

Central Queensland Coal Chain Network

Department of Infrastructure and Regional Development – Case studies of critical supply chains

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Illustrative case studies showing operational moves and associated bottlenecks for each stage of the supply chain:

- i. Mine
 - ii. Rail
 - iii. Port
-

Overview

1

Introduction

Scope and objectives

PricewaterhouseCoopers Consulting (Australia) and Ranbury have prepared a case study of the Central Queensland Coal Chain Network (CQCCN) on behalf of the Department of Infrastructure and Regional Development (DIRD) as part of the National Freight Inquiry. This work is intended to assist the Inquiry in informing the forthcoming National Freight and Supply Chain Strategy.

The presentation provides an overview of:

- the CQCN supply chain
- participants and associated infrastructure
- shared usage of the rail network for non-coal traffic
- the regulatory framework

An illustrative case study provides a high level example of:

- supply chain operations
- potential bottlenecks.

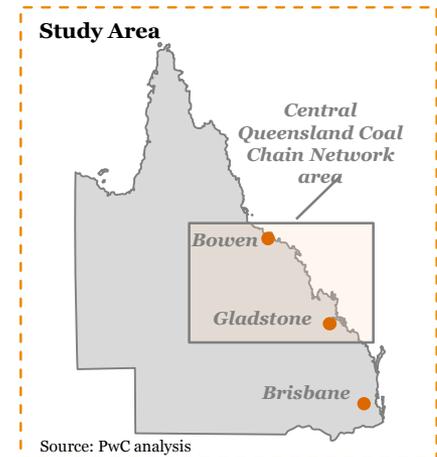
Study area

This case study extends to coal produced in and transported from the Central Queensland basin (below), for both domestic consumption and export.

The Central Queensland coal basin, as defined by the Department of Natural Resources and Mines (QLD), includes the following sub basins/coal measures:

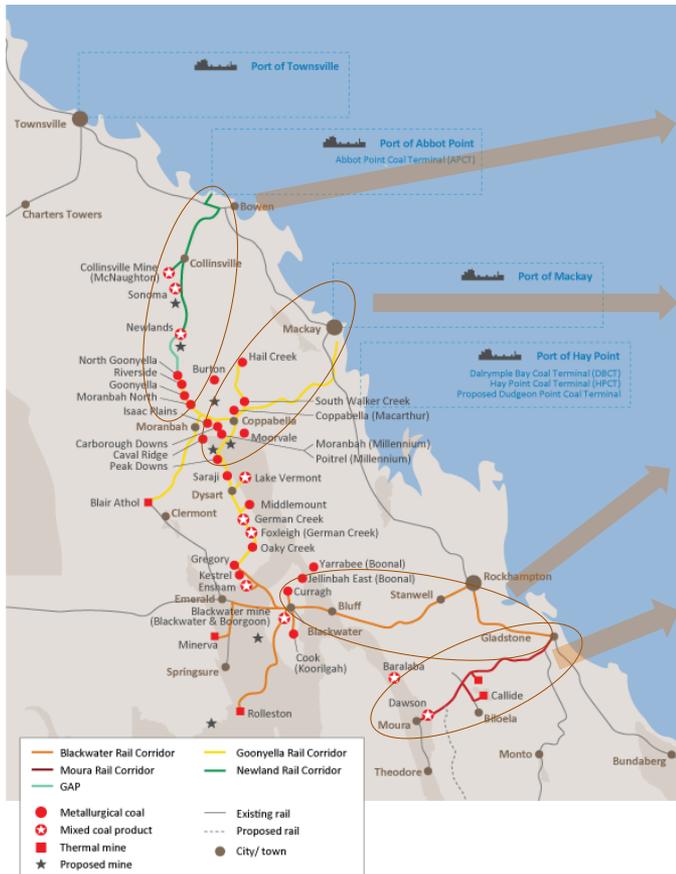
- Bowen
- Callide
- Calen*
- Gallilee*
- Mulgildie*
- Styx*

