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Syerston Project

MODIFICATION 4 ENVIRONMENTAL ASSESSMENT

NOVEMBER 2017

PROJECT NAME CHANGE NOTIFICATION

On 2 November 2017, Clean TeQ Holdings Limited announced that the name of the Syerston Project will be changed to the Clean TeQ Sunrise Project.

Any reference to the Syerston Project or the Project in the Environmental Assessment (including Appendices) should be read as the Clean TeQ Sunrise Project.

SYR - Syerston Project and Operation

Modification 4 – Environmental Assessment

00881671

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10-Nov-17	0

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1 Introduction

This document is an Environmental Assessment (EA) for a proposed modification to the Syerston Project (the Project), an approved nickel cobalt scandium mining project. Scandium21 Pty Ltd owns the rights to develop the Project. Scandium 21 Pty Ltd is a wholly owned subsidiary of Clean TeQ Holdings Limited (Clean TeQ).

This Modification is sought under section 75W of the New South Wales (NSW) *Environmental Planning and Assessment Act, 1979* (EP&A Act).

1.1 Overview of the Approved Project

The Project is situated approximately 350 kilometres (km) west-northwest of Sydney, near the village of Fifield, NSW (Figure 1).

Development Consent DA 374-11-00 (Attachment 1) for the Project was issued under Part 4 of the EP&A Act in 2001.

The Project includes the establishment and operation of the following (Figure 1):

- mine (including the processing facility);
- limestone quarry;
- rail siding;
- gas pipeline;
- borefields and water pipeline; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and intersection upgrades).

The Project includes an initial scandium oxide focussed production phase (the Initial Production Phase) prior to shifting to scandium oxide and nickel and cobalt precipitate production by developing the full Project (the Full Production Phase).

The Initial Production Phase is a smaller-scale operation compared to the Full Project Phase and will include preferentially mining scandium-rich areas of the Syerston deposit at a run-of-mine (ROM) ore production rate of 100,000 tonnes per annum (tpa) to produce up to 1,000 tpa of nickel and cobalt metal equivalents, as either sulphide or sulphate precipitate products, and up to approximately 80 tpa of scandium oxide.

The Project would transition to the Full Production Phase once scandium-rich areas of the Syerston deposit are depleted or sooner if favourable market conditions prevail for larger scale nickel cobalt scandium production.

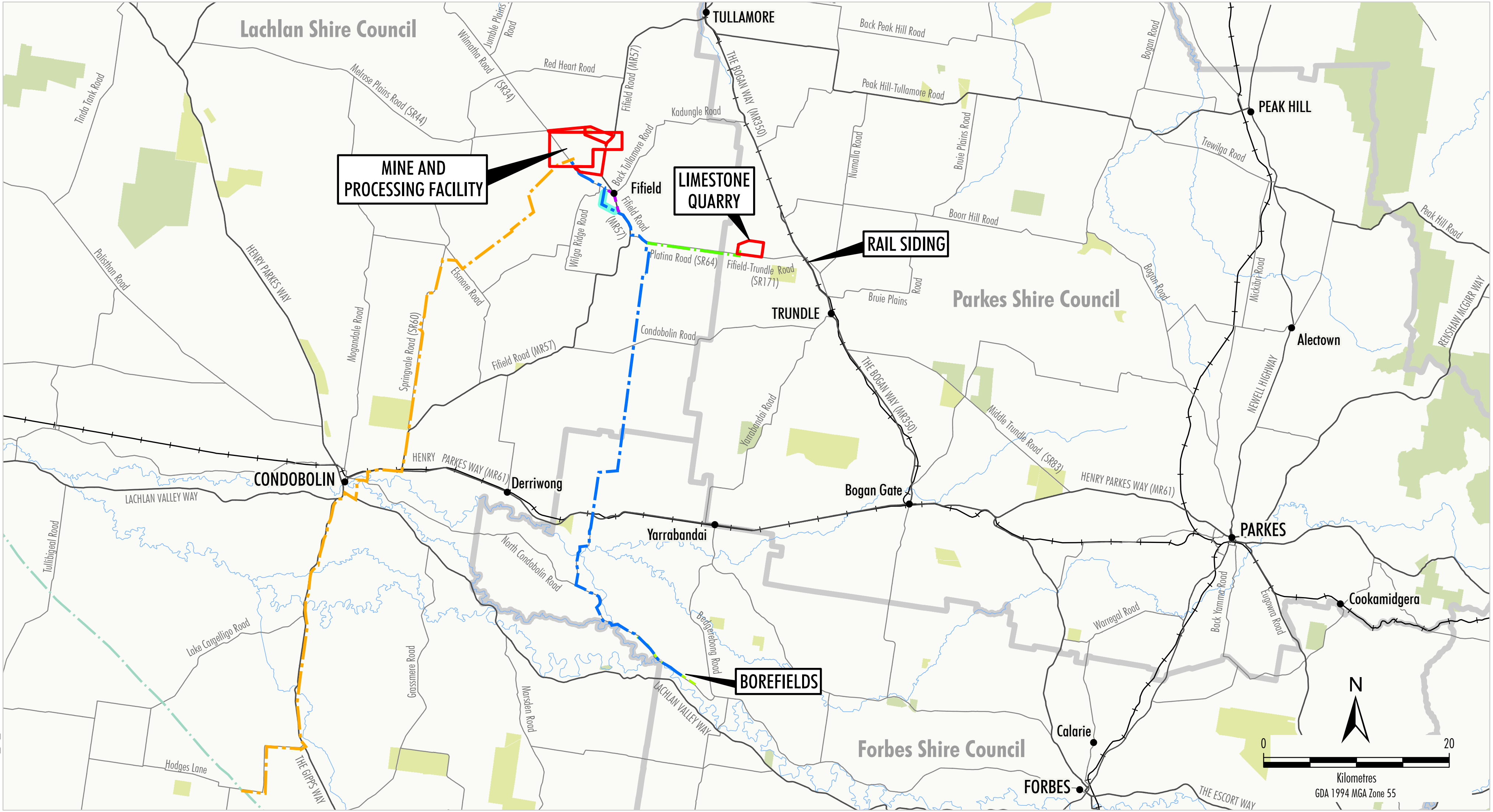
The mining and processing will then increase to allow for an autoclave feed rate of 2.5 million tonnes per annum (Mtpa) to produce up to 40,000 tpa of nickel and cobalt metal equivalents, as either sulphide or sulphate precipitate products, and up to approximately 180 tpa of scandium oxide.

Construction of the Project commenced in 2006 with the construction of components of the borefields, however Project operations are yet to commence.

1.2 Overview of the Modification

Clean TeQ has undertaken a Project Optimisation Study to identify opportunities to improve the overall efficiency of the Full Production Phase of the Project. The Modification involves the implementation of these opportunities and would include:

- mining in a more selective manner to initially increase the processing facility ore feed grade;



LEGEND

- National Park/Conservation Area
- State Forest
- Local Government Boundary
- Existing Gas Pipeline
- Mining Lease Application Boundary
- Approved Water Pipeline
- Approved Limestone Quarry Water Pipeline
- Approved Gas Pipeline
- Approved Borefield Infrastructure Corridor
- Modified Water Pipeline Alignment Option
- Approved Fifield Bypass

Source: Black Range Minerals (2000); NSW Department of Industry (2017); NSW Land & Property Information (2017); Office of Environment and Heritage NSW (2017)

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Regional Location

Figure 1

- addition of drilling and blasting at the mine site;
- adoption of the resin-in-pulp (RIP) processing method option (i.e. the counter current decantation processing method option is no longer proposed)[1];
- increased sulphur demand and sulphuric acid production to leach additional nickel, cobalt and scandium from the higher grade ore;
- increased limestone demand to neutralise the additional acid required in the acid leach circuit;
- addition of a crystalliser to the processing facility to extract ammonium sulphate from an existing waste stream for use as a fertiliser product;
- changes to process input and product road transport requirements;
- addition of a water treatment plant to the processing facility to recycle process water and minimise make-up water demand;
- increased tailings storage facility capacity to hold increased tailings volume due to the additional limestone required for acid neutralisation;
- reduced evaporation pond capacity due to the recycling of process water;
- relocation of mine infrastructure to avoid resource sterilisation and improve operational efficiency;
- addition of licensed surface water extraction from the Lachlan River to improve water supply security;
- minor changes to borefield transfer station layout and water pipeline alignment;
- short-term road transport of water from the borefield to the mine site during the initial construction phase; and
- reduced gas demand as the increased sulphuric acid production would generate additional steam for power generation.

The Modification would not involve changes to any aspects of the approved limestone quarry, rail siding or gas pipeline. Table 1 provides a comparative summary of the approved and proposed modified Project.

1.3 Consultation

Consultation has been conducted with key State government agencies and the relevant local councils during the preparation of this EA. A summary of this consultation is provided below.

It is anticipated that consultation with these stakeholders will continue during the assessment of the Modification by the NSW Government.

State Government Agencies

Department of Planning and Environment

A meeting was held with representatives of the Department of Planning and Environment (DP&E) on 28 April 2017 to provide an overview of the proposed Modification, discuss environmental assessment requirements and provisional timing for lodgement of the Modification.

Clean TeQ submitted a request to modify Development Consent DA 374-11-00 to the DP&E in the form of a letter with accompanying application form on 4 May 2017, which sought notification of any environmental assessment requirements relevant to the Modification.

[1] The approved Project includes the option to use either the RIP or counter current decantation processing method.

Table 1 Comparative Summary of the Approved and Modified Project

Component	Approved Syerston Project [1,2]	Modification
Mining Tenement	• Mining Lease Application (MLA) 113, 132, 139, 140, 141 and limestone quarry MLA 162.	• Unchanged.
Mine Life	• 21 years from commencement of mining.	• Unchanged.
Hours of Operation	• 24 hours per day, seven days per week.	• Unchanged.
Open Cut Mining	• Open cut mining method.	• Unchanged, however ore would be mined in a selective manner to initially increase the processing facility ore feed grade.
Blasting	• Blasting undertaken at the limestone quarry only.	• No change limestone quarry blasting. • Blasting undertaken at the mine site.
Waste Rock Management	• Waste rock deposited in open cut voids and in waste rock emplacements.	• Unchanged.
Mineral Processing	• Autoclave feed rate of up to 2.5 Mtpa. • Processing facility consists of counter current decantation or RIP circuit/metals recovery.	• No change to autoclave feed rate. • RIP circuit only (i.e. no counter current decantation circuit). • Addition of a crystalliser to allow production of ammonium sulphate.
Reagent Production	• Up to 700,000 tpa of sulphuric acid would be produced in the sulphuric acid plant. • Hydrogen sulphide, hydrogen and nitrogen would be produced in the processing facility.	• Sulphuric acid demand (and production) would increase to up to 1,050,00 tpa. • Hydrogen sulphide, hydrogen and nitrogen would no longer be produced in the processing facility.
Product	• Up to 180 tpa of scandium oxide. • Up to 40,000 tpa of nickel and cobalt metal equivalents, as either sulphide or sulphate precipitate products.	• No change to scandium oxide production. • Up to 40,000 tpa of nickel and cobalt metal equivalents, as sulphate precipitate products only. • Up to 100,000 tpa of ammonium sulphate.
Tailings Management	• Waste deposited in the tailings storage facility and evaporation ponds.	• Increased tailings storage facility capacity to hold increased tailings volume. • The size of the evaporation ponds would decrease due to the increase in water recycling.
Mine Surface Facilities	• Construction of surface facilities within the approved surface development area.	• Relocation of some infrastructure components inside the approved surface development area to avoid potential resource sterilisation and improve operational efficiency.
Surface Water Management	• Overall objective is to control runoff from the construction and operational areas while diverting upstream water around these areas. • The water management system will include both permanent features that will continue to operate post-closure and temporary structures during mining operations.	• Overall objectives of the surface water management would be unchanged. • A water treatment plant would be added to the processing facility to increase process water recycling and minimise make-up water demand. • Changes to the site water management system to reflect modified layout.

Table 1 Comparative Summary of the Approved and Modified Project (Continued)

Component	Approved Syerston Project [1,2]	Modification
Water Supply	• Development of borefields and water pipeline from the borefields to the mine.	• Borefields unchanged. • Transfer station relocated and reconfigured initially to allow water to be transported to the mine site by road. • Addition of licensed surface water extraction from the Lachlan River to improve water supply security. • Alternative water pipeline alignment through Fifield may be used.
Limestone Supply	• Development of a limestone quarry to extract up to 790,000 tpa of limestone.	• No change in limestone quarry. • Increased limestone demand (990,000 tpa). • Up to 560,000 tpa of limestone would be sourced from third party suppliers.
Power Supply	• On-site gas power plant (34 megawatts [MW]). • Diesel standby generators.	• No change to gas power plant, however gas demand would be reduced as the increased sulphuric acid production would generate additional steam for power generation. • Increased capacity of the diesel standby generators.
Gas Pipeline	• Development of a gas pipeline from an existing gas pipeline to the mine.	• Unchanged.
Material Transport	• Transport of inputs and products via a combination of road and rail (including development of a rail siding).	• Changes to approved transport sources, frequencies, routes and transport method.
Road Upgrades	• Road upgrades in accordance with the Development Consent DA 374-11-00 and Voluntary Planning Agreements (VPAs).	• Minor changes to reflect changes to Project road transport requirements.
Employees	• Approximately 300 people during operations.	• Unchanged.

1 Development Consent DA 374-11-00 (as modified).

2 Full Production Phase (maximum case) has been described.

A response letter from the DP&E was received on 15 June 2017 confirming the Modification can be assessed and determined under section 75W of the EP& Act. Formal Secretary's Environmental Assessment Requirements were not issued, however the DP&E provided advice regarding key aspects for consideration in this EA and consultation requirements.

A letter was provided to the DP&E on 27 September 2017 describing proposed changes to the Modification (i.e. compared to the Modification proposed in the application submitted in May 2017). A response letter from the DP&E was received on 13 October 2017, which provided revised advice regarding key aspects for consideration in this EA.

Meetings were also held with representatives of the DP&E on 24 May 2017 and 29 August 2017 to provide updates on the Modification.

Division of Resources and Geoscience (within the NSW Department of Planning and Environment)

A meeting was held with the Division of Resources and Geoscience (formerly the Division of Resources and Energy within the NSW Department of Industry) on 12 September 2017 to provide an overview of the Modification.

Department of Primary Industries – Water

A meeting was held with the Department of Primary Industries – Water (DPI-Water) on 11 September 2017 to provide an overview of the Modification and an outline of the proposed assessment approach for the Water Management Assessment.

Environment Protection Authority

A meeting was held with representatives of the Environment Protection Authority (EPA) on 12 September 2017 to provide an overview of the Modification and to confirm the proposed assessment methodologies for the air quality and noise assessments would meet the requirements of the relevant policies and guidelines.

Office of Environment and Heritage

A briefing package was provided to the Office of Environment and Heritage (OEH) on 14 September 2017 describing the Modification and offering a meeting to provide further detail.

Roads and Maritime Services

A meeting was held with Roads and Maritime Services (RMS) on 5 September 2017 to provide an overview of the Modification and to discuss the assessment approach for the Road Transport Assessment.

Forestry Corporation of NSW

A meeting was held with the Forestry Corporation of NSW on 11 September 2017 to provide an overview of the Modification. Project interactions with the Fifield State Forest and Forestry Act, 2012 approval requirements were discussed.

Department of Industry – Lands and Forestry

A meeting was held with Lands and Forestry (within the Department of Industry) on 12 September 2017 to provide an overview of the Modification. Project interactions with Crown land and Crown Lands Act, 1989 approvals were also discussed.

Local Government

Consultation has been conducted with the relevant local councils regarding the approved Project, the Modification and revised VPAs during the preparation of this EA. A summary of this consultation is provided below.

Lachlan Shire Council

A meeting was held with representatives of the Lachlan Shire Council (LSC) on 5 September 2017 to provide an overview of the Modification and the proposed approach to the environmental assessment.

In addition, Clean TeQ has regularly consulted with the LSC regarding the terms of the VPA agreement.

Consultation was also undertaken with the LSC in June 2017 with regard to the construction camp.

Parkes Shire Council

A meeting was held with representatives of the Parkes Shire Council (PSC) on 5 September 2017 to provide an overview of the Modification and the proposed approach to the environmental assessment.

