Chapter 7

Operation

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Figures

7. OPERATION

7.1 Introduction

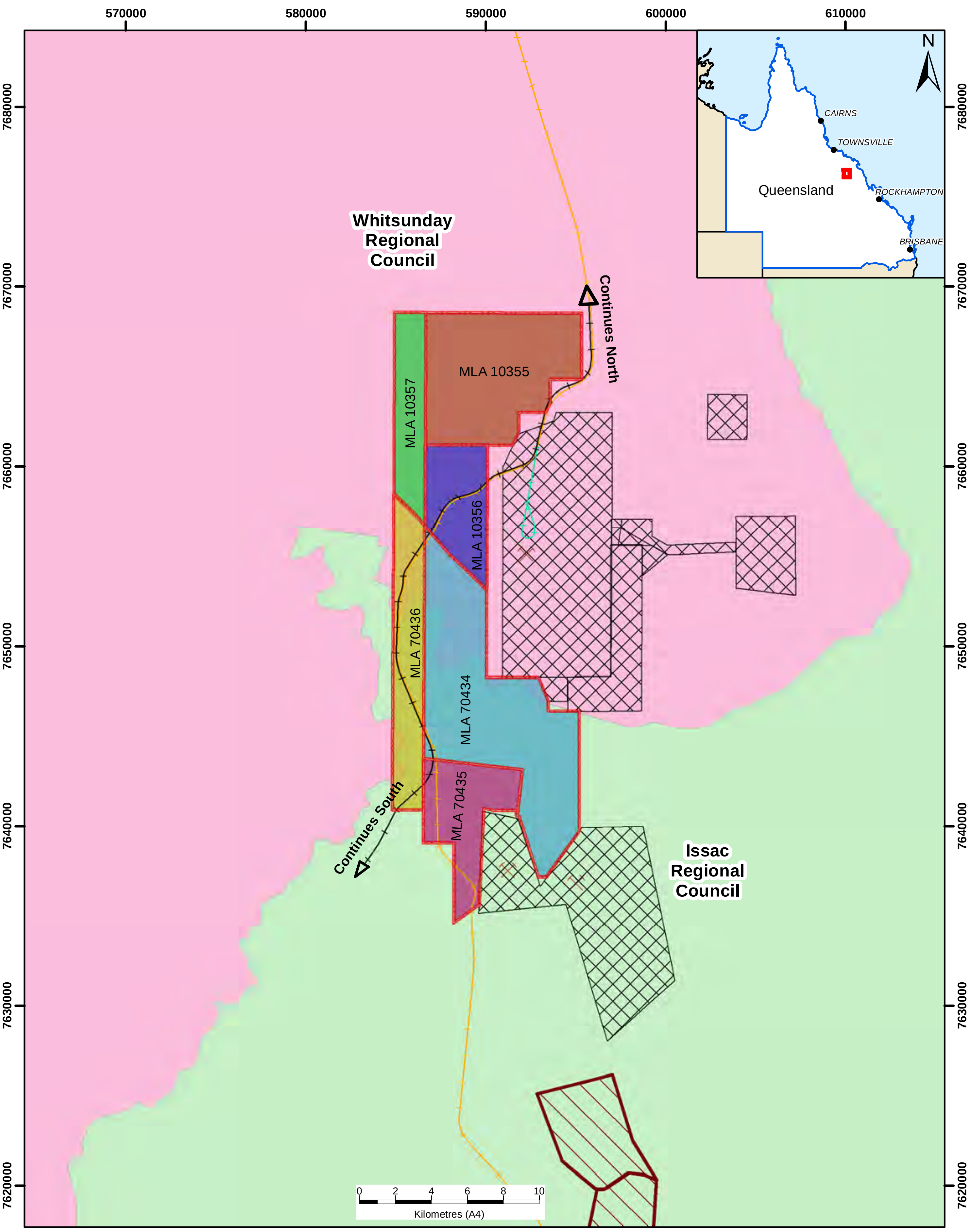
This chapter describes the operation of the project's coal mines, including the timing of operations, operational area, open pit excavations, waste rock management, reject's management, operation of mining infrastructure and the operations workforce.

7.2 Tenements

7.2.1 QCoal's and Byerwen Coal's Tenements

The project area consists of six mining leases applications (MLAs), MLA 10355, MLA 10356, MLA 10357, MLA 70434, MLA 70435 and MLA 70436. The proponent holds the two underlying exploration permit for coal (EPC) tenements in the project area, EPC 614 and EPC 739. The project area covers a portion of the two underlying EPCs.

Figure 7-1 shows the proponent's tenements as relevant to the project and surrounding mining leases of other projects. QCoal and its subsidiaries (including Byerwen Coal Pty Ltd) are the holders of other mining tenements in Queensland, which are shown on **Figure 7-2**.



Legend

- Byerwen Project Mining Lease Boundaries
- Issac Regional Council
- Whitsunday Regional Council
- BHP Granted MLs
- Xstrata Granted MLs
- Alpha Coal Project Rail Line
- GAP Rail line
- Newlands Mine Rail Loop

Project Tenements		
Figure 7-1	**Byerwen Coal Project**	
Date: *25/01/2013*	**Author:** samuel.ferguson	
	Map Scale: 1:275,000	
Revision: R1	**Coordinate System:** GDA 1994 MGA Zone 55	
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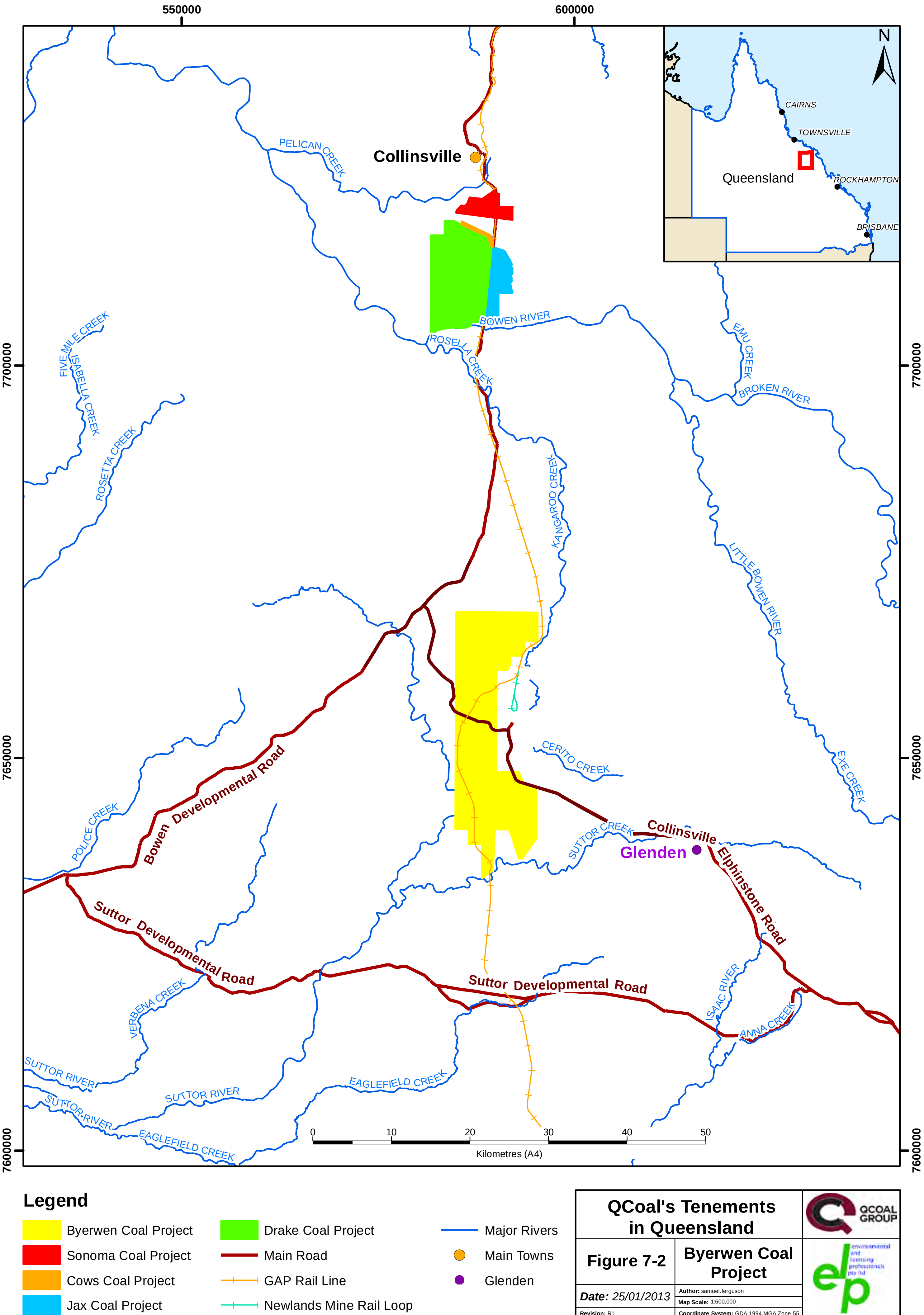

QCoal's Tenements in Queensland	
Figure 7-2	Byerwen Coal Project
Date: 25/01/2013	Author: samuel.ferguson
	Map Scale: 1:600,000
Revision: R1	Coordinate System: GDA 1994 MGA Zone 55
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7.3 Resource Base and Mine Life

The proponent is seeking 50 year mining leases (two years for construction, 45 to 46 years of operation and 2 to 3 years for decommissioning and rehabilitation) for the extraction of the coal resource at a rate of approximately 15 million tonnes per annum (Mtpa) ROM coal. From commencement, the project will ramp up production to achieve an average of 15 Mtpa ROM coal.

Exploration by QCoal in the northern Bowen Basin over recent years has resulted in the delineation of a significant coal resource of approximately 690 Mt ROM coal within the project area. It is proposed that the mine will produce approximately 10 million tonnes per annum of product coal for the export market over the 46 year operational mine life. Production from the project will primarily be high quality coking coal with some thermal coal.

The project area is situated in the north Bowen Basin. The resource includes coal within the Moranbah and Rangal Coal Measures. The Moranbah Coal Measures represent the main stratigraphic unit of interest in the project area, and contain up to seven persistent coal seams. The Moranbah Coal Measures are approximately 290 m thick in the project area and strike north-south, dipping to the east at between 4^{o} and 12^{o}. The principal seams of economic interest are the Goonyella Lower (6-8 m thick), Goonyella Middle (6-10 m), and P Rider (2-4.5 m) seams. The main seam of interest in the Rangal Coal Measures is the Leichhardt seam, a correlative of the Upper Newlands seam which averages 6.5 m thick in the neighbouring Xstrata Coal Newlands Mine and 4.5 m thick in Xstrata Coal Suttor Creek Mine. **Table 7-1** provides a summary of the stratigraphy in the project area.

Table 7-1 Stratigraphy of the Byerwen area

Age	Group	Formation	Thickness
Tertiary		Suttor Formation	
Triassic	Rewan Group	Arcadia Formation Sagittarius Sandstone	230m 280m
Late Permian	Blackwater Group	Rangal Coal Measures Fort Cooper Coal Measures Moranbah Coal Measures	60m 400m 290m
Early Permian	Back Creek Group	Exmoor Formation Blenheim Formation Gebbie Formation Tiverton Formation	85m

Based on analysis of the raw coal to be extracted and processed at the project, the following three products may be marketed:

- washed coking coal
- washed thermal coal
- potential to produce and market a crushed raw coal.

7.3.1 Ongoing Evaluation and Exploration Activities

The proponent has additional exploration areas immediately adjacent to the project area and exploration activity will be ongoing during the life of the project. These exploration activities do not form part of the project described in the EIS.

7.3.2 Gas in the Coal Seams

Initial investigations indicate that there is insufficient gas (predominately methane) in the coal seams to warrant economic recovery for use on the mine site.

7.3.3 Sterilisation of Resources

Infrastructure has been located on the mining lease in areas where it is uneconomic to recover coal and hence will not result in sterilisation of economic coal reserves. It is unlikely that economic reserves of coal seam gas exist in the project tenements. As of January 2013, there were no petroleum lease applications or petroleum leases overlapping the project tenements.

7.4 Mine Sequencing, Methods and Equipment

7.4.1 Mine Planning

At the commencement of conceptual design for the project, an underground mine in the northern tenement area was under consideration. Accordingly the possibility of an underground mine was included in the initial advice statement (IAS) for the project and was subsequently included in the project's ToR and referral under the *EPBC Act*. Following further subsequent mine planning, the proponent has decided that underground mining will not form part of the project. Impact assessments therefore do not do not consider underground mining.

7.4.2 Overview

The mining schedule is based on taking advantage of the area of shallowest depth from surface to top of coal and orienting the mining such that it advances progressively deeper along the coal seam wherever possible. The open cuts will become deeper as mining progresses to the east. The maximum depth below surface level of the open cuts will vary between 140 m in East Pit 2 and 35 0m in South Pit 1.

The mine plan was developed to optimise production based on the geological conditions and overall strike length of the potential mine. Open cut methods were selected to ensure maximum recovery of the coal resources within the project mining leases.

Four mining zones have been identified for the project, comprising eight open pits. The tenement area in which the zones are located and the pits within in each zone are described in **Table 7-2**.

Table 7-2 Mining Zones and Pits

Tenement area	Zone	Open pit
Southern	South	South Pit 1
		South Pit 2
	East	East Pit 1
		East Pit 2
	West	West Pit 1
		West Pit 2
		West Pit 3
Northern	North	North Pit

The proposed mine layout and sequencing of open pit operations is shown in **Figure 7-3**.

The east zone targets coal seams in the Rangal Coal Measures. The south, west and north zones focus on the seams in the Moranbah Coal Measures. The southern and northern tenement areas are split by the rail alignment of the Goonyella to Abbott Point (GAP) rail line resulting in some sterilisation of coal resources under the existing railway easement.

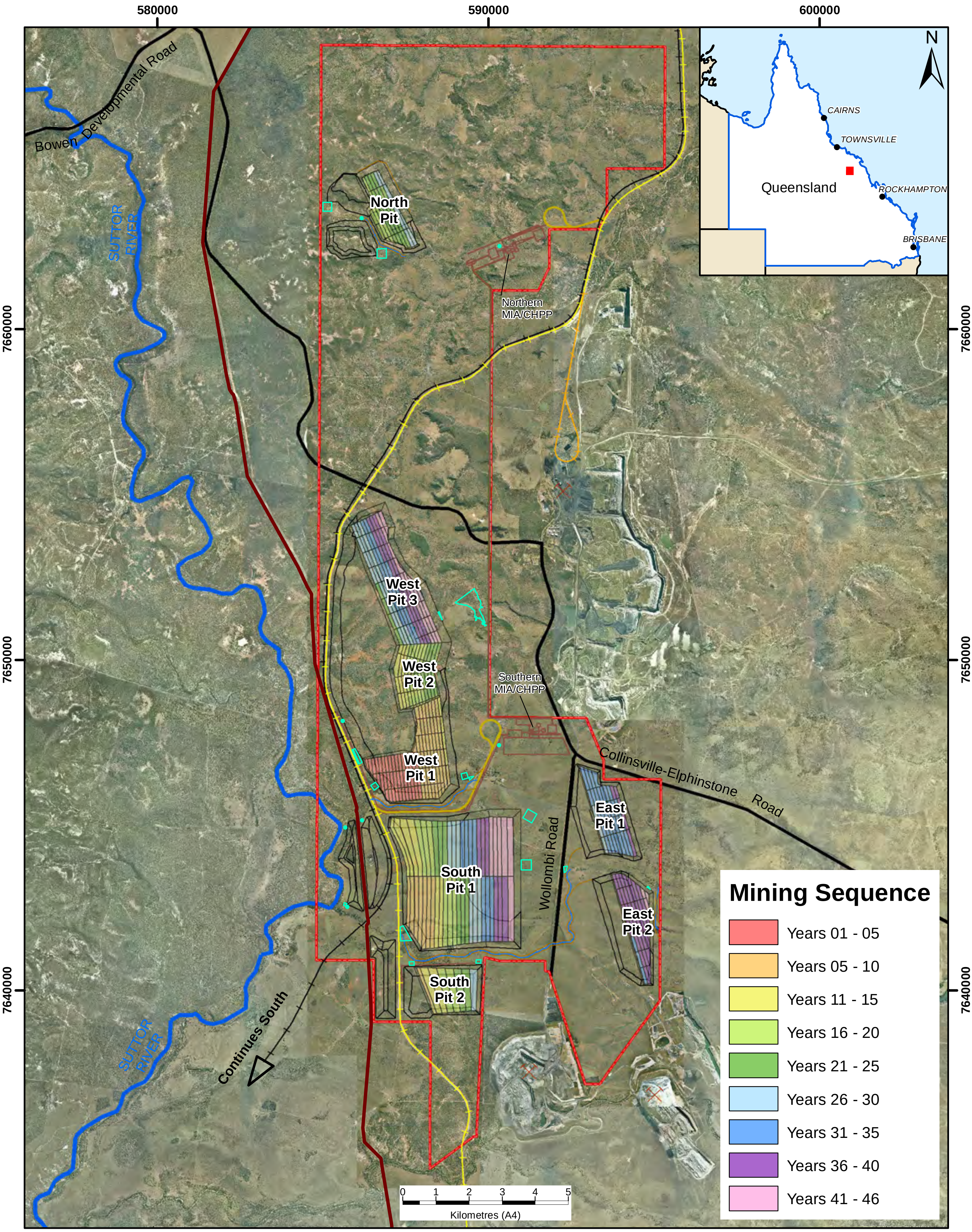
Mining will commence in the southern tenement area (West Pit 1), adjacent to initial infrastructure, to allow for the staged ramp up of production to planned capacities. Given the extended strike length of the project area it was decided to split the coal washing capacity between two CHPPs, one in the northern tenement area and the other in the southern tenement area.