* No operational mines



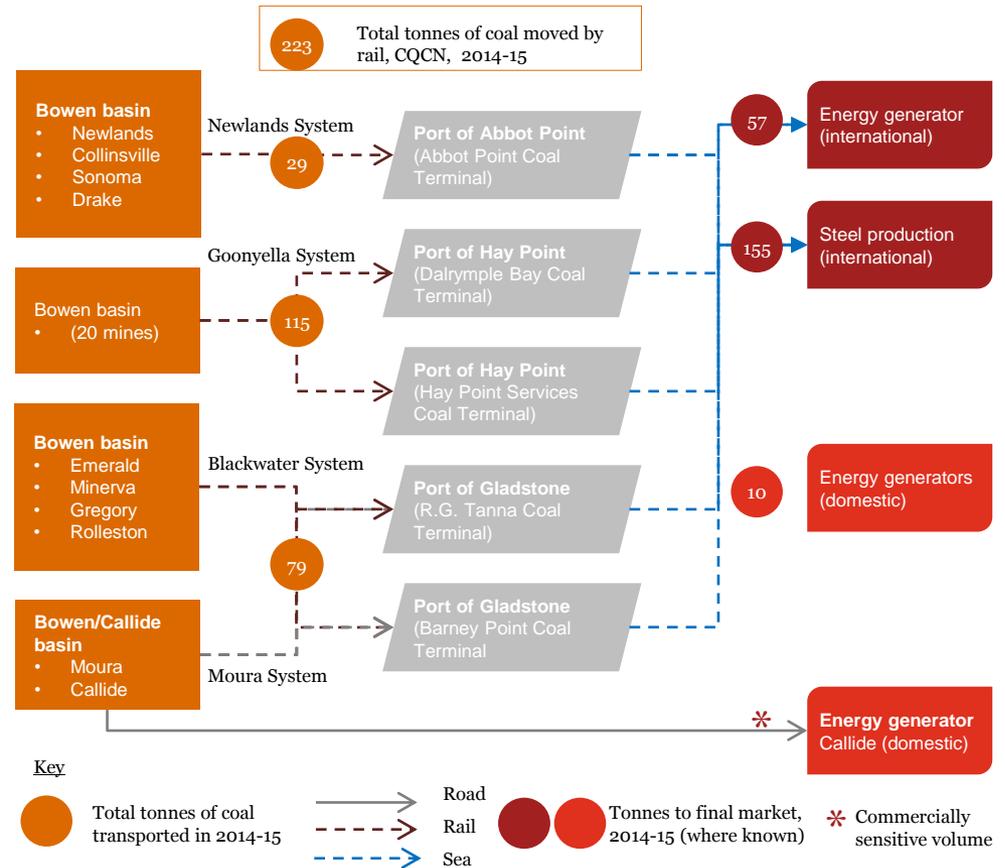
Four key rail systems are used to transport coal from the mines to the bulk export ports

CQCCN Network map including 49 active mines



Source: QCA (2017)

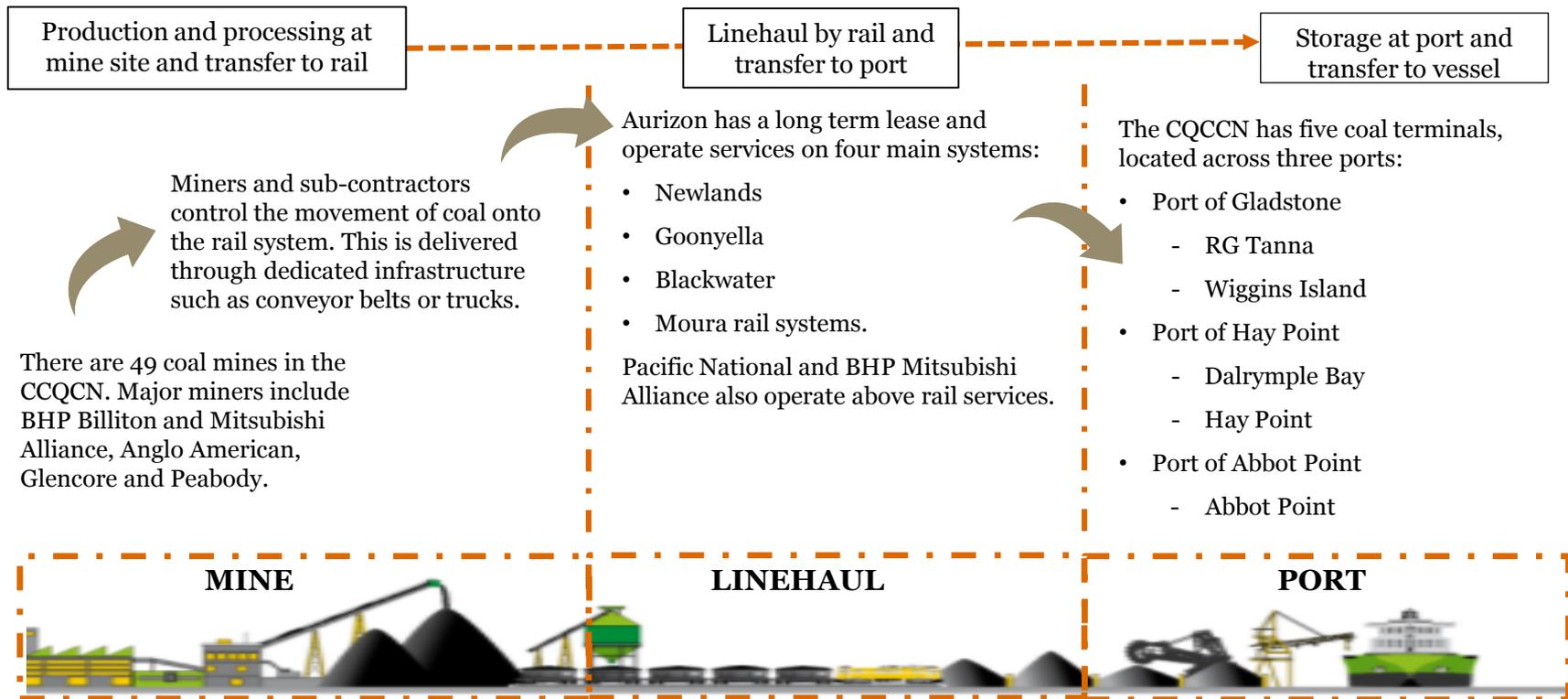
Stylised supply chain: CQCCN coal movements