In addition to the consultation described above, Clean TeQ has regularly consulted with the PSC regarding the terms of the VPA agreement.

Forbes Shire Council

A meeting was held with representatives of the Forbes Shire Council (FSC) on 5 September 2017 to provide an overview of the Modification and the proposed approach to the environmental assessment.

In addition to the consultation described above, Clean TeQ has regularly consulted with the FSC regarding the terms of the VPA agreement.

Community Consultative Committee

In accordance with Condition 7, Schedule 5 of Development Consent DA 374-11-00, a Community Consultative Committee (CCC) was established for the Project.

A briefing on the Modification was provided during the inaugural CCC meeting held on 10 October 2017.

A further update on the Modification will be provided during the next CCC meeting on 23 November 2017.

Local Community and Landholders

Clean TeQ has also undertaken individual consultation with a number of private landholders that reside in the vicinity of the Project to discuss the upcoming development of the Project.

In addition, community liaison kiosks were established within Fifield, Trundle and Tullamore in August 2017 to provide opportunities for the local community to learn more about the Project and the Modification.

A community newsletter on the Project was distributed to the local community in October 2017. Clean TeQ will continue to provide updates on the Modification in future community newsletters.

Aboriginal Community

Aboriginal community consultation was undertaken in consideration of the requirements of the OEH's *Aboriginal cultural heritage consultation requirements for proponents 2010* (Department of Environment, Climate Change and Water [DECCW], 2010) the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (Department of Environment and Conservation [DEC], 2005) and clause 80c of the NSW *National Parks and Wildlife Regulation, 2009*.

In accordance with these guidelines and regulations, Clean TeQ consulted with relevant government agencies and Registered Aboriginal Parties (RAPs), as described in Appendix F.

As a result of the registration process undertaken for the Modification in accordance with *Aboriginal cultural heritage consultation requirements for proponents 2010*, a total of seven RAPs registered an interest in the Modification[2], including:

- Wiradjuri Condobolin Corporation.
- Murie Elders Group.
- Binjang Wellington Wiradjuri Aboriginal Heritage Survey.
- West Wyalong Local Aboriginal Land Council (LALC).
- Condobolin LALC.
- Louise Davis.
- Peter Peckham.

Surveys of the additional surface development areas associated with the Modification were undertaken with representatives of the RAPs (Appendix F). All RAPs were consulted regarding the Aboriginal cultural heritage management and mitigation measures documented in this EA.

[2] The Forbes Aboriginal & Community Working Party were originally registered as stakeholders for the consultation process, however at a later date they advised Clean TeQ that they did not wish to be included in the Aboriginal consultation process going forward, and hence have not been described further in this EA.

1.4 Structure of this Document

This EA comprises a main text component and supporting studies. An overview of the main text sections is presented below:

Section 1	Provides an overview of the approved Project and the Modification and the consultation undertaken in relation to the Modification.
Section 2	Provides a description of existing and approved operations at the Project.
Section 3	Provides a description of the Modification.
Section 4	Provides an environmental assessment of the Modification.
Section 5	Provides a description of the approved and proposed rehabilitation strategy for the Project.
Section 6	Describes the general statutory context of the Modification.
Section 7	Provides a conclusion providing justification for the Modification.
Section 8	References.

Attachment 1 and Appendices A to H provide supporting information as follows:

Attachment 1	Project Consolidated Development Consent.
Appendix A	Air Quality Assessment.
Appendix B	Noise and Blasting Assessment.
Appendix C	Preliminary Hazard Analysis.
Appendix D	Water Management Assessment.
Appendix E	Road Transport Assessment.
Appendix F	Aboriginal Cultural Heritage Assessment.
Appendix G	Surface Water Extraction Baseline Flora and Fauna Habitat Report.
Appendix H	Alternative Water Pipeline Alignment Baseline Flora Report.

2 Approved Project

2.1 Approval History

Development Consent DA 374-11-00 for the Project was issued under Part 4 of the EP&A Act in 2001. Three modifications to Development Consent DA 374-11-00 have since been granted under the EP&A Act:

- 2005 – to allow for an increase of the autoclave feed rate, limestone quarry extraction rate and adjustments to ore processing operations;
- 2006 – to allow for the reconfiguration of the borefields; and
- 2017 – to allow for the production of scandium oxide.

The consolidated Development Consent DA 374-11-00, incorporating these modifications, is provided in Attachment 1.

In addition, a Modification application was lodged on 13 October 2017 for changes to hazard study requirements (the Hazard Studies Modification [MOD 5]). The Hazard Studies Modification will be subject to separate environmental assessment and approval.

2.2 Mineral Resource

At the Syerston deposit the nickel-cobalt lateritic mineralisation is largely confined within goethite and siliceous goethite zones at depths of 10 metres (m) to 60 m from the surface in deposits up to 40 m in thickness (Black Range Minerals, 2000).

Scandium mineralisation at the Syerston deposit is developed throughout the lateritic profile, mainly within the overburden, alluvial, and goethite zones on the periphery of the main nickel cobalt deposit. The average depth of the scandium-rich areas is approximately 1 m to 30 m below the surface but tend to be variable across the area dependent upon the lateritic profile (Clean TeQ, 2015).

2.3 General Arrangement

The general arrangement of the approved Project includes the following main components (Figure 1):

- mine (including processing facility);
- limestone quarry;
- rail siding;
- gas pipeline;
- borefields and water pipeline; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass and road and intersection upgrades).

During the Initial Production Phase, only the mine (including the mine processing facility), borefield and water pipeline will be developed. The limestone quarry, rail siding and gas pipeline will be developed as part of the Full Production Phase.

A description of the general arrangement of the approved mine is provided in this section. The general arrangements of the other Project components are described in Sections 2.11 to 2.14.

The general arrangement of the approved mine site includes the following main components:

- multiple open cut pits (including small-scale scandium rich open cut pits);
- waste rock emplacements;
- ROM pad ore stockpiles;
- topsoil stockpiles;
- processing facility;
- reagent production plants and storage areas;
- gas-fired power plant and associated power distribution infrastructure;
- tailings storage facility;
- evaporation ponds;
- water storage dam;
- sediment dams, diversion dams, raw water dam, diversions, pumps, pipelines and other water management equipment and structures;
- construction camp;
- concrete batch plant;
- gravel and clay borrow pits (within the footprint of the tailings storage facility and open cut pits);
- offices, workshops, warehouse, laboratory and amenities buildings and car parking facilities;
- fuel storage areas;
- potable water treatment plant;
- wastewater (including sewage) treatment plant;
- laydown areas;
- access road, internal roads and haul roads; and
- other associated minor infrastructure, plant, equipment and activities.

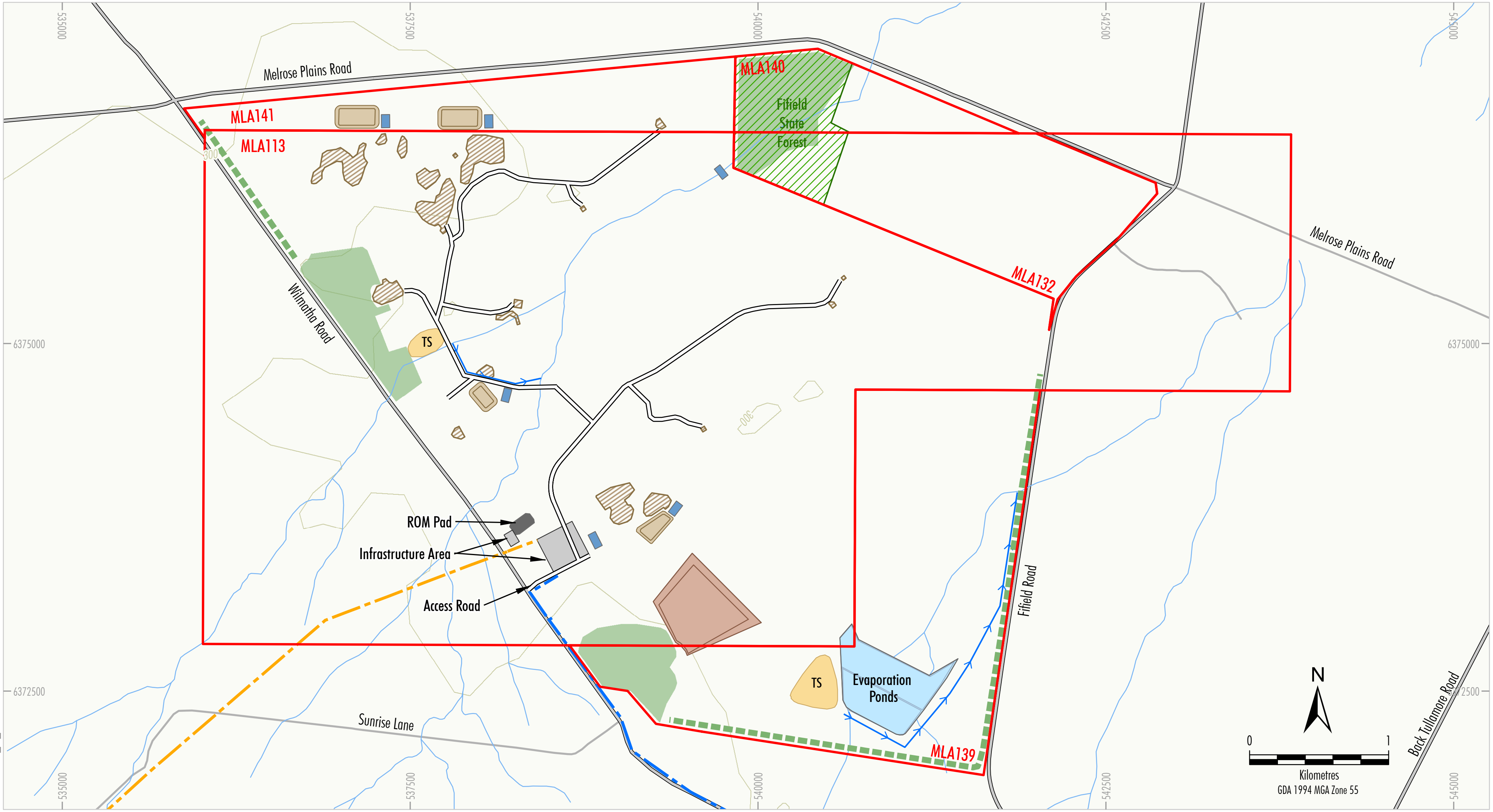
The approved mine general arrangement for the Initial Production Phase and the Full Production Phase are shown on Figures 2a and 2b, respectively.

2.4 Construction Activities

Construction activities for the Initial Production Phase will be required for the development of the mine (including the processing facility), borefields, water pipeline and road upgrades and are anticipated to last approximately two years.

A second construction phase to fully develop all Project components (i.e. limestone quarry, rail siding, gas pipeline) will be required prior to the commencement of the Full Production Phase of the Project. It is anticipated that the second construction phase will require an additional two years to complete.

Construction activities will be undertaken during the approved construction hours outlined in Condition 1, Schedule 3 of Development Consent DA 374-11-00.



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LEGEND

- Mining Lease Application Boundary
- Open Cut Pit
- Waste Rock Emplacement
- Tailings Storage Facility
- TS Topsoil Stockpile
- ROM Pad
- Mine Infrastructure Area
- Sediment Dam
- Diversion Structure
- Gas Pipeline
- Water Pipeline
- Vegetation Screening
- Existing Open Woodland
- State Forest

Source: Black Range Minerals (2000); NSW Department of Industry (2017); NSW Land & Property Information (2017)

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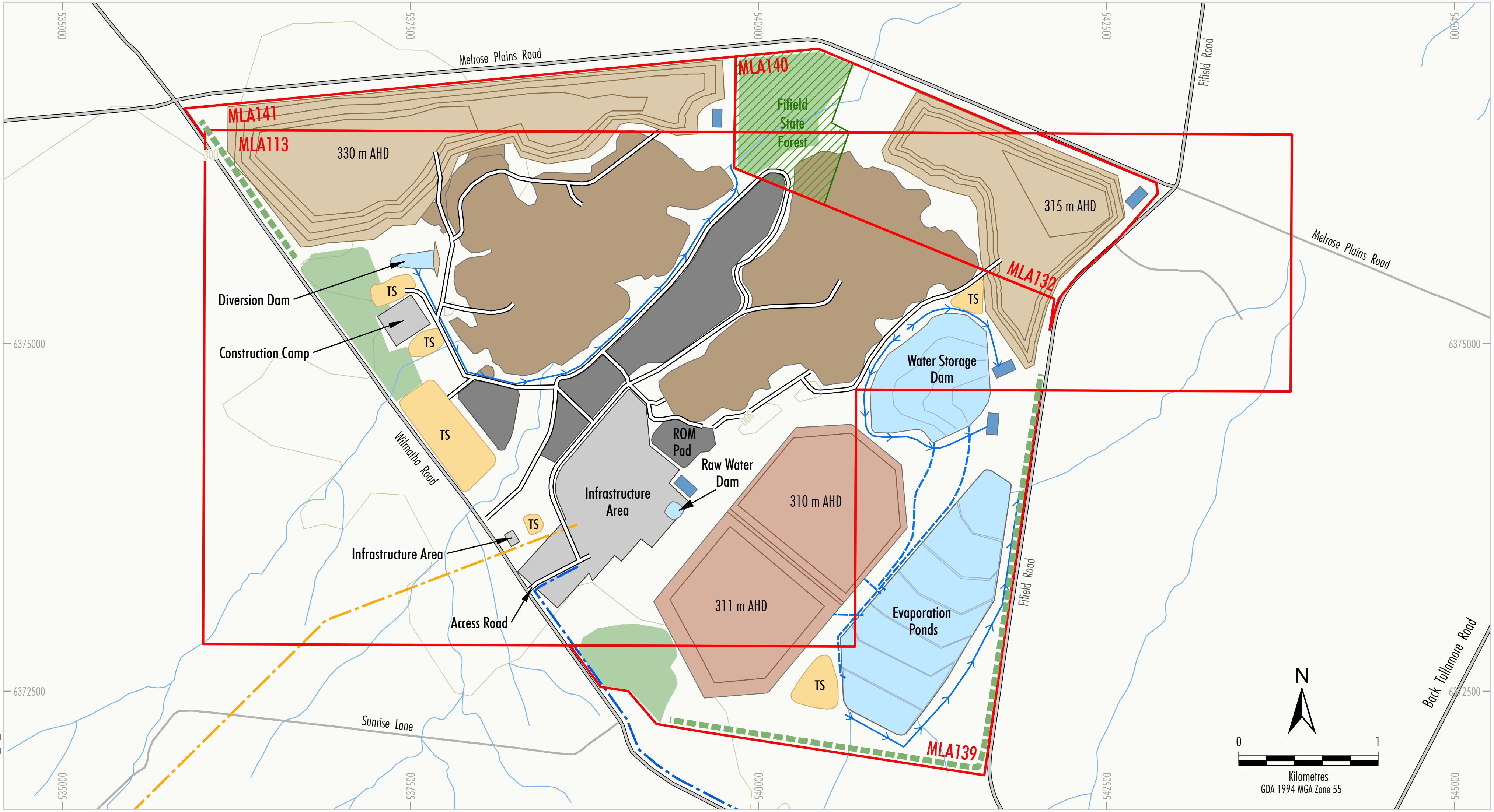
Approved Mine and Processing Facility General Arrangement (Initial Production Phase)

Figure 2a



LEGEND

- Mining Lease Application Boundary
- Ore Stockpile
- Open Cut Pit
- Waste Rock Emplacement
- Tailings Storage Facility
- TS Topsoil Stockpile
- Mine Infrastructure Area
- Sediment Dam
- Diversion Structure
- Key Site Water Pipeline
- Gas Pipeline
- Water Pipeline
- Vegetation Screening
- Existing Open Woodland to be Maintained
- State Forest

Source: Black Range Minerals (2000); NSW Department of Industry (2017); NSW Land & Property Information (2017)

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Approved Mine and Processing Facility General Arrangement (Full Production Phase)

Figure 2b

2.5 Mining Operations

2.5.1 Mining Areas

During the Initial Production Phase, multiple small-scale open cut pits will be developed to target scandium-rich areas of the Syerston deposit (Figure 2a). The small-scale open cut pits will have relatively small footprints (Figure 2a) and be up to 30 m deep.