There will be two train loading facilities (TLFs), one in the northern tenement area and the other in the southern tenement area. These TLFs will be located adjacent to the CHPPs and each will have its own associated rail loop and rail spur linking to the GAP rail line.

A mining schedule was developed that exploited the low strip ratio areas whilst maintaining a sustainable dumping operation. The developed mining sequence considered the progressive mining of the shallower, less intruded coal and increasing overall strike length to optimise equipment performance. Initial mining focuses on the lowermost Moranbah Coal Measure seams.

Production from the north phase is expected to commence later in the project life (from approximately year 16 onwards) to allow balancing of coal flow from open cut sources and to maximise CHPP production.

Mining activities are proposed on a 7 days per week, 24 hour per day basis. CHPP and reject disposal systems are proposed to be built on the project area. The proposed production plan is based on a number of similar mine operations already operating within the Bowen Basin. As such, design and technology risk is considered low.



Legend

- Project Area
- Waste Rock Dumps and Pits
- Burdekin to Moranbah Pipeline
- Existing Mine Site
- GAP Rail line
- Newlands Mine Rail Loop
- Alpha Coal Project Rail Line
- Train Loading Facilities
- Central Infrastructure Corridor
- Dam (mine affected, sediment affected, clean water)
- Suttor River
- Drainage Bund
- Drainage Diversion
- Formed Road
- Mine Infrastructure

Proposed Mine Layout and Sequencing

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Figure 7-3

Byerwen Coal Project

Date: *28/02/2013*

Author: samuel.ferguson

Map Scale: 1:150,000

Revision: R1

Coordinate System: GDA 1994 MGA Zone 55

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7.4.3 Scheduling

Subject to statutory approvals, soil removal from open pit areas is scheduled to commence in early 2014 and the first shipment of product coal is scheduled in 2016. Construction of mine facilities will commence immediately after grant of the mining leases. Mining is to commence on the mining leases as soon as construction of the mine facilities has been completed.

The years of mining for each of the open pits are provided in **Table 7-3**.

Table 7-3 Mining Schedule for Open Pits

Open pit	Years of mining
South Pit 1	6 - 46
South Pit 2	6 - 30
East Pit 1	26 - 40
East Pit 2	31 - 46
West Pit 1	1 - 15
West Pit 2	11 - 25
West Pit 3	21 - 46
North Pit	16 - 30

Within each Pit, a logical sequence of extraction of the mine blocks has been determined to ensure the deposit is fully extracted enabling all activities of mining to be carried out without impeding others and that in pit waste dumping can be made sustainable.

Mining will commence in West Pit 1, adjacent to the southern CHPP, to minimise initial ROM coal haul distances. The initial box cut will be in West Pit 1 to establish access to low strip ratio, high quality seams of the Moranbah Coal Measures. Development will then proceed to South Pit 1 and South Pit 2 along strike and down dip. Additional pits will then be established to exploit other coal seams and provide blending coal to allow the production of a range of product specifications.

The project area is split by the corridor created by the GAP rail line. As a consequence a portion of the overall coal resource has previously been sterilised and it is not possible to mine the Moranbah Coal Measures sequence as a continuous pit. The mine plan has established a pit to the north, which will be serviced by the northern CHPP plant adjacent to the northern train loading facility.

7.4.4 Open Cut Mining

The open cuts will become deeper as mining progresses. The maximum depth of the open cut will be approximately 350 m below surface in South Pit 1.

The open pits are shown in **Figure 7-3**. The maximum extent of these open pits, the approximate maximum depth below surface at which coal seams are located and the year in which the maximum extent is reached is provided in **Table 7-4**.

Table 7-4 Maximum Open Pit Extent

Pit name	Extent (ha)	Maximum depth of coal (m)	Year of maximum extent
South Pit 1	1,489	350	41 - 46
South Pit 2	258	230	26 - 30
East Pit 1	282	140	36 - 40
East Pit 2	255	140	41 - 46
West Pit 1	549	270	11 - 15
West Pit 2	299	280	21 - 25
West Pit 3	601	280	41 - 46
North Pit	286	220	26 - 30

The broad mining methodology for each open pit is:

- vegetation clearing (where required)
- soil stripping and storage or direct spreading
- blasting of the waste rock (where required)
- removal of waste rock by truck, excavator and drag line in box-cuts, creating new mining strips and filling in old/previously mined voids
- possible blasting of coal and the excavation of ROM coal by excavator and/or drag line
- hauling of ROM coal to the ROM pad by off-road trucks and then to the CHPPs for washing and processing and train load out
- final landform re-profiling, topsoiling and revegetation activities by earthmoving equipment.

The open cut mining process involves stripping surface soils, weathered and fresh waste rock and extracting coal quantities to meet coal production requirements. Other activities, including drilling and blasting, production dozing and ripping and pushing of thin coal seams, are scheduled to allow an orderly progression from one activity to the next to achieve a required ROM coal production.

The initial boxcut will be developed utilising a ramp formed in the low wall of West Pit 1. It is proposed that most of the waste rock will be dumped to the north west of the pit for the initial 2 strips and then be dumped in-pit for the remaining strips. The waste rock is a mix of Tertiary basalts, sediments and fresh Permian material with a proportion of weathered material near the surface. Some of the weathered sandstones and fresh sandstones will be used for concurrent civil works and construction of haul roads.

Initial out-of-pit dumping is required as the boxcuts are developed. Out of pit dumps will be up to 60 m high. The pit depths along the subcrop are very shallow allowing coal to be mined and in-pit dumping to commence early in the operation. Once in-pit dumping commences, the in-pit dumps will merge with out of pit dumps and contain all of the subsequent waste material at elevation height of up to 60 m above the initial topography.

7.4.5 Open Cut Mining Equipment

Based on annual coal and waste rock removal requirements and the application of truck haul cycles, the plant fleets and suitable work rosters were identified and annual fleet productivities were estimated.

Fleet requirements have also been identified for land clearing, water management structure construction, soil removal, drilling and blasting, and rehabilitation.

The proposed open cut mining method involves a dragline and large truck and excavator mining operation with truck haulage direct to the crusher dump hopper or the ROM pad adjacent to the CHPPs. A single dragline is proposed and it is estimated that it will commence operations between Year 5 and Year 8.

The open cuts require mobilisation of a mining fleet comprising large excavators supported by smaller excavators. The large excavators will be used to remove the bulk of the waste rock. The smaller machines are required to effectively remove thin interburden and partings to minimise coal dilution and are also used to load coal.

Based on the life of mine plan, it is proposed that the open cut equipment list detailed in **Table 7-5** will provide ample capacity to supply sufficient coal to meet planned output levels.

Table 7-5 Proposed Schedule of Open Cut Mine Equipment

Mine activity	Indicative mine equipment	
	Item	Number
Excavate, Load & Haul	Dragline	1
	500T class excavator	3 - 8
	350T class excavator	1 - 4
	240T off highway haul trucks	24 - 45
	180T off highway haul trucks	6 - 20
	Caterpillar D10T tracked dozer	3 - 8
Stockpiling (waste rock)	Caterpillar D11T tracked dozer	3 - 8
	Caterpillar 994 wheeled dozer	1 - 3
Road maintenance	Caterpillar 16M Grader	3 - 5
	100T off highway water truck	3 - 5
Ancillary equipment	40T excavator	2
	Service trucks	3 - 5

7.4.6 Waste Rock and ROM Coal Production

Waste rock is scheduled to be placed back into each pit from approximately year three of the commencement of operations of that pit. Waste rock will be dumped in-pit once the initial mining strips are established, however out of pit dumping will continue sporadically over the life of mine. During the initial years of pit operations, waste rock will either be trucked or crushed (in-pit) and conveyed to out of pit dumps located to the west of the pit operations. In-pit crushing and conveying may only occur when waste rock is required to cross the GAP rail line and potentially the proposed Alpha Coal Project rail line to reach the out of pit waste rock dump.

There will be a single out of pit dump for waste rock from West Pit 1, West Pit 2 and West Pit 3, which will merge with the in pit dump to create a final landform approximately 60 m above the natural ground level.

There will be two out of pit waste rock dumps for South Pit 1, which are separated by an existing infrastructure corridor for SunWater's Burdekin to Moranbah pipeline system. Both waste rock dumps are separated from the open pit by the GAP rail line and potentially the proposed Alpha Coal Project rail line and hence waste rock will either be trucked, using suitably engineered bridges, or crushed and conveyed to the dumps. Out of pit dumps will not merge with in-pit dumps as they are separated by third party linear infrastructure. Out of pit waste rock dumps will be up to 60 m above ground level.

There will be two out of pit waste rock dumps for South Pit 2. The more westerly waste rock dump is separated from the pit by the GAP rail line. The out of pit dump to the east of the rail line will merge with the in pit dump to form a final landform.

East Pit 1, East Pit 2 and North Pit will each have a single out of pit waste rock dump, which will merge with the in-pit dump to form a final landform up to 60 m above ground level.

Table 7-6 shows the estimated volume of waste rock and ROM coal expected from each pit over the life of the project.

Table 7-6 Estimated Waste Rock and ROM Coal Quantities

Pit	Waste rock volume (Mbcm)[1]	ROM coal (Mt)
South Pit 1	2,977	334
South Pit 2	284	44
East Pit 1	198	15
East Pit 2	165	14
West Pit 1	531	74
West Pit 2	478	61
West Pit 3	303	122
North Pit	373	26
Total	**5,309**	**690**

Note 1: million bank cubic meters

7.4.7 ROM Coal Handling

ROM coal will be transported to one of the onsite CHPP facilities and either directly tipped into the crushing and screening system or stockpiled on the ROM pad for future reclaim. From there it will be processed, blended and transported to one of the two TLFs for transfer to the Port of Abbot Point for export. The southern and northern ROM pads will be approximately 300 m by 250 m (7.5 ha). ROM coal stockpiles will be approximately 10 m high.

The southern ROM stockpile area will be capable of stockpiling approximately 400,000 tonnes. The northern ROM stockpile area will be capable of stockpiling approximately 200,000 tonnes.

The proposed mine production schedule delivers approximately 15 Mtpa of ROM coal. The initial development will expose approximately 1 Mt of ROM equivalent coal in the first year. **Table 7-7** provides estimates of ROM coal production rates over the life of the mine.

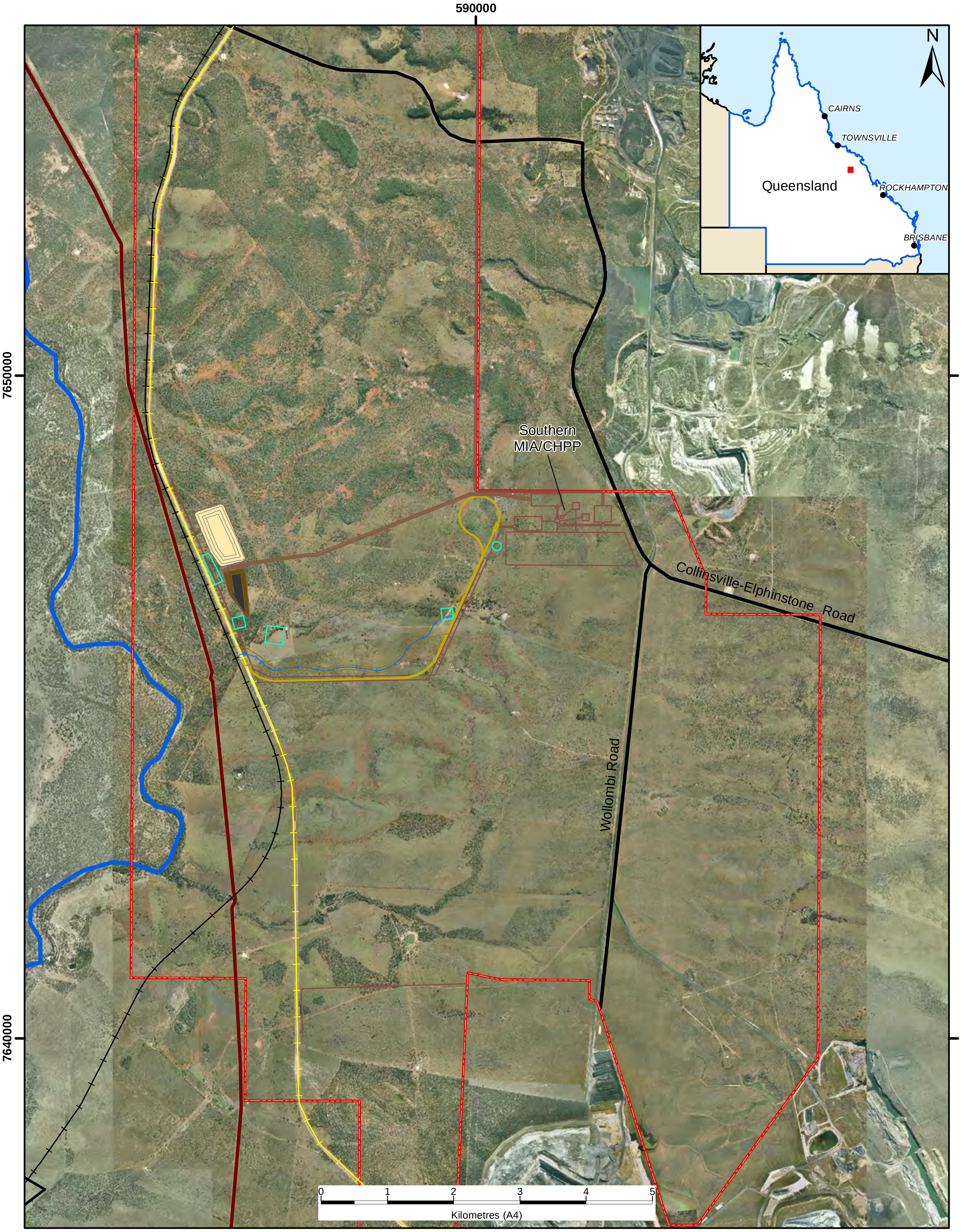
Table 7-7 ROM Coal Production Volumes

Year	ROM coal volumes (Mtpa)
1	1
2	2
3	5
4	7.5
5 to end of mine life	15

7.5 Mine Site Layout and Project Footprint over the Mine Life

The proposed mine layout is shown:

- at the commencement of operations in **Figure 7-4**
- at year 3, during the ramp up phase in **Figure 7-5**
- at year 5, when full production rates are achieved, in **Figure 7-6**
- at year 10, in **Figure 7-7**
- at year 16 (for North Pit Construction) **Figure 7-8**
- at year 25 (North), approximately half way through the operational life of the mine, **Figure 7-9**
- at year 25 (South), **Figure 7-10**
- at the end of mine life (year 45) final landform (North) in **Figure 7-11**
- at the end of mine life (year 45) final landform (South) in **Figure 7-12.**



Legend

- Expit Waste Rock Dump
- Highwall
- Pit Floor
- Drainage Bund
- Drainage Diversion
- GAP Rail line
- Project Area
- Suttor River
- Formed Roads
- Mine Infrastructure
- Dam (mine affected, sediment affected, clean water)
- Train Loading Facilities
- Alpha Coal Project Rail Line
- Burdekin to Moranbah Pipeline

