals Corp		

Bulk reagents would be delivered to Site in a mixture of bulk tanker, drum, bulka bag and transport containers. Reagents will be stored separated according to storage requirements, chemical properties and potential hazards and in accordance with the requirements of the relevant MSDS sheets. In summary, however, the following management measures would be implemented to ensure that the storage, transfer and use of reagents within the Site does not result in adverse environmental impacts.

- All reagents would be stored on suitably sealed surfaces under cover with suitable sumps to capture any surface water for use within the processing plant.
- All liquid reagents would be stored within suitably bunded areas. All bunds would be constructed in accordance with the relevant standards and would be designed to contain 100% of the volume of largest container within the bunded area.

- Reagents likely to result in adverse reactions or outcomes if mixed would be stored separately.
- All transfer pipes and tanks would be within a sealed and bunded area, with suitable sump(s) to capture all surface water flows from an identified rainfall event for reuse within the processing plant without discharge to the environment.
- A *Reagent and Chemical Management Plan* identifying detailed storage, handling and use procedures for each reagent, as well as emergency management measures would be prepared and implemented by the Applicant.
- All contractors and employees would receive detailed training and assessment in the appropriate management of reagents.

2.7.5 Sulphuric Acid Plant

As indicated in Section 2.7.3, the Proposal would require a significant amount of sulphuric acid for processing operations. In order to limit the potential for environmental incidents associated with transportation of such material, the Applicant would generate the required sulphuric material on site using the proposed sulphuric acid generation plant (**Figure 6**).

The plant would, at this stage, generate sulphuric acid through roasting and oxidation of approximately 30t/d of elemental sulphur to produce sulphur dioxide which would be removed from the roaster off-gasses using a scrubber.

The resultant sulphuric acid would be stored in appropriately bunded and constructed tanks adjacent to the sulphur plant and transferred to the processing plant as required.

Finally, it is noted that the Applicant is investigating other sources of sulphur for sulphuric acid generation. Further details will be provided in the *Environmental Impact Statement.*

2.8 TAILINGS MANAGEMENT

2.8.1 Introduction

This sub-section describes the management of tailings or ore material from which Scandium has been removed, including the design, construction and management of the Tailings Storage Facility.

The Applicant anticipates that the Tailings Storage Facility would be a “prescribed” dam and would be listed in Schedule 1 of the *Dams Safety Act 1978*. As a result, the facility would be constructed in accordance with the requirements of the NSW Dams Safety Committee.

2.8.2 Tailings Management and Neutralisation

Tailing solids from the various filter processes within the processing plant would be passed to the tailings pug mixer for neutralisation. Lime solution would be added to neutralise the tailings to a pH of 7.0 or more. The resulting neutralised tailings would be discharged to a

hopper for loading into a truck for transport to the Tailings Storage Facility. The tailings pug mixer would be fitted with a scrubber to capture and remove any chloride gasses that may be generated during tailings neutralisation.

Liquid waste from the scrubber bleed from the pug mill scrubber, containing scrubbed chlorides as well as spent acidic regeneration solution from the regeneration mixer/settler and furnace scrubber bleed containing acidic solid dust would be collected with the tailings transfer tank and pumped to a sealed and lined evaporation pond. This liquid material cannot be recycled through the processing plant because the contained chlorides would interfere with the Scandium extraction

2.8.3 Design and Construction of the Tailings Storage Facility

The indicative design criteria for the facility are as follows.

- Maximum area of disturbance: 300m x 300m (9ha).
- Slope of outer face of the embankment: 1:3 (V:H)
- Design volume: 607 000m^3.

The Applicant would adopt recommendations by Mining One, who will be undertaking geotechnical studies for the Tailing Storage Facility. The detailed specifications will be provided in the *Environmental Impact Statement*. In summary, however, the facility would, as a minimum, be designed to comply with the requirements of the following.

- NSW Dam Safety Committee.
- *Environmental Guidelines – Management of Tailings Storage Facilities* published by the Victorian Department of Primary Industries in 2004.

2.8.4 Tailings Placement Procedures

Neutralised tailings would be placed within the Tailings Storage Facility by truck. The material would be stacked in a manner that would permit compaction by movement of heavy vehicles over the surface of the facility.

In addition, the facility would be capable of collecting and retaining both incident rainfall and seepage from the tailings material for reuse within the processing plant or evaporation within the evaporation pond.

2.8.5 Tailings Volume

The Applicant anticipates that the Proposal would produce approximately 50 000m^3 of tailings solids per year, or approximately 1 000 000m^3 of tailings solids over the life of the Proposal. As indicated in Section 2.8.3, the design capacity for the Tailings Storage Facility is 607 000m^3, suggesting that the Tailings Storage Facility would need to be extended in year 10 so as to accept all tailings produced by the Proposal.

2.9 WASTE ROCK MANAGEMENT

Waste rock extracted from the open-cut would initially be used for form flood immunity structures and in the construction of the site infrastructure. Waste rock would then be placed within a waste rock emplacement until open cut mining operations have progressed sufficiently to permit in-pit placement of waste rock material. Once in-pit placement has commenced and the waste rock emplacement is no longer required, it would be shaped to form the final landform and rehabilitated.

Details in relation to the characteristics of the waste rock material, and on the particulars of the waste rock emplacement will be provided in the *Environmental Impact Statement.*

2.10 NON-PRODUCTION WASTE MANAGEMENT

Table 5 presents a description of the non-production wastes that would be generated during the life of the Proposal and briefly describes how they would be stored and subsequently removed from the Mine Site.

2.11 TRANSPORTATION

2.11.1 Introduction

This sub-section describes the Proposal-related transportation activities within and surrounding the Site.

2.11.2 Site Transportation

2.11.2.1 Internal Road Network

A range of internal haul roads and other roads would be constructed during and following site establishment. These would include the following.

- A site access road (discussed in Section 2.4.2).
- A haul road from the open-cut to the ROM pad.
- Various unsealed access tracks.

Table 5
Non-Production Waste Management

Waste Type	Storage	Removal
General waste (including food scraps)	Covered bins located within lunch rooms, offices, and elsewhere as required. They would be fitted with animal-proof lids.	Collected on a regular basis by licensed waste contractor and transported to a licensed waste disposal facility.
Waste oils and greases	Placed within bunded tank within the workshop area.	Collected on a regular basis by a licensed waste contractor and transported to an appropriately licensed facility.
Batteries and tyres	Batteries would be placed within a covered and marked used battery storage area until removed form site. Tyres would be placed within a marked used tyre storage area until removed from site or used for another purpose.	Batteries would be collected on an as needs basis by a licensed disposal contractor and recycled. Tyres would be reused on site for construction of retaining walls, erosion protection, traffic control, or would be removed from site for reuse elsewhere or recycling.
Scrap steel/metal	Stored in a specified area within the workshop area or elsewhere as required.	Collected on an as needs basis by a scrap metal recycler.
General recyclables	Covered bins located within lunch rooms, offices, and elsewhere as required. They would be fitted with animal-proof lids.	Collected on a regular basis by a licensed recycling contractor and transported to an appropriate recycling facility.
Sewage sludge	Stored within the sewage treatment facility.	Collected as required by a suitably licensed contractor and disposed of at an appropriate facility.

2.11.3 External Transportation

2.11.3.1 External Road Network

The Applicant anticipates that all Proposal-related vehicles would access the Site via the Barrier Highway and Gilgai Road (**Figure 8)**. Traffic leaving the site would turn right onto Gilgai Road before passing over a level crossing for the Nyngan to Cobar Railway and accessing the Barrier Highway. The vast majority of vehicles would turn right to Nyngan located to the east of the Site.

A traffic assessment is in progress to determine suitable layouts for the Site Access Road, Gilgai Road and Barrier Highway intersections.

