



Regional Roads Investment Strategy

Far North Queensland Regional Organisation of Councils

Heavy Vehicle Freight Networks

15 May 2021



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Project No: IH167200
Document Title: Heavy vehicle freight networks
Document No.:
Revision: 6.15
Date: 15 May 2021
Client Name: Far North Queensland Regional Organisation of Councils
Project Manager: Craig Gorlick
Author: Craig Gorlick
File Name: J:\IE\Projects\05_Northern\IH167200\21 Deliverables\Freight routes\Report\IH167200 FNQROC RRIS Heavy Vehicle Freight Networks Rev 6.15.docx

Jacobs Australia Pty Limited

32 Cordelia Street
PO Box 3848
South Brisbane QLD 4101 Australia
T +61 7 3026 7100
F +61 7 3026 7300
www.jacobs.com

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Document history and status

Revision	Date	Description	Author/s
3.4	28/08/2019	Issued draft for review	C. Gorlick
4.8	08/03/2020	Issued draft for review	C. Gorlick / S. Manders / D. Hooper
5.4	18/06/2020	Issued draft for review	C. Gorlick
5.5	24/08/2020	Issued draft for review	C. Gorlick
6.14	11/01/2021	Final draft	C. Gorlick
6.15	15/05/2021	Final	C. Gorlick

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Executive Summary

Efficient, fit for purpose all-weather roads are critical for virtually all aspects of regional economies – from major economic activity sectors of agriculture, mining and tourism to supplying the day to day necessities of the businesses and people that call these locations home. Australia has some of the most remote regions in the world where transport routes to communities, ports and major markets can be several thousand kilometres long. In such circumstances, it is not possible to undertake every desired upgrade or development. It becomes necessary to determine which investments will provide the best return in the immediate, medium and longer term.

The Far North Queensland Regional Road Investment Strategy (FNQRRIS) develops a new, more effective basis with which to inform the Far North Queensland Regional Organisation of Councils' (FNQROC) infrastructure priorities and planning program. This will lead to more effective lobbying and negotiation with transport agencies such as the Queensland Department of Transport and Main Roads (TMR), the federal Department of Infrastructure, Regional Development and Cities (DIRDC), and Infrastructure Australia, based on firmer, more reliable and comprehensive evidence.

The outlook for road freight demand is industry-based. Forecast population growth is not expected to have a notable impact on freight movements. The industries that underpin FNQROC's economic activity from a high productivity vehicle perspective are construction, manufacturing and agriculture. Freight routes that support these industries should be of the standard that matches the type of heavy vehicles using them.

The primary objective of this report is presenting the outputs of the infrastructure deficiency analysis. Over 6,000kms have been assessed for deficiencies, albeit with data limitations. The roughness/rutting assessment has been undertaken where data is available for each road collected within the ARRB LIDAR survey in 2017. The assessment accordingly extends beyond the heavy vehicle network.

The width assessments are in accordance with the Performance Based Standards (PBS) Scheme - Network Classification Guidelines administered by the National Heavy Vehicle Regulator. It is important to note that a route's existing PBS heavy vehicle access level dictates if there are width deficiencies triggered. A route that is gazetted as general heavy vehicle access (i.e. PBS1) does not have minimum width requirements, therefore width deficiencies are not triggered. This is particularly the case for the Council road network. Although route fitness-for-purpose can be managed through limiting heavy vehicle access with permits, the objective of the deficiency assessment is to seek permanent arrangements.

It is likely that Councils allow HPVs to operate on some roads currently gazetted as general heavy vehicle access. It is expected in these cases that Councils have undertaken a fitness-for-purpose assessment and deemed that HPV access is acceptable. If so, gazetted the road at a level higher than general heavy vehicle access is recommended to be considered. Immediate opportunities have been identified within the complementary Heavy Vehicle Productivity Technical Report.

The deficiency analysis has identified approximately \$839m is required over the next 20 years as summarised in the below table. Immediate funding required over the period 2020-2023 is \$522m.

Road network	Immediate		Future	Total	
	Structural Deficiency (Capital Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	Structural Deficiency (Capital Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)
State controlled network	\$ 402 m	\$ 51 m	\$ 184 m	\$ 402 m	\$ 235 m
Councils road network	\$ 14 m	\$ 56 m	\$ 133 m	\$ 14 m	\$ 189 m
Total	\$ 416 m	\$ 106 m	\$ 317 m	\$ 416 m	\$ 424 m

Future infrastructure investment planning can be significantly improved with the following measures:

- A joint asset management system that sees data collated and presented in a consistent format, allowing investment principles to be applied across FNQROC in a uniform manner
- Regular traffic counts to identify travel patterns across individual roads, allowing for demand to be managed from a whole-of-network perspective
- Regular collection and validation of infrastructure data through onsite inspection

Council roads that present a high road safety risk can also be identified more readily with regular traffic counts. Risk probability can be better determined through applying a road's crash history to trip demand over the same historical time period.

1. Introduction

1.1 Context

By the very nature of its large geography, Far North Queensland Regional Organisation of Councils (FNQROC) has a diverse range of economic activities underpinned by the road freight network. The region has both production-oriented industries such as resources and agriculture, as well as the consumption-driven industries of building and construction, hospitality and retail, accommodation and business services. The size of the region and the climate present significant challenges for maintaining a connected and accessible road freight network.

The Regional Road Investment Strategy (RRIS) seeks to achieve improved funding support for FNQ road projects from organisations including the Queensland Department of Transport and Main Roads (TMR), the federal Department of Infrastructure, Transport, Cities and Regional Development and Infrastructure Australia. A key aspect is a road freight network that improves industry competitiveness and access reliability across supply chains.

Opportunities that encourage the development, innovation and efficiency of the road freight sector have flow on benefits throughout the economy. Moving freight efficiently requires a fit for purpose road network that is safe, does not hinder productivity and minimises transport costs. Better connecting locations of economic activity to their markets enhances the FNQROC region's competitiveness on a domestic and international level.

An effective road network that supports high productivity vehicles (HPV) is essential in order to manage the road transport component of the growing freight task in a safe and sustainable way. HPV's are defined as multi-combination vehicles ranging from 23 metre B-doubles to 53 metre roadtrains.

The road network needs to be capable of ensuring that on-going growth in tourism, agriculture, mining and construction can be serviced through provision of access for vehicles which are capable of safely carrying more freight, more efficiently, while minimising infrastructure damage and community impacts.

With these points in mind, a range of investment principles are available:

- 1) **Maintain existing HPV gazetted access across the road network.** *The focus here is ensuring the network continues to facilitate current freight movements safely while not adding additional costs. For example, deteriorating road infrastructure can mean access is withdrawn or limitations are placed on heavy vehicle operations. Similarly, existing infrastructure may pose a safety risk to all road users.*
- 2) **Increase HPV access across the road network.** *This focus is on extending high productivity vehicle networks whilst ensuring safety to all road users is not compromised. Network connectivity is increased through targeted investment in removing bottlenecks that restrict widespread high productivity vehicle use. This can include poor geometric alignment, narrow pavement widths and bridge load capacity.*

This report is based on the first principle, in that the adequacy of the existing network's infrastructure is being assessed. Increasing HPV access is considered within the Far North Queensland Regional Road Investment Strategy's Heavy Vehicle Productivity Technical Report.

This report is structured as follows:

- Section 2 contains a review of the strategic context in which the RRIS has been undertaken, including relevant planning regional development, transport and freight strategies
- Sections 3 to 7 examines the strategic outlook for general economic activity and the agricultural, mining and other emerging industries across FNQROC likely to contribute to freight generation. Tourism industry issues are examined in the Tourism Routes Technical Paper and its influence on the heavy vehicle road network.
- Sections 8 to 10 review the current situation for relevant factors, including:

- Heavy vehicle growth
- Crashes across the FNQROC network
- Heavy Vehicle Infrastructure Ratings as defined by the Australian Government
- Section 11 examines planned and proposed heavy vehicle network investments
- Section 12 presents how road infrastructure deficiencies are assessed
- Section 13 and 14 contains a summary of costed deficiencies findings that strategic investment would target

2. Strategic context

2.1 Planning Strategies

Our North, Our Future: A White Paper on Developing Northern Australia (2015)¹

The White Paper outlines the global drivers that will provide substantial growth opportunities for Northern Australia. These include:

- The booming economies of south east Asia and southern China are within three to five hours flying time from Darwin
- The Tropics account for 40% of the world's population today, rising to 50% by 2050
- By 2030 Asia will represent approximately two thirds of the global middle-class population and of middle-class consumption
- The north operates in similar time zones to the most dynamic economies in Asia — a particular advantage for service industries.
- The region is integrating fast — Australia has recently concluded Free Trade Agreements (FTA) with Japan, South Korea and China, and is in ongoing negotiations with India, Indonesia and on regional FTAs such as the Trans-Pacific Partnership (TPP), the Regional Comprehensive Economic Partnership (RCEP) and the Pacific Agreement for Closer Economic Relations (PACER) Plus
- It is a gateway for our defence and security cooperation into the Indo-Pacific region and supports Australia's ability to project and sustain forces into the region for surveillance, humanitarian assistance and disaster relief.



The white paper states that the development of the north's water resources by building the right water infrastructure in the right place will be crucial to realise the full potential of the north². There is the potential for significant development in irrigated agriculture, which could include surface catchment, storage and irrigation from the Flinders and Gilbert River catchments. This has the potential to generate a significant increase in perishable and chilled port volume, particularly for exports over the long term³. Etheridge Council in its report '*Gulf Rivers Irrigation Area: Foundation of a Northern Foodbowl*' identified the \$50 million upgrade of the Hann Highway to improve access into southern markets for Gilbert River and other North Queensland products as a key initiative to develop irrigated agriculture in the region⁴.

The Commonwealth Government has already committed nearly \$5bn of its \$50bn nationwide investment in transport infrastructure to the north. These investments include over \$3bn for northern sections of the Bruce Highway, \$208.4m for the Cape York Region Package (refer below).

A \$600 m roads package has also been considered to improve key roads including the Kennedy Development Road between Hughenden and The Lynd (also known locally as the Hann Highway).

¹ <https://www.industry.gov.au/data-and-publications/our-north-our-future-white-paper-on-developing-northern-australia>

² <https://www.industry.gov.au/sites/g/files/net3906/f/June%202018/document/pdf/nawp-fullreport.pdf>

³ https://www.infrastructureaustralia.gov.au/sites/default/files/2019-06/ia_northern_australia_audit.pdf

⁴ <https://www.etheridge.qld.gov.au/downloads/file/346/http-1-pdf>

Developing Northern Australia Implementation Report 2018⁵

The Northern Australia Roads Program and Northern Australia Beef Roads Program continue commitments to developing world-class infrastructure. These programs commit \$700 million across 37 projects to improve safety and access to services, and to better connect communities and businesses to domestic and international markets.

Almost half of the projects are either completed or underway, with most remaining projects to commence by early 2019. Current estimates are that these road upgrades will create up to 2,400 direct local jobs, and will create significant employment opportunities for Indigenous people. Through the inclusion of Indigenous employment and business use targets these projects are providing Indigenous Australians with greater opportunities to access employment opportunities and develop businesses.

The Roads of Strategic Importance (ROSI) initiative was included in the 2018–19 budget, with committed investments of an additional \$1.5 billion in northern Australia. This is targeted to upgrade key corridors across northern Australia to better connect industry and producers to markets, and provide more reliable and safer transport links for freight, tourism and community road users. In the north, extreme weather events can make roads impassable for weeks at a time leaving business and industry without links to market or for inwards goods, disrupting local and global supply chains and ability to deliver on commitments to customers.

ROSI will expand on the Northern Australia Roads and Beef Roads programs. Funding is available over a ten-year period from 2018–19 and will ensure a continuous pipeline of road upgrades after the current programs are complete. The Australian Government will work with jurisdictions and other stakeholders to identify strategic road corridors that will deliver maximum benefits for producers, businesses and residents of the north. This investment in road infrastructure will grow the northern economy and create jobs through to 2028.

Northern Australia Roads of Strategic importance (2019)⁶

The Australian Government will invest \$4.5bn through its new Roads of Strategic Importance (ROSI) initiative (\$1bn of additional funding in the 2019-20 Budget). It seeks to improve productivity and efficiency on Australia's key freight roads, providing better connections between agricultural regions and ports, airports and other transport hubs and better access for tourism, mining and other sectors.

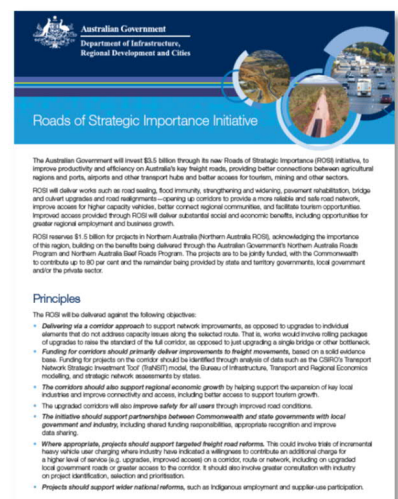
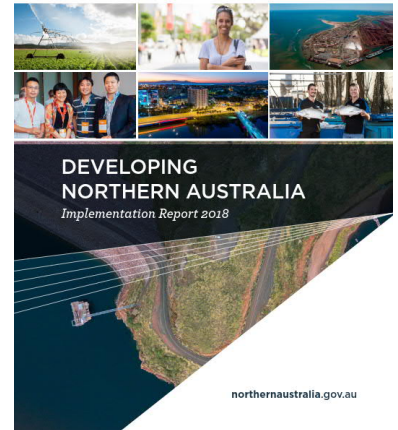
ROSI has set aside \$1.5 bn for projects in Northern Australia. Projects are to be 80% funded by the Commonwealth and the remainder by State/Territory/Local Governments and/or the private sector.

ROSI funding will be used to upgrade the following freight routes in FNQ:

- Cooktown to Weipa Corridor Upgrade.** The project will deliver targeted upgrades to the Mulligan Highway and Peninsula Developmental Road and surrounding roads. The corridor is a key intra-regional link that connects remote communities to essential services and employment opportunities. The upgrades are intended to improve access to and from remote communities, in addition to better supporting the mining, tourism and agricultural interests located along the corridor. Estimated cost is \$237.5m (\$190m Commonwealth funded).

Australian Government
Department of Industry,
Innovation and Science

Office of
Northern
Australia



⁵ <https://www.industry.gov.au/data-and-publications/our-north-our-future-developing-northern-australia-2018-implementation-report>

⁶ <https://investment.infrastructure.gov.au/files/roads-of-strategic-importance-initiative-investment-principles.pdf>

- **Cairns to Northern Territory Border Corridor Upgrade.** This project will deliver targeted upgrades along the Corridor. The early works package includes two projects on the Gulf Developmental Road to dual lane seal single lanes between Georgetown and Croydon (estimated cost of \$22.5m). Upgrades are intended to ensure key freight roads efficiently connect agricultural and mining regions to ports, airports and other transport hubs; provide a more reliable and safer road network, especially during the wet season; improve access for higher capacity vehicles. Estimated cost is \$62.5m (\$50m Commonwealth funded).

Transport Network Strategic Investment Tool (TraNSIT) – Application to Northern Australian Beef Roads Programme (2016)⁷

CSIRO's Beef Roads Project informs the Australian Government's \$100 million Northern Australia Beef Roads Programme form part of the Northern Australian White Paper. The project used the TraNSIT tool to estimate cost savings to cattle transport for a range of road infrastructure scenarios across northern Australia.

FNQROC routes assessed include:

- Sealing of Ootann Road, heading south from Almaden to the Kennedy Highway (Queensland) is currently unsealed, with 91km of gravel (savings per head of \$7.83).
- Sealing unsealed sections of the Richmond-Croydon Road (savings per head of \$3.24)
- Sealing unsealed sections of the Peninsula Developmental Road (400km from Laura to Weipa) (savings per head of \$1.44)
- Sealing unsealed sections, road widening and bridges upgrades of the Hann Highway (north of Hughenden) (savings per head of \$1.30)
- Sealing unsealed sections of the Mt Garnet to Winton Road, and upgrading to Type 2 access (savings per head of \$0.76)
- Sealing unsealed sections of the Burke Developmental Road between Mareeba and Normanton (savings per head of \$0.35)
- Widening sections of the Burke Developmental Road between Cloncurry and Normanton (savings per head of \$0.23)
- Partial Mareeba bypass, linking the Mulligan Highway to the Burke Developmental Road (savings per head of \$0.15)
- Widening sections of the Gulf Developmental Road between Mt Garnet and Normanton Road (savings per head of \$0.01)



Cape York Region Package⁸ (2014)

The Cape York Region Package (CYRP) is a five-year \$276 m program of works (2014-15 to 2018-19) jointly funded by the Australian and Queensland Governments to upgrade critical infrastructure on Cape York Peninsula.

The package consisted of three sub-programs:

- \$215.5m program of works to progressively seal sections of the Peninsula Developmental Road (PDR) between Laura and the Rio Tinto boundary, south of Weipa.

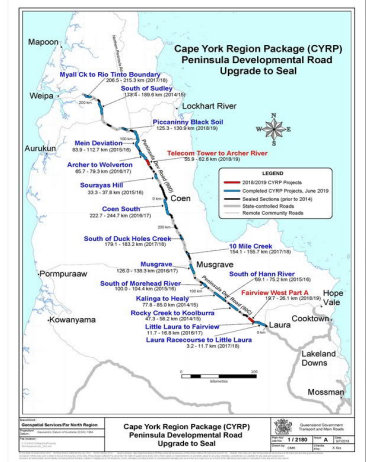
⁷ <https://publications.csiro.au/rpr/download?pid=csiro:EP161298&dsid=DS3>

⁸ <https://www.tmr.qld.gov.au/Projects/Name/C/Cape-York-Region-Package-Peninsula-Developmental-Road>

- \$10m over four years for sealing works on sections of the Endeavour Valley Road between Cooktown and Hope Vale.
- \$50.5m for priority Indigenous community infrastructure works identified by the Torres Cape Indigenous Council Alliance (TCICA) – formerly known as the Cape Indigenous Mayors Alliance (CIMA).

The progressive upgrade of the PDR is delivering significant benefits to industry and Cape York communities in terms of improved economic opportunities, freight efficiency, road safety and access to essential services. Delivery of PDR works has been instrumental in building local and Indigenous business capability and providing improved Indigenous and local employment and training opportunities.

CYRP Stage 2 is currently being assessed by TMR. A funding submission for consideration by the Commonwealth Government is expected in late 2019.



Infrastructure Australia Priority List (2019)⁹

Through the Infrastructure Priority List (IPL), Infrastructure Australia provides all levels of government with a prioritised list of infrastructure challenges and opportunities for the short, medium and longer term.

Proposals included on the Infrastructure Priority List fit into two broad groups:

- 1) Projects are advanced proposals that have undergone a full business case.
- 2) Initiatives are proposals that have been identified to potentially address a nationally significant problem or opportunity but require further development and rigorous assessment to determine if they are the most appropriate solution.

Projects or initiatives that address major problems or opportunities of national significance are highlighted as High Priority or Priority. Upgrades to the Bruce Highway have been assigned Priority Project status, including the Edmonton to Gordonvale duplication and Ingham to Cardwell Range deviation.

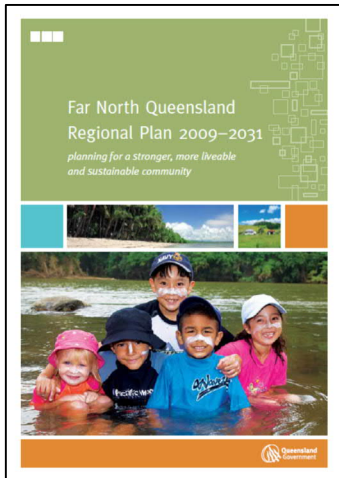


High priority initiatives listed that may impact FNQ more broadly are:

- **Regional road network safety improvements - Safety on regional roads (near term).** This program initiative recognises the need to continue identifying, assessing and prioritising high-risk sections of regional roads across Australia. These sections could be addressed through targeted infrastructure improvements, such as alignment corrections and safety barriers, as well as modern road safety infrastructure technology to improve road safety outcomes.
- **National Freight and Supply Chain Strategy (near term).** The 20 year strategy seeks to establish a strategic planning framework to support end-to-end planning of key freight and supply chains, to guide future investment, support better use of existing infrastructure assets and to enable a program of regulatory reforms and capital initiatives to be developed.
- **National electric vehicle fast-charging network - Enabling infrastructure (near term).** The initiative includes developing a network of fast-charging stations on the national highway network to provide national connectivity developing policies and regulation to support charging technology adoption. Initially the focus would be on passenger cars but could move to heavy vehicles in the longer term.

⁹ https://www.infrastructureaustralia.gov.au/projects/infrastructure-priority-list.aspx#anc_ip1

Far North Queensland Regional Plan 2009-2031¹⁰



The regional plan applies to the following local government areas within the FNQ region:

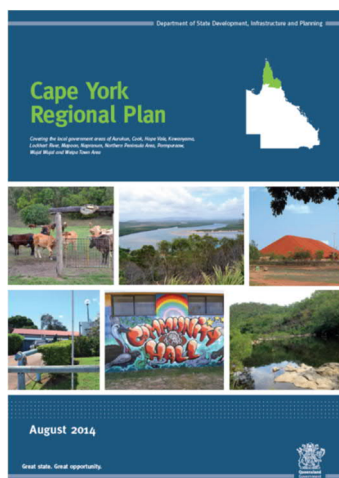
- Cairns Regional Council (including Douglas Shire Council)
- Tablelands Regional Council (including Mareeba Shire Council)
- Cassowary Coast Regional Council
- Yarrabah Aboriginal Council
- Wujal Wujal Aboriginal Council.

The plan identifies that there are also challenges in managing road freight to ensure road space is shared effectively between heavy vehicles, passenger vehicles and other road users.

Significant volumes of freight are generated from the Atherton Tablelands agricultural land and pastoral holdings west and south.

The long-term growth of mining is expected to place significant demands on the transport system, particularly roads, used for transporting ore from mine to processing plant and on designated highways for transport of concentrate or metals to the coast for further processing or export, primarily in Townsville.

Cape York Regional Plan 2014



The Cape York Regional Plan¹¹ covers the local government areas of Aurukun, Cook, Hope Vale, Kowanyama, Lockhart River, Mapoon, Napranum, Northern Peninsula Area, Pormpuraaw, Wujal Wujal and Weipa Town Area.

Economic activity in the region is characterised by large-scale enterprises centred on mining (largely in the north-west), agriculture activity (cattle and intensive horticulture primarily in the south-eastern areas) and small- to medium-scale tourism enterprises.

Freight and personal travel costs are high in the region as a result of the limited transport options, long distances and travel times, unreliable transport networks and poor infrastructure conditions.

The PDR and other access roads in the region are subject to seasonal flooding and surface saturation, with road access from the south cut for months at a time.

Improvements to the PDR and community access roads are critical for more efficient, affordable and safe freight and personal transport and for supporting economic growth aspirations.

¹⁰ <http://www.dlgrma.qld.gov.au/resources/plan/far-north-queensland/fnq-regional-plan-2009-31.pdf>

¹¹ <http://www.dlgrma.qld.gov.au/resources/plan/cape-york/cape-york-regional-plan.pdf>

FNQROC Strategic Plan 2017 - 2021



FNQROC has identified five strategic economic priorities¹²:

- a) Develop resilient transport infrastructure and connectivity
- b) Provide reliable and affordable water and energy
- c) Respect and manage our natural assets and environment
- d) Develop equitable social infrastructure
- e) Provide an equitable communication network.

Resilient transport infrastructure to ensure connectivity across the region is identified as essential if FNQ is to have sustainable economic growth and development. The Strategic Plan identifies that current situation is far from

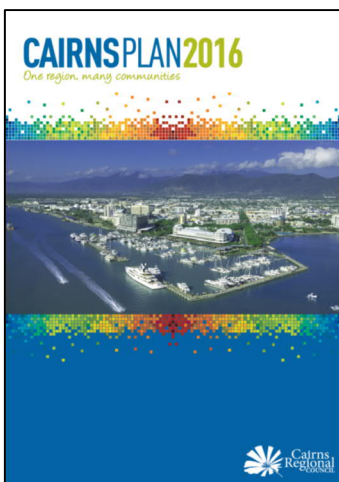
satisfactory, and the state of roads and ports is an inhibitor to further realise the vast untapped potential that Far North Queensland offers.

The Strategic Plan identifies that over 80% of Cape York cannot be accessed by land-based transport during the wet season due to the unsealed nature of large parts of the PDR and the numerous low-level river crossings. Equally the east-west linkages are poor and simply cannot cope with any increased level of heavy transport.

The FNQ region has four major ports with the capacity to connect the resource and agricultural industries, including live export of cattle, to international markets. The region has a large Indigenous population and their attempts to achieve economic growth and prosperity is thwarted by the poor transport infrastructure. A resilient transport infrastructure is expected to support a diversity of road users from agriculture and the resource industries.

2.2 Local Government Planning Schemes

Cairns Regional Council – Planning Scheme 2016



The strategic framework within the planning scheme¹³ sets the policy direction for the planning scheme and forms the basis for ensuring appropriate development occurs within the planning scheme area for the life of the planning scheme.

The region is recognised as Far North Queensland's key economic centre providing major industrial, agricultural, maritime, aviation, defence, health, education, commercial, retail, recreational and entertainment facilities and opportunities.

The Cairns City Centre is identified as the capital of commerce and services for Far North Queensland, Cape York, the Gulf Country, Papua New Guinea and the wider South Pacific region.

Due to the quality of the natural environment and extent and availability of productive agricultural land, tourism and primary production remain the key economic drivers. However, the region's economy will become more diversified,

improving business and employment opportunities and providing resilience against future adverse economic, social and environmental conditions.

Designated transport, freight and haulage routes will be appropriately managed and maintained to ensure the efficient supply of goods and services.

¹² <http://www.fnqroc.qld.gov.au/files/media/original/004/0b2/9d8/a91/FNQ-Elevator-Note-Full-Suite.pdf>

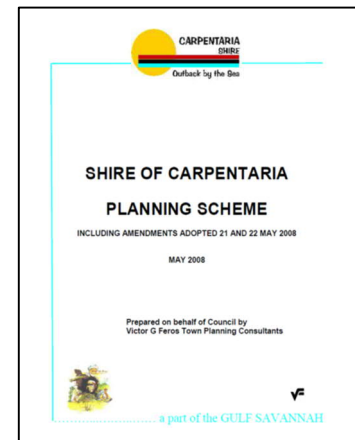
¹³ <https://www.cairns.qld.gov.au/building-planning-business/planning-schemes/v1.2cp2016/v1.2-documents>

Carpentaria Shire Council Planning Scheme 2008

The Planning Scheme Alignment Amendment¹⁴ identifies that the towns of Normanton and Karumba will continue to provide a focus for business, community activities and infrastructure provision within the Shire, with Normanton being the more important centre.

The Strategic Planning Framework for the Shire comprises several objectives which form the basis for the provisions of this planning scheme. These include:

- The existing major roads and the railway provide an essential communication framework connecting the towns of Normanton and Karumba with each other and with centres outside the local government area.
- Important natural features or identified resources, including mineral and extractive resources, will constrain the use of land due to the desire to protect their values or the potential hazard they impose.
- New uses and works are located, designed and managed in ways that maximize the efficiency of infrastructure, and compatibility with other uses, works, cultural features, cultural resources and natural resources, including mineral and extractive resources.



A desired outcome of the plan is to maximise the economic base of the Shire by increasing the Shire's Tourism, Business, Commercial, Industrial and Agricultural potential. This will be done, in part, by protecting extractive and mining resource areas, associated haul routes and major transport corridors from incompatible land use and establishing a co-ordinated approach linking the provision of infrastructure, land use and economic development.

Cassowary Coast Regional Council Planning Scheme 2015



The Planning Scheme¹⁶ identifies that in 2014, the region's economy was largely reliant on cane farming, banana farming and tourism. The goal for planning and development is to assist in diversifying this economic base to provide greater economic resilience and employment opportunities.

The region is comprised of a network of centres, with Innisfail containing the major regional activity centre, Tully containing a district regional activity centre and the villages of Mission Beach, Wongaling Beach and Cardwell containing village activity centres.

Development of an appropriate site for a multi-modal transport hub south of the township of Innisfail is encouraged. The location of a suitable site for the facility will be determined following the detailed consideration of transport network requirements, environmental constraints, availability of infrastructure to service the facility and the potential to co-locate regional scale industrial activities.

Noise and visually sensitive land uses are located away from freight transport routes, rail corridors and State controlled roads where practicable.

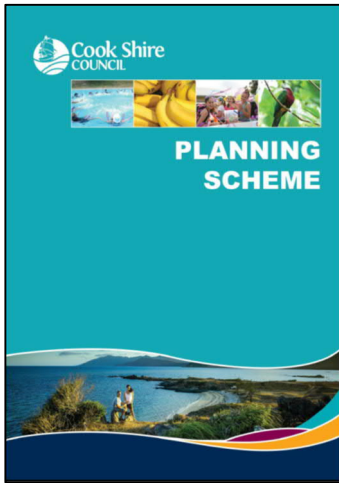
The plan identifies that the Port of Mourilyan has the potential to play a greater role in the economic diversification of the Region. The establishment of uses complementary to the activities of the Port of Mourilyan are encouraged in the industry precinct at Mourilyan and in particular at the Mourilyan Harbour locality.

¹⁴ <http://www.carpentaria.qld.gov.au/planning>

¹⁵ On 3 July 2017, a new planning system commenced in Queensland. Council carried out an "Alignment Amendment" to its existing planning scheme to align with the new Act. The "Alignment Amendment" has also been included in this review.

¹⁶ <http://www.cassowarycoast.qld.gov.au/documents/1422210/42234576/CCRC%20Planning%20Scheme%202015%20%28V3%29>

Cook Shire Council Planning Scheme 2017



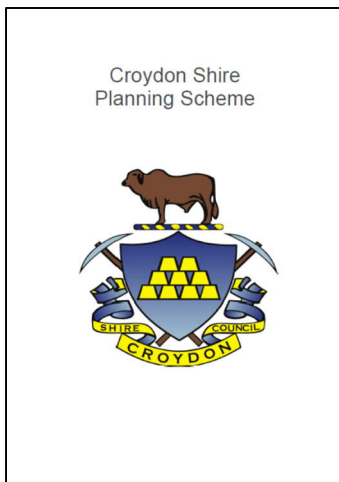
The strategic intent of the planning scheme¹⁷ is, in part, for development in Cook Shire over the next 20 years to deliver an efficient land use pattern, sustainable economic growth, sound environmental management, infrastructure security and resilient communities. Given the size, remoteness and tenure issues confronting Cook Shire, it is identified that these issues involve a wide range of stakeholders and all levels of government.

Investment and development present opportunities for the community to increase self-sufficiency, create regional and local collaboration to improve services, improve food supply (and food security), infrastructure, arts and culture and natural resource management.

The plan seeks to protect agricultural land around Lakeland from fragmentation and alienation and protect sources of extractive materials such as gravel pits and quarries.

Major industries and social and physical infrastructure and energy projects (such as liquid fuels, solar and wind) will be supported where there are demonstrated economic benefits to the local community, local employment opportunities and impacts on cultural, rural and environmental values are managed in line with community expectation.

Croydon Shire Council Planning Scheme 2019



The planning scheme¹⁸ seeks to further enhance economic opportunities in the agricultural and tourism sectors, as well as supporting residential, commercial, community infrastructure and services, and industrial development in town.

Cattle grazing is a major employer in the Shire and pastoral leases make up a large portion of Croydon Shire's land area. Agriculture supports other businesses within the agricultural supply chain. Given the importance the rural area plays to the economy of the Shire, the rural area will be protected from fragmentation that would result in diminished productivity of lands.

New mining opportunities are encouraged though they must satisfy any constraints including environmental and agricultural.

Gulf Development Road (part of National Highway 1 and the Savannah Way) links Croydon Shire to other regional centres. The road is sealed, though a few small sections in adjoining shires remain one lane, and need upgrading. To

improve the safety and accessibility of this road for all users Council desires that the entire road be upgraded to two lanes (one each direction).

To support Croydon's grazing industry, the planning scheme identifies that it is important that not just the main road but other roads within the Shire are accessible. Richmond-Croydon Road is a major cattle corridor and is being progressively sealed. Council seeks to improve the length of time Shire roads can remain open. Roads that remain operational and accessible in all weather conditions ensure access in emergencies, prevents isolation on rural properties, and allows communities and businesses to continue functioning uninterrupted year-round. New developments should consider impacts on, and provide safe access to, both local and state road networks.

¹⁷ <http://www.cook.qld.gov.au/development/town-planning-and-land-management/cook-shire-council-planning-scheme/planning-scheme-2017/cook-shire-council-planning-scheme-2017-v1-3-6.pdf>, sourced 19 Feb 2019

¹⁸ <https://www.croydon.qld.gov.au/documents/98276/4916464/Croydon%20Shire%20Planning%20Scheme%202019.pdf>, sourced 20 Feb 2019

Douglas Shire Council Planning Scheme 2018



The planning scheme¹⁹ identifies that the tourism and sugar industries are the principal determinants of economic activity, employment and population growth in Douglas Shire. The development and construction industry and the retail service sectors are dependent on these important income generating industries. Other primary production activities, such as fisheries, although important, have a relatively minor role to play.

Mossman and Port Douglas are both District regional activity centres under the Regional Plan. Mossman is the main administrative, service, agricultural and industrial centre, whereas Port Douglas has a stronger tourism focus.

The Captain Cook Highway provides the principal access into Douglas Shire, linking the area to Cairns. The highway is of great scenic importance. It is mostly a winding two-lane road. Upgrading this road to a higher standard has the potential to significantly detract from its scenic appeal. Accordingly, reduced

vehicular capacity of the highway has implications for ultimate development and population capacity.

Other significant roads in the Shire include the Mossman-Mount Molloy Road providing direct access to the Tablelands, the Mossman-Daintree Road providing the main route north of Mossman to the Daintree River and Village, Bailey Creek and Cape Tribulation Roads, north of the Daintree River and the four wheel-drive Bloomfield Track, between Cape Tribulation and Degarra.

Etheridge Shire Council Planning Scheme Alignment Amendment

The Planning Scheme Alignment Amendment²⁰ identifies that the towns of Georgetown, Forsayth, Kidston, Mount Surprise and Einasleigh will continue to provide a focus for business, community activities and infrastructure provision within the Shire, with Georgetown being the more important centre.

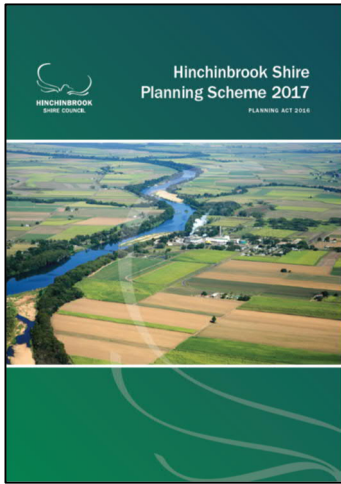
The rural areas of the Shire will provide for, and accommodate, a range of agricultural (predominantly cattle grazing) uses with all the local government area providing for compatible Tourism Activities. Major transport corridors will be protected by ensuring that land uses sensitive to noise, dust and/or fuel combustion emissions are suitably located away from the corridors.

¹⁹ <https://douglas.qld.gov.au/development/schemes-masterplans/douglas-shire-planning-scheme/>

²⁰ <http://www.etheridge.qld.gov.au/documents/43741283/44086033/Planning%20Provisions.pdf>

²¹ On 3 July 2017, a new planning system commenced in Queensland. Council carried out an "Alignment Amendment" to its existing planning scheme to align with the new Act. The "Alignment Amendment" only has been reviewed.

Hinchinbrook Shire Planning Scheme 2017



The Planning Scheme²² identifies that Hinchinbrook includes substantial port infrastructure at Lucinda which is used for exporting sugar internationally. The port has significant capacity to expand the volume and range of exports.

Ingham is the main activity centre for Hinchinbrook. Hinchinbrook had a population of approximately 11,800 people (2011 Census). The population has been declining at a rate of -0.1% (approx. 30 people annually) since 1976 and is predicted to continue to decline over the next 20 years.

The Herbert River valley is a very fertile alluvial plain with very reliable rainfall and in addition to sugar and grazing, there is potential for a range of alternative crops and boutique rural industries.

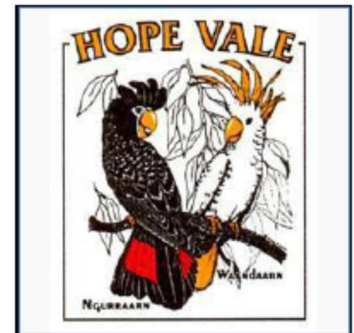
Hinchinbrook's 560 cane growers generate 52,000ha of sugar cane, producing up to five million tonnes of cane annually valued at \$243 million (12.1% of Australia's sugar cane). The efficiency of the harvesting, milling and export process is an economic strength. This industry is supported by other local exports including cattle, fish, pork, geo-spatial services and manufactured food goods.

Hope Vale Aboriginal Shire Council Planning Scheme 2014

Hope Vale Shire spans a vast and varied landscape featuring freshwater springs, palm tree lined rivers, spectacular beaches, significant wetlands, beautiful coloured sand dunes, rich red soil and mineral resources.

The Planning Scheme²³ identifies that while Hope Vale Council will continue to be the dominant employer in the Shire, opportunities are emerging for the community to benefit from mining, plantations and agriculture; and a small but sustainable tourism industry.

Opportunities for significant investment in Hope Vale are explored, particularly in agriculture, forestry, tourism and retail. Development proposals however should not damage the economic viability and future sustainable development of the natural and cultural resources of the Shire.



Mareeba Shire Council Planning Scheme 2016



The Planning Scheme recognises Mareeba as the major regional activity centre for the Shire. Kuranda is identified as the premier tourist destination for Far North Queensland and is described as the village in the rainforest. Chillagoe and Dimbulah are identified as rural activity centres within the Shire.

Mareeba is identified as providing a strategic alternative and secure location to limited supplies of industrial land in Cairns, and potentially expands as a base for increased agricultural, cattle and mining activities, and for servicing Gulf Savannah and Cape York communities.

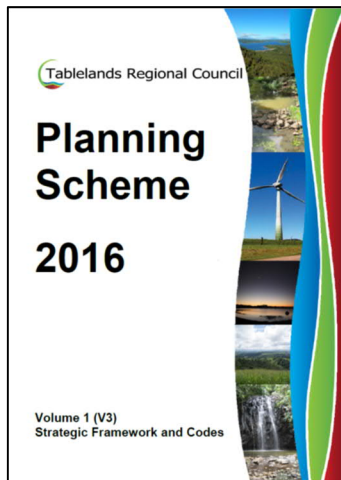
Key enterprise and employment areas including the Tableland Sugar Mill in Arriga, Lotus Glen Correctional Facility and Springmount Waste facility are protected from development which could compromise their expansion and ongoing operation.

²² https://s3-ap-southeast-2.amazonaws.com/os-data-2/hsc/documents/hinchinbrook_shire_planning_scheme_2017_web_version.pdf

²³ <https://www.hopevale.qld.gov.au/sites/hopevale.qld.gov.au/files/Hope%20Vale%20Planning%20Scheme.pdf>

The need to progressively upgrade and maintain roads to a high standard to support a variety of uses is identified. The rail network is also recognised as important for tourist, passenger and freight movements.

Tablelands Regional Council – Planning Scheme 2016



The planning scheme²⁴ identifies that the settlement pattern of the Tablelands supports a widely dispersed population in a variety of settings, including urban living in rural towns, small rural settlements, rural residential areas, cropping lands, dairy and grazing lands, broad-hectare grazing properties and a variety of other rural settings.

The town of Atherton is the major regional activity centre and the focus of the Tablelands centre network and regional population growth. The major industrial areas situated at Tolga and Ravenshoe provide the primary location for industrial development and particularly high impact industries in the Tablelands region. Malanda has the potential to accommodate additional industrial uses within urban expansion areas.

Designated freight routes (including B-double routes) will be appropriately managed, upgraded and are not impeded by inappropriate land uses to ensure the efficient transportation of essential goods and services. Rail corridors are recognised as important strategic infrastructure resulting from significant past investment. Active rail corridors are protected from development which could compromise rail operations. Planned and identified future state roads in Atherton, Malanda and Yungaburra are protected from development which will prejudice or impede their future construction.

Wujal Wujal Aboriginal Shire Council



The Wujal Wujal Plan²⁵ is a Council plan that aims to support the community's vision for the development of the township of Wujal Wujal and surrounding traditional lands. Wujal Wujal is located on the banks of the Bloomfield River and on the Bloomfield track.

The Council's vision is that Wujal Wujal is an active, safe, progressive and healthy community with increased participation in sports and improved economic opportunities available for the locals. People are culturally rich and appreciate and value the traditional Eastern Kuku Yalanji knowledge, language, skills and connection to the natural landscape and resources.

The scenic landscapes, rainforest and the Bloomfield River are the traditional grounds of Eastern Kuku Yalanji people. The lands and rivers are protected, valued and managed sustainably. Land is limited, and community development is determined by a collaborative partnership between all stakeholders, representing the community and providing a transparent decision-making process.