Year 1
Proposed Mine Layout

Figure 7-4 | **Byerwen Coal Project**

Date: *28/02/2013*

Author: samuel.ferguson

Map Scale: 1:75,000

Revision: R1

Coordinate System: GDA 1994 MGA Zone 55

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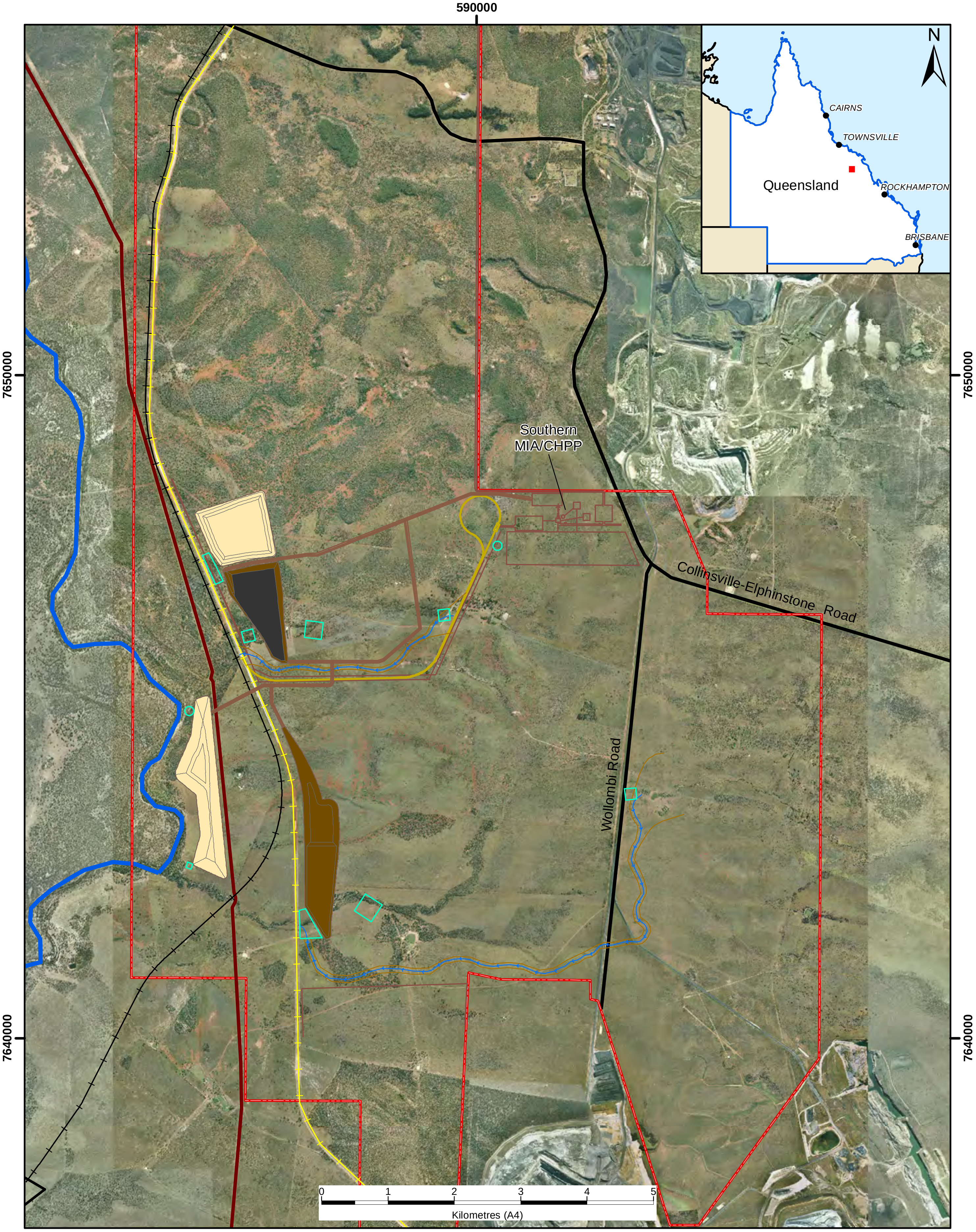

Legend

- Expit Waste Rock Dump
- Highwall
- Pit Floor
- Drainage Bund
- Drainage Diversion
- GAP Rail line
- Project Area
- Suttor River
- Formed Roads
- Mine Infrastructure
- Dam (mine affected, sediment affected, clean water)
- Train Loading Facilities
- Alpha Coal Project Rail Line
- Burdekin to Moranbah Pipeline

Year 3 Proposed Mine Layout		QCOAL GROUP
Figure 7-5	**Byerwen Coal Project**	environmental and licensing professionals pty ltd
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Revision: R1	**Coordinate System:** GDA 1994 MGA Zone 55	
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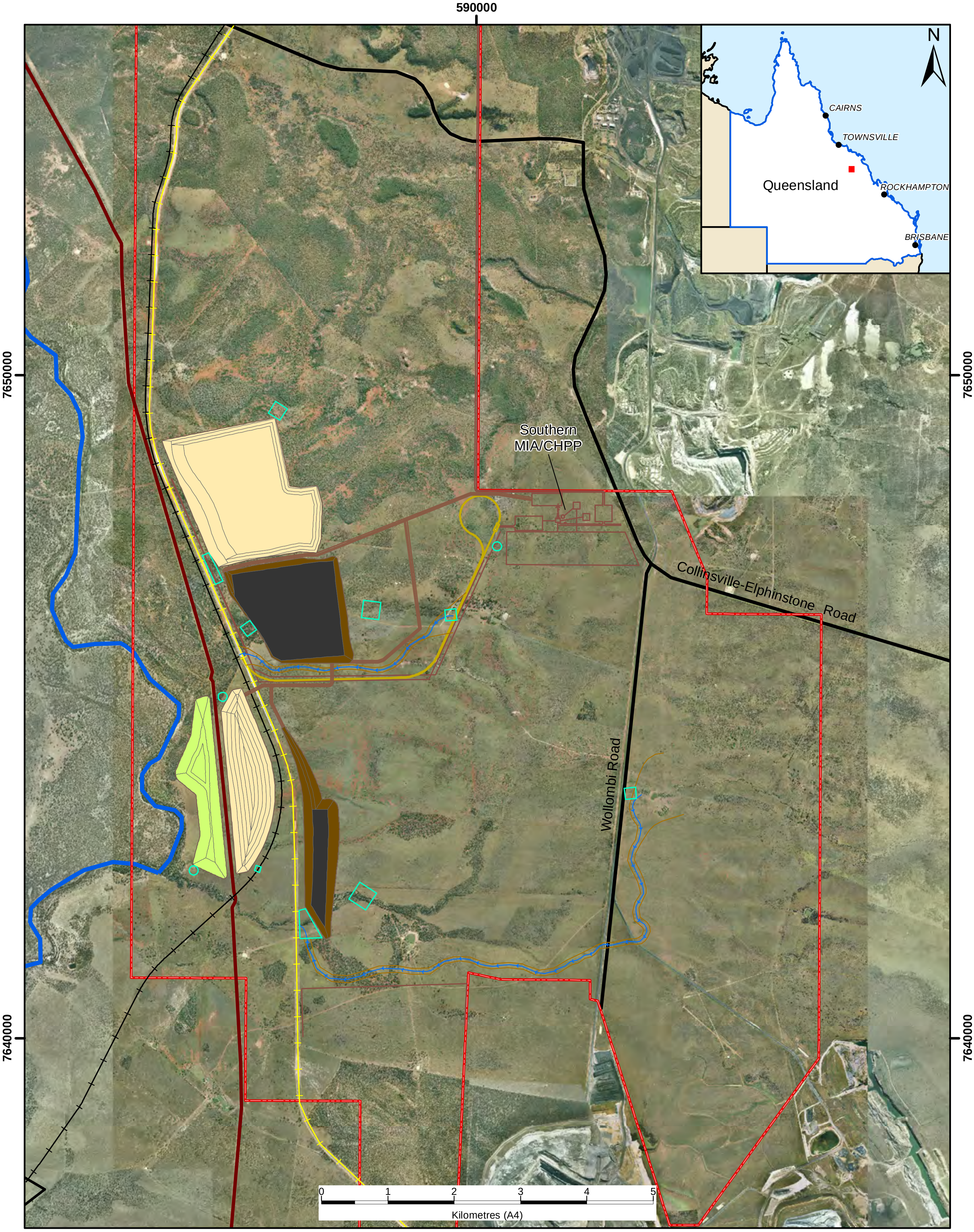

Legend

- Completed Rehab
- Expit Waste Rock Dump
- Highwall
- Pit Floor
- GAP Rail line
- Project Area
- Suttor River
- Formed Roads
- Mine Infrastructure
- Drainage Bund
- Drainage Diversion
- Dam (mine affected, sediment affected, clean water)
- Train Loading Facilities
- Alpha Coal Project Rail Line
- Burdekin to Moranbah Pipeline

Year 5 Proposed Mine Layout

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Figure 7-6

Byerwen Coal Project

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Author: samuel.ferguson

Map Scale: 1:75,000

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Coordinate System: GDA 1994 MGA Zone 55

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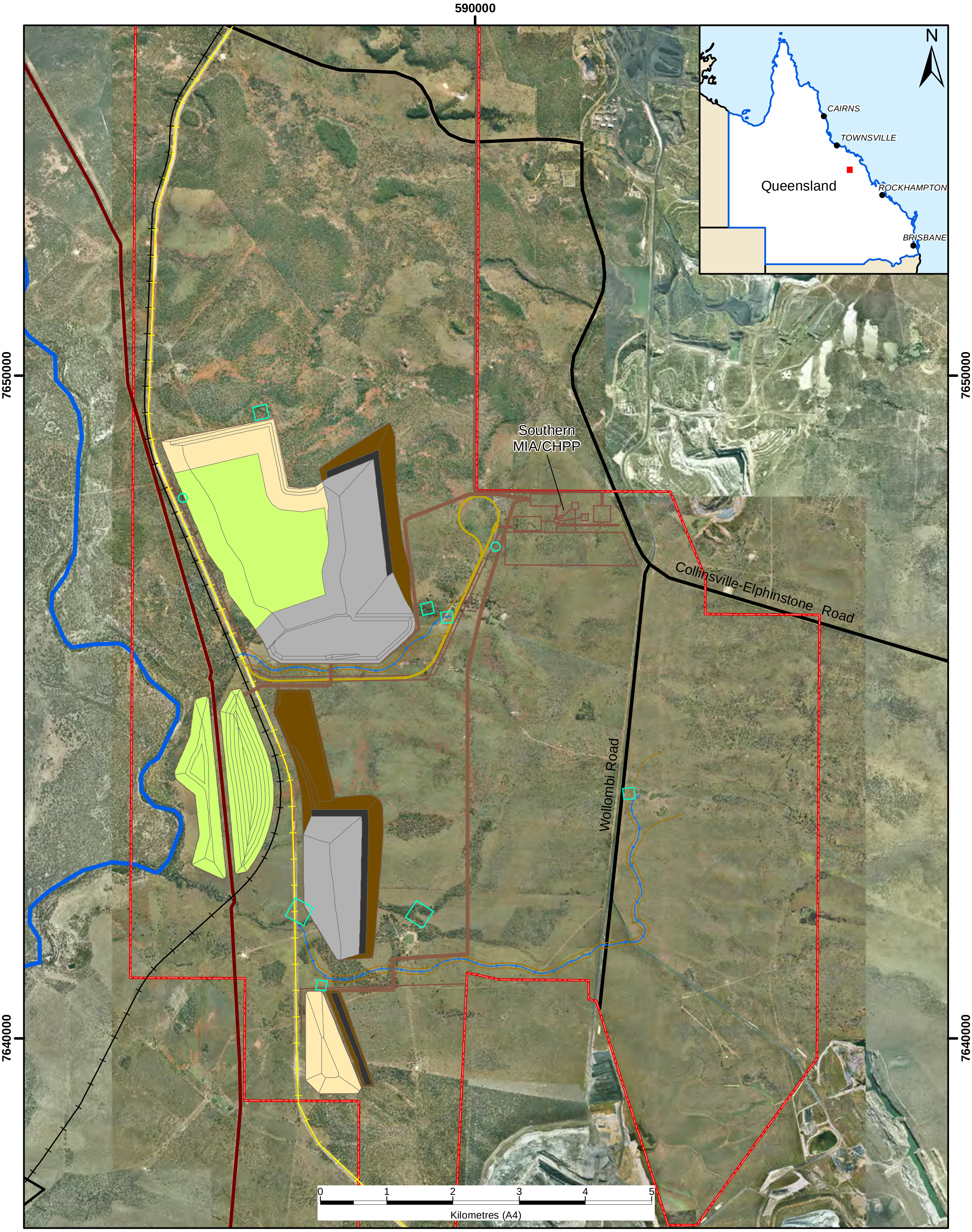

Legend

- Completed Rehab
- Inpit Waste Rock Dump
- Expit Waste Rock Dump
- Highwall
- Pit Floor
- GAP Rail line
- Project Area
- Suttor River
- Formed Roads
- Mine Infrastructure
- Drainage Bund
- Drainage Diversion
- Dam (mine affected, sediment affected, clean water)
- Train Loading Facilities
- Alpha Coal Project Rail Line
- Burdekin to Moranbah Pipeline

Year 10 Proposed Mine Layout	QCOAL GROUP
Figure 7-7	**Byerwen Coal Project**
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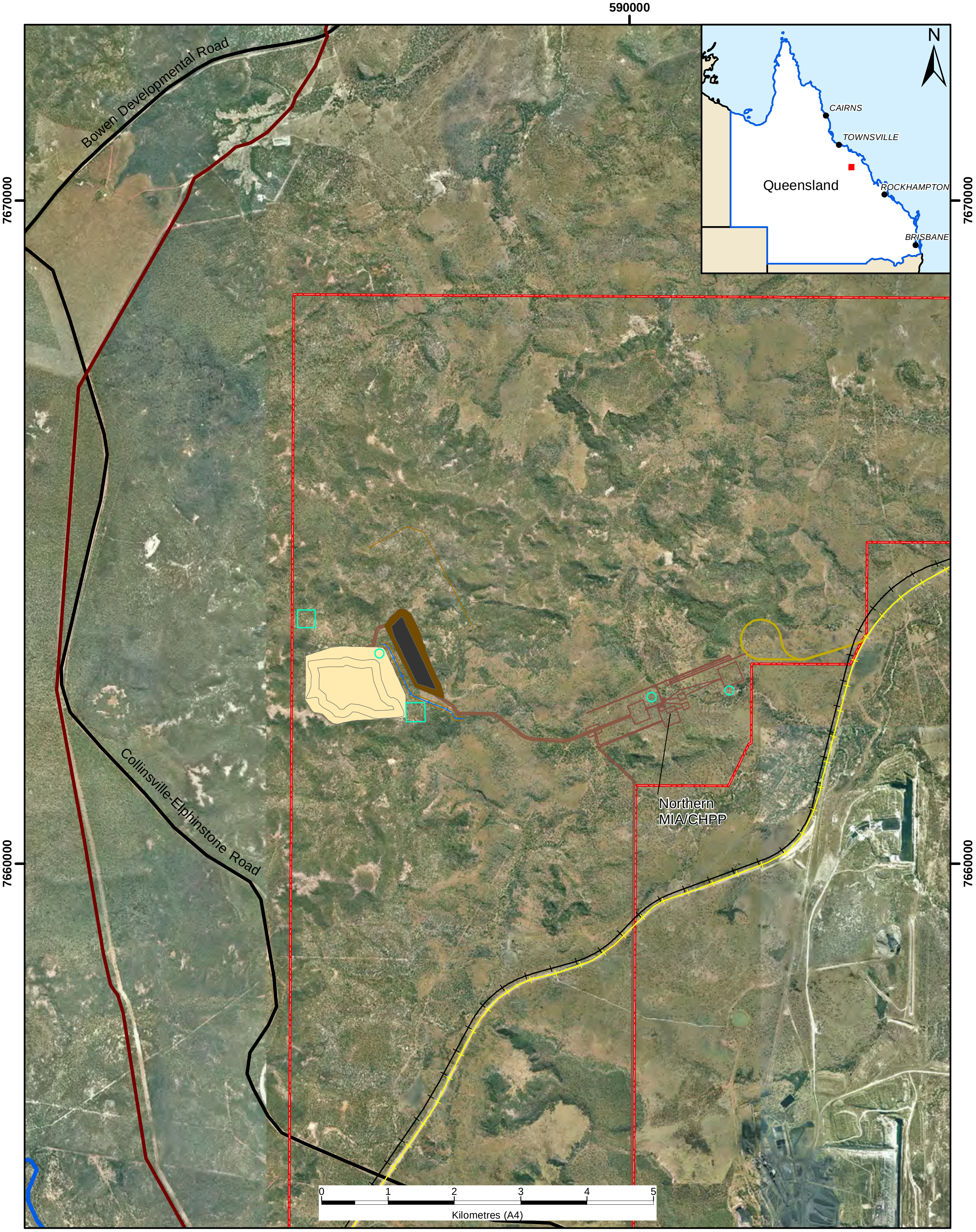