These small-scale open cut pits will be either incorporated into the larger open cut pits or backfilled during the Full Production Phase (Figure 2b).

The larger open cut pits will have an average depth of 35 m with localised deeper areas up to approximately 55 m.

2.5.2 Mining Method

Conventional open cut mining methods will be used to develop the Syerston deposit.

The rate of open cut mining during the Initial Production Phase will be approximately 100,000 tpa of ROM ore. The mining rate will increase to greater than 2.5 Mtpa during the Full Production Phase, to allow for an autoclave feed rate of 2.5 Mtpa.

Ore will be loaded directly to haul trucks for transfer to the ROM pad or ore stockpiles for processing (Section 2.7).

The approved waste rock management is described in Section 2.6.

Mining operations will be conducted 24 hours per day, seven days per week.

2.5.3 Mining Equipment and Supporting Equipment/Plant

Hydraulic excavators, haul trucks, dozers, graders and front end loaders will be used during mining operations.

A list of the approved major mobile equipment for the Project is provided in the Noise and Blasting Assessment (Appendix B).

2.6 Waste Rock Management

2.6.1 Quantities and Geochemistry

Approximately 125 million tonnes of waste rock will be generated from the Project. Quantities of mine waste material will increase during the mine life as the open pits deepen, reaching up to approximately 8.5 Mtpa.

The waste rock material is highly weathered, oxidised and non-acid forming (Black Range Minerals, 2000).

2.6.2 Waste Rock Emplacement Strategy

Waste rock material generated will be placed either in one of two waste rock emplacements or in small-scale open cut pits located outside the approved open cut pit areas (Figures 2a and 2b).

The development of the waste rock emplacements will entail progressive pre-stripping of the emplacement footprint and systematic development by truck unloading and dozer pushing.

The waste rock emplacements will be up to approximately 20 m and 30 m high. The overall batter slopes of the waste rock emplacements will be 1 vertical (V):4 horizontal (H) with reverse graded berms at approximately 10 m intervals. Intermediate batter slopes will be constructed to 1V:3H grades.

2.7 Processing Facility

2.7.1 Process Description

During the Initial Production Phase, the process facility will use a RIP circuit and will include the following stages:

- **Ore preparation circuit** – removal of oversize material and production of an ore slurry suitable for acid leaching;
- **Acid leach circuit** – leaching of nickel, cobalt and scandium from the ore slurry by application of sulphuric acid under high pressure and temperature in an autoclave to produce an autoclave slurry containing acid and soluble nickel and cobalt sulphates;
- **RIP circuit** – a two stage process that first separates scandium and then nickel and cobalt from residue solids (tailings) contained in the autoclave slurry using ion exchange resin;
- **Tailings neutralisation and thickening circuit** – neutralisation of residue solids slurry (tailings) with a limestone slurry prior to thickening and transfer to the tailings storage facility (Section 2.8); and
- **Metals recovery circuit** – recovery of:
  - scandium oxide from the loaded resin by desorption with sodium carbonate followed by precipitation and calcination; and
  - nickel and cobalt sulphates from the loaded resin by desorption with sulphuric acid followed by solvent extraction and precipitation.

Approximately 100,000 tpa of ore will be processed during the Initial Production Phase to produce up to 1,000 tpa of nickel and cobalt metal equivalents as sulphate precipitate products and up to 80 tpa of scandium oxide.

For the Full Production Phase, the processing facility will either use a RIP circuit and include the same stages as described above for the Initial Production Phase, or a counter current decantation circuit will be used, with the following stages:

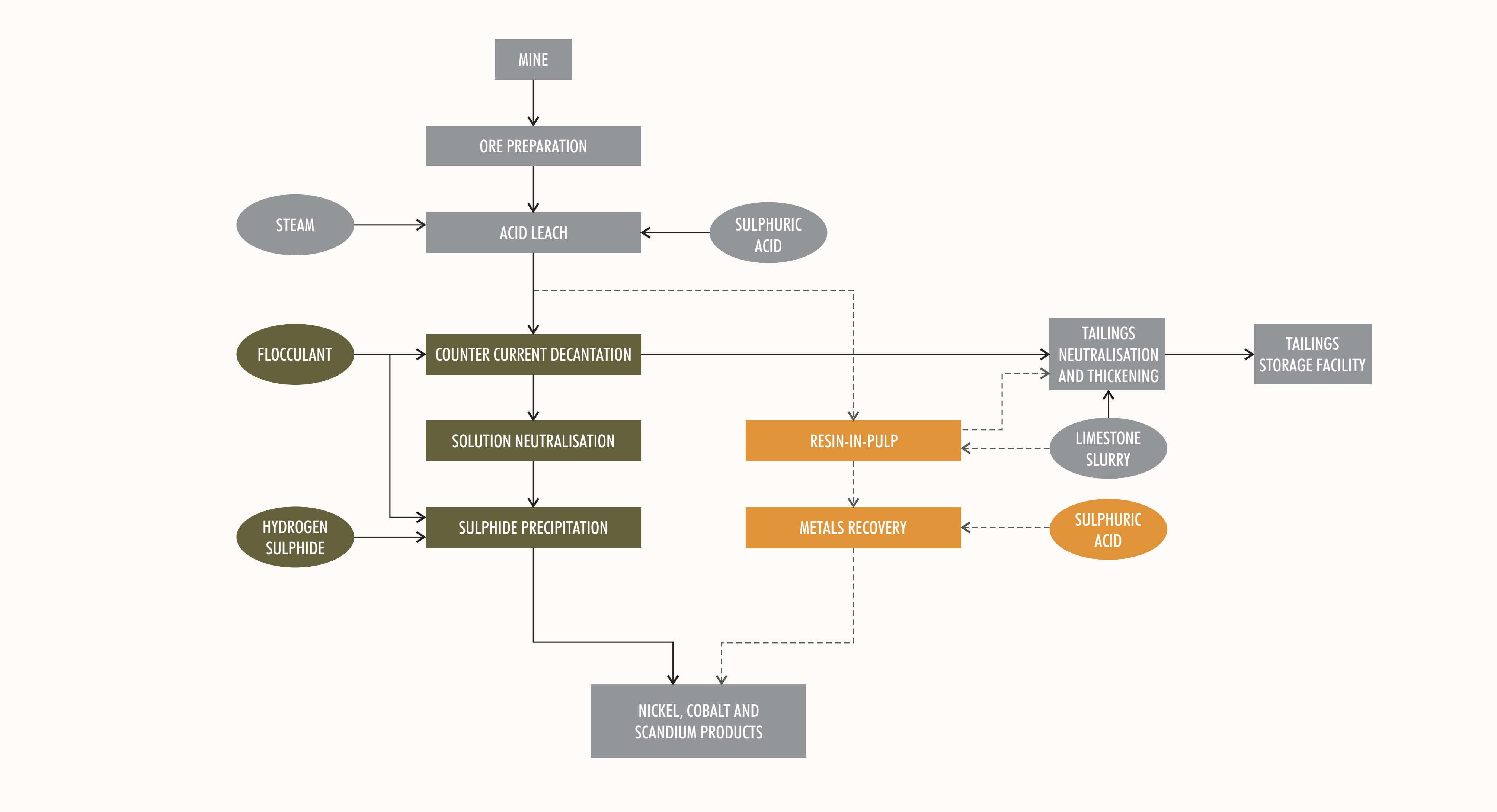
- **Ore preparation circuit** – as per the Initial Production Phase;
- **Acid leach circuit** – as per the Initial Production Phase;
- **Counter current decantation circuit** – separation of free acid and soluble nickel and cobalt sulphates from residue solids (tailings) contained in the autoclave slurry;
- **Tailings neutralisation and thickening circuit** – as per the Initial Production Phase;
- **Solution neutralisation circuit** – neutralisation of free acid and soluble nickel and cobalt solution from the counter current decantation circuit; and
- **Sulphide precipitation circuit** – precipitate a high grade nickel and cobalt product from the neutralised nickel and cobalt solution.

During the Full Production Phase, the processing facility will operate with an autoclave feed rate of 2.5 Mtpa of ore to produce up to 40,000 tpa of nickel and cobalt metal equivalents, as either sulphide or sulphate precipitate products, and up to 180 tpa of scandium oxide.

A conceptual ore processing flowsheet for the approved Project is provided on Figure 3.

A summary of the approved process inputs, atmospheric emissions and liquid waste streams is provided in Table 2.

Processing operations will be conducted 24 hours per day, seven days per week.



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LEGEND
- Counter-current Decantation Process (Full Production Phase Option)
- Resin-in-pulp Process (Initial Production Phase and Full Production Phase Option)
- Process Operations required for both Processes

Source: After SNC-Lavalin (2000); Scandium21 (2016)

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Approved Conceptual Ore Processing Flowsheet

Figure 3

Table 2 Summary of Approved Processing Facility Process Inputs, Process Input Production, Atmospheric Emissions and Liquid Waste Streams

Project Components	Initial Production Phase	Full Production Phase	
	RIP Circuit	RIP Circuit Option	Counter Current Decantation Circuit Option
Process Input Requirements			
Sulphur	-	260,000 tpa	260,000 tpa
Sulphuric Acid	30,000 tpa	-	-
Limestone	25,000 tpa	790,000 tpa	790,000 tpa
Flocculant	20 tpa	1,100 tpa	1,100 tpa
Caustic Soda	1,000 tpa	2,300 tpa	100 tpa
Extracant	200 litres per annum (Lpa)	3,000 Lpa	-
Modifier	100 Lpa	1,500 Lpa	-
Diluent	1,000 Lpa	15,000 Lpa	-
Sodium Carbonate	4,800 tpa	10,500 tpa	-
Minor reagents (e.g. hydrated lime, mill balls, coagulant, diatomaceous earth, hydrochloric acid, ammonia)	Used in ore preparation, thickening and tailings neutralisation, sulphuric acid plant and wastewater treatment plant.	Used in ore preparation, thickening and tailings neutralisation, sulphuric acid plant and wastewater treatment plant.	Used in ore preparation, thickening and tailings neutralisation, sulphuric acid plant and wastewater treatment plant. Diatomaceous earth required.
Atmospheric Emissions			
Carbon Dioxide	0.38 kilograms per second (kg/s)	9.35 kg/s	9.35 kg/s
Extraction Fan over Sulphide Filter Vent (H_2S)	-	-	5.3 Normal cubic metres per second (Nm^3/s) (dry, 273 Kelvin [K], 101.3 kiloPascals [kPa])
Sulphuric Acid Plant Stack (H_2SO_4, SO_3 and SO_2)	-	19.2 Nm^3/s (dry, 273K, 101.3 kPa)	19.2 Nm^3/s (dry, 273K, 101.3 kPa)
Flare Stack (H_2S, SO_2, NO_2 and NO)	-	-	0.65 Nm^3/s (dry, 273K, 101.3 kPa)
Hydrogen Reformer Stack (NO_2 and NO)	-	-	1.42 Nm^3/s (dry, 273K, 101.3 kPa)
Power Plant Heat Recovery Steam Generator (HRSG) (NO_2 and NO)	0.74 Nm^3/s (dry, 273K, 101.3 kPa)	18.4 Nm^3/s (dry, 273K, 101.3 kPa)	18.4 Nm^3/s (dry, 273K, 101.3 kPa)
Liquid Waste			
Liquid Waste Streams	Waste liquid streams associated with tailings neutralisation.		
Reagent Production			
Sulphuric Acid	-	700,000 tpa	700,000 tpa
Hydrogen Sulphide	-	-	88 tonnes per day (tpd)
Hydrogen	-	-	5 tpd
Nitrogen	-	For plant purging.	For plant purging.

2.7.2 Reagent Transport

The following reagents will be transported to the mine (Table 2):

- sulphuric acid (Initial Production Phase only);
- sulphur (Full Production Phase only); and
- limestone (Initial and Full Production Phases only).

Smaller amounts of other reagents will be transported to the mine, such as caustic soda and flocculent.

Additional reagents (e.g. diatomaceous earth) will be required if the counter current decantation circuit is implemented (Table 2).

A summary of the approved process inputs is provided in Table 2.

2.7.3 On-Site Reagent Production

The following reagents are approved to be manufactured at the mine (Table 2):

- sulphuric acid (Full Production Phase);
- lime slurry (Initial and Full Production Phases only);
- nitrogen (Full Production Phase);
- hydrogen (Full Production Phase if the counter current decantation circuit option is selected); and
- hydrogen sulphide (Full Production Phase if the counter current decantation circuit option is selected).

These reagents are approved to be manufactured in reagent production plants located adjacent the process facility inside the mine infrastructure area.

The lime slurry plant will be developed during the Initial Production Phase.

Sulphuric acid and nitrogen plants will be developed during the Full Production Phase as the larger scale operation will then justify the manufacture of these reagents.

If the counter current decantation circuit is adopted during the Full Production Phase, the hydrogen and hydrogen sulphide plants will be developed.

A summary of the reagent production is provided in Table 2.

2.7.4 Production Storage and Transport

Product will be stored in an onsite product storage area for periodic transport from the site.

The nickel and cobalt sulphate precipitates and scandium oxide produced at the mine will be transported by road from the mine site during the Initial Production Phase.

During the Full Production Phase, when the rail siding will be developed, nickel and cobalt sulphide or sulphate precipitates and scandium oxide will be backloaded into sulphur trucks and transported by road to the rail siding for transport by rail.

2.8 Tailings Management

The saline nature of the tailings water (principally magnesium sulphate) prevents the re-use of it in the process facility without additional treatment and an evaporative system is required to remove excess supernatant water from the tailings storage facility.

2.8.1 Tailings Storage Facility

The main engineering components required for the operation of the tailings storage are:

- starter embankment;
- upstream embankment lifts;
- tailings delivery pipeline and discharge spigots;
- underdrainage and seepage collection system;
- decant towers and associated pipeline system to the evaporation ponds; and
- earthfill access causeway to each of the two decant tower structures.

In accordance with Condition 29, Schedule 3 of Development Consent DA 374-11-00, the design of the tailings storage facility will conform to *DSC3A Consequence Categories for Dams* (Dams Safety Committee [DSC], 2015) and *DSC3F Tailings Dams* (DSC, 2012).

An initial starter embankment will be constructed during the construction phase and upstream lifts that increase the height of the tailings storage facility will be constructed in advance of storage requirements throughout the mine life (Figure 4).

In accordance with Condition 29, Schedule 3 of Development Consent DA 374-11-00, the floor and side walls of the tailings storage facility will be designed with a minimum of:

- a 900 millimetre (mm) clay liner with a permeability of no more than 1 x 10-9 metres per second (m/s); or
- a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than 1 x 10-14 m/s (or equivalent).

Tailings will be pumped from the processing facility to the tailings storage facility where it will be deposited into two adjoining tailings storage cells (Figure 4).

Sub-aerial tailings deposition in the tailings storage facility will involve peripheral discharge of tailings from a spigotted ring main located around the perimeter embankment of each of the tailings storage cells.

The method of tailings deposition will facilitate the formation of a central decant pond remote from the tailings storage cell perimeter embankment. Decant towers within each of the tailings storage cells will allow the decanting of supernatant water to the evaporation ponds.