Due to distance and carrying capacity, rail is the preferred mode to export coal in the CQCCN

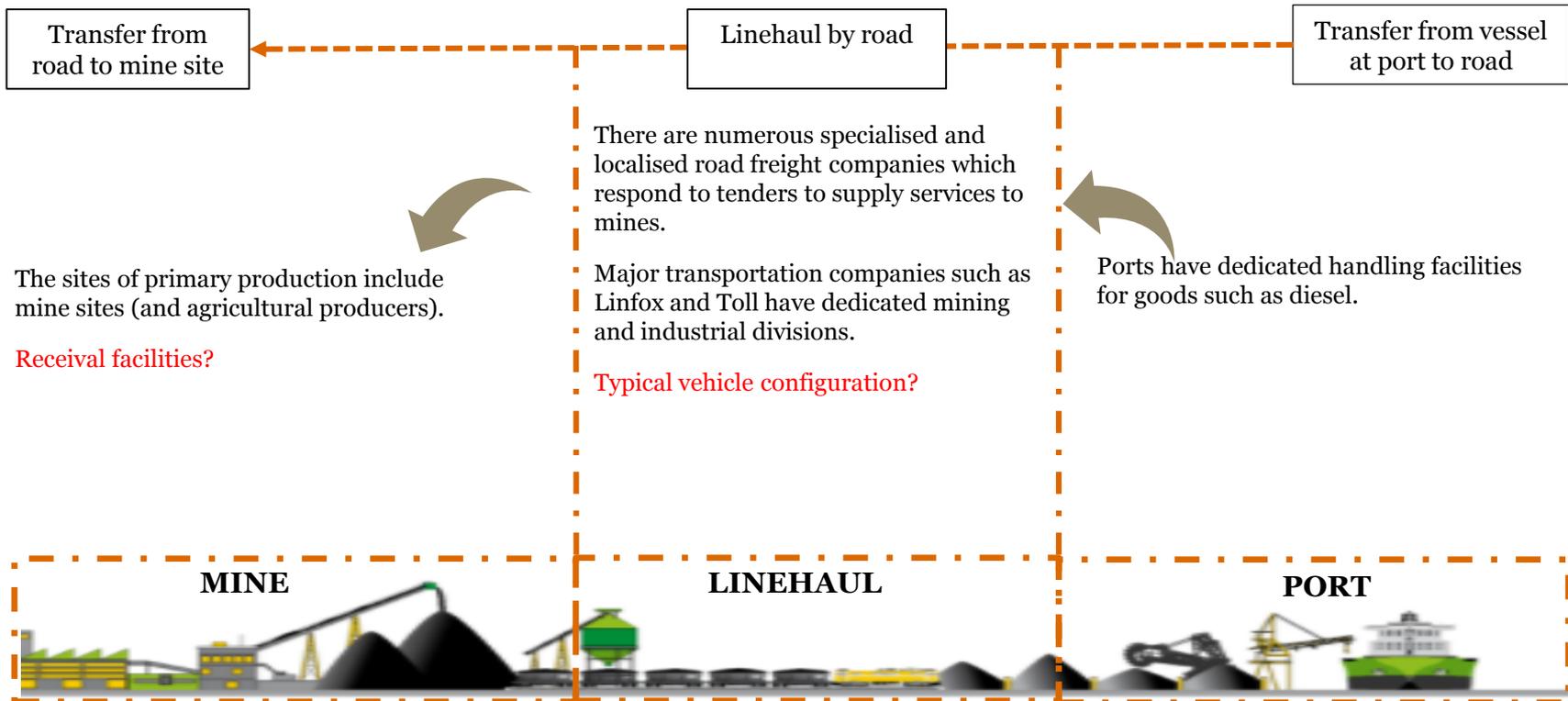
The majority of coal is exported. Coal is transported to these final markets using high capacity bulk ships.