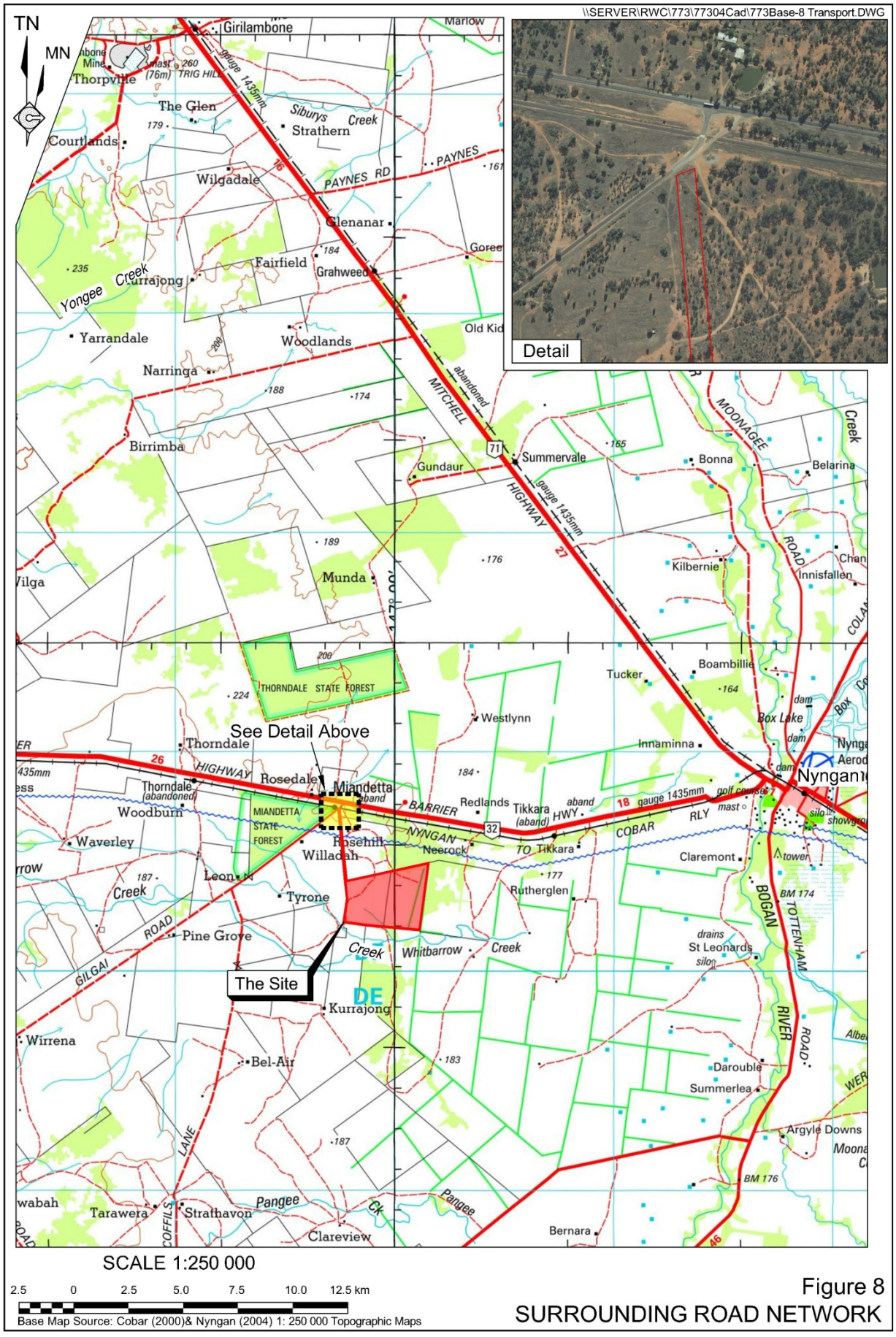


Figure 8
SURROUNDING ROAD NETWORK

2.11.3.2 Traffic Types

Traffic types associated with the Proposal would include the following.

- Light vehicles – including passenger vehicles and light trucks.
- Heavy vehicles – including rigid trucks, and semi-trailers delivering consumables and supplies.
- Oversize and overweight vehicles – delivering components of the processing plant and mobile fleet. The Applicant would ensure that all oversize and overweight vehicles would have the appropriate permits and approvals and would be appropriately escorted, when required.

2.12 FACILITIES AND SERVICES

2.12.1 Facilities

An office area and carpark would be constructed during the site establishment phase of the Proposal and would comprise the following components.

- A demountable building that would comprise the Applicant's site office, ablution facilities, first aid room, security and meeting rooms.
- An unsealed car park.

2.12.2 Services

2.12.2.1 Electricity Supply

As discussed in Section 2.4.4, electricity would be provided via a 33kV electricity transmission line connected to the existing 33kV transmission line owned and operated by Essential Energy.

Power for the processing plant and various buildings within the Site would be provided by a distribution system from the proposed substation described in Section 2.4.4. The distribution network would be both above and below ground.

Additional details in relation to the distribution network will be provided in the *Environmental Impact Statement.*

2.12.2.2 Communications

The Applicant's office and processing plant would be serviced by telephone and data lines. In addition, communications within the remainder of the Site would be via two-way radio and/or mobile phone.

2.12.2.3 Hydrocarbons

All diesel for the mobile equipment would be stored in tanks and would either be self bunded or located within a bunded fuel bay. Bunding, if required, would be sized to meet the relevant containment requirements and Australian Standard AS 1940:2004.

Any bulk oils, greases and waste oils would be stored within a similarly bunded area.

2.12.2.4 Potable Water

Potable water would be transported to site as required. Water for ablutions purposes would be sourced from the Nyngan-Cobar pipeline.

2.12.2.5 Operational Water

As discussed in Section 2.4.4, water for operational purposes would likely be sourced from the Bogan River via the Nyngan-Cobar pipeline. Further details will be provided in the *Environmental Impact Statement*.

2.12.3 Life of the Proposal

2.12.3.1 Hours of Operation

The proposed hours of operation for each of the relevant components of the Proposal are given in **Table 6**.

Table 6
Proposed Hours of Operation

Activity	Proposed Days of Operation	Proposed Hours of Operation
Vegetation clearing and topsoil stripping	7 days a week, during each campaign	7:00am to 6:00pm
Construction operations	7 days a week	24 hours per day
Open Cut mining operations	7 days a week, during each campaign	7:00am to 6:00pm
Maintenance operations	7 days a week	24 hours per day
Processing operations	7 days a week	24 hours per day
Transportation operations	7 days a week	7:00am to 6:00pm
Rehabilitation operations	7 days a week	7:00am to 6:00pm
Source: EMC Metals		

2.12.3.2 Life of the Proposal

The Applicant anticipates that mining operations would require approximately 21 years to complete. However, in the event that the proposed rate of mining is lower than anticipated or more ore material is identified within the approved open-cut shell through successful ongoing exploration, additional time may be required. Following completion of mining operations, site decommissioning and rehabilitation operations may take up to two years. As a result, the life of the Proposal would indicatively be 23 years.

In the event the Applicant identifies further ore reserves through continued exploration for possible extensions to the known mineralisation and for new areas of mineralisation within its mineral authorities, separate applicants for approval to extract that material would be made at that time.

2.13 EMPLOYMENT, CAPITAL COST AND ECONOMIC CONTRIBUTIONS

Additional information in relation to the employment, capital cost and economic constructions of the Proposal would be provided in the *Environmental Impact Statement*. However, in summary the Proposal would contribute the following to the surrounding communities.

- Approximately 50 full-time equivalent positions during the construction phase of the Proposal.
- Approximately 30 full-time equivalent positions during the operational phase of the Proposal.
- The capital cost of the Proposal is anticipated to be approximately $100 million (see **Appendix A**).
- The Proposal would contribute between approximately $20 million to $25 million per year to the local, regional and national economies through wages, purchases of goods and services and taxes and royalties.

2.14 SAFETY AND SECURITY

The Applicant recognises the proximity of the Site to residences, and the township of Nyngan, and accordingly would implement procedures and controls to protect the safety of the public. Additionally measures would be implemented to ensure the safety of visitors, contractors and employees present at the Site. Unauthorised access to facilities equipment would be in force at all times.

It is the Applicant's policy that each person employed on, or visiting the Site would be provided with a safe and healthy working environment. To achieve this, the Applicant would implement an induction and training program to achieve the relevant objectives.

2.15 SITE REHABILITATION AND DECOMMISSIONING

2.15.1 Introduction

The Applicant would, where practicable, adopt a progressive approach to the rehabilitation of disturbed areas within the Site to ensure that areas where mining–related operations have been completed are quickly shaped and vegetated to provide a stable final landform. The progressive formation of the post-mining landform and the establishment of a vegetative cover would also minimise the potential Proposal-related visual amenity and air quality impacts.

The following sub-sections describe the Applicant's rehabilitation objectives and the proposed final landform on completion of all proposed mining and associated disturbance. The procedures to be applied to each component of the mine, the water management structures and other areas of disturbance associated with the mining activities are also outlined. Refinements to these procedures, if required, would be undertaken on the basis of operational experience gained by the Applicant, or by others at similar operations. These refinements would be reported in the relevant *Annual Environmental Management Report* and/or any amended *Mining Operations Plan* produced by the Applicant throughout the life of the Proposal.

2.15.2 Rehabilitation Objectives

The Applicant's rehabilitation objectives for all areas of mine-related disturbance within the Site can be defined in the short term and long term as follows.

Short Term Objectives

- Stabilise all disturbed areas no longer required for Proposal-related activities. This would assist to minimise erosion and dust generation, as well as reducing the visual impact of the proposed operation upon surrounding residents. This objective would be achieved through progressive reshaping, spreading of topsoil and seeding of bunding, flood protection structures and other areas of disturbance.
- Reduce the visual impact upon surrounding residents by early establishment of vegetation in areas where mining-related operations have been completed or in other areas of the Project Site.

Long Term Objectives

- Provide a low maintenance, geotechnically stable and safe landform which blends with surrounding landforms and provides land suitable for the final land use of agriculture and nature conservation.

2.15.3 Final Landform and Land Use

Further details of the final landform, land use and related information would be provided in the *Environmental Impact Statement*. In summary, however, the final landform would include the following components.