²⁴ <https://www.trc.qld.gov.au/download/volume-1-strategic-framework-codes/>

²⁵ <https://wujalwujalcouncil.qld.gov.au/council/wujal-wujal-plan/>

Yarrabah Aboriginal Shire Council Planning Scheme 2014



The Planning Scheme²⁶ identifies that economic prosperity is an essential component to achieving the long sustainability of Yarrabah as a properly functioning community.

The continued role of Yarrabah as an indigenous dormitory community that is largely 'out of sight and out of mind' needs to change. Yarrabah is not an isolated aboriginal community, being close to Cairns with good bitumen road access to the education, training and jobs that the Cairns city offers.

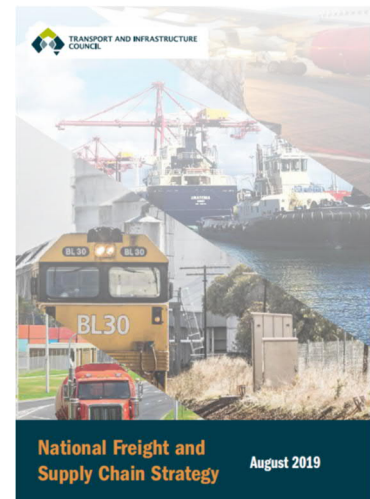
The plan identifies that a large proportion of the land within the shire is constrained by several natural features such as steep slopes and wetlands. While there is currently enough land for development it will need to be carefully planned to ensure ongoing land supply.

2.3 Freight Strategies

National Freight and Supply Chain Strategy (2019)²⁷

The National Freight and Supply Chain Strategy sets a 20-year agenda for coordinated government and industry action across all freight modes through:

- Smarter and targeted infrastructure investment
- Ensure that domestic and international supply chains are serviced by resilient and efficient key freight corridors, precincts and assets
- Provide regional and remote Australia with infrastructure capable of connecting regions and communities to major gateways, through land links, regional airports or coastal shipping
- Identify and support digital infrastructure and communication services necessary for improved and innovative supply chains
- Advance heavy vehicle road reform to facilitate efficient investment in infrastructure
- Enable improved supply chain efficiency
- Adopt and implement national and global standards, and support common platforms, to reduce transaction costs and support interoperability along supply chains
- Promote training and re-skilling of industry and government workforces appropriate to current and future freight needs
- Facilitate new and innovative technologies that improve freight outcomes and understand the deployment, skills and workforce requirements for operators and infrastructure
- Build community acceptance of freight operations
- Better planning, coordination and regulation
- Ensure freight demand is integrated in transport and land use planning across and between jurisdiction boundaries and freight modes.
- Strengthen the consideration of freight in all other government planning and decision-making.



²⁶ <https://www.yarrabah.qld.gov.au/yarrabah-aboriginal-shire-council-planning-scheme>

²⁷ <https://www.freightaustralia.gov.au/sites/default/files/documents/national-freight-and-supply-chain-strategy.pdf>

- Investigate policy, planning and operational solutions to improve freight access and movement along domestic and international supply chains.
- Improve regulation to be more outcomes focused and risk-based to support innovation and reduce regulatory burden whilst maintaining safety, security and sustainability.
- Better freight location and performance data
- Develop an evidence base of key freight flows and supply chains and their comparative performance to help business and governments improve day-to-day freight and network operations, make better investment decisions, and monitor and evaluate the performance of the freight system.

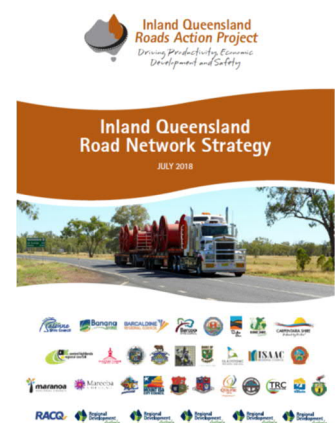
The Strategy is supported by a National Action Plan²⁸ that outlines action areas over the next 5 years. From a pure road infrastructure investment perspective, these actions include:

- Develop a national framework for freight-related infrastructure investment, including consideration of non-build solutions
- Develop new major freight gateways and hubs
- Improve landside access to major freight gateways
- Assess and improve the resiliency of key freight assets and supply chains
- Develop regionally based investment frameworks for key freight corridors
- Provide infrastructure to connect regions and remote areas to markets
- Target infrastructure investment programs to improve regional and remote freight access and safety
- Fund local governments to maintain and upgrade freight assets that support community sustainability
- Specific investments as part of the National Action Plan are subsequently yet to be identified.

Inland Queensland Road Network Strategy – July 2018²⁹

The strategy identifies \$862 m in FNQ and \$1bn in North West (the majority in the next 5-15 years) road network infrastructure. Significant expenditures noted include:

- \$10m Kennedy Hwy (Cairns to Mareeba) - widening and overtaking lanes
- \$44m Kennedy Hwy (Mareeba to Ravenshoe) - widening, sealing, bridge replacement
- \$75m Ootann Road (Bourke Developmental Road to Kennedy Highway) - sealing
- \$87m Gregory Developmental Rd (The Lynd to Quartz Blow Ck) - widening
- \$79m Burke Developmental Rd (Cloncurry to Normanton) - widening, bridge widen/replacement
- \$135m Wills Developmental Rd (Julia Creek to Burketown) - widening, bridge widen/replacement
- \$548m Burke Developmental Rd (Normanton to Dimbulah) - widening, bridge widen/replacement
- \$86m Gulf Developmental Rd (Croydon to Georgetown) - widen/sealing, bridge widen/replacement
- \$14m Kennedy Hwy (Ravenshoe to Mt Garnet) - widen/overlaying, bridge widen/replacement
- \$157m Savannah Way (Burketown to Normanton) - pave/sealing
- \$147m Richmond-Croydon Road - widening



²⁸ <https://www.freightaustralia.gov.au/sites/default/files/documents/national-action-plan-august-2019.pdf>

²⁹ <https://www.rdanwg.org.au/wp-content/uploads/2019/12/IQRNS-Appendices-July-2018-FINAL.pdf>

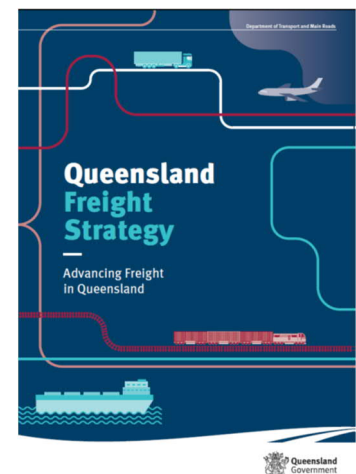
- \$81m Gregory Developmental Rd (Charters Towers to The Lynd) - widening, bridge widen/replacement
- \$88m Kennedy Developmental Rd (The Lynd to Hughenden) - widening, bridge widen/replacement
- \$12m Kennedy Developmental Rd (Mt Garnet to The Lynd) - widening, bridge widen/replacement
- \$132m Gulf Developmental Rd (Georgetown to Mt Garnet) 92C widening, bridge widen/replacement
- \$4m Gulf Developmental Rd (Normanton to Croydon) 92A widening, bridge widen/replacement, realignment through Croydon

Queensland Freight Strategy 2019³⁰

The Queensland Freight Strategy sets a 10-year shared vision for the state's freight system: an integrated, resilient and safe freight system that supports the economy and community. It outlines a series of shared commitments (by industry, customers and governments) to achieve this vision.

These commitments are:

- Build Effective Partnerships - work collaboratively to deliver a freight system that advances customer, industry and government interests, now and into the future
- Unlock Economic Opportunity - optimise the use of existing freight infrastructure and target investment towards creating economic opportunities
- Smarter Connectivity and Access - plan a freight system that provides Queensland businesses with smarter access to local, national and overseas markets
- A Resilient Freight System - Support the adoption of sustainable freight practices and resilient infrastructure
- Safer Freight Movements - support safe freight movements across Queensland through technology and system planning



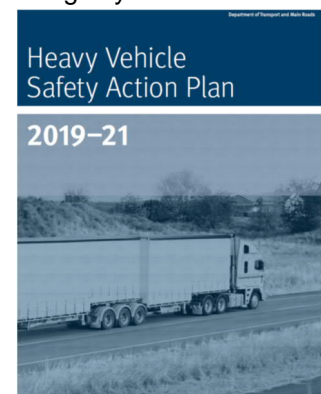
The strategy is guiding the development of a rolling two-year Queensland Freight action plan that will outline a range of activities the Queensland Government will undertake in the future.

Heavy Vehicle Safety Action Plan 2019-21³¹

The 2019–21 Plan builds on the priorities and initiatives of its predecessor reprioritising Queensland's focus for the next three years to deliver 36 heavy vehicle safety interventions across the following key action areas: Safer Roads, Safer Vehicles, Safer Speeds and Safer people.

Key relevant actions include:

- TMR to lead the development of a guideline to assist officers to assess the suitability of roads for higher productivity vehicle operation.
- TMR to lead the development of policies to promote PBS vehicles on appropriate routes.
- Apply road safety treatments including wide centreline, audible line markings, safer roadsides, and channelised right turn lanes at rural intersections on key freight routes.
- Apply Township Entry Treatments on key freight routes in rural areas.



³⁰ <https://www.tmr.qld.gov.au/business-industry/Transport-sectors/Freight/Queensland-freight-strategy-advancing-freight>

³¹ <https://www.tmr.qld.gov.au/-/media/Safety/roadsafety/Strategy-and-action-plans/heavyvehiclesafetyactionplan2016.pdf?la=en>

- Construct up to nine new heavy vehicle stopping opportunities (yet to be identified) and upgrade up to 21 existing stopping opportunities as part of the Bruce Highway Safety Package.

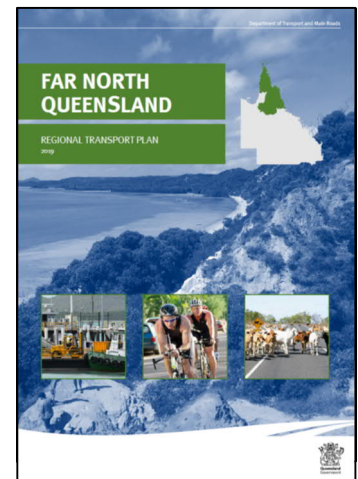
2.4 Transport Strategies

Far North Queensland Regional Transport Plan 2018³²

The Far North Queensland Regional Transport Plan (which includes all FNQROC member council areas except Carpentaria) aligns with the Far North Queensland Regional Plan, Cape York Regional Plan, Gulf Regional Development Plan and the Torres Strait and Northern Peninsula Area Regional Plan.

Key challenges for the region's heavy vehicle transport network include:

- **Network safety.** Safety for transport users can be influenced by a number of factors, including their awareness and respect for other road users (like heavy and recreational vehicles), changing road environments as the surrounding land uses change (for example, heavy vehicles passing through busy city centres, with people and cyclists in close proximity) and how different users share infrastructure (for example, rest areas with mixed vehicle usage, such as cars and heavy vehicles).
- **Geography and climate.** The size of the region and the climate present significant challenges for maintaining a connected and accessible transport system. Distance increases the cost of goods to market making business marginal, dictates the road standard achievable with available funds, increases the time required to undertake repairs and results in a higher delivery cost of transport services. The wet season impacts transport networks, their dependent communities and businesses from November to March.
- **Network efficiency and reliability.** Improving global competitiveness of Queensland's industries through reduced freight costs. Changes required to meet this challenge are better, safer roads, optimised road network access for High Productivity Vehicles (HPVs) on key road freight links and facilitation of oversize over mass loads along key transport routes.
- **Competing needs of road users.** The growth of the self-drive tourism market is positively contributing to the region's economy. The differing customer needs of a rural and regional network are recognised as a challenge nationally. The *National Remote and Regional Transport Strategy* identifies that standards and regulations can hinder economic and social development because they cannot be applied flexibly in ways that are relevant to remote areas.



The plan identifies four sub-regions based on climate and geographic characteristics: Coastal Centres and Tablelands, Savannah, Torres Strait and Cape York.

A key challenge for the region is improving global competitiveness of Queensland's industries through reduced freight costs. The cost of transport for livestock from Northern Australia can be up to 35% of the market price.

As well as the existing key industry sectors; agriculture, mining and tourism, new economic opportunities are offered by emerging industries such as education, tropical health and clean energy.

Well established agricultural areas identified include:

- The Lakeland Downs area, 250 km north of Cairns, supports small-scale horticulture and broad acre development;

³² <https://www.tmr.qld.gov.au/About-us/Corporate-information/Publications/Regional-Transport-Plans>

- Mareeba Dimbulah Water Supply Scheme area, mainly used for sugarcane, and a wide range of vegetables, nuts and fruits (Mareeba Airport upgrade supporting faster market access for high value products such as beef, dairy and high value horticulture);
- Coastal area south of Cairns, has long-established crop production of bananas and sugarcane and is also beginning to diversify into growing pawpaws, tea, rambutans, pineapples, watermelon, pumpkins, lettuces, lychees, mangosteens, tomatoes and vanilla (Cassowary Coast local government area contributed 66 % of the state's production of fruit – 2011);
- A strong cattle industry exists through the Cape, Gulf and Tablelands - grazing livestock production in the FNQ, which accounts for 75% of current land use. Also, supports abattoirs located at Weipa, Tully and Tolga, and saleyards in Mareeba. Live export to Asian markets occurs out of the ports of Weipa, Karumba and Mourilyan;
- Flinders Gilbert agricultural zone - the Flinders and Gilbert Rivers - according to Agriculture and Fisheries, the strategic location of this development allows produce to be delivered to national and international markets with easy access to ports and international airports via Townsville, Darwin, Cairns and Brisbane. A large fishing industry also exists, supplying Asian and domestic markets with fresh and frozen products. The aquaculture sector produces prawns, barramundi and red claw crayfish for local markets.

A significant mining, energy and natural resources sector operates in the region. It is responsible for the production of many resources, including bauxite, kaolin, gold, tin, zinc, lead, silver, silica, marble, limestone, perlite and copper³³. Most of the region's mining and resource areas are in Cook, Mareeba, Etheridge, Croydon and Tablelands Shires, with some mines also located throughout Cape York, most notably Rio Tinto Alcan's bauxite mining at Weipa. Mining activities have potential for significant negative impacts on the road network. These negative impacts were demonstrated during the construction of Rio Tinto's Amrun mine at Weipa, which will extend the Weipa bauxite operations for at least forty years. There were substantial increases in HV traffic during the mine's five year construction, with specific measures taken to assist other road users in the area³⁴.

The plan identified growth of new and existing industries including shipbuilding, maintenance and home porting, tropical health and research, education and energy production e.g. the Kidston solar and hydro-electricity project in Etheridge Shire Council, the Lakeland Solar and storage project in Cook Shire and the use of sugar cane waste to generate electricity.

Actions for the heavy vehicle road network, by plan priority, are summarised in Table 2-1.

³³ <https://www.tmr.qld.gov.au/-/media/aboutus/corpinfo/Publications/regionaltransportplans/RTP-Far-North-Qld.pdf?la=en>

³⁴ <http://www.capeyorknrm.com.au/news-events/newsletter/issue-31/amrun-project-peninsula-developmental-road-pdr-trucking-movements>

Table 2-1 Regional Transport Plan - heavy vehicle road network actions

Priority	Action category	Action
A safer, more resilient transport network	A1.01 Road safety projects	Focus areas include implementation of High Risk Roads priority safety treatments. High Risk Roads planning for the FNQ region includes Captain Cook Highway, Gillies Range Road, Kennedy Highway (Cairns to Mareeba), Cairns Western Arterial Road and Mulgrave Road.
	A1.03 Safety of range roads	Key range roads in the region include the Kennedy Highway (Kuranda Range), Gillies Range Road, Pine Creek-Yarrabah Road, Palmerston Highway and Mossman-Mount Molloy Road (Rex Range).
	A1.04 Overtaking lanes and wide centreline	Between Kuranda and Ravenshoe on the Kennedy Highway and as part of treatments identified under High Risk Roads planning.
	A1.05 Rest areas that meet different customers' needs	Ensure planning and provision of rest areas addresses safety risks associated with potential for incompatibility or conflicts between trucks and recreation vehicles.
	A1.06 Facilities to support a safe trucking and transport industry	Includes planning for the Atherton Tablelands heavy vehicle network, the region's developmental roads, heavy vehicle rest stops and decoupling facilities at key locations, for example in the Cairns city area and west of Kuranda.
	A1.11 Resilience analysis and flood immunity strategy	Includes through studies such as the Cape York Access Strategy, and for priority locations such as Spear and Rifle Creek at Mount Molloy, McLeod River bridge (Mulligan Highway) and Archer River (PDR).
	A1.15 Cross-agency solutions to infrastructure betterment	Explore opportunities to coordinate disaster and reconstruction funding with investment into preventative infrastructure to improve resilience, reduce on-going maintenance costs and cater for the region's changing climate.
Transport that supports the economy	A2.01 Strategic corridors	Core priorities for strategic corridor investigations are: Palmerston Highway linking Port of Mourilyan and Innisfail to the Tablelands and beyond; Kennedy Highway linking key freight generators and population centres between Cairns and Mareeba; and the potential extension of the National Land Transport Network (Bruce Highway) to connect with the Cairns International Airport.
	A2.03 Far North Queensland multi-modal freight strategy	Develop a multimodal freight strategy to identify and prioritise productivity and safety improvements throughout the region in response to state-wide freight and heavy vehicle network strategies.
	A2.04 Oversize overmass (OSOM) routes	Define the optimum dimensions for oversize overmass (OSOM) clearance envelopes on the region's key freight routes, and identify priority upgrades for inclusion in future works programs, including road widening and heavy vehicle roadside facilities.
	A2.05 Reducing road freight transport costs	Investigate opportunities to support industry use of high productivity vehicles (HPVs) including improving the continuity of the HPV network and investigating better connectivity for freight transport between Cape York, Atherton Tablelands, Gulf-Savannah, coastal ports and southern markets.
	A2.06 Industrial access	Work with local government, the private sector and other government agencies to provide an appropriate level of access to industrial areas at existing and proposed new industrial areas and transport industry hubs at Mareeba, Innisfail and South of Cairns.
	A2.07 Bridge renewal	Using the outputs of regional bridge renewal investigations, commence planning for necessary bridge replacements or structural enhancements, including strengthening of the Mulligan Highway bridges at Kelly St George River, Spear Creek (near Mt Molloy), Spring Creek and Palmer River, and bridge replacements at Spear (near Palmer River) and Rifle Creeks and Archer River.

Priority	Action category	Action
	A2.11 Strategic outlook for mining	Position the region's transport authorities to efficiently respond to development and diversification in the mining and resources industry, particularly from the North East Minerals Province and in western Cape York.
	A2.13 Future road corridors	Plan and protect future road corridors including the Mareeba, Atherton, Smithfield and Innisfail bypass corridors.
	A2.16 Innisfail freight network	Improve road access between the Palmerston Highway and the Port of Mourilyan, and through the township of Innisfail including as part of the Innisfail Bypass – Plan and Preserve Corridor project.
Connected, liveable and sustainable communities	A3.17 Cape York and Torres Strait Access	Improve key transport infrastructure in Cape York and the Torres Strait including the Peninsula Developmental Road, community access roads, airstrips and barge landings, and the accesses to those facilities.
	A3.18 Remote community access and cost of living	Investigate freight and passenger transport options to help address the cost of living, and improve access to basic goods and services for the more remote parts of the region (such as the Torres Strait islands, and Cape York communities).
	A3.23 Capacity pressures on range roads	Determine the role of changing vehicle technology, and intelligent transport systems, in addressing increasing traffic pressure and capacity constraints on the Kuranda Range Road (Kennedy Highway).
Better coordination of transport infrastructure and services	A4.01 Design standards fit for remote conditions	Consider 'fit for purpose' transport infrastructure design standards for rural and remote areas to achieve value for money outcomes, including applying solutions that were developed in sealing the Peninsula Developmental Road under the Cape York Region Package.

Ports North – Annual Report 2017-18³⁵

Ports North is responsible for the development and management of the declared Ports of Cairns, Cape Flattery, Karumba, Mourilyan, Skardon River, Quintell Beach, Thursday Island, Burketown and Cooktown.

Cairns Seaport is a multi-purpose regional port that caters for a diverse range of customers from bulk and general cargo, cruise shipping, fishing fleet and reef passenger ferries. The Port's bulk cargo includes petroleum products, sugar, fertiliser and liquid petroleum gas. The Port is also a consolidation and redistribution centre for supplies that are shipped to the coastal communities north of Cairns as well as the Torres Strait Islands and the Gulf of Carpentaria.

Ports North proposes to deepen and widen the Trinity Inlet shipping channel and upgrade wharves to enable mega class cruise ships to berth at the Port of Cairns. The \$120 million project will facilitate the growth of cruise, navy and large cargo ship visits directly to the Port of Cairns and allow expansion of the naval base.

The Port of Cape Flattery is situated more than 200 kilometres north of Cairns on the east coast of Cape York Peninsula. It is used for the export of silica sand from the Cape Flattery mine.

The Port of Karumba is located at the mouth of the Norman River in the south-east corner of the Gulf of Carpentaria. The port provides for general cargo, fuel, fisheries products, and the export of live cattle and minerals from the New Century Resources operation. Karumba also acts as a transshipment port for Mornington Island, other Gulf communities and the Port of Weipa for most of the year, with refrigerated semi-trailers bringing goods north to Karumba for transshipment.

The Port of Mourilyan exports raw sugar and molasses from the Innisfail, Babinda, Tully and the Atherton Tableland sugar growing districts. Other facilities at the port include a stockpile facility used in the export of iron ore from a local mine to markets in Asia as well as a livestock export facility.

Skardon River is located north of Weipa in the Gulf of Carpentaria. Previously a kaolin export facility, the port is now home to Metro Mining's bauxite export operation which commenced in May 2018.

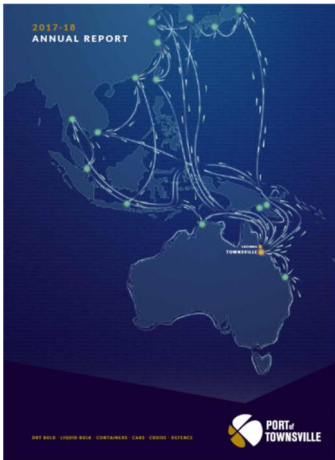
Quintell Beach is a community port with a barge facility located on the east coast of northern Cape York that services the needs of the Lockhart River community and remote grazing properties.

Ports North owns the wharf facilities, which are established on both Thursday Island and Horn Island. The port services the two islands and operates as a major transshipment point for the supply of essential cargoes to other islands of the Torres Strait. Several government agencies, including Customs and Fisheries patrols, are based at these ports.

The Ports of Cooktown and Burketown are declared ports, but no commercial trade currently takes place.

³⁵ https://s3-ap-southeast-2.amazonaws.com/os-data-2/portsnorth-com-au/documents/annual_report_fy2018_website.pdf

Port of Townsville – Annual Report 2017-18³⁶



The Port of Townsville Ltd owns and operates the ports of Townsville and Lucinda.

The annual report identifies that Townsville Port handles more than 30 different commodities; is the largest exporter in Australia of sugar, molasses, copper, lead, zinc and fertiliser. It is the largest container and automotive port in Northern Australia, servicing around 70% of Northern Australia's population. It plays a critical role in growing tourism activities with a world class cruise ship terminal. It also provides strategic enduring naval capabilities with state of the art naval berth and infrastructure facilities, particularly in servicing the Australian Defence Force's Landing Helicopter Dock ships.

The Port of Lucinda is situated approximately 100 kilometres north of Townsville and is primarily dedicated to the export of raw sugar from the Herbert River sugar growing district. It also services nearby islands with regular general cargo barge services.

Northern Australia Beef Roads Program/CSIRO

The Australian Government announced projects to be funded under the Northern Australia Beef Roads Program in October 2016. The \$100 million program is making targeted upgrades to key roads necessary for transporting cattle to improve the reliability, productivity and resilience of cattle supply chains in northern Australia, thereby reducing freight costs and strengthening links to markets. The region's heavy vehicle road network supports the mining and agricultural industries and can be a significant component of the cost to deliver goods and services to customers - the cost of transport for livestock from Northern Australia can be up to 35% of the market price.

To help identify priority projects, the Australian Government actively engaged with key stakeholders, including members of the northern Australian beef and transport industries, through a series of stakeholder roundtables held in Rockhampton, Kununurra and Darwin throughout late in 2015 and early in 2016.

The CSIRO analysed and modelled the different scenarios put forward by state, territory and local governments using the Transport Network Strategic Investment Tool (TraNSIT) to determine the extent of benefits to the movement of cattle and assist in the prioritisation of projects.

The Australian Government will fund up to a maximum of 80 per cent of the total project cost in partnership with the state, territory and local governments. Funding is available over three years from the 2016 to 2017 financial year to the 2019 to 2020 financial year.

The agreed projects are summarised in Figure 2-1. Some of these are within the FNQROC region, including:

- Burke Developmental Road: Chillagoe to Almaden: Progressive sealing works.
- Ootann Rd: Almaden to Kennedy Hwy (Gunnawarra): Progressive sealing works.
- Richmond-Croydon Road: Progressive sealing works.

³⁶ https://s3-ap-southeast-2.amazonaws.com/os-data-2/port-townsville/documents/port_annual_report_17-18_lo-res.pdf

Legend

- Northern Australia Roads Programme
- Northern Australia Beef Roads Programme
- Tropic of Capricorn
- Major Road

Prepared by Spatial Systems: 20/161017

2.5 Summary

The review of the relevant planning strategies, local government planning schemes and freight strategies highlight several common priorities for assessing heavy vehicle network investments. These priorities are:

- Table 2-2 provides a summary of the planned / proposed key heavy vehicle roads, routes and corridor investments by these priority areas.

Table 2-2 Summary of key heavy vehicle roads, routes, and corridor investments by priority area

Priority	Action
A safer, more resilient transport network	<ul style="list-style-type: none"> High Risk Roads priority safety treatments for the FNQ region includes Captain Cook Highway, Gillies Range Road, Kennedy Highway (Cairns to Mareeba), Cairns Western Arterial Road and Mulgrave Road. Key range roads in the region include the Kennedy Highway (Kuranda Range), Gillies Range Road, Pine Creek-Yarrabah Road, Palmerston Highway and Mossman-Mount Molloy Road (Rex Range). Overtaking lanes and wide centreline between Kuranda and Ravenshoe on the Kennedy Highway and as part of treatments identified under High Risk Roads planning. Facilities to support a safe trucking and transport industry. Includes planning for the Atherton Tablelands heavy vehicle network, the region's developmental roads, heavy vehicle rest stops and decoupling facilities at key locations, for example in the Cairns city area and west of Kuranda. Resilience analysis and flood immunity strategy, which includes through studies such as the Cape York Access Strategy, and for priority locations such as Spear and Rifle Creek at Mount Molloy, McLeod River bridge (Mulligan Highway), Archer River (PDR), and Gilbert River (GDR).
Transport that supports the economy	<ul style="list-style-type: none"> Core priorities for strategic corridor investigations are: Palmerston Highway linking Port of Mourilyan and Innisfail to the Tablelands and beyond; Kennedy Highway linking key freight generators and population centres between Cairns and Mareeba; and the potential extension of the National Land Transport Network (Bruce Highway) to connect with the Cairns International Airport and Smithfield. Far North Queensland multi-modal freight strategy to identify and prioritise productivity and safety improvements throughout the region in response to state-wide freight and heavy vehicle network strategies. Define the optimum dimensions for OSOM clearance envelopes on the region's key freight routes, and identify priority upgrades for inclusion in future works programs, including road widening and heavy vehicle roadside facilities. Investigate opportunities to support industry use of high productivity vehicles (HPVs) including improving the continuity of the HPV network and investigating better connectivity for freight transport between Cape York, Atherton Tablelands, Gulf-Savannah, coastal ports and southern markets. Work with local government, the private sector and other government agencies to provide an appropriate level of access to industrial areas at existing and proposed new industrial areas and transport industry hubs at Mareeba, Innisfail and South of Cairns. Using the outputs of regional bridge renewal investigations, commence planning for necessary bridge replacements or structural enhancements, including strengthening of the Mulligan Highway bridges at Kelly St George River, Spear Creek (near Mt Molloy), Spring Creek and Palmer River, and bridge replacements at Spear (near Palmer River) and Rifle Creeks and Archer River. Position the region's transport authorities to efficiently respond to development and diversification in the mining and resources industry, particularly from the North East Minerals Province and in western Cape York. Plan and protect future road corridors including the Mareeba, Atherton, Smithfield and Innisfail bypass corridors. Innisfail freight network; improve road access between the Palmerston Highway and the Port of Mourilyan, and through the township of Innisfail including as part of the Innisfail Bypass – Plan and Preserve Corridor project.

Priority	Action
Connected, liveable and sustainable communities	<ul style="list-style-type: none"> • Improve key transport infrastructure in Cape York and the Torres Strait including the Peninsula Developmental Road, community access roads, airstrips and barge landings, and the accesses to those facilities. • Investigate freight and passenger transport options to help address the cost of living, and improve access to basic goods and services for the more remote parts of the region (such as the Torres Strait islands, and Cape York communities). • Determine priority projects to enhance access to Gulf communities • Determine the role of changing vehicle technology, and intelligent transport systems, in addressing increasing traffic pressure and capacity constraints on the Kuranda Range Road (Kennedy Highway).
Better coordination of transport infrastructure and services	<ul style="list-style-type: none"> • Consider 'fit for purpose' transport infrastructure design standards for rural and remote areas to achieve value for money outcomes, including applying solutions that were developed in sealing the Peninsula Developmental Road under the Cape York Region Package.

Local council considerations for heavy vehicle network investments

For each council there are a number of key heavy vehicle road network investment considerations. These are divided into the following sub-areas:

- **Coastal** - this is the area extends between Mossman and Tully and adjoining hinterland. It includes the local government areas of Cairns, Cassowary Coast, Douglas, Hinchinbrook, Mareeba, Tablelands, and Yarrabah.
- **Gulf Savannah** - this area encompasses Carpentaria, Croydon and Etheridge local government areas. It also includes Burke and Doomadgee to the west.
- **Cape York** - this area includes Cook, Hope Vale and Wujal Wujal local government areas. It also includes Kowanyama, Pormpuraaw, Mapoon, Napranum, Northern Peninsula area, Lockhart River and Torres Strait local government areas.

Coastal

There are significant industries within the sub-area:

- Sugarcane plays a major role and has the dominant production value within the Cairns, Douglas and Hinchinbrook boundaries. Both irrigated and unirrigated production is supported by seven sugar mills from Mossman down to Ingham.
- The Tablelands area and its Mareeba-Dimbulah Water Supply Scheme area are mainly used to irrigate sugarcane and a wide range of vegetables, nuts and fruits.
- A strong cattle industry exists through the Tablelands. Abattoirs are located at Tully, El Arish and Tolga and saleyards in Mareeba.
- Mining and resource areas are located in the Mareeba and Tablelands Shires.
- There is long-established crop production of sugar cane and bananas across the sub-area (particularly Cassowary Coast). There is also early diversifying into pawpaws, tea, rambutans, pineapples, watermelon, pumpkins, lettuces, lychees, mangosteens, tomatoes and vanilla.

Table 2-3 outlines the key heavy vehicle network prioritisation considerations for each Council (where relevant).

Table 2-3 Key heavy vehicle network prioritisation considerations for the Coastal sub-area

Council	Consideration
Cairns	Key economic centre providing major industrial, agricultural, maritime, aviation, defence, health, education, commercial, retail, recreational and entertainment facilities and opportunities. Designated transport, freight and haulage routes need to be appropriately managed and maintained to ensure the efficient supply of goods and services. The Cairns South State Development Area seeks to promote the development of priority industries such as biofutures, advanced manufacturing and defence. It has been recently expanded to include 303 hectares of land around the Mulgrave Mill in Gordonvale, further supporting sugarcane production.
Cassowary Coast	Largely reliant on cane farming, banana farming and tourism. Development of an appropriate site for a multi-modal transport hub south of the township of Innisfail is encouraged. The planning scheme identifies that the Port of Mourilyan has the potential to play a greater role in the economic diversification of the Region. The establishment of uses complementary to the activities of the Port of Mourilyan are encouraged in the industry precinct at Mourilyan and in particular at the Mourilyan Harbour locality.
Douglas	Besides the Captain Cook highway which links to Cairns, significant freight roads in the Shire include: <ul style="list-style-type: none"> • The Mossman-Mount Molloy Road providing direct access to the Tablelands • The Mossman-Daintree Road providing the main route north of Mossman to the Daintree River and Village • Bailey Creek and Cape Tribulation Roads, north of the Daintree River
Hinchinbrook	In addition to sugar and grazing, there is potential for a range of alternative crops and boutique rural industries. Cane growers in the region produce up to five million tonnes of cane annually valued at \$243m (12.1% of Australia's sugar cane). The efficiency of the harvesting, milling and export process is an economic strength. This industry is supported by other local exports including cattle, fish, pork, geo-spatial services and manufactured food goods.
Mareeba	Mareeba is identified as providing a strategic alternative and secure location to limited supplies of industrial land in Cairns, and potentially expands as a base for increased agricultural, cattle and mining activities, and for servicing Gulf Savannah and Cape York communities. Mareeba Industrial Park is strategically located to allow access to the Mulligan and Kennedy Highways. Chillagoe and Dimbulah are identified as rural activity centres within the Shire. Key enterprise and employment areas include Arriga Sugar Mill, Lotus Glen Correctional Facility and Springmount Waste facility. The shire recognises the need to progressively upgrade and maintain roads to a high standard to support a variety of uses.
Tablelands	Incorporates cropping lands, dairy and grazing lands, broad-hectare grazing properties. The town of Atherton is the major regional centre and the major industrial areas situated at Tolga and Ravenshoe provide the primary location for industrial development and particularly high impact industries in the Tablelands region. Malanda has the potential to accommodate additional industrial uses within urban expansion areas. Planned and identified future state roads in Atherton, Malanda and Yungaburra are protected from development which will prejudice or impede their future construction.

Gulf Savannah

Significant agricultural and mining industries in the sub-area include:

- Cattle industry, including live export to Asian markets from Kurumba.
- Mining and resource areas located in the Etheridge, Croydon and Carpentaria Shires.

- the Flinders Gilbert agricultural zone - the Flinders and Gilbert Rivers - allows produce (particularly mangoes) to be delivered to national and international markets with easy access to ports and international airports via Townsville, Darwin, Cairns and Brisbane.

Table 2-4 outlines the key heavy vehicle network prioritisation considerations for each Council where relevant.

Table 2-4 Key heavy vehicle network prioritisation considerations for the Gulf Savannah sub-area

Council	Consideration
Etheridge	<p>The rural areas of the Shire will provide for and accommodate a range of agricultural uses including dry cropping and cattle grazing. A cotton gin is under consideration, with trial evaluation by CSIRO³⁷.</p> <p>Dry land cropping currently exceeds 20,000 hectares in the Gilbert River Catchment. On top of this, the Gilbert River Irrigation Project will facilitate the development of over 28,000 ha³⁸.</p> <p>Local government areas are providing for compatible tourism activities.</p> <p>Major transport corridors will be protected by ensuring that land uses sensitive to noise, dust and/or fuel combustion emissions are suitably located away from the corridors.</p>
Croydon	<p>Cattle grazing is a major employer and pastoral leases make up a large portion of Croydon Shire's land area. Gulf Development Road (part of National Highway 1 and the Savannah Way) links Croydon Shire to other regional centres. The road is sealed, though a few small sections in adjoining shires remain one lane, and need upgrading. To improve the safety and accessibility of this road for all users Council desires that the entire road be upgraded to two lanes (one each direction).</p> <p>To support Croydon's grazing industry, the planning scheme identifies that it is important that not just the main road but other roads within the Shire are accessible. Richmond-Croydon Road is a major cattle corridor and is being progressively sealed. Council seeks to improve the length of time Shire roads can remain open. Roads that remain operational and accessible in all weather conditions ensure access in emergencies, prevents isolation on rural properties, and allows communities and businesses to continue functioning uninterrupted year-round. New developments should consider impacts on, and provide safe access to, both local and state road networks.</p>
Carpentaria	<p>Normanton and Karumba will continue to provide a focus for business, community activities and infrastructure provision within the Shire. A desired outcome is to maximise the economic base of the Shire by increasing Tourism, Business, Commercial, Industrial and Agricultural potential. This will be done, in part, by protecting extractive and mining resource areas, associated haul routes and major transport corridors from incompatible land use and establishing a co-ordinated approach linking the provision of infrastructure, land use and economic development.</p>

Cape York

Significant agricultural industries in the region include:

- The Lakeland Downs area, 250 km north of Cairns, supports small-scale horticulture and broad acre development.
- A strong cattle industry exists through the Cape. An abattoir is located at Weipa and some production is exported to Asian markets.

³⁷ <https://publications.csiro.au/rpr/download?pid=csiro:EP143218&dsid=DS4>

³⁸ https://www.fnqroc.qld.gov.au/files/media/original/004/9f4/03b/3e7/FNQROC-Federal-Priorities_November-2019.pdf

- mining and resource areas are in the Cook Shire, with mines located throughout Cape York, most notably:
- Rio Tinto Alcan's bauxite mining at Weipa
- Cape Flattery silica mines
- Metro Mining's Bauxite Hills operations, approximately 95 kilometres (km) north of Weipa

Table 2-5 outlines the key heavy vehicle network prioritisation considerations for each Council (where relevant).

Table 2-5 Key heavy vehicle network prioritisation considerations for the Cape York sub-area

Council	Consideration
Cook	<p>Recognises that investment and development present opportunities for the community to increase self-sufficiency, create regional and local collaboration to improve services, improve food supply (and food security), infrastructure, arts and culture and natural resource management. The planning scheme seeks to protect agricultural land around Lakeland from fragmentation and alienation and protect sources of extractive materials such as gravel pits and quarries.</p> <p>Major industries and social and physical infrastructure and energy projects (such as liquid fuels, solar and wind) will be supported where there are demonstrated economic benefits to the local community, local employment opportunities and impacts on cultural, rural and environmental values are managed in line with community expectation.</p>
Hope Vale	<p>Identify that opportunities are emerging for the community to benefit from mining, plantations and agriculture; and a small but sustainable tourism industry.</p> <p>Opportunities for significant investment include agriculture, forestry, tourism and retail. Development proposals however should not damage the economic viability and future sustainable development of the natural and cultural resources of the Shire.</p>
Wujal Wujal	<p>Leverage off opportunities emerging across Cape York in developing micro, small and medium enterprises. Maintain focus on tourism opportunities and improved community facilities.</p>

3. Freight generation

Road freight generation, along with passenger trips, are a factor of derived demand. Transport provides direct benefits through connecting distinct activities e.g. connecting consumer demand for the goods and services from their source of production. Indirect demand is generated through supplying resources to undertake the direct demand freight movements e.g. supplying fuel by road tanker to a production centre to enable its products to be carried to market.

There are two broad categories of freight generation:

- **Population**– the location and quantum of population impacts the transport of consumer staples and general household goods
- **Economic activity** – the demand for physical inputs to production and end-user commodities for domestic and international markets.

3.1 Population growth and implications for freight generation

The Queensland Government Statistician's Office³⁹ produces Local Government population forecasts based on trends and assumptions around fertility, mortality and migration. Because of the uncertainty of these components, three projection series (low, medium and high) are produced to illustrate a range of possible growth scenarios. The analysis presented in this section is based on the medium projection scenario.

The analysis year 2016 provides actual observations as the starting point for forecasts to 2041, which are illustrated in Figure 3-1.

Figure 3-1 Population 2016

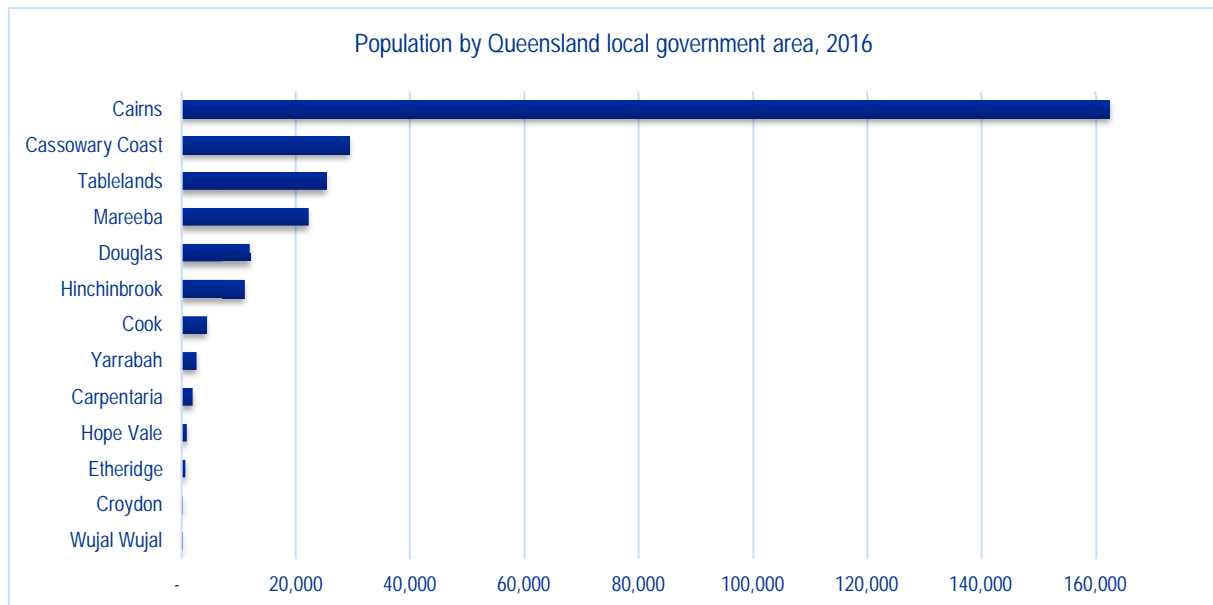


Figure 3-2 and Table 3-1 illustrate that the annual change to 2041 varies substantially across FNQROC. Cairns understandably has the highest overall growth and percentage increase, with Hinchinbrook incurring the largest decrease. Further illustrations are presented in Figure 3-3 to Figure 3-6.

