Chapter 6

Construction

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6. CONSTRUCTION

6.1 Overview

This chapter describes the various activities and their expected timing for the construction phases of the project, which includes:

- site clearance and preparation
- civil works
- structure and plant erection and installation
- construction of mine infrastructure
- commissioning and testing
- materials, plant and equipment sourcing and transportation
- accommodation and transport of construction personnel
- construction of coal haul roads
- construction of the train loading facilities
- construction of ancillary infrastructure such as power and water reticulation systems.

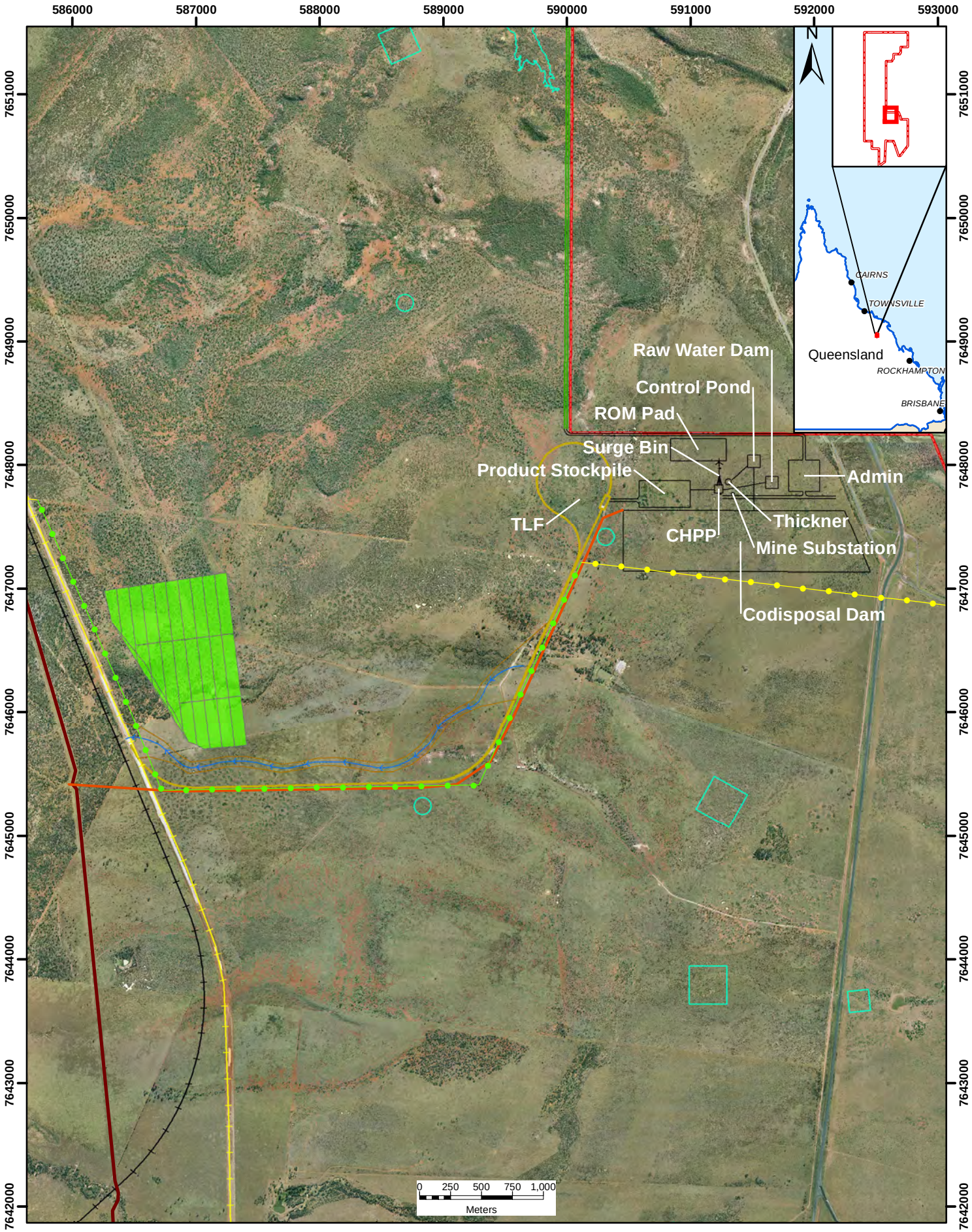
This chapter does not describe construction activities for those activities not within the scope of this EIS, (refer **Chapter 3**). No easements are required for the construction of the project as all works will occur within the mining lease areas.

6.2 Construction Program

6.2.1 Project Phases

There will be two periods of construction, in the south and north tenement areas. A map of the infrastructure to be constructed in the south and north phases is provided in **Figure 6-1** and **Figure 6-2** respectively.