Legend

- Expit Waste Rock Dump
- Highwall
- Pit Floor
- GAP Rail line
- Project Area
- Suttor River
- Formed Roads
- Mine Infrastructure
- Drainage Bund
- Drainage Diversion
- Dam (mine affected, sediment affected, clean water)
- Train Loading Facilities
- Alpha Coal Project Rail Line
- Burdekin to Moranbah Pipeline

Year 16 (North) Proposed Mine Layout

Figure 7-8

Byerwen Coal Project

Date: *28/02/2013*

Author: samuel.ferguson

Map Scale: 1:75,000

Revision: R1

Coordinate System: GDA 1994 MGA Zone 55

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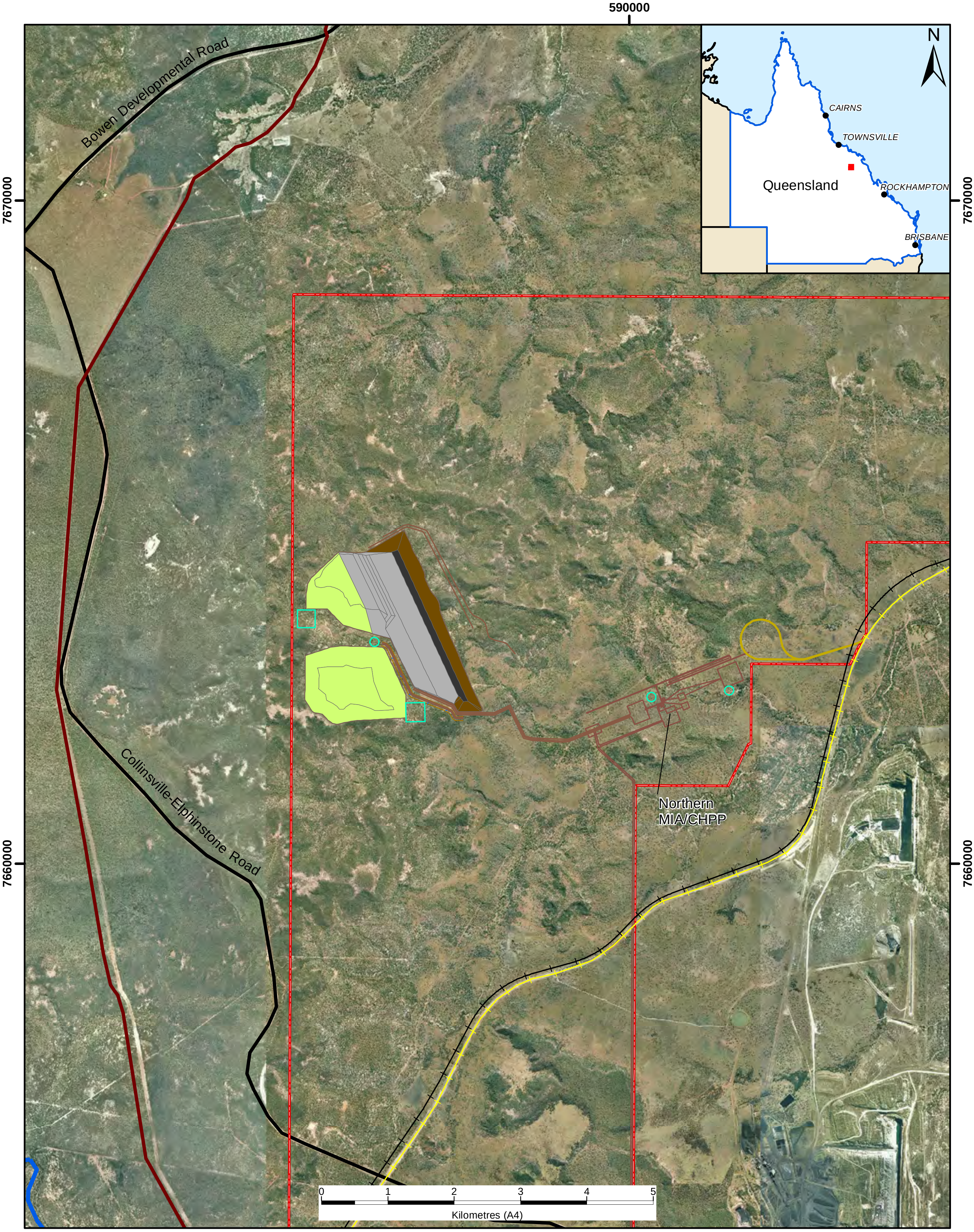

Legend

- Completed Rehab
- Inpit Waste Rock Dump
- Highwall
- Pit Floor
- GAP Rail line
- Project Area
- Suttor River
- Formed Roads
- Mine Infrastructure
- Drainage Bund
- Drainage Diversion
- Dam (mine affected, sediment affected, clean water)
- Train Loading Facilities
- Alpha Coal Project Rail Line
- Burdekin to Moranbah Pipeline

Year 25 (North) Proposed Mine Layout	
Figure 7-9	Byerwen Coal Project
Date: *28/02/2013*	**Author:** samuel.ferguson
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Revision: R1	**Coordinate System:** GDA 1994 MGA Zone 55

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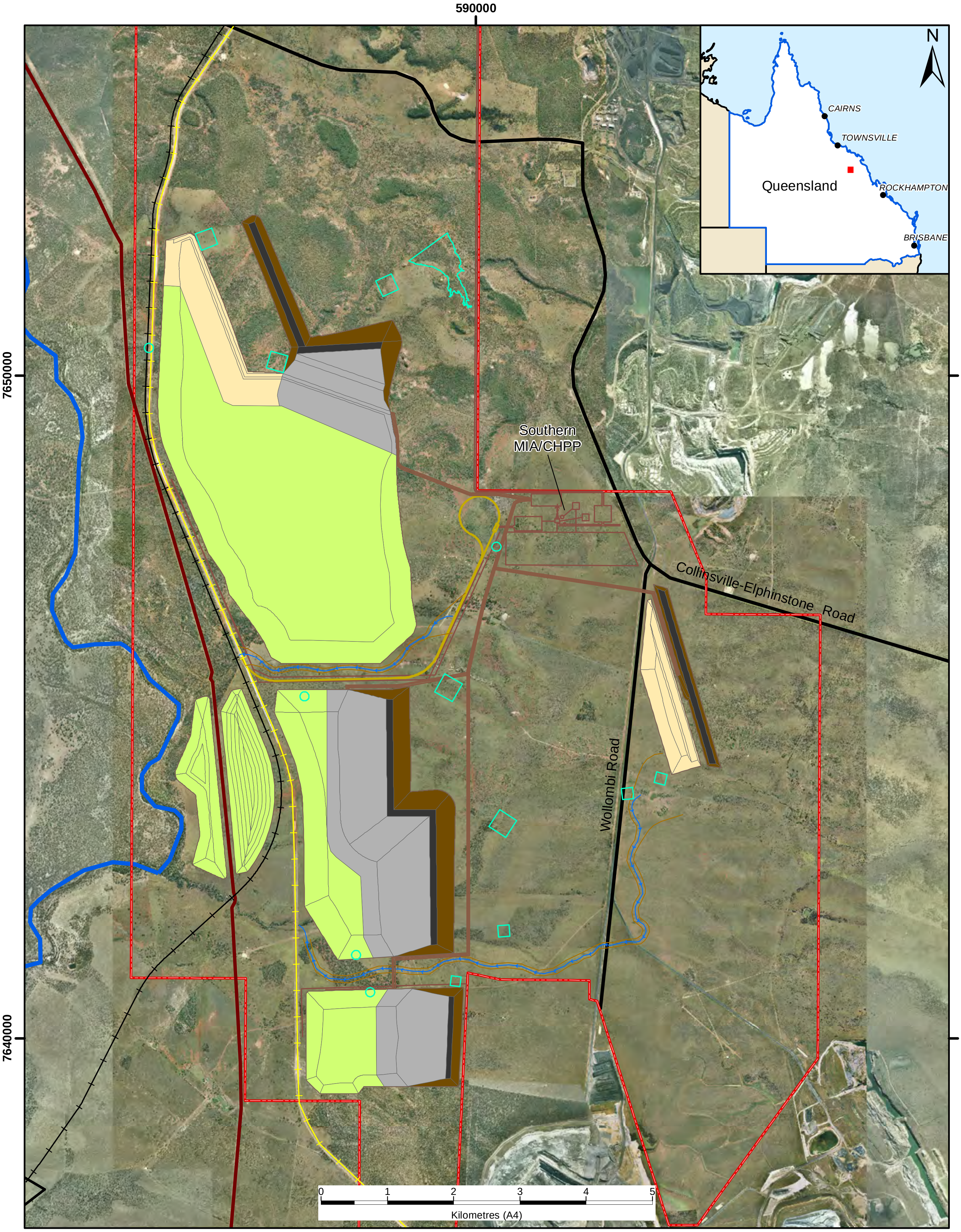

Legend

- Completed Rehab
- Inpit Waste Rock Dump
- Expit Waste Rock Dump
- Highwall
- Pit Floor
- GAP Rail line
- Project Area
- Suttor River
- Formed Roads
- Mine Infrastructure
- Drainage Bund
- Drainage Diversion
- Dam (mine affected, sediment affected, clean water)
- Train Loading Facilities
- Alpha Coal Project Rail Line
- Burdekin to Moranbah Pipeline

Year 25 (South) Proposed Mine Layout

QCOAL GROUP

Figure 7-10

Byerwen Coal Project

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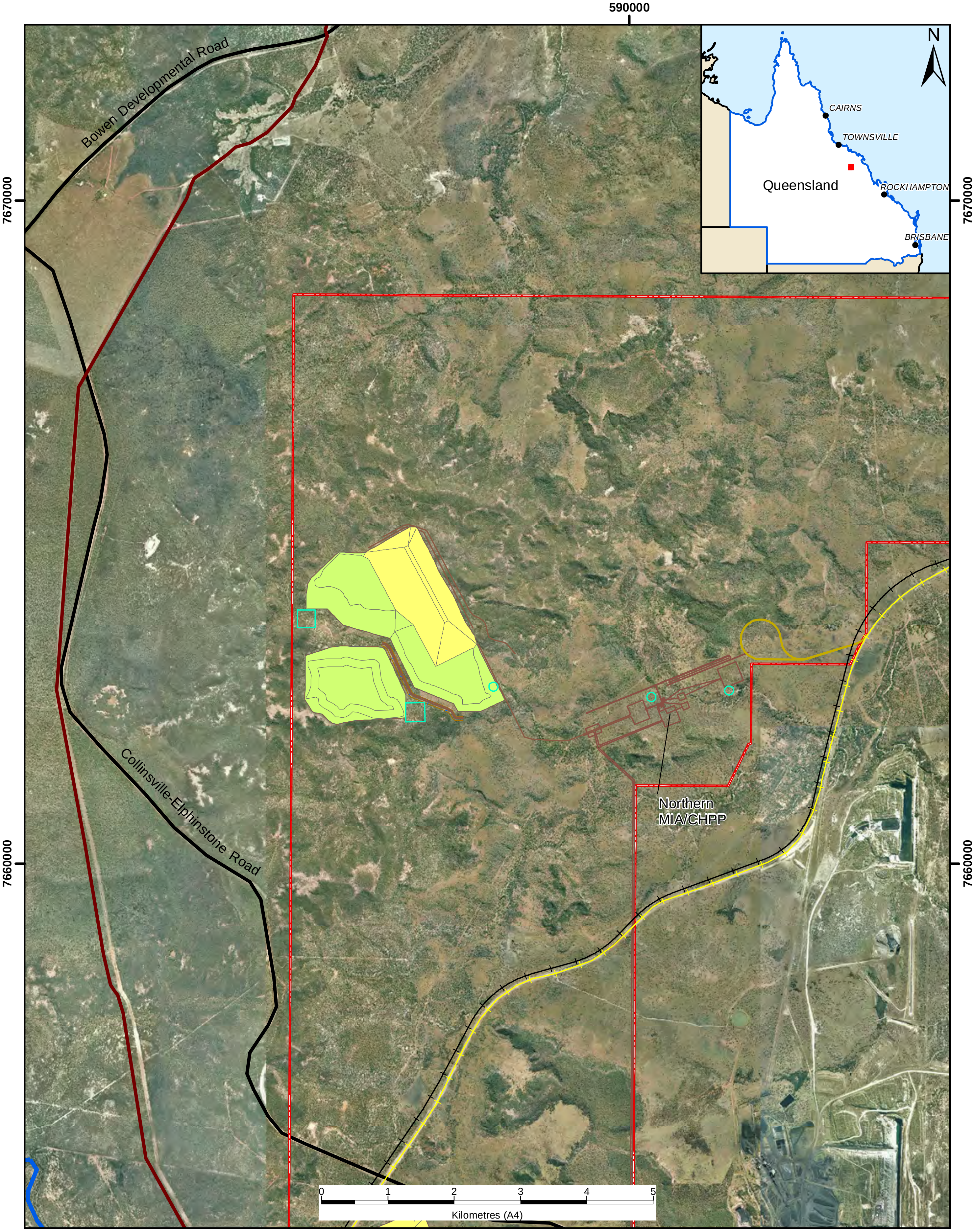

Legend

- Completed Rehab
- Final Void
- GAP Rail line
- Project Area
- Suttor River
- Formed Roads
- Mine Infrastructure
- Drainage Bund
- Drainage Diversion
- Dam (mine affected, sediment affected, clean water)
- Train Loading Facilities
- Alpha Coal Project Rail Line
- Burdekin to Moranbah Pipeline

Final Landform (North)

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Figure 7-11 Byerwen Coal Project

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Date: 28/02/2013

Author: samuel.ferguson
Map Scale: 1:75,000
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Coordinate System: GDA 1994 MGA Zone 55

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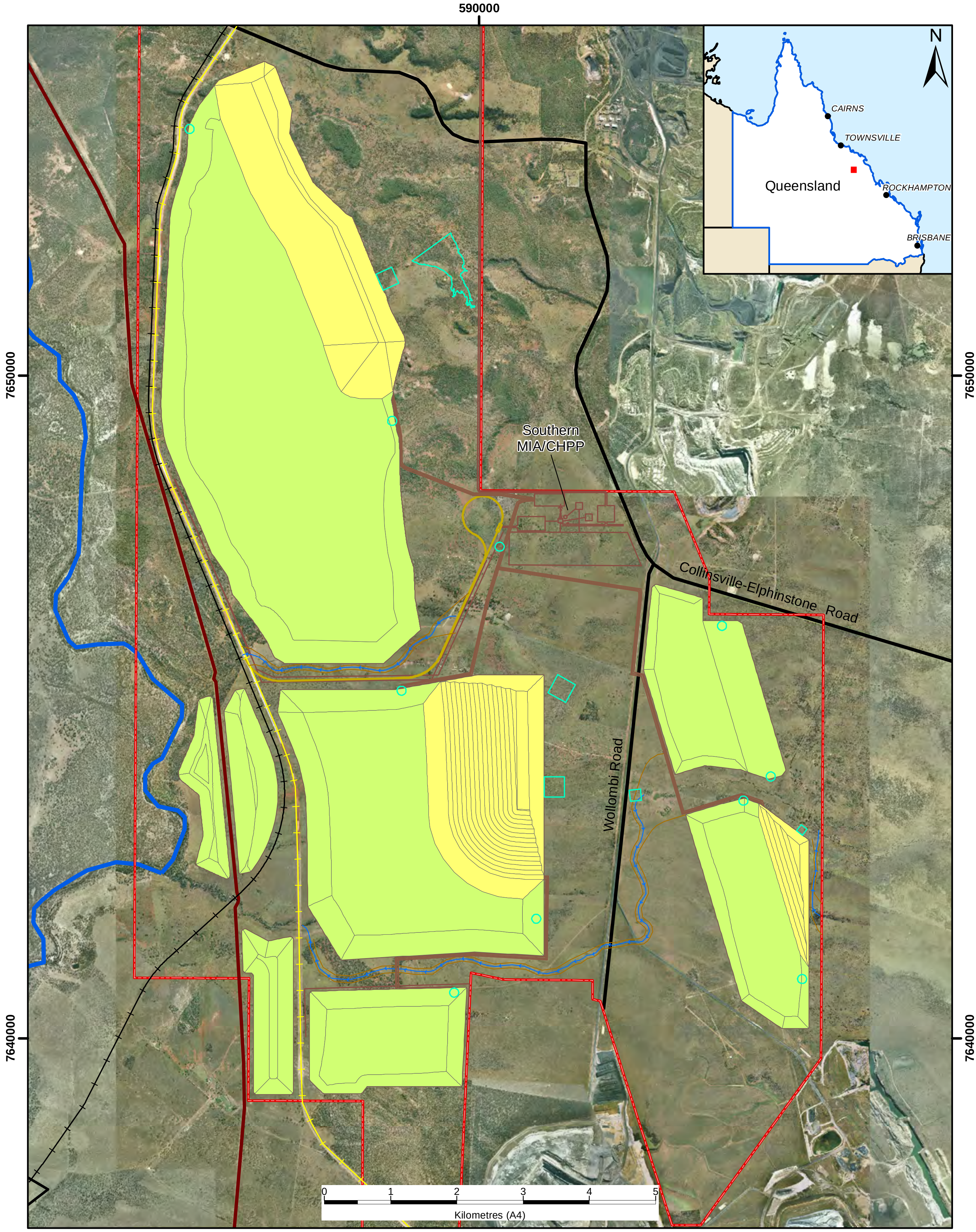

Legend

- Completed Rehab
- Final Void
- GAP Rail line
- Project Area
- Suttor River
- Formed Roads
- Mine Infrastructure
- Drainage Bund
- Drainage Diversion
- Dam (mine affected, sediment affected, clean water)
- Train Loading Facilities
- Alpha Coal Project Rail Line
- Burdekin to Moranbah Pipeline

Final Landform (South)	
Figure 7-12	**Byerwen Coal Project**
Date: *28/02/2013*	**Author:** samuel.ferguson **Map Scale:** 1:75,000
Revision: R1	**Coordinate System:** GDA 1994 MGA Zone 55
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Table 7-8 shows estimates of the project footprint (hectares) at each major stage of development for each open pit, separated between active open pit / waste rock dump, rehabilitated waste rock dump and final void. **Table 7-9** shows the footprint (hectares) of components of mine infrastructure at each major stage of development.