³⁹ <http://www.qgso.qld.gov.au/subjects/demography/population-projections/tables/proj-pop-lga-qld/index.php>

Figure 3-2 Average annual population change

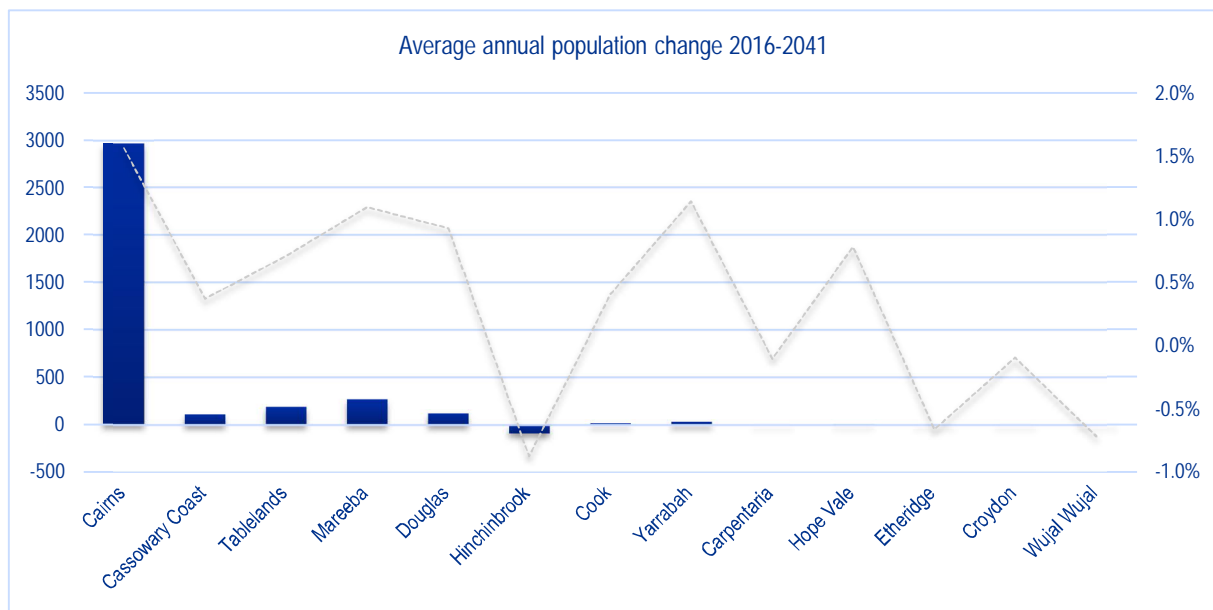


Table 3-1 Average annual population change

Council	Annual change	% annual change
Cairns	2966	1.6%
Cassowary Coast	112	0.4%
Tablelands	193	0.7%
Mareeba	271	1.1%
Douglas	122	0.9%
Hinchinbrook	-88	-0.9%
Cook	19	0.4%
Yarrabah	34	1.1%
Carpentaria	-2	-0.1%
Hope Vale	8	0.8%
Etheridge	-5	-0.7%
Croydon	0	-0.1%
Wujal Wujal	-2	-0.7%

Figure 3-3 Cairns population forecasts

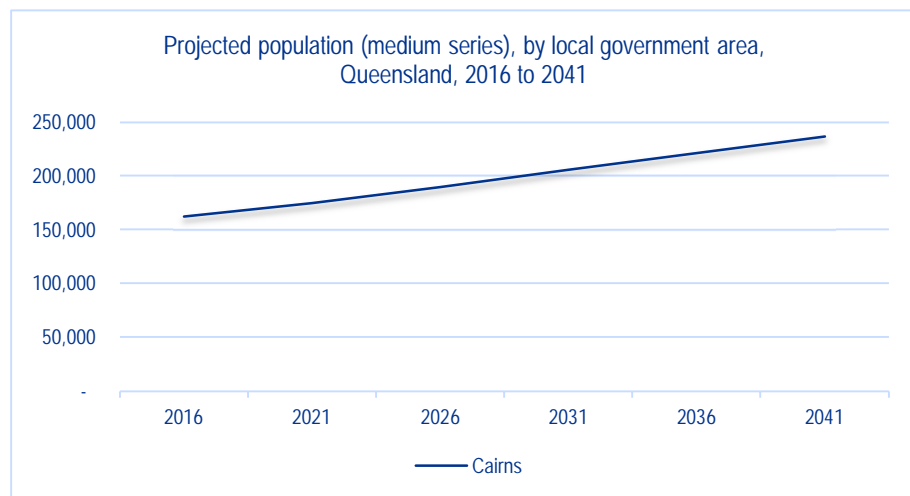


Figure 3-5 Hinchinbrook, Cook, Yarrabah, Carpentaria population forecasts

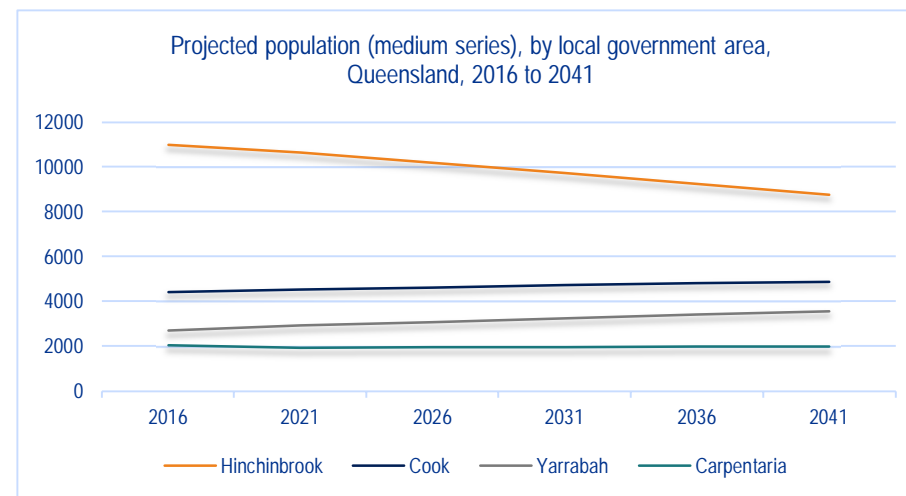


Figure 3-4 Cassowary Coast, Tablelands, Mareeba, Douglas population forecasts

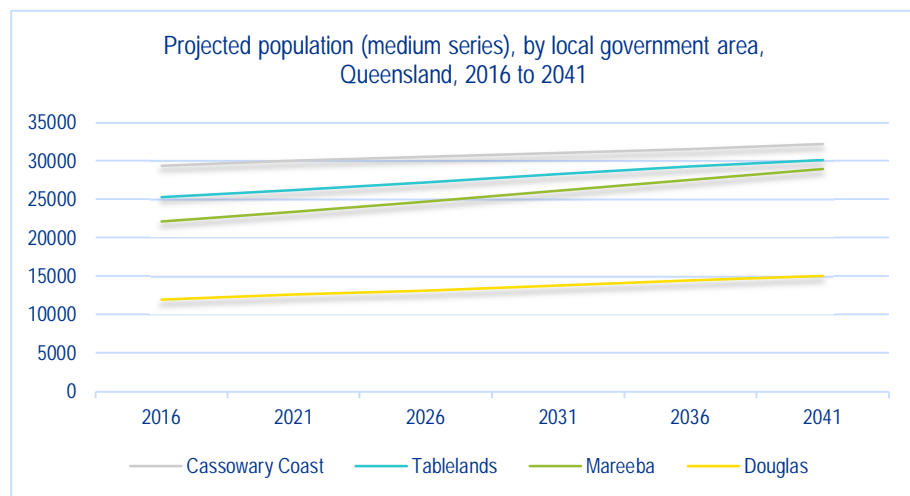
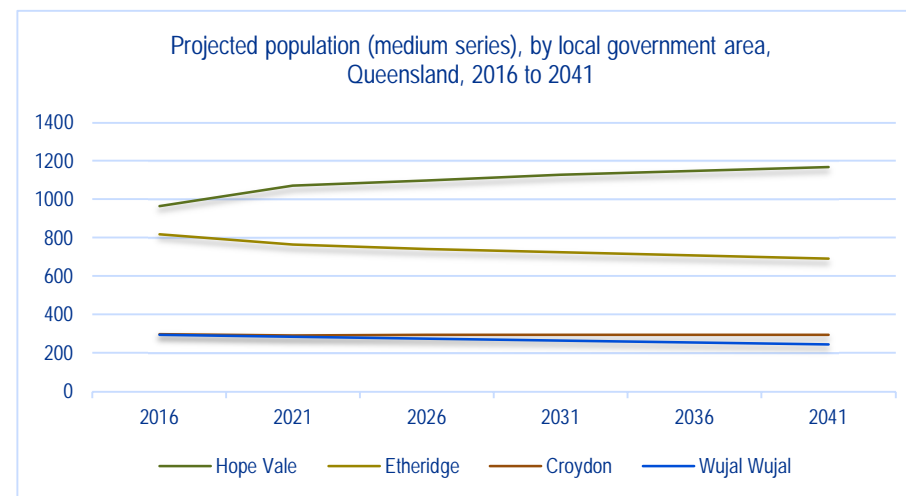


Figure 3-6 Hope Vale, Etheridge, Croydon, Wujal Wujal population forecasts



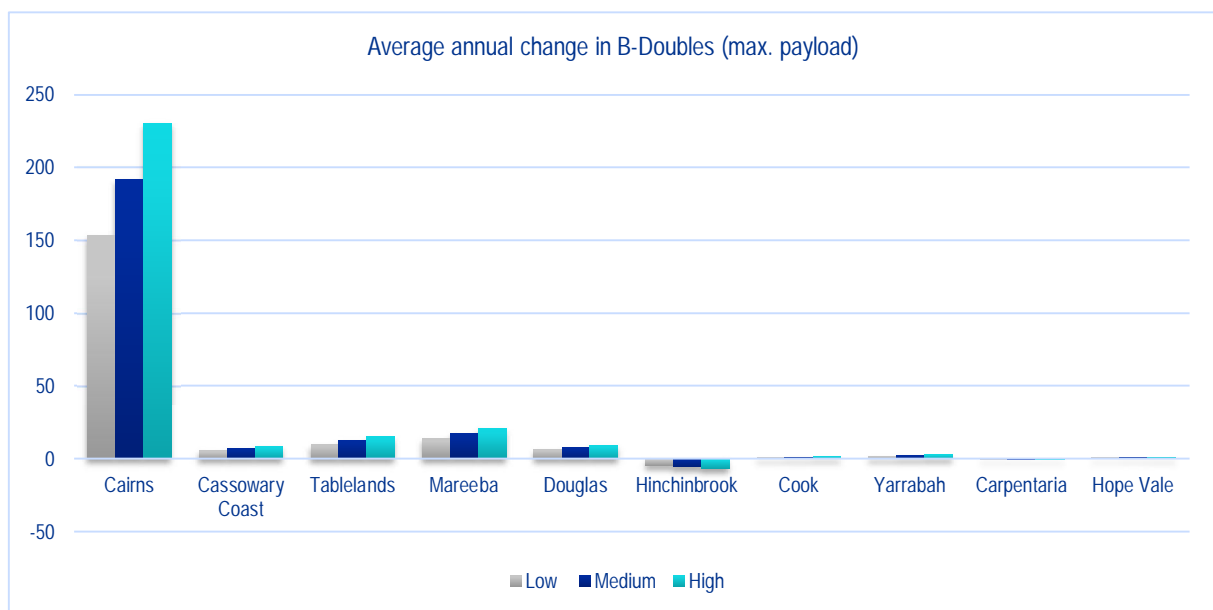
Population implications for freight movements

Forthcoming data from the Bureau of Infrastructure, Transport and Regional Economics (BITRE)⁴⁰ suggests that around 163 tonnes of freight for every person is moved annually across Australia. This is more representative of Australia's total freight task that also considers bulk movements across various transport modes. From a personal consumption perspective, Melbourne requires approximately 15,000 tonnes of food to be delivered every day. This equates to around 1.1 tonnes of food per person per year.

A separate 2009 study by Jacobs of general freight in regional Victoria suggests an annual relationship of 1.2 tonnes of freight per person annually. The value was based on limited data on inwards household consumables (including food), exclusion of waste volumes, and a downturn in the building construction industry at the time. The value is therefore likely understated.

Figure 3-7 illustrates the potential impact on annual B-double movements with the change in population projections. Scenarios are presented to gauge the potential freight required per person in addition to food, and cover consumption of personal and household goods e.g. food, clothing, kitchenware, cleaning supplies and furniture. The low scenario assumes 2 tonne per person, medium is 2.5 tonnes per person and high is 3 tonnes per person. The results show a minor change in B-double movements over a year. The largest impact is the high growth scenario for Cairns, which equates to 4.5 additional B-double per week.

Figure 3-7 Annual change in B-double scenarios



The results suggest that the current need for population-driven investment across FNQROC is minimal from a freight perspective. While these freight movements are more prevalent along the coast, road network capacity constraints will result from passenger vehicle demand rather than heavy vehicles.

Greater population-based freight demand will accompany the continuing development of Far North Queensland. The Northern Australia Infrastructure Audit⁴¹ assessed population growth accompanying economic activity and investment scenarios. The scenarios are applied to a Baseline forecast, which is broadly a continuation of current trends. This is similar to the Queensland Government Statistician's business-as-usual approach which is reflected in Figure 3-7.

The change-to-Baseline scenarios are:

⁴⁰ <https://www.freightaustralia.gov.au/sites/default/files/documents/national-freight-and-supply-chain-strategy.pdf>

⁴¹ https://www.infrastructureaustralia.gov.au/sites/default/files/2019-06/ia_northern_australia_audit.pdf

- Aspirational economic growth beyond the Baseline against industry opportunities outlined in the 2030 Vision
 - Increasing the real value of Northern Australia's real agricultural output to \$14,906 million by 2031, which helps double Northern Australia's contribution to Australia's agricultural output to 24.4 per cent
 - Increasing international visitor stopovers to 2.8 million per annum by 2031
 - Increasing energy exports from Northern Australia to \$150 billion by 2031 with all publicly announced energy projects, projects in feasibility stage and committed projects proceeding to completion.
- Medium economic growth beyond the Baseline against industry opportunities outlined in the 2030 Vision
 - Increasing the real value of Northern Australia's real agricultural output to \$7,452 million in 2031 (double the 2011 level)
 - Increasing international visitor stopovers to 2.0 million per annum by 2031
 - Increasing energy exports from Northern Australia to \$150 billion by 2031 with a weighted probability that publicly announced energy projects, projects in feasibility stage and committed projects proceeding to completion (based on their capital expenditure value and progress to date). Northern population shift in Queensland and Western Australia
- Northern population shift beyond the Baseline in Queensland and Western Australia
 - The target in the Queensland Plan of doubling the Queensland population outside of South East Queensland by 2044 (approximately 1.52 million people in Northern Queensland by 2031)
 - The Pilbara Cities vision of growing the population in the Pilbara region from 68,000 in 2011 to 140,000 by FY35 (approximately 126,000 by 2031).
- Lower population growth than the Baseline
 - Realise lower than Baseline population growth due to lower overseas migration and lower net internal migration to Northern Australia (the more volatile components of population growth)

The same tests of 2 tonne, 2.5 tonnes and 3 tonnes per person have been applied to each of the scenarios. Figure 3-8 to Figure 3-11 show how B-double movements for each scenario differs from the Baseline forecast i.e. current trends. The low growth scenario has a lower population than the Baseline, resulting in fewer B-double movements (than the Baseline).

Figure 3-8 Aspirational economic growth (change to Baseline)

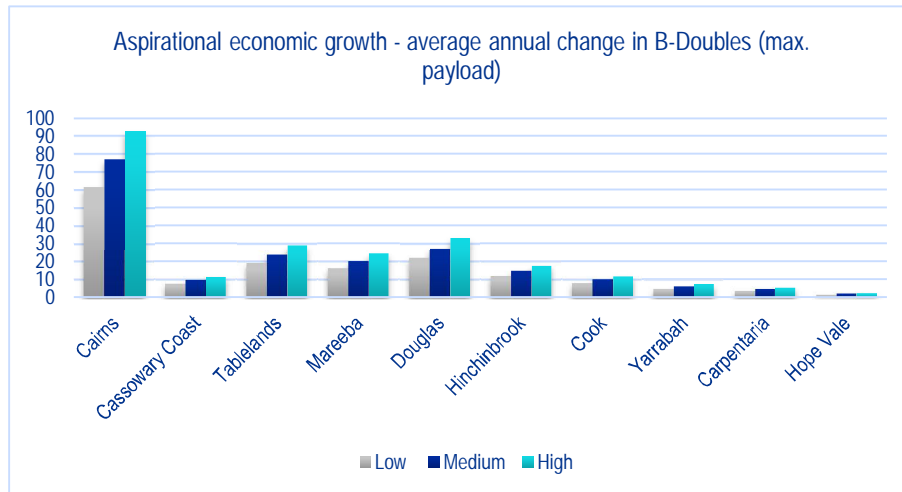


Figure 3-10 Population shift (change to Baseline)

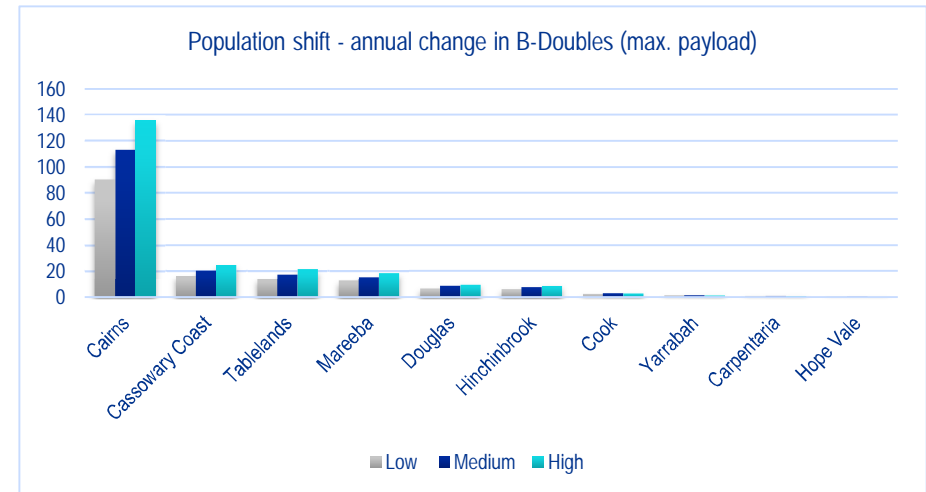


Figure 3-9 Medium economic growth (change to Baseline)

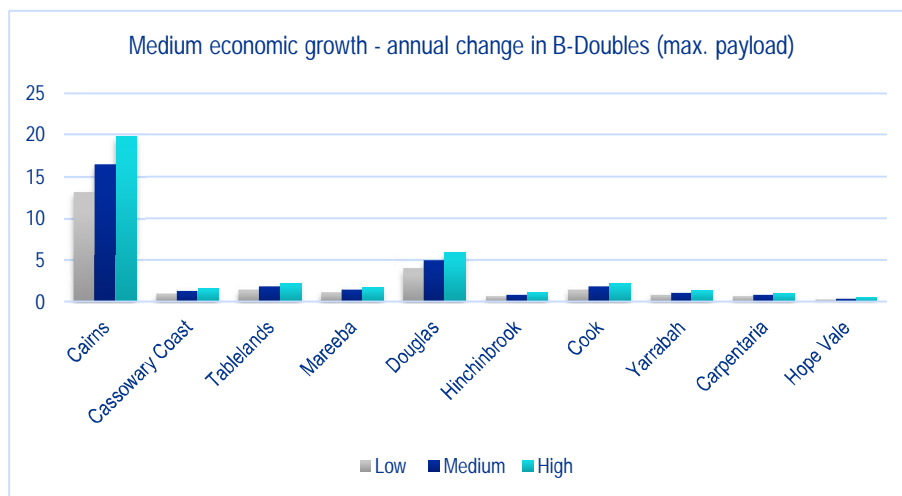
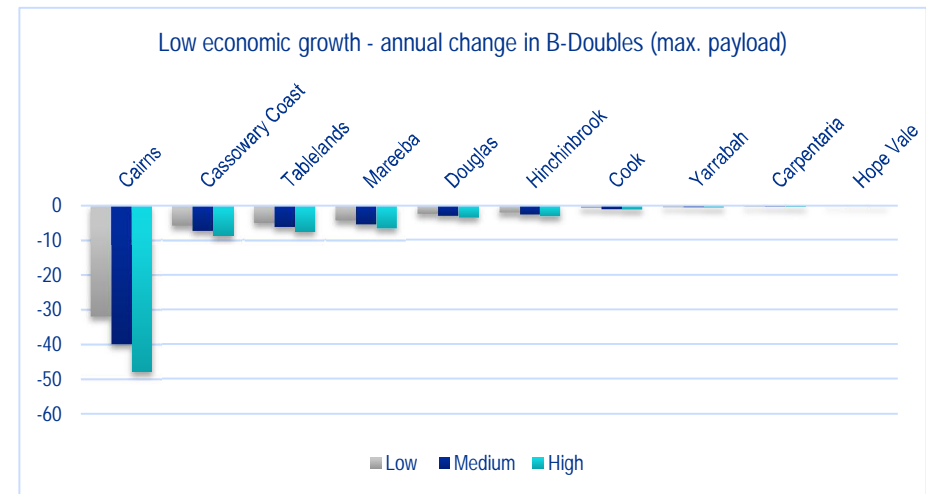


Figure 3-11 Low population growth (change to Baseline)



3.2 Economic activity

General economic activity is assessed through a range of economic indicators⁴². The indicators allow a comparison of geographies and relative importance of industries locally and across FNQROC as a whole. The indicators show those industries that underpin FNQROC's economic activity, and infer that freight routes that support these industries should be of the standard that matches the type of heavy vehicles using them.

The comparisons are presented for industries grouped at the 19-sector level as presented in Table 3-2. Further analysis is provided for industries suggested as freight-orientated rather than providing services. Freight-orientated industries mainly produce physical commodities that require transport to consumers, and some also require transport of inwards goods from suppliers.

Table 3-2 Industry sectors⁴³

Industry sectors	Freight orientated industries
Accommodation and Food Services	Accommodation and Food Services
Administrative and Support Services	
Agriculture, Forestry and Fishing	Agriculture, Forestry and Fishing
Arts and Recreation Services	
Construction	Construction
Education and Training	
Electricity, Gas, Water and Waste Services	
Financial and Insurance Services	
Health Care and Social Assistance	
Information Media and Telecommunications	
Manufacturing	Manufacturing
Mining	Mining
Other Services	
Professional, Scientific and Technical Services	
Public Administration and Safety	
Rental, Hiring and Real Estate Services	
Retail Trade	Retail Trade
Transport, Postal and Warehousing	Transport, Postal and Warehousing
Wholesale Trade	Wholesale Trade

The following sections discuss FNQROC as a whole, with analysis at the Council level provided in Appendix A.

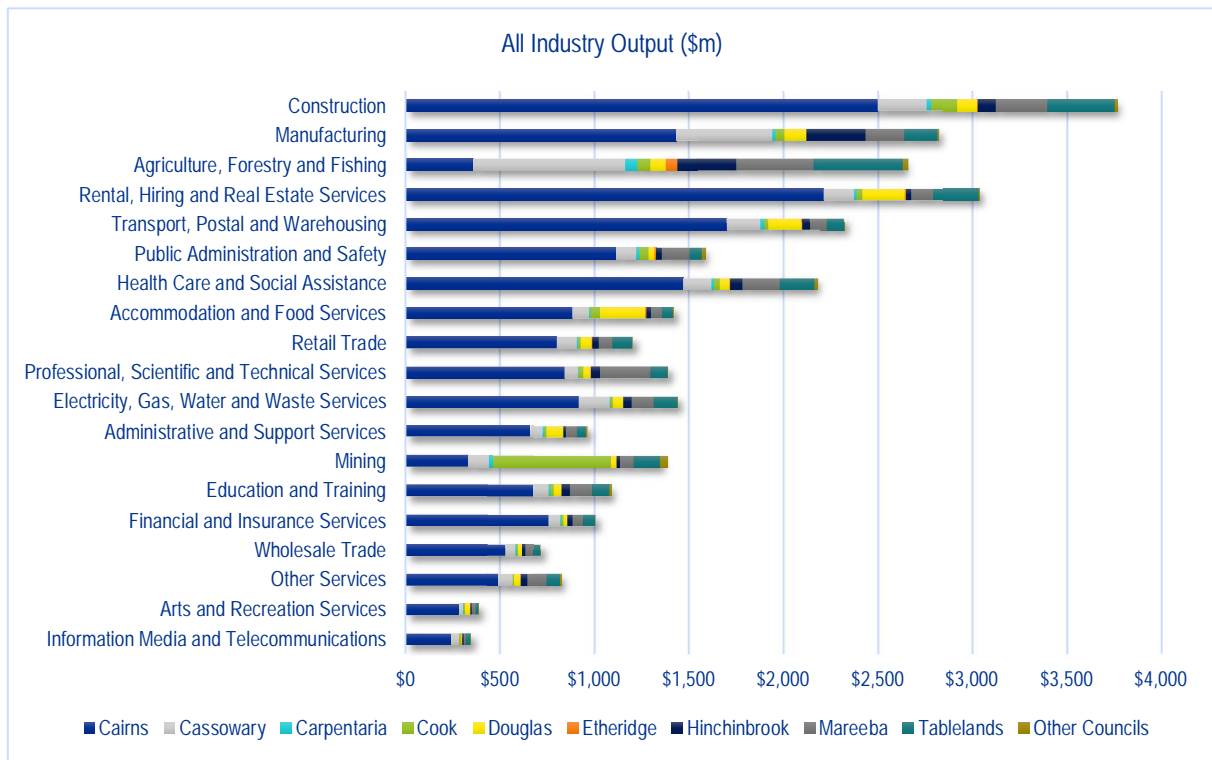
3.2.1 Output

Output is the gross sales of an industry, which includes the cost of inputs to that industry. Figure 3-12 shows the construction industry generates the highest output value across FNQROC.

⁴² <https://economy.id.com.au/fnqroc>

⁴³ Tourism is not specifically included within the National Accounts. The Australian Bureau of Statistics instead publishes the Tourism Satellite Accounts separate to the National Accounts.

Figure 3-12 All Industry Output (2018/19)



The larger councils within the FNQROC generate value from a wider range of industries than the smaller councils, which tend to be heavily reliant on one or two industries. For example, approximately 60% of Etheridge economic output is generated from agriculture, forestry and fishing and 50% of Cook total economic output is created by the mining industry.

Cairns' economy is the largest of the councils within FNQROC, producing over half of the total group's economic output. A significant portion of this value is from freight-reliant industries consisting of the construction, manufacturing and retail trade industries. The high proportion of output generated from rental, hiring and real estate services as well as transport, postal and warehousing is likely to reflect the high tourism demand in the area.

Cairns, Cassowary Coast, Mareeba and Tablelands generate around 90% of all industry output. The value of freight-orientated economic output from these regions is primarily produced by the agriculture, forestry and fishing industry, with construction and manufacturing also contributing significant value to each region's output.

Carpentaria, Cook, Douglas Etheridge and Hinchinbrook, produce a combined all-industry output of 10% to the FNQROC region. The agriculture, forestry and fisheries industries contribute the majority of output to these councils. The construction and manufacturing industries are also economically significant.

The remaining councils (Croydon, Hope Vale, Wujal Wujal and Yarrabah) have been calculated through subtracting the known council's data from the values for all of FNQROC. Noting these councils are geographically dispersed and of different population sizes, the most significant industries are construction, manufacturing, and agriculture/ forestry/ fishing.

Figure 3-13 Freight-Orientated Industry Output (2018/19)

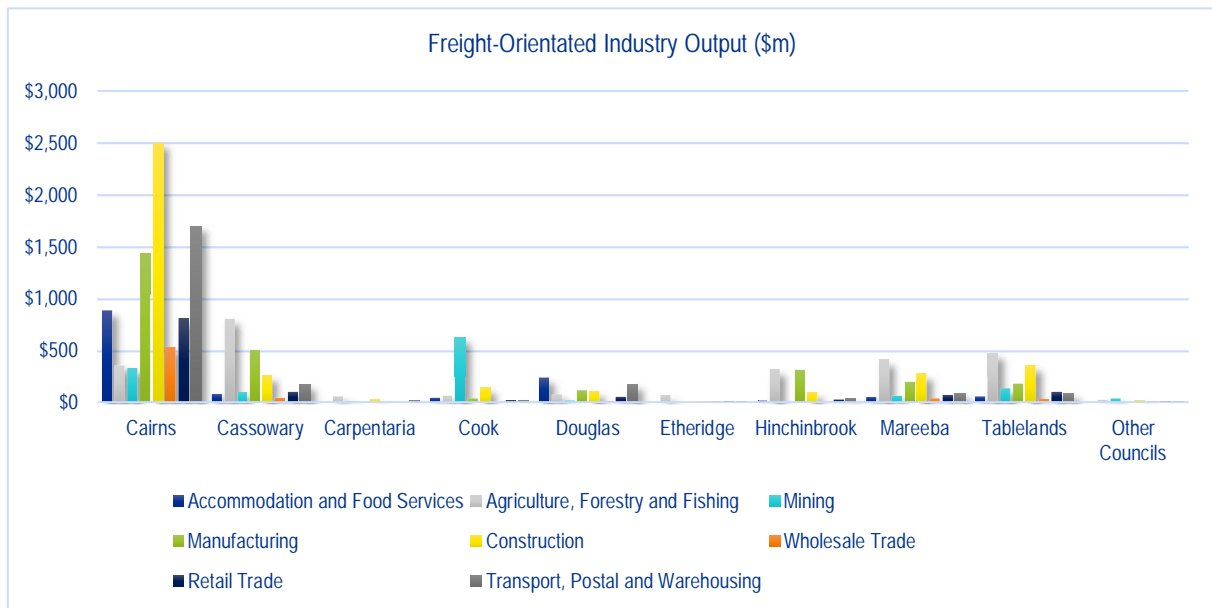
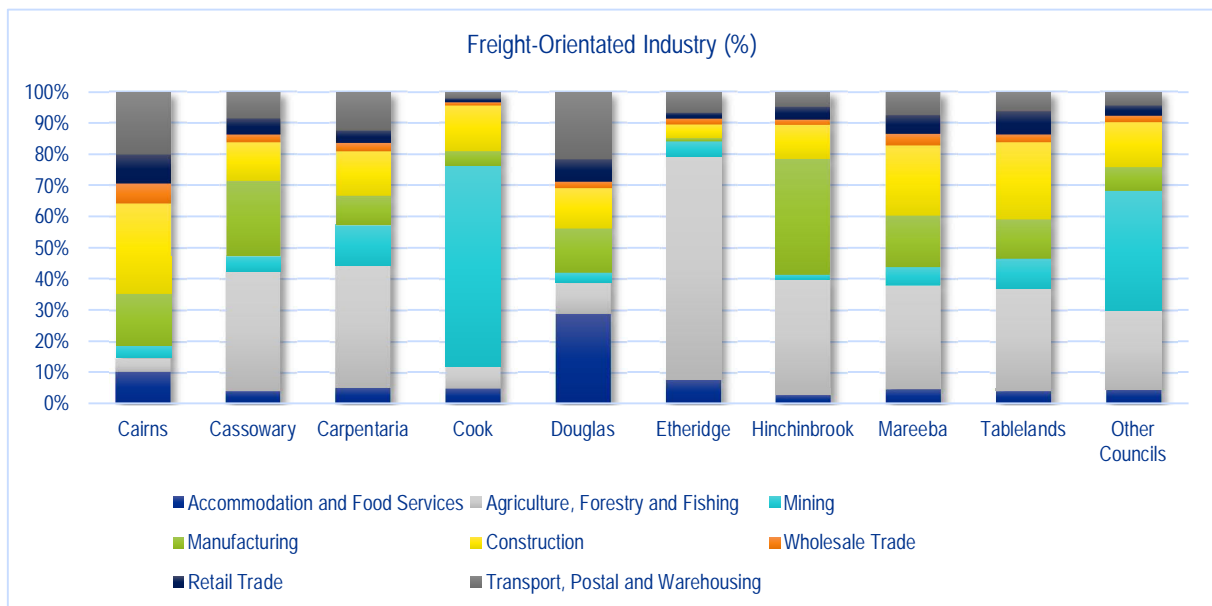


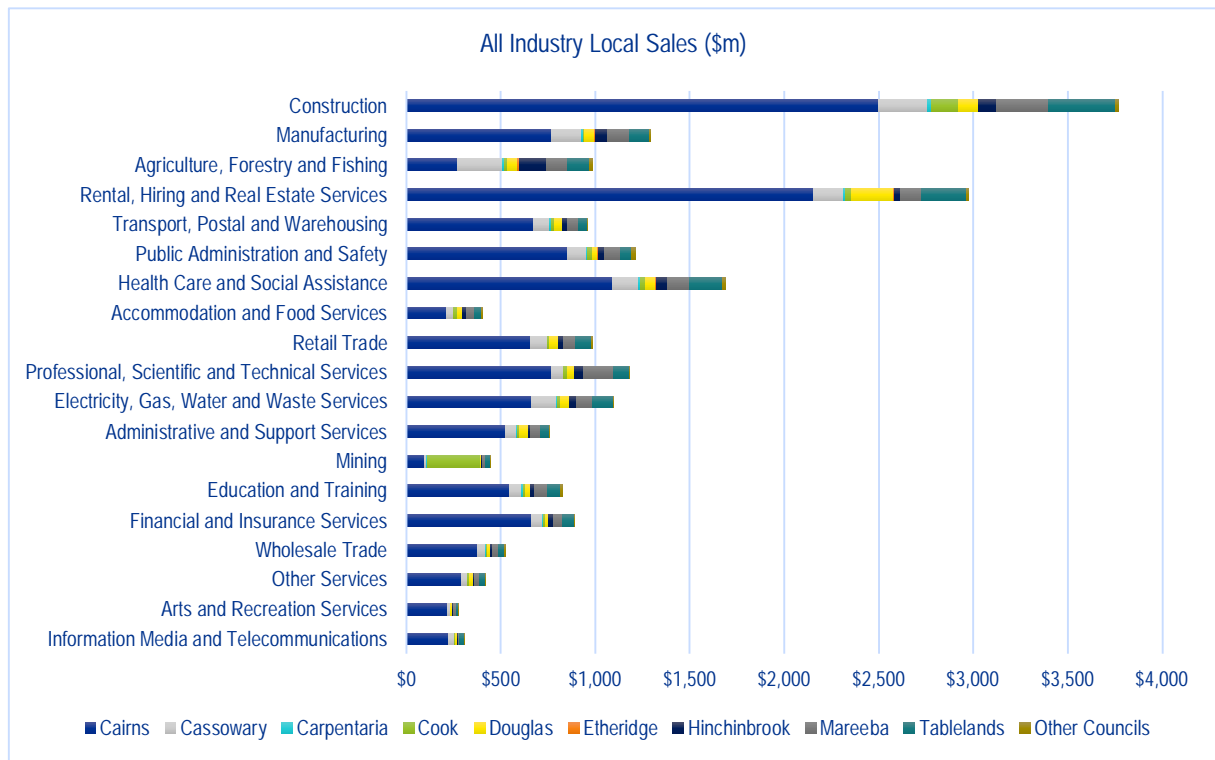
Figure 3-14 Freight-Orientated Industry Output proportions (2018/19)



3.2.2 Local Sales

Local sales include the gross economic output (sales) which are purchased by local consumers, businesses and government. It is equal to total output minus total exports. The construction industry contributes the largest value to local sales within FNQROC.

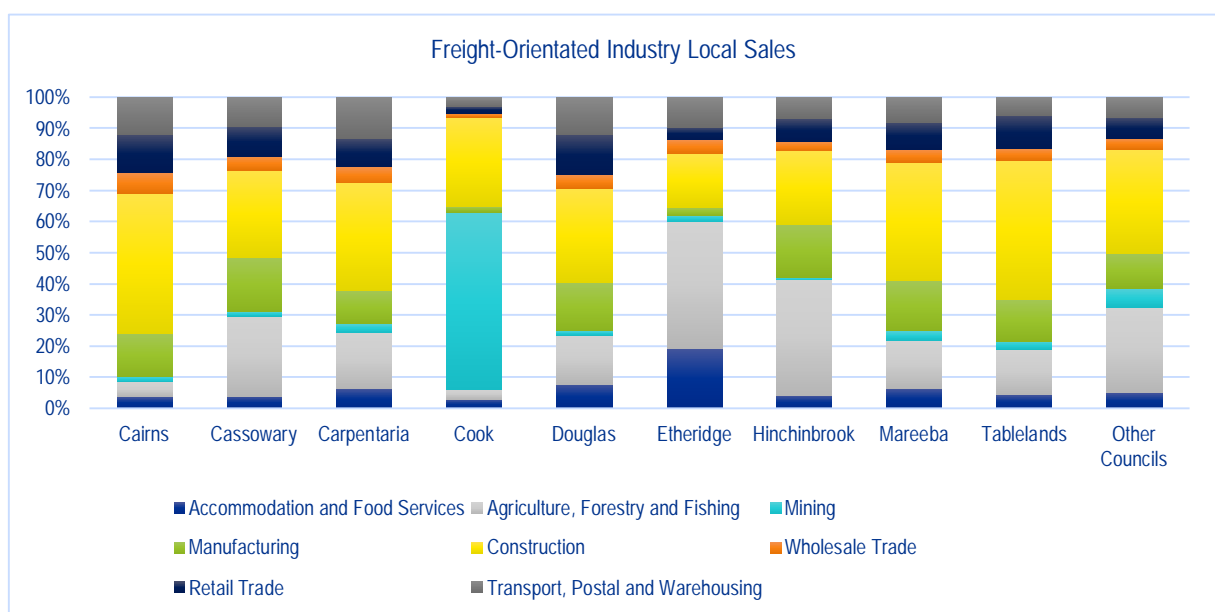
Figure 3-15 All Industry Local Sales (2018/19)



The freight-orientated industries which contribute the greatest value to local sales are the construction, agriculture, forestry and fishing and manufacturing industries, contributing around 65% of all local sales.

The high value of the construction's local sales is reflective of it also being the highest output industry.

Figure 3-16 Freight-Orientated Industry Local Sales (2018/19)



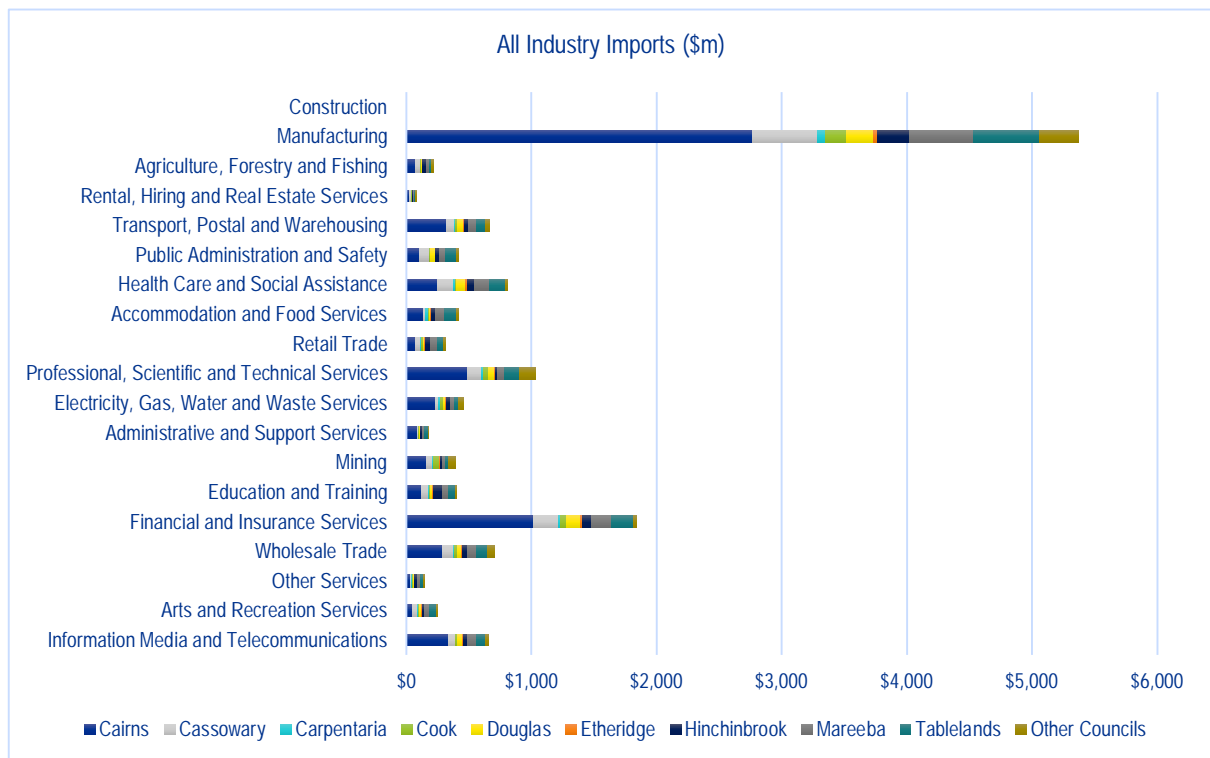
3.2.3 Imports and exports

Imports are purchases of goods and services from industries located outside FNQROC/Council boundaries for use in the production function of that industry. It is important to note that goods imported for direct on-sale are not included if they are not in some way transformed into a higher value product i.e. additional value has been added⁴⁴. While not included within imports, sale of these goods still generate economic output and employment.