- Major metallurgical coal export markets include India, Japan, China, South Korea and Taiwan.
- Major thermal coal export markets include Japan, South Korea, China, Taiwan and Malaysia.



Road is more appropriate to handle the inbound freight task

Inbound traffic in the CQCCN includes liquid bulk (acid, diesel), fertilizers, cement, explosives and other industrial goods. There is limited backhaul freight by rail as bulk coal wagons are unsuitable for the commodity task. Road freight services are more flexible with respect to shipment size, connecting multiple origins and destinations, and offering greater frequency and potentially faster services.



Coal traffic is prioritised on shared paths with passengers and agricultural exports such as grain

There are sections of the CQCCN rail network which are shared with both coal and other non-coal traffic.

However, there is negligible impact of this shared access on the coal supply chain given coal traffic is given priority by the **ROC (?)** – if non-coal traffic does not meet its allocated path window, priority is given to coal freight movement.

Shared traffics and shared track lengths on the CQCCN include:

CQCCN System	Non-coal traffics	Shared distance	Freight trains/week (non-coal)	Freight trains/week (coal)	Passenger services	Passenger services/ week
Blackwater	Central Line - grain, livestock and passenger	263 km	Limited freight (seasonal)	280	Spirit of the Outback	2 (each direction)
	North Coast Line - long distance passenger and freight services (intermodal, grain, livestock)	109 km	120	260	<ul style="list-style-type: none"> • Spirit of the Outback • Spirit of Queensland • Tilt Train 	9 (each direction) <ul style="list-style-type: none"> • 2 - Spirit of the Outback • 5 - Spirit of Queensland • 2- Tilt Train
Goonyella	Limited bulk grain from Mount McLaren to Mackay		4 (seasonal)	480		
Newlands	North Coast - passenger, intermodal, grain, livestock	7 km	75	170		

Source: Ranbury analysis and <https://www.queenslandrailtravel.com.au/>

The CQCCN is regulated in response to vertical integration and concentrated asset ownership

The following table outlines the regulators with oversight of monopoly infrastructure and their key access and pricing arrangements.

	Road	Rail	Ports and Terminals
Regulators	Dept. of Transport and Main Roads Heavy Vehicle Regulator	Queensland Competition Authority (QCA)	Queensland Competition Authority (QCA)
Remit & Powers	Road gross mass limit standards Vehicle standards	<ul style="list-style-type: none"> Rail pricing and access Procedures regulating the operation of the network Performance reporting. 	<ul style="list-style-type: none"> The Dalrymple Bay Coal Terminal (DBCT) is subject to formal pricing and access regimes. The remaining three multi-user coal terminals and both GOC port authorities (GPC and NQBP) are not subject to formal competition regulation BMA's Hay Point Coal Terminal is single user and closed access to 3rd parties.

Source: <http://ilco.com.au/About-Us/History-Background>

As in any multi user supply chain, coordination is critical to supply chain efficiency

The need for a supply chain coordinator depends on the complexity of the supply chain and level of rail service demand. In the CQCCN, supply chain coordination is required given there are multiple users and service providers.

There are a range of formal structures of cooperation which could be introduced between supply chain agents, such as vertical integration, joint ventures and joint ownership. Such structures can align incentives for operating as well as mechanisms for sharing capital investment expenditure and risk. The ACCC is the regulatory body responsible for authorising supply chain participants to coordinate the delivery of new infrastructure and/or collectively bargain.

A central coordinator role has been implemented in the Goonyella system to ensure that parties operate collectively to ensure efficiency and improve the price competitiveness of the supply chain. Operational efficiencies include dynamic scheduling, queue management and scheduling in response to disruptions.