Table 7-8 Estimated Project Footprint (ha) at Each Major Stage of Development

Pit / Infrastructure	Activity	Year 1	Year 3	Year 5	Year 10	Year 25	Final Landform (Year 46)
West Pit 1	active open pit / waste rock dump	59	175	580	603	163	-
West Pit 2	active open pit / waste rock dump	-	-	-	-	217	-
West Pit 3	active open pit / waste rock dump	-	-	-	-	92	-
West Pit Complex	rehabilitated waste rock dump	-	-	-	347	1,202	1,918
	final void	-	-	-	-	-	548
South Pit 1	active open pit / waste rock dump	-	216	256	347	592	-
	rehabilitated waste rock dump	-	-	105	251	491	1,197
	final void	-	-	-	-	-	543
South Pit 2	active open pit / waste rock dump	-	-	-	113	185	-
	rehabilitated waste rock dump	-	-	-	-	163	500
East Pit 1	active open pit / waste rock dump	-	-	-	-	153	-
	rehabilitated waste rock dump	-	-	-	-	-	409
East Pit 2	active open pit / waste rock dump	-	-	-	-	-	-
	rehabilitated waste rock dump	-	-	-	-	-	352
	final void	-	-	-	-	-	88
North Pit	active open pit / waste rock dump	-	-	-	-	353	-
	rehabilitated waste rock dump	-	-	-	-	236	373
	final void	-	-	-	-	-	163
Infrastructure	Refer **Table 7-9**	347	523	522	526	915	907
Total Footprint		**406**	**914**	**1,464**	**2,186**	**4,764**	**6,997**

Table 7-9 Estimated Footprint of Mine Infrastructure (ha)

Infrastructure Area	Year 1	Year 3	Year 5	Year 10	Year 25	Final Landform (Year 46)
Southern MIA & CHPP	114	114	114	114	114	114
Southern Co-disposal Dam	94	94	94	94	94	94
Northern MIA & CHPP	-	-	-	-	140	140
Northern Co-disposal Dam	-	-	-	-	9	9
Haul Roads	16	42	37	48	76	73
Northern TLF	-	-	-	-	33	33
Southern TLF	38	38	38	38	38	38
Water Supply Pipleine - South	11	11	11	11	11	11
Central Infrastructure Corridor	-	-	-	-	83	83
Powerline Diversions	16	15	15	23	23	23
Drainage Diversions - South	39	167	167	167	167	178
Drainage Diversions - North	-	-	-	-	31	31
Water Management Dams	18	40	45	30	95	77
Total	**347**	**523**	**522**	**526**	**915**	**907**

7.6 Processing and Products

There will be two CHPPs used for the project, the southern CHPP and the northern CHPP. The southern CHPP will be capable of processing 15 Mtpa ROM coal and the northern CHPP will be capable of processing 5 Mtpa ROM coal. The total amount of ROM coal that is processed at both CHPPs will be approximately 15 Mtpa. In the first 17 years of operation, all ROM coal will be processed at the southern CHPP. Construction of the northern CHPP will commence in approximately Year 15 to coincide with the extraction of coal from North Pit. Once mining commences in the northern area (approximately Year 17), the amount of coal that is processed at the southern CHPP will be reduced to balance the total ROM processed at both CHPPs to 15 Mtpa. North Pit will produce between 1 and 5 Mtpa ROM coal for processing at the northern CHPP and hence the southern CHPP will process between 10 and 14 Mtpa ROM coal once northern area operations commence.

The southern CHPP and northern CHPP will be capable of producing 10 Mtpa and 3.3 Mtpa product coal respectively, although the joint output will be approximately 10 Mtpa.

It is proposed that the two CHPP plants will be similar, despite the differences in scale, to streamline the design and construction phase of the project as well as optimising the holding of maintenance spares and consumables.

The proposed CHPP design is similar to plants already in place throughout the Bowen Basin and as such is considered tried and proven technology.

The CHPP areas will be designed to capture all runoff from disturbance areas surrounding the CHPP in environmental control ponds and sediment dams.

All ROM coal will be washed through the CHPPs and stockpiled at product coal stockpiles adjacent to the CHPPs for transfer to the TLFs.

7.6.1 Coal Handling and Processing Plants

The CHPPs are proposed to operate 24 hours a day, seven days a week, up to 7,200 hours a year. The CHPPs will stand approximately 30m high and will have an overhead crane, concrete floor, be a free-standing steel structure, and be fully lit to provide adequate lighting for continuous 24 hour operations.

Each CHPP will comprise a two stage dense medium cyclone and spiral/reflux classifier and froth flotation operation with a co-disposal system for rejects management. It is likely the southern CHPP will be developed in modules either 2 x 1,100 tonnes per hour (tph) or 3 x 700 tph configuration while the northern CHPP will be a single 700 tph module.

Waste streams from the CHPPs include coarse and fine rejects, and process water. Process water will be recovered and recycled to the maximum possible extent.

The key elements of each CHPP include:

- receiving, sizing and processing ROM coal at a nominal rate of 2,100-2,200 tph for the south and 700 tph for the north
- stacking the primary and secondary product coal separately, each at a rate of up to 1,000 tph onto separate product coal stockpiles
- both the northern and southern TLF will be designed for reclaiming product coal from different stockpile sections at a controlled rate up to 3,500 tph and discharging into a 300 t capacity train load-out bin
- loading the trains at a rate of 3,300 tph
- co-disposal dams located close to each CHPP to reduce pumping or trucking distances.

Figure 7-13 provides a flowchart of the coal processing.

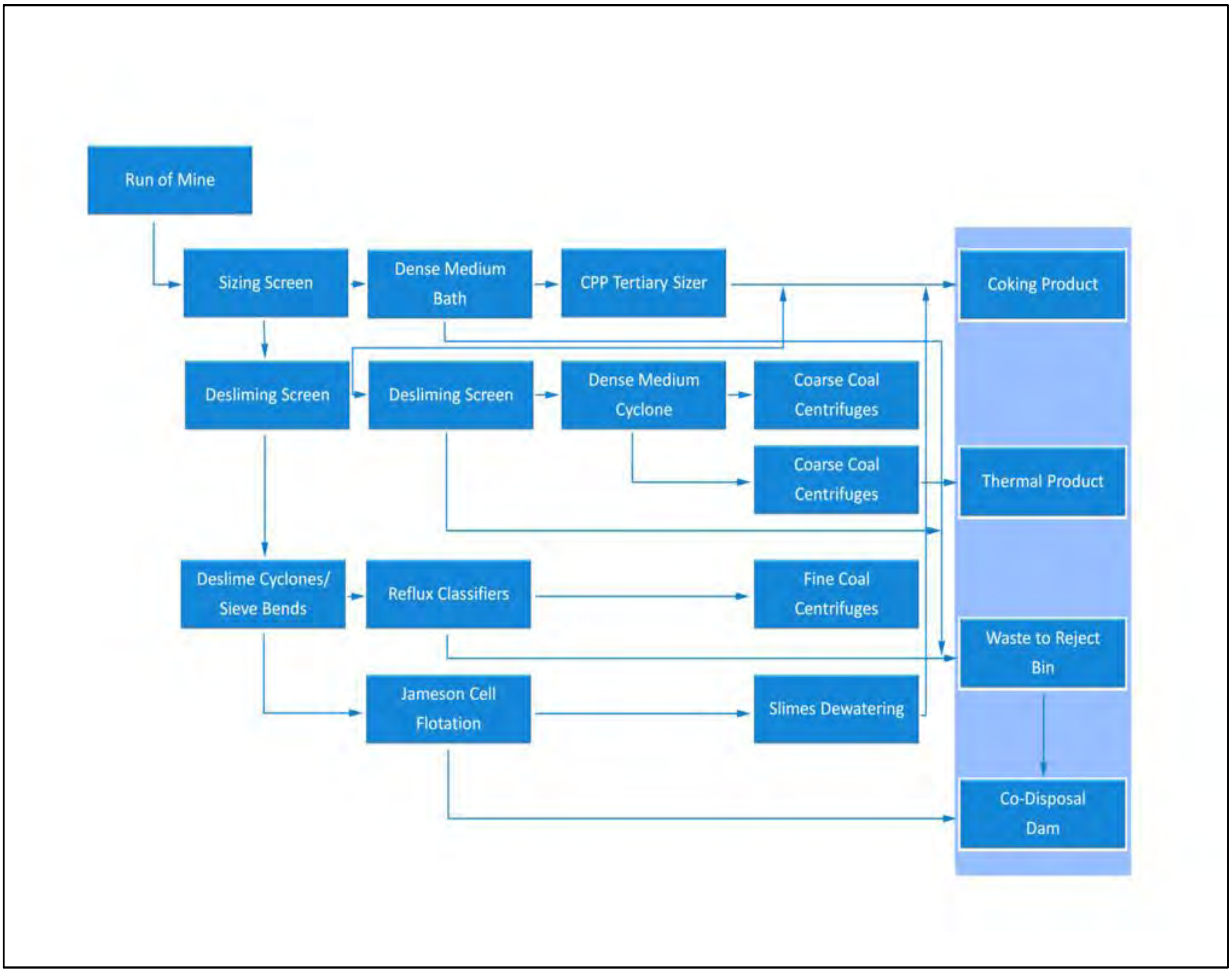


Figure 7-13 Coal Processing Schematic

The approximate annual throughputs of the CHPP are shown in **Table 7-10**. It is not expected that any coal will bypass the CHPP.

Table 7-10 Indicative CHPP Outputs

Component	Indicative tonnages (Mtpa)	
	Southern CHPP	Northern CHPP
ROM feed to CHPP	10 to 15.0	0 to 5.0
Washed product coal	6.7 to 10.0	0 to 3.3
CHPP coal rejects waste	3.3 to 5.0	0 to 1.7

ROM Coal Crushing

The uncrushed ROM coal will be transported from the mine pits by haul trucks where it will be directly tipped into the ROM hopper or stockpiled for later reclaim by front end loader. The ROM stockpile will have a nominal capacity of 400,000 t in the south and 200,000 t in the north.

Coal will be crushed through a primary feeder breaker / jaw crusher system to produce a product top size of 250 mm and then through secondary and tertiary crushing to produce a plant feed produce with a top size of 50 mm. From the crushing system coal will be conveyed to a 500 t plant feed bin before being fed to the process plant at a constant feed rate determined by the coal type and other plant settings.

Desliming

The plant feed conveyor discharges onto a single deck multi-slope desliming screen. Sprays will assist the desliming operations and the 1.4 mm material and water will be collected in the desliming screen sump. Oversize material will feed to the dense medium cyclone feed tank.

Coarse Coal Circuit

The coarse coal circuit will be a two stage dense medium cyclone circuit. The circuit will produce a primary and secondary coal product. A magnetite circuit with magnetic separators will be incorporated into the circuit to assist in maximising product recovery. Rejects from the circuit will report to a reject hopper for disposal.

Small and Fines Coal Circuit

Fines coal will be screened on the desliming screen and then be fed into a cyclone circuit for sizing. From the cyclones the oversize material will report to the flotation circuit and the underflow to the spirals circuit. Spirals will be used to recover fine coal with product reporting to the flotation circuit and reject reporting to the disposal system. The flotation circuit will use either Jamieson or Microcel flotation to produce a final fine coal concentrate that will be dewatered via filters and discharged onto the primary product conveyor. Flotation tailings will report to a thickener for de-watering and subsequent disposal.

Air Services

Compressed air will be reticulated around the CHPP for use as plant and instrument air. Plant air will be reticulated to the CHPP workshop facility, raw coal area sizing station and ROM hopper.

Reagents/Diesel System

The reagents required to operate the flotation cell (diesel and Methyl Isobutyl Carbinol (MIBC)) will be provided and stored in a purpose built fuel farm. The fuel farm will consist of one storage tank for each of the reagents located in a fully bunded area. The diesel tank will also be used for light vehicle and product stockpile dozer refuelling. Pumps and piping to transport the reagents from the storage tanks to the flotation circuit will be supplied.

7.7 Rejects Handling and Disposal

7.7.1 Disposal Alternatives

Two disposal methods, common to both the southern and northern CHPPs, were assessed for the project. The preferred option is to truck the coarse reject (greater than 12 mm) to mined waste rock dumps and co-dispose the mid-size reject (1 mm to 12 mm) and fine rejects material (less than 1 mm) to disposal cells in a co-disposal dam using gravel pumps and a combination of steel and poly pipework. Co-disposal of mid-size and fine rejects is a common practice successfully employed in many Australian mines.

The coarse rejects will be deposited by truck, initially in the voids between the waste rock stockpiles. The waste rock stockpile peaks will then be dozed to cover the rejects, and subsequently overlain by soil as part of rehabilitation.

The alternative method is to truck all reject and dewatered rejects material to in-pit co-disposal cells with fine rejects being dewatered using belt filters. Filter pressing of fine rejects is an accepted process in coal preparation plants throughout Australia.

The selected method will be subject to the most appropriate design based on the characteristics of rejects and in pit disposal options and timing.

7.7.2 Option 1 - Trucking of Coarse Rejects and Co-disposal of Fine and Mid-size Rejects

All feed material greater than 1 mm will be treated using dense medium cyclones. The rejects from the dense medium cyclones will be screened at 12 mm with all reject material greater than 12 mm (coarse rejects) conveyed to a reject bin for removal via truck. The mid-size rejects (1 mm to 12 mm) will report to the co-disposal system.

The feed material less than 1 mm will be treated using a combination of reflux classifiers and flotation cells. The tailings from these processes will report to the tailings thickener where flocculants will be added. Thickened tailings will then be combined with the mid-size rejects and sent to the co-disposal dam.

A maintenance regime involving the rotation of the co-disposal pipework at regular intervals will be employed to prevent failure of the pipework.

7.7.3 Option 2 - Trucking Rejects and Filter Pressed Fine Rejects

Mid-size rejects from the dense medium cyclone will be combined and dewatered over a screen before being discharged to the reject conveyor. Feed material less than 1mm will be beneficiated using reflux classifiers. The fine reject material from this process will be dewatered over a high frequency screen before also reporting to the reject conveyor.

Fine rejects will report to the tailing thickener where flocculants will be added. Thickened tailings will be pumped to a belt press filter feed tank before being pumped to belt press filters. The moisture content of the tailings will be reduced to approximately 35%.

Combined mid-size and fine reject tailings filter cake will be conveyed to a reject bin for removal via truck to the pits.