- A partially backfilled open cut with a bunded and fenced final void.
- Appropriately shaped and covered, free draining tailings storage facility and waste rock emplacement with appropriate surface water management structures and side slopes of approximately 1:3 (V:H) or less.
- A shaped, covered and vegetated processing plant and office area with all infrastructure removed.

The water management structures and dams, where required, would remain in place following completion of mining operations.

Final land uses would be determined in consultation with surrounding residents and the relevant government agencies and would be presented in the *Environmental Impact Statement*. It is likely, however, that sections of the Site would be revegetated and used for nature conservation or agriculture.

2.15.4 Decommissioning of Infrastructure and Services

Following completion of mining-related operations, and assuming that no further mining operations are proposed, the Applicant would remove infrastructure and services specifically established to service the mining operation. This would include the Processing Plant and associated infrastructure.

A select number of items of infrastructure may remain provided that a subsequent use for them can be identified. Indicatively, this may include the following.

- Site buildings, including the office and workshops.
- Site access roads.
- Surface water management structures.

In summary, areas to be decommissioned would be rehabilitated as follows.

- All infrastructure, including buildings, concrete pads and hardstand areas not required for any subsequent land use would be removed.
- Where relevant, potentially hydrocarbon or chemically contaminated areas would be tested and any contaminated material removed and appropriately treated. A detailed land contamination report would be prepared and the recommendations of that report would be implemented in full.
- Disturbed areas would be ripped and, where required, stockpiled soil materials would be replaced. Soil placement procedures will be further identified in the *Environmental Impact Statement*.
- Seed of appropriate species would be spread and the area to be revegetated would be track rolled. The advice of a suitably experienced ecologist or rehabilitation specialist would be sought to identify the most appropriate species and revegetation techniques. In summary, however, species selected would be endemic to the area surrounding the Site and, where possible, seed would be collected within or immediately surrounding the Site.
- Stockpiled vegetation removed during clearing operations would be spread over the area to be revegetated.

2.15.5 Open Cut

The open cut would be partially backfilled during the life of the Proposal. During backfilling operations, the open cut would be filled to slightly above the existing landform to facilitate shedding of water from the constructed landform, stockpiled soil material would be placed on the backfilled landform and the landform would be revegetated as preciously described.

At the completion of mining operations, however, a final void would remain. This would be backfilled using material placed in-pit to ensure that the base of the final void is higher than the wet weather groundwater level and prevent the final void from being a source of groundwater loss and accumulation of highly saline water. The base of the final void would then be spread with soil material and revegetated as previously described.

The walls of the final void would be constructed in a manner that would ensure that they are stable in the long-term. The upper crest of the final void would be bunded and fenced and appropriate signage would be installed.

Additional details in relation to the design of the final landform for the open cut and final void will be included in the *Environmental Impact Statement*.

2.15.6 Tailings Storage Facility

The tailings storage facility would, following completion of mining-related operations, be shaped to form a free draining landform, capped with suitable material, revegetated and appropriate surface water control structures installed. Additional details in relation to the design of the final landform for the rehabilitated tailings storage facility will be included in the *Environmental Impact Statement*.

2.15.7 Other Areas of Disturbance

On completion of all mining-related and associated activities, the Applicant would:

- remove and rip all remaining internal roads tracks, with the exception of the site access road, spread subsoil and revegetate;
- remove buildings and rip or scrape the compacted floor of hardstand areas not required for subsequent land uses, spread subsoil and topsoil and revegetate; and
- install appropriate drainage controls.

2.15.8 Rehabilitation Management and Monitoring

The Applicant's commitment to effective rehabilitation would involve an ongoing monitoring and maintenance program following completion of mining-related operations. Areas being rehabilitated would be regularly inspected.

No time limit has been placed on post-mining rehabilitation monitoring and maintenance. Rather, maintenance would continue until such time as the objectives outlined in Section 2.15.2 are achieved to the satisfaction of the relevant government agencies.

3. PERMISSIBILITY, APPROVALS REQUIRED AND PLANNING ISSUES

3.1 PERMISSIBILITY OF THE DEVELOPMENT

The Site is located within the Bogan Local Government Area and permissibility of the Proposal is governed by the *Bogan Local Environment Plan 1991*(Bogan LEP). Under that Plan, the Site is zoned RU1, Primary Production (**Figure 2**)**.** Open cut mining is permissible with consent within this zone (see Section 3.3.8).

3.2 APPROVALS REQUIRED

The Applicant anticipates that the following approvals will be required for the Nyngan Scandium Project.

- Development Consent – Minister for Planning
  As the Proposal may be classified as State Significant Development (see Sections 3.3.1), Development Consent will be required from the Minister for Planning for the Proposal under Part 4, Division 4.1 of the EP&A Act.
- Environment Protection Licence – Department of Environment, Climate Change and Water
  An Environment Protection Licence for mining operations, mineral processing operations and use of the tailings storage facility will be required. It is anticipated that the licence will also identify licensed discharge points and discharge limits and concentrations.
- Mining Lease – Industry and Investment NSW.
  The Applicant currently holds EL6009 and EL6096 over the Site. A mining lease will be required.
- Water Access Licences - Department of Environment, Climate Change and Water – Office of Water.
  A Water Access Licence will be required under either the *Water Act 1912* or the *Water Management Act 2000* to permit dewatering of the proposed open cut.
- A Section 138 Permit – Bogan Shire Council
  A permit under Section 138 of the *Roads Act 1993* will be required for the construction of the intersection of the Site Access Road and Gilgai Road.
- Dam Safety Approval – Dam Safety Committee
  An approval from the NSW Dams Safety Committee will be required for the design and construction of the tailings storage facility.

In addition, if Development Consent is granted, subsequent approvals would be required in accordance with the Mining Operations Plan requirements of the *Mining Act 1992* and mining lease conditions.

3.3 CONSIDERATIONS OF PLANNING INSTRUMENTS

3.3.1 State Environmental Planning Policy (State and Regional Development) 2011

Clause 8 of the *State Environmental Planning Policy (State and Regional Development SEPP)* identifies that development of the kind specified in Schedule 1 of the State and Regional Development SEPP is declared to be a State Significant Development. Paragraph 5(1)(c) of Schedule 1 identifies development for the purposes of mining-related works with a capital cost of more than $30 million as development to which the State and Regional Development SEPP applies. The Applicant estimates that the capital cost for the Nyngan Scandium Project would be approximately $100 million (**Appendix A)**. As a result, it is anticipated that the Minister will declare the Proposal to be State Significant Development for which approval under Part 4, Division 4.1 of the EP&A Act is required.

3.3.2 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

The *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries)* 2007 (Mining SEPP) was gazetted on 17 February 2007 and specifies matters requiring consideration in the assessment of any mining-related development. These matters include the following.

- The compatibility of the proposed mine with surrounding land uses.
- The compatibility of the proposed development with other mining, petroleum production or extractive industry.
- Potential impacts on issues associated with natural resource management and environmental management.
- The efficiency of resource recovery and minimisation of the creation of waste.
- Consideration of alternative means of product transportation other than by road and that a code of conduct for the transport of materials on public roads is prepared.
- Consideration of rehabilitation of the land affected by the development.

An assessment of how each of these considerations is addressed will be provided within the *Environmental Impact Statement*.

3.3.3 State Environmental Planning Policy (Infrastructure) 2007

The *State Environmental Planning Policy (Infrastructure) 2007*(Infrastructure SEPP) identifies, amongst other things, the matters to be considered in the assessment of development adjacent to particular types of infrastructure.

Clause 45 of the Infrastructure SEPP identifies that where development would be carried out within or immediately adjacent to an easement for electricity purposes, the determining authority must give written notice to the electricity supplier, inviting comments about potential

safety risks and take into consideration any response received. The Applicant notes that the Proposal would require the connection of an electricity transmission line. As a result, the determining authority would be required to consult with Essential Energy in relation to the Proposal.

Clause 84of the Infrastructure SEPP identifies that where development would involve a likely significant increase in the total number of vehicles or the number of trucks using a level crossing that is in the vicinity of the development, the consent authority must give written notice of the application to the chief executive officer of the rail authority for the rail corridor and take into consideration any response received. The Applicant notes that the Proposal would require access over the level crossing on Gilgai Road. As a result, the determining authority would be required to consult with Australian Rail Track Corporation Ltd in relation to the Proposal.

3.3.4 State Environmental Planning Policy (Rural Lands) 2008

The aims of this policy are as follows.

- To facilitate the orderly and economic use and development of rural lands for rural and related purposes.
- To identify the Rural Planning Principles and the Rural Subdivision Principles so as to assist in the proper management, development and protection of rural lands for the purpose of promoting the social, economic and environmental welfare of the State.
- To implement measures designed to reduce land use conflicts.
- To identify State significant agricultural land for the purpose of ensuring the ongoing viability of agriculture on that land, having regard to social, economic and environmental considerations.
- To amend provisions of other environmental planning instruments relating to concessional lots in rural subdivisions.

The Site is currently used for agricultural purposes and, as discussed in Section 2.15.2, where possible land will be returned to this or nature conservation use following rehabilitation.