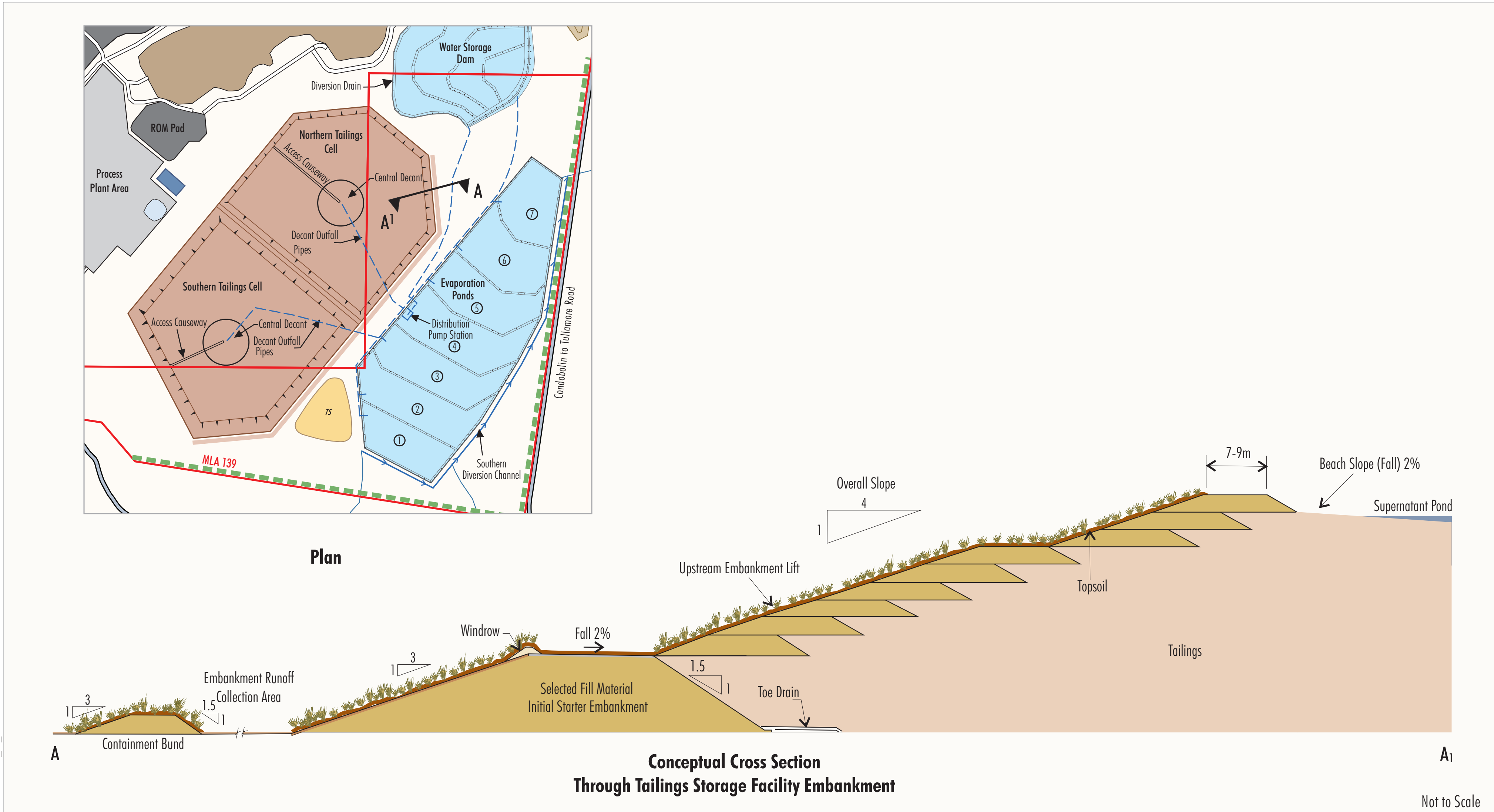
A seepage interception drain will be installed at the inner toe of the initial starter embankment (Figure 4) to intercept seepage through the tailings and near-surface soils under the storage. Seepage collected in the seepage interception drain will be drained through pipes under the tailings storage facility initial starter embankment to seepage collection sumps. These sumps will be dewatered to either the tailings storage facility decant pond or the evaporation ponds.

An earthfill access causeway will be constructed to each of the decant towers. The access causeway and decants will be raised during the development of the tailings storages.

2.8.2 Tailings Storage Facility Water Management

The tailings storage facility will only receive water inflows from the tailings slurry and incident rainfall, as the tailings storage facility will be a ‘turkeys nest’ arrangement with a fully encompassing raised perimeter embankment (Figure 4).

Supernatant waters (including any incident rainfall) decanted from the tailings storage cells will gravitate through the decant pipelines to Evaporation Ponds 3 and 4. This water will then be distributed by gravity to Evaporation Ponds 5, 6 and 7 and/or pumped to Evaporation Ponds 1, 2 and 3 via a distribution pipeline (Figure 4).



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Source: Black Range Minerals (2000)

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SYERSTON PROJECT MODIFICATION 4

Approved Tailings Storage Facility Embankment Details and Conceptual Storage Cross Section

Figure 4

The tailings storage facility will be operated to maintain a freeboard storage, above the level of the decant pond, in excess of that required to store the volume of runoff generated from a 1 in 100 year average recurrence interval (ARI) rain event of 72 hours duration, in accordance with Condition 29, Schedule 3 of Development Consent DA 374-11-00. The decant system will be designed to remove stored water so that capacity to store a 1 in 100 year ARI rain event of 72 hours duration rain event within five days of the event occurring.

When the evaporation ponds reach full capacity, during prolonged wet periods, flows from the tailings storage cell decants will be redirected to the water storage dam. As storage capacity subsequently becomes available in the evaporation ponds, water will be pumped back from the water storage dam to the evaporation ponds.

Similar to the tailings storage facility, the evaporation ponds and water storage dam only receive water inflows from the tailings slurry and incident rainfall as they will be ‘turkeys nest’ dams.

In accordance with Condition 29, Schedule 3 of Development Consent DA 374-11-00, the floor and side walls of the evaporation ponds and water storage dam will be designed to the same standard as the tailings storage facility (Section 2.8.1).

The evaporation ponds and water storage dam will also be operated to maintain a freeboard storage in excess of that required to store the volume of runoff generated from a 1 in 100 year ARI rain event of 72 hours duration in accordance with Condition 29, Schedule 3 of Development Consent DA 374-11-00.

2.9 Mine Water Management

2.9.1 Water Demand

The main water demand (usage) for the mine site is the processing facility. Other water demand requirements include dust suppression, cooling water and potable and non-potable uses in the mine infrastructure area.

During the Full Production Phase (i.e. 2.5 Mtpa autoclave feed rate), the total raw water demand for the mine (including the processing facility) was originally estimated and approved to be up to 17.5 million litres per day (ML/day), or on an annualised basis, up to 6,390 million litres per year (ML/year).

The water demand for the Initial Production Phase will be significantly lower (approximately 1.75 ML/day) due to the lower processing rate.

2.9.2 Water Supply

Water for the mine site will be supplied from a number of sources during the life of the Project, including:

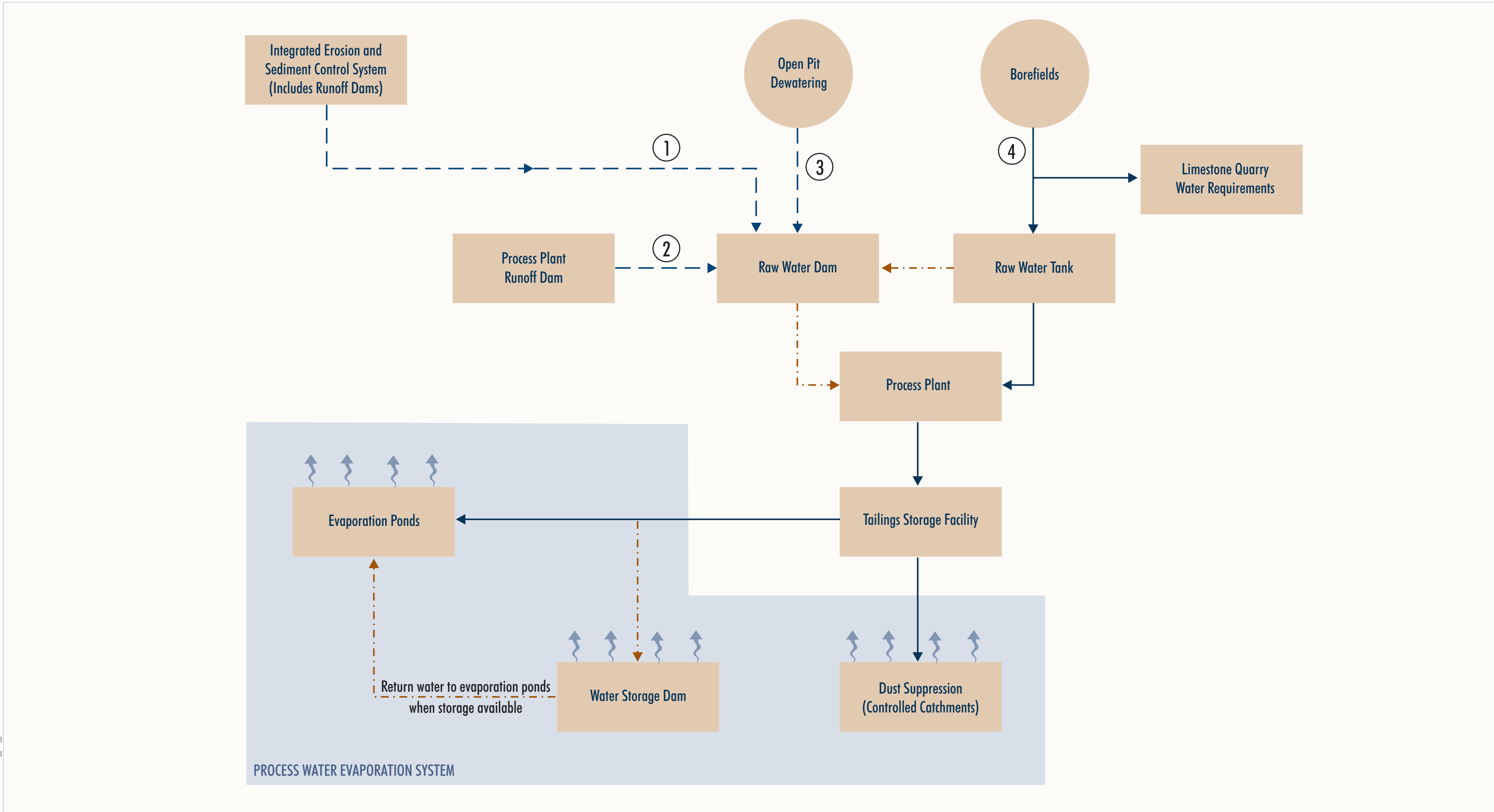
- mine dewatering (in-pit and advance, expected to be negligible);
- internal runoff collection at the mine site (including harvestable rights); and
- the borefields (primary source of water).

The approved water supply scheme layout is shown on Figure 5.

2.9.3 Site Water Management

The overall objective of the water management system is to control runoff from the development/construction areas and the operation areas, while diverting upstream water around these areas.

The water management system will include both permanent features that will continue to operate post-closure (e.g. diversion dam, northern and southern diversion channels) and temporary structures during mining operations.



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LEGEND

- ① Water Supply Priority
- Intermittent Flow Path (rainfall dependent)
- Alternative Flow Path
- Evaporation

Source: Black Range Minerals (2000)

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Approved Water Supply Schematic

Figure 5

The water management system will be progressively developed during the construction and operation of the mine as diversion and containment requirements change.

Some existing drainage paths will require diversion around the northern open cut pit and evaporation ponds into exiting drainage lines by development of the northern and southern diversion structures, respectively (Figure 2b). The design will consider long term stability and compatibility with existing hydrological features, landforms and vegetation. A detailed description of the clean water diversion systems will be included in the Surface Water Management Plan in accordance with Condition 30, Schedule 3 of Development Consent DA 374-11-00.

An internal drainage system will be constructed to collect and contain water generated within the development/construction areas and operation areas.

Sediment control structures such as sediment dams and sediment fences will be employed where necessary within and downstream of disturbance areas.

Sediment control structures will be designed, installed and maintained in accordance with *Managing Urban Stormwater: Soils and Construction* in accordance with Condition 29, Schedule 3 of Development Consent DA 374-11-00.

2.10 Construction Camp

A construction camp will be constructed on the mine site (Figure 2b) during Project construction.

The construction camp will house approximately 1,000 persons during the peak construction period.

In accordance with Condition 47, Schedule 3 of Development Consent DA 374-11-00, Clean TeQ will prepare a final layout and location of the construction camp in consultation with the LSC.

2.11 Borefields and Water Pipeline

2.11.1 Borefields

The borefields will comprise six production bores within the Lachlan River Palaeochannel located approximately 65 km to the south of the mine site (Figures 1 and 6).

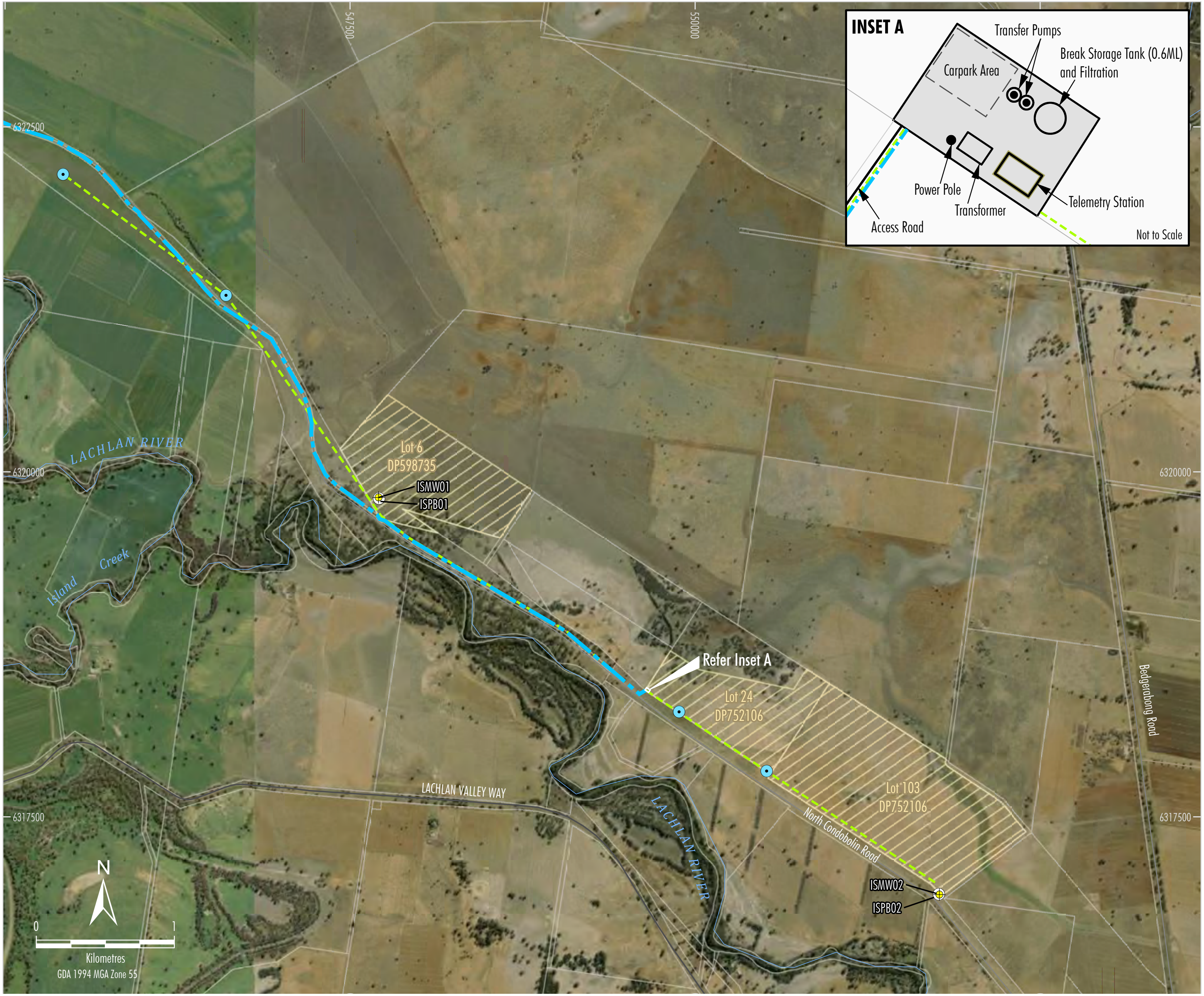
An infrastructure corridor will link the bores to the transfer station (Figure 6). The infrastructure corridor will include linking pipeline, access road and electricity transmission line. Transformers will be located at each of the six bore locations to service each bore pump.

The transfer station will include the following infrastructure (Figure 6):

- break storage tank;
- transfer pumps;
- transformer;
- telemetry station;
- laydown area; and
- access road.

Power will be provided to the borefields from a nearby substation (Black Range Minerals, 2000).

Groundwater investigations and supply feasibility assessments by Coffey Geosciences (2000) indicated that the borefields could maintain a supply of up to approximately 17 ML/day (6,300 ML/year) for a 30 year period (subject to obtaining relevant water access licences [WALs]).