In 2014, the ACCC granted authority for coal transportation arrangements to be coordinated through the DBCT until 2019. BMA and Hay Point Services are excluded from central coordination.

Dalrymple Bay Coal Chain Coordinator (DCCC)

The Dalrymple Bay Coal Terminal (DBCT) is a common user facility servicing several mines in the central Bowen Basin.

DBCT is owned by the Queensland State Government and leased to DBCT Management (Brookfield Asset Management).

A central coordination role was created for the DBCT following the recommendations of a joint Queensland Government and Queensland Resources Council supply chain review conducted by Stephen O'Donnell in 2007.

A consortium of terminal users is responsible for the day-to-day operation of the terminal under the terms of the operating and maintenance contract. DCCC members currently include Rio Tinto, Peabody Energy, Pacific National (PN) and Glencore.

Members have implemented an agreement and charter, which includes:

- Appointing a Central Co-ordinator to oversee the coal chain operations – this is currently PN which acts on behalf of all members in submitting orders to the port and the below rail operators.
- Identifying improvement Initiatives
- Developing an integrated plan across the whole of coal chain
- Monitoring and reporting on whole of coal chain performance.

Case studies

2

There are three key moves in CQCCN rail based supply chains



Campaign Rail Model

Consistent rail volume and frequency per month.

Reliant on greater stockpile infrastructure capacity at mine and port – capacity in load in capacity at mine and port can be less.

Reliant on significant rail capacity.

Cargo Assembly Model

Rail volume and frequency dictated by vessel viability and ship queuing (generally 15 vessels minimum)

Miners given 72 hours to build cargo parcel – 40,000 tonne

Significant load in and load out infrastructure to present capacity bottlenecks at Port

High potential for demurrage costs

Port and Rail must
operate the same

model.

Move 1: Mine



(1)
Mine

Production and processing at mine site and transfer to rail

(2)
Rail

Linehaul by rail and transfer to port

(3)
Port

Storage at port and transfer to vessel

Process

Miner A has been in operation in the Goonyella System for 10 years and produces 5mtpa of coal. Production schedules have been relative stable for the least three years but there is a scheduled uplift of 2mtpa for the next five years.

Miner A adopts the campaign rail method, ROM coal is stockpiled then transferred by conveyor to the coal processing plant. Once washed, crushed, screened and separated the coal is transferred by conveyor to another stockpile and then transferred via rail load out conveyor to train. Load in specification is dictated by the rail operator to optimise cycle times.

Miner A has a ten year roll over contract with Pacific National for above rail services. There is a take or pay component based on fixed costs of service (below rail access, rolling stock charge) and a variable component based on volume. There is provision for some surge capacity in the contract.

Miner A also has a ten year contract with DBCT including a take or pay fixed fee plus a variable fee based on cost plus model.

Potential Bottlenecks

Capacity

The production uplift may cause in situ constraints at the mine dependent on tph conveying and processing rates – this has the potential to flow through into train cycle times if the service provider seeks to contract additional services to address volume uplift. Lack of capacity could cause mine production to cease until stockpile, plant or rail capacity becomes available.

Commercial

Miner A will need to renegotiate the contract with above rail, Port service providers and potentially the below rail network owner (above rail provider may do this on behalf of Miner). Miner A may be required to bear the total cost of any required investment upgrade which may impact the viability of increased production.

Move 2: Rail



Process

Pacific National is providing above rail services under a ten year rolling contract to Miner A to transport 5mtpa from mine to DBCT. The contract is due to roll over in three years.

Currently Pacific National is operating 10 services per week on train consists with 10,000 tonne payload to service Miner A.

Pacific National have made provision within the contract for 10% surge capacity on negotiated rates.

Given the increase in production volumes scheduled for the next year, Pacific National are investigating:

- Is there latent capacity in the supply chain including:
 - Rolling stock
 - Below rail paths(in collaboration with Aurizon network)
- Can the current operations (across all positions in the supply chain) be flexed simultaneously to introduce extra capacity
- Will network investment be required

Potential Bottlenecks

Capacity

Pacific National do not have additional rolling stock capacity in the network and need to acquire stock.

Aurizon network need to invest in the below rail network if there are insufficient paths for new services.