1. **South -** Construction in the southern tenement area (ML 70435, ML 70434 and ML 70436) will occur prior to any operations and includes construction of the south coal handling and preparation plant (CHPP), mine infrastructure area (MIA), water management infrastructure, and south train loading facility (TLF).
2. **North -** Construction in the northern tenement area (ML 10355, ML 10356 and ML 10357) will commence in approximately Year 15 of south phase mining operations, to coincide with the planned commencement of operations of the open pit in the north in Year 17. Construction in the north tenement area will include the north CHPP, MIA, water management infrastructure and TLF.



Legend

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

Infrastructure Construction South Phase	QCOAL GROUP
Figure 6-1	**Byerwen Coal Project**
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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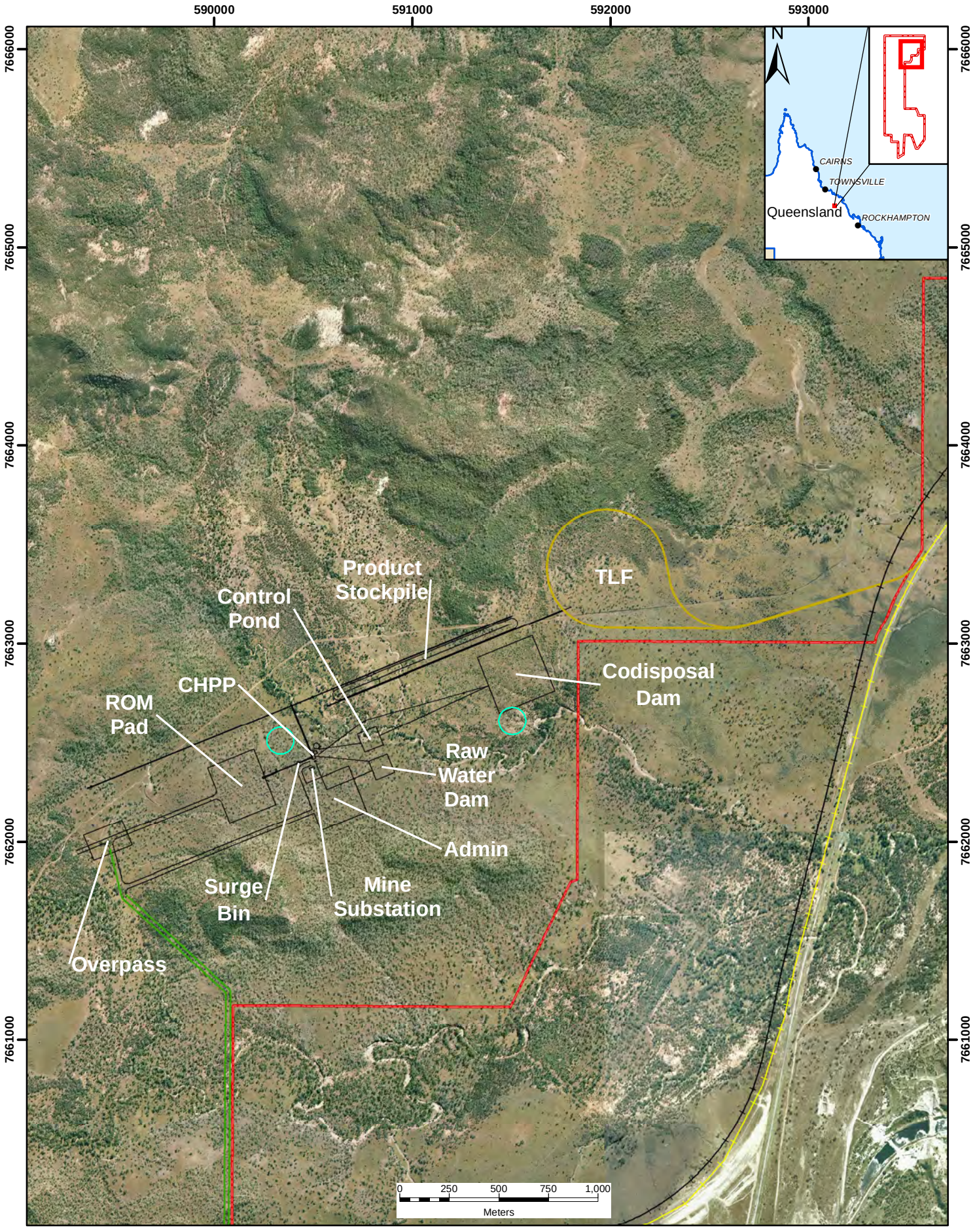

Legend

- Project Area
- Mine Infrastructure
- Central Infrastructure Corridor
- Train Loading Facilities
- GAP Rail line
- Alpha Coal Project Rail Line
- Sediment Dam

Infrastructure Construction North Phase	QCOAL GROUP
Figure 6-2	**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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6.2.2 Estimated Timing of Construction Activities

The commencement date for construction is dependent upon the timing of the project approvals process, therefore the EIS can only provide indicative estimates of construction timing.