3.3.5 State Environmental Planning Policy No 33—Hazardous and Offensive Development

Hazardous and offensive industries, and potentially hazardous and offensive industries, related to industries that, without the implementation of appropriate impact minimisation measure, would, or potentially would, pose a significant risk in relation to the locality, to human health, life or property, or to the biophysical environment. A risk screening of the Project will be presented in the *Environmental Impact Statement* in accordance with the document entitled *Applying SEPP 33 2nd edition*, (DUAP, 1997).

3.3.6 Bogan Local Environment Plan 1991

As identified in Section 3.1, the permissibility of development is governed by the Bogan LEP, which identifies the Site as zoned RU1, Primary Production.

Clause 9 of the Bogan LEP identifies the objectives of this zone are:

a) protecting, enhancing and conserving:

   i) agricultural land in a manner which sustains its efficient and effective agricultural production potential,

   ii) soil stability by controlling and locating development in accordance with soil capability,

   iii) forests of existing and potential commercial value for timber production,

   iv) valuable deposits of minerals, coal, petroleum and extractive materials by controlling the location of development for other purposes in order to ensure the efficient extraction of those deposits,

   v) trees and other vegetation, particularly in environmentally sensitive areas where the conservation of the vegetation is significant to scenic amenity or natural wildlife habitat or is likely to control land degradation,

   vi) water resources for use in the public interest,

   vii) areas of significance for nature conservation, including areas with rare plants, wetlands and significant habitat, and

   viii) places and buildings of archaeological or heritage significance, including the protection of aboriginal relics and places,

b) preventing the unjustified development of prime crop and pasture land for purposes other than agriculture,

c) facilitating farm adjustments,

d) minimising the cost to the community of:

   i) fragmented and isolated development of rural land, and

   ii) providing, extending and maintaining public amenities and services, and

e) providing land for future urban development, for rural-residential development and for development for other non-agricultural purposes, in accordance with the need for that development.

In addition to the existing Bogan LEP, *Draft Bogan Local Environmental Plan 2011* on display. This also identifies the Site as zoned as RU1, Primary Production. Mining is still permissible, however the new objectives of the zone are as follows.

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.

- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.

It is, however, noted that land zone RU3, Forestry is located approximately 4.5km to the northwest of the proposed processing plant. The objects of this zone under the Bogan LEP and the Draft Bogan LEP are as follows:

- To enable development for forestry purposes.
- To enable other development that is compatible with forestry land uses.

Mining is not permissible in this zone.

3.4 CONSULTATION

Preliminary consultation has commenced with both government agencies, and local landholders. Government agencies and infrastructure authorities that have been or will be consulted include the following.

- Department of Planning and Infrastructure.
- Department of Trade, Investment and Regional Infrastructure and Services – Division of Resources and Energy.
- Office of Environment and Heritage.
- NSW Office of Water.
- RTA.
- Department of Primary Industries – Crown Lands.
- Bogan Shire Council.
- Australian Rail and Track Corporation.
- Essential Energy.

Negotiations with immediate landholders have commenced, with agreements established such that environmental studies can commence. Further consultation with immediate neighbours and the wider community will occur throughout preparation of the *Environmental Impact Statement*.

4. ENVIRONMENTAL SETTING AND PRELIMINARY IMPACT ASSESSMENT

4.1 BACKGROUND

4.1.1 Introduction

The following sub-sections present background information in relation to the regional and local environment that surrounds the Site and provides a preliminary insight into the environmental setting which the Nyngan Scandium Project lies within.

4.1.2 Topography and Drainage

4.1.2.1 Regional Topography and Drainage

The area surrounding the Site is relatively flat with a very gentle slope to the east (**Figure 9**). The highest point in wider region surrounding the Site is Trig Station 'Thorndale', located approximately 10km's northwest of the Site at 232m AHD.

Regional drainage is controlled by the gently easterly sloping topography that determines the creek and stream flows throughout the region. Being in a semi-arid environment, there are no major rivers close to the Site (within 15km's) but rather ephemeral drainage lines and tributaries to Whitbarrow Creek, which is located immediately south of the Site. Whitbarrow Creek drains the land surrounding the Site and flows easterly until it reaches the Bogan River, approximately 15km east of the Site (**Figure 9**).

4.1.2.2 Local Topography and Drainage

The areas directly surrounding, and including the Site, are also relatively flat, with a typically very gentle easterly slope (**Figure 10**). Including the future access road, the localised topography ranges from 205m AHD in the far northeast of the Site to 182m AHD in the far south-western corner. It is noteworthy that approximately 500-1000m south of the Site, Whitbarrow Creek flows parallel from west to east ranging from 185m AHD to 181m AHD over the width of the Site (**Figure 10**).

4.1.2.3 Site Topography and Drainage

There are three dams located on the Site that are fed by ephemeral drainage lines throughout the site. Because of the relatively flat nature of the topography, the difference in heights between the dams and Whitbarrow Creek are negligible (**Figure 11**).