Exports are sales of goods and services to non-resident households, businesses and other organisations outside the FNQROC/Council boundaries. These sales include both local value added and the value of inputs i.e. they are equivalent to total sales.

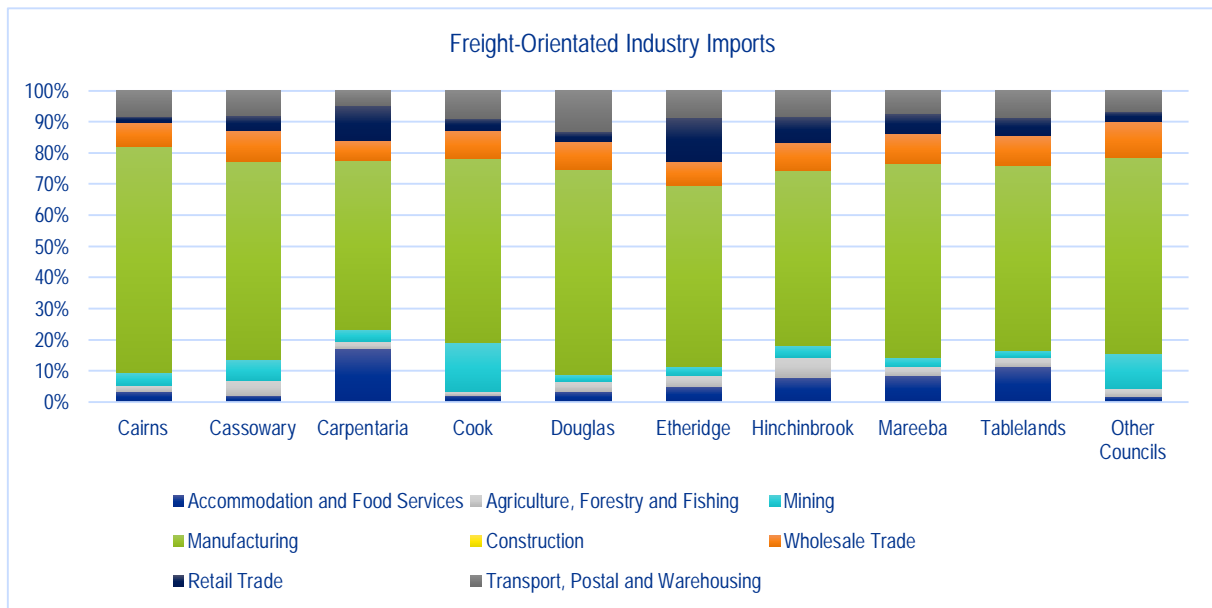
Import value within the manufacturing industry is significantly greater than any other industry. The subindustries within manufacturing that are most reliant on imported sales are machinery/equipment, transport equipment and food products.

Figure 3-17 All Industry Imports (2018/19)



⁴⁴ For example, retail trade is a service industry whose production is based on selling goods to consumers. The value of the goods themselves is not included in the imports total, only the value of goods and services used in providing this service e.g. an accounting service, inventory management software, shop furnishings (<https://economy.id.com.au/fnqroc/topic-notes/#domestic-imports-by-industry>)

Figure 3-18 Freight-Orientated Industry Imports (2018/19)



Around 20% of all export value across FNQROC is contributed by the agriculture industry, and manufacturing contributes 15%.

Figure 3-19 All Industry Exports (2018/19)

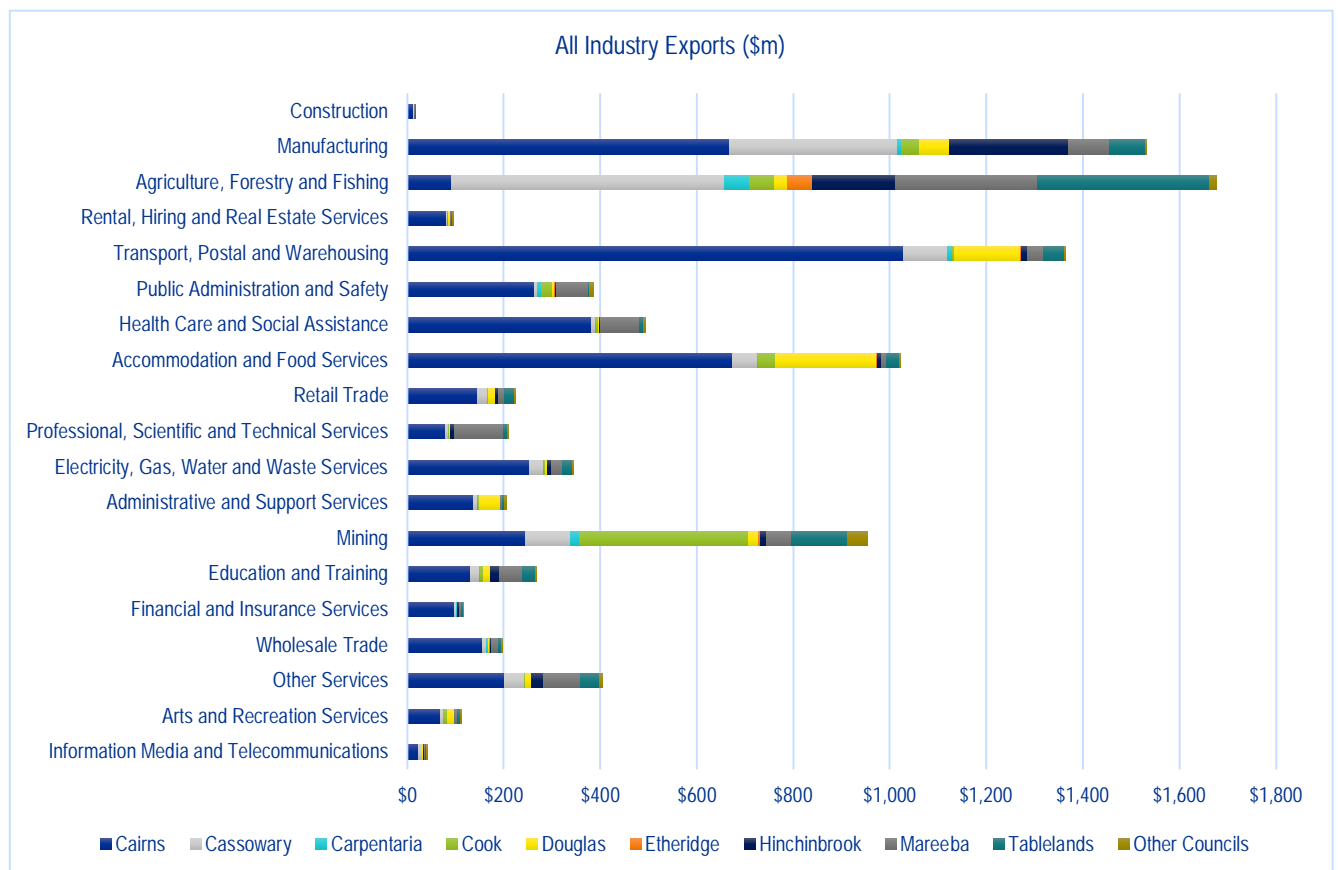
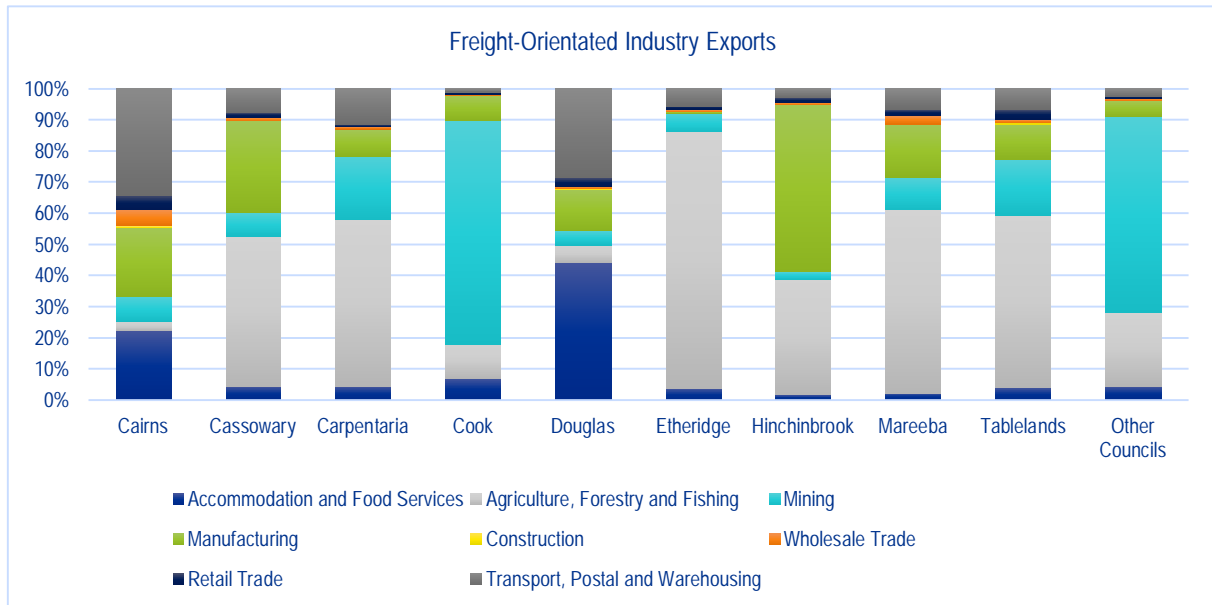
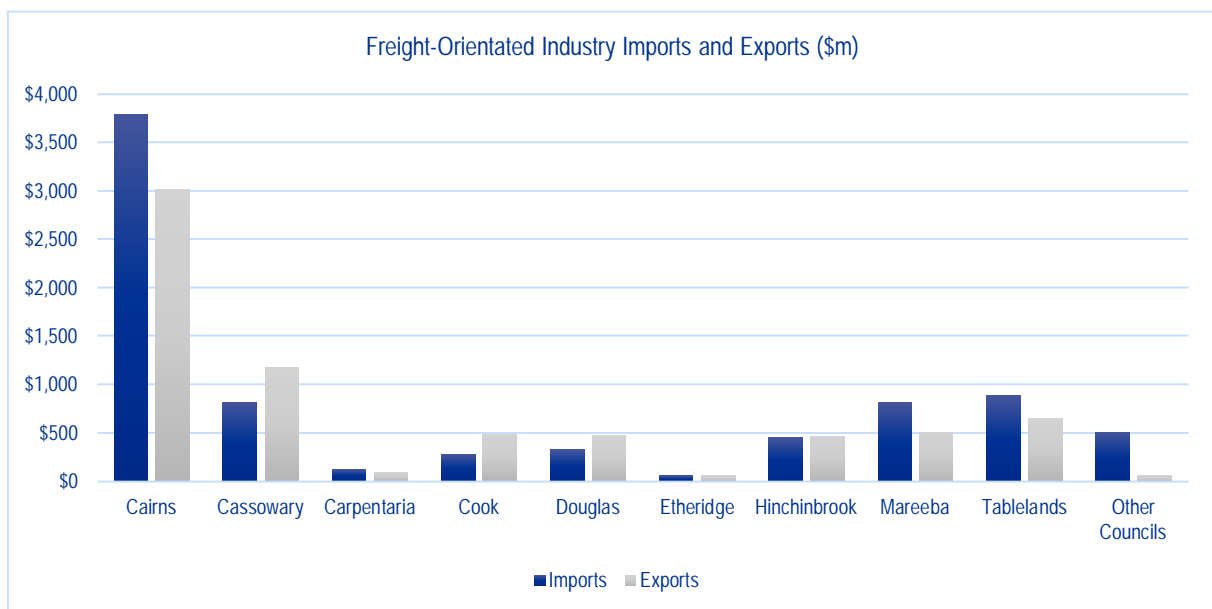


Figure 3-20 Freight-Orientated Industry Exports (2018/19)



Comparing imports and exports within the freight-orientated industries, the total value of imports is 16% greater than total exports from the area. Councils that export a greater value than imports are Cassowary Coast, Cook and Douglas.

Figure 3-21 Freight-Orientated Industry Imports and Exports (2018/19)



3.2.4 Employment

The employment estimates within an industry sector include full-time and part-time regardless of where they live. Health Care and Social Assistance is the largest employment industry within FNQROC. Within the freight-

orientated industries, retail trade is the largest employment industry at 20%. Accommodation and Food Services and Construction each have 19% of freight-orientated industry employment.

Figure 3-22 All Industry Employment (2018/19)

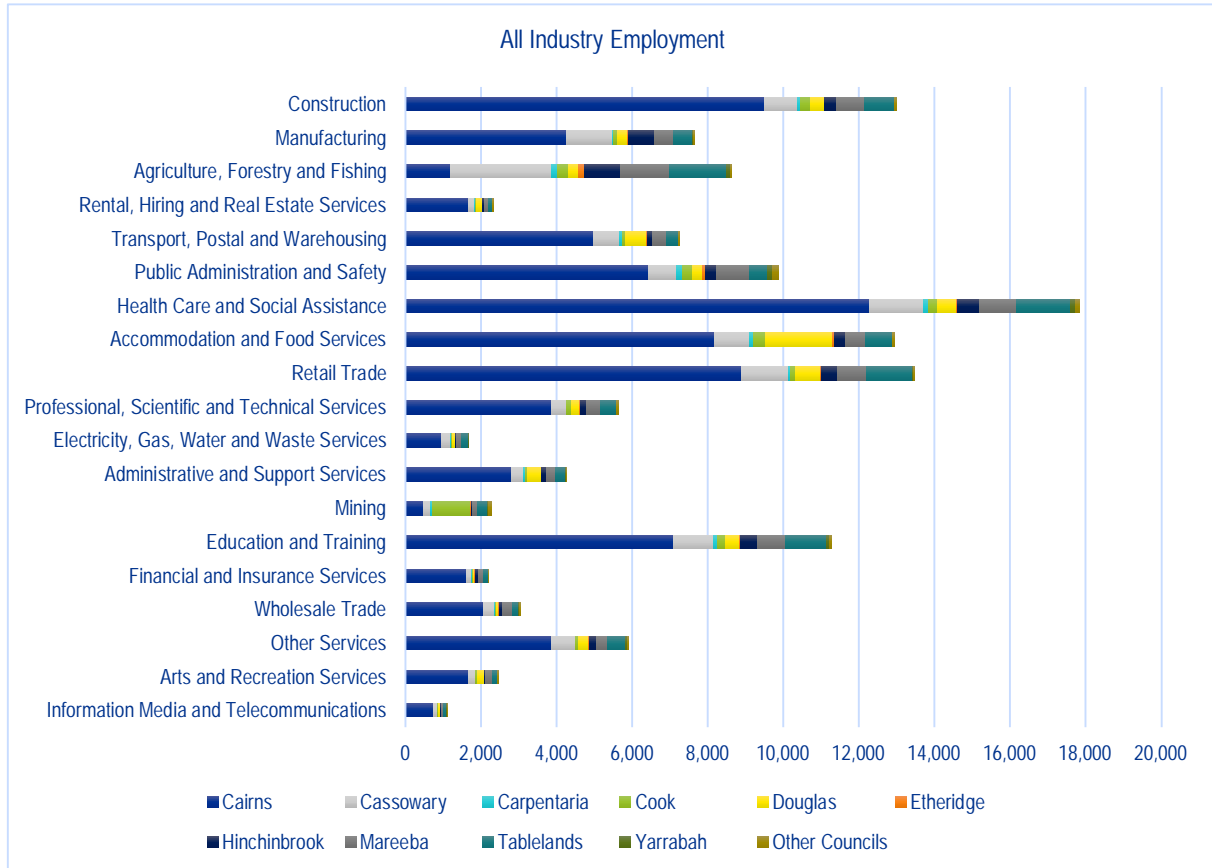
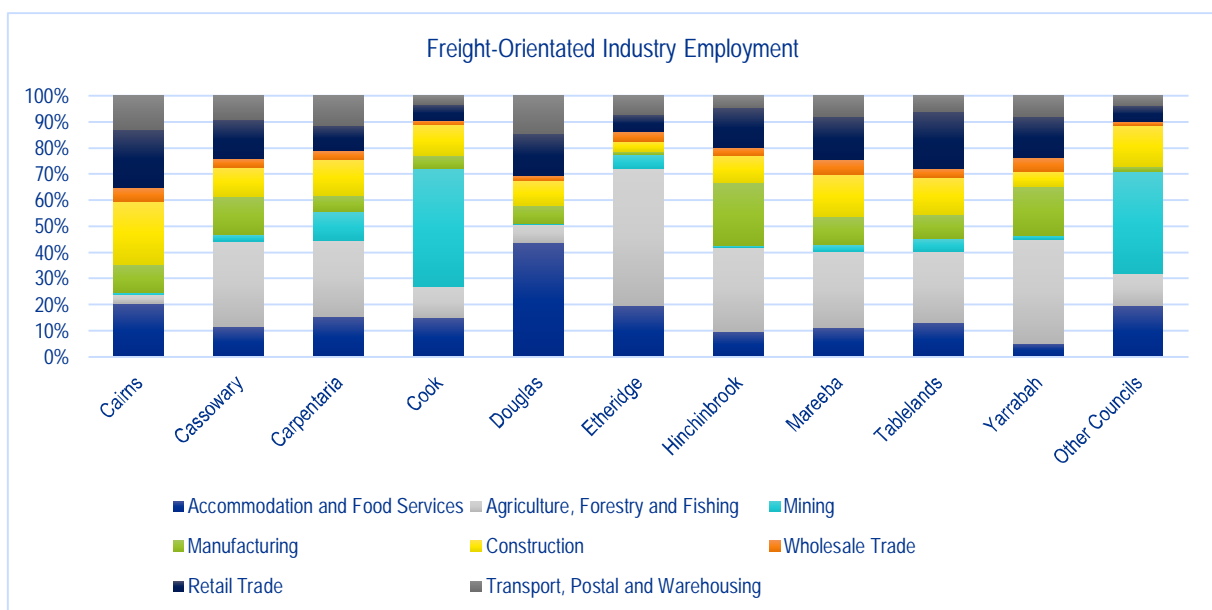


Figure 3-23 Freight-Orientated Industry Employment (2018/19)



4. Agriculture

Priorities for investment in agricultural freight routes requires a focus on both supporting and maintaining the competitiveness of significant existing industries, as well as supporting those industries with a favourable growth outlook. Because of the untapped market potential, Far North Queensland's priority export commodities are seafood, horticultural tree crops, vegetables and beef⁴⁵. The target markets for these products are China, Japan, Hong Kong, Singapore and Indonesia. While these high value commodities are exported by air, product freshness can be improved with efficient road freight.

Access to and from the Tablelands region has been identified as a notable barrier to exported high-value freight movements⁴⁶. The focus has traditionally been on gaining B-double access via the Kuranda Range, with current access ending at Speewah. Installation of decoupling pads at the top and bottom of the Kuranda Range has been suggested however the productivity gains are expected to be minimal. This is due to the time and operating costs incurred through decoupling to a single trailer, multiple trips between the pads and recoupling both trailers can outweigh any benefit. The mixing of HPVs with increasing tourist traffic is undesirable, particularly when combined with the high investment costs.

4.1 Current activity

FNQROC's key agricultural areas are within Tablelands, Cassowary Coast, Mareeba, Cairns, Hinchinbrook, and south-west Carpentaria. Emerging areas are within Etheridge around Gilbert River and Cook (Lakeland). The coastal areas contain an extensive network of national, state strategic and local roads. More remote areas are heavily reliant on the state regional network and Local Roads of Regional Significance (LLRS).

Presented in Appendix B, the Queensland Department of Agriculture and Fisheries has mapped the production locations of:

- current agriculture and processing locations as at 2013
- bananas as at 2018
- treecrops from 2015 to 2020
- potential locations of broadacre cropping, intensive livestock and sugarcane as at 2013

The Australian Bureau of Statistics (ABS) produces the value of agricultural commodities in 2018/19 for large geographies:

- States and territories
- Statistical Area 4 (SA4)
- Defined Natural Resource Management areas (NRM)

Economy.id presents ABS agricultural activity for most Local Government Areas (LGA) within FNQROC. The data is from 2015/16, being the latest year that the ABS has produced estimates at the LGA level. Lower level estimates from ABS since 2015/16 are restricted to SA4 and NRM. While the 2015/16 data provides estimates at the LGA level, the timeline difference means the Economy.id outputs are not directly comparable to the ABS 2018/19 data.

It is important to note that the 2015/16 local government estimates developed by the ABS have been collected at the Statistical Area 2 level (SA2), and then apportioned to LGA regions based on the proportion of SA2 area that overlays each LGA region. As an example, an LGA that crosses over multiple SA2 regions might be approximated by:

⁴⁵ Advance Cairns / KPMG 2019, Far North Queensland Agricultural Supply Chain Study

⁴⁶ Ibid

- 100% of SA2 region A
- 60% of SA2 region B
- 45% of SA2 region C
- 90% of SA2 region D

This approach can produce anomalies by estimating particular commodities that are not actually produced within an LGA. This unreliability is likely the reason why the ABS has restricted estimates to SA4/NRM since 2015/16. The LGA data is consequently considered indicative rather than absolute.

Noting the inconsistency between timelines and reliability of LGA estimates, the following sections present both FNQROC and NRM estimates. The NRM geographies provide more detail in Far North Queensland than SA4, better approximating activity within FNQROC.

4.1.1 FNQROC

Agriculture provides significant employment opportunities within in Far North Queensland. Nearly 35% of Etheridge's workforce rely on the agricultural, fishing and forestry industries. Cassowary Coast, Carpentaria and Hinchinbrook employment is also heavily reliant on agriculture and the freight routes that support it.

Table 4-1 Agricultural, Fishing and Forestry employment (2018/19)

Council	Percentage of total workforce
FNQROC	6%
Cairns	1%
Cassowary	20%
Carpentaria	16%
Cook	8%
Douglas	4%
Etheridge	34%
Hinchinbrook	19%
Mareeba	15%
Tablelands	15%
Yarrabah	12%
Other Councils	4%

Figure 4-1 presents the agricultural value across FNQROC and individual councils with Economy.id's latest data (2015/16). The highest value commodities are livestock slaughterings, other fruit and other broadacre crops. These commodities contribute over 92% of all agricultural value. Key points are

- 94% of livestock slaughterings are cattle/calves and 5% is poultry. Cattle/calves value is mainly generated in Carpentaria, Etheridge and Mareeba. Poultry is predominantly within Mareeba and Tablelands.
- Other fruit is dominated by bananas (74%), avocados (13%) and mangoes (9%). Cassowary Coast Banana value is predominantly generated in Cassowary Coast, while avocado and mango value is largely generated in Mareeba.
- Other broadacre crops is almost all sugarcane, with value mainly generated in Cassowary Coast and Hinchinbrook. Canola is the next highest commodity value generated largely in Mareeba, Cassowary Coast and Hinchinbrook.

Figure 4-1 Agriculture value (2015/16)

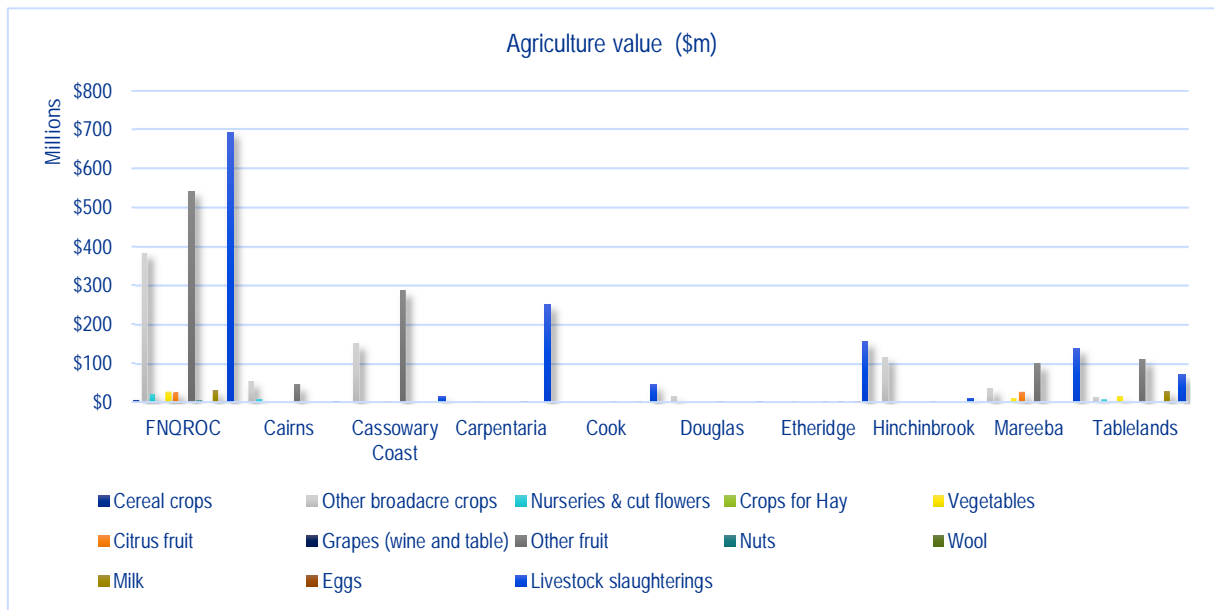


Figure 4-2 Livestock slaughtering (2015/16)



Figure 4-3 Other fruit (2015/16)

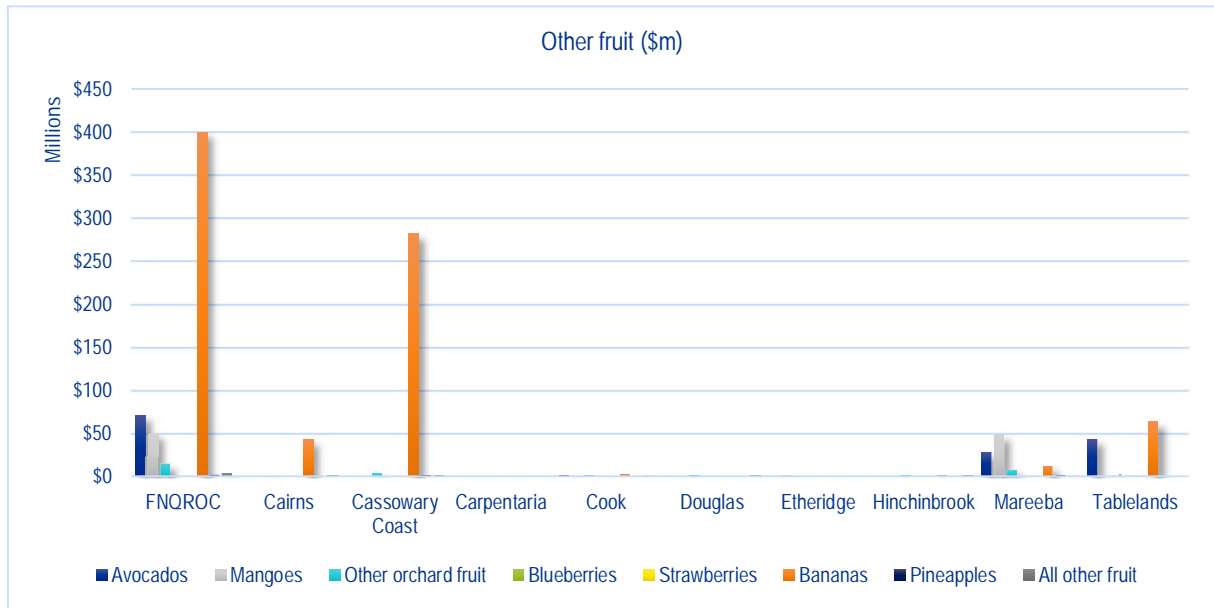


Figure 4-4 Sugarcane (2015/16)

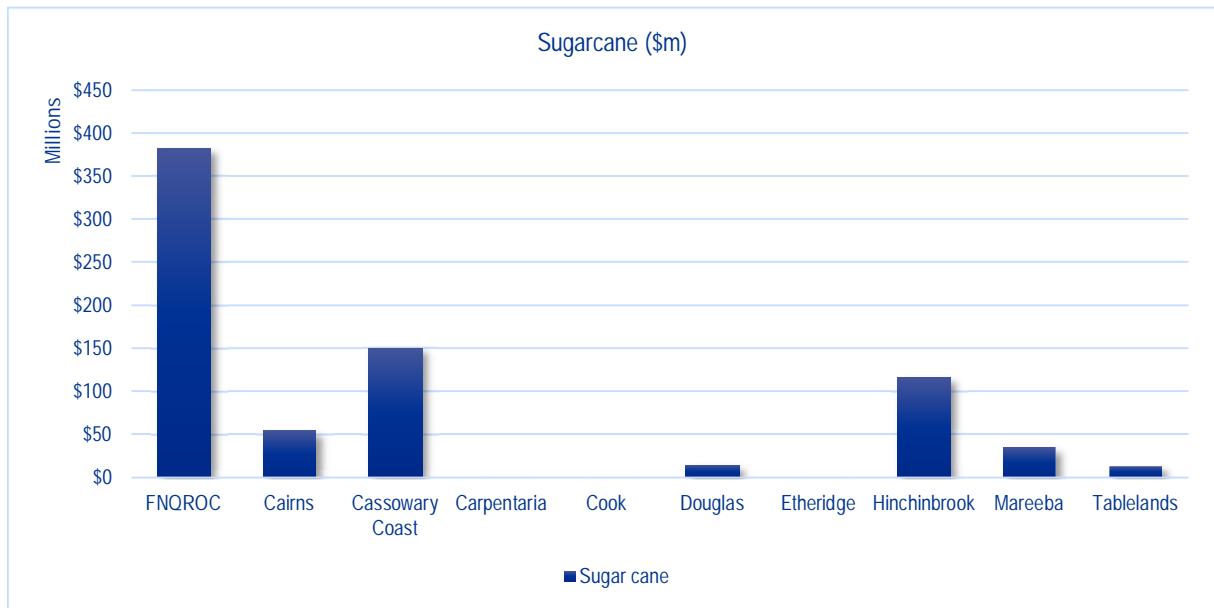
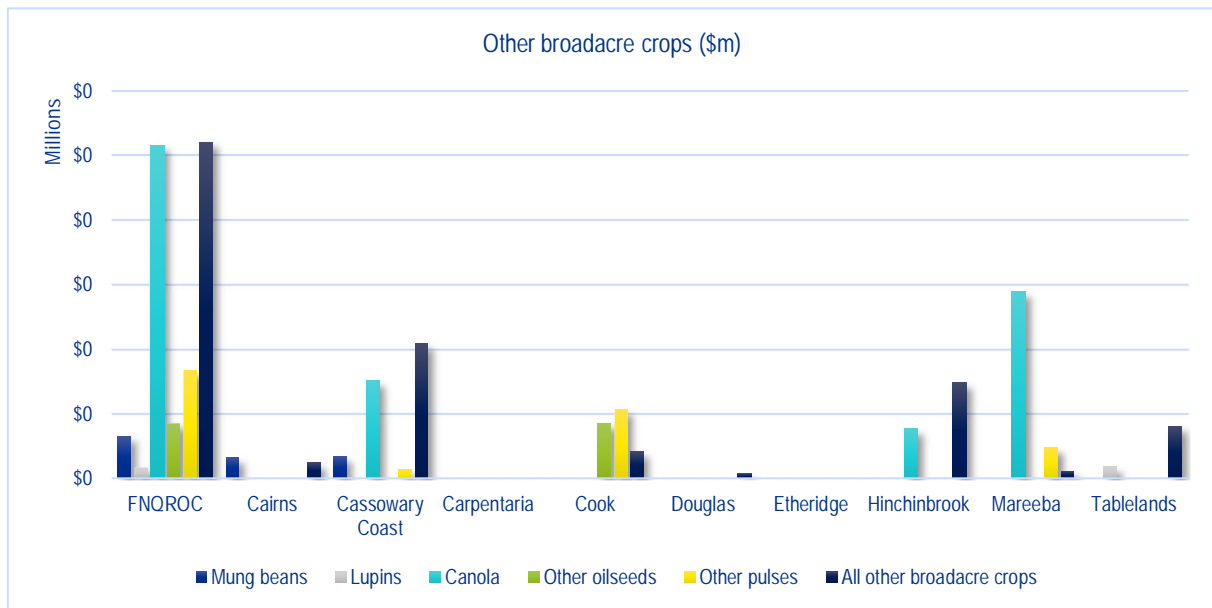


Figure 4-5 Other broadacre crops (2015/16)

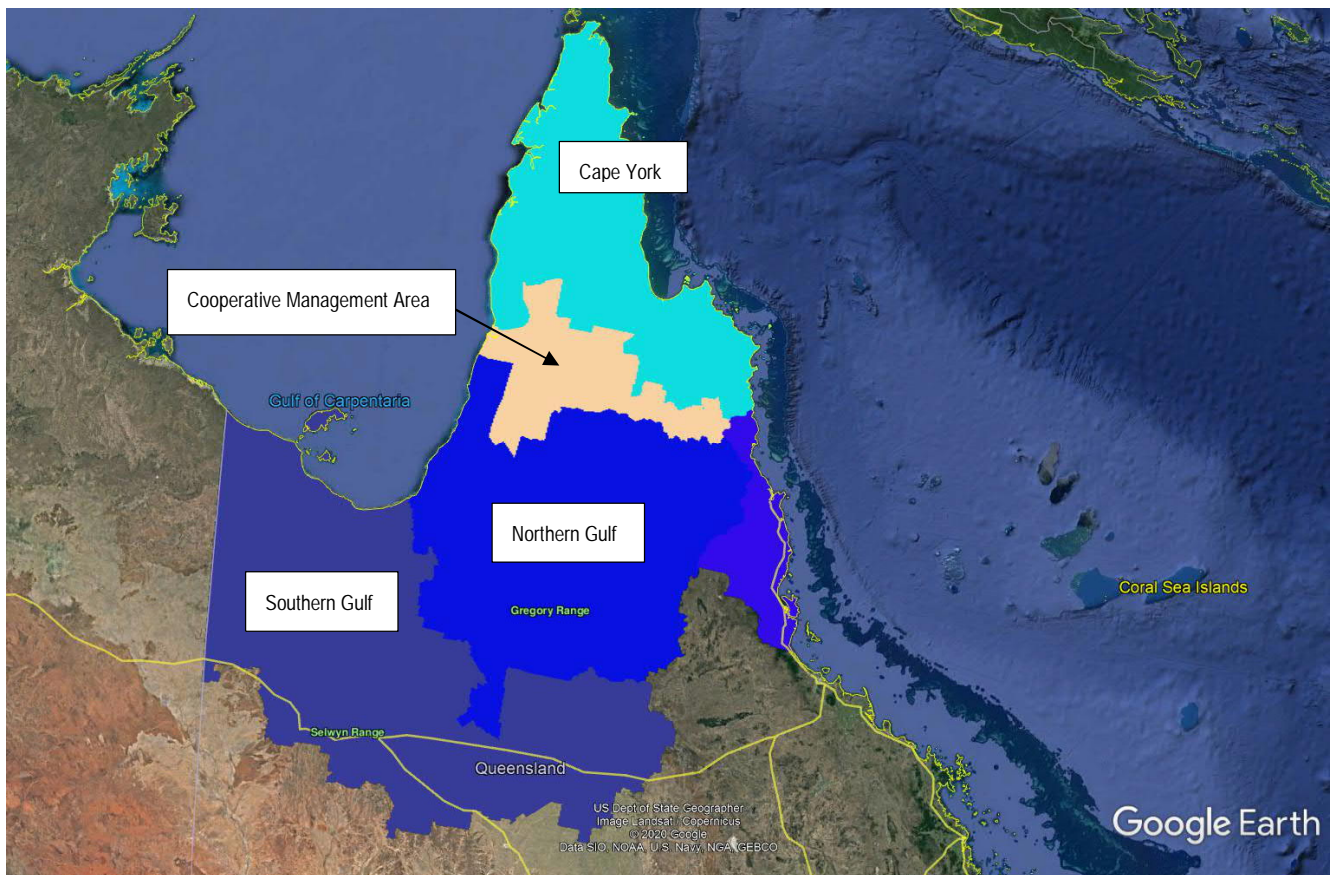


4.1.2 Natural Resource Management Areas

FNQROC contains wholly or partly contained the NRMs of Cape York NRM, Northern Gulf, Southern Gulf and Terrain. Data is provided for 2018/19.

The key commodities contributing to the total value of agricultural production in each NRM are presented in the following figures. The Cape York and Southern Gulf are dominated by cattle industry production. The Cape also produces broadacre crops such as sorghum and small-scale production of citrus fruits, avocados, melons and pumpkins. The Northern Gulf is also dominated by the cattle industry, however its boundaries also contain parts of the Mareeba Dimbulah Water Supply Scheme area and associated production of sugarcane, avocados, citrus and pumpkins. Mango production is also significant in the Northern Gulf.

Figure 4-6 NRM boundaries



The Terrain NRM is dominated by sugarcane and banana production, particularly in the coastal area south of Cairns. Avocados also contribute significantly.