The phasing of the project is discussed in terms of pre-construction, (commencing in Year -2), with site preparation and construction in the south tenement starting in approximately Year -1.5, followed by first year of operation as Year 1. Indicative project timing is provided in **Table 6-1**.

The first year of construction in the north tenement area will be approximately Year 15 and continue for two years.

Table 6-1 Indicative Project Timing

Year	Activity	Indicative dates
South Phase		
Y-2	Pre-construction: detailed design, tenders, and procurement.	2013
Y-1.5	Construction: site preparation works, civil works, structure and plant erection and installation, construction of mine infrastructure, clearing, grubbing and topsoil management for the open pits in southern tenement area.	2014
Y1	Operations – commence open cut mining in the southern tenement area	2015
North Phase		
Y15	Construction of north CHPP and associated infrastructure	2030
Y16	Commence open cut mining in the northern tenement area	2032

6.3 Pre-construction

Activities not involving on-site construction activities will be undertaken including detailed design, tenders and early procurement of infrastructure components with long lead times. This stage does not require approvals for resource allocations.

6.4 Site preparation

6.4.1 South Phase

Removal, relocation or demolition will include the removal of existing standing structures, subject to an agreement with landholders for conduct and compensation in accordance with the granting of the mining lease for the project. Where infrastructure is not in a location required for mining operations it may be retained to allow ongoing use of unused portions of the mining lease areas.

Site clearance will include clearance of vegetation, soil removal and storage, bulk earthworks, and temporary drainage works. The initial site clearance works will be focused on the internal site access road, and south MIA (including construction laydown area) and CHPP. Site clearance will be staged throughout the construction phases on an as-needed basis to coincide with structure installation and erection to minimise the extent and duration of cleared areas at any time.

Suitable soil resources for use in rehabilitation (refer **Chapter 13**) will be stripped from areas where construction and mining operations will occur. Stripped soils from construction areas and from areas in the first three to five years of mine operation, will be stockpiled within the footprint of the West Pit 1

area to the east of the advancing open pit. Soil will be used in progressive rehabilitation once out of pit waste rock dumps have attained their final landform. Soil stockpiles will be approximately 2 m high. It is expected that between years three and five, soil removed will be used in ongoing progressive rehabilitation and there will be no need for long term stockpiling of soil. Ongoing stripping and management of soils during operations is described in **Chapter 7**.

Site preparation activities will include the following:

- site security - it is likely that fencing will be developed adjacent to the main access road security gate, and other strategic areas across the construction site, including the MIAs
- site clearance
- civil works:
  - environmental protection measures
  - washdown facilities
  - erosion and sediment controls
  - quarry materials – where required will be sourced from onsite deposits, where possible
  - concrete batch plant - concrete will be batched on site, with suitable batching materials delivered to site by third parties
- mobilisation to site:
  - accommodation (in Glenden)
  - crib huts
  - fencing
  - amenities
- access road establishment and upgrade
- establishment of yards:
  - installation of temporary water supply with potable water trucked to the site until a water treatment plant is installed
  - sewerage management infrastructure with effluent trucked from site by a licensed contractor to a licensed waste disposal facility
  - demountable offices
  - car park
- establishment of laydown and storage areas.

Upgrades to the intersection of the Collinsville-Elphinstone Road and the site access road (as described in **Chapter 27**) will be determined through consultation with the relevant road authority. It is noted that the Collinsville-Elphinstone Road currently provides access to Xstrata Coal's Newlands Coal Mine.

6.4.2 North Phase

Construction in the north tenement area is anticipated to occur in Year 15 and will include the same site preparation activities as the south phase.

6.5 Construction of Key Infrastructure Components

Construction phase activities can be broadly described as:

- earthworks

- civil works including temporary and permanent drainage works
- rail construction
- structure and plant erection and installation
- commissioning and testing of plant and equipment
- construction site demobilisation.

6.5.1 South Phase

Infrastructure that will be constructed during the south phase of construction (noting that some construction works will continue into the operational years of the project) includes:

- the south CHPP and product coal stockpile area
- the south MIA, including administration facilities, workshops, servicing facilities, fuel storage and environmental control pond
- south ROM coal stockpile area and ROM dump station (comprising dump hopper, product conveyor, crushers and surge bin)
- south train loading facility including train loading bin and associated conveyors connected to the product coal stockpile area, rail loop and rail spur
- ROM coal haul roads and waste rock haul roads and / or conveyor
- sewage and waste management facilities, for the ongoing use of the operational workforce, including package sewage treatment plant
- water supply pipeline and management facilities, including raw water supply, storage and a water treatment plant to treat water to potable quality
- south co-disposal dam
- mine affected water dams, sediment affected water dams and clean water dams required for management of water during the initial years of operations for West Pit 1 (further described in **Chapter 8**)
- drainage line diversion for the tributary of the Suttor River that intersects West Pit 1 (further described in **Chapter 8** and **Chapter 16**)
- light and heavy vehicle internal roads
- main gate and security building
- explosives storage and preparation facilities
- power lines and substation
- transmission line relocation and new transmission lines
- bridges and underpasses, where required for crossing of third party infrastructure.