LEGEND

- Property Boundary

Approved Project

- Transfer Station
- Water Pipeline
- Borefield Infrastructure Corridor *
- Potential Borefield Location
- Approximate Location of Production Bore (not constructed)
- Production Bore (constructed)
- Monitoring Bore

* Infrastructure Corridor includes linking pipline, access road and electricity transmission line.

Source: NSW Land & Property Information (2017); Ivanplats Syerston (2005)
NSW Imagery: © Department of Finance, Services & Innovation (2017)

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Approved Borefields General Arrangement

Figure 6

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Clean TeQ currently holds 3,154 shares (currently equivalent to 3,154 ML/year) in the Upper Lachlan Alluvial Groundwater Source, administered by the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources, 2012* under the *Water Management Act, 2000*.

In accordance with Condition 30, Schedule 3 of Development Consent DA 374-11-00, the borefields will be operated in accordance with a Groundwater Management Plan.

2.11.2 Water Pipeline

The approved water pipeline alignment between the borefields and mine site is shown on Figure 1. An approximate 12 km spur line will run from the main pipeline to the limestone quarry (the limestone quarry water pipeline) (Figure 1).

The water pipeline alignment generally follows existing road reserves from the borefields to the mine/limestone quarry.

The water pipeline will be buried, where possible, along the route. However, at river and major tributary crossings the pipeline will cross the watercourse on a raised structure.

The reticulation system from the borefields to the mine site will have a capacity of approximately 17 ML/day.

2.12 Power Generation and Gas Pipeline

2.12.1 Power Generation

The mine power requirements during the Full Production Phase of approximately 34 MW will be provided by an on-site gas fired co-generation plant. Gas will be supplied to the mine site via the gas pipeline during the Full Production Phase (Section 2.12.2).

Electricity will be generated by two 20 MW gas turbines each fitted with a HRSG unit and a 10 MW steam turbine.

The steam required for use in the process will be generated through heat recovery from the sulphuric acid plant or from steam produced from the HRSGs or auxiliary boiler.

Emergency power requirements will be provided by three one megavolt amps diesel generators.

The power demand for the Initial Production Phase will be significantly lower due to the lower processing rate. Given the lower power demand during the Initial Production Phase of the Project, gas will be transferred to the mine by road.

2.12.2 Gas Pipeline

Gas will be supplied to the mine during the Full Production Phase via the gas pipeline from the existing Moomba to Sydney Gas Pipeline (Figure 1).

The alignment of the proposed pipeline has been designed in accordance with public safety, environmental impact and pipeline integrity concerns.

The majority of the pipeline is located within road reserves and has been aligned so as to minimise vegetation clearing and avoid areas of significant remnant vegetation.

The section of pipeline within private property has been aligned to run along fencelines and property boundaries where possible, and to minimise interruption to farming practices and the requirement for vegetation clearing.

The infrastructure associated with the gas pipeline will likely include:

- t-junction and valve at the connection point with the Moomba to Sydney gas pipeline;
- scraper station at the connection point and at the mine site;
- compressor (if required);
- metering station at the mine site; and
- mainline valves and cathodic generators and testers (locations to be determined during detailed design).

All monitoring, diagnostic and control signals will be relayed and integrated into the process control system for remote monitoring and control at the central control room at the mine.

The gas for the power generation plant will however be transported to the mine site as liquefied natural gas (LNG) via road during the Initial Production Phase as the relatively small quantity of gas required does not justify the development of the gas pipeline.

2.13 Limestone Quarry

The limestone quarry located approximately 20 km south-east of the mine will provide this limestone during the Full Production Phase of the Project (Figure 1).

Conventional open cut pit drill and blast methods will be used at the limestone quarry to produce approximately 790,000 tpa of crushed limestone.

The limestone will be crushed before being transported by road to the mine.

The limestone quarry will include the open cut, waste rock emplacement, soil stockpiles, haul roads, ROM pad, limestone screening and crushing facility, product stockpile, site buildings (administration and workshop buildings), water storage and treatment plant, fuel storage, explosive storage, access roads and security fencing.

The limestone quarry will have a water demand of approximately 50 ML/year predominately associated with crushing and mining activities. Other water demand requirements include potable water. The water will be supplied via a 12 km spur line from the main water pipeline (the limestone quarry water pipeline) to a raw water dam/tank at the limestone quarry (Figure 1).

The limestone quarry will not be utilised during the Initial Production Phase as the relatively small quantities of limestone required do not justify the development of the limestone quarry. During the Initial Production Phase of the Project, limestone will be sourced from external suppliers.

2.14 Rail Siding

A rail siding will be constructed on the Tottenham to Bogan Gate Railway for the Full Production Phase of the Project and will be used to deliver consumables and product to and from the Project. The rail siding will be located approximately 25 km south-east of the mine site (Figure 1).

The rail siding will include a rail spur, container loading and unloading facilities, equipment compound, office, fuel storage, short-term container storage facilities (hardstands), access roads and security fencing. The rail level crossing on Scotsons Lane will require upgrading.

An average of six train movements per week (three trains) will be required, with a maximum of two trains per day. The trains will arrive or depart according to freight scheduling.

The rail siding will not be utilised during the Initial Production Phase as the relatively small quantities of deliveries and product transport required do not justify the development of the rail siding.

2.15 Road Upgrades and Maintenance

Condition 17, Schedule 2 of Development Consent DA 374-11-00 requires Clean TeQ to enter into VPAs with the LSC, PSC and FSC. The LSC and PSC VPAs must include provision of funding for road upgrades outlined in Appendix 3 of Development Consent DA 374-11-00.

Appendix 3 of the Development Consent DA 374-11-00 requires upgrades to the following roads prior to the commissioning of the (Figure 7):

- Fifield-Trundle Road [SR171] (between The Bogan Way [MR350] and the Parkes Shire boundary);
- Platina Road [SR64] (between the Lachlan Shire Boundary and Fifield Road [MR57]);
- Fifield Road [MR57] (between Platina Road [SR64] and Slee St [in Fifield Village]); and
- Wilmatha Road [SR34] (between Slee St [in Fifield Village] and the mine.

Appendix 3 of the Development Consent DA 374-11-00 also requires upgrades to the following intersections prior to the commissioning of the mine (Figure 7):

- The Bogan Way [MR350] / Fifield-Trundle Road [SR171];
- Platina Road [SR64] / Fifield Road [MR57];
- Fifield Road [MR57] / Slee St [in Fifield Village]; and
- Slee St [in Fifield Village] / Wilmatha Road [SR34] / Fifield Road.

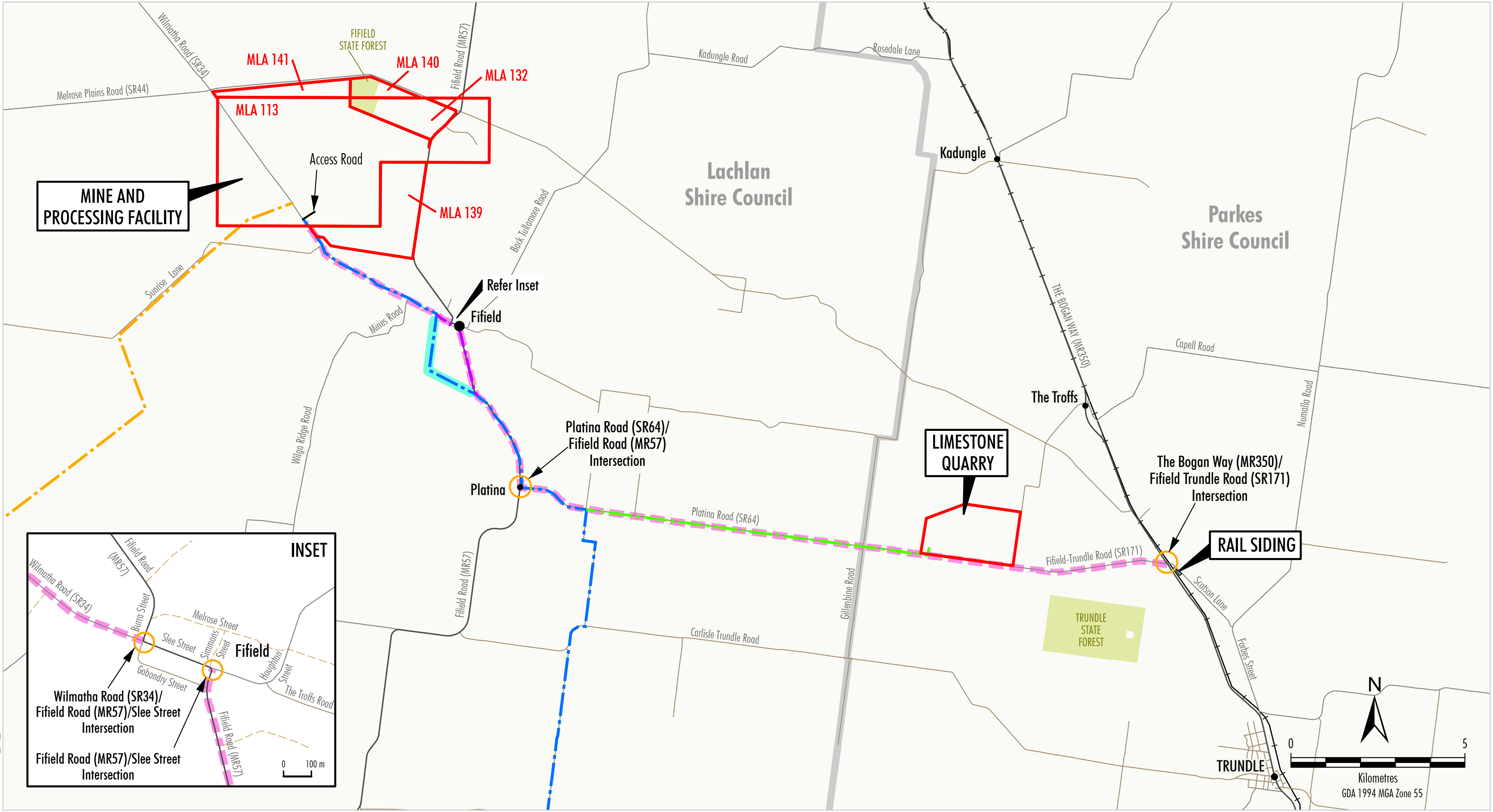
In addition, the intersection upgrades outlined in Appendix 5 of Development Consent DA 374-11-00 are required prior to commissioning of the mine:

- Henry Parkes Way (MR61) and Middle Trundle Road (SR83); and
- Henry Parkes Way (MR61) and The Bogan Way (MR350).

In accordance with the terms of the VPAs, a road safety audit will be conducted prior to the commencement of the commissioning of the limestone quarry and/or rail siding to determine appropriate road upgrade requirements for the Full Production Phase. Prior to the commissioning of the limestone quarry and/or rail siding, Clean TeQ will pay for the road upgrades identified in the road safety audit.

The LSC and PSC VPAs must also include provision of funding for road maintenance as outlined in Appendix 3 of Development Consent DA 374-11-00. Appendix 3 of the Development Consent DA 374-11-00 requires contributions to the maintenance of the following roads:

- Henry Parkes Way [MR61] (between Westlime Road [western outskirts of Parkes] and The Bogan Way [MR350]);
- Henry Parkes Way [MR61] (between Jones Lane [eastern outskirts of Condobolin] and Fifield Road [MR57]).
- Middle Trundle Road [SR83] (between Henry Parkes Way [MR61] and The Bogan Way [MR350]);
- The Bogan Way [MR350] (between Henry Parkes Way [MR61] and Fifield Trundle Road [SR171]);
- Fifield-Trundle Road [SR171] (between The Bogan Way [MR350] and the Parkes Shire boundary);
- Platina Road [SR64] (between the Lachlan Shire Boundary and Fifield Road [MR57]);
- Fifield Road (between Henry Parkes Way and Slee St [in Fifield Village]);
- Slee St [in Fifield Village] (between Fifield Road [MR57] and Wilmatha Road [SR34]);
- Wilmatha Road [SR34] (between Slee St [in Fifield Village] and the mine and processing facility access road).



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LEGEND

- State Forest
- Local Government Boundary
- Mining Lease Application Boundary
- Approved Gas Pipeline
- Approved Water Pipeline
- Approved Limestone Quarry Water Pipeline
- Approved Fifield Bypass
- Extent of Road Upgrade

Source: Black Range Minerals (2000); NSW Department of Industry (2017); NSW Land & Property Information (2017); Office of Environment and Heritage NSW (2107)

Note: The Limstone Quarry, Rail Siding, Limestone Quarry Water Supply Pipeline and Gas Pipeline would not be constructed during the Initial Production Phase.

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SYERSTON PROJECT MODIFICATION 4

Road Upgrades

Figure 7

Condition 43, Schedule 3 of Development Consent DA 374-11-00 requires the preparation of a Road Upgrade and Maintenance Strategy. The Road Upgrade and Maintenance Strategy will detail all road upgrade requirements and a program for their implementation and maintenance.

2.16 Workforce

The Project will require an average construction workforce of approximately 600 personnel (peaking at 1,000 personnel) for the Full Production Phase. The construction workforce will predominately reside in the construction camp.

During operations, an average workforce of approximately 300 personnel will be required for the Full Production Phase. It is expected that the operational workforce will reside in surrounding towns.

For the Initial Production Phase, the construction workforce will be expected to be smaller than the Full Production Phase construction workforce size at approximately 300 personnel (peak).

The operational workforce for the Initial Production Phase will be approximately 45 personnel due to the smaller-scale operation.

An operational workforce of approximately 30 and 5 personnel will be required for the limestone quarry and rail siding, respectively.

2.17 Community Enhancement Contributions

Clean TeQ will make community enhancement contributions to the LSC, PSC and FSC in accordance with Condition 17, Schedule 2 of Development Consent DA 374-11-00.

2.18 Rehabilitation

Rehabilitation objectives and principles, final landform concepts and the revegetation strategy for the Project are described in Section 5.

3 Modification Overview

A description of the Modification is provided in this section, including a comparison of the modified Project to the approved Project.

As described in Section 1.2, the Modification involves the implementation of opportunities to improve the efficiency of the Full Production Phase of the Project identified in the Project Optimisation Study. The Modification would generally not change the approved Initial Production Phase, with the exception of alterations to the Project water supply (Section 3.9).

It is noted that, depending on market conditions, the Project may move straight to the Full Production Phase rather than commencing with the Initial Production Phase.

The modified Project would include the same main project components as described in Section 2.3.

3.1 Construction Activities

There would be no change to the timing of construction activities as described in Section 2.4.

Construction activities would continue to be undertaken during the approved construction hours outlined in Condition 1, Schedule 3 of Development Consent DA 374-11-00.

3.2 General Arrangement

A description of the general arrangement of the modified mine is provided in this section. The general arrangements of the other Project components are described in Sections 3.9, 3.10, 3.12 and 3.13.

The following components of the approved mine site would be modified:

- mine infrastructure area components would be relocated to avoid potential resource sterilisation and improve operational efficiency;
- increased tailings storage facility footprint (capacity) to hold increased tailings volume due to the additional limestone required for acid neutralisation;
- reduced evaporation pond facility footprint (capacity) due to the recycling of process water;
- an explosives magazine would be constructed north of the diversion dam; and
- minor alterations would be made to on-site water management infrastructure (e.g. sediment dams, pipelines, diversions) to account for the modified layout and increased water recycle on-site.