Figure 4-7 Cape York NRM commodity production values (2018/19)

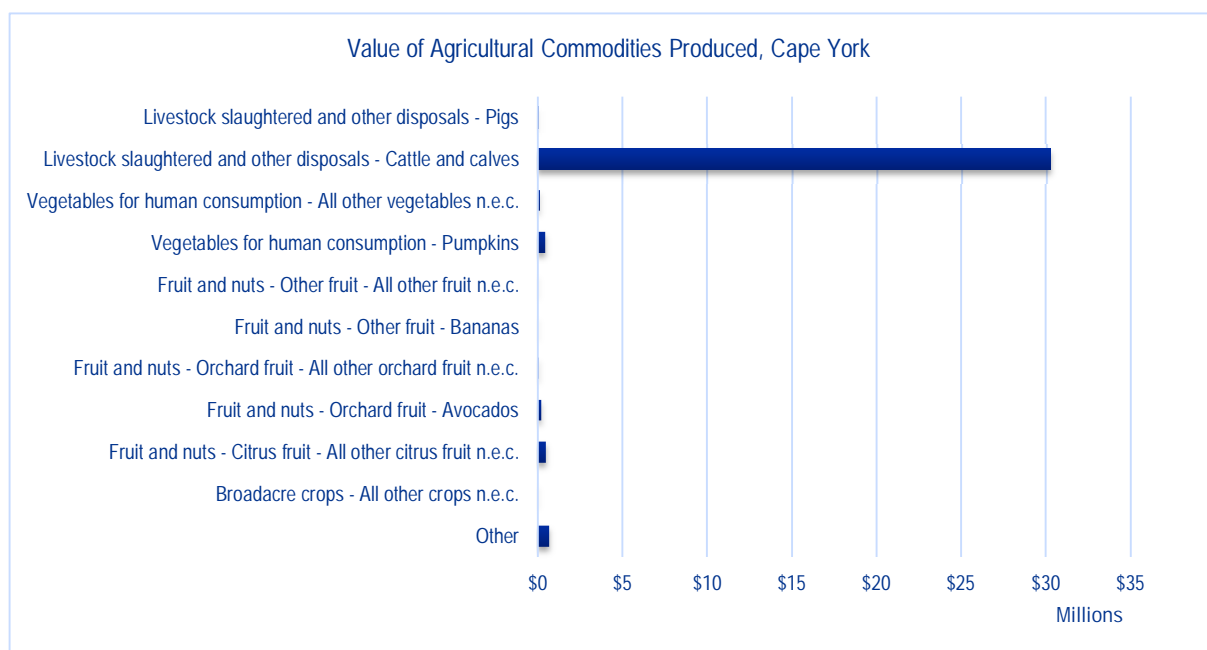


Figure 4-8 Cooperative Management Area NRM commodity production values (2018/19)

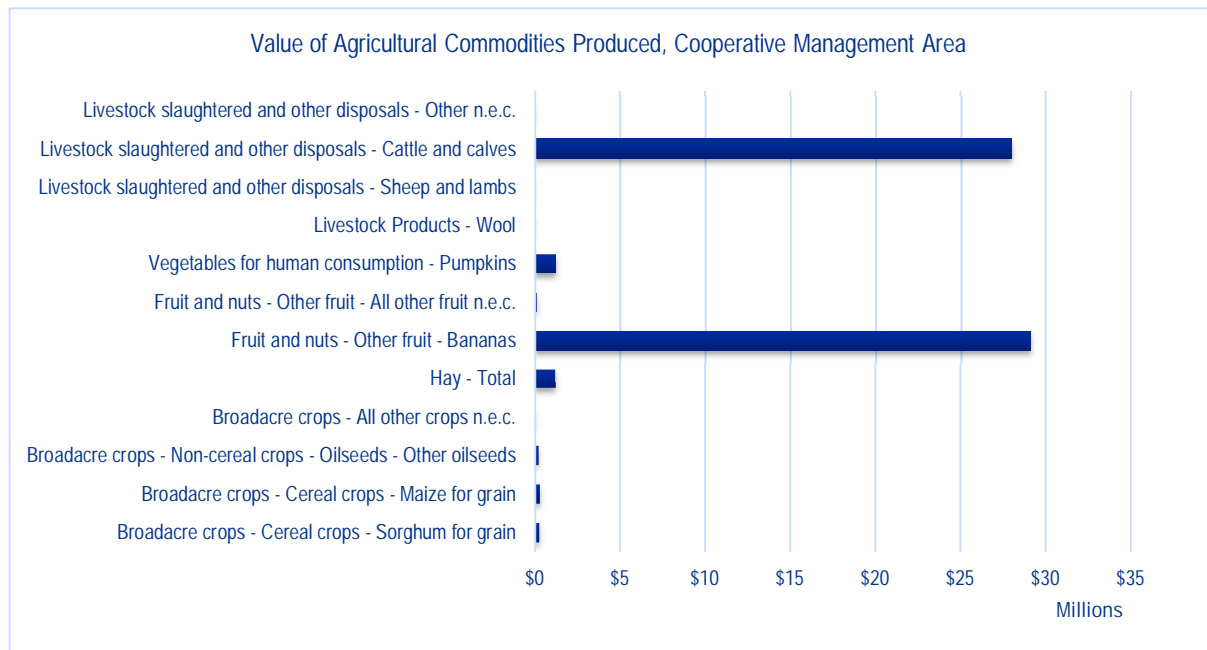


Figure 4-9 Northern Gulf NRM commodity production values (2018/19)

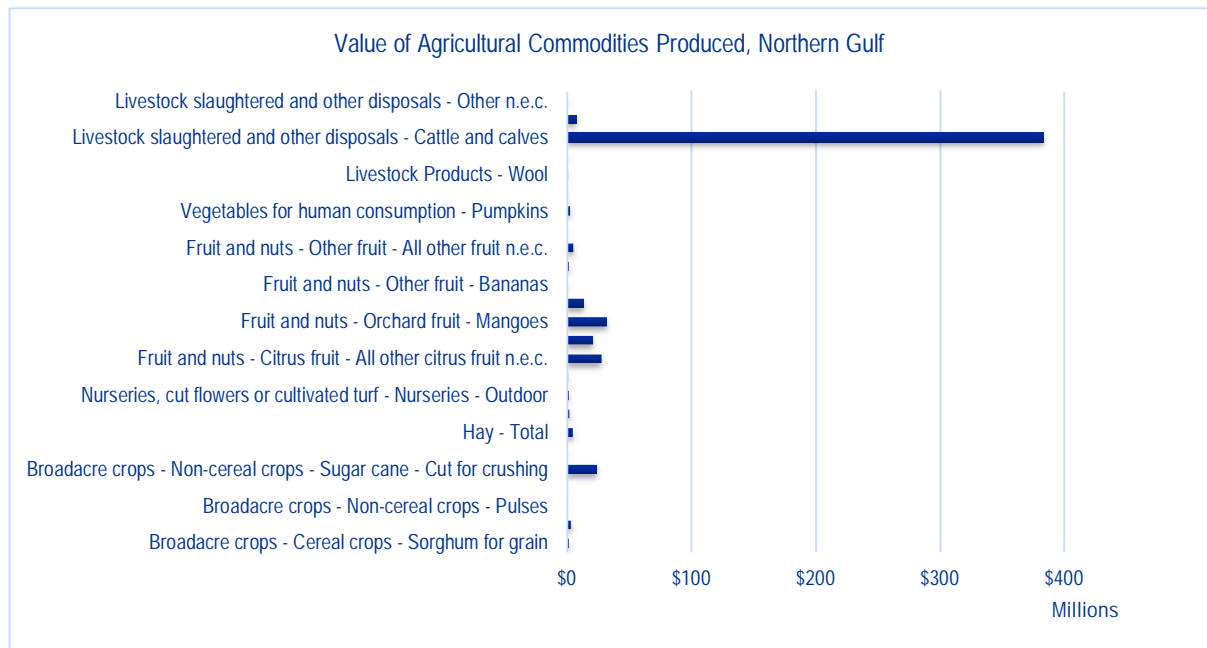


Figure 4-10 Southern Gulf NRM commodity production values (2018/19)

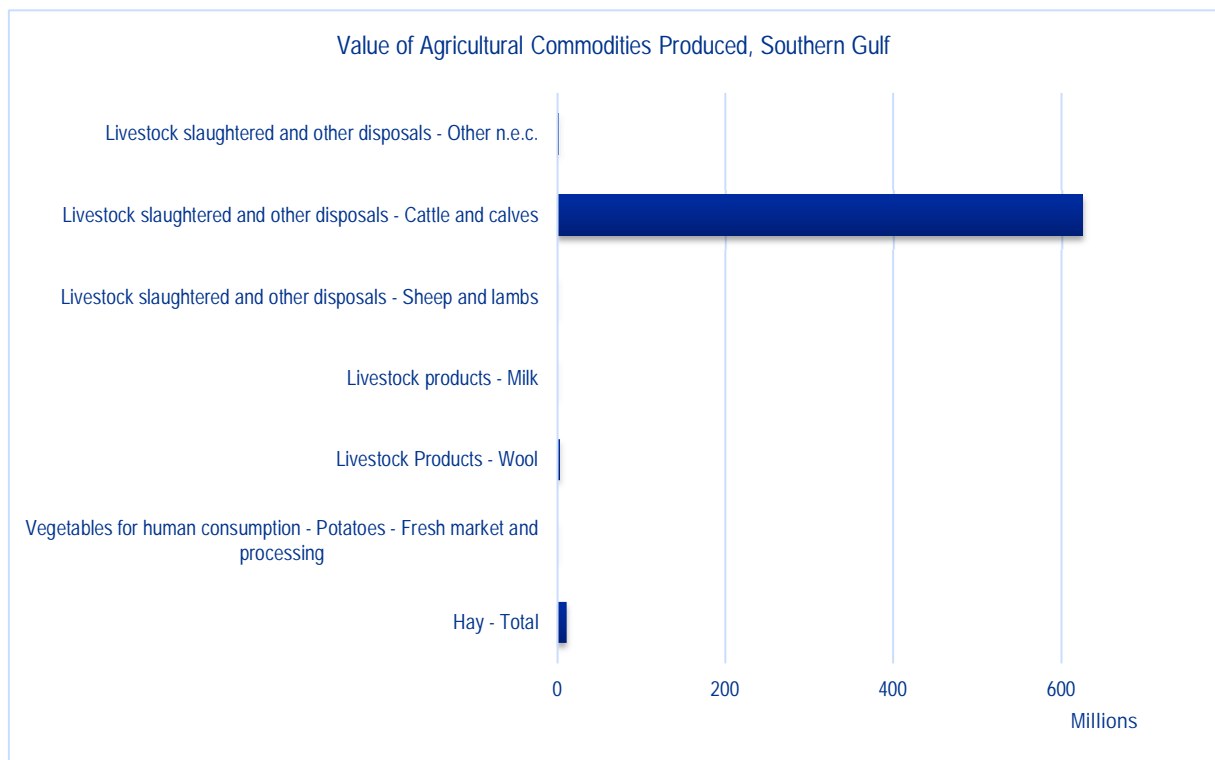
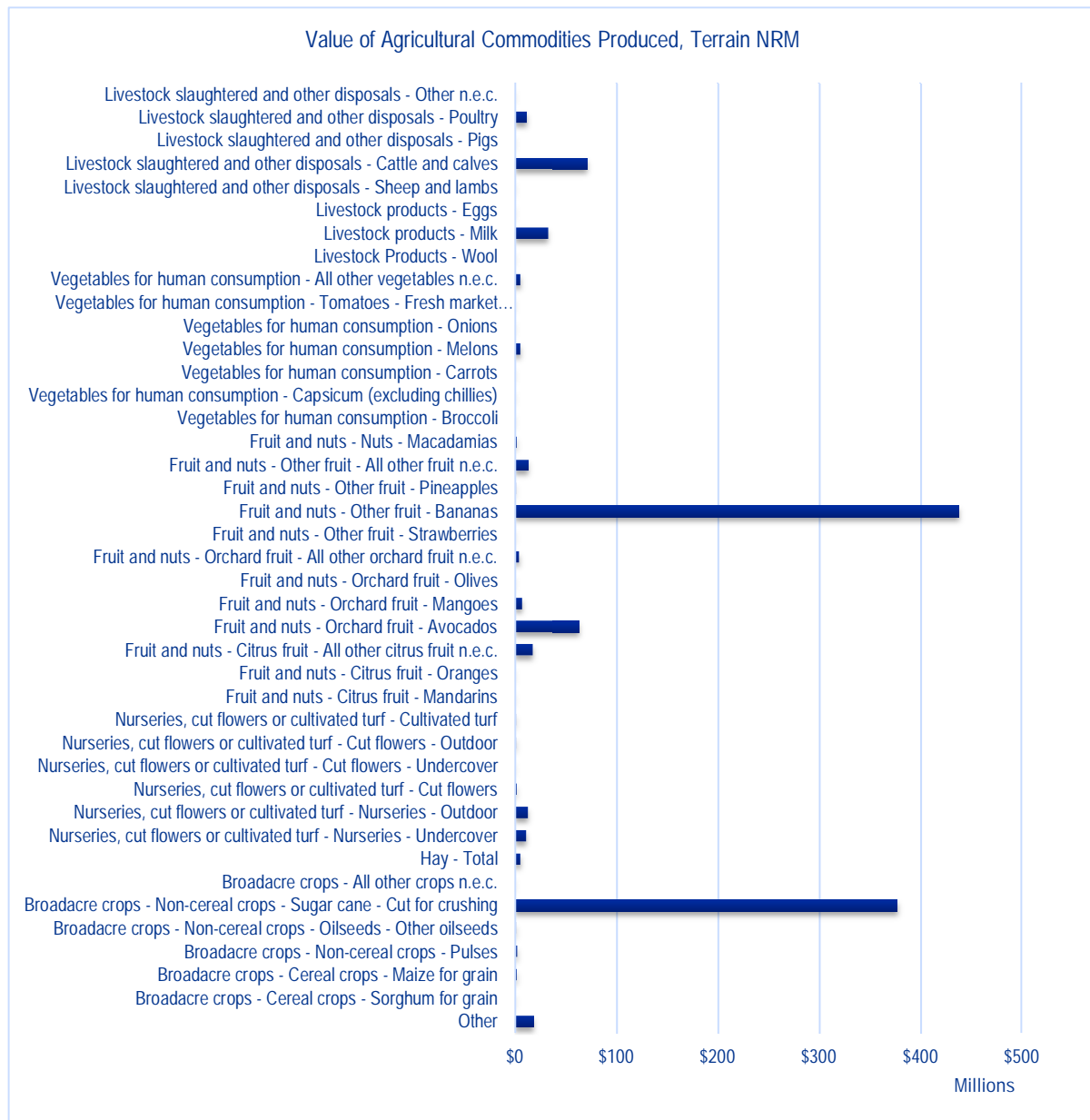


Figure 4-11 Terrain NRM Agricultural production



4.2 Outlook

Agricultural potential is defined with criteria based on characteristics such as the soil, climate, and landform as well as native vegetation⁴⁷.

The Queensland Land Audit from 2013 show shows that Tablelands, Etheridge, Carpentaria and Cook have the potential for large developments of sugarcane, horticulture and broadacre cropping. Locations are presented in Appendix B.

⁴⁷ https://www.daf.qld.gov.au/_data/assets/pdf_file/0003/74829/QALA-tech-report-final-13.pdf

Table 4-2 below provides a general outlook for commodities within FNQROC.

Table 4-2 Far North Queensland Commodity Production and Outlook⁴⁸

Commodity	Observations
Livestock	<ul style="list-style-type: none"> Growth in production volume for beef is expected for the five years to 2023 Long-term world demand for beef is strong with ongoing -increases in per capital consumption in China - Queensland's second largest destination for beef The total amount of beef produced each year by existing cattle breeding enterprises could be increased in the Mitchell catchment by using irrigated forages but would require investment in water infrastructure
Sugarcane	<ul style="list-style-type: none"> Queensland production is forecast to be stable over the five years to 2023 Potential for long-term reduction in sugar demand from Queensland because of changing consumer preferences, ongoing protectionist policies for foreign producers and continued global overproduction in the medium term Longer term production under pressure due to potential land use change opportunities in FNQ New dams in the Mitchell catchment could support up to 140,000ha of sugarcane production sugar production
Cotton	<ul style="list-style-type: none"> Healthy global demand growth for cotton to be matched by global supply leading to stable Queensland cotton demand in the five years to 2023 Some longer-term potential for growth through water infrastructure investment, particularly in the Gilbert Catchment where there is up to 2 million ha of suitable soils for production of cotton
Fruits	<ul style="list-style-type: none"> Queensland production to grow 3% per year until 2023 Very strong growth for avocados in the next five years Strong long-term prospects due to income growth in Asia, Queensland's counter-seasonality to northern hemisphere producers, and strong biosecurity Potential for domestic growth in mango consumption and expansion into the United States and the Middle East markets Longer term opportunities for export growth in avocados Potential for existing agricultural land in FNQ to transition to fruit production Water infrastructure in the Mitchell catchment could open up land for citrus and perennial fruit trees
Vegetables	<ul style="list-style-type: none"> Stable outlook for the next five years Up to 2 million ha of soils are classified as at least moderately suitable for trickle irrigation of intensive horticultural crops such as capsicum, cucurbits (e.g. pumpkin) and sweet corn in the Gilbert catchment (seizing this opportunity will require investment in water infrastructure) Vegetable production opportunities also exist in the Mitchell catchment (subject to investment in water infrastructure)
Grains	<ul style="list-style-type: none"> Slow growth in world grain consumption for next five years, except for feed grains for cattle (sorghum)

⁴⁸ Sources and reports relied upon for commodity outlooks and opportunities include:

- Queensland agriculture snapshot 2018, Department of Agriculture and Fisheries
- Australian Bureau of Agricultural and Resource Economics and Sciences (Various Publications - <http://www.agriculture.gov.au/abares>)
- Developing Northern Australia Implementation Report 2018, Department of Industry Innovation and Science
- CSIRO Developing Northern Australia Research Series (Various Publications - <https://www.csiro.au/sitecore/content/CSIRO/Website/Research/Major-initiatives/Northern-Australia/Current-work/>)
- Advance Cairns / KPMG 2019, Far North Queensland Agricultural Supply Chain Study

Commodity	Observations
	<ul style="list-style-type: none"> Grains for human consumption to experience stagnation in the longer term as market saturation is reached in developing economies due to rising incomes Robust long-term growth in feed grains (sorghum) to support the growing beef industry Approximately 0.9 million ha of soils are classified as moderately suitable for sorghum in the Gilbert River catchment but would require investment in water infrastructure
Seafood	<ul style="list-style-type: none"> Strong global demand growth, however Queensland is not well positioned to seize this opportunity Environmental constraints and concerns in the wet tropics will limit the ability in the medium to long term to tap into growing demand Significant potential for growth in aquaculture in the Mitchell catchment with 235,000 ha of coastal land suitable for lined aquaculture ponds. This area has biosecurity advantages and fewer regulatory constraints than the East Coast Some opportunity for increased fishing intensity along the Gulf coastline

5. Mining

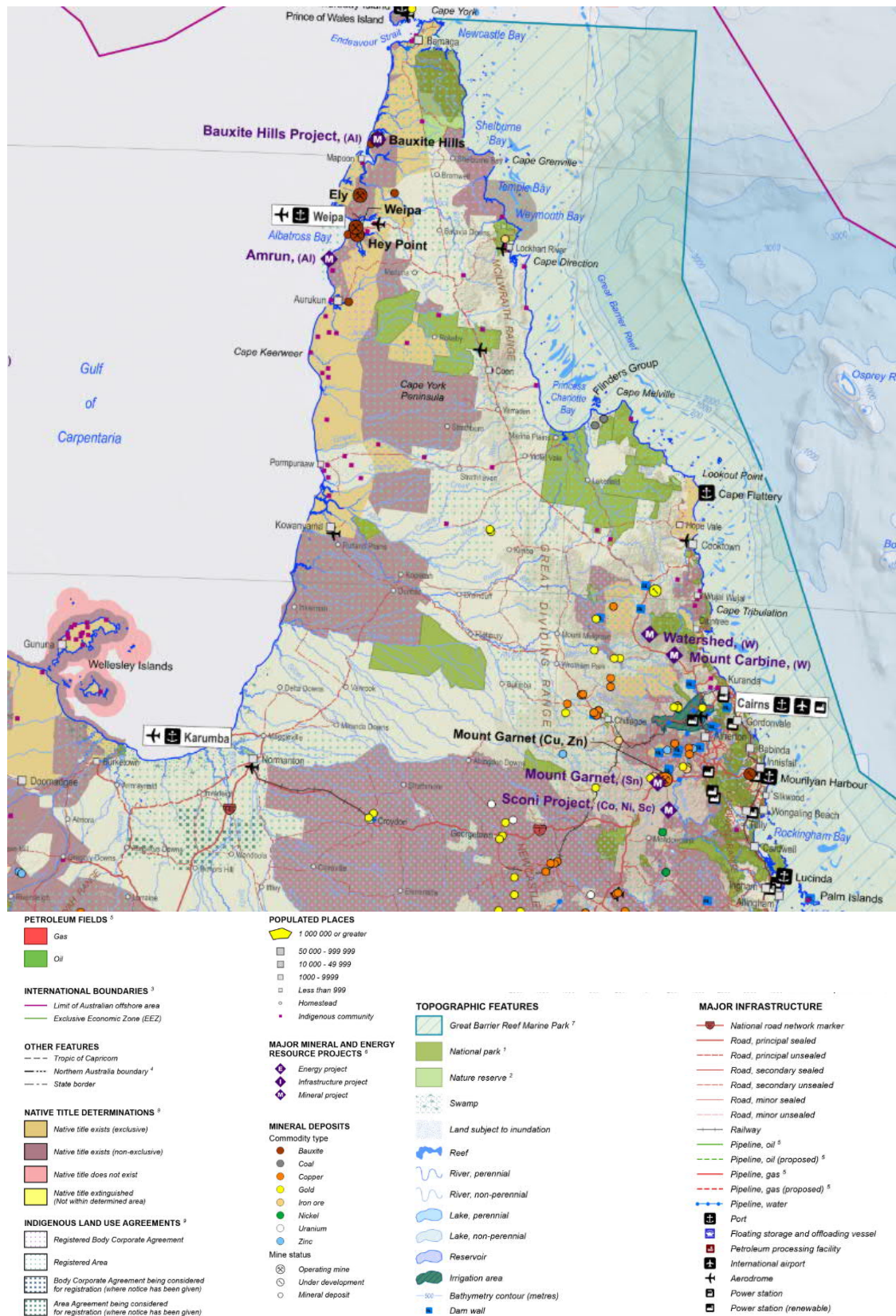
Mining activities can have significant implications for the road network. Movements between mine, refineries and end user are often transported by HPVs at maximum payload. The outcome is a shorter lifecycle for pavements, subsequently requiring earlier rehabilitation or reconstruction. The maintenance of roads that support mine operations often are the responsibility of councils without any direct funding compensation. There is regularly a disconnect between approval processes and conditions imposed through state government legislation and road assets owned by local governments.

Significant mining, energy and natural resources sector operate throughout FNQROC, most notably within Cook, Mareeba, Etheridge, Croydon and Tablelands. Major operations are also located within Cape York. The south-eastern part of the Cape York area centred around Chillagoe is a major geological research area under examination by James Cook University, with some of this work published⁴⁹.

Major mining operations include:

- Bauxite - Rio Tinto (Weipa)
- Silica - Mitsubishi Corporation (Cape Flattery near Cooktown)
- Tin, Zinc, Lead and Copper - Consolidated Tin Mines (Mount Garnet, 140 km SW of Cairns)
- Bauxite - Metro Mining and Metallica (Weipa)

⁴⁹ https://ausimm.com/wp-content/uploads/2019/08/16-Chillagoe-District-Epithermal_targets.pdf

Figure 5-1 Mining/mineral projects and deposits⁵⁰

⁵⁰ <https://www.industry.gov.au/data-and-publications/developing-northern-australia-map>

Table 5-1 Far North Queensland Mining Activity and Outlook

Commodity	Observations
Bauxite	<ul style="list-style-type: none"> Production around 23 mtpa from Rio Tinto Weipa operations, with production expected to increase to 50 mtpa from the new Amrun mine⁵¹ Metallica's Urquhart bauxite operation 5 km south of Weipa hopes to commence operations from its leased tenement within a few years⁵² Australian exports expected to increase to 36 mtpa from Weipa, including new Amrun mine⁵³ Other bauxite deposits in the Weipa Bauxite Plateau, including Metallica's Urquhart, are expected to provide long term resource opportunities and potential for continued industry growth in the region⁵⁴
Zinc	<ul style="list-style-type: none"> King Vol mine west of Cairns is increasing production with ore concentrated at Mungana facility, Chillagoe. New Century Resources completed rehabilitation of Century Mine infrastructure in 2018, and is currently ramping up to produce over 500 ktpa⁵⁵ (not within FNQROC, but is likely to be accessed through the region) Exploration continues at Girofla zinc resource near Mungana process plant (zinc and lead) South32 is investigating a number of zinc-lead-silver resources north and west of Lawn Hill⁵⁶
Copper	<ul style="list-style-type: none"> King Vol mine west of Cairns is increasing production with ore concentrated at Mungana facility, Chillagoe⁵¹ Tartana is progressing exploration and copper and zinc resource quantification at its four mining leased tenements 150 km west of Cairns near Chillagoe (former operators successfully produced copper sulphate for mineral processing uses from the site⁵⁷, and exploration is targeting 20-47 mtpa porphyry copper mineralisation at 0.6-0.8% Cu⁵⁸) Malaco Pty Ltd is continuing exploration around the Leichardt project north of Lawn Hill in the southern gulf region⁵⁹ (this area has been successfully mined for copper in the past) Red River's Liontown 4.1mtpa operations are intended to commence mining in 2022-23⁶⁰ (not within FNQROC, but is likely to be accessed through the region)
Tin	<ul style="list-style-type: none"> The Collingwood underground tin mine, 35 km south of Cooktown operated 2005-2008 and was placed into liquidation in 2015 when the operator disclaimed the leases (a remediation plan for the site is under development by the Department of Natural Resources, Mines and Energy⁶¹) The Baal Gammon Copper Mine near Watsonville, southwest of Cairns was closed in 2016 following a pollution investigation by the Department of Environment and Science
Gold, Silver	<ul style="list-style-type: none"> Mungana Mine near Chillagoe now in care and maintenance A number of gold deposits in the Alice River area 350 km west of Cairns have had active exploration and test drilling⁶² Crater Gold Mining's Polymetallic Project continues to undertake exploratory drilling within the Croydon area as recently as November 2019⁶³ Tartana's Valentino section showing some silver mineralisation⁵⁵ Red River's Liontown operations (refer above) has a significant gold component which will materially increase gold production at Thalanga

⁵¹ <https://www.riotinto.com/news/releases/Amrun-bauxite-project-approved>

⁵² <https://www.metallicaminerals.com.au/urquhart-bauxite/>

⁵³ <https://www.minister.industry.gov.au/ministers/canavan/media-releases/new-26-billion-bauxite-mine-spread-wealth-throughout-queensland>

⁵⁴ <http://www.portergeo.com.au/database/mineinfo.asp?mineid=mn807>

⁵⁵ <https://www.newcenturyresources.com/century-mine-project/>

⁵⁶ <https://ausimm.com/wp-content/uploads/2019/08/17-Exploration-Mining-Roundup-by-BHD.pdf>

⁵⁷ <https://tartanaresources.com.au/project/copper-ore-mining/>

⁵⁸ <https://ausimm.com/wp-content/uploads/2019/08/13-Tartana-Resources-Limited-Presentation-30-May-2019.pdf>

⁵⁹ <https://ausimm.com/wp-content/uploads/2019/08/12-MALACO-LEICHARDT-CRUSADER.pdf>

⁶⁰ <https://www.redriverresources.com.au/operations/thalanga/orient.html>

⁶¹ <https://www.qld.gov.au/environment/land/management/abandoned-mines/projects/collingwood-tin>

⁶² <https://www.asx.com.au/asxpdf/20170526/pdf/43ji4dbp56czw9.pdf>

⁶³ <http://www.cratergold.com.au/irm/PDF/743179f9-eb4f-439d-92bc-2fa2b676426a/AssaysforCroydonDrillingReceived>

Commodity	Observations
	<ul style="list-style-type: none"> Laneway Resources continues to undertake drilling to expand its Agate Creek Gold Project⁶⁴
Uranium	<ul style="list-style-type: none"> Mary Kathleen uranium mine between Cloncurry and Mt Isa closed in 1982⁶⁵ Queensland lifted its 32 year ban on uranium mining in 2012⁶⁶ Known possible mines in Queensland include Westmoreland near the NT border, Valhalla and other sites near Mt Isa, and Ben Lomond located 50 km west of Townsville near Charters Towers, though evidence exists there are plans for exploration at numerous other sites throughout Queensland⁶⁷ Future opportunities could arise, depending on world demand, public sensitivity and political considerations
Silica	<ul style="list-style-type: none"> Mitsubishi owned Cape Flattery Silica Mines (CFSM) exports around 2 mtpa from its 63 km² Cape Flattery mine and shiploading facility⁶⁸ CFSM has an estimated 200 mtpa sand reserves giving a mine life of 100 years at current volumes Diatreme's Galalar Silica Project, targeting commencement in 2021, encompasses an area of 542 km² at Cape Bedford/Cape Flattery, covering the extent of a large Quaternary sand dune field (excluding CFSM)⁶⁹ Agripower's amorphous silica plant near Charters Towers will produce around 200 ktpa from a mine at Greenvale⁷⁰, south of the FNQROC region Stockhead⁷¹ reports industry research showing worldwide demand for high quality silica sand growing at 6% pa Metallica's Cape Flattery Silica Sands is pursuing its silica mining operations, with an estimated 20-100 mtpa of silica sands in areas recently leased⁷⁴
Kaolin	<ul style="list-style-type: none"> Kaolinite deposits below bauxite in Weipa Bauxite Plateau⁷², Gulf Minerals Pty Limited holding Kendall Kaolin Project mining lease that covers over 182,000 hectares on the west of Cape York (appears to be in exploration phase)⁷³ Remoteness and relatively low commodity value (e.g. USD\$120-150 / t 2018⁷⁴) suggest that kaolin from Weipa may be uncompetitive on world markets There could be some potential for resource development in the longer term

⁶⁴ <http://www.lanewayresources.com.au/irm/content/agate-creek-gold-project.aspx?RID=373>

⁶⁵ https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Former_Committees/uranium/report/c07

⁶⁶ <http://theconversation.com/queensland-lifts-its-uranium-ban-but-is-the-price-worth-the-cost-28105>

⁶⁷ <https://www.foe.org.au/queensland-campaign-against-uranium-mining>

⁶⁸ <https://www.mitsubishicorp.com/jp/en/csr/management/business/sustainability03.html>

⁶⁹ <https://www.diatreme.com.au/projects/galalar-silica-project-diatreme-100/>

⁷⁰ <https://www.agripower.com.au/>

⁷¹ <https://stockhead.com.au/resources/metallica-unearths-99-per-cent-silica-sands-next-door-to-world-class-mitsubishi/>

⁷² <http://www.portergeo.com.au/database/mineinfo.asp?mineid=mn807>

⁷³ <https://www.energymin.com/>

⁷⁴ <https://www.wakaolin.com.au/the-kaolin-market>

6. Coordinated Projects

Under the State Development and Public Works Organisation Act (1971), a project with one or more of the following characteristics can be declared as a Coordinated Project:

- Complex approval requirements, involving local, state and federal governments
- Significant environmental effects
- Strategic significance to the locality, region or state, including for the infrastructure, economic and social benefits, capital investment or employment opportunities it may provide
- Significant infrastructure requirements

Coordinated Projects require either an environmental impact statement (EIS) or impact assessment report (IAR). An EIS is more stringent through a formal Terms of Reference which must be addressed. An IAR is applied to well-defined, low-medium risk projects where the likely impacts are highly predictable able to be avoided, minimised or mitigated.

Transport impacts are a feature of both processes, with the assessment to consider the total transport task for the project, including workforce, inputs and outputs, during the construction and operational phases. The objective is to determine the impact on existing transport infrastructure, overall transport efficiency across modes, and impacts on communities.

The scale of Coordinated Projects undoubtedly has implications for the road network beyond the immediate project area. Downstream effects are generated through logistical and supply chain requirements e.g. fuel carried by road tanker to remote areas not connected to rail.

Figure 5-1 illustrates the locations of completed assessments. Projects with possible freight movement impacts include Kidston Pumped Storage Hydro Project (Etheridge) and South of Embley and Amrun mines (Cook and Aurukun). The Kidston IAR has not identified any traffic/road infrastructure impacts. Amrun saw most equipment and materials transported by sea from Cairns to Weipa. A 25% increase in traffic for the Aurukun Road was predicted during construction, and specific management measures were implemented to minimise impact on other road users in the area⁷⁵. Pavement impact increases of more than 5% are likely during some stages for the following:

- the PDR between the Archer River Quarry and the Aurukun Road turnoff during delivery of aggregate
- the PDR between Weipa and the Aurukun Road turnoff prior to construction of the barge/ferry terminals and Mine Access Road
- Kerr Point Road and John Evans Drive prior to construction of the barge/ferry terminals and Mine Access Road, and during operations at 50 mtpa;
- Aurukun Road between the PDR and the Access Road turnoff during the construction phase.

While not within FNQROC, the CopperString Project⁷⁶ may have impact on the road network to the north and north east if materials are transported through Karumba or Cairns Ports. At this stage, most materials are expected to be transported by road via the Flinders Highway.

The 15 Mile Irrigated Agricultural Development⁷⁷ project is also south of FNQROC. The Impact Assessment Report states the existing Council and SCR networks will likely be the main mode of transporting construction materials and product output. This may have implications for the Kennedy Developmental Road, although the Flinders Highway provides a more direct route to Townsville. Unsealed sections of the Kennedy Developmental Road are due to be completed by 2020. Once the harvest area is fully developed, approximately 12 heavy vehicles per day are required to transport product to market. The Co-Ordinator-General states that the current

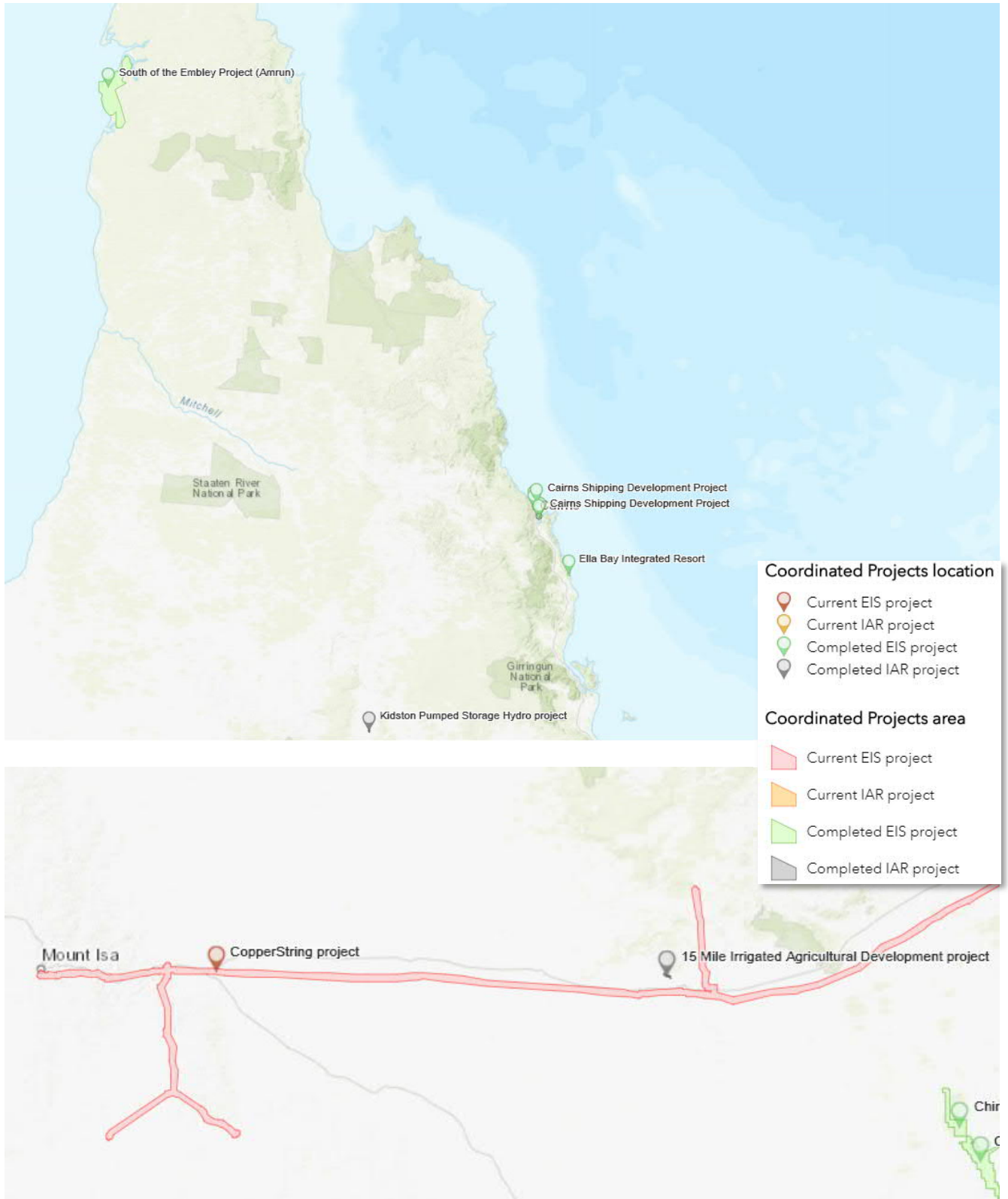
⁷⁵ <http://www.capeyorknrm.com.au/news-events/newsletter/issue-31/amrun-project-peninsula-developmental-road-pdr-trucking-movements>

⁷⁶ <http://www.dsdmip.qld.gov.au/coordinator-general/assessments-and-approvals/coordinated-projects/current-projects/copperstring-project.html>

⁷⁷ <http://www.statedevelopment.qld.gov.au/coordinator-general/assessments-and-approvals/coordinated-projects/completed-projects/15-mile-irrigated-agricultural-development-project.html>

transport infrastructure is underutilised, and that no road upgrades and no significant road infrastructure are required.

Figure 6-1 Coordinated Projects across Far North Queensland⁷⁸



⁷⁸ <http://statedevelopment.qld.gov.au/coordinator-general/assessments-and-approvals/coordinated-projects/coordinated-projects-map.html>

7. Freight movements

7.1 TMR Qld Freight Model

TMR is currently developing the Qld Freight Model with the goal of better understanding heavy vehicle freight movements across Queensland, particularly regarding (a) commodities being carried and (b) what routes they are being carried. Although still in development, preliminary outputs have not been made available for this study.

7.2 Australian Bureau of Statistics Road Freight Movement Survey

As an alternative, the ABS' Road Freight Movement Survey⁷⁹ microdata has been analysed to give a high-level assessment of commodity movements. The Survey, jointly conducted with the ABS Survey of Motor Vehicle Use (SMVU), presents estimates for the period 1 November 2013 to 31 October 2014.

The Survey relies on a sample of 16,000 articulated and rigid trucks (8,000 trucks selected only in the road freight movements component, and 8,000 within SMVU) over a one-week period. There is no indication of what roads/routes have been incorporated within the Survey.

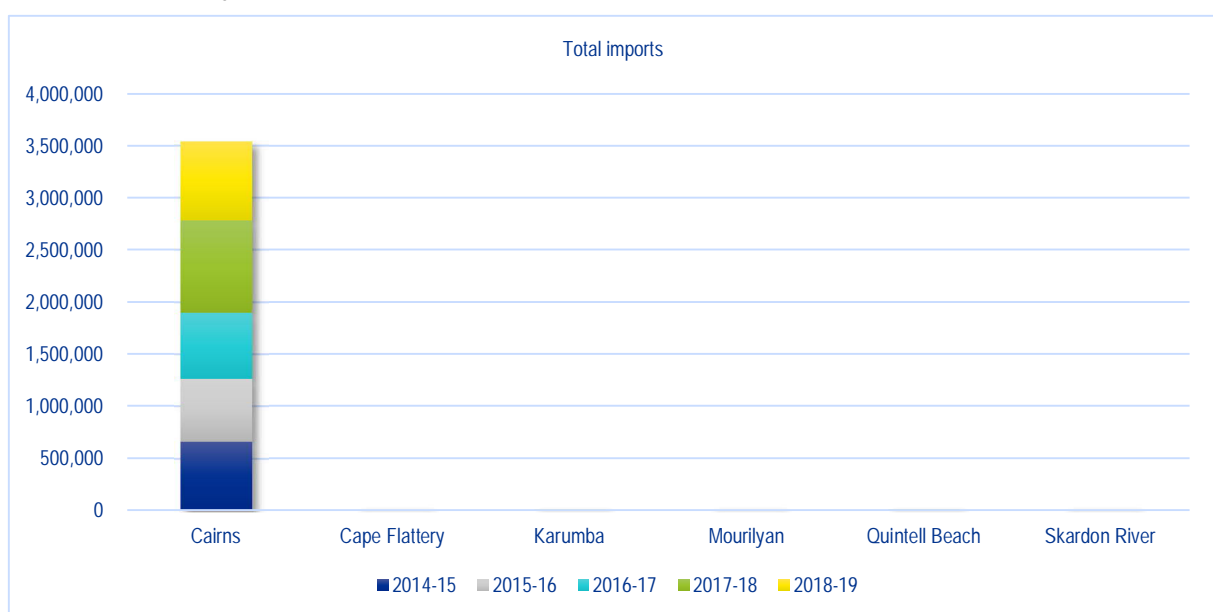
The limitations see the survey data not aligning with expected operations across FNQROC, and have not been incorporated into this study.

7.3 Port freight movements

The throughput of commodities through FNQROC Ports can provide additional indications of freight movements and the routes they use. The statistics produced by TMR⁸⁰ are highly aggregated into a small number of commodity categories.

Figure 7-1 illustrates Cairns as practically being the sole importing port for commercial purposes, with petroleum being the dominant commodity. Karumba and Quintell Beach receive small amounts of general cargo, expected to be primarily for local population needs rather than large-scale inputs to commercial activities.

Figure 7-1 Total imports by Port (tonnes)



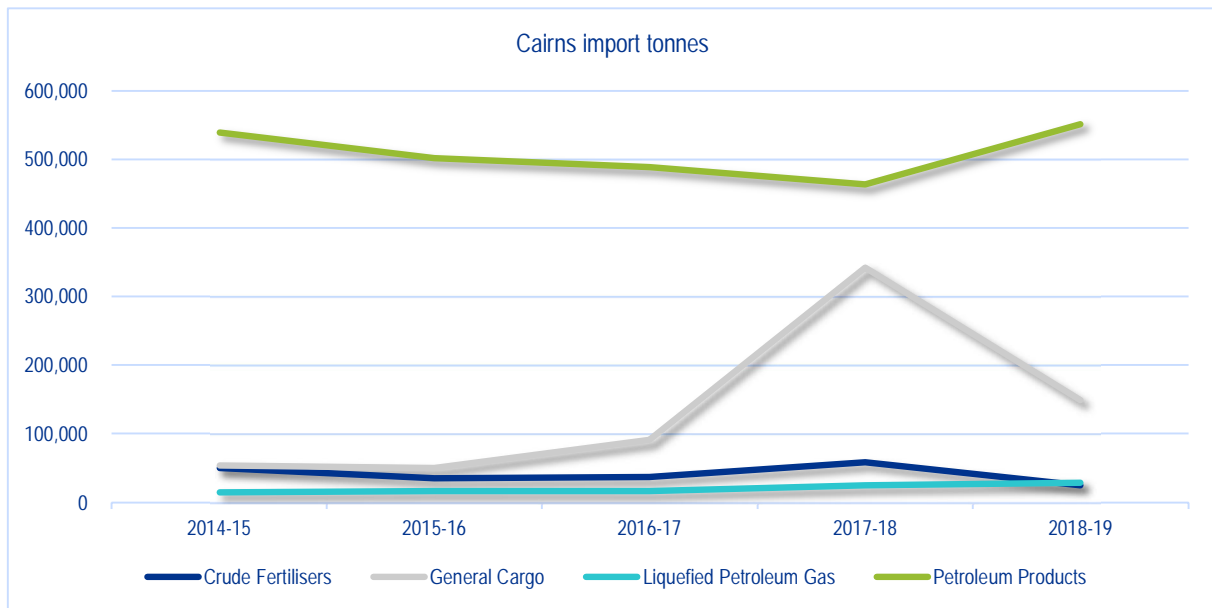
⁷⁹

<https://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/9223.0Explanatory%20Notes112%20months%20ended%2031%20October%202014?OpenDocument>

⁸⁰

<https://www.tmr.qld.gov.au/business-industry/Transport-sectors/Ports/Port-governance/Trade-statistics-for-Queensland-ports>

Figure 7-2 Cairns imports (tonnes)



Exports from FNQROC are more widespread and a better indicator of economic output and freight generation. Figure 7-3 illustrates around 4 million tonnes are exported from Far North Queensland annually, noting that around the bulk is silica sand as a single commodity through Cape Flattery and recent increases in Bauxite production has led to significant increase in export from Skardon River.