7.7.4 Comparative Assessment of Disposal Methods

The preferred method for disposal is option 1 - trucking of the coarse rejects and co-disposal of the mid-size and fine rejects. The coarse rejects can then be hauled as back loads to disposal areas using mine haulage trucks.

Dewatering of the fine rejects will require up to fifteen belt press filters. The operation of these units is labour and energy intensive involving regular adjustment of operating parameters and replacement of filter cloths. The presence of reactive clays can also adversely affect the moisture content of the produced filter cake.

Rehabilitation for both disposal methods is similar.

7.7.5 Co-disposal System

Mid-size rejects material will report to the rejects hopper from where it will be directed to the co-disposal sump or a reclaim bunker. If necessary, reclaim bunker material can be reclaimed by front end loader. The thickener underflow material will be pumped to the co-disposal sump where it will be slurried and combined with fine reject material for pumping to the co-disposal facility.

Recoverable water from the co-disposal dam will flow into a return water dam from where it will be recirculated through the CHPP as required.

7.7.6 Rejects Disposal

During Year 1 to 10 of mining, fine and mid-size rejects from the southern CHPP will be deposited into an external co-disposal facility located adjacent to the CHPP. From Year 10 rejects from the southern CHPP will be deposited into in-pit disposal facilities. During the initial years of operation of the northern CHPP, fine and mid-size rejects will be deposited in a co-disposal facility located adjacent to the CHPP. In later years, fine and mid-size rejects will be deposited into in-pit disposal facilities. These facilities will be designed, constructed and operated to minimise discharges to surface waters and groundwater. Supernatant from the pit disposal facilities will be returned the CHPP's.

The location and design of the in-pit rejects disposal facilities will be selected based on mining engineering, geotechnical, hydrogeological, safety and other studies.

In-pit rejects disposal has the advantage of creating a reduced environmental footprint by reducing the extent of above ground storage facilities and reducing environmental and safety risks associated with dam construction and operation. As mining will be advanced as a series of pits, the progressive filling of mined-out pits with coal processing wastes is an effective long term rejects storage option.

Within the voids, fine and mid-size reject will be placed within cells, allowing rotation between cells and promoting desiccation and drying. Once rejects have dried, they will be capped with benign waste rock to achieve the final landform for rehabilitation (refer to **Chapter 10**).

The selection of the void into which rejects will be placed is dependent on a number of factors:

- the stage of mining within each pit, remaining economic coal reserves and the availability of suitable areas for in-pit disposal facilities
- the available capacity within each void
- environmental and safety considerations in the design of in-pit disposal facilities
- economic factors related to the cost of disposal at different voids.

Based on the mine schedule it is likely that the sequence of voids, in the southern tenement area, in which in-pit rejects' disposal facilities will be constructed is West Pit 1, West Pit 2 and then West Pit 3. In the northern tenement area, North Pit will be used for in-pit reject disposal.

7.7.7 Co-Disposal Dams

Co-disposal dams will be constructed at each of the CHPPs. The southern co-disposal dam will hold approximately 10,000 ML and be 2,000 m by 500 m by 10 m deep. The northern co-disposal dam will hold approximately 900 ML and be 300 m by 300 m by 10 m deep.

It is expected that the co-disposal dams will be regulated dams and will be designed in accordance with the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams (the Manual) and any other relevant codes and guidelines. Refer to **Chapter 8** contains a dam hazard assessment for the co-disposal dams. This will include determining the design storage allowance (DSA) of the dams. DSA is an available volume, estimated in accordance with the Manual that must be provided in a dam as at 1 November each year in order to prevent a discharge from that dam to an annual exceedance probability (AEP) specified in the Manual.

Co-disposal dams will be designed by a Registered Professional Engineer of Queensland (RPEQ) and will involve site specific geotechnical and hydraulic investigations.

Co-disposal dam design will be based on a turkey's nest configuration with no external catchment reporting to the cells within the dams. No geotechnical assessments for these structures have been carried out. With further geotechnical assessment the batter slope will be determined to take into account embankment fill properties and the aim of minimising dam footprint where possible.

Further investigation into the permeability of the materials to be used in the wall and floor of co-disposal facilities will be undertaken to determine the requirements to limit seepage.

The maximum height of the dam walls is 10 metres. The freeboard height, to allow for storm water catchment in the facility, will be determined during detailed design. Crests for the co-disposal dams will be approximately 4 metres wide to allow for access and for pipe work associated with rejects disposal and rejects water recycling. The co-disposal dams may be referrable dams (refer **Chapter 8**) and will comply with all relevant regulations, codes and guidelines for referable dams.

7.8 Product Coal Handling

This section describes the handling of product coal following processing. **Figure 7-14** shows the processing, handling and transfer of coal from the mine and ROM stockpile to the Port of Abbot Point.

Product conveyors will deliver product coal from the southern and northern CHPPs to nearby product coal stockpiles. There will be a primary product conveyor for transfer of coking coal from the coarse, small and fine coal circuits and a secondary conveyor for transfer of non-coking coal by-products. There will be a single product coal stockpile pad in the north and the south, with separate sections for the primary and secondary product. Coal product will be discharged onto the product stockpiles via a 1,000 tph skyline stacker.

The southern primary and secondary stockpiles will have capacities of 300,000 t each with push out capacity of a further 600,000 t (across both) for a total of 1,200,000 t. The northern product stockpiles will each have a capacity of around 125,000 t each with an additional 150,000 t of push out capacity (across both) for a total of 400,000 t.

The southern and northern product coal stockpiles will be approximately 20 m high and approximately 5ha and 3ha respectively. The stockpile areas will be fitted with dust suppression sprays.

The product stockpile will be bunded to prevent ingress of clean stormwater. Stormwater from the product stockpile will be directed to an environmental control pond.

Product coal will be reclaimed from the stockpile by in-ground coal valves feeding an underground conveyor for transfer to adjacent train loading facilities.

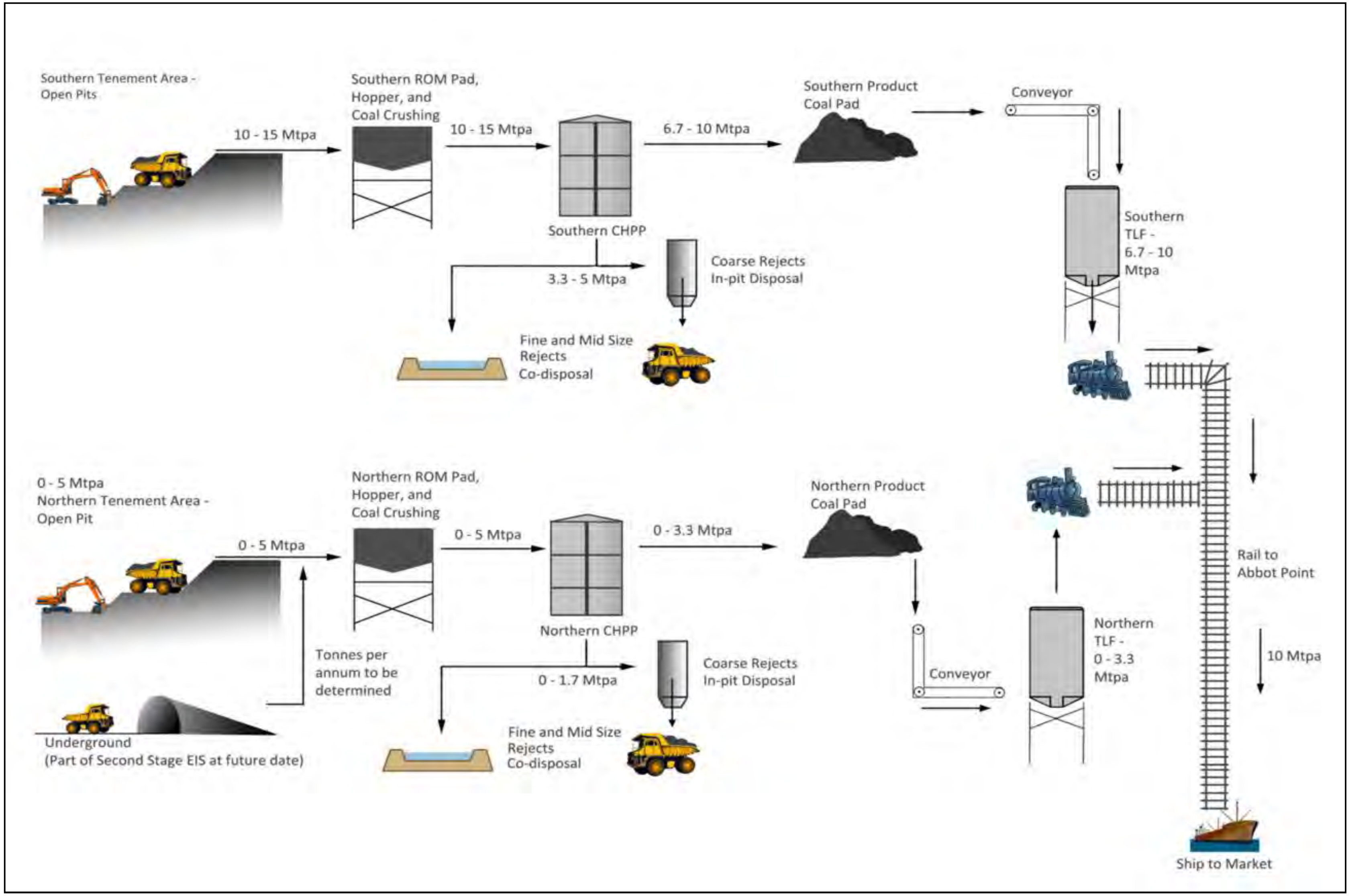


Figure 7-14 Product Processing, Handling and Transfer

7.8.1 Product Coal Transport to Train Loading Facilities

The GAP rail line traverses the project tenements from south to north. Two TLF connections to the GAP railway, one in the northern and one in the southern tenement areas, are planned for the transport of product coal from stockpiles adjacent the northern and southern CHPPs. Product coal will be direct fed from the product coal stockpiles to the train loading bins using conveyors.

Rail capacity has been secured for 5 Mtpa of product coal from the project and negotiations are underway to secure an additional 5 Mtpa. It is expected that rail upgrades approved as part of QR National's GAP Expansion Project will provide sufficient capacity to carry 10 Mtpa product from the project.

7.8.2 Train Loading Facilities

Coal will be loaded onto trains via the southern and northern TLFs comprising rail loop, train loading bin and rail spur, connected to the GAP rail line. The southern rail spur and rail loop will be approximately 7 km in length and will connect the GAP rail line to the southern CHPP. The northern rail spur and rail loop will be approximately 3.5 km in length and will connect the GAP rail line to the northern CHPP.

Both the southern and northern TLFs will be located entirely within the project's mining leases. The northern TLF will be developed in approximately Year 15 to coincide with the extraction of coal from North Pit. The indicative location and layout of the north and south TLFs and connection with the GAP rail line are shown in **Figure 7-15** and **Figure 7-16** respectively.

Prior to development of the northern tenement area, all trains will be loaded at the southern TLF. Once operations have commenced in the northern tenement area, approximately two thirds of coal will be loaded at the southern TLF and one third at the northern TLF.

There will be approximately 4 to 5 trains per day, capable of transporting approximately 6,800 tonnes per train. Trains will be loaded at a rate of 3,300 tph with a loading time of around 2 hours per train. Each train is expected to have three 4000 class diesel locomotives hauling approximately 85 coal wagons.

Multiple product coal dozers will maintain the required loading rate (depending on the required product blend). The train loading bin will be positioned above the rail line. Coal will be fed to the 300 t capacity train loading bin by a reclaim conveyor system from the product coal stockpile. The train loading bin structure will be approximately 20 m high.

A rail haulage provider will contract the rolling stock to transport coal. The project's track operating class will be designed to meet the requirements of Aurizon (formerly QR National (QRN)). Other key assumptions are that:

- the rail spur will connect to the GAP rail line close to existing natural surface level
- the rail spur will not require the crossings of state or local roads or third party infrastructure such as pipelines and powerlines
- the rail spur will include a balloon loop that enables reversal of train direction without shunting
- embankment and cutting volumes will be minimised.

More detailed information regarding rail transport infrastructure is included in **Chapter 27**.

7.8.3 Rail Line to Abbot Point

Coal will be hauled approximately 150 km along the GAP rail line to the Port of Abbot Point Coal Terminal. The coal export port facility for the project is located at the Abbot Point Coal Terminal, approximately 25 km north of Bowen.

Adani Abbot Point Coal Terminal is the owner of the Abbot Point Bulk Coal Terminal. The terminal has recently completed upgrades and now has a nominal capacity to handle 50 Mtpa. Port capacity has been secured for 5 Mtpa of product coal from the project and negotiations are underway to secure an additional 5 Mtpa.

7.9 Mine Infrastructure Area Requirements

There will be two MIAs, one in the southern tenement area adjacent to the southern CHPP and one in the northern tenement area adjacent to the northern CHPP. The southern MIA will be established in the initial (south) construction phase and the northern MIA will be established in the second (north) construction phase. Both MIAs will contain similar facilities with the main points of difference being sizing, with the northern MIA to be smaller than the southern MIA, as infrastructure will be required to support production of 5 Mtpa ROM, compared to 15 Mtpa ROM from the southern tenement area.

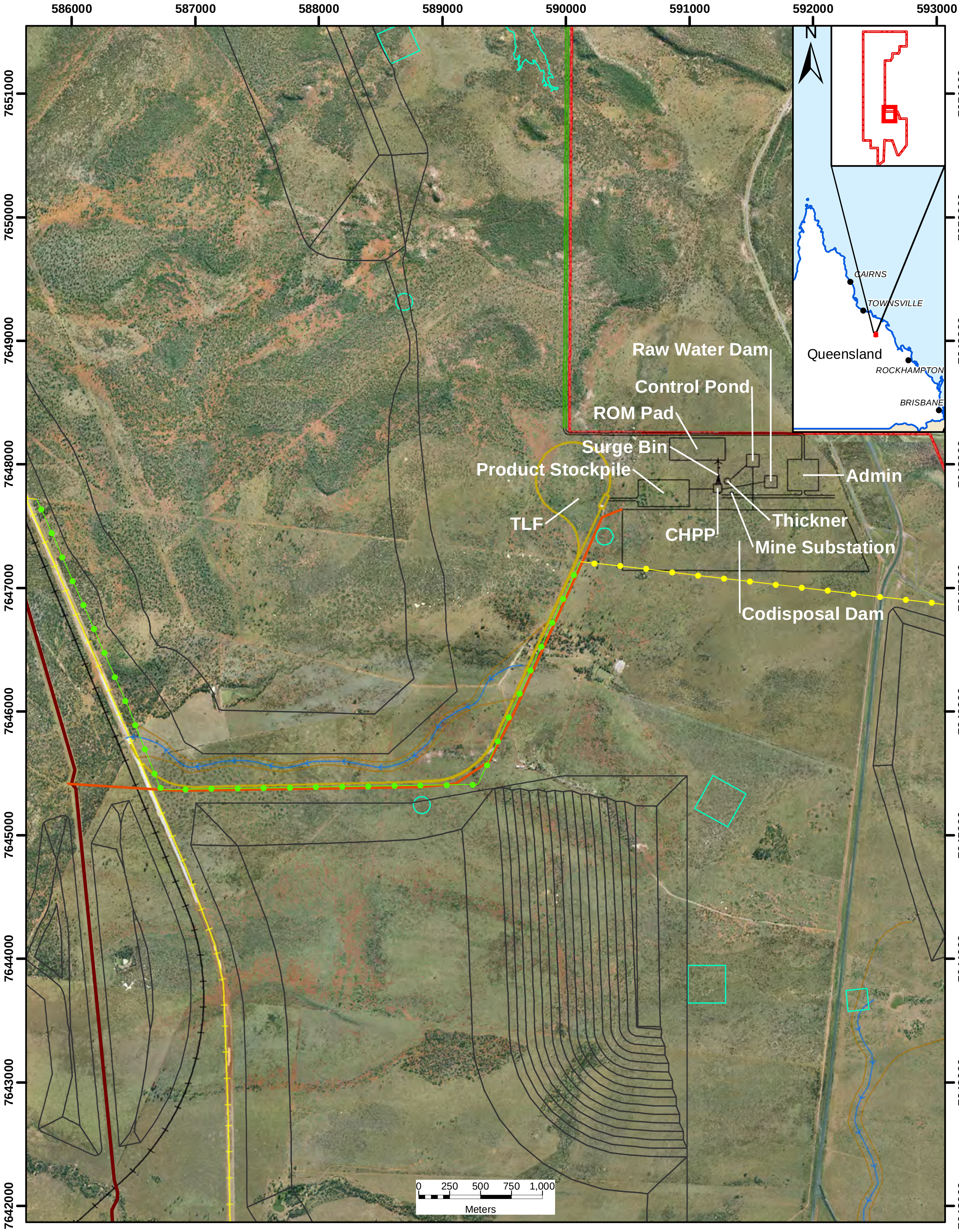
The southern MIA will be located adjacent to the southern CHPP facility which will ensure ready access to the Collinsville-Elphinstone Road and established infrastructure such as power. As the project expands an additional satellite MIA will be established adjacent to northern CHPP in approximately Year 15.