Regulatory & Commercial

Regulatory triggers based on the Aurizon investment dictate who will pay for the additional capacity - Miner A or all Miners operating along this supply chain who may benefit

Regulatory

The asset is regulated – may require a new access undertaking to be struck for additional services

Approvals

Protracted lead time for environmental and safety approvals – may lag beyond production uplift

Move 3: Port



(1)
Mine

Production and processing at mine site and transfer to rail

(2)
Rail

Linehaul by rail and transfer to port

(3)
Port

Storage at port and transfer to vessel

Process

DBCT is a regulated entity and has a mandated process for new access seekers, an access queue, and pricing provisions.

Extra capacity for Miner A for its extra 2 Mtpa could arise from a relinquishment of another user's capacity, or via terminal expansion.

Miner A would need to establish itself in the capacity queue (similar to getting rail network access), and, if capacity expansion was needed, be ready to commit to underpinning the capacity expansion with Take-Or-Pay contract arrangements. The more extensive upgrades would require a number of new capacity seekers to agree to provide sufficient new capacity utilisation to warrant expansion.

Current regulated pricing arrangements provide for a socialising of expansion capital costs where costs for all users would be lowered (greater throughput supporting the increased regulated asset base), or on an incremental cost basis for new users otherwise.

Potential Bottlenecks

DBCT has a capacity of 85 Mtpa, which is essentially fully contracted.

The current DBCT Master Plan (2016) provides for four further upgrade stages, to an initial 89 Mtpa, then to 93.5 Mtpa and up to an ultimate 135 Mtpa. The ultimate includes a new stockyard area and, a 4th rail in-loader and 4th out-loading system and ship-loader. The intermediate expansions provide for some limited increased stockpile capacity and speeding up conveyors and stackers and reclaimers.

Environmental approvals are in place for expansion up to 89 Mtpa, and construction lead-times would likely be of the order of two years.

Capacity upgrade lead-times include planning and environmental approvals and construction durations. Depending on where Miner A was in the capacity queue, would dictate the extent of the bottleneck and cost of obtaining the additional tonnage. The major expansion lead-time would likely be of the order of four to five years, assuming timely environmental approvals

Appendix: Infrastructure Australia priority list projects & the CQCCN

A

Targeted investments on the IA Priority List would increase CQCCN supply chain capacity

IA Status	Project Title	Project description*	Impact	Timing
Priority Projects	Bruce Highway Upgrade – Cooroy to Curra Section C	The project is part of a package of works to upgrade and realign 61 km of the Cooroy to Curra section of the Highway. The Section C South project will construct an 8.8 km four lane dual carriageway highway and a 1.8 km single carriage highway along a new alignment. The project will provide safer and more efficient travel along the Bruce Highway and will minimise disruption and road closures from flooding. This project forms part of a broader initiative to upgrade the Bruce Highway, which is listed as a Priority Initiative on the Infrastructure Priority List.	Upgrades to the Bruce Highway, which runs through the CQCCN, will support the efficiency of the road freight supply chain into the CQCCN, increasing capacity and safety.	Near term (0–5 years)
	Bruce Highway Upgrade – Mackay Ring Road Stage 1	The Mackay Ring Road Stage 1 project proposes to construct a two-lane, 11.3 km highway bypass of Mackay. This would provide faster journeys for through traffic, and reduce congestion in Mackay’s urban area. The project will require the construction of 10 bridges, and major intersection upgrades. The bypass will have 1-in-100 year flood immunity, and is expected to carry approximately 3.65 million vehicles per year. This project is part of the Bruce Highway Upgrade program, which is listed as a Priority Initiative on the Infrastructure Priority List.		Near term (0–5 years)
Priority Initiative	Bruce Highway upgrade	Progressive priority upgrades to the Bruce Highway to address specific capacity constraints, flood resilience and safety concerns. Major planned works include: <ul style="list-style-type: none"> • Burdekin deviation • Mackay Ring Road • Edmonton to Gordonvale duplication • Maroochydore Road interchange • Ingham to Cardwell Range deviation • Haughton River and Pink Lily Lagoon upgrade. 		The Port of Gladstone is a key site for the export of bulk commodities including coal from the CQCCN. Increases to the capacity of the port would address capacity related bottlenecks.
	Gladstone Port land and sea access upgrade	The proposal covers a range of potential projects including: <ul style="list-style-type: none"> • Channel management to increase export capacity through the port • Upgrades to road and bridge infrastructure that service the port • New rail infrastructure to provide direct connections from the Surat Basin to the port. 	Medium term (5–10 years)	

Source: Infrastructure Australia, Infrastructure Priority List, July 2017

*Infrastructure Priority List, Australian Infrastructure Plan, Project and Initiative Summaries, February 2017