Figure 7-3 Total exports by Port (tonnes)

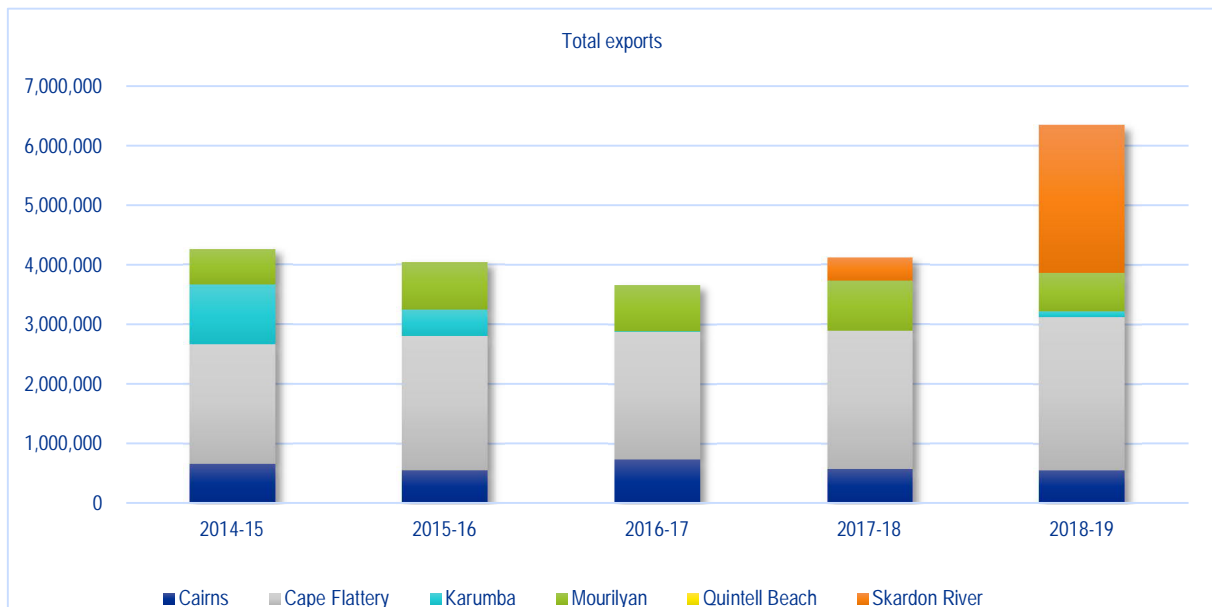


Figure 7-4 to Figure 7-7 illustrate the primary commodities exported from each Port. Key points are:

- Cairns is more recently dominated by general cargo, which are likely redistributed to coastal communities in Cape York, Torres Strait Islands and the Gulf of Carpentaria
- Sugar is the dominant commodity for Mourilyan,
- Mourilyan primarily exports raw sugar and molasses from the Innisfail, Babinda, Tully and Atherton Tableland and appears to be attracting these commodities away from Cairns
- Karumba re-commenced exporting of minerals in 2018/19, accompanying continuing exports of general cargo and livestock

- Skardon River commenced exports from Bauxite Hills Mine in April 2018, currently around 2.5 mtpa

Figure 7-4 Cairns exports (tonnes)

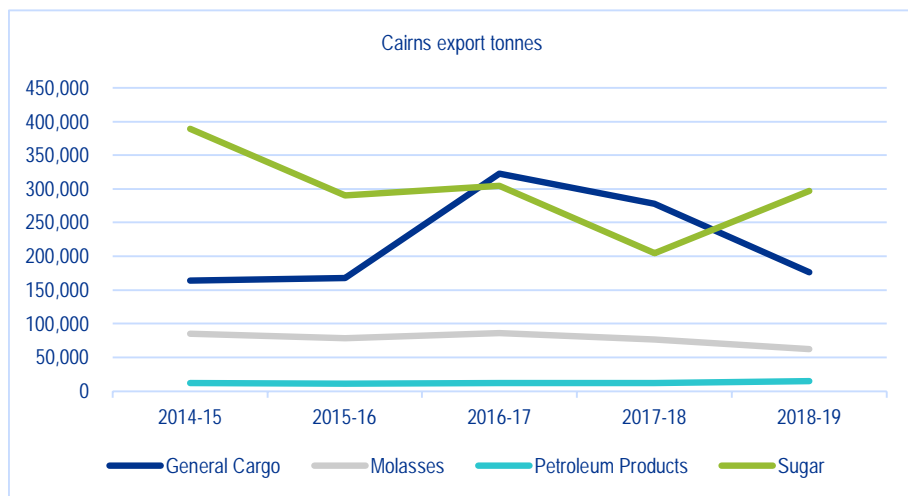


Figure 7-6 Mourilyan exports (tonnes)

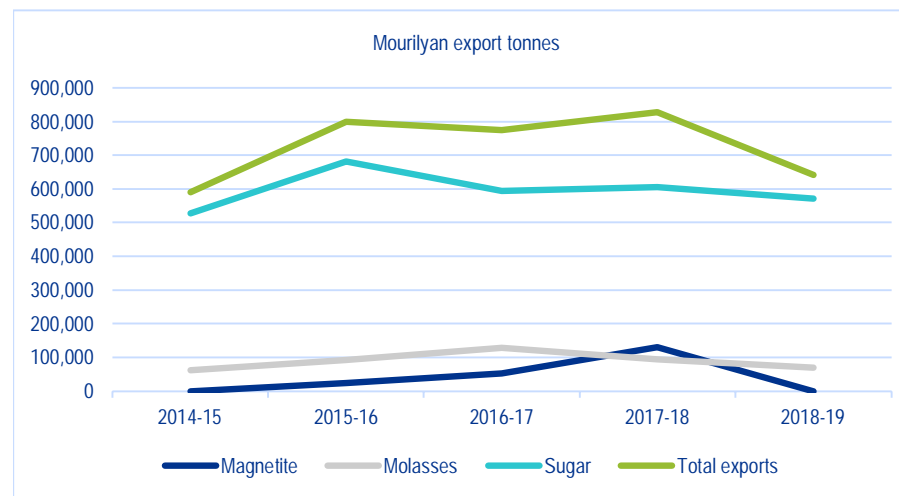


Figure 7-5 Karumba export (tonnes)

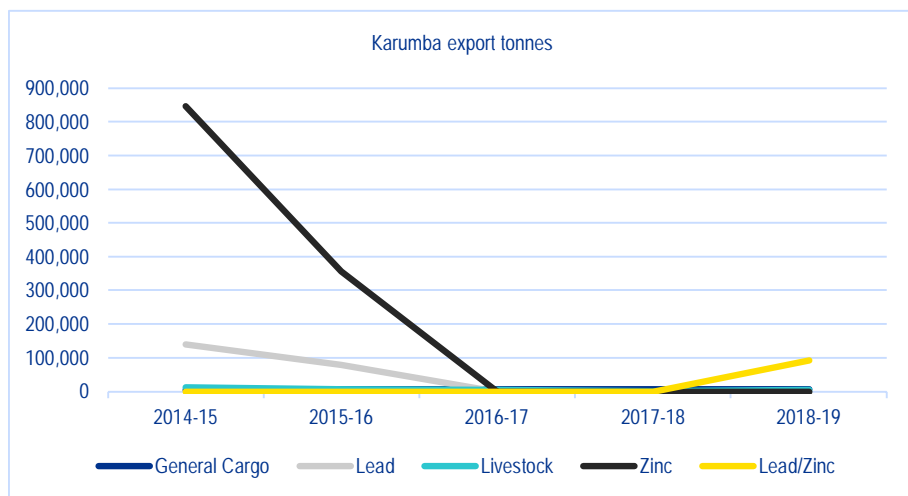
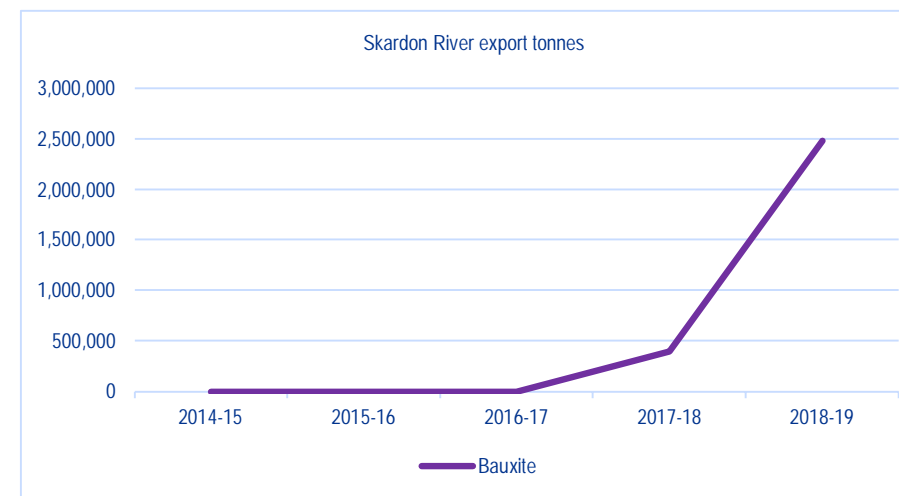


Figure 7-7 Skardon River exports (tonnes)



7.3.1 Commodity values

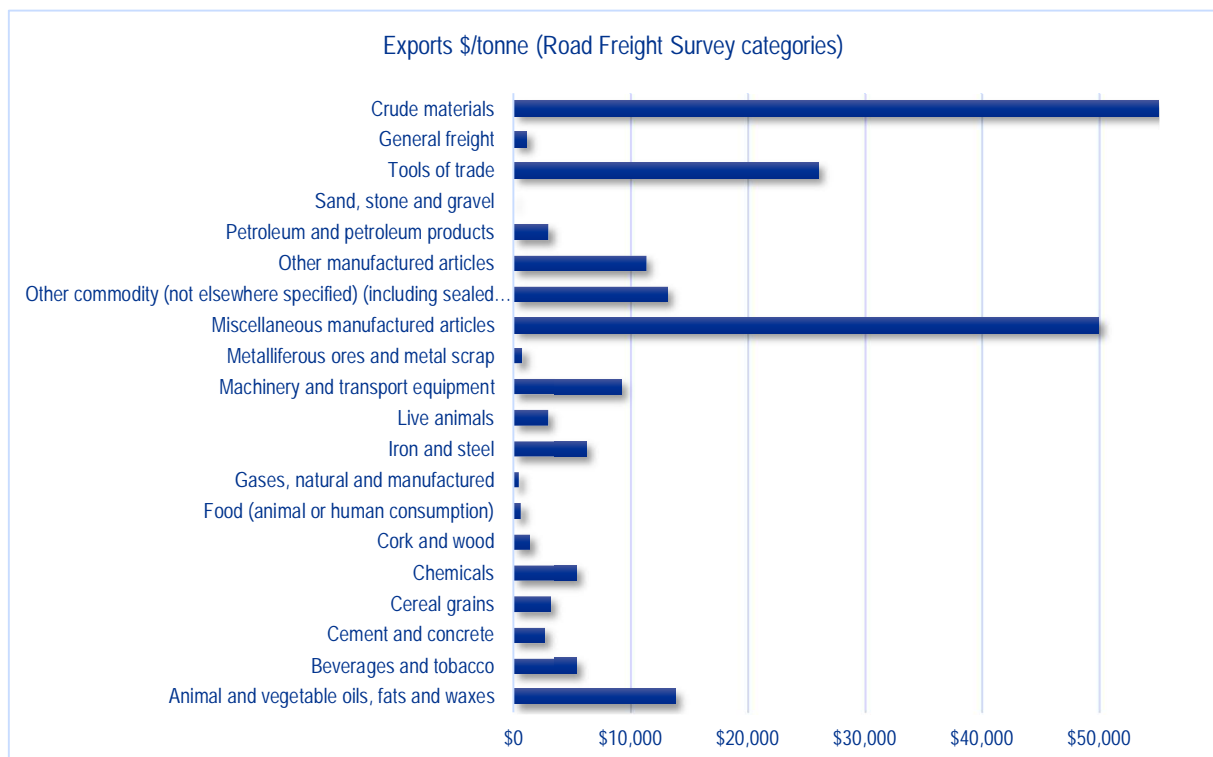
Road infrastructure investment is historically influenced by trip volumes. Budgetary constraints often result in low volume roads obtaining insignificant funding, however it is also worthwhile considering the economic contribution of a particular road/route. Incorporating the value of the commodities moved by heavy vehicles on a route can inform how investment can contribute to a region's overall economic prosperity.

Indicative commodity value estimates transported through FNQROC have been estimated by analysing exports⁸¹ and imports⁸² for Cairns, Mourilyan and Karumba for the last 5 years. While the data aligns with these three ports, it also covers freight moved by air, ship or parcel post.

The detailed export/import data is collected according to the Standard International Trade Classification, which differs to the ABS Road Freight Movement Survey classifications. A mapping exercise is necessary to align the two classifications. Because of overlaps/non-distinction between categories and adjustments to remove outlying values, the estimates should be considered indicative.

The results are presented in Figure 7-8 and Figure 7-9, noting that import data is for Cairns only. The results notably reflect a wide range of individual commodity values that do have varying elements of movement by road, and also including those that are ultimately imported/exported by air (e.g. raw hides/skins, office/scientific equipment and medicinal/pharmaceutical products).

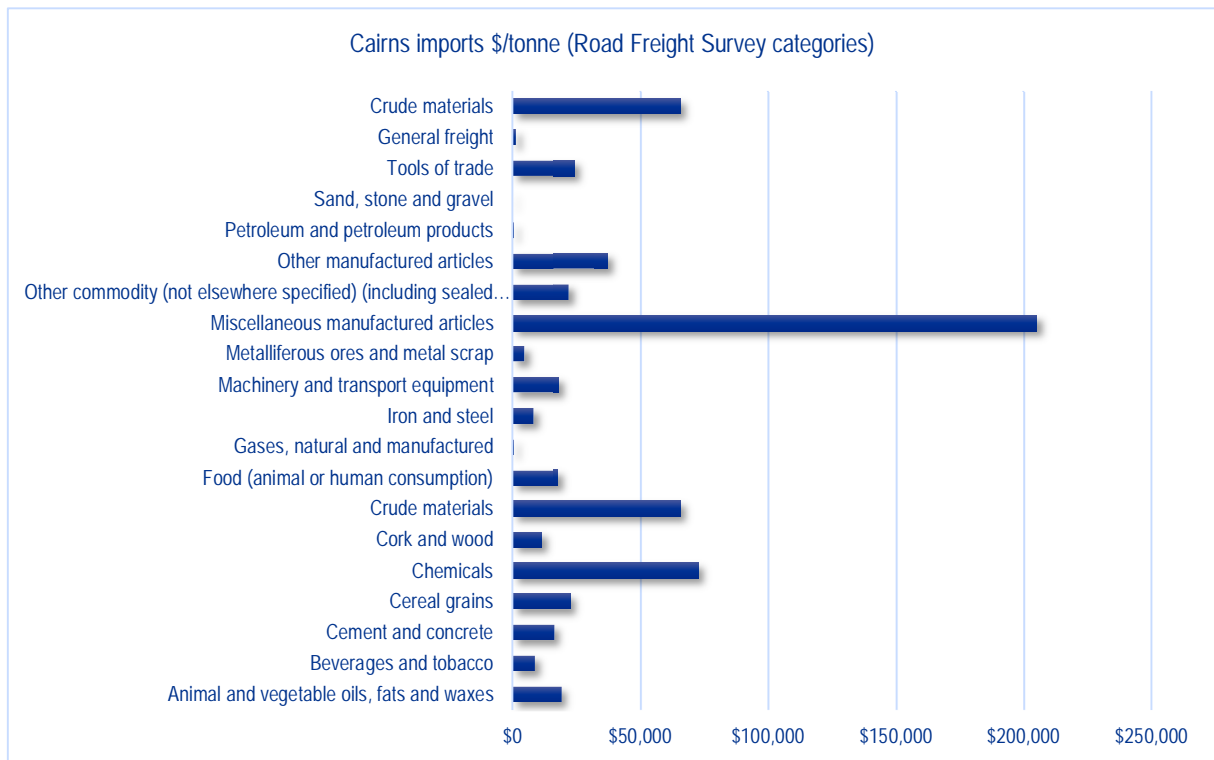
Figure 7-8 Export commodities \$/tonne



⁸¹ <http://www.qgso.qld.gov.au/products/tables/trade-data-overseas-exports-port-load-com-sitc/index.php>

⁸² <http://www.qgso.qld.gov.au/products/tables/trade-data-overseas-imports-port-load-com-sitc/index.php>

Figure 7-9 Import commodities \$/tonne (Cairns only)



8. State Controlled Roads heavy vehicle growth

Assessing the historical growth of heavy vehicle traffic provides further insight into where road infrastructure investment may be required into the future. The analysis of five-year traffic history is presented as differentiated by heavy vehicle type on State Controlled Roads (SCR). Traffic history is available for additional routes with the proportion of heavy vehicles presented as a combined percentage (growth by each heavy vehicle category is unable to be determined in these cases).

It is important to note the analysis is based on how often traffic counts are collected. Where traffic counts are not collected for a particular year, the previous year appears to be adopted. This results in the unlikely presentation of zero growth for some roads e.g. the Captain Cook Highway. Similarly, data for 2018 does not appear to have been updated from 2017.

Occasionally there is growth is shown for heavy vehicles above the gazetted access for a particular route. This is a representation of issued permits, traffic counter error or both. The Bruce Highway for example is gazetted as a B25 B-double route but shows growth for roadtrains.

Noting the data reliability, the growth rates have remained positive and relatively stable with some routes experiencing significant and sustained increases. The analysis shows noticeable growth in:

- Rigid and smaller articulated vehicles on the Kennedy Highway (Cairns – Mareeba)
- B-doubles on Kennedy Highway (Ravenshoe - Mt Garnet)
- B-doubles and roadtrains on the Mulligan Highway (Mount Molloy - Lakeland)
- B-doubles on the Mareeba - Dimbulah Road
- Triple roadtrains on the Burke Developmental Road (Normanton - Dimbulah)
- All multicomination vehicles on the Peninsula Dev Road (Laura - Coen)
- Triple roadtrains on the Gulf Developmental Road (Normanton - Croydon)
- Double roadtrains on the Kennedy Developmental Road (Mt Garnet - The Lynd)

Table 8-1 shows that, across all routes, the five-year average growth rate is significantly declining for all vehicles. However heavy vehicle growth is mostly increasing, notably for six axle articulated and above.

Table 8-1 Average 5 year growth rate, all vehicles

Average 5 year growth rate	2014	2015	2016	2017	2018
All vehicles	2.90%	1.04%	1.52%	0.04%	0.18%

Table 8-2 Average 5 year growth rates, heavy vehicles

Average 5 year growth rate	3 axle articulated or rigid vehicle & trailer	4 axle articulated or rigid vehicle & trailer	5 axle articulated or rigid vehicle & trailer	≥6 axle articulated or rigid vehicle & trailer	B-double or heavy truck trailer	Double road train or heavy truck and trailers	Triple road train or heavy truck and three trailers
2014	0.89%	0.99%	0.41%	2.30%	1.20%	1.17%	1.33%
2015	1.01%	0.98%	0.53%	2.21%	1.25%	1.26%	1.44%
2016	0.96%	1.06%	0.45%	2.56%	1.33%	1.78%	1.77%
2017	0.84%	1.07%	0.41%	2.64%	1.46%	1.89%	1.80%

The following diagrams shows 5 year growth rates with available data. A B23 is a 23 metre B-Double (PBS2), B25 is a 25 metre B-Double (PBS2), RT1 is a Type 1 roadtrain (PBS3) and RT2 is a Type 2 roadtrain (PBS4).