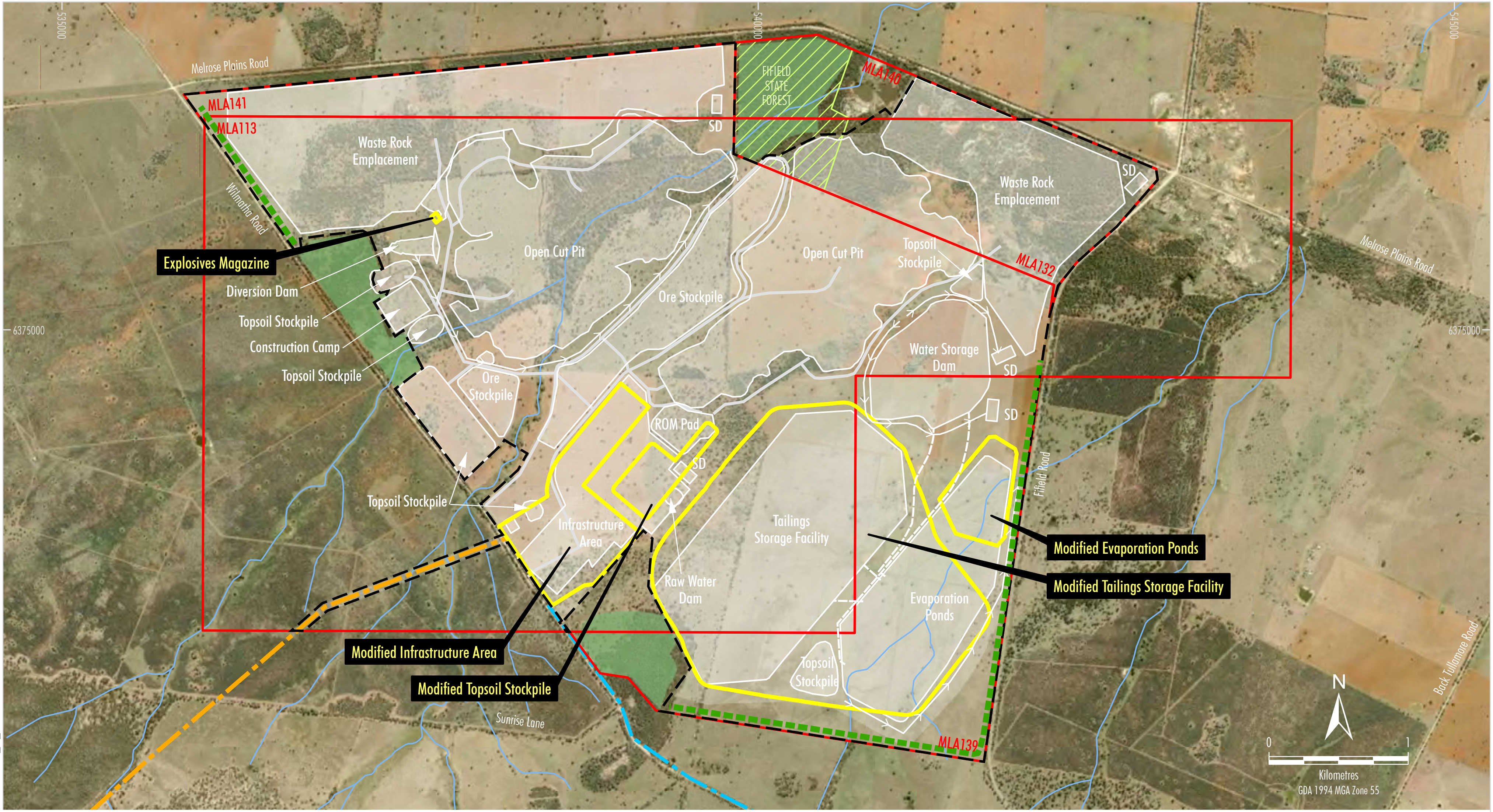
The general arrangement of the modified mine (including the processing facility) is provided on Figure 8. Progressive general arrangements of the modified mine (including the processing facility) are provided on Figures 9 to 12.

In addition to the above, gravel and clay borrow pits would be developed within the waste rock emplacement footprint as well as in the open cut pit and tailings storage facility footprints.

Clean TeQ is considering seeking separate approval for the relocation of the construction camp off the mine site. If the alternative construction camp is approved, the construction camp on the mine site would not be constructed.

3.3 Mineral Resource

The mineral resource developed as part of the Modification would remain unchanged from the approved Project (Section 2.2).



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LEGEND

- State Forest
- Mining Lease Application Boundary
- Approved Surface Development Area
- Approved Mine Footprint
- Diversion Structure
- Key Site Water Pipeline
- Approved Gas Pipeline
- Approved Water Pipeline
- Vegetation Screening
- Existing Open Woodland
- Modified Layout

Source: Black Range Minerals (2005); NSW Department of Industry (2017); NSW Land and Property Information (2017)
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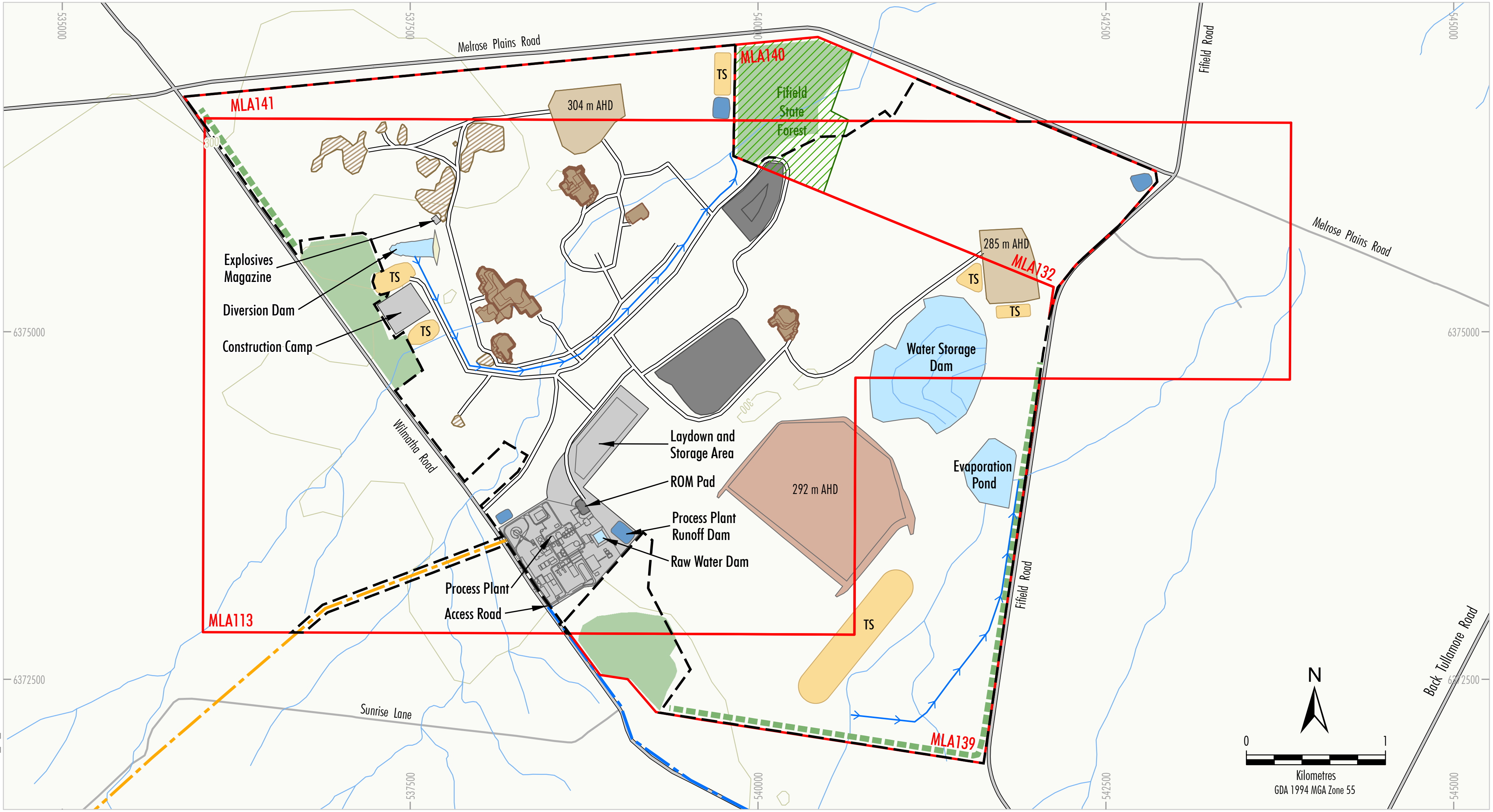
SYERSTON PROJECT MODIFICATION 4

Indicative Modified Mine and Processing Facility General Arrangement

Figure 8



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LEGEND

- Mining Lease Application Boundary
- Approved Surface Development Area
- Open Cut Pit (Scandium Oxide)
- Open Cut Pit
- Waste Rock Emplacement
- Tailings Storage Facility
- TS Topsoil Stockpile
- Ore Stockpile
- Mine Infrastructure Area
- Sediment Dam
- Diversion Structure
- Gas Pipeline
- Water Pipeline
- Vegetation Screening
- Existing Open Woodland to be Maintained
- State Forest

Source: Black Range Minerals (2000); NSW Department of Industry (2017); NSW Land & Property Information (2017)

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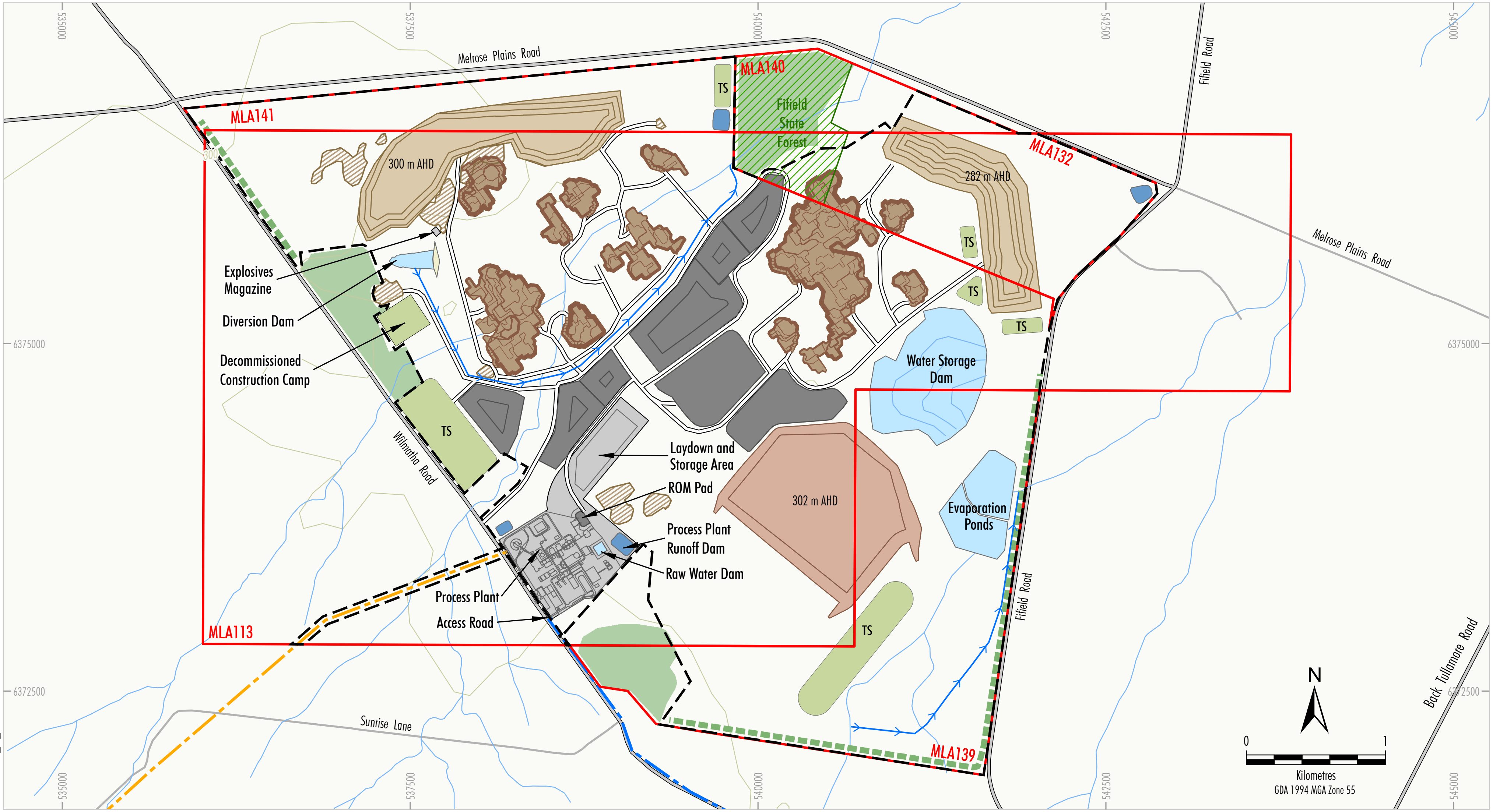
SYERSTON PROJECT MODIFICATION 4

Modified Mine and Processing Facility Conceptual General Arrangement Year 1

Figure 9



LEGEND

- Mining Lease Application Boundary
- Approved Surface Development Area
- Open Cut Pit (Scandium Oxide)
- Open Cut Pit
- Waste Rock Emplacement
- Tailings Storage Facility
- TS Topsoil Stockpile
- Ore Stockpile
- Mine Infrastructure Area
- Sediment Dam
- Initial Rehabilitation
- Diversion Structure
- Gas Pipeline
- Water Pipeline
- Vegetation Screening
- Existing Open Woodland to be Maintained
- State Forest

Source: Black Range Minerals (2000); NSW Department of Industry (2017); NSW Land & Property Information (2017)

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SYERSTON PROJECT MODIFICATION 4

Modified Mine and Processing Facility Conceptual General Arrangement Year 6

Figure 10

LEGEND

- Mining Lease Application Boundary
- Approved Surface Development Area
- Open Cut Pit (Scandium Oxide)
- Open Cut Pit
- Waste Rock Emplacement
- Tailings Storage Facility
- TS Topsoil Stockpile
- Ore Stockpile
- Mine Infrastructure Area
- Sediment Dam
- Initial Rehabilitation
- Intermediate/Advanced Rehabilitation
- Diversion Structure
- Gas Pipeline
- Water Pipeline
- Vegetation Screening
- Existing Open Woodland to be Maintained
- State Forest

Source: Black Range Minerals (2000); NSW Department of Industry (2017); NSW Land & Property Information (2017)

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SYERSTON PROJECT MODIFICATION 4

Modified Mine and Processing Facility Conceptual General Arrangement Year 11

Figure 11

LEGEND

- Mining Lease Application Boundary
- Approved Surface Development Area
- Open Cut Pit (Scandium Oxide)
- Open Cut Pit
- Waste Rock Emplacement
- Tailings Storage Facility
- TS Topsoil Stockpile
- Ore Stockpile
- Mine Infrastructure Area
- Sediment Dam
- Initial Rehabilitation
- Intermediate/Advanced Rehabilitation
- Diversion Structure
- Gas Pipeline
- Water Pipeline
- Vegetation Screening
- Existing Open Woodland to be Maintained
- State Forest

Source: Black Range Minerals (2000); NSW Department of Industry (2017); NSW Land & Property Information (2017)

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SYERSTON PROJECT MODIFICATION 4

Modified Mine and Processing Facility Conceptual General Arrangement Year 21

Figure 12

3.4 Mining Operations

3.4.1 Mining Areas

The mining areas for the modified Project would be unchanged from the approved Project (Section 2.5.1).

3.4.2 Mining Method

The mining method for the modified Project would be unchanged from the approved Project (i.e. conventional open cut mining method). Mining would however be undertaken in a more selective manner to initially increase the processing facility ore feed grade.

In addition, overburden and ore material that is not able to be easily ripped and excavated by mobile equipment would be drilled and blasted as required (Section 3.4.4)

There would also be no change to the approved mining rate (i.e. greater than 2.5 Mtpa, to allow for an autoclave feed rate of 2.5 Mtpa).There would be no change to the operating hours of the mine (i.e. 24 hours per day, seven days per week).

Waste rock management is described in Section 3.5.

3.4.3 Mobile Equipment and Supporting Equipment/Plant

Hydraulic excavators, haul trucks, dozers, graders and front end loaders would be used during mining operations.

An indicative list of the major mobile equipment that would be used for the modified Project is provided in the Noise and Blasting Assessment (Appendix B).

3.4.4 Blasting

It is proposed to drill and blast overburden and ore material that is not able to be efficiently ripped and excavated by mobile equipment. This is expected to occur in deeper parts of the open cut pits where harder siliceous material may be encountered and in the gravel borrow pits.

An ammonium nitrate based emulsion explosive would be used at an average powder factor of approximately 0.23 kilograms per bank cubic metre. Blast sizes would typically be approximately 22,500 bank cubic metres in volume.

Actual numbers of blasts in any week would be dependent on mine production and overburden/ore material properties. It is estimated, however, that an average of three blasts per week would be required when blasting is required. Blasting would only occur during daylight hours.