Electricity requirements for the south phase of construction will be supplied via diesel generators for construction power requirements and to provide lighting to the site when required, until such time as a connection to the electricity transmission grid is established. It is not expected that more than 5MW of power will be required during the project's construction phase. Diesel will be used for all major mobile plant, equipment and vehicles during the construction period. Diesel will be stored in self-bunded tanks.

6.5.2 North Phase

Infrastructure to be constructed during the north construction phase includes:

- the north CHPP and product stockpile area

- north ROM coal stockpile area and ROM dump station (comprising dump hopper, product conveyor, crushers and surge bin)
- north train loading facility including train loading bin and associated conveyors connected to the product coal stockpile area, rail loop and rail spur
- ROM coal and waste rock haul roads
- light and heavy vehicle internal roads
- the north MIA, including administration facilities, workshops, servicing facilities, fuel storage and environmental control pond
- power lines and substation
- water supply and management facilities, including raw water supply and storage
- north mine affected water dams and sediment dams
- north co-disposal dam
- mine affected water dams, sediment affected water dams and clean water dams required for management of water during the initial years of operations for North Pit (further described in **Chapter 8**)
- drainage line diversion for the tributary of the Kangaroo Creek that intersects North Pit (further described in **Chapter 8** and **Chapter 16**)
- explosives storage and preparation facilities.

Electricity requirements for the north phase of construction will be supplied by either diesel generators or power lines connecting the electricity transmission grid to the project. Substations will be installed adjacent the north and south MIA.

Chapter 7 - Operations further describes the infrastructure of the project.

6.5.3 Civil Works

Civil works are likely to include, but may not be limited to:

- civil earthworks, including foundation construction
- installation of permanent and temporary drainage
- trenching and laying of reticulated services and any other underground pipelines and services
- reconfiguration and installation of powerlines and substations adjacent to MIAs
- road formation construction, surfacing and finishing required for unsealed roads
- rail loop and rail spur formation construction, track laying and finishing for both south and north TLFs
- conveyor footings
- earthworks for the establishment of drainage diversions
- dams, including co-disposal dams, raw water dams, sediment affected water dams, mine affected water dams and clean water with construction generally involving ‘turkey’s nest’ style dams.

Civil earthworks, including any construction of structure foundations, permanent laydown areas and hardstands will be undertaken mostly in Year-1 in the south phase and in approximately Year 15 and 16 in the north phase. The timeframe for completion will depend on ground conditions, topography and geology encountered, and the priorities as determined by the proponent. In the event that piled foundations are required, piling rigs will be needed.

Installation of permanent drainage will be undertaken to accommodate both the construction and operational phase drainage where possible. Where permanent drainage for the operational phase cannot be installed, temporary drainage for the construction period will be designed to the appropriate standards.

An environmental control pond will be established at the north and south MIAs to capture runoff from construction of the MIA, CHPP, ROM pad, product coal pad and associated infrastructure. The environmental control ponds are nominally sized to each capture 100ML. Final sizing of these dams will be determined in accordance with the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams (DERM, 2012).

The south and north raw water dams (containing water imported to site from SunWater's Burdekin to Moranbah water pipeline system) will be sized to each hold approximately 100ML.

Roads associated with the project mining leases include ROM coal and waste rock haul roads, site access roads, light and heavy vehicle internal roads, and public roads. Construction of ROM coal and waste rock haul, site access, light and heavy vehicle internal roads will be phased over the life of the construction and operations of the mine. No roads will be sealed, other than the Collinsville-Elphinstone Road.

Temporary closures and relocation of public roads and stock routes may occur during the construction and operation of the mine. Alternative access routes and arrangements will be made for any temporary closures or relocations of public roads and stock routes. Sealing of road surfaces, laydown areas and hardstands may be required. Some private landholder roads may be temporarily closed or relocated. Alternative arrangements or access routes, built to the same standard as existing private roads will be provided to private landholders.

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 (Austraods, 2012) (particularly Part 4 Intersections and Crossings – General) as well as Queensland Government Transport and Main Roads Department, Road Planning and Design Manual (DTMR, 2012).

Existing power lines within the project mining lease areas may be reconfigured and additional power lines and substations will be installed to provide electricity supply to the site.