Figure 8-1 5 year growth rates - Bruce Highway (Townsville - Ingham) 10M

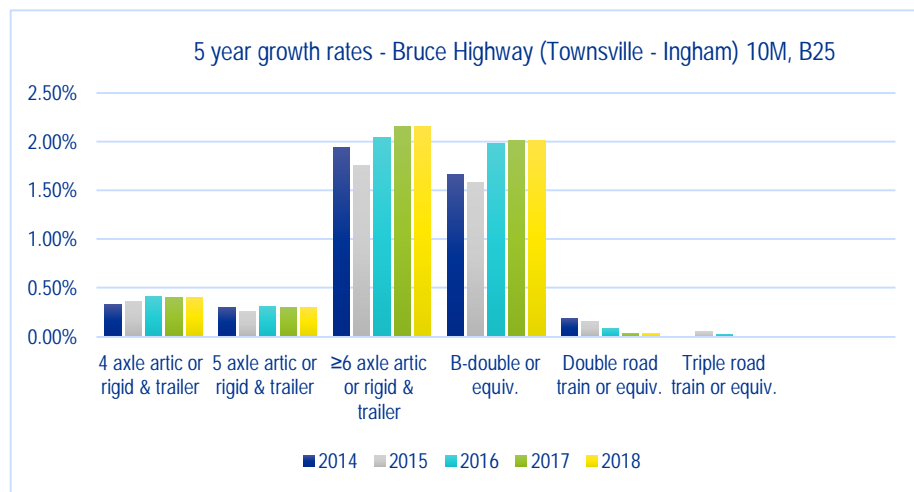


Figure 8-3 5 year growth rates - Bruce Highway (Innisfail - Cairns) 10P



Figure 8-2 5 year growth rates - Bruce Highway (Ingham - Innisfail) 10N

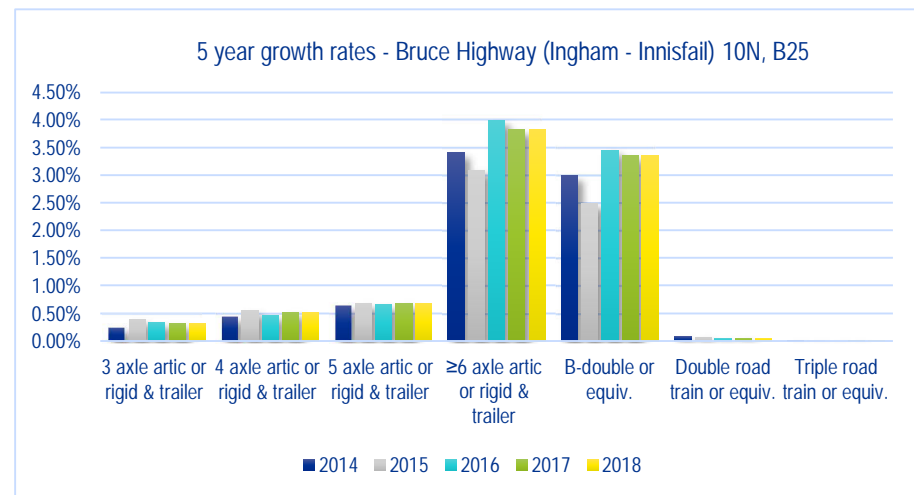


Figure 8-4 5 year growth rates - Captain Cook Highway (Cairns - Mossman) 20A

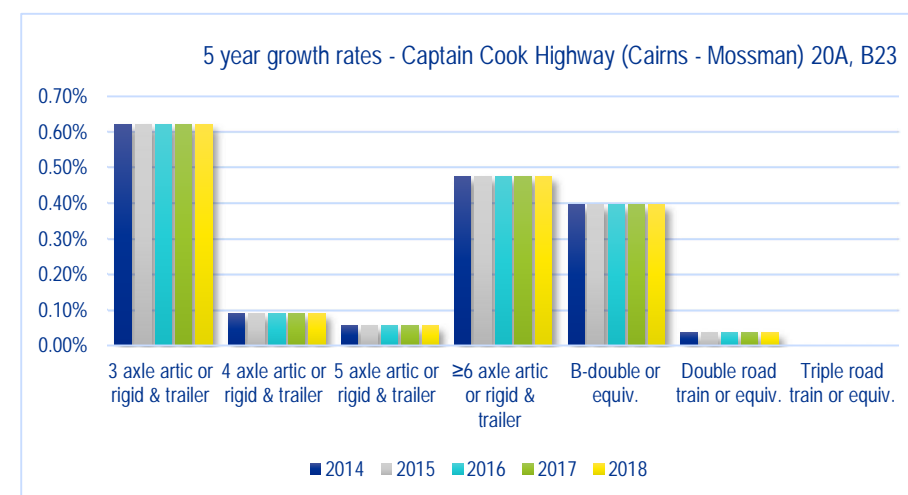


Figure 8-5 5 year growth rates - Palmerston Highway (Innisfail - Ravenshoe) 21A

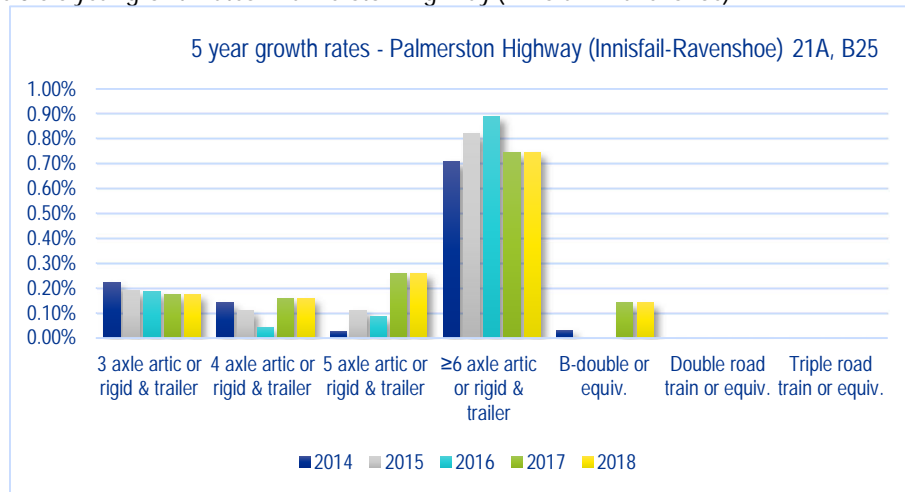


Figure 8-7 5 year growth rates - Kennedy Highway (Mareeba - Ravenshoe) 32B

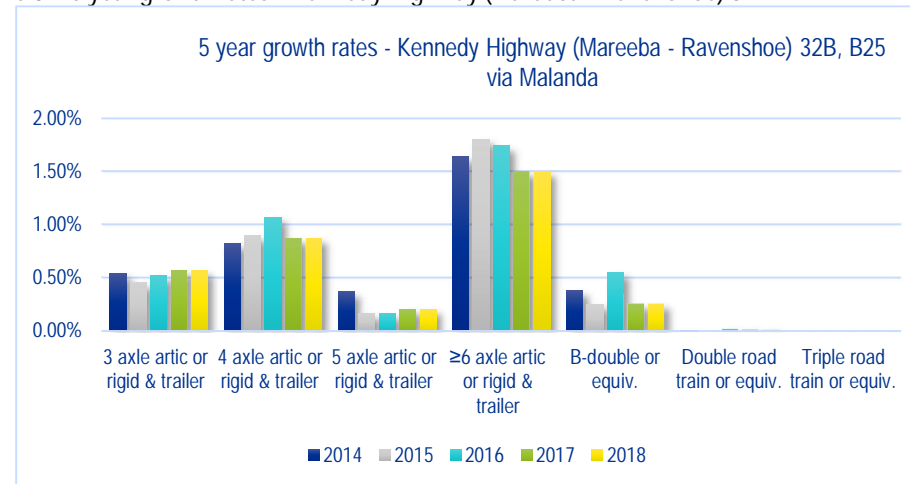


Figure 8-6 5 year growth rates - Kennedy Highway (Cairns - Mareeba) 32A

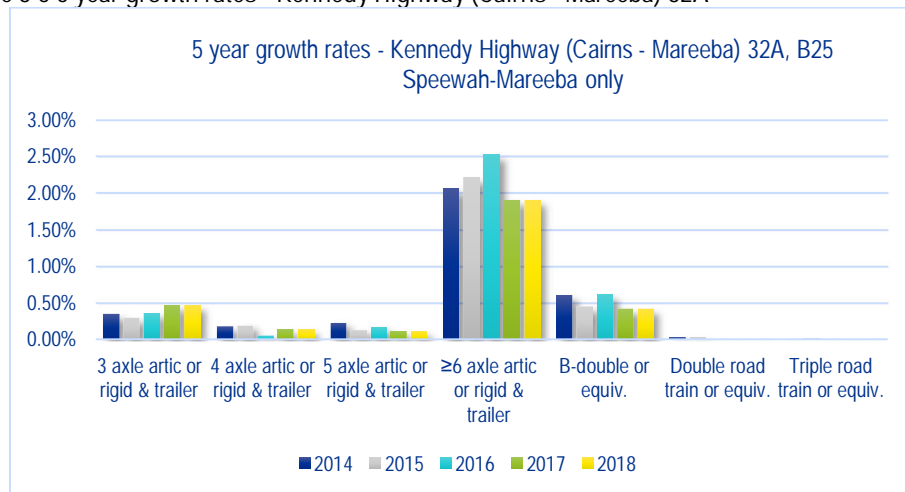


Figure 8-8 5 year growth rates Kennedy Highway (Ravenshoe - Mt Garnet) 32C

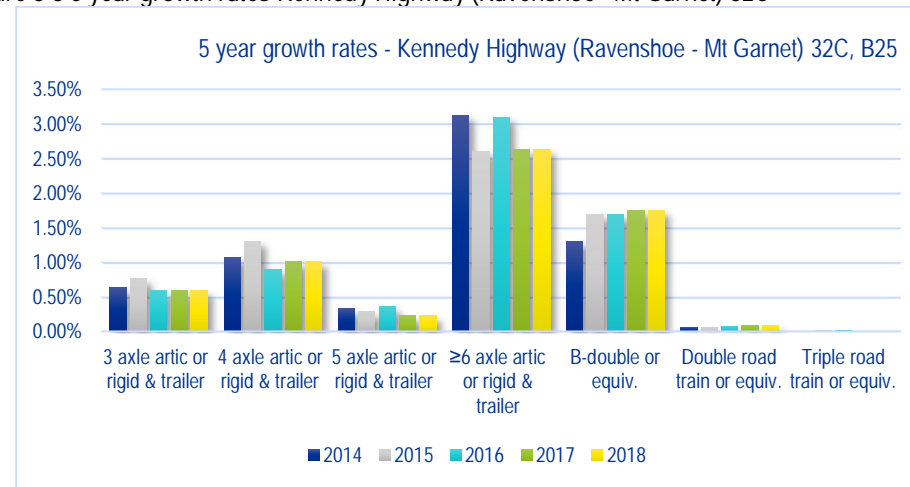


Figure 8-9 5 year growth rates - Mulligan Highway (Mareeba - Mount Molloy) 34A

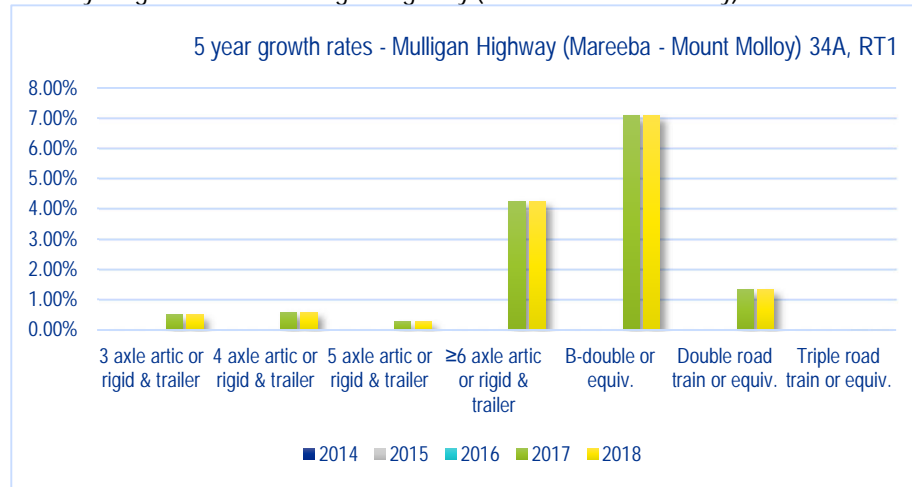


Figure 8-11 5 year growth rates - Mulligan Highway (Lakeland - Cooktown) 34C

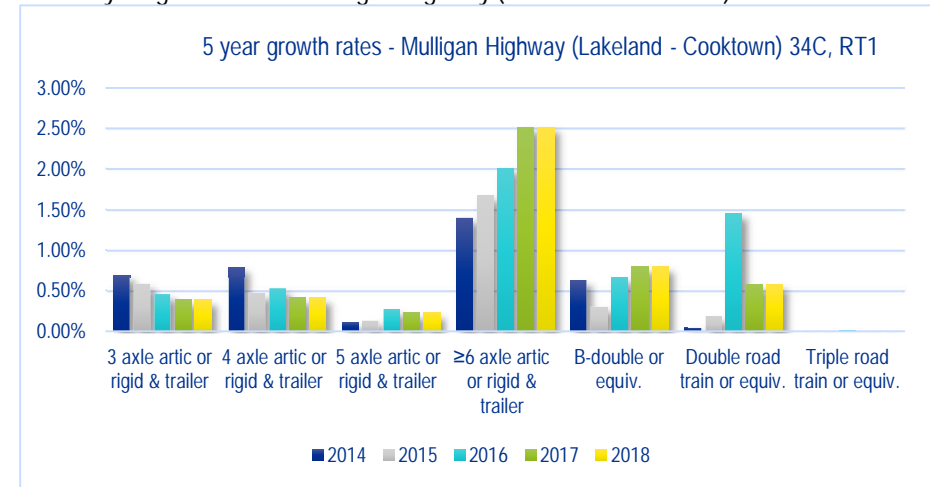


Figure 8-10 5 year growth rates - Mulligan Highway (Mount Molloy - Lakeland) 34B

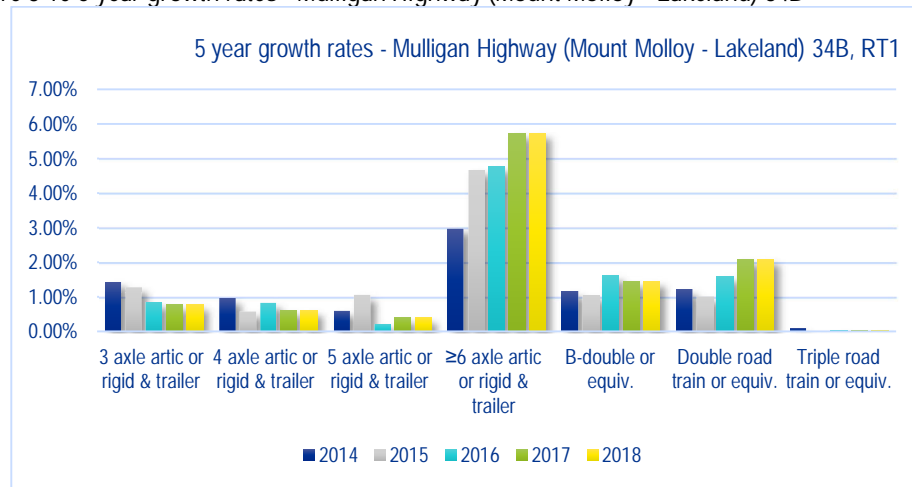


Figure 8-12 5 year growth rates - Kennedy Highway (Mt Garnet - The Lynd) 32D

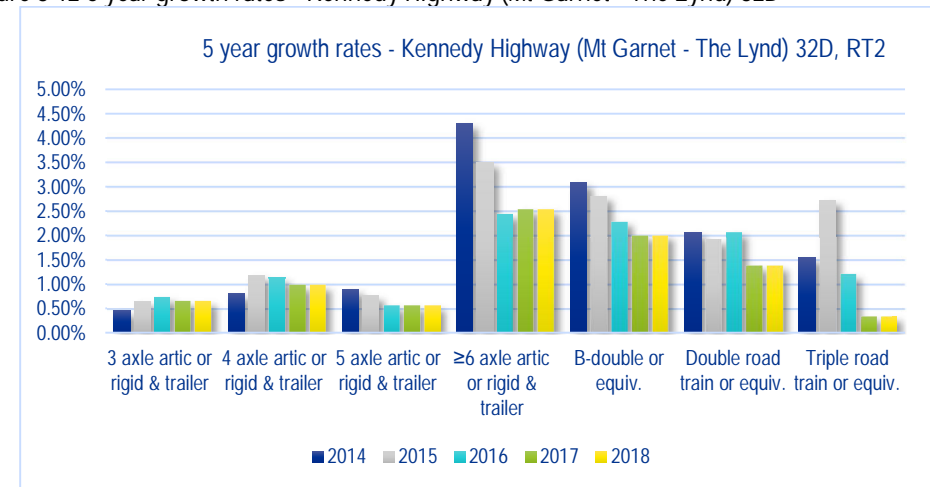


Figure 8-13 5 year growth rates - Mareeba - Dimbulah Road 664

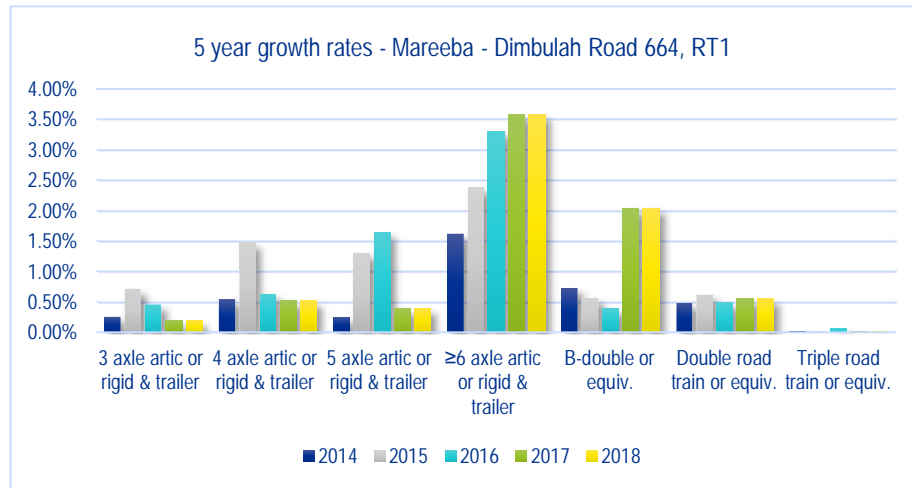


Figure 8-15 5 year growth rates - Peninsula Dev Road (Lakeland - Laura) 90B

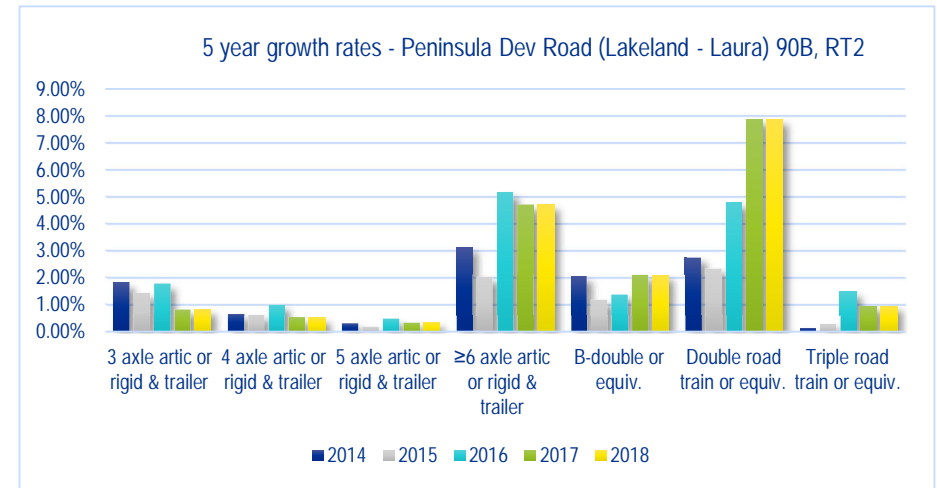


Figure 8-14 5 year growth rates - Burke Dev Road (Normanton - Dimbulah) 89B

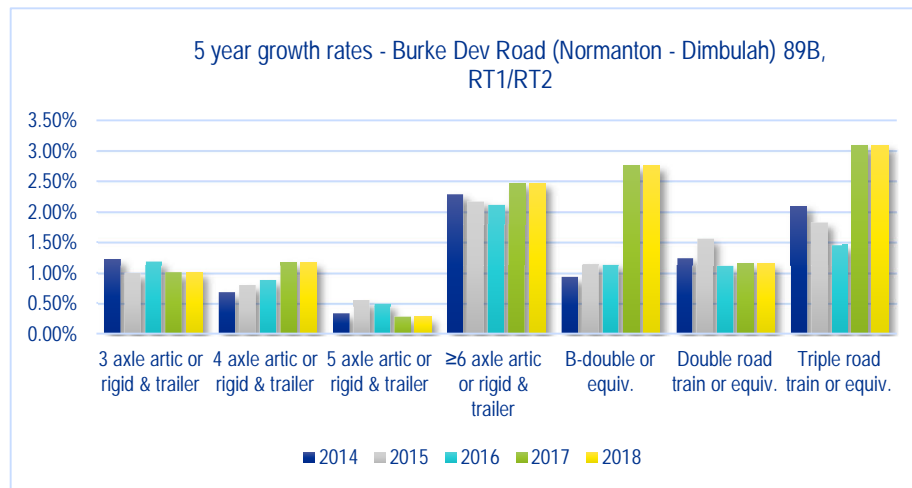


Figure 8-16 5 year growth rates - Peninsula Dev Road (Laura - Coen) 90C

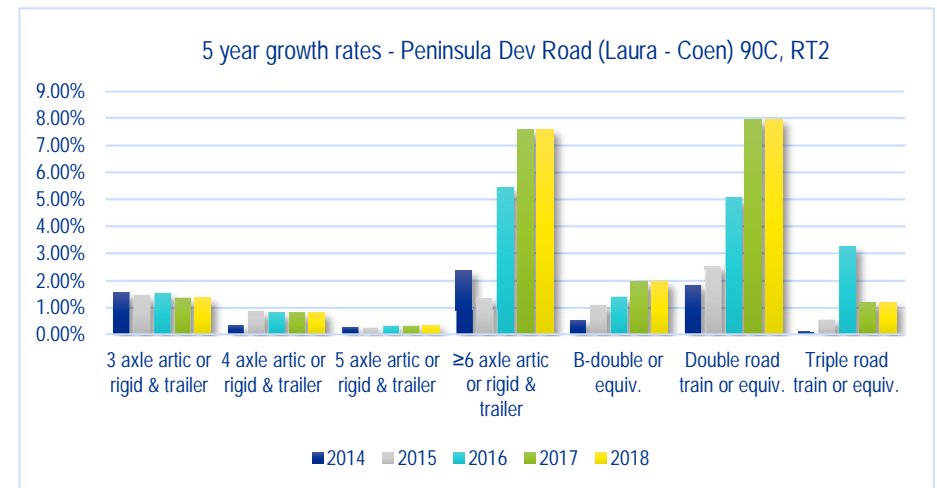


Figure 8-17 5 year growth rates - Peninsula Dev Road (Coen - Weipa) 90D

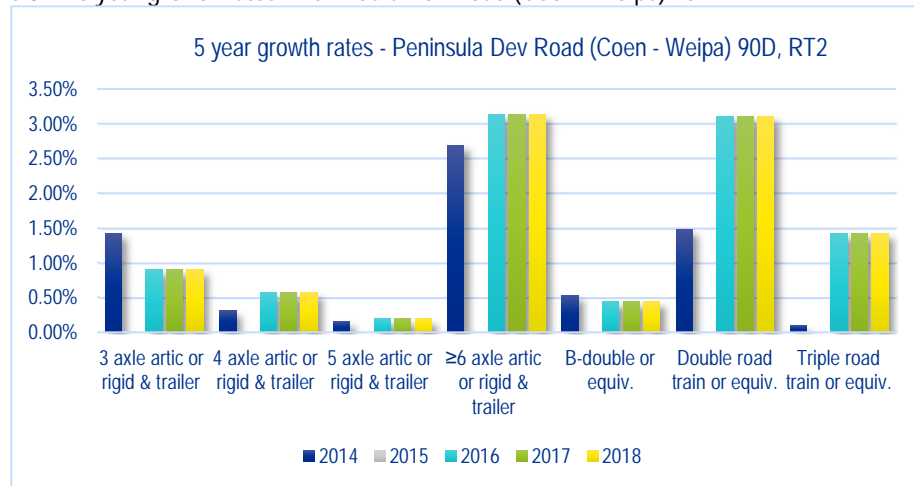


Figure 8-19 5 year growth rates - Gulf Dev Road (Croydon - Georgetown) 92B

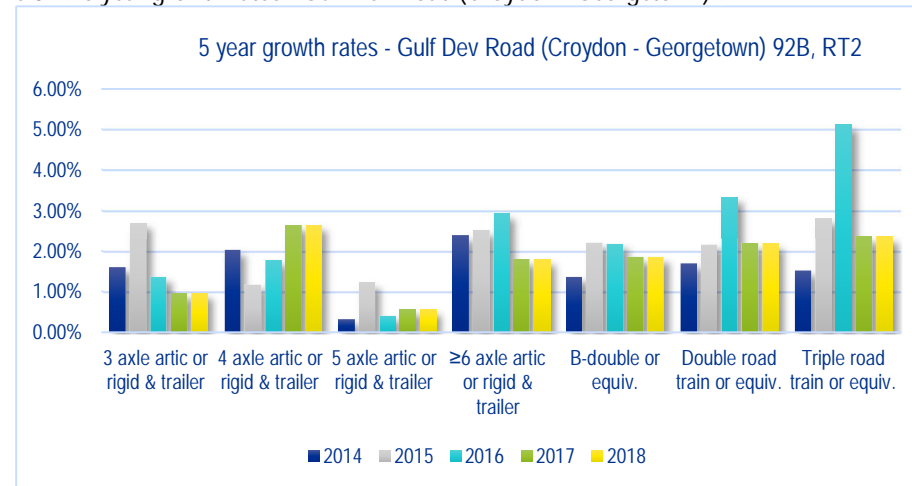


Figure 8-18 5 year growth rates - Gulf Dev Road (Normanton - Croydon) 92A

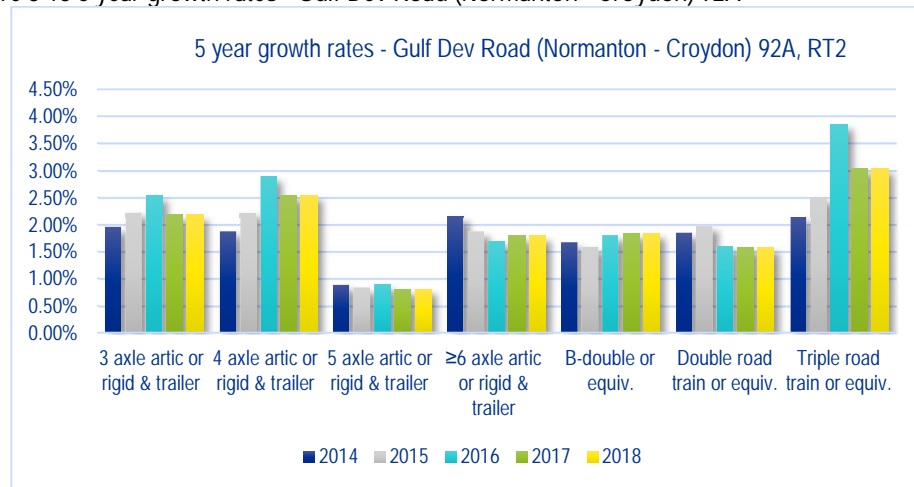


Figure 8-20 5 year growth rates - Gulf Dev Road (Georgetown - Mt Garnet) 92C

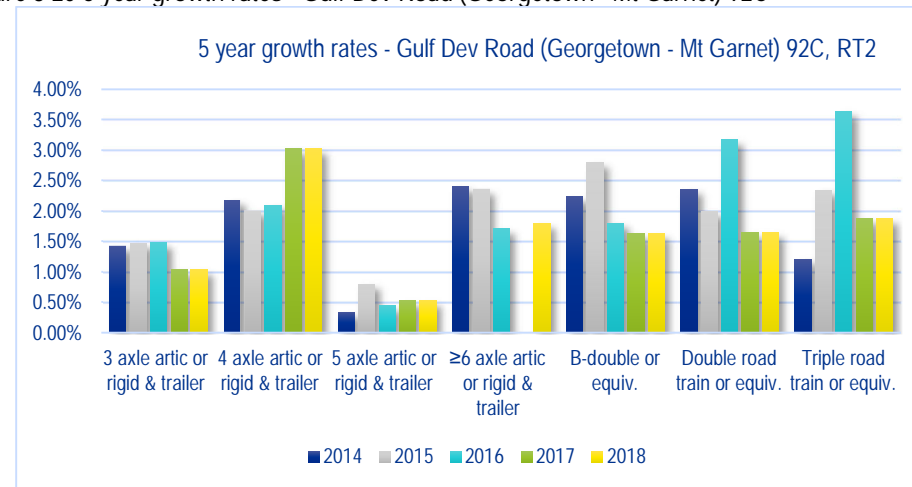


Figure 8-21 5 year growth rates - Kennedy Dev Road (Mt Garnet - The Lynd) 99A

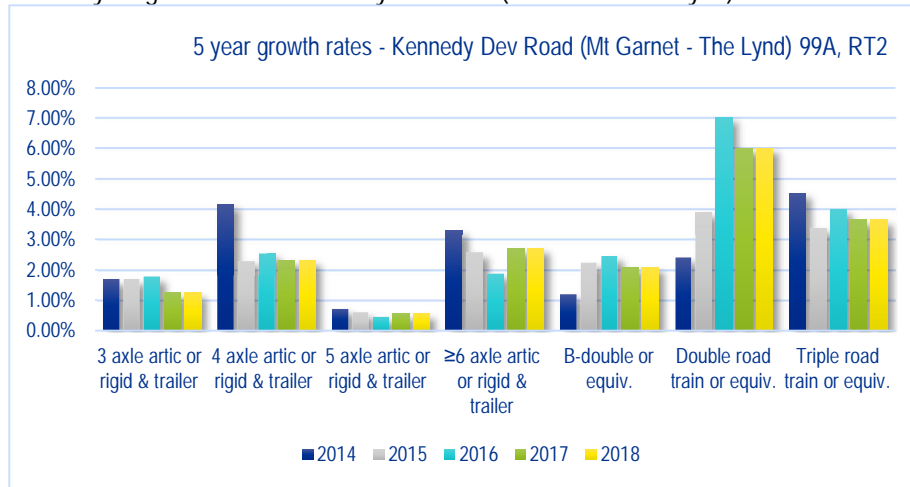
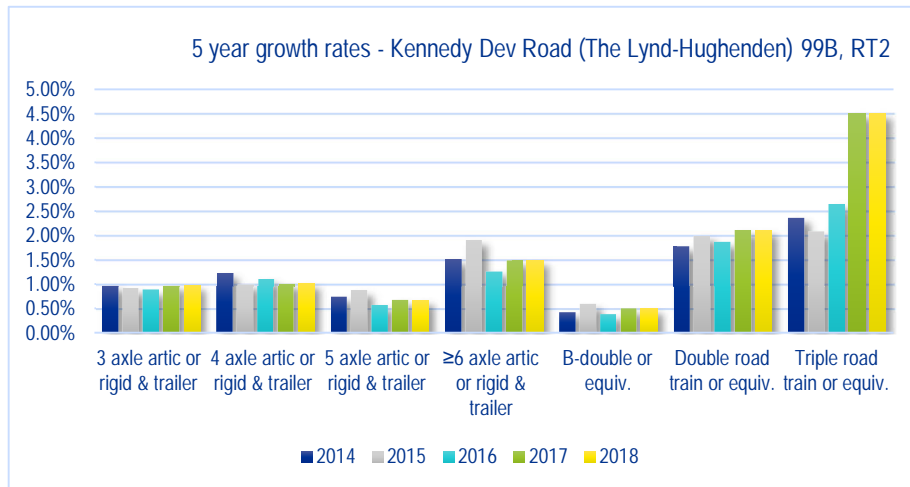


Figure 8-22 5 year growth rates - Kennedy Dev Road (The Lynd - Hughenden) 99B



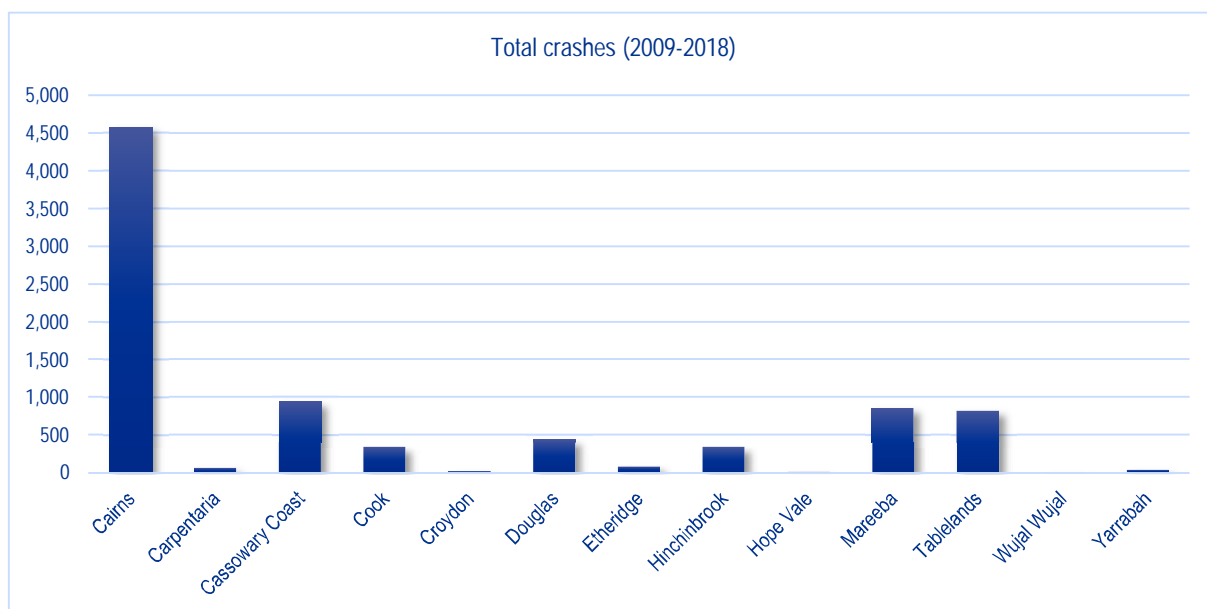
9. Crash analysis

Crashes can impact all road users either being directly involved in an incident, or indirectly through road closures and delays. Crashes involving heavy vehicles are not always directly related to the quality of the road infrastructure. Recent analysis⁸³ suggests:

- Losses arising from the actions/behaviour of drivers (fatigue, inappropriate speed and driver error) continue to represent most losses, remaining steady at around 54% of all losses since 2009
- Mechanical failure losses increased from 3.5% to 6.5% of all losses with steer tyre failures being the predominant underlying cause
- The proportion of losses attributed to fatigue is 14.8%
- Roll over while tipping accidents remain around 5%
- The proportion of large losses involving multiple vehicles has continued to grow, increasing by 12% over the 2015 data to now constitute 37% of losses
- For fatal multi-vehicle incidents, the third-party vehicle was at fault 83% of the time
- The findings do not explicitly align crashes to road characteristics, although driver behaviour is likely to be partly in response to the quality of the infrastructure.

Over 8,500 crashes occurred within the FNQROC region over the 10-year period January 2009 to June 2018⁸⁴, with around 55% occurring within in the Cairns Region. Cassowary Coast, Mareeba Shire and Tablelands each incur around 10%. Almost 16% of total crashes is jointly attributed to the remaining councils.

Figure 9-1 Total crashes in FNQROC (2009-2018)



These crashes resulted in over 10,000 casualties of varying severity.

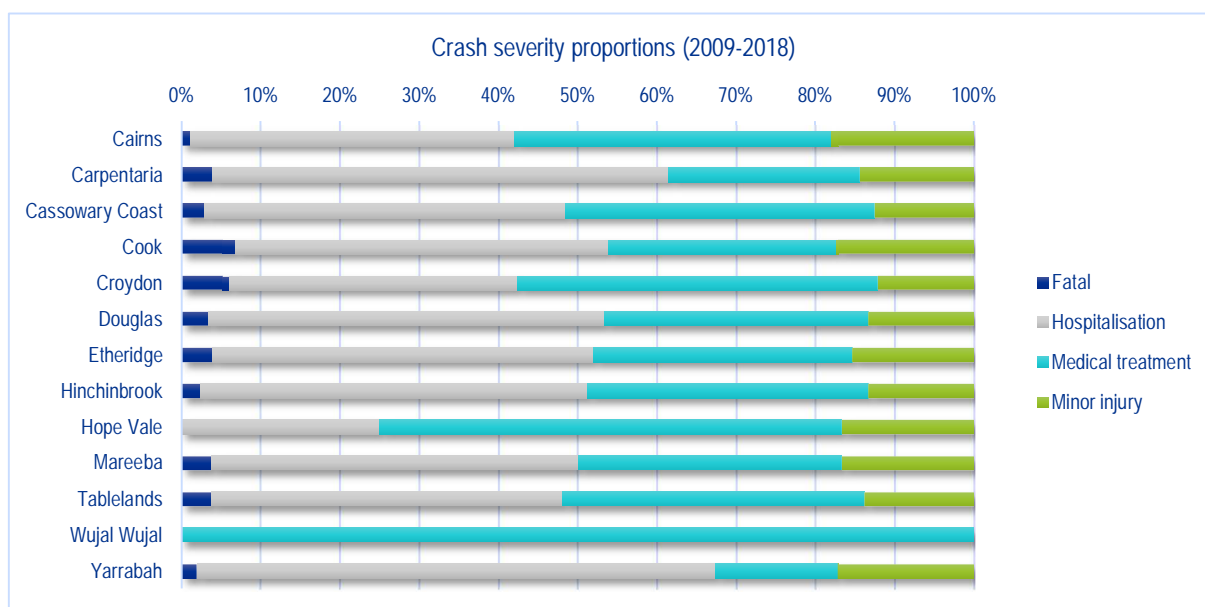
⁸³ <https://www.nationaltransportinsurance.com.au/getmedia/051587db-9583-4ac1-afa5-7660e118c8d9/NTI1183-NTARC-Accident-Report-297x210-4C-FINAL.pdf>

⁸⁴ Crash data is sourced from the Qld Government's Open Data Portal.

Table 9-1 Total crashes by severity (2009-2018)

Council	Fatal	Hospitalisation	Medical treatment	Minor injury	Total casualties
Cairns	57	2,074	2,035	913	5,079
Carpentaria	4	60	25	15	104
Cassowary Coast	31	491	422	135	1,079
Cook	31	215	132	79	457
Croydon	2	12	15	4	33
Douglas	20	295	197	79	591
Etheridge	4	50	34	16	104
Hinchinbrook	11	219	159	60	449
Hope Vale	0	6	14	4	24
Mareeba	42	521	374	188	1,125
Tablelands	36	429	368	134	967
Wujal Wujal	0	0	2	0	2
Yarrabah	1	34	8	9	52
Total	239	4,406	3,785	1,636	10,066

Figure 9-2 Crash severity proportions (2009-2018)



Crashes are assessed within the Definitions for Coding Accidents (DCA) system, based on the traffic movements leading up to the crash. Table 9-2 below shows each Council's top three most frequently occurring crash type, and the proportion of crashes within each Council's boundary.

Table 9-2 Rank and frequency of crash DCA codes (2009-2018)

Council		1	2	3
Cairns	DCA Description and code	Veh'S Same Direction: Rear End (301)	Veh'S Opposite Approach: Thru-Right (202)	Veh'S Adjacent Approach: Thru-Thru (101)
	% council crashes	17%	10%	8%
Carpentaria	DCA Description and code	Off Path-Straight: Out Of Control On Cway (705)	Off Path-Straight: Left Off Cway Hit Obj (703)	Veh'S On Path: Temporary Object On C'Way (607)
	% council crashes	17%	9%	8%
Cassowary Coast	DCA Description and code	Off Path-Straight: Left Off Cway Hit Obj (703)	Veh'S Same Direction: Rear End (301)	Veh'S Opposite Approach: Head On (201)
	% council crashes	10%	9%	8%
Cook	DCA Description and code	Off Path-Straight: Out Of Control On Cway (705)	Off Path-Curve: Out Of Control On Cway (805)	Veh'S On Path: Temporary Object On C'Way (607)
	% council crashes	15%	13%	8%
Croydon	DCA Description and code	Off Path-Straight: Out Of Control On Cway (705)	Off Path-Straight: Other (700)	Off Path-Straight: Right Off Cway (702)
	% council crashes	23%	9%	9%
Douglas	DCA Description and code	Veh'S Opposite Approach: Head On (201)	Off Path-Curve: Off Cway Rt Bend Hit Obj (803)	Off Path-Curve: Off Cway Lt Bend Hit Obj (804)
	% council crashes	11%	8%	8%
Etheridge	DCA Description and code	Off Path-Curve: Out Of Control On Cway (805)	Off Path-Straight: Left Off Cway Hit Obj (703)	Off Path-Straight: Out Of Control On Cway (705)
	% council crashes	17%	10%	10%
Hinchinbrook	DCA Description and code	Veh'S Adjacent Approach: Thru-Thru (101)	Veh'S Same Direction: Rear End (301)	Off Path-Straight: Left Off Cway Hit Obj (703)
	% council crashes	1%	1%	1%
Hope Vale	DCA Description and code	Off Path-Straight: Other (700)	Off Path-Straight: Left Off Cway Hit Obj (703)	Pass & Misc: Fell In/From Vehicle (901)
	% council crashes	17%	17%	17%
Mareeba	DCA Description and code	Off Path-Curve: Off Cway Rt Bend Hit Obj (803)	Veh'S Opposite Approach: Head On (201)	Veh'S Same Direction: Rear End (301)
	% council crashes	10%	7%	7%
Tablelands	DCA Description and code	Off Path-Curve: Off Cway Rt Bend Hit Obj (803)	Veh'S Opposite Approach: Head On (201)	Off Path-Curve: Off Cway Lt Bend Hit Obj (804)
	% council crashes	13%	8%	7%
Wujal Wujal	DCA Description and code	Off Path-Straight: Right Off Cway Hit Obj (704)	Ped'N: Hit Other (0)	Ped'N: Near Side Vehicle Hit From Right (1)
	% council crashes	100%	0%	0%
Yarrabah	DCA Description and code	Off Path-Curve: Off Cway Rt Bend Hit Obj (803)	Ped'N: Play; Work; Stand; Lie On C'Way (4)	Off Path-Straight: Left Off Cway Hit Obj (703)
	% council crashes	14%	11%	9%

Table 9-3 presents the top 3 DCA codes by number of casualties.

Table 9-3 Rank by number of casualties of crash DCA codes

Council		1	2	3
Cairns	DCA Description and code	Veh'S Same Direction: Rear End (301)	Veh'S Opposite Approach: Thru-Right (202)	Veh'S Adjacent Approach: Thru-Thru (101)
	% council crashes	17%	11%	9%
Carpentaria	DCA Description and code	Veh'S Same Direction: Rear End (301)	Veh'S Opposite Approach: Thru-Right (202)	Veh'S Adjacent Approach: Thru-Thru (101)
	% council crashes	2%	0%	2%
Cassowary Coast	DCA Description and code	Veh'S Opposite Approach: Head On (201)	Veh'S Same Direction: Rear End (301)	Off Path-Straight: Left Off Cway Hit Obj (703)
	% council crashes	12%	10%	9%
Cook	DCA Description and code	Off Path-Straight: Out Of Control On Cway (705)	Off Path-Curve: Out Of Control On Cway (805)	Off Path-Curve: Off Cway Rt Bend Hit Obj (803)
	% council crashes	16%	14%	9%
Croydon	DCA Description and code	Off Path-Straight: Out Of Control On Cway (705)	Off Path-Curve: Out Of Control On Cway (805)	Off Path-Straight: Other (700)
	% council crashes	21%	15%	9%
Douglas	DCA Description and code	Veh'S Opposite Approach: Head On (201)	Off Path-Curve: Off Cway Rt Bend Hit Obj (803)	Veh'S Same Direction: Rear End (301)
	% council crashes	16%	9%	7%
Etheridge	DCA Description and code	Off Path-Curve: Out Of Control On Cway (805)	Off Path-Straight: Left Off Cway Hit Obj (703)	Off Path-Curve: Off Cway Lt Bend Hit Obj (804)
	% council crashes	19%	11%	11%
Hinchinbrook	DCA Description and code	Veh'S Adjacent Approach: Thru-Thru (101)	Off Path-Curve: Off Cway Rt Bend Hit Obj (803)	Off Path-Straight: Left Off Cway Hit Obj (703)
	% council crashes	1%	1%	1%
Hope Vale	DCA Description and code	Off Path-Curve: Out Of Control On Cway (805)	Off Path-Straight: Other (700)	Off Path-Straight: Left Off Cway Hit Obj (703)
	% council crashes	25%	17%	17%
Mareeba	DCA Description and code	Off Path-Curve: Off Cway Rt Bend Hit Obj (803)	Veh'S Opposite Approach: Head On (201)	Veh'S Same Direction: Rear End (301)
	% council crashes	12%	10%	7%
Tablelands	DCA Description and code	Off Path-Curve: Off Cway Rt Bend Hit Obj (803)	Veh'S Opposite Approach: Head On (201)	Off Path-Curve: Off Cway Lt Bend Hit Obj (804)
	% council crashes	15%	12%	6%
Wujal Wujal	DCA Description and code	Off Path-Straight: Right Off Cway Hit Obj (704)	Ped'N: Hit Other (0)	Ped'N: Near Side Vehicle Hit From Right (1)
	% council crashes	100%	0%	0%
Yarrabah	DCA Description and code	Off Path-Curve: Off Cway Rt Bend Hit Obj (803)	Off Path-Curve: Out Of Control On Cway (805)	Ped'N: Play; Work; Stand; Lie On C'Way (4)
	% council crashes	12%	12%	10%

9.1 Comparing the relative crash risk

Comparing the relative crash risk between roads is usually more complex than solely comparing the number of crashes. Urban roads with high-volumes of traffic incur more crashes simply because of the higher number of vehicles. To be meaningful, the crash history needs to be considered with an exposure/probability element over the same historical time period.

A typical approach is applying trip demand to the associated crash history. Trip demand is usually measured by vehicle-kilometres-travelled (VKT), which is historical average annual daily traffic (AADT) multiplied by the road length. This forms the basis for two formulae used in the SCR analysis:

- 1)
$$\frac{\text{No. crashes over } n \text{ years}}{\text{Total VKT over } n \text{ years}} = \text{average crash/vkt}$$
- 2)
$$\frac{\text{No. crashes over } n \text{ years by severity}}{\text{Total VKT over } n \text{ years}} = \text{average crash cost/vkt}$$

Estimating VKT requires traffic counts that are both reliable and match the crash history. The State-controlled network has traffic count history, although occasionally counts are simply adopted from previous years rather than undertaking new counts. Council roads generally have little or no reliable traffic count data, making the two formulae redundant.

As an alternative, the relative crash risk is assessed with road length as a proxy exposure element. There is some bias towards shorter roads which are typically urban, however these are often the same roads with higher trip demand. The revised formulae used in both the SCR and Council road analysis are:

- 3)
$$\frac{\text{No. crashes over } n \text{ years}}{\text{Road length}} = \text{average crash/km}$$
- 4)
$$\frac{\text{No. crashes over } n \text{ years by severity}}{\text{Road length}} = \text{average crash cost/km}$$

9.1.1 State controlled roads (SCR)

Applying formulae 1 and 2 to the SCR sees Shiptons Flat Road with the highest crash/VKT. This is somewhat reflective of low traffic volumes. Its costs reflect one fatality and nine hospitalisations over the 10-year period.

Figure 9-3 Top 20 SCR crashes per million VKT (2009-2018)

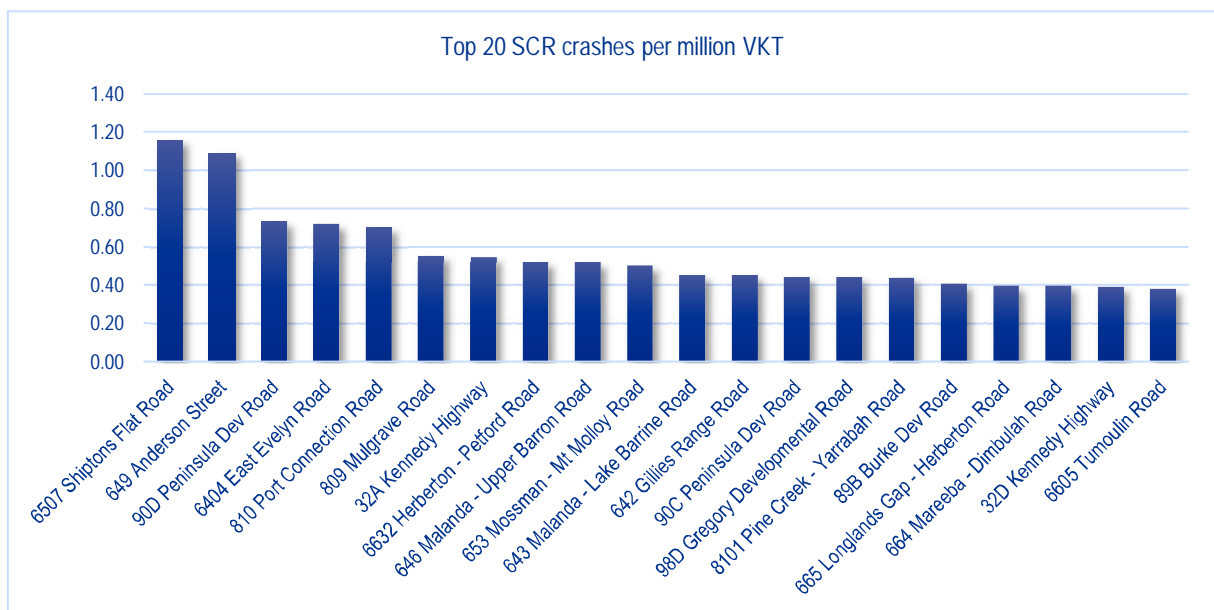
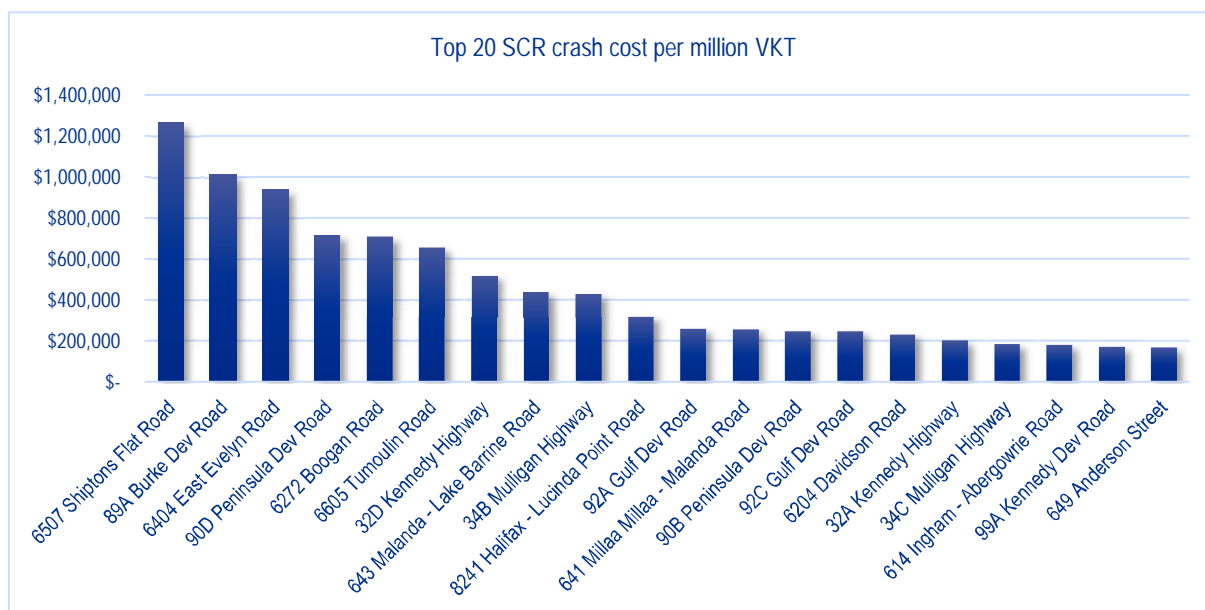


Figure 9-4 Top 20 SCR crash cost per million VKT (2009-2018)



Applying formulae 3 and 4 generate substantially different results that illustrate bias towards shorter, high volume urban roads. The top four roads with highest annual average cost/km also have the highest crash rates/km.

Figure 9-5 SCR annual average crashes/km (2009-2018)

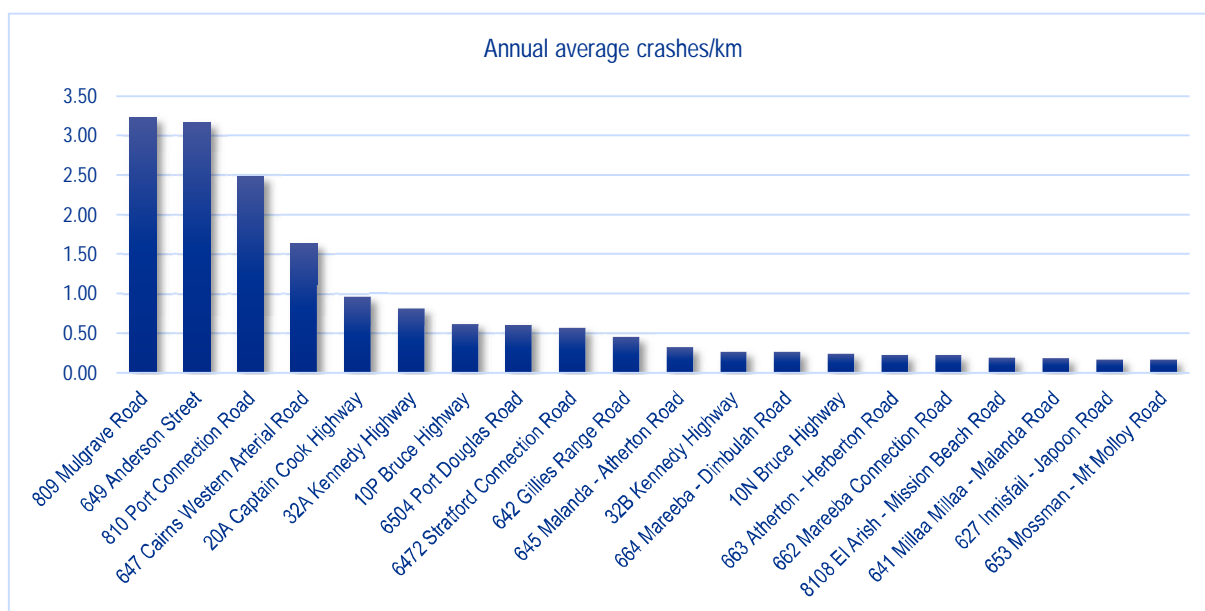
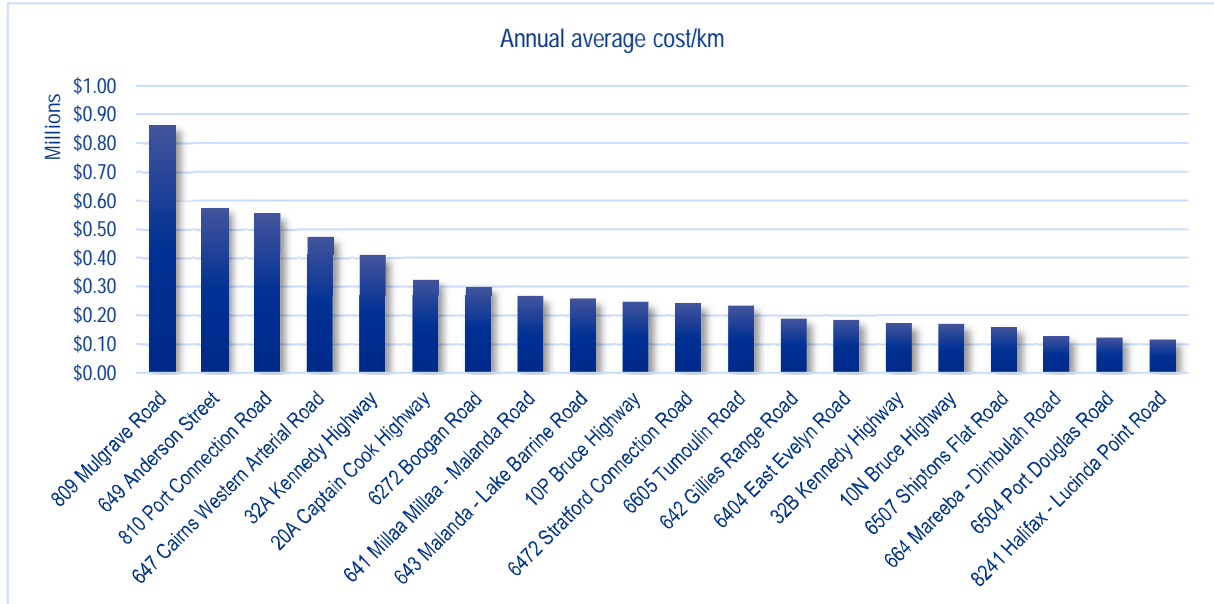


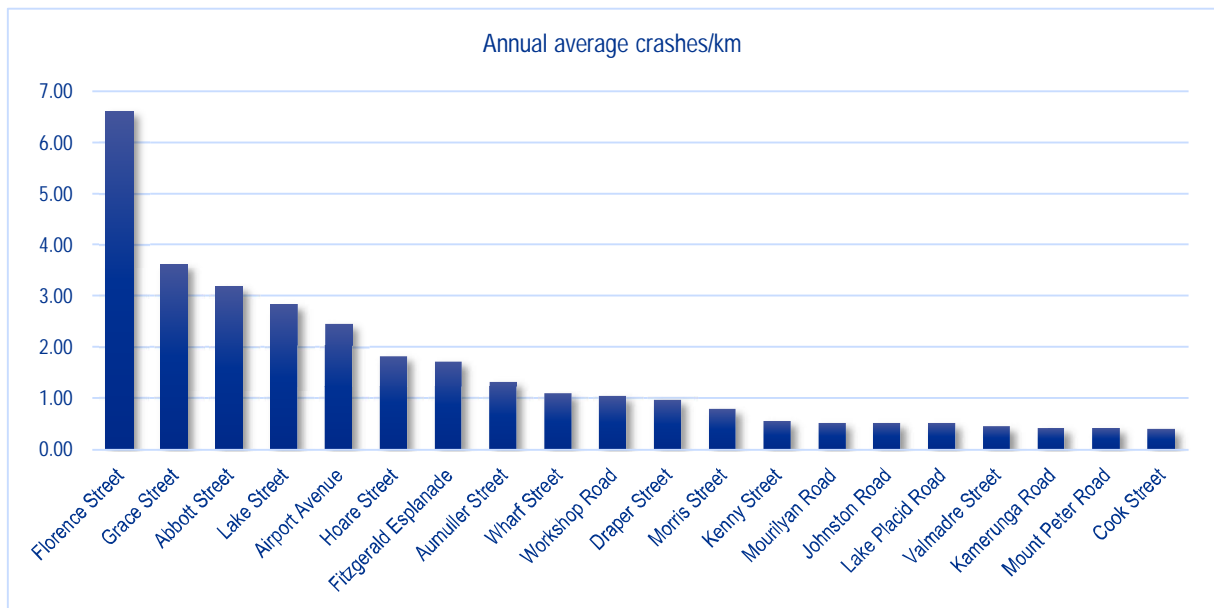
Figure 9-6 SCR annual average cost/km (2009-2018)



9.1.2 Council roads

Formulae 3 and 4 have been applied to the assessed Council road network⁸⁵. As with the SCR, shorter urban roads dominate the top 20 rankings.

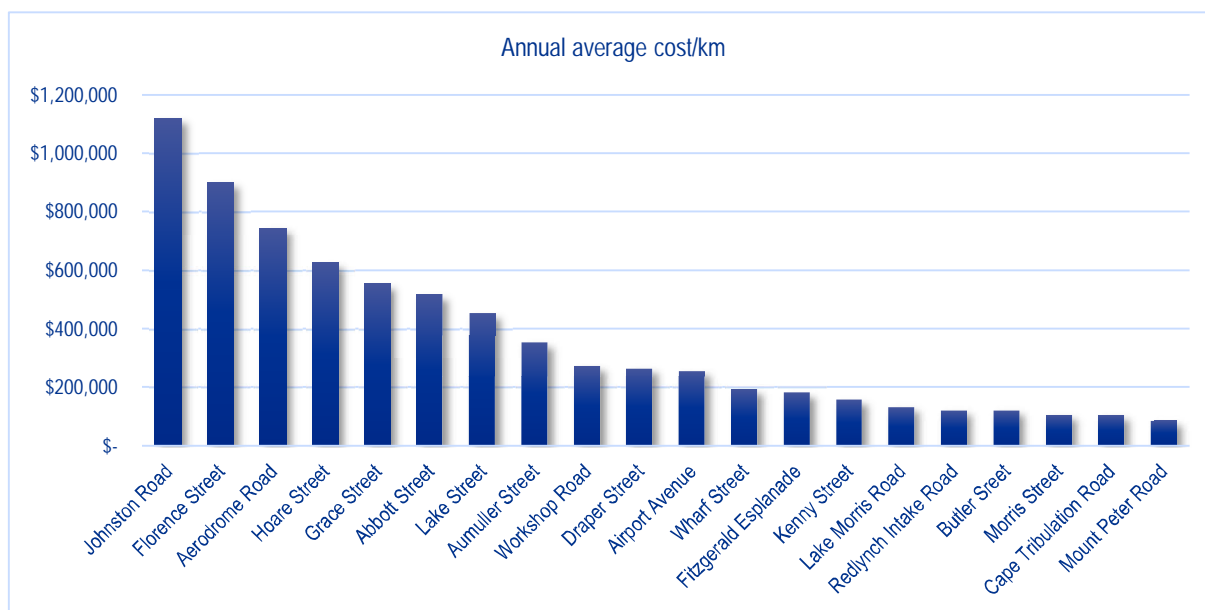
Figure 9-7 Top 20 Council roads annual average crashes/km (2009-2018)



Illustrated in Figure 9-8, Johnston Road has a notably higher annual average cost/km despite only 5 crashes occurring on this road during the analysis period. This is attributable to a fatality and several hospitalisations along this relatively short road (0.95km).