The south and north MIAs are shown in **Figure 7-15** and **Figure 7-16** respectively. Both south and north MIA administration area footprints are approximately 250 m by 250 m (6.2 ha). Based on flood modelling (refer **Chapter 16**), the MIA sites will be above the 1 in 100 year annual recurrence interval (ARI) flood level.

The MIAs will include the following:

- site offices
- hardstands and laydowns
- an administration facility
- workshop and stores, including tyre change and storage facility
- heavy vehicle servicing facility
- heavy vehicle and light vehicle fuel facilities
- lube and oil storage facility
- heavy vehicle and light vehicle wash down facilities
- generator (if required)
- potable water storage tanks
- reticulated services, including for fire fighting
- potable water treatment and sewage treatment plants
- external area lighting.

The MIAs will be bunded to direct clean water around the area and direct potentially contaminated water to an environmental control pond. Areas storing fuels or oils and washdown areas will be bunded and runoff from these areas will be directed to a sump to separate oils and water prior to releasing water to the environment control pond. Oils and fuel will be collected and disposed of by a licensed waste disposal contractor.



Legend

Project Area	Drainage Bund	Central Infrastructure Corridor
Waste Rock Dump and Pits	Drainage Diversion	Alpha Coal Project Rail Line
Dam (mine affected, sediment affected, clean water)	GAP Rail line	Powerline
	Train Loading Facilities	Powerline Diversion
Burdekin to Moranbah Pipeline	Mine Infrastructure	Raw Water Pipeline

South MIA and TLF Area		QCOAL GROUP
Figure 7-15	Byerwen Coal Project	environmental and licensing professionals pty ltd
Date: 30/01/2013	Author: samuel.ferguson Map Scale: 1:40,000	
Revision: R1	Coordinate System: GDA 1994 MGA Zone 55	

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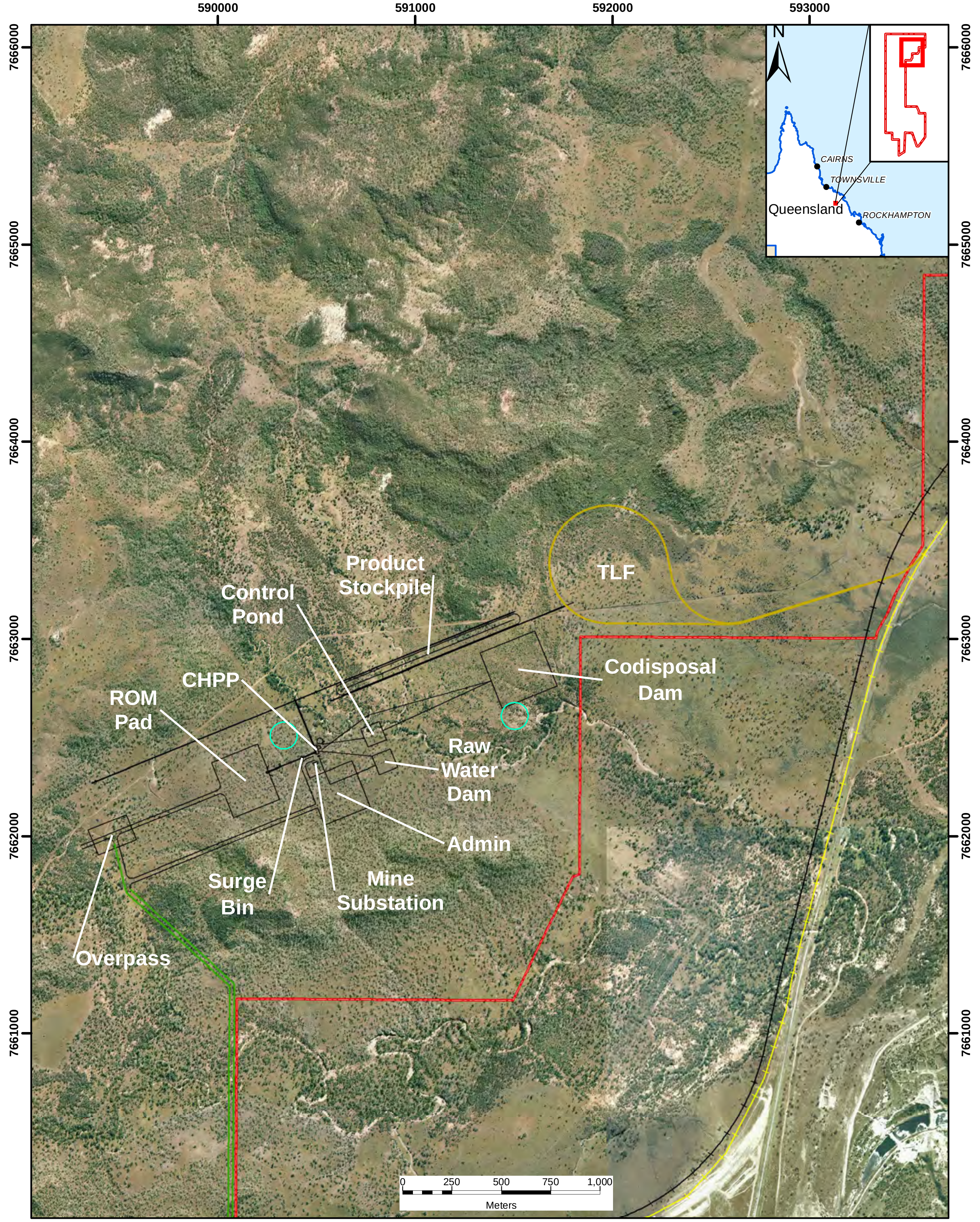

Legend

- Project Area
- Mine Infrastructure
- Central Infrastructure Corridor
- Train Loading Facilities
- GAP Rail line
- Alpha Coal Project Rail Line
- Dam (mine affected, sediment affected, clean water)

North MIA and TLF	QCOAL GROUP
Figure 7-16	**Byerwen Coal Project**
Date: *30/01/2013*	**Author:** samuel.ferguson **Map Scale:** 1:25,000
Revision: R1	**Coordinate System:** GDA 1994 MGA Zone 55

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7.9.1 Administration Facility

The administration facility will provide office facilities for staff, a muster area for shift changes and locker room and change facilities for personnel. Access to the administration facility will be via two-way internal access roads. Key features of the administration facility are likely to include:

- meeting the building requirements in accordance with the Building Code of Australia (BCA) and the Queensland Development Code
- air-conditioned office facilities, kitchen facilities, toilets, safety showers, meeting and training rooms, IT rooms, and first aid facilities
- a crib room with a covered area, sized to accommodate shift changes
- a centrally located muster area
- car park for light vehicles and bus drop off
- first aid facility
- emergency equipment store and fire vehicle garage
- external lighting.

7.9.2 Workshop and Store

Workshop facilities will be centrally located at the MIAs for servicing heavy mining equipment and are proposed to include the following features:

- maintenance bay for servicing mine site vehicles
- service bay and axle bay
- secure store
- electrical, tools, hydraulics machining and welding shops
- covered drum store and bunded lube area
- eyewash and shower facilities
- a switchboard and compressor
- covered battery storage area
- fenced waste storage hardstand area.

A tyre change and storage facility will be located near the workshops and will include the key features of:

- a tyre changing area
- a secure tyre and tyre changing equipment store
- an uncovered, fenced hardstand area for large tyre storage, air compressor, potable and fire water supply.

7.9.3 Fuel Facility

During peak operations, it is estimated that approximately 20 ML of diesel fuel will be required per annum.

The main fuel storage facility will be at the southern MIA with a satellite facility established at the northern MIA.

The fuel facility will comprise a number of interconnected self bunded bulk diesel storage tanks. It is anticipated that approximately 800 kL of fuel storage will be stored on site. Diesel will be reticulated to heavy vehicle service bays, and heavy and light vehicle bowsers. Access to the fuel facility will be via the internal MIA access roads. The fuel facility will be located at a safe operating distance from other MIA and surrounding facilities in accordance with *Australian Standard AS1940 - The storage and handling of flammable and combustible liquids.*

There will be no in-field fuel storage. Fuel trucks will transfer fuel from the fuel storage tanks to mine vehicles.

7.9.4 Lube and Oil Facility

The primary lube and oil facility will be at the southern MIA with a satellite facility at the northern MIA. The lube and oil facility will generally include:

- self bunded lube and oil storage tanks for a number of different types of oil and lube
- an anticipated total oil storage volume of approximately 90,000 L, consisting of 30,000 L of transmission oil, 15,000 L of hydraulic oil, 10,000 L of diesel engine oil, 10,000 L of final drive oil and 25,000 L of waste oil
- a total storage volume for lubricants and coolants of approximately 7,500 L, consisting of 2,500 L of engine coolant, 2,500 L of gear oil and 2,500 L of other lubricants
- slab on ground oil and lube tanker unloading area, allowing for oil transfer from the delivery vehicle to the storage tanks
- some reticulation of oils and lubricants depending on the final configuration of the MIA facilities.

Hydrocarbon and other contaminated waste will be collected, transported by a licensed waste transporter and disposed of an appropriately licensed waste disposal facility (further described in **Chapter 26**).

7.9.5 Washdown Facilities

Heavy vehicle and light vehicle washdown facilities will be provided on the MIAs. Access to the washdown facility will be via the MIA hardstand. Prewashing by water cannons will remove excessive amounts of large material, before heavy vehicles enter the washpad for washing with hand-held high pressure water cannons.

All water and drainage from washdown facilities will discharge into a grit trap then an oil/water separator, with water recycled back into the washdown process where possible, oils removed by a licensed contractor, and remaining washdown water discharged to an adjacent environmental control pond.

7.9.6 Reticulated Services

Reticulated services around the MIA will include:

- raw water and fire water
- potable water
- sewerage
- power and lighting
- communications.

The services will be reticulated via a common service trench around the MIAs.

The key features of the raw water and fire water reticulation will include:

- that raw water will be supplied to a raw water storage tank from the raw water storage dams
- raw water will be reticulated to supply water for fire fighting and washdown to the truck workshop, administration and bathhouse, workshop, washdown facility, diesel storage area and general hydrants.

The duration that coal is stockpiled will be minimized so as to minimise the risk of spontaneous combustion. Any coal showing signs of spontaneous combustion will be broken up and potentially watered from the water reticulation system.

A potable water reticulation system, including storage tank, pump set and ring mains, will distribute potable water from the potable water storage tank to the administration building, locker rooms, main workshop, CHPP, security building, workshop and warehouse, and covered external eyewash/deluge shower facilities.

Potable water will be supplied by water treatment plants (in north and south) which will treat raw water supplied by SunWater.

Sewerage systems are described in **Section 7.18.3**. Sewerage reticulation systems will connect the CHPPs and MIAs (in the north and south) to a sewage treatment plant.

The MIA power supply (in the north and south) will be provided by a transformer based on the maximum demand estimate for the MIA. A main switchboard will reticulate power to switchboards within the MIAs, located at the administration building, workshop and washdown facilities. Power supply to the project mining leases is discussed further in **Section 7.13**.

External area lighting will be provided around all infrastructure and hardstand of the MIA. Internal lighting will be provided in all buildings at the MIA.

7.9.7 Explosives Magazine and Storage

Over the life of the mine it is estimated that up to 55,000 tpa of ammonium nitrate/fuel oil (ANFO) (50,000 tpa ammonium nitrate and 5,000 tpa fuel oil) will be used to blast overburden.

An explosives magazine to house detonating explosives, bulk storage and all associated materials will be designed and constructed to *Australian Standard (AS) 2187 Explosives — Storage, Transport and Use*, and any other applicable standards and industry best practice. The magazine will be located in an isolated area for safety and security purposes.

Explosives and blasting agents will be stored on site in a purpose built compound once operations commence. It is anticipated that the explosives storage facility will be supplied and managed by a specialist explosive supplier in accordance with all statutory and Australian Standards requirements.

The explosives magazine location will provide sufficient separation distance to other mine infrastructure on the MLA areas in accordance with segregation distances outlined as *AS 2187 Explosives – Storage, Transport and Use*. The nearest residence to the magazine will be at least 3 km away.

7.10 Infrastructure Corridors

There are two infrastructure corridors within the project tenements:

- southern infrastructure corridor
- central infrastructure corridor.

The southern infrastructure corridor will connect the GAP railway to the southern CHPP and contain:

- southern rail line
- drainage diversions to divert water flowing between West Pit 1 and South Pit 1.
- raw water supply
- existing power line re-alignment.

The central infrastructure corridor will connect the southern CHPP and MIA to the northern CHPP and MIA and contain:

- road for light and heavy mine site vehicles
- power lines
- raw water supply pipeline
- communications.

The central infrastructure corridor will be used for the transfer of mining equipment between the various pits in the project so as to limit impacts on public roads.

The investigation area for the infrastructure corridors (other than drainage diversions) is approximately 100 metres wide to allow for minor changes in horizontal alignment during the detailed design. The final corridor width will be less than 100 metres to allow for the required infrastructure. Depending on an evaluation of security requirements, the infrastructure corridor may be fenced along both sides. Fencing providing a high level of security will be provided near road crossings and where the infrastructure is visible from public roads.

7.11 Road Transport

Roads associated with the mine are divided into the following categories:

- ROM coal haul roads and waste rock haul roads within the mine site
- site access roads and other internal roads for light and heavy vehicles, including roads within the infrastructure corridor
- public access roads to the mine site
- closures and relocations of public roads and stock routes.

Crossing points are required to be established where roads cross the Collinsville-Elphinstone Road, the GAP rail line and potentially the proposed Alpha Coal Project rail line which will run parallel to the GAP rail line. Additional crossing points will also be required to allow waste rock haul truck traffic to cross the GAP rail line and proposed Alpha Coal Project rail line in the southern portion of the project area to access out of pit dump locations and to facilitate equipment movement.

Where light and heavy vehicles utilise the same routes, a light vehicle and heavy vehicle separation will be achieved as per standard industry practice.

The central infrastructure corridor will pass through two properties not owned by the proponent and the southern infrastructure corridor is predominantly in a property owned by the proponent. Where required, crossings of the infrastructure corridors will be provided to allow landholders access from one side of the property to the other for the movement of stock and vehicles. The design and location of crossings will be determined in conjunction with landholders.

7.11.1 ROM Coal and Waste Rock Haul Roads

A haul road for ROM coal is required from all mine pits to the ROM coal stockpiles at CHPPs. Temporary haul roads will also be constructed to the out-of-pit waste rock dumps. These roads will be extended / relocated as required as the pits are excavated and waste rock dumps are built upwards and extended.

Approximately 150 km of haul roads are proposed over the life of the mine. Haul roads will be constructed as needed by the opening and operation of pits, and closed and rehabilitated once pit access by mining vehicles is no longer required.

Haul roads will be designed as all-weather access, unsealed roads that are approximately 30 m wide to allow two-way traffic of mining vehicles and equipment. It is expected that suitable quarry materials for construction of the roads can be sourced from within the project mining leases.

Haul road crossings of watercourses and drainage lines will be designed to minimise impacts and may include culverts and bridges.

7.11.2 Site Access and Internal Roads

There will be two site access roads which connect the Collinsville-Elphinstone Road to the southern and northern MIA and CHPP. The main gates will be along the site access road from the intersection with Collinsville-Elphinstone Road, and will be serviced by a permanently manned security building.

Approximately 20 km of internal roads for light and heavy (not vehicles directly involved in mining) vehicles are proposed. These roads will be approximately 15 m wide. Any other light vehicle access to the mining areas will be via the haul roads and be controlled by site road rules and site operating procedures.

7.11.3 Public Access Roads to the Mine Site

The major roads likely to be used to access the project include the Bruce Highway, Peak Downs Highway, Suttor Developmental Road, Bowen Developmental Road and Collinsville-Elphinstone Road. All roads are sealed and currently carry traffic for a number of existing mines in the vicinity of the project area. Road transport on public roads is described in **Chapter 27**.