Quarry materials will be sourced from onsite deposits, where possible, for use as road base, select fill, rail ballast, rock protection, sealing aggregates and other construction materials. Further geotechnical investigations are required to determine the quality/suitability of the deposits for construction purposes although it is likely that only low to medium quality material will be available. It is expected that waste rock from open pit excavations will provide the majority of quarry and bulk fill materials.

These deposits consist of basaltic materials that overlay waste rock from open pits. No additional disturbance to areas outside of the pit footprint will be required to obtain quarry materials. If these deposits are not suitable for a particular purpose, material will be sourced from nearby quarries.

6.5.4 Structure and Plant Erection and Installation

Construction of buildings and structures will occur after the civil works.

Installation of plant and related building components will follow superstructure erection, including the installation of pipe works, cables and instrumentation. Where possible, main plant components will be pre-fabricated and delivered complete to site to minimise the requirement for on-site assembly work.

6.5.5 Construction Management Facilities

The main construction management facilities will be located near the proposed MIAs. Permanent administration facilities will replace the construction phase facilities.

The construction management facilities provided at both the south and north MIAs will include:

- demountable buildings including offices, meeting rooms, crib rooms/kitchen, toilets, first aid, communications and storage
- car park
- a light vehicle wash down slab
- temporary power supply from diesel generators, until access to the electricity grid is provided
- temporary construction water storage
- a temporary potable water storage, until permanent facilities are installed
- temporary wastewater storage, until permanent facilities are installed.

6.5.6 Dragline

It is expected that a single dragline will be required and that it will commence operations in approximately Year 5. The dragline will be assembled onsite. This would involve construction of a concrete hardstand and the use of scaffolding and mobile cranes for assembly.

6.5.7 Coal Handling and Preparation Plants

Construction of the CHPPs, ROM coal and product conveyors and stockpiles is anticipated to last approximately twenty months in total. Given the height and size of the CHPP modules, product stockpiles, surge bin and crushing facilities, the use of cranes, lifts, and multistorey scaffolding is anticipated. All work will be in accordance with recognised Building Standards and Regulations.

Construction of the north CHPP will commence during the operations phase in the south mine area.

6.5.8 Train Loading Facilities

Two TLFs comprising train loading bin, rail loop and rail spur, will be constructed for the transport of product coal. The TLFs will be connected to the Goonyella to Abbot Point (GAP) rail line, with one connection in the southern tenement area and the other connection in the northern tenement area. The south rail spur and rail loop will be approximately 7 km in length and will connect the GAP rail line to the south CHPP. The north rail spur and rail loop will be approximately 3.5 km in length and will connect the GAP rail line to the north CHPP. Product coal will be direct fed from the product coal stockpiles adjacent to the CHPPs to the train loading bins using conveyors.

The rail lines will be a narrow gauge line with a turn out to spur lines from the GAP rail line and a rail loop with a radius of approximately 300 m. The south TLF will be constructed during Years -1 and the north TLF will be constructed in approximately Year 15 and 16.

Cut and fill volumes for construction of the rail loop and rail spurs will be minimised. Any quantities of excess cut and fill will be determined during detailed engineering. Management of potential excess cut will be determined during detailed engineering with excess fill potentially used during other construction activities or stockpiled.

6.5.9 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 rail line to the south CHPP and contain:

- south rail spur
- drainage diversions to divert water flowing between West Pit 1 and South Pit 1
- raw water supply pipeline
- existing powerline re-alignment.

The central infrastructure corridor will connect the south CHPP and MIA to the north 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 the use of public roads.

The southern and central infrastructure corridor widths are based on the estimated corridor width for each component of linear infrastructure within the corridor as follows:

- rail 25 m buffer from centreline (i.e. 50 m wide corridor).
- haul roads 20 m buffer from centreline (i.e. 40 m wide corridor).
- access roads 10 m buffer from centreline. (20 m corridor).
- power 10 m buffer from centreline (i.e. 20 m wide corridor).
- water pipeline 10 m buffer from centreline (i.e. 20 m wide corridor).
- Drainage diversion corridor 100 to 300 m.

The estimated width of the southern and central infrastructure corridors are 400 m and 100 m respectively. The central infrastructure corridor will cross the Collinsville-Elphinstone Road (a public road), the GAP rail line and potentially the proposed Alpha Coal Project rail line which will run parallel to the GAP rail line. Crossing points are required to be established where mine roads cross the Collinsville-Elphinstone Road and the railway lines. An additional light vehicle overpass will be required to provide separation between light and heavy vehicle traffic streams as per standard industry practice. In all instances it is proposed that a suitably engineered overpass will be used to separate the respective traffic streams.

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 south portion of the project (within the southern infrastructure corridor and near South Pit 2) to access out of pit dump locations and to facilitate equipment movement. Waste rock will either be transported by conveyor or by haul truck over a constructed bridge crossing.