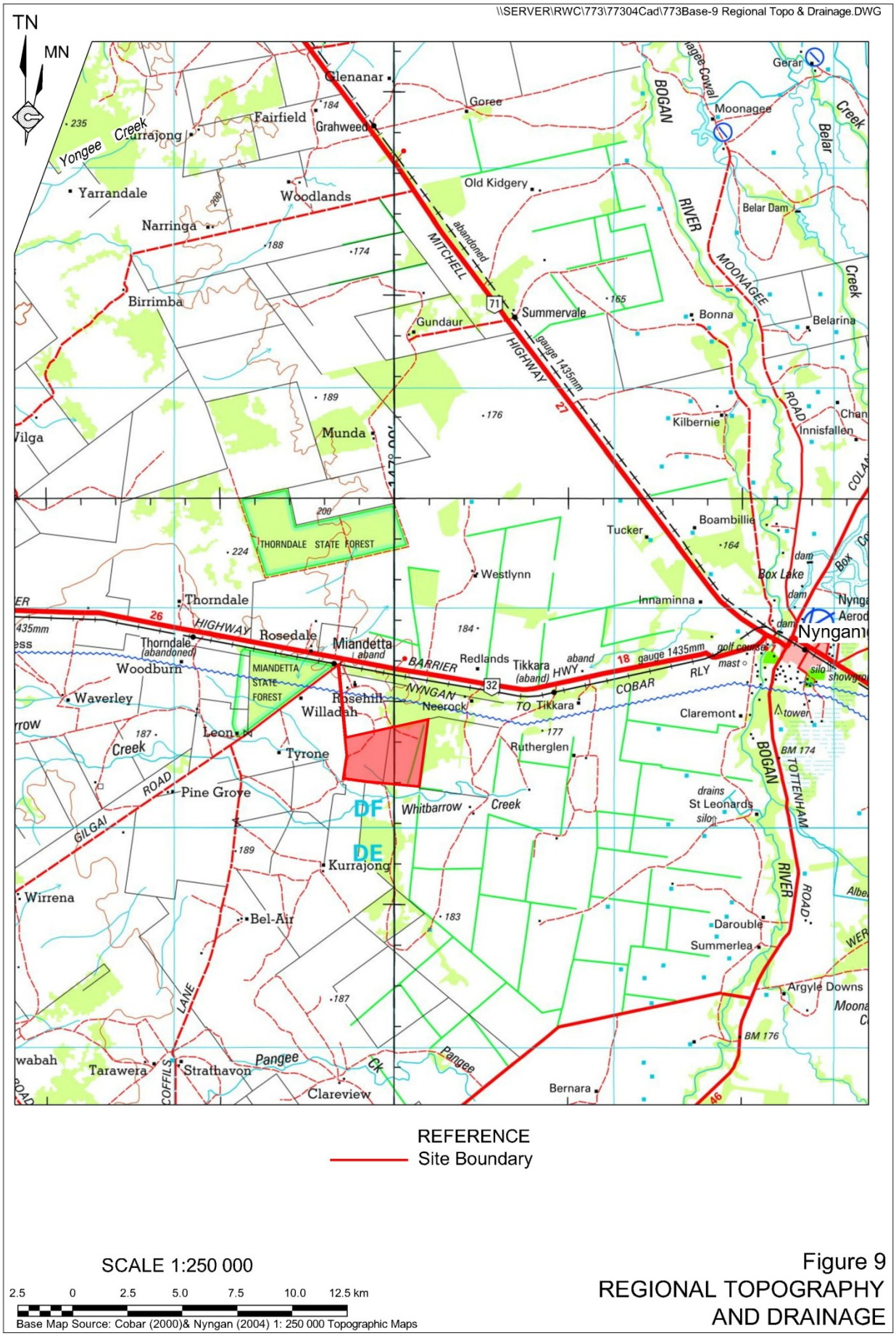


Figure 9
REGIONAL TOPOGRAPHY
AND DRAINAGE

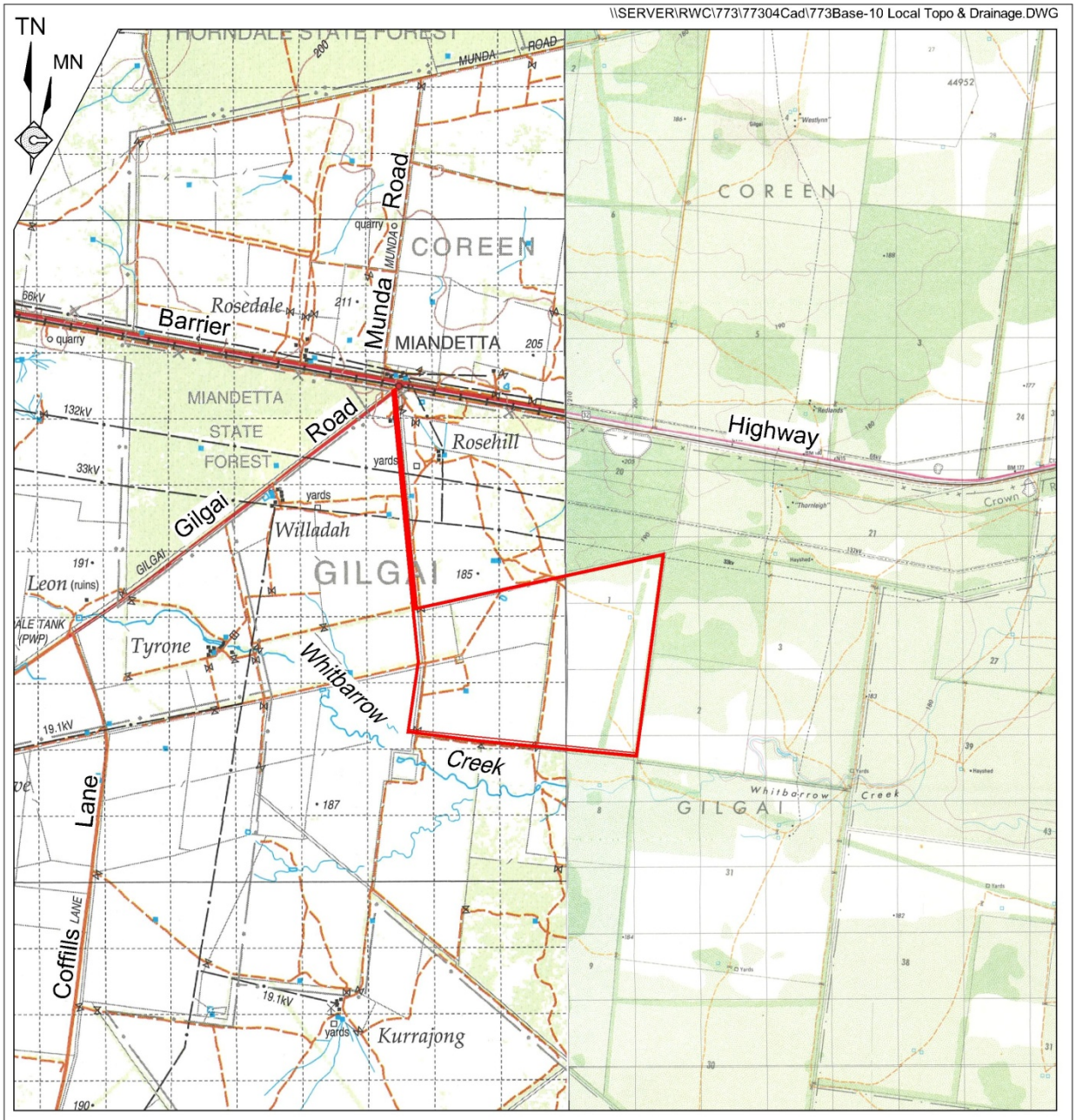


Figure 10
LOCAL TOPOGRAPHY
AND DRAINAGE

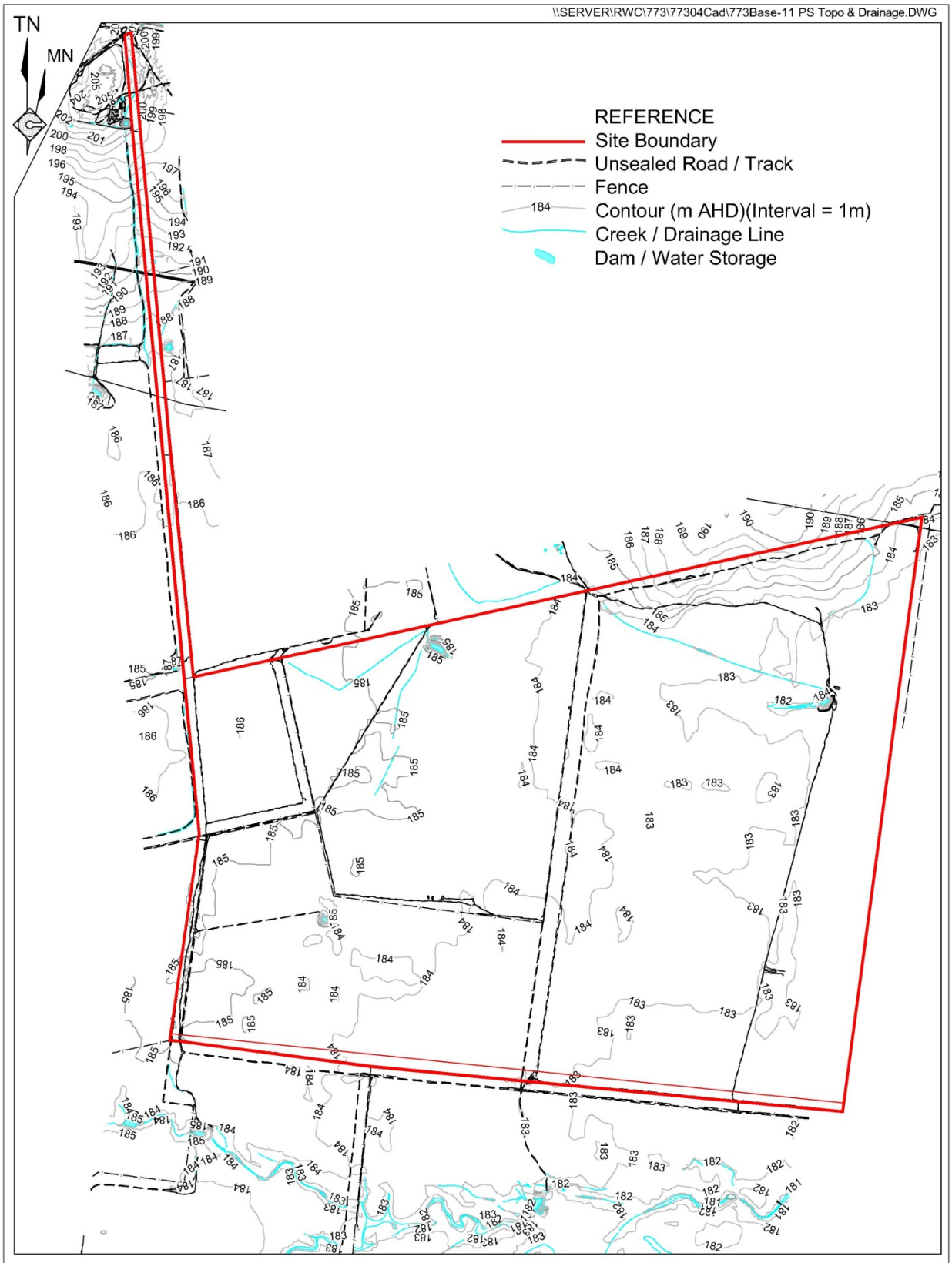


Figure 11
SITE TOPOGRAPHY AND DRAINAGE

4.1.3 Climate

4.1.3.1 Introduction

Table 7 presents Meteorological data (temperature and humidity, rainfall and evaporation) sourced from the Nyngan (Nyngan Airport) Bureau of Meteorology (BOM) station (station number 051039 – 1879 till present). The Nyngan meteorological station is located approximately 20km to the east of the Site.

It should be noted that rainfall data is available from 1879 – 2011 and temperature data has been available from 1920 – 2010 at the Nyngan Airport meteorological station. Furthermore, there is no evaporation data present that is specific to Nyngan. Consequently, monthly evaporation data has been sourced from the 'Annual Average Pan Evaporation' map created by the Bureau of Meteorology whilst mean daily evaporation has been calculated by dividing the mean monthly evaporation levels by the number of days in the month.

4.1.3.2 Temperature and Humidity

January is typically the hottest month of the year with a mean maximum temperature of 34.2°C and mean minimum temperature of 19.5°C being the highest throughout the year. The coldest month of the year is July with the lowest mean maximum temperature of 16.4°C and coldest mean minimum temperature of 3.7°C.

In both the 9:00am and 3:00pm relative humidity data sets, the highest humidity was recorded in June with 80% and 55% respectively. Again for both 9am and 3 pm, the lowest humidity was recorded in December with 46% and 29% respectively.

4.1.3.3 Rainfall and Evaporation

January has on average the highest rainfall per month with 51.0mm which equates to approximately 11% of the total rain falling throughout the year. September has the least amount of rainfall in the year with only 27.8mm falling which equates to approximately 6% of the total rain falling throughout the year.