The site access road (to the east of the south CHPP) intersects the Collinsville-Elphinstone Road, with the intersection to be upgraded as applicable to the Austroads Guide to Road Design (Austroads, 2012) specification (particularly Part 4 Intersections and Crossings – General) as well as Queensland Government Transport and Main Roads Department, Road Planning and Design Manual (DTMR, 2012) guidance and will allow for adequate turning lanes, visibility from both directions and safety protocols/infrastructure for heavy vehicle traffic. Construction access will be from the same access points.

Chapter 27 - Traffic and Transport describes the conditions of these roads, existing and potential future road use, project generated traffic and measures to mitigate potential impacts, including potential road upgrades and road maintenance.

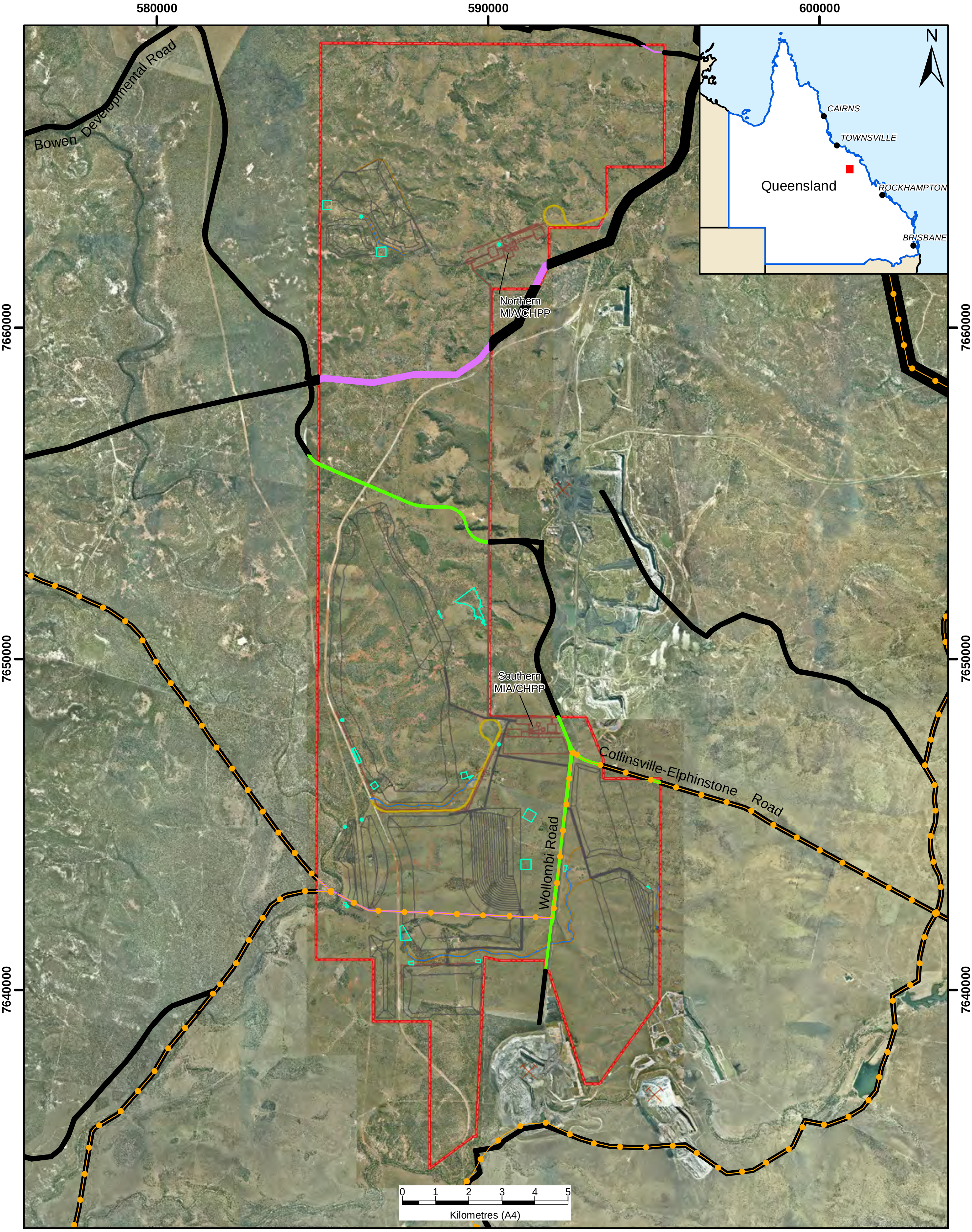
7.11.4 Public Road Closures and Relocations

The proposed coal pit locations may result in the requirement for relocations of local government owned roads, new sections of road and temporary closure of some roads.

Any proposed temporary road closures and relocation alignments are subject to detailed design and consultation with the Department of Transport and Main Roads, Regional Councils and EHP.

There is one stock route which is designated as unused or inactive by the Queensland government that intersects the southern tenement areas of the project and which follows property boundaries. The portion of the stock route within the proponent's mining leases that runs north to south is within or parallel to Xstrata Coal Queensland's mining lease application for a transport corridor.

Approvals will be sought for all works associated with temporary road and stock route closures and relocations. All road and stock route closures or relocations will be communicated to the public. Public roads and stock routes are shown in **Figure 7-17**.



Legend

- Project Area
- Waste Rock Dumps and Pits
- Existing Mine Site
- Train Loading Facilities
- Central Infrastructure Corridor
- Mine Infrastructure
- Drainage Bund
- Drainage Diversion
- Dam (mine affected, sediment affected, clean water)
- Unused/Inactive Stock Route
- Formed Roads (Inside Project Area)
- Unformed Gazetted Roads (Inside Project Area)
- Gazetted Roads (Outside Project Area)

Public Roads and Stock Routes	
Figure 7-17	**Byerwen Coal Project**
Date: *28/02/2013*	**Author:** samuel.ferguson
	Map Scale: 1:150,000
Revision: R1	**Coordinate System:** GDA 1994 MGA Zone 55

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7.12 Forestry Products and Quarry Material

The proponent does not intend to take, disturb or use any timber resources or quarry for purposes other than mining within the boundaries of the project's mining leases, or outside of the mining leases as part of the project.

Quarry materials for construction, including haul road base material, will be sourced from onsite deposits, where possible. The exact location and quality/suitability of the deposits is yet to be determined, although it is expected that materials can be sourced from basalt outcrops that form part of the waste rock from mining.

This EIS describes the expected area of clearance of vegetation, including native timbers. The proponent will consider whether any vegetation clearance has potential as commercial native timber (e.g. fencing type timber) and may allow for salvage of timber to occur prior to clearance for mining activities.

7.13 Energy

Power supply and distribution are essential functions for the operation of the project. The following sections provide a basic outline of the considerations associated with power for the project, addressing:

- power demand
- power supply options
- power distribution across the project mining lease areas
- existing power infrastructure relocations.

7.13.1 Power Demand

Power demand at the mine is characterised by a base load component of 23 MW originating from steady loads such as the CHPPs, conveyor belts and MIA facilities. Approximately 15 MW of power is required in the southern tenement area and 8 MW in the northern tenement area. In addition, 8 MW will be required for the dragline.

7.13.2 Power Supply Options

Power supply to the southern and northern tenement areas will be via spurs to an existing 66 kV line that originates from the Newlands substation and traverses the project area. The existing line was built to provide power to a de-commissioned gold mine west of the project area. The spurs will be entirely on the proponent's mining leases.

Incoming power will enter the site substations in the southern and northern tenement areas and then reticulated throughout the site as required.

7.13.3 Existing Power Infrastructure Relocations

The existing 66 kV power line, which will supply power to the project, traverses West Pit 1 and will be relocated to avoid West Pit 1, with the most likely route following the southern infrastructure corridor.

The existing local electrical infrastructure is a combination of 22 kV overhead power lines and single-wire earth return (SWER) lines across the project area. These lines supply the properties within and adjacent the project area.

Relocation of the existing electricity infrastructure within the project area will be timed to co-ordinate with the proposed mining schedule and in conjunction with the relevant energy provider. Properties outside the project area which rely on electrical infrastructure that currently crosses the project area will have power provided via the relocated infrastructure.

7.14 Telecommunications

The project will utilise microwave technology for telecommunications and is therefore expected to have no physical impact on existing telecommunications infrastructure and will not require connection points on site. No mapping of existing infrastructure is therefore required.

7.15 Water Management

Water management for the project is described in **Chapter 8**. This includes a description of:

- water demand for the project
- raw and potable water supply
- water balance considering all inflows such as rainfall and groundwater inflows
- management of mine affected water, sediment affected water and stormwater runoff
- release strategy for captured mine affected water
- drainage diversions
- water conservation measures.

The proponent has commenced discussions with a third party water supplier (SunWater) for the sourcing and delivery of water for the project from a pipeline system that traverses the western side of the tenement area and connects to the Burdekin water supply scheme at Gorge Weir. The connection point will be within the tenement area and the raw water supply pipeline will be within the southern infrastructure corridor for supply of raw water to the southern raw water dam. The raw water pipeline will be extended along the central infrastructure corridor for supply of raw water to the northern raw water dam.

Approximately 100 ML of water will be stored at both the southern raw water dam and northern raw water dam.

7.16 Workforce

The operational workforce increases from approximately 195 in Year 1 to 495 in Year 5 and then to 515 in Year 15 to Year 17. Once construction in the northern tenements areas for the open pit is completed, the operational workforce will increase to approximately 545 before declining to approximately 265 in the later years of mine life.

A workforce profile showing the construction workforce during both construction phases and the operations workforce is presented in **Table 7-11**.

Table 7-11 Byerwen Workforce Profile

Project Phase		Construction South			Construction and Operation South	Operation South				Operation South / Construction North			Operation South and North						Rehabilitation	
Duration		**1.5 years**			**1 year**	**13 years**				**3 years**			**29 years**						**2 Years**	
Project period		-1.5yrs	-1yr	-0.5yr	1yr	2yrs	3yrs	5yrs	14 yrs	15yrs	16yrs	17yrs	18yrs	19yrs	20yrs	30yrs	40yrs	46yrs	47yrs	48yrs
Construction workforce		40	265	350	40	-	-	-	-	40	265	130	-	-	-	-	-	-	-	-
Operational workforce		-	-	-	195	365	365	495	495	515	515	515	545	545	545	545	445	265	115	115
Operation workforce breakdown	Staff				25	45	45	75	75	75	75	75	75	75	75	75	75	45	20	20
	Open cut				150	300	300	400	400	400	400	400	400	400	400	400	300	150	75	75
	CHPP				20	20	20	20	20	40	40	40	70	70	70	70	70	70	20	20
Total workforce		**40**	**265**	**350**	**235**	**365**	**365**	**495**	**495**	**555**	**780**	**645**	**545**	**545**	**545**	**545**	**445**	**265**	**115**	**115**

The operational workforce will comprise of approximately 10% administrative/managerial staff who will work a five day on, 2 days off roster. The remainder of the operational staff will be split into two shifts working 7 days on, 7 days off roster, or similar. Workers will be transported by bus from the accommodation facilities to the mine site and bus services will be offered between Glenden accommodation and regional centres (e.g. Mackay) at shift change-over.

7.17 Workforce Accommodation

Accommodation for up to 780 workers is required for the project's peak (year 16) for the combined construction and operation workforce. The proponent's preference is for accommodation to be provided in Glenden, however should this option be rejected by the local authorities, the proponent will seek the necessary approvals to accommodate all workers in alternative accommodation, including in a camp on the project mining leases.

Workers will have the choice of whether to live locally or commute to work. The proponent's preferred option is to house workers in Glenden, which is within a safe daily travelling distance to the mine site. It is anticipated that approximately 30% of workers will choose to live locally in Glenden in houses and duplexes while 70% will choose to commute from other locations to stay in purpose built accommodation village during their shift.

Sufficient land is currently being sourced to provide for the future workforce's preferred accommodation requirements and a third party is developing this accommodation on behalf of the proponent. Duplexes and houses will attract families, allowing for the growth of a resident population in Glenden while well-designed accommodation village facilities will provide a suitable option to those who wish to commute.

The accommodation village will consist of single en-suite units with meals and dining provided in a common facility and a common area for recreation. The accommodation village in Glenden is likely to contain the following features:

- accommodation unit blocks with two to four rooms to a block, with one person per room
- no on-site couple or family accommodation
- car parks
- dining room, laundries and kitchen
- recreation room, gym and covered barbeque areas
- external lighting to the buildings, walkways and car park
- communications to all facilities and for each room
- security fencing
- internal reticulation of water, power and sewage
- covered walkways
- landscaping and outdoor recreational areas.

Duplexes will comprise one and two en-suite rooms per duplex and individual living and dining areas. They will be suitable for couples, singles or couples with a child.

Houses will consist of a mix of two or three bedroom modular houses with quality design and materials. Houses will be suitable for families.

The proponent will continue to seek land for accommodation within Glenden and review accommodation options beyond year 16 to cater for the north construction phase and a greater operational workforce.

Accommodation in Glenden is off tenement and will require development approval under the *Sustaining Planning Act 2009* (SP Act). The proponent has an arrangement with a third party who will develop the accommodation facilities in Glenden and seek all relevant approvals for the construction and operation of the facilities. This EIS assesses the social and community impacts of an accommodation village in Glenden and the traffic and transport impacts of workers commuting between Glenden and the mine site and regional centres. This EIS does not assess the localised impacts from accommodation facilities in Glenden, such as impacts to the ecology within the accommodation facility footprint or noise impacts on nearby sensitive receptors, as the location of the accommodation facilities cannot be confirmed at the time of this EIS and these impacts will be assessed during the application for development approval.

7.18 Waste Management

7.18.1 Excavated Waste and Coal Rejects

The primary source of waste from mining operations is excavated waste rock waste rock and rejects from the CHPP. Rejects management will be required since the ROM coal will require washing on-site. Plant water consumption and water availability are the major considerations in the selection of the most appropriate method of rejects disposal. Characterisation of waste rock and rejects and management of excavated waste rock and rejects is described in **Chapter 9** and **Section 7.4** and **Section 7.7**.

7.18.2 Solid and Liquid Waste

The project will generate non-mining wastes during both construction and operational phases. Wastes will be effectively managed and reduced through the implementation of site specific recycling practices and licensed collection for waste oils, batteries, tyres etc. No landfill disposal will occur on-site, although used tyres may be disposed of in-pit. Solid waste generated by the project will include waste from the following streams:

- solid wastes generated from wastewater treatment plant
- sediment from sediment traps
- packaging materials (e.g. cardboard, paper, plastic, wood)
- scrap material
- timber
- geotextiles
- electrical off-cuts
- concrete and rubble
- scrap metals
- hydrocarbons
- oily waste such as rags and filters
- tyres
- sealant/resin and paint materials
- batteries
- green waste
- general domestic waste.

Waste management, including a description of types of waste and estimated volumes, is described in **Chapter 26** (other than mining waste described in **Chapter 9**).

The recycling and re-use of waste materials will be the preferred option for the project both during construction and operation. If the waste can be recycled or re-used, it will be separated out into various skips according to its waste stream.

It is unlikely that hydrocarbons, chemicals and detergents will be stored on site in significant quantities during the construction and operational phases of the project. Only quantities required for day to day operation will be stored on site and will be stored in accordance with the requirements of the relevant Australian Standard.

The proponent proposes to use the Isaac Regional Council's (IRC's) waste facilities for disposal of general wastes other than:

- wastes that are reused or recycled, either on-site or at a designated facility
- wastes planned for on-site disposal
- regulated wastes or other wastes that cannot be accepted by the local waste facilities.

Regulated waste will be disposed of at appropriately licensed waste disposal facilities.

7.18.3 Sewerage System

A primary sewerage treatment plant (STP) will be situated on site to treat waste from the ablution facilities at various mine infrastructure sites. Treated effluent will be reused, most likely for irrigation, with sludge/biosolid disposed of by a certified third party contractor at an appropriately licensed regional waste disposal facility.

The STP will be designed to treat effluent to a class suitable for irrigation to land so that there are no long term detrimental impacts to soils or watercourses. Sufficient storage will be provided in bunded tanks to hold treated effluent during periods of wet weather. The storage capacity will be determined during detailed engineering.

7.19 Rehabilitation and Decommissioning

Rehabilitation and decommissioning is described in **Chapter 10**.

Rehabilitation of the mine will be progressive throughout the operation and decommissioning of the mine, and considers many elements addressed throughout the EIS, including but not limited to, mine scheduling, waste rock and soils management, water management and terrestrial and aquatic ecology.

Decommissioning will be phased over the life of the mine with the majority of decommissioning activities occurring during the mine closure phase.