The central infrastructure corridor crossing of Kangaroo Creek and crossings of other ephemeral drainage lines, including the crossing of the diversion channel between West Pit 1 and South Pit 1, will be designed and constructed to provide sufficient flood immunity for a 1 in 100 year flood event. The watercourse crossing will be designed to limit works within the watercourse itself. Further details of creek crossing design are provided in **Chapter 19**.

Landholder properties will be bisected by the infrastructure corridors. Crossing points will be designed along the infrastructure corridors to allow movement of vehicles and stock around properties, if required for ongoing agricultural use during mining.

SunWater water pipeline crossings will likely be provided as a reverse culvert with the final design made in accordance with SunWater standards for crossings of SunWater pipelines.

6.5.10 Water Requirements

Table 6-2 provides an estimate of construction water requirements for dust suppression, potable water and civil works. Construction water will be entirely supplied from the connection to SunWater's Burdekin to Moranbah water supply pipeline system that traverses the western side of the tenements. This connection, and the south raw water dam used to hold water, will be constructed in the initial phases of construction.

Potable water may be supplied by truck from a local municipal source (likely Glenden) during the initial phases of construction. Following construction of a water treatment plant, raw water from the SunWater supply will be treated to potable standard. All potable water will be procured, transported, treated monitored and stored in compliance with the *Australian Drinking Water Guideline 2011* (NHMRC, NRMMC 2011).

Glenden town water supply is administered by Isaac Regional Council and supplied by Sunwater as part of the Broken Rivers supply infrastructure. The volume of water sourced from municipal sources is likely to be minor (approximately 4 ML of potable water and less than 100 ML for dusts suppression) prior to connection to SunWater's Burdekin to Moranbah pipeline system.

Table 6-2 Construction Water Requirements

Water requirements	Volume (MLpa)	
	Average	Maximum
Dust suppression	1,000	1,300
Potable water	4	6
Civil works	1,000	1,500

6.5.11 Water Supply Infrastructure

The proponent is in discussions with SunWater for the sourcing and delivery of water for the project from SunWater's Burdekin to Moranbah 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 south raw water dam. The raw water pipeline will be extended along the central infrastructure corridor during the second phase of construction for supply of raw water to the north raw water dam.

Water supply pipelines will be approximately 450 mm in diameter. It is likely that these pipelines will be welded in 12 to 18m lengths and constructed in a trench, requiring a construction width of 15 to 20 m. Following installation the corridor will be progressively rehabilitated, allowing for maintenance access and limitation of deep rooted vegetation in proximity to the pipeline. Information about design parameters, including capacity, design life, above ground facilities, construction materials, operations and maintenance will be determined during detailed design.

The project will initially take water from the SunWater's existing Burdekin to Moranbah pipeline. When the proposed Sunwater - Gorge Weir to Byerwen duplicate pipeline (to be built in the same easement as the existing Burdekin to Moranbah pipeline) becomes available, the project will take water from the new pipeline.

6.5.12 Water and Rejects Management Infrastructure

Dams will be constructed in accordance with the design requirements as determined by assessment of the dams in accordance with the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams (DERM, 2012) (the Manual).

The hazard category of any dam will be assessed by a suitably qualified and experienced person in accordance with the Manual. **Chapter 8** contains further details on the hazard category of proposed dams.

All regulated dams will be designed and constructed under the supervision of a suitably qualified and experienced person in accordance with the requirements of the Manual. Regulated dams will be designed to prevent:

- floodwaters from a watercourse entering the regulated dam, to the annual exceedance probability (AEP) specified in the Manual
- wall failure from floodwaters from a watercourse to the AEP specified in the Manual
- overtopping as a result of a flood event of the AEP specified in the Manual
- seepage from the dam.

Regulated dams will be designed and constructed in accordance with the Manual and with floor and sides of material that will contain the wetting front and any entrained contaminants within the bounds of the containment system during its operational life and any period of decommissioning and rehabilitation.

Dams will be constructed, operated and maintained in accordance with accepted engineering standards (e.g. Australian National Committee on Large Dams guidelines and Australian Standards).

6.5.13 Watercourses

During construction, the following stormwater management practices will generally be used:

- sediment and erosion controls will be installed around construction areas
- clean water will be diverted from disturbed areas
- sediment dams will retain and settle dirty water with a sediment load, before releasing any water

Sediment dams will be constructed in accordance with the design requirements as determined by assessment of the hazard category of dams in accordance with the Manual. Sediment dam design will also be undertaken in consideration of DERM guidelines and the 'Best Practice Erosion and Sediment Control Guideline' from the International Erosion Control Association Australasia (IECA) (IECA, 2012).

Drainage diversions (further described in **Chapter 8** and **Chapter 16**) will be constructed to divert clean water flows in the following areas:

- between West pit 1 and South pit 1
- between South pit 1 and South pit 2
- to the west of North Pit
- to the east of East Pit 2.