Evaporation levels fluctuate on a regular basis throughout the year, with the summer months typically experiencing the highest rates of evaporation while the winter months experience the lowest rates of evaporation. In particular, January and December share the highest evaporation rates with both months losing 300mm per month of water to evaporation with June and July sharing the lowest rates of evaporation with each only having evaporation rates of 50mm per month. It is noted that in all months evaporation exceeds rainfall.

Table 7
Climate Data

	Jan	Feb	Mar	April	May	Jun	July	Aug	Sept	Oct	Nov	Dec	Annual
Temperature (°C) and Humidity (%)													
Mean maximum temperature	34.2	33.3	30.5	25.6	20.6	17.0	16.4	18.4	22.5	26.5	30.0	33.0	25.7
Mean minimum temperature	19.5	19.2	16.4	11.8	7.8	4.9	3.7	4.7	7.8	11.4	15.0	17.8	11.7
Mean 9 am relative Humidity	48	53	56	61	72	80	79	70	59	51	47	46	60
Mean 3 pm relative humidity	31	36	37	40	49	55	52	44	38	34	30	29	39
Rainfall (mm)													
Mean rainfall	51.0	47.3	41.1	35.0	36.4	32.5	29.3	29.6	27.8	35.3	36.6	42.8	444.2
Highest rainfall	275.6	297.0	233.1	373.4	234.0	128.8	121.0	145.2	111.9	150.8	202.6	197.2	1127.0
Lowest rainfall	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	169.3
Highest daily rainfall	145.0	146.1	89.6	193.2	85.0	57.4	55.1	59.4	54.0	63.0	80.0	102.0	193.2
Evaporation (mm) (1975 to 2011)													
Mean Monthly Evaporation	300	250	200	125	100	50	50	80	125	175	250	300	2055
Mean Daily Evaporation	9.7	8.9	6.5	4.2	3.2	1.7	1.6	2.6	4.2	5.6	8.3	9.7	-

Source: Bureau of Meteorology Station – Nyngan Airport NSW (Station No.: 051039)
Note- blue indicates the lowest record and red the highest record

Throughout the year, there are no particular months that stand significantly above the rest in both rainfall and evaporation but more reflect the nature of the climate of inland New South Wales. Although summer has the highest amounts of rainfall in the year, it is a relatively small amount compared to other areas of the state, which in turn, reflects the semi-arid conditions typical of the area.

4.1.3.4 Wind and Atmospheric Stability

Information in relation to the wind and atmospheric stability environment surrounding the Site will be provided in detail in the *Environmental Impact Statement.*

4.1.4 Surrounding Land Use

Land uses surrounding the Project Site include the following (**Figure 12**).

- Agriculture- The principal land use in the area is cropping, with some grazing.
- Transportation- The Barrier Highway and Nyngan to Cobar Railway are major transport routes through the area.
- Nature conservation and forestry- The Miandetta State Forest is located approximately 3km to the northwest and the Thorndale State Forest is located approximately 8km to the north-northwest of the Processing Plant.
- Residential and rural residential- The township of Nyngan is approximately 18km to the east of the Site and surrounding areas include areas of rural residential and residential land use.
- Mineral exploration and mining- The Great Hermidale Mine is located approximately 32km northwest of the Site, and the Girilambone Copper Mine is located approximately 40km north-northwest of the Site.

4.1.5 Land Ownership and Residences

Figure 13 presents the land ownership and residences surrounding the Site.

4.2 AIR QUALITY

4.2.1 Introduction

Environ Australia Pty Ltd has completed their Stage 1 assessment of the Proposal, examining the existing environment and potential constraints. The impact assessment will be undertaken and the resulting report will be presented in the Specialist Consultant Studies Compendium that will accompany the *Environmental Impact Statement.* The following is a summary of the relevant information in the Stage 1 Report.

4.2.2 Existing Environment

A review if the National Pollutant Inventory (NPI) and NSW OEH environment protection licence databases for the greater Nyngan region has identified the Tritton Copper Mines operated by Tritton Resources Ltd, located approximately 40km north-northwest of the Site at Girilambone, as the only significant operational emissions source in the region. Given that the facilities identified are remote from the Site, it is not expected that emissions from these facilities would contribute significantly to airborne particulate concentrations at the Site.

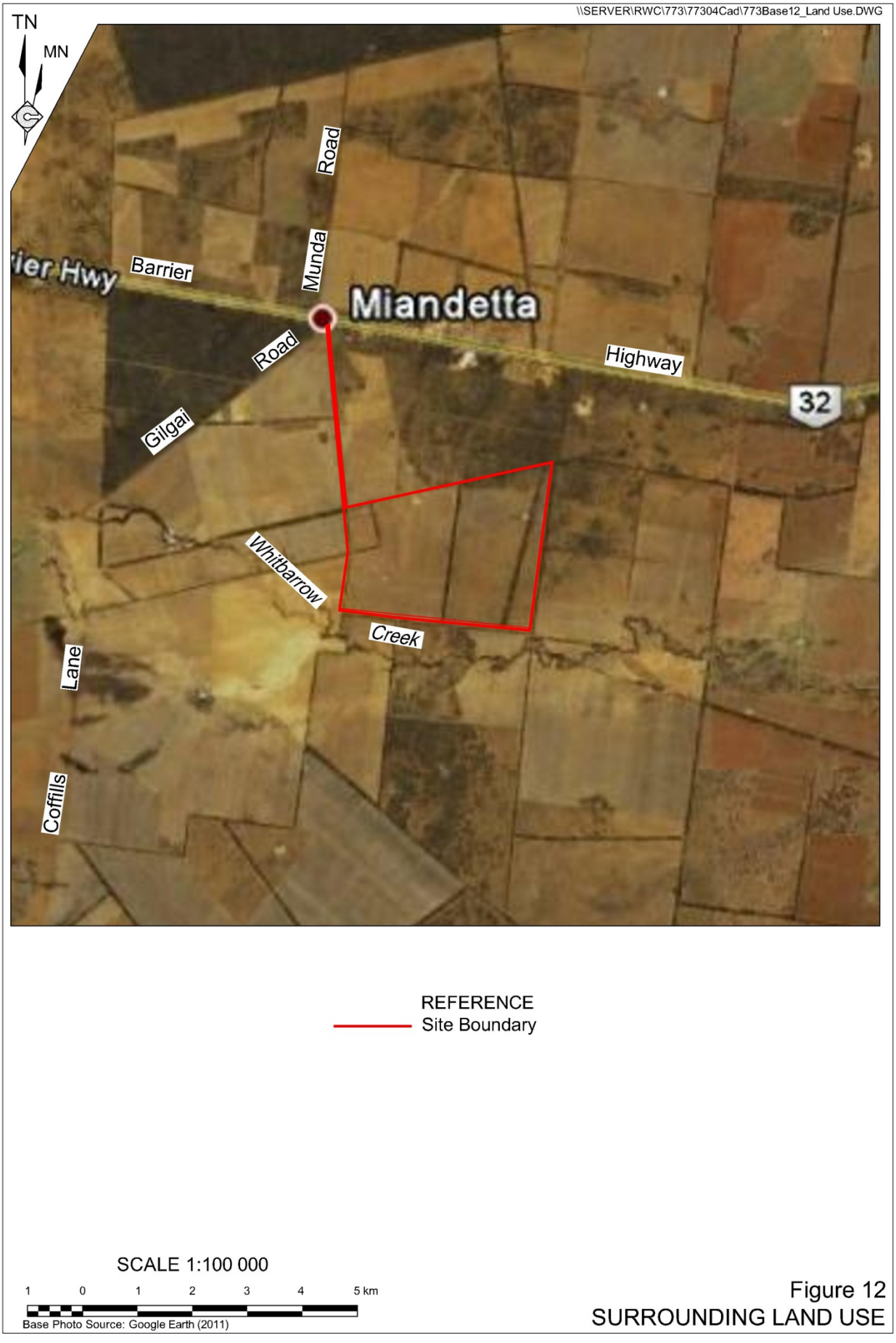
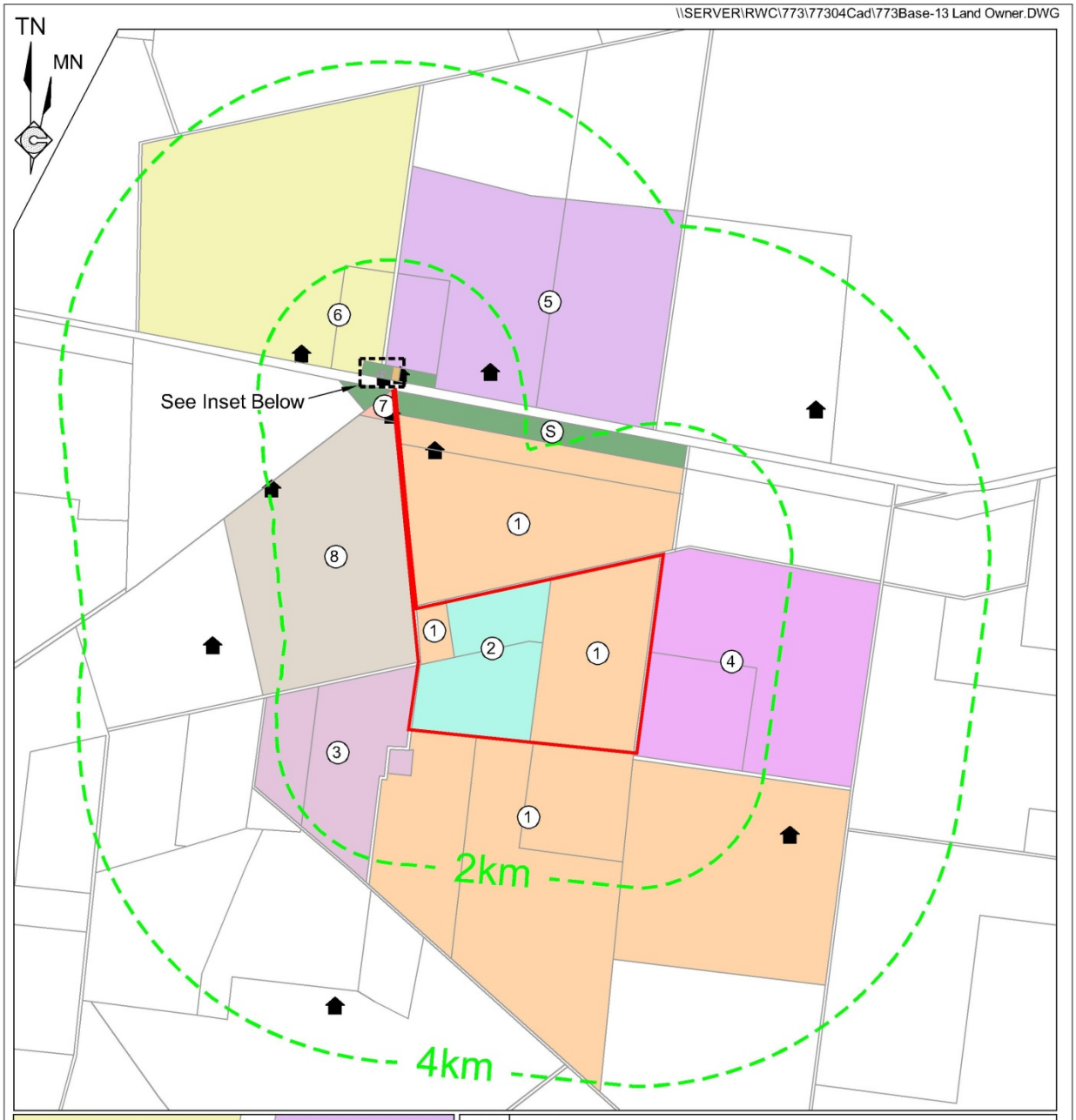