Prior to each blast an assessment of meteorological conditions (e.g. wind speed and direction) would be made. Blasts would be modified or delayed, where practicable, during unfavourable conditions to minimise the potential for excessive dust or blast fume migration from the site.

Explosives required for the modified Project would include initiating products and detonators, and ammonium nitrate based emulsion explosives. The explosives magazine would be located to the north of the diversion dam (Figures 9 to 12).

The explosives would be handled and used in accordance with Australian Standard (AS) 2187.2-2006 *Explosives – Storage and Use – Use of Explosives*. AS 2187.2-2006 details the requirements for transport, handling and safe storage of explosives.

3.5 Waste Rock Management

There would be no change to the quantities and geochemistry of the waste rock or the waste rock emplacement strategy for the modified Project.

3.6 Processing Facility

3.6.1 Process Description

The processing facility for the modified Project would utilise a RIP circuit for both the Initial Production Phase and Full Production Phase (i.e. the counter current decantation processing option is no longer proposed). The processing facility would therefore include the following stages (Figure 13):

- **Ore preparation circuit** – removal of oversize material and production of an ore slurry suitable for acid leaching;
- **Acid leach circuit** – leaching of nickel, cobalt and scandium from the ore slurry by application of sulphuric acid under high pressure and temperature in an autoclave to produce an autoclave slurry containing acid and soluble nickel and cobalt sulphates;
- **RIP circuit** – a two stage process that first separates scandium and then nickel and cobalt from residue solids (tailings) contained in the autoclave slurry using ion exchange resin;
- **Tailings neutralisation and thickening circuit** – neutralisation of residue solids slurry (tailings) with a limestone slurry prior to thickening and transfer to the tailings storage facility (Section 2.8); and
- **Metals recovery circuit** – recovery of:
  - scandium oxide from the loaded resin by desorption with sodium carbonate followed by precipitation and calcination; and
  - nickel and cobalt sulphates from the loaded resin by desorption with sulphuric acid followed by solvent extraction and precipitation.

The adoption of the RIP processing method would result in the elimination of the ‘Extraction Fan over Sulphide Filter Vent’, ‘Flare Stack’ and ‘Hydrogen Reformer Stack’ emission release points associated with the counter current decantation circuit (Table 3).

The processing facility would operate with an autoclave feed rate of 2.5 Mtpa to produce up to 40,000 tpa of nickel and cobalt metal equivalents, as sulphate precipitate products, and up to 180 tpa of scandium oxide.

As described in Section 3.4.2, the nickel and cobalt grade of the processing facility ore feed would initially be higher than previously assumed for the approved Project due to the proposed more selective mining method.

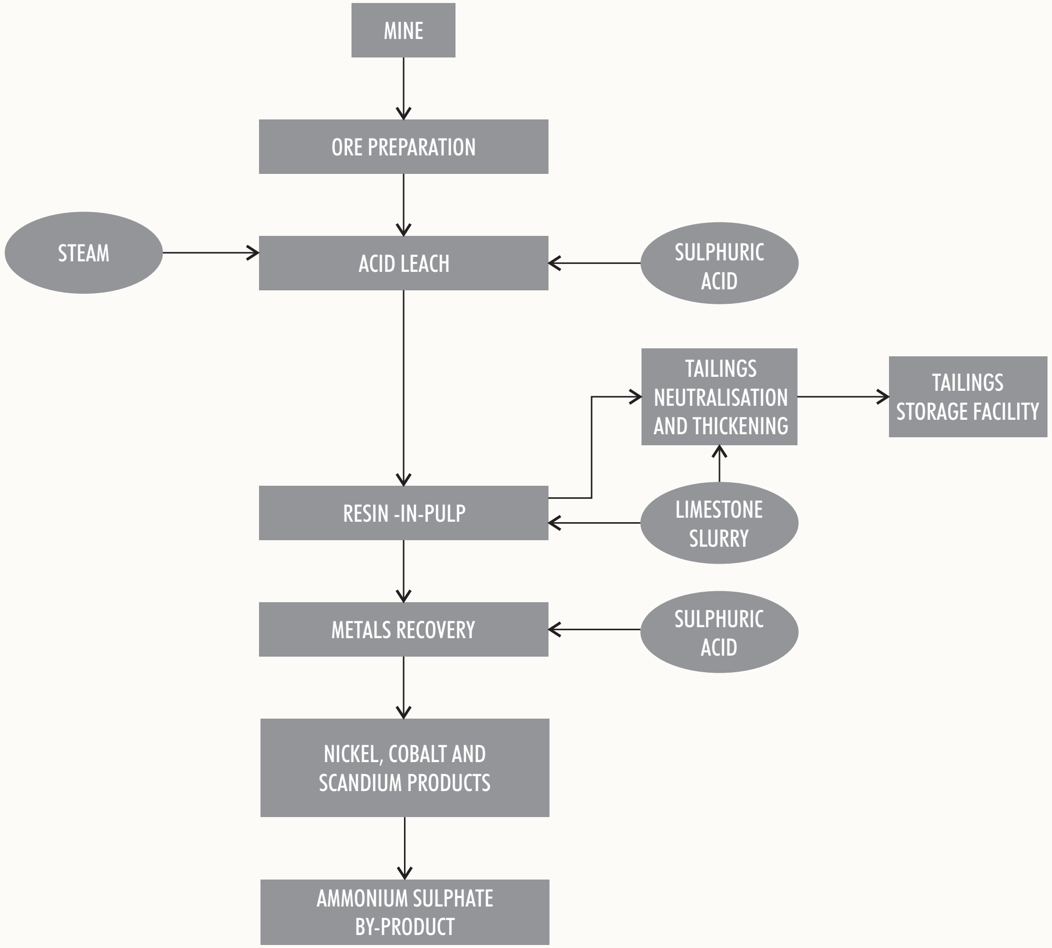
The higher grade in the processing facility feed would require a corresponding increase in sulphuric acid demand in the acid leach circuit from 700,000 tpa to 1,050,000 tpa.

The additional sulphuric acid used in the acid leach circuit would require an increase in limestone demand from 790,000 tpa to up to 990,000 tpa in the tailing neutralisation circuit (Table 3).

A crystalliser would be added to the processing facility to extract ammonium sulphate from an existing waste stream for use as a fertiliser product. Up to 100,000 tpa ammonium sulphate would be produced.

A water treatment plant would also be added to the processing facility to recycle process water and minimise make-up water demand (Section 3.8.4). The water treatment plant would produce a solid waste stream consisting primarily of manganese and magnesium hydroxides. This would be transferred to the tailings storage facility (Section 3.7.1).

A summary of the process inputs, atmospheric emissions and liquid and solid waste streams for the modified processing facility is provided in Table 3.



CTL-16-02 Mod4_EA_005A

Source: Scandium21 (2016)

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Modified Conceptual Ore Processing Flowsheet

Figure 13

Table 3 Summary of Approved and Modified Processing Facility Process Inputs, Process Input Production, Atmospheric Emissions, Liquid Waste Streams and By-product Production

Project Component	Approved Processing Facility [1]	Modified Processing Facility
Process Input Requirements		
Sulphur	260,000 tpa	350,000 tpa
Limestone	790,000 tpa	990,000 tpa
Flocculant	1,100 tpa	820 tpa
Caustic soda	2,300 tpa	330 tpa
Sodium carbonate	10,500 tpa	7,500 tpa
Ammonia	Minor amount	26,000 tpa
Hydrochloric acid	Minor amount	17,000 tpa
Quicklime	Minor amount	40,000 tpa
Sodium metabisulphite	-	5,600 tpa
Formic acid	-	3,400 tpa
Resin, cRIP	Minor amount	720 tpa
Diluent	15,000 Lpa	190,000 Lpa
Extractant	3,000 Lpa	75,000 Lpa
Minor reagents (mill balls, coagulant, oxalic acid, hydrogen peroxide, resin [Sc cLX])	Hydrated lime, mill balls, coagulant, diatomaceous earth, hydrochloric acid	Used in ore preparation, thickening and tailings neutralisation, sulphuric acid plant, RIP circuit and water treatment plant.
Atmospheric Emissions		
Carbon Dioxide	9.35 kg/s	11.1 kg/s
Sulphuric Acid Plant Stack (H_2SO_4, SO_3 and SO_2)	19.2 Nm/s (dry, 273K, 101.3 kPa)	53.2 Nm^3/s (dry, 273K, 101.3 kPa)
Diesel Power Plant (SO_2, NO_2, CO, particulate matter)	Not quantified – start-up only	5.6 Nm^3/s (dry, 273K, 101.3 kPa)
Diesel-fired Auxiliary Boiler (SO_2, NO_2, CO, particulate matter)	Not quantified – start-up only	8.8 Nm^3/s (dry, 273K, 101.3 kPa)
Power Plant HRSG (if utilised) (NO_2 and NO)	18.4 Nm/s (dry, 273K, 101.3 kPa)	No change.
Extraction Fan over Sulphide Filter Vent (H_2S)	5.3 Nm/s (dry, 273K, 101.3 kPa)	-
Flare Stack (H_2S, SO_2, NO_2 and NO)	0.65 Nm/s (dry, 273K, 101.3 kPa)	-
Hydrogen Reformer Stack (NO_2 and NO)	1.42 Nm/s (dry, 273K, 101.3 kPa)	-
Waste Streams		
Liquid Waste Streams	Waste liquid streams associated with tailings neutralisation.	Waste liquid streams associated with tailings neutralisation.
Solid Waste Streams	-	Solid waste stream associated with water treatment plant (primarily magnesium and manganese hydroxide precipitates)
Reagent Production		
Sulphuric Acid	700,000 tpa	1,050,000 tpa
Hydrogen Sulphide	88 tpd	-
Hydrogen	5 tpd	-
By-product Production		
Ammonium sulphate	-	100,000 tpa

1 Maximum of RIP and counter current decantation circuits for the approved Project (refer Table 2).

The conceptual ore processing flowsheet for the modified Project is provided on Figure 13.

There would be no change to the hours of operation of the processing facility (i.e. 24 hours per day, seven days per week).

3.6.2 Reagent Transport

As described in Section 3.6.1, the modified processing facility would have an increased sulphuric acid and limestone demand. This would require an increase in the amount of the following reagents transported to the mine during the Full Production Phase:

- sulphur (increased from 260,000 tpa to 350,000 tpa); and
- limestone (increased from 790,000 tpa to up to 990,000 tpa).

Sulphur would be transported by rail to the rail siding and then by road to the mine site.

Up to approximately 560,000 tpa of limestone from third party suppliers would be used to supplement the limestone quarry supply. This material would have a higher neutralising capacity than limestone from the limestone quarry. The limestone would be transported from external suppliers by road. The combined maximum amount of limestone transported from the limestone quarry and third party suppliers would be 990,000 tpa.

Smaller amounts of other reagents would also continue to be transported to the mine, such as ammonia, quicklime, caustic soda and flocculent.

A summary of the modified process inputs is provided in Table 3.

Condition 42, Schedule 3 of Development Consent DA 374-11-00 requires that no heavy vehicles use The McGrane Way when travelling to or from the Project, unless otherwise agreed by the Secretary. As part of the Modification, it is proposed that heavy vehicles would use The McGrane Way to travel to and from the Project.

There would be no change to the reagent transport requirements during the Initial Production Phase.

3.6.3 On-site Reagent Production

The following reagents would continue to be manufactured at the mine:

- sulphuric acid; and
- lime slurry.

The lime slurry plant would be developed during the Initial Production Phase. The sulphuric acid plant would be developed during the Full Production Phase as the larger scale operation would then justify the manufacture of this reagent.

As described in Section 3.6.1, the amount of sulphuric acid and lime slurry produced would be increased to account for the higher grades in the processing facility feed.

As the RIP processing method would be adopted, the production of hydrogen sulphide, hydrogen and nitrogen would no longer be required.

A summary of the modified reagent production is provided in Table 3.

3.6.4 Product Storage and Transport

Product would continue to be stored in an onsite product storage area for periodic transport from the site.

Nickel and cobalt sulphate precipitates, scandium oxide and ammonium sulphate would be backloaded into sulphur trucks and transported by road to the rail siding for transport by rail.

3.7 Tailings Management

3.7.1 Tailings Storage Facility

The capacity of the tailings storage facility would be increased to hold increased tailings volume due to the additional limestone required for acid neutralisation. To increase the tailings storage facility capacity, the footprint would be increased and the construction methodology would change from upstream to downstream. The final elevation of the tailings storage facility would also slightly increase from approximately 310 metres Australian Height Datum (m AHD) to 314 m AHD.

Other components of the tailings storage facility, such as tailings delivery, underdrainage, seepage collection and decant systems would be generally unchanged. Decant water would however be pumped to the water storage dam rather than the evaporation ponds (Section 3.7.2).

Waste solids from the water treatment plant (Section 3.8.4) would be deposited in the tailings storage facility.

The design (including geotechnical stability) of the modified tailings storage facility would conform to the relevant guidelines and requirements described in Condition 29, Schedule 3 of Development Consent DA 374-11-00. This includes the requirements for permeability of liners, storage capacity and DSC design requirements (Sections 2.8.1 and 2.8.2).

The proposed layout of the modified tailings storage facility and a conceptual cross section through the modified tailings storage facility embankment are provided on Figure 14.

3.7.2 Tailings Storage Facility Water Management

The tailings storage facility would continue to only receive water inflows from the tailings slurry and incident rainfall, as the tailings storage facility would be a ‘turkeys nest’ arrangement with a fully encompassing raised perimeter embankment (Figure 14).

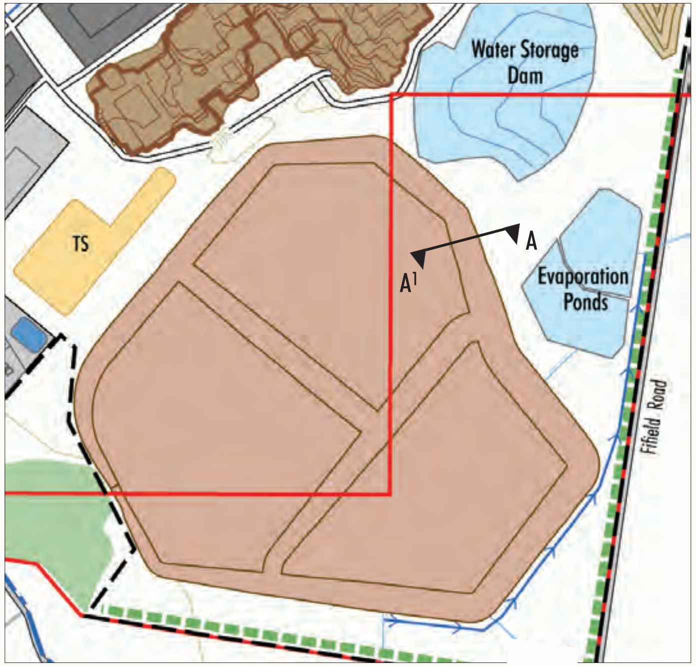
Supernatant waters (including incident rainfall) decanted from the tailings storage cells would be pumped to the water storage dam for reuse in the processing facility. Prior to reuse, a portion of the returned water would be directed to the water treatment plant at the processing facility (Section 3.8.4) for treatment.

An approved liquid waste stream from the processing facility containing high concentrations of chloride would be separated from other processing facility waste streams and pumped to the evaporation ponds. This would prevent the build-up of chloride in the process water as the water in the evaporation ponds would be evaporated rather than be recycled in the site water management system for reuse in the processing facility.