These drainage diversions will allow for the flow of clean water diverted away from open pits and waste rock dumps. The design and hydrology of drainage diversions is described in **Chapter 16**.

Construction activities in or near watercourses will be conducted in accordance with established guidelines.

6.5.14 Air Supply

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.

6.5.15 Power Supply Infrastructure

Power to infrastructure in the southern and northern tenement areas will be supplied by a connection to an existing 66 kV power line that intersects the tenements adjacent to the Collinsville-Elphinstone Road. All additional power lines will be located within the mining lease boundaries. Power line corridors will be approximately 20 m wide for construction and operational purposes. It is anticipated that power lines will be installed above ground on steel or concrete poles.

6.5.16 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.

6.5.17 Commissioning and Testing

Commissioning and testing of major components of plant and equipment in the south phase will be undertaken mostly during Years -1 and 1, and will include:

- potable water supply infrastructure
- wastewater treatment infrastructure
- MIA mechanical services
- workshop fuel and lubricant storage and reticulation
- the south CHPP, including associated product pad conveyors, conveyors, dump station and processing plant
- coal conveyor, crushers and hoppers
- train loading, movement and signalling
- power supply lines and substations
- raw water supply pipelines and storage
- all reticulation services, including raw and fire water, power and lighting, and telecommunications.

Commissioning of the north CHPP will occur during the north phase of construction. The potential impacts associated with all commissioning works are included as part of the construction phase assessments for value specific chapters.

6.5.18 Site Demobilisation

As the initial construction phase nears completion, construction areas will be progressively demobilised ready for operations in Year 1. However, complete demobilisation will continue into the operational period to coincide with various construction activities including the North phase of construction across the mine. Hardstand and laydown areas established during construction within the project mining leases may continue to be used for similar purposes during operations, such as major maintenance.

6.6 Construction Workforce

The south construction phase will last approximately 18 months to 2 years, with approximately 350 workers at the peak. The North construction phase will occur from Year 15 to Year 17 with

approximately 265 workers at the peak. A workforce profile showing the construction workforce during both construction phases and the operations workforce (further discussed in **Chapter 7**) is presented in **Table 6-3**.

The construction workforce will comprise heavy equipment operators, boilermakers, electricians, carpenters, scaffolders, riggers and technical / supervisory personnel.

Aside from the CHPPs, other specialist workforce personnel will include:

- high voltage and low voltage substation construction and transmission line erection
- steel fabrication
- reticulated services
- administration building construction
- fuel and lubricant storage and reticulation
- rail spur, rail loop and railway signalling
- telecommunications.

The majority of the construction workforce will work a 12 hour daylight shift. Occasional night works may be undertaken for some construction activities requiring continuous 24 hour working (including Sundays) while they are in progress. Examples of 24 hour construction activities include:

- construction of the CHPPs
- deliveries of materials, plant and equipment
- concrete pouring
- electrical installation
- building fit-out
- plant and equipment commissioning.

6.6.1 Construction Workforce Accommodation

During the site preparation and construction phases, temporary accommodation for the initial workforce will be provided in Glenden preferably in a location close to the town's existing accommodation villages. Temporary accommodation 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 will have approximately 200 units, which will provide for a workforce of 400 with half on shift at any one time.

The proponent will seek all relevant approvals for the construction and operation of the temporary accommodation village under the *Sustainable Planning Act 2009*. Should approval for accommodation facilities in Glenden not be granted then then proponent will consider construction of accommodation facilities on the mining leases and seek all relevant approvals at such time.

6.6.2 Construction of Accommodation for the Operational Workforce

Permanent accommodation facilities will be developed in Glenden for the operational workforce and will include units, duplexes and houses, which are further described in **Chapter 7**. The proponent will seek all relevant approvals for the construction and operation of the permanent accommodation facilities under the *Sustainable Planning Act 2009.* In the event that development approvals are not obtained for the proposed accommodation, a facility may be developed on the mining leases.

Table 6-3 Byerwen Workforce Profile

Project Phase		Construction South			Construction and Operation South	Operation South				Operation South / Construction and Operation 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

6.6.3 Transportation of Construction Personnel

Personnel will be transported from accommodation facilities to site by bus. Assessment of the potential impacts of the transport of personnel from accommodation facilities in Glenden to and from site during the construction and operation phases of the project is described in **Chapter 27 - Traffic and Transport**.

6.6.4 Potable Water Supply and Sewage Management

Potable water for the construction workforce on the mine site will be imported by road tanker from Glenden or an alternative local municipal source and stored in appropriate sealed containers at various locations around the MIA and the CHPP construction sites until such a time as a water treatment plant is commissioned.