Figure 12
SURROUNDING LAND USE



Ref.	Landowner
S	State of New South Wales (Certificate of Title has not been issued)
1	Owen Bernard Carter
2	Jervois Mining Limited
3	Arthur Kingsley Gordon Young & Richard Louis John Young
4	Tikkora Pty Limited
5	Estate: Perpetual Lease - Rodger Joseph Ward
6	Estate: Perpetual Lease - Senako Pty Ltd
7	Cecil Boland
8	Paul Francis Carter
9	Anthony & Lynette Woodhouse
10	Derek & Lesley Thomson
11	Zampool Pacific Pty Limited
12	Rodney Lettice

Figure 13
LAND OWNERSHIP AND RESIDENCES

It is considered that, given the lack of industrial and extractive operations in the vicinity of the Site, the dominant sources of particulate matter emissions in the vicinity of the Proposal include:

- wind generated dust from dry, exposed areas within the surrounding area;
- dust emissions from agricultural activities at neighbouring properties;
- dust entrainment due to vehicle movements along unsealed and sealed roads with high silt loadings;
- seasonal emissions from household wood burning; and
- episodic emissions from vegetation fires.

Long-range transport of fine particles is also expected to contribute to suspended particulate concentrations within and surrounding the Site.

With the exception of periodic motor vehicle movements, it is considered that existing concentrations of fuel-combustion related pollutants will be negligible given the general absence of such sources currently in the Nyngan region.

Receptors in the vicinity of the Proposal are discussed in Section 4.1.4.

4.2.3 Preliminary Management and Mitigation Measures

Emissions to air from the Proposal may include:

- particulates from activities such as mining operations, haul roads, processing operations, and rehabilitation;
- gaseous emissions from the processing operations, including sulphur dioxide and other deleterious gasses should the proposed scrubbers and management measures not operate effectively; and
- greenhouse gases from combustion of fossil fuels.

The impact assessment will identify management and mitigation measures to ensure concentrations of pollutants at receptors are within the NSW guidelines for air quality. Such management and mitigation measures may include the following.

Particulates

- Watering of roads and tracks, ROM pad, waste rock emplacement, tailings storage facility and open cut, as well as other areas of Proposal-related disturbance.
- Enclosure of relevant components of the processing plant.
- processing operations, and management of the concentration of water within the Tailings Storage Facility to prevent windblown dust.

Greenhouse Gas and other pollutants

- Installation, operation and maintenance of appropriate scrubbers and treatment facilities to capture and recycle all deleterious gaseous emissions.
- Design of the process to limit the generation of greenhouse gases and pollutants, including measures to maximise recycling of heat and energy.

4.2.4 Preliminary Risk Assessment

Taking into account the distance to and limited number of receptors as well as the proposed management measures, risks associated with the release of particulates, greenhouse gas and other pollutants is expected to be minimal.

4.3 SURFACE WATER

4.3.1 Introduction

The surface water assessment for the Proposal has commenced and is being undertaken by SEEC. The *Environmental Impact Statement* will include a full description of the surface water environment including a description of the bunding and flood protection structures and an assessment of the surface-water related impacts of the Proposal.

4.3.2 Existing Environment

Catchments within and surrounding the Site are described in Section 4.1.2.

In summary, there are three dams located within the Site that are fed by ephemeral drainage lines. Due to the relatively flat nature of the topography, the difference in heights between the dams and Whitbarrow Creek are negligible. Consequently the site is predicted to be prone to flooding.

4.3.3 Preliminary Management and Mitigation Measures

In order to minimise the potential for flooding of the Site, bunding and flood protection structures would be constructed and maintained. Additionally to protect the waterways from impact by the Proposal, suitable surface water management structures would be designed and implemented within the Site. These will be detailed in the *Environmental Impact Statement.*

As described in Section 2.8.3, the Tailings Storage Facility will be engineered to meet relevant design criteria.

4.3.4 Preliminary Risk Assessment

The design and environmental impact assessment processes will result in engineered designs and appropriate management and mitigation measures to manage surface water within the Site, and the possible contamination of off-site surface water from the proposed activities. With the implementation of these designs and controls, the risk of impact of the Proposal on surface waters is expected to be minimal.

4.4 GROUNDWATER

4.4.1 Introduction

The groundwater assessment is to be undertaken by the Impax Group. The resulting report will be presented in the Specialist Consultant Studies Compendium that will accompany the *Environmental Impact Statement*. The following is a summary of the relevant information in the Stage 1 Report.

4.4.2 Existing Environment

Eight monitoring bore were constructed and tested within the Site, with the following observations made.

- Based on lithology observed in boreholes, the Site appears to be underlain by 6m to 33m of alluvium, consisting of various mixes of clay, silt, sand and gravel. The underlying weathered rock consists of shale and/or sandstone.
- Groundwater was not encountered in the alluvium in any of the monitoring bores. Groundwater was inferred to have been encountered in the underlying fractured rock.
- In the eight boreholes drilled within the Site the uppermost water bearing zone ranged from 30m below ground level (m bgl) to 42m bgl but was typically encountered at a depth of 33m bgl. Standing water levels ranged from 22m bgl to 25m bgl.
- At five monitoring bores the total dissolved salt concentrations were greater than 14 000ppm. This means that groundwater beneath the Site would not be suitable for any common beneficial uses without prior treatment.

Only two registered groundwater bores were identified within a 10km radius of the Site. The intended use of one of the bores was for stock and domestic use and the intended use of the second bore is not known. Given the salty nature of groundwater at the Site, the identified stock and domestic bore may be located within a different aquifer or may not be used for that purpose. The absence of other registered bores within the search area indicates that the water quality is poor and/or the availability of groundwater is limited.

4.4.3 Preliminary Management and Mitigation Measures

As the open cut would extend to a depth greater than 30m bgl they are likely to encounter water bearing strata. The potential rate of groundwater inflow to the open cut would depend on the area of aquifer exposed in the walls and/or base of the open cut and the depth of the excavation.

Given the design of the open cut was not known at the time of the Stage 1 assessment, the extent of interaction of the Proposal with groundwater was not determined. Appropriate management and mitigation measures will be determined at the time of the Impact Assessment and will be presented in the *Environmental Impact Statement*.

4.4.4 Preliminary Risk Assessment

Proposal-related groundwater risks are considered to be minimal for the following reasons.