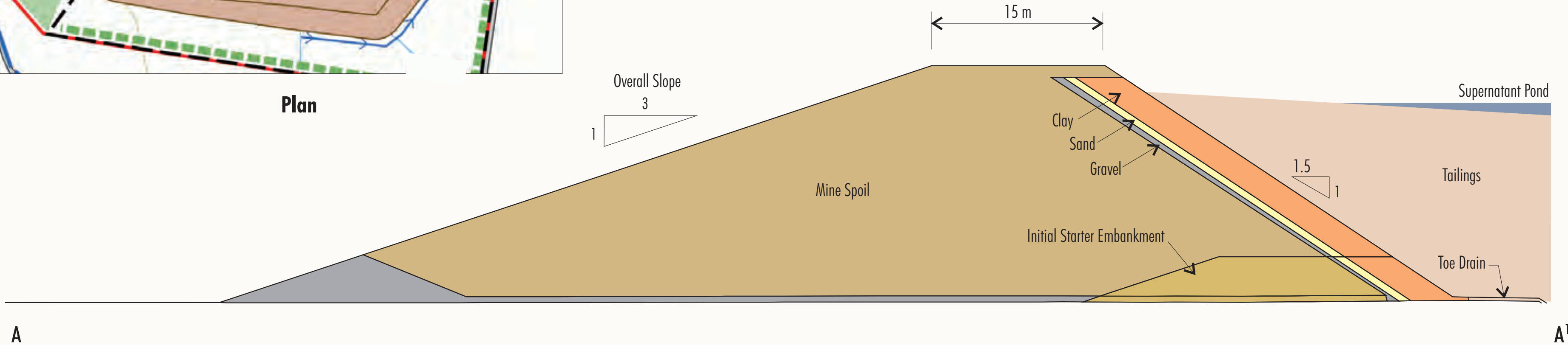
Due to the reduction in water volume reporting to the evaporation ponds, the footprint of the ponds would be reduced (Figure 8).

The tailings storage facility, water storage dam and evaporation ponds would be operated to maintain a freeboard storage in excess of that required to store the volume of runoff generated from a 1 in 100 year ARI rain event of 72 hours duration, in accordance with Condition 29, Schedule 3 of Development Consent DA 374-11-00. The decant system will be designed to remove stored water so that capacity to store a 1 in 100 year ARI rain event of 72 hours duration rain event within five days of the event occurring.

In accordance with Condition 29, Schedule 3 of Development Consent DA 374-11-00, the floor and side walls of the evaporation ponds and water storage dam would be designed to the same standard as the tailings storage facility (Section 3.7.1).



Plan



Conceptual Cross Section
Through Tailings Storage Facility Embankment

Not to Scale

CTL-16-02 Mod4_EA_006B

Source: Clean TeQ (2017)

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Modified Tailings Storage Facility Embankment Details and Conceptual Storage Cross Section

Figure 14

3.8 Mine Water Management

3.8.1 Water Demand

The main water demand (usage) for the mine site would continue to be the processing facility. Water would also continue to be required for dust suppression, cooling water and potable and non-potable uses in the mine infrastructure area.

The water treatment plant (Section 3.8.4) would reduce the estimated water demand requirements for the processing facility and increase the volumes of water returned from the tailings storage facility.

A breakdown of the revised water demand requirements is provided below.

Processing Facility

With the implementation of the water treatment plant, raw water requirements for the processing facility are expected to decrease from approximately 17.5 ML/day to approximately 8.1 ML/day, or approximately 2,960 ML/year (Appendix D).

Dust Suppression

The estimated water demand for dust control on haul roads within controlled catchments at the mine site is approximately 0.48 ML/day, or on an annualised basis, 175 ML/year.

3.8.2 Water Supply

Water for the mine site would be supplied from a number of sources during the life of the Project, including:

- internal runoff collection at the mine site (including harvestable rights);
- mine dewatering (in-pit and advance);
- return water from the tailings storage facility;
- the borefields; and
- surface water extraction from the Lachlan River.

Water would continue to be sourced primarily from the borefields (e.g. in accordance with existing WAL 32068). During construction and prior to commissioning of the water pipeline, water would be transported from the borefields to the mine site by road (Section 3.9.3).

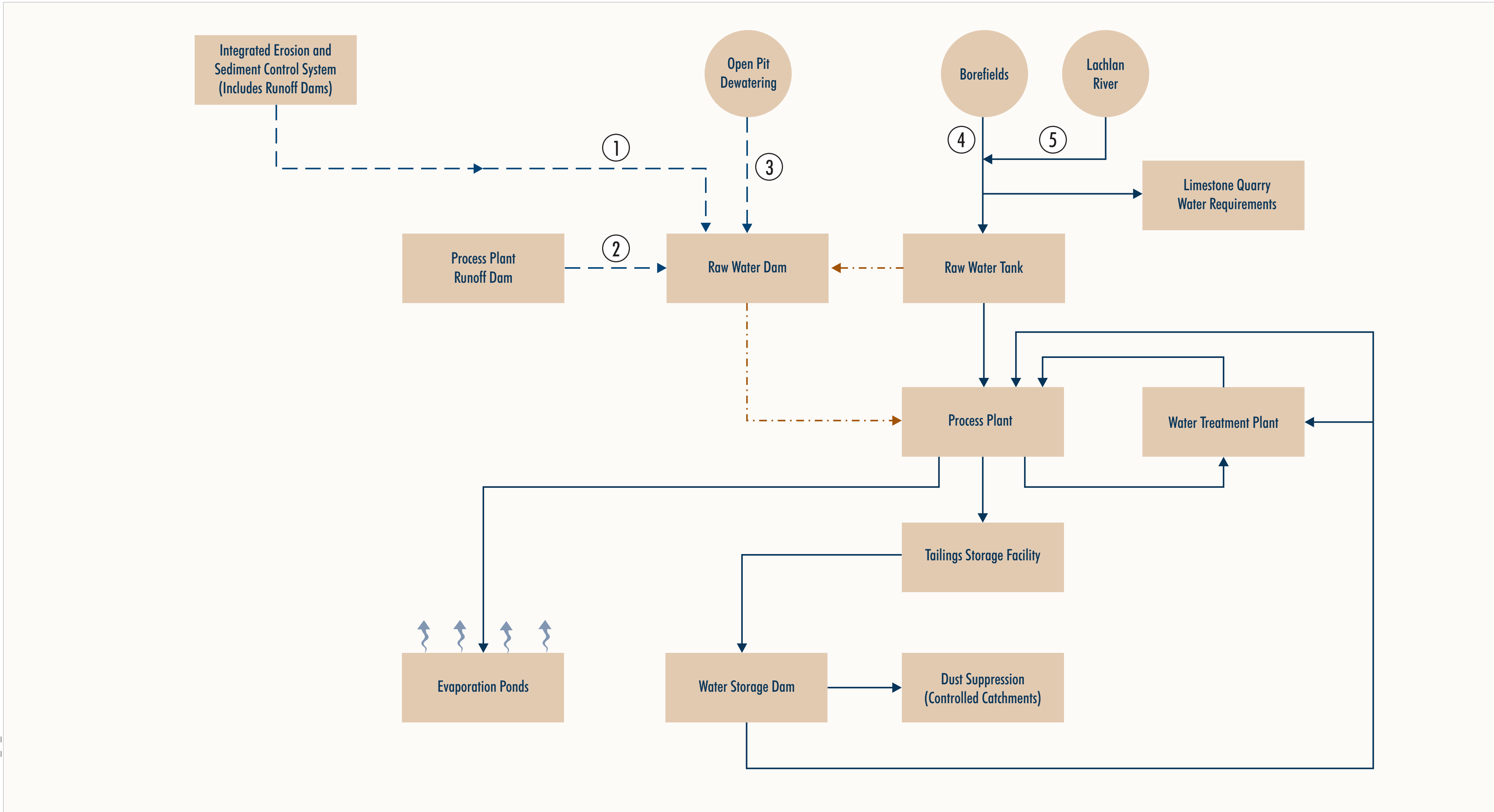
To improve the water supply security of the Project, water extracted from the borefields would be supplemented by licensed surface water extraction from the Lachlan River which is regulated by upstream releases from Wyangala Dam (Section 3.9.2).

In accordance with Condition 26, Schedule 3 of Development Consent DA 374-11-00, Clean TeQ would ensure that sufficient water is supplied for all stages of the development, and obtain the necessary water licences for the development under the *Water Management Act, 2000*, and if necessary, adjust the scale of development on-site to match its available water supply.

The modified water supply scheme layout is shown on Figure 15.

Mine Dewatering

In-pit dewatering is expected to be negligible over the life of the Project as only the deepest area of the open cut pits is predicted to intercept groundwater (Appendix D).



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LEGEND

① Water Supply Priority

Intermittent Flow Path (rainfall dependent)

Alternative Flow Path

Evaporation

Source: Golder Associates (2017)

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Modified Water Supply Schematic

Figure 15

The predicted pit inflows during the short-term period of mining that intercepts the groundwater table is estimated to be up to approximately 0.07 ML/year in the first year of interception of the groundwater table and would reduce in the long-term to be generally less than 0.002 litres per second (L/s) (Appendix D). Sensitivity analysis (Appendix D) indicates that there is however potential for pit inflows to range up to 0.15 ML/year (in the short term).

Advance dewatering may also occur on a temporary basis in areas in the vicinity of potential groundwater interception to reduce peaks and regulate pit inflows.

Groundwater extracted by mine dewatering (in-pit and advance) from the open cut pit (and immediate surrounds) is located in the Lachlan Fold Belt Murray-Darling Basin Groundwater Source administered by the *Water Sharing Plan for the NSW Murray-Darling Basin (MDB) Fractured Rock Groundwater Sources* under the *Water Management Act, 2000*.

Clean TeQ currently holds 243 share components (currently equivalent to 243 ML/year) in the corresponding Lachlan Fold Belt Murray-Darling Basin Groundwater Source.

Internal Runoff Collection (including Harvestable Rights)

None of the main water storages proposed on-site (i.e. tailings storage facility, water storage dam, or evaporation ponds) would be used to harvest runoff from land as these storages would be used to contain mine water or effluent in accordance with best management practice (Appendix D).

A number of runoff-harvesting and in-stream (farm) dams exist on-site and in the nearby surrounding lands owned by Clean TeQ. Based on the ownership of contiguous lands at the mine site, the maximum harvestable right dam capacity is equal to approximately 105 million litres (ML) (Appendix D). Where the opportunities arise, run-off harvested on-site would be used for the Project.

Water collected from the disturbance footprint (e.g. internal haul roads and waste rock emplacements) would be temporarily contained in sediment basins. Where opportunities arise water would be recycled for dust suppression or use in the processing facility, or otherwise released in accordance with the requirements of an Environment Protection Licence (EPL) issued under Part 3 of the *Protection of the Environment Operations Act, 1997* (POEO Act) by the EPA.

Return Water from the Tailings Storage Facility

All tailings generated in the processing facility would be pumped to and stored in the tailings storage facility.

The tailings slurry would be deposited through a series of spigots located at the perimeter of the cells and a decant pond would be maintained in the centre of each cell. Decant water would be piped to the water storage dam for reuse in the processing facility.

The density of settled tailings has been used based on the results of settling tests (Appendix D), with a maximum dry density of the tailings when dewatered and compacted of approximately 1.8 tonnes per cubic metre.

A GoldSim water balance model has been used by Golder Associates Pty Ltd (Golder Associates) (Appendix D) to simulate the volumetric reliability of water supply from the tailings storage facility return water (including that stored in the water storage dam). The analysis was undertaken for three (3) rainfall scenarios based on the SILO rainfall data record:

- **dry** (cumulative driest sequential 20 years or rainfall data);
- **average** (average sequential 20 years of rainfall data); and
- **wet** (wettest sequential 20 years of rainfall data).

The modelling results indicate that in all scenarios (and with the exception of the short start-up period), the recycled water supply (direct and treated) was able to reliably supply approximately 4 ML/day, or on an annualised basis, 1,451 ML/year.

Borefields

The borefields (Section 3.9.1) would extract groundwater from within Zone 5 of the Upper Lachlan Alluvial Groundwater Source which is administered by the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources, 2012* under the *Water Management Act, 2000*.

Groundwater investigations and supply feasibility assessments by Coffey Geosciences (2000) indicated that the borefields could maintain a supply of up to approximately 17 ML/day (6,300 ML/year) for a 30 year period (subject to obtaining relevant WALs).

Clean TeQ currently holds 3,154 share components (currently equivalent to 3,154 ML/year) in the corresponding Upper Lachlan Alluvial Groundwater Source.

Lachlan River Surface Water Extraction

To increase water supply security for the Project, Clean TeQ would seek to purchase volumetric allocations from the Lachlan River to allow for licensed surface water extraction and conveyance via the adjacent water pipeline to the mine site.

For the purposes of assessment, Clean TeQ is seeking approval for up to approximately 350 ML/year surface water extraction from the Lachlan River. When compared to the total share components of general security access licences traded since 1 July 2016, this is less than 1% based on an Available Water Determination (AWD) of 1. If the volume per unit of access licence share component was as low as 0.02 (based on previous AWD orders), then this volume would be approximately half of the total volumetric allocation of general security access licences traded since 1 July 2016, and is unlikely to be available to Clean TeQ on the trading market, and consequently groundwater use in accordance with the existing (and/or future) WAL would be preferentially utilised for make-up raw water supply during such times

It is however noted, that if opportunities were to arise (e.g. during wet climate scenarios) to obtain additional access licences for surface water extraction beyond 350 ML/year, Clean TeQ would obtain the necessary water licences in accordance with Condition 26, Schedule 3 of Development Consent DA 374-11-00. This would have a potential additional benefit to then reduce the volumetric allocations required to be obtained in the Upper Lachlan Alluvial Groundwater Source.

An application would therefore be made by Clean TeQ for a new specific purpose WAL or zero share component WAL (for subsequent trading of water on the open market). Further details, including the availability of water on the trading market in the Lachlan River Regulated River Source, are provided in Section 4.8.1.

More detail on the surface water extraction infrastructure is provided in Section 3.9.2.

3.8.3 Site Water Management

The site water management system for the modified Project would be generally unchanged. The southern diversion alignment would be revised to reflect the modified tailings storage facility and evaporation ponds (Figures 9 to 12).

3.8.4 Water Treatment Plant

The water treatment plant would allow greater volumes of process water to be recycled and re-used in the processing facility.

Process water would first be treated in a high-density sludge (HDS) process to remove magnesium and manganese. This would involve using lime to raise the pH sufficiently to precipitate magnesium and manganese. The precipitate solids would be concentrated in a thickener and transferred to the tailings storage facility.

Process water treated in the HDS process would then be advanced to an ammonia membrane. The microporous membrane uses sulphuric acid to strip gaseous ammonia from the process water. This creates a by-product of ammonium sulphate which would be combined with the ammonium sulphate produced elsewhere in the processing facility (Section 3.6.1).

Finally, the process water proceeds to an ion exchange process, which uses two circuits to remove calcium, magnesium, sulphate and other impurities from the process water via a resin. The resin would be washed with sulphuric acid and lime respectively for each circuit and recycled back to the start of the ion exchange process. The wash liquors would be recycled back to the HDS process, eliminating any waste streams.

The treated process water would then be transferred to the processing facility to supplement the raw water supply.

3.9 Borefields and Water Pipeline

3.9.1 Borefields

There would be no change to the location of the existing/approved bores in the borefields for the modified Project. However, the transfer station location would be relocated approximately 300 m to the north-west. The relocation of the transfer station would require the realignment of the associated borefield infrastructure corridor, transfer station access road and water pipeline.

The layout of the modified transfer station once the water pipeline has been commissioned is shown on Figure 16.

3.9.2 Surface Water Extraction from the Lachlan River

To improve the water supply security of the Project, it is proposed to diversify supply sources by including licensed extraction of surface water from the Lachlan River which is regulated by upstream releases from Wyangala Dam.

A pump station would be constructed near the Lachlan River to extract surface water and pump it to the borefield transfer station for transfer to the mine site. The pump station would be connected to the transfer station via a surface water infrastructure corridor that would include a linking pipeline (underground), access road and electricity transmission line. The pump station and surface water infrastructure corridor are collectively known as the surface water extraction infrastructure.

The pump station at the Lachlan River and all associated infrastructure would be constructed to be at an elevation higher than the 1 in 25 year flood event (Golder Associates, 2017a).

The indicative location of the surface water extraction infrastructure is shown on Figures 16 and 17. The conceptual design of the pump station is shown on Figure 18.

Construction of the pump station would necessitate clearance of understorey and groundcover within River Red Gum Woodland adjacent to the Lachlan River. The proposed pump station has been sited specifically in a location where no mature River Red Gums (i.e. trees old enough to flower) would be cleared. The alignment of the surface water extraction infrastructure corridor would be finalised during detailed design of the Project, however it would not involve the disturbance of any mature River Red Gums (Section 4.12.2).

Relevant water licences to allow for the extraction of surface water from the Lachlan River would be obtained, as described in Section 3.8.2.

3.9.3 Water Supply Prior to the Pipeline Commissioning

During construction and prior to the commissioning of the water pipeline (approximately 6 months), water would be transported from the borefields to the mine site by road.