Sewage generated by the construction workforce on the mine site will be treated onsite at a sewage treatment plant (STP). Effluent from the STP will be treated to a standard which will allow reuse on site and will be pumped to a holding dam or tanks prior to use. Biosolids will be disposed of by a certified third party contractor at an appropriately licensed regional waste disposal facility.

During the initial site preparation phase, prior to installation of the STP, all sewage will be contained on site and transferred by a certified third party contractor to an appropriately licensed regional waste disposal facility.

6.7 Materials, Plant and Equipment Sourcing and Transportation

During construction, all materials, plant and equipment will be delivered to the project via road. Transportation of building materials contributes to the project's environmental impact. Sourcing materials from local suppliers potentially reduces the project's environmental footprint. However, due to the nature of the project, specialist plant and equipment will be required to be sourced from across Australia and overseas.

Large and over-size loads are anticipated, particularly during the CHPP, dump station, stacker/reclaimer and heavy mining equipment construction and installation phase. Loads will mostly be hauled from either the Port of Brisbane, Port of Mackay or the Port of Gladstone, with some loads requiring an escort. Consideration will be given to the timing of such transportation to minimise disruption to other road users.

Construction traffic will involve rigid and articulated vehicles, and light goods vehicles. Traffic flows and vehicles types are expected to vary over the construction period, reflecting the types of materials and equipment required at a specific time. Chapter 27 provides further assessment of transportation issues via road for the construction and operational phases of the project.

The project will use standard construction equipment, general trade equipment and specialised equipment as required. The indicative number and type of construction equipment required is shown in **Table 6-4**. Construction equipment will be serviced and maintained at the site workshop.

Table 6-4 Indicative Construction Equipment

Equipment	Indicative number and type
Scraper	12 - 13
Excavator	2 - 3 (50 T)
Front-end loader	2 - 3 (Cat 966)
Grader	2 (Cat 16G)

Equipment	Indicative number and type
Crane	5 - 6 (up to 500 T)
Water tanker	2 - 3
Concrete trucks/pumps	3 -5
Concrete batch plant	1 - 2

6.7.1 Construction Materials

The indicative types and quantities of construction materials required for the project are shown in **Table 6-5.**

Table 6-5 Indicative Construction Materials Volumes

Construction materials	Estimated quantity
Steel	4,000 - 5,000 tonnes
Concrete	8,000 – 12,000 m^3
Haul road base (gravel)	7,500 m^3

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.

6.7.2 Hazardous Materials

During construction, the environmentally hazardous materials that will be used on site are diesel, lubricants, paints and protective coatings and oils. Specialist handling will be undertaken during transport of these materials in accordance with applicable legislation. Tanks and drums of potentially polluting or otherwise hazardous materials will be stored in secure containers or compounds which are locked when not in use. Secure valves will be provided on oil and fuel storage facilities. Equipment and vehicles will be locked, have keys removed and be stored in secure compounds. Further details are provided in **Chapter 32 – Hazard and Risk**.

6.7.3 Timber Resources

No timber resources will be taken, disturbed or used during construction. This does not preclude vegetation clearing during construction.

6.8 Waste Management

General waste will be generated during the construction of the project. General waste likely to be generated during construction includes green waste, concrete and rubble, scrap metals, waste hydrocarbons, timber, tyres, sealant/resin and paint materials, sewage, wash down water and domestic rubbish. The method of disposal of waste streams is outlined in **Chapter 26 – Waste Management**.

In the initial stages of construction, all sewage will be transferred by truck by a company licensed to transfer regulated waste to an appropriate waste disposal facility until a sewage treatment plant (STP) is installed. Effluent from the STP will be treated to a standard which will allow reuse on site and will be pumped to a holding dam or tanks prior to use. The storage capacity of effluent holding areas will be

determined during detailed engineering. Biosolids will be disposed of by a certified third party contractor at an appropriately licensed regional waste disposal facility.

6.9 Site Management and Security

There will be a Site Senior Executive and contract superintendent appointed by the proponent, and a principal contractor management team on site for the duration of the construction phase. The team will supervise the construction of the project including monitoring the contractors' performance to ensure that the proposed construction phase mitigation measures are implemented and that construction impacts and nuisance are minimised.

A site Safety and Health Manager will also be appointed by the proponent and will be present on the site during the construction phase.

An Emergency Management Plan will address all foreseeable site specific risks, such as fire, flood, and accidents, including appropriate contact details of emergency services agencies. A draft Emergency Management Plan is provided as **Appendix 33**. Designated construction personnel will have appropriate environmental spill response training and the contact details of relevant responsible persons, should a significant spillage of oils or chemicals occur.

Construction works within MIAs will have 24 hour security coverage. A manned security gate will be established at the entrance to the site. All personnel entering the site and the construction village will have to pass through the security gate. All construction areas will be monitored on a 24 hour basis. The primary function of the site security team is to ensure that no unauthorised entry to the site occurs.