- Groundwater in the upper 45m of the subsurface within the Site is of poor quality and is relatively low yielding.
- Use of groundwater within a 10km radius of the Site is limited.

4.5 ECOLOGY

4.5.1 Introduction

The flora impact assessment will be undertaken by Geoff Cunningham Natural Resource Consultants Pty Ltd and the fauna assessment will be by Biodiversity Monitoring Services. The resulting reports will be presented in the Specialist Consultant Studies Compendium that will accompany the *Environmental Impact Statement*. The following is a summary of the relevant information in the Stage 1 Flora Report.

4.5.2 Existing Environment

A survey of the existing flora environment identified three vegetation communities;

- cereal crops;
- cleared land supporting volunteer pasture; and
- Bimble Box – Red Box – White Cypress Pine Community.

The cleared land was dominated by ground cover species although there were a number of individual and small clumps of trees that were remnants of the third community scattered through the area. The Bimble Box – Red Box – White Cypress Pine Community occupies the whole of the area within the study area that comprises remnant native vegetation.

In addition to these communities, two noxious weeds for the Bogan Shire Local Government Area were also identified, namely the Bathurst Burr and Galvanised Burr.

No threatened flora species, endangered or threatened ecological communities, or critical habitat has been identified within the Site.

4.5.3 Preliminary Management and Mitigation Measures

The impact assessments for flora and fauna will be undertaken and appropriate management and mitigation measures proposed in the *Environmental Impact Statement*. This will include the avoidance of clearing of vegetation where possible.

In order to avoid the clearing of the Bimble Box – Red Box – White Cypress Pine Community identified along the access road route, the Applicant is considering alternatives to realign the proposed route.

4.5.4 Preliminary Risk Assessment

Given the highly impacted nature of the Site, and that no endangered or threatened species or communities have been identified on the site, potential risk of impact of the Proposal on flora is expected to be minimal. Impacts on fauna are also expected to be minimal however this will be assessed and the results of both the flora and fauna impacts assessments will be presented in the *Environmental Impact Statement.*

4.6 NOISE

4.6.1 Introduction

Spectrum Acoustics Pty Ltd has been commissioned to undertake an assessment of the existing environment and potential impacts of the Proposal on the noise environment. The resulting report will be presented in the Specialist Consultant Studies Compendium that will accompany the *Environmental Impact Statement.*

4.6.2 Existing Environment

The existing noise environment surrounding the Project Site is typical of noise environments in rural setting. The noise environment is typically dominated by noise associated with agricultural operations, vehicles on roads, wind in the trees and insect and bird noise.

As a result of the above, the Applicant anticipates that the default noise assessment criteria of 35dB(A) identified in the *Industrial Noise Policy* will be applied to the Proposal during the day, evening and night.

No residences have been identified within a 2km radius of the Site (see Section 4.1.5 and **Figure 13**).

4.6.3 Preliminary Management and Mitigation Measures

The noise impact assessment will determine what management and mitigation measures are appropriate for implementation for the Proposal.

4.6.4 Preliminary Risk Assessment

Given the distance to receptors, the risk of impact of the Proposal at residences is expected to be manageable, with mitigation measures to achieve legislated criteria to be determined during the impact assessment. The risk is therefore assessed as being low.

4.7 HERITAGE

4.7.1 Introduction

Artefact Heritage Services Pty Ltd has completed their Stage 1 assessment of the Proposal, examining the existing environment and potential constraints. The impact assessment will be undertaken and the resulting report will be presented in the Specialist Consultant Studies Compendium that will accompany the *Environmental Impact Statement*. The following is a summary of the relevant information in the Stage 1 Report.

4.7.2 Existing Environment

The findings of the Stage 1 assessment of Aboriginal heritage were as follows.

- There are no recorded Aboriginal sites or areas of Aboriginal archaeological potential within the study area.
- The study area is currently assessed as having low archaeological potential.
- No Aboriginal heritage constraints exist for the proposed development within the study area.
- The cultural significance of the study area will be addressed by the registered Aboriginal stakeholder groups, yet to be received.

Regarding non-Indigenous heritage, the findings were as follows.

- Remnants of structures and archaeological deposits associated with a pre-1889 house and tank are present within the study area. Further remains associated with the house and tank may be present beneath a tank wall or elsewhere in the vicinity of the currently visible slab.
- The house site is of local heritage significance and possesses moderate/high research potential and a moderate/high archaeological potential.

4.7.3 Preliminary Management and Mitigation Measures

The non-Indigenous heritage structures and deposits are located away the proposed infrastructure associated with the Proposal. As such it is proposed that these be cordoned off and avoided. The will be marked on a site map and all workers made aware of its presence so that it is not inadvertently harmed. It would also be fenced off from the Proposal activities.

If any Aboriginal objects or archaeological deposits are located during construction, work would stop immediately and the Office of Environment and Heritage, the Aboriginal stakeholder groups, and an archaeologist would be contacted.

4.7.4 Preliminary Risk Assessment

Given the preliminary results of the Heritage Assessment, risk of impact to Aboriginal and non-Indigenous heritage is predicted to be negligible.

4.8 TRAFFIC AND TRANSPORTATION

4.8.1 Introduction

The traffic and transportation assessment is to be undertaken by Traffic Solutions. The resulting report will be presented in the *Specialist Consultant Studies Compendium* that will accompany the *Environmental Impact Statement.*

4.8.2 Existing Environment

An assessment of the existing traffic environment will be undertaken as part of the Traffic and Transportation Assessment.

4.8.3 Preliminary Management and Mitigation Measures

As discussed in Section 2.11, the Applicant anticipates that there would be one transportation route to access the Site; this would be via Gilgai Road and the Barrier Highway. Traffic leaving the Site would turn right onto Gilgai Road before crossing the Nyngan to Cobar railway line and accessing the Barrier Highway, with the vast majority of traffic turning right onto the Highway.

During the construction phase, oversize and overweight vehicles would be delivering components of the processing plant and mobile fleet. The Applicant would ensure that all oversize and overweight vehicles would have the appropriate permits and approvals and would be appropriately escorted, when required.

During the operational phase of the Proposal, light and heavy vehicles would access the site. Requirements for road and intersection works to facilitate this, and potential impacts will be assessed as part of the impact assessment. A Driver's Code of Conduct would be developed and contractors and site personal directed to comply.

4.8.4 Preliminary Risk Assessment

Given the short duration of the traffic during the construction phase, and the limited Proposal associated traffic during the operational phase, risk of impacts from traffic and transportation is expected to be minimal.

4.9 SOILS

4.9.1 Introduction

The soils assessment is to be undertaken by SEEC. The resulting report will be presented in the *Specialist Consultant Studies Compendium* that will accompany the *Environmental Impact Statement.*

4.9.2 Existing Environment

An assessment of the existing environment for soils will be presented in the *Environmental Impact Statement*.

4.9.3 Preliminary Management and Mitigation Measures

As assessment of the Proposal regarding the existing soils will be undertaken and presented in the *Environmental Impact Statement.* Management and mitigation measures will include issues including:

- Stripping and stockpiling procedures;
- Erosion potential; and
- Suitability for rehabilitation.

4.9.4 Preliminary Risk Assessment

Risk of impacts will be assessed and presented in the *Environmental Impact Statement*.

5. JUSTIFICATION AND CONCLUSION

5.1 INTRODUCTION

Given the description of the Proposal and the mitigation measures described throughout this document, it is anticipated that the risks associated with the Proposal will be manageable through management and mitigation measures which will be investigated and presented in the *Environmental Impact Statement.* This sub-section provides a discussion on the alternatives considered and a justification of the Proposal.

5.2 ALTERNATIVES CONSIDERED

Given that the Proposal is designed to access an existing geological resource, there are limitations on the ability to consider alternatives to the placement of the open cut and limitations associated with the transportation of mined material constrains the locations of other items of infrastructure.. While this is the case, results of the Stage 1 assessments is influencing the Proposal particularly regarding site layouts. For example the potential to move the footprint of the access road is being investigated in order to avoid impact on the existing vegetation on the originally proposed aligned. Similarly, the non-Indigenous heritage survey identified structures and deposits at the northern section of the site. This area is now planned to be avoided so impact on these structures is minimised.

A full description of alternatives considered will be presented in the *Environmental Impact Statement*.

5.3 JUSTIFICATION OF THE PROPOSAL

Because of several unique properties of Scandium, it is finding increasing use as an alloying agent with aluminium and also as a substitute for yttrium in the manufacture of solid fuel cells. Already, scandium-aluminium alloys are being incorporated in aircraft because not only of the weight saving but also the increase in strength. To a lesser extent, scandium alloys are finding application with sporting equipment such as high performance bicycles, golf clubs etc.

The Proposal has been designed, as far as practicable, to address the issues of concern to the environment as they are currently understood. The Proposal provides for the recovery of a highly valuable resource which will contribute significantly to the economies of NSW and Australia. Environmental and other impacts associated with the Proposal are considered to be minimal and the final landform would be constructed to sustain agricultural operations and nature conservation.