⁸⁵ The assessed road network is explained within Section 12.1.

Figure 9-8 Council roads annual average crash cost/km (2009-2018)



10. Heavy Vehicle Infrastructure Ratings (HVIR)

As part of the Council of Australian Government's (COAG) Heavy Vehicle Road Reforms, the Transport Infrastructure Council's⁸⁶ has introduced the Heavy Vehicle Infrastructure Rating (HVIR) which is an indication of the level of service provided by road infrastructure to heavy vehicles.

The HVIR provides an overview of level of service provided to heavy vehicle operators across various road categories. It is updated annually, and is based on three service attributes:

- Access is the size and mass of vehicles that can be legally and/or physically accommodated by a road
- Ride quality is a measure of the comfort experienced by the occupants of a vehicle. It is different from roughness, which is a characteristic of the road surface, because it includes the vehicle's response to the road roughness.
- Safety is measured by lane and shoulder width

The HVIR is measured with weightings applied to each attribute:

$$HVIR (\%) = 100 \times (0.4A + 0.4R + 0.2S)$$

Road segments are measured in 100 metre lengths and receive a score as:

- High is above the expected range
- Medium within the expected range
- Low is below the expected range

Each road segment is also scored according to its classification as described in Table 10-1.

Table 10-1 HVIR road category definitions

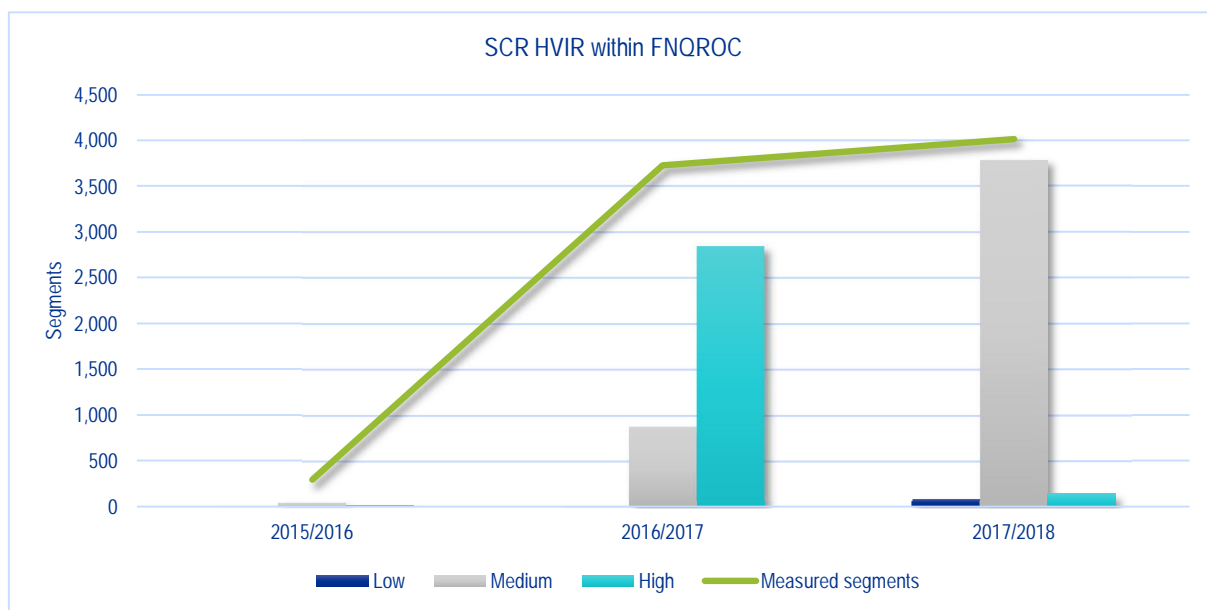
Category	Road features
Freeways	Divided carriageway with 2 or more lanes in each direction and wide, sealed shoulders; high capacity and high speed.
Urban Highways	Divided or separated carriageway with 2 or more lanes in each direction, no requirements for shoulders; high capacity and high speed.
Urban arterials and rural highways	Single carriageway with 1 lane in each direction, may have sealed or unsealed shoulders; medium capacity and high speed.
Collector and distributor roads	Single carriageway with 1 lane in each direction, may have sealed or unsealed shoulders; medium capacity and medium speed.
Access roads	Single carriageway with 1 lane in each direction, no requirements for shoulders; low capacity and low speed.

Data has progressively been collected commencing from 2015/16. Data has been progressively applied to the HVIR framework, where over 99% of the network has been assessed by 2018.

There is a notable difference in ratings between 2016 and 2017. Although 76% of the measured segments are rated as high in 2016, only 3% obtain the same rating in 2017. This suggests a change in rating methodology or better data collection. No information is available to confirm which is the case.

⁸⁶ https://www.transportinfrastructurecouncil.gov.au/publications/heavy_vehicle_road_reform_phase_one

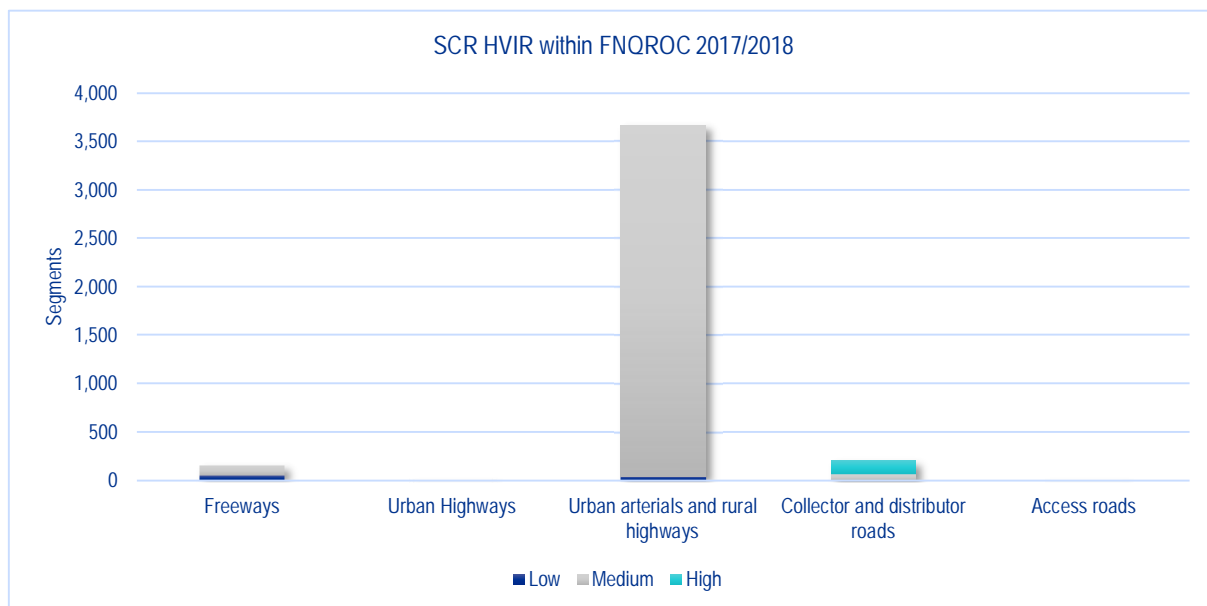
Figure 10-1 HVIR within FNQROC



The data discrepancy means that a trend progression cannot be reliably observed.

The latest data is illustrated in Figure 10-2, showing that the bulk of the segments are urban arterials and rural highways and over 94% is rated as medium. Only 2% is rated as low.

Figure 10-2 SCR HVIR within FNQROC 2017/2018



11. Planned and proposed heavy vehicle network investments

11.1 Strategic review

The review of the planning and freight strategies discussed above identified a number of specific heavy road network investments. These are listed by planning/freight strategy in the table below.

Table 11-1 Planned, proposed and assessed heavy vehicle road network investments

Planning / Freight Strategy	Planned / proposed / assessed heavy road network investment
Our North, Our Future: A White Paper on Developing Northern Australia	Include over \$3bn for northern sections of the Bruce Highway the Kennedy Development Road (known locally as the Hann highway) which runs north from Hughenden to the Mount Garnet in Far North Queensland. Part of the \$600m roads package to improve key roads in the north.
Norther Australia Roads of Strategic importance (ROSI) - DIRDC	Cooktown to Weipa Corridor Upgrade to deliver targeted upgrades to the Mulligan Highway and Peninsula Developmental Road (PDR) and surrounding roads. Estimated Project Cost: \$237.5m (potentially includes future stages of the Cape York Regional Package). Cairns to Northern Territory Border Corridor Upgrade to deliver targeted upgrades to Gulf Developmental Road, Burke Developmental Road (sealing between Almaden to Chillagoe) and Kennedy Highway. Allocated funding is \$62.5m (\$50m Commonwealth funded). The early works package includes two projects on the Gulf Developmental Road to dual lane seal single lanes between Georgetown and Croydon (estimated cost of \$22.5m).
Transport Network Strategic Investment Tool – Application to Northern Australian Beef Roads Programme (CSIRO)	Ootann Road, heading south from Almaden to the Kennedy Highway is currently unsealed with 91km of gravel - savings per head \$7.83. Sealing unsealed sections of the Burke Developmental Road Chillagoe and Almaden - savings per head \$0.35 Unsealed sections of the Richmond to Croydon Road – savings per head \$3.24
Cape York Regional Plan 2014	\$215.5m program of works to progressively seal sections of the PDR between Laura and the Rio Tinto boundary, south of Weipa. \$10m over four years for sealing works on sections of the Endeavour Valley Road between Cooktown and Hope Vale.
IA Infrastructure Priority List	Progressive priority upgrades to the Bruce Highway to address specific capacity constraints, flood resilience and safety concerns. Major planned works include the Edmonton to Gordonvale duplication and Ingham to Cardwell Range deviation. The National Freight and Supply Chain Strategy seeks to develop a 'whole of network' strategy that examines Australia's freight and supply chains. The Queensland inland road network upgrade initiative includes the Kennedy Highway and Developmental Road, the Gregory Highway and Developmental Road, the Gulf Developmental Road, Ootann Road, Richmond-Croydon Road and Burke Developmental Road.
FNQROC Federal Election Priorities 2019 and State Priorities for FNQ 2019	Kuranda Range Road – Funding by State and Federal Government for an allocation of \$21 million for a Strategic Assessment of Service Requirements (SASR), and Preliminary Evaluation and Business Case. Gulf Developmental Road: State and Federal Governments to a) the reinstatement of a Western Roads Program with an annual allocation of \$8 million per year for 5 years be attributed to the Gulf Developmental Road to upgrade 48km of single sealed road to dual seal, and b) the allocation of \$25 million to upgrade the Gilbert River Bridge from single to dual lane carriageway.

Planning / Freight Strategy	Planned / proposed / assessed heavy road network investment
	<p>Burke Developmental Road: State and Federal Governments for an allocation of \$17 million to complete the sealing of 11.04km on Burke Developmental Road between Dimbulah and Chillagoe.</p> <p>Extension of the National Land Transport Network to Cairns Airport and Smithfield and investment of \$72 million (80/20) in support of capacity enhancements on this road corridor.</p>
Croydon Shire	<p>Gulf Development Road links Croydon Shire. The road is sealed, though a few small sections in adjoining shires remain one lane, and need upgrading. To improve the safety and accessibility of this road for all users Council desires that the entire road be upgraded to two lanes (one each direction).</p> <p>Richmond-Croydon Road is a major cattle corridor and is being progressively sealed.</p>
Douglas Shire Council	<p>Upgrading the Captain Cook Highway to a higher standard has the potential to significantly detract from its scenic appeal. The reduced vehicle capacity of the highway has implications for development and population capacity.</p> <p>Other significant roads include the Mossman-Mount Molloy Road, the Mossman-Daintree Road, Bailey Creek and Cape Tribulation Roads.</p>
Inland Queensland Road Network Strategy – July 2018	<p>The strategy identifies \$862m in FNQ and \$1bn in North West (the majority in the next 5-15 years) road network infrastructure. Significant expenditures include:</p> <ul style="list-style-type: none"> • 10m Kennedy Hwy (Cairns to Mareeba) - widening and overtaking lanes • \$44m Kennedy Hwy (Mareeba to Ravenshoe) - widening, sealing, bridge replacement • \$75m Ootann Road (Bourke Developmental Road to Kennedy Highway) - sealing • \$87m Gregory Developmental Rd (The Lynd to Quartz Blow Ck) - widening • \$79m Burke Developmental Rd (Cloncurry to Normanton) - widening, bridge widen/replacement • \$135m Wills Developmental Rd (Julia Creek to Burketown) - widening, bridge widen/replacement • \$548m Burke Developmental Rd (Normanton to Dimbulah) - widening, bridge widen/replacement • \$86m Gulf Developmental Rd (Croydon to Georgetown) - widen/sealing, bridge widen/replacement • \$14m Kennedy Hwy (Ravenshoe to Mt Garnet) - widen/overlaying, bridge widen/replacement • \$157m Savannah Way (Burketown to Normanton) - pave/sealing • \$147m Richmond-Croydon Road - widening • \$81m Gregory Developmental Rd (Charters Towers to The Lynd) - widening, bridge widen/replacement • \$88m Kennedy Developmental Rd (The Lynd to Hughenden) - widening, bridge widen/replacement • \$12m Kennedy Developmental Rd (Mt Garnet to The Lynd) - widening, bridge widen/replacement • \$132m Gulf Developmental Rd (Georgetown to Mt Garnet) 92C widening, bridge widen/replacement • \$4m Gulf Developmental Rd (Normanton to Croydon) 92A widening, bridge widen/replacement, realignment through Croydon

11.2 Completed and planned

The Queensland Transport and Roads Investment Program 2019-2020 to 2022-2023 (QTRIP) details the current transport and road infrastructure projects that the Queensland Government plans to deliver over the

next 4 years.⁸⁷ QTRIP investments are separated into the National Network and State Network programs. The National Network includes the Bruce Highway, a component of many popular tourist routes. The State Network incorporates the strategic road network across Far North Queensland.

The review of the Queensland Transport and Roads Investment Program (QTRIP), Far North and North West district program highlights and National and State Network Programs identified several planned and completed FNQ heavy road network investments.

District program highlights

In 2018–19, the following heavy vehicle road network works were completed:

- Sealing of Endeavour Valley Road between Cooktown and Hope Vale, jointly funded by the Australian Government and Queensland Government
- Upgrade works at priority locations on the Peninsula Developmental Road, including Piccaninny Black Soil, South of Duck Holes and 10 Mile Creek, jointly funded by the Australian Government and Queensland Government.
- Sealing and widening of a four-kilometre section of Richmond-Croydon Road, jointly funded by the Australian Government and Queensland Government

In 2019–20, the following heavy vehicle road network works are planned:

- Commence construction of the Bruce Highway – Cairns Southern Access Corridor (stage 3) (Edmonton to Gordonvale) project, jointly funded by the Australian Government and Queensland Government
- Continue construction of the Bruce Highway – Cairns Southern Access Corridor (stage 4) (Kate Street to Aumuller Street), jointly funded by the Australian Government and Queensland Government
- Commence widening and sealing works on Burke Developmental Road between Chillagoe and Almaden, jointly funded by the Australian Government and Queensland Government
- Continue paving and sealing sections of Peninsula Developmental Road between Telecom Tower and Archer River, and Fairview West (part A), jointly funded by the Australian Government and Queensland Government
- Commence road safety improvements on the Kennedy Highway between Kuranda and Mareeba
- Commence design for road safety improvements on Gillies Range Road
- Continue upgrading six rest areas and installation of two new rest areas on the Bruce Highway between Cardwell and Cairns funded by the Australian Government
- Commence construction of a new overtaking lane on the Bruce Highway near Smith's Gap, including construction of a fauna crossing
- Continue road safety improvements on the Captain Cook Highway
- Complete paving and sealing sections of the Kennedy Developmental Road (Hann Highway) between The Lynd and Hughenden, jointly funded by the Australian Government and Queensland Government

Also, in 2019–20, the following heavy vehicle road network planning is planned:

- Commence an investment and maintenance strategy for the Burke Developmental Road between Normanton and the Carpentaria and Mareeba Shire boundary
- Continue planning for widening sections of Burke Developmental Road (Cloncurry – Normanton), between Burke and Wills, and Normanton section

⁸⁷ <https://publications.qld.gov.au/dataset/queensland-transport-and-roads-investment-program-qtrip-2018-19-to-2021-22/resource/d50c165f-4055-45c3-a5e8-63716f08d1d8>
<https://publications.qld.gov.au/dataset/queensland-transport-and-roads-investment-program-qtrip-2018-19-to-2021-22/resource/b4796e38-5eed-464d-ab2d-5e83c06b5d51>

- Commence planning for widening and upgrading of floodways on sections of Burke Developmental Road (Cloncurry – Normanton)
- Descriptions of the proposed QTRIP works and locations are within the following tables.

Table 11-2 QTRIP National Network

Local government	Heavy vehicle access level	Investment name/location	Location description	Indicative total cost \$'000	Estimated expenditure to 30 June 2019	Approved 2019-20	Indicative 2020-21	Indicative 2021-22 to 2022-23	Beyond	Work description
Hinchinbrook Shire	B25 and lower	Bruce Highway (Townsville – Ingham)	Hechts Road – Yuruga Road (95.10 – 99.80km)	9,064	-	8	5,966	2,144	-	Widen pavement
	B25 and lower	Bruce Highway (Townsville – Ingham)	Yuruga Road – Easter Creek (101.30 – 102.50km)	1,945	-	10	1,271	425	-	Widen pavement
	B25 and lower	Bruce Highway (Townsville – Ingham)	Hechts Road – Yuruga Road (93.69 – 98.73km)	12,200	-	21	7,499	4,244	-	Construct overtaking lane/s
	B25 and lower	Bruce Highway (Townsville – Ingham)	Cartastis Road, Scrubview Road and Yuruga Road	132	-	1	85	45	-	Improve intersection/s
	B25 and lower	Bruce Highway (Townsville – Ingham)	Helens Hill rest area	475	-	238	238	-	-	Install/replace rest areas, stopping places and pull over areas
Cairns Regional Council	B25 and lower	Bruce Highway (Innisfail – Cairns)	Various intersections	1,000	-	250	500	250	-	Improve intersection/s
	B25 and lower	Bruce Highway (Innisfail – Cairns)	Cairns Southern Access (stage 3) (Edmonton – Gordonvale)	481,000	36,745	37,895	90,587	190,773	125,000	Duplicate from two to four lane/s

Local government	Heavy vehicle access level	Investment name/location	Location description	Indicative total cost \$'000	Estimated expenditure to 30 June 2019	Approved 2019-20	Indicative 2020-21	Indicative 2021-22 to 2022-23	Beyond	Work description
	B25 and lower	Bruce Highway (Innisfail – Cairns)	Cairns Southern Access (stage 4) (Kate Street – Aumuller Street)	104,070	29,736	30,301	18,680	25,353	-	Widen from four to six lanes
	B25 and lower	Bruce Highway (Innisfail – Cairns)	Munro Street (Babinda)	3,881	229	1,091	2,133	428	-	Improve intersection/s
	B25 and lower	Bruce Highway (Innisfail – Cairns)	Northbound overtaking lane (43.95 – 45.15km)	4,865	4,195	50	50	570	-	Construct overtaking lane/s
	B25 and lower	Bruce Highway (Innisfail – Cairns)	Cairns Southern Access (stage 5) (Foster Road intersection)	225,000	-	-	-	10,000	215,000	Grade separation – road works
	B25 and lower	Bruce Highway (Innisfail – Cairns)	Coombs Street	1,158	-	250	760	148	-	Improve intersection/s
Cassowary Coast Council	B25 and lower	Bruce Highway (Ingham – Innisfail)	Smith's Gap	9,885	599	47	3,907	5,332	-	Construct overtaking lane/s
	B25 and lower	Bruce Highway (Ingham – Innisfail)	Victoria Street (Cardwell)	321	-	321	-	-	-	Improve intersection/s
	B25 and lower	Bruce Highway (Ingham – Innisfail)	Innisfail (139.6 – 147.40km)	1,312	1,253	59	-	-	-	Widen pavement

Local government	Heavy vehicle access level	Investment name/location	Location description	Indicative total cost \$'000	Estimated expenditure to 30 June 2019	Approved 2019-20	Indicative 2020-21	Indicative 2021-22 to 2022-23	Beyond	Work description
	B25 and lower	Bruce Highway (Ingham – Innisfail)	Innisfail – Japoon Road and McGowan Drive	3,959	252	2,871	456	380	-	Improve intersection/s
	B25 and lower	Bruce Highway (Ingham – Innisfail)	Centenary Bridge (South Johnstone River bridge)	450	-	450	-	-	-	Strengthen bridge/s
	B25 and lower	Bruce Highway (Ingham – Innisfail)	Bamboo River Creek	450	-	450	-	-	-	Replace bridge/s
	B25 and lower	Bruce Highway (Ingham – Innisfail)	Dallachy Road	11,000	368	275	3,406	6,950	-	Install floodway/s
	B25 and lower	Bruce Highway (Ingham – Innisfail)	Behana Creak – Edmonton (55.30 – 73.20km)	3,150	2,924	226	-	-	-	Replace/upgrade guardrail section/s and end/s
	B25 and lower	Bruce Highway (Ingham – Innisfail)	Bluff Road	448	-	345	103	-	-	Improve intersection/s
	B25 and lower	Bruce Highway (Ingham – Innisfail)	North of Innisfail (Sections 5.73 0 12.69km)	1,731	190	780	764	-	-	Improve intersection/s

Table 11-3 QTRIP State Network

Local government	Heavy vehicle access level	Investment name/location	Location description	Indicative total cost \$'000	Estimated expenditure to 30 June 2019	Approved 2019-20	Approved 2020-21	Indicative 2021-22 to 2022-23	Beyond	Work description
Carpentaria Shire	One Tonne MTN	Burke Developmental Road (Cloncurry to Normanton)	239.77 – 248.96km	11,240	-	-	-	11,240	-	Widen pavement
Cairns Regional Council	B25 and lower	Cairns Western Arterial Road	Lennon Street	356	69	252	35			Improve intersection/s
	B25 and lower	Cairns Western Arterial Road	Loridan Drive / View Street	1,257	849	309	100			Improve intersection/s
	B25 and lower	Cairns Western Arterial Road	Harley Street	16,357	337	3,353	9,031	3,636	-	Improve intersection/s
	B25 and lower, B23 only	Captain Cook Highway (Cairns – Mossman)	Sections: 0 – 6.80km	2,943	1,781	294	868	-	-	Install/retrofit pedestrian crossing/s and facilities
	B25 and lower, B23 only	Captain Cook Highway (Cairns – Mossman)	Sections: 6.80 – 25.70km	21,917	3,628	3,826	5,774	8,688	-	Improve intersection/s
	B32 only	Smithfield Bypass	McGregor Road – Caravonica roundabouts (0 – 3.80km)	152,000	31,029	46,275	42,381	32,315	-	Construct bypass – sealed standard
Cassowary Coast Regional Council	B25 and lower	El Arish – Mission Beach Road	11.47 – 11.85km	564	14	451	100	-	-	Install/replace signs
	B25 and lower	Palmerston Highway (Innisfail – Ravenshoe)	Various locations	1,084	200	884	-	-	-	Rehabilitate pavement

Local government	Heavy vehicle access level	Investment name/location	Location description	Indicative total cost \$'000	Estimated expenditure to 30 June 2019	Approved 2019-20	Approved 2020-21	Indicative 2021-22 to 2022-23	Beyond	Work description
Cook Shire	RT2 and lower	Peninsula Developmental Road (Coen – Weipa) (Stage 2)	Telecom Tower – Archer River	20,500	5,992	14,508				Pave and seal
	RT2 and lower	Peninsula Developmental Road (Lakeland – Laura)	Agnarra campground (45.72 – 45.73km)	250	-	150	100			Install/replace rest areas, stopping places and pull over areas
	RT2 and lower	Peninsula Developmental Road (Laura – Coen)	Fairview West (part A)	10,800	8,588	2,212	-	-	-	Pave and Seal
Douglas Shire	B25 and lower	Captain Cook Highway (Cairns – Mossman)	Various intersections (60.70 – 74.93km)	2,420	-	400	1,400	620	-	Improve intersection/s
Etheridge Shire Council	RT and lower	Gulf Developmental Road (Croydon – Georgetown)	Gilbert River Bridge (73.21km)	3,000	11	-	2,160	829	-	Strengthen bridge/s
	RT and lower	Gulf Developmental Road (Georgetown – Mount Garnet)	Routh Creek Bridge (19.59km)	1,200	15	-	1,185	-		Strengthen bridge/s
	RT and lower	Kennedy Developmental Road (The Lynd – Hughenden)	2.24 – 75.45km	736	-	736	-	-	-	Strengthen bridge/s

Local government	Heavy vehicle access level	Investment name/location	Location description	Indicative total cost \$'000	Estimated expenditure to 30 June 2019	Approved 2019-20	Approved 2020-21	Indicative 2021-22 to 2022-23	Beyond	Work description
Mareeba Shire Council	HML Other declared roads	Burke Developmental Road (Normanton – Dimbulah) (package 1)	Chillagoe – Almaden (566.55 – 570.00km)	4,734	741	2,877	1,116	-	-	Widen pavement
	HML Other declared roads	Burke Developmental Road (Normanton – Dimbulah) (package 2)	Chillagoe – Almaden (584.30 – 586.10km)	2,726	482	2,244	-	-	-	Widen pavement
	B25 or lower	Kennedy Highway (Cairns – Mareeba)	Kuranda Road / Rob Veivers Road / Myola Road	300	57	203	40	-	-	Improve intersection/s
	B25 or lower	Kennedy Highway (Cairns – Mareeba)	Various locations	474	-	426	47	-	-	Install/upgrade audio tactile line marking and rumble strips
	B25 or lower	Kennedy Highway (Cairns – Mareeba)	10.20 – 27.35km	6,996	-	1,480	2,059	3,457	-	Install/upgrade audio tactile line marking and rumble strips
	B25 or lower	Kennedy Highway (Cairns – Mareeba)	27.19 – 33.95km	8,760	-	200	150	8,410	-	Install/upgrade audio tactile line marking and rumble strips

Local government	Heavy vehicle access level	Investment name/location	Location description	Indicative total cost \$'000	Estimated expenditure to 30 June 2019	Approved 2019-20	Approved 2020-21	Indicative 2021-22 to 2022-23	Beyond	Work description
	B25 or lower	Kennedy Highway (Cairns – Mareeba)	31.12 – 36.80km	8,049	-	1,070	2,580	4,399	-	Install/upgrade audio tactile line marking and rumble strips
	B25 or lower	Kennedy Highway (Cairns – Mareeba)	37.77 – 40.74km	8,008	-	170	1,130	6,708	-	Improve intersection/s
	B25 or lower	Kennedy Highway (Cairns – Mareeba)	41.82 – 43.80km	4,158	-	300	1,244	2,614	-	Install/upgrade audio tactile line marking and rumble strips
	B25 or lower	Kennedy Highway (Cairns – Mareeba)	44.30 – 48.84km	7,477	-	300	150	7,027	-	Install/upgrade audio tactile line marking and rumble strips
	B25 or lower	Kennedy Highway (Mareeba – Ravenshoe)	1.40 – 6.20km	160	-	61	62	37	-	Install/upgrade audio tactile line marking and rumble strips
	RT1 and lower	Mareeba – Dimbulah Road	42.90 – 44.30km	3,499	-	400	2,292	807	-	Seal shoulder/s
	RT1 and lower	Mareeba – Dimbulah Road	Byrnes Street / Rankin Street	3,473	330	2,743	401	-	-	Improve intersection/s
	B23 only	Mossman – Mount Molloy Road	2.20 – 9.40km	704	509	155	40	-	-	Install/replace signs
	RT1 and lower	Mulligan Highway (Mount)	Rifle Creek Bridge	12,000	-	-	-	12,000	-	Replace bridge/s

Local government	Heavy vehicle access level	Investment name/location	Location description	Indicative total cost \$'000	Estimated expenditure to 30 June 2019	Approved 2019-20	Approved 2020-21	Indicative 2021-22 to 2022-23	Beyond	Work description
		Molloy – Lakeland)								
Tablelands Regional Council	B25 and lower	Kennedy Highway (Mareeba – Ravenshoe)	66.40 – 66.75km	329	-	38	215	76	-	Install/ replace signs
	B25 and lower	Kennedy Highway (Mareeba – Ravenshoe)	59.40 – 60.50km	368	-	85	198	85	-	Install guardrails
	B25 and lower	Kennedy Highway (Mareeba – Ravenshoe)	Belson Road	539	-	124	291	124	-	Improve intersection/s
	B25 and lower	Malanda – Atherton Road	Curtain Fig Tree Road	245	-	74	115	57	-	Improve channelisation

Table 11-4 QTRIP Local Road Network

Local government	Heavy vehicle access level	Investment name/location	Location description	Indicative total cost \$'000	Estimated expenditure to 30 June 2019	Approved 2019-20	Indicative 2020-21	Indicative 2021-22 to 2022-23	Beyond	Work description
Hinchinbrook Shire	B25 and lower	Four Mile Road	Various locations	318	39	-	120	-	-	Pave and seal
Carpentaria Shire	HML Other declared roads	Burketown Road	Armstrong River	800	-	-	-	400	-	Install minor culvert/s

Local government	Heavy vehicle access level	Investment name/location	Location description	Indicative total cost \$'000	Estimated expenditure to 30 June 2019	Approved 2019-20	Indicative 2020-21	Indicative 2021-22 to 2022-23	Beyond	Work description
	HML Other declared roads	Burketown Road	47.50 – 55.50km	1,820	-	910	-	-	-	Construct to new sealed two lane standard
Cairns Regional Council	B25 and lower	Cook Street	1.50 – 1.75km	1,500	-	750	-	-	-	Construct bridge/s
Cassowary Coast Regional Council	B25 and lower	Ann Road	Dallachy Road	798	-	-	399	-	-	Improve intersection/s
Mareeba Shire Council	B25 and lower	Chettle Road	5.50 – 7.21km	720	-	360	-	-	-	Rehabilitate and widen
	B25 and lower	Chettle Road	2.24 – 4.00km	630	-	315	-	-	-	Rehabilitate and widen
Tablelands Regional Council	No RT or BD	Tolga – Kairi Road	1.38 – 1.54km	500	-	250	-	-	-	Improve intersection/s
	No RT or BD	Tolga – Kairi Road	1.53 – 3.08km	420	-	210	-	-	-	Widen and seal shoulder/s

Table 11-5 Transport planning projects

Local government	Heavy vehicle access level	Investment name/location	Location description	Indicative total cost \$'000	Estimated expenditure to 30 June 2019	Approved 2019-20	Indicative 2020-21	Indicative 2021-22 to 2022-23	Beyond	Work description
Hinchinbrook Shire Council	B25 and lower	Bruce Highway (Ingham – Innisfail)	Ingham – Cardwell Range	48,000	-	150	500	47,350	-	Undertake transport project planning
Carpentaria Shire Council	RT1 and lower	Burke Developmental	Wills Developmental Road –	175	-	125	-	-	-	Undertake transport project planning

Local government	Heavy vehicle access level	Investment name/location	Location description	Indicative total cost \$'000	Estimated expenditure to 30 June 2019	Approved 2019-20	Indicative 2020-21	Indicative 2021-22 to 2022-23	Beyond	Work description
		Road (Cloncurry – Normanton)	Normanton (Sections 195.35 – 378.27 km)							
	RT1 and lower	Burke Developmental Road (Normanton – Dimbulah)	0 – 303.38km	150	-	100	150	-	-	Undertake transport project planning
Cassowary Coast Council	B25 and lower	Bruce Highway (Innisfail – Cairns)	Innisfail Bypass	9,000	200	500	1,100	7,200	-	Undertake transport project planning
Cairns Regional Council	-	Cairns transit network review	Various locations	700	-	-	100	600	-	Corridor planning
	-	Cairns urban integrated transport network strategy	Various locations	600	20	580	-	-	-	Undertake transport project planning
	B25 and lower	Cairns Western Arterial Road	Loridan Drive / View Street intersection	550	-	100	450	-	-	Undertake transport project planning
	B25 and lower	Cairns Western Arterial Road	Pease Street / Reservoir Road intersection	675	485	190	-	-	-	Undertake transport project planning
	B25 and lower	Captain Cook Highway (Cairns – Mossman)	Holloways roundabout and Machans roundabout	700	248	452	-	-	-	Undertake transport project planning
	B25 and lower	Captain Cook Highway (Cairns – Mossman)	Poolwood Road roundabout – Endeavour Road	500	212	388	-	-	-	Undertake transport project planning

Local government	Heavy vehicle access level	Investment name/location	Location description	Indicative total cost \$'000	Estimated expenditure to 30 June 2019	Approved 2019-20	Indicative 2020-21	Indicative 2021-22 to 2022-23	Beyond	Work description
			(18.90 – 20.61km)							
	B25 and lower	Captain Cook Highway (Cairns – Mossman)	Reed Road and Trinity Beach Road intersections	750	-	-	400	350	-	Undertake transport project planning
	B25 and lower	Captain Cook Highway (Cairns – Mossman)	Barren River – Airport Avenue (3.07 – 6.79km)	843	404	439	-	-	-	Undertake transport project planning
	-	James Cook University, Cairns to Barron River transit improvements business case	Various locations	580	120	110	150	200	-	Undertake transport project planning
Cook Shire Council	RT2 and lower	Peninsula Development al Road	Various locations	4,133	3,633	500	-	-	-	Undertake transport project planning
Mareeba Shire Council	RT1 and lower	Burke Developmental Road (Normanton – Dimbulah)	Eureka Creek (645.00 – 647.00km)	600	-	-	150	450	-	Undertake transport project planning
	RT1 and lower	Mareeba – Dimbulah Road	Various intersections	400	-	50	350	-	-	Undertake transport project planning
	RT1 and lower	Mulligan Highway (Mount Molloy – Lakeland)	Spear Creek Bridge, Rifle Creek Bridge	704	396	308	-	-	-	Undertake transport project planning

Local government	Heavy vehicle access level	Investment name/location	Location description	Indicative total cost \$'000	Estimated expenditure to 30 June 2019	Approved 2019-20	Indicative 2020-21	Indicative 2021-22 to 2022-23	Beyond	Work description
			and McLeod River Bridge							

Table 11-6 Local Roads of Significance Statements of Intent

Local government	Road	Heavy Vehicle Link Function	Current Link Status	Vision	Fit for Purpose	Scope of works	Work description
Mareeba Shire	Chettle Road (Mareeba-Dimbulah Road to Spring mount Road) 7.508km B25 heavy vehicle access	<ul style="list-style-type: none"> Provides access to Tableland Sugar Mill. Heavy haulage - General Cane haulage Extractive industry 	<ul style="list-style-type: none"> Sealed over its entire length to a minimum width of 6.5m. 6.982 km (92.99%) of the road has a formation, pavement and seal width less than the vision standard; The entire length (100%) of the road has formation, pavement and seal width that meets the fit-for-purpose standard. 	<ul style="list-style-type: none"> 10m Formation 8m Pavement 8m Seal 	<ul style="list-style-type: none"> 8m Formation 6m Pavement 6m Seal 	<ul style="list-style-type: none"> Undertake reseals as required Rehabilitate pavement as required due to excessive roughness, rutting or fatigue; Undertake routine maintenance as required; Respond to flood events as required. 	<ul style="list-style-type: none"> Annual routine maintenance \$15k Pavement Construction \$350k Reseals \$350k (based on \$6.5/m² with 1 reseal being done within the 20yr period (7.5km by 7.0m).
Mareeba Shire	Springmount Road (Kennedy Highway to Mareeba – Dimbulah Road) 22.727 km	<ul style="list-style-type: none"> Major transport access for sugar to Tableland Mill Access to Springmount Waste Management Facility Heavy haulage - General Extractive industry 	<ul style="list-style-type: none"> sealed over its entire length to various widths from 3.6m to 14.5m. 22.175 km (97.57%) of the road has a formation, pavement and seal width less than the vision standard; 18.293 km (80.49%) of the road has a formation, pavement and seal width that meets the fit for purpose standard. 	<ul style="list-style-type: none"> 10m Formation 9m Pavement 9m Seal 	<ul style="list-style-type: none"> 8m Formation 6m Pavement 6m Seal 	<ul style="list-style-type: none"> Widen formation, pavement and seal for identified sections; Rehabilitate pavement as required due to excessive roughness, rutting or fatigue; Undertake reseals as required; Undertake routine maintenance as required; Respond to flood events as required; 	<ul style="list-style-type: none"> Annual routine maintenance \$60k Pavement Construction \$100k Reseals \$1m (based on \$6.5/m² with 1 reseal being done within the 20yr period (22.727km by various widths).

Local government	Road	Heavy Vehicle Link Function	Current Link Status	Vision	Fit for Purpose	Scope of works	Work description
Tablelands Regional Council	Hansen Road (Kennedy Highway to Granite Creek) 5.94 km	<ul style="list-style-type: none"> Provides access to: <ul style="list-style-type: none"> Tableland Sugar Mill Mt Carbine Quarry Springmount Waste Management Facility Mt Uncle winery 	<ul style="list-style-type: none"> sealed over its entire length to a width of 8.2m. The entire length (100%) of the road has a formation, pavement and seal width less than the vision standard; The entire length (100%) of the road has a formation, pavement and seal width that meets the fit for purpose standard. 	<ul style="list-style-type: none"> 10m Formation 8m Pavement 8m Seal 	<ul style="list-style-type: none"> 8m Formation 6.5m Pavement 6.5m Seal 	<ul style="list-style-type: none"> Widen formation, pavement and seal for identified sections; Rehabilitate pavement as required due to excessive roughness, rutting or fatigue; Undertake reseals as required; Undertake routine maintenance as required; Respond to flood events as required; Upgrade Intersection with Chewko Road to a fit-for-purpose standard. 	<ul style="list-style-type: none"> Annual routine maintenance \$15k Reseals \$320k (based on \$6.5/m² with 1 reseal being done within the 20yr period (5.94km by 8.2m).
Tablelands Regional Council	Lawson Street (Tolga – Kairi Road to Kennedy Highway) 0.52km	<ul style="list-style-type: none"> B-Double route for heavy vehicles through Tolga. 	<ul style="list-style-type: none"> sealed over its entire length to a width of 7m. The entire length (100%) of the road has a formation, pavement and seal width less than the vision standard and the fit-for-purpose standard. 	<ul style="list-style-type: none"> 11m Formation 11m Pavement 11m Seal 	<ul style="list-style-type: none"> 11m Formation 11m Pavement 11m Seal 	<ul style="list-style-type: none"> Widen formation, pavement and seal for identified sections; Kerb and channel and drainage for full length; Rehabilitate pavement as required due to excessive roughness, rutting or fatigue; Undertake reseals as required; Undertake routine maintenance as required. Respond to flood events as required. 	<ul style="list-style-type: none"> Annual routine maintenance \$2k Reseals \$100k (based on resealing with Asphalt @ \$28.0/m² with 1 reseal being done within the 20yr period (0.52km by 7.0m).

Local government	Road	Heavy Vehicle Link Function	Current Link Status	Vision	Fit for Purpose	Scope of works	Work description
Tablelands Regional Council	Marks Lane (Tinaroo Falls Dam Road to Atherton – Malanda Road) 5.26 km	<ul style="list-style-type: none"> Major North/South regional B-Double Route. Heavy vehicle route for road transport companies. Major freight access route for rural and agricultural producers. Provides access to Tinaroo Dam. 	<ul style="list-style-type: none"> sealed over its entire length to a width of 8.3m. The entire length (100%) of the road has a formation, pavement and seal width less than the vision standard; The entire length (100%) of the road has a formation, pavement and seal width that meets the fit for purpose standard. 	<ul style="list-style-type: none"> 10m Formation 8m Pavement 8m Seal 	<ul style="list-style-type: none"> 8m Formation 6.5m Pavement 6.5m Seal 	<ul style="list-style-type: none"> Widen formation, pavement and seal for identified sections; Rehabilitate pavement as required due to excessive roughness, rutting or fatigue; Undertake reseals as required; Undertake routine maintenance as required; Respond to flood events as required. 	<ul style="list-style-type: none"> Annual routine maintenance \$10k Reseals \$300k (based on \$6.5/m² with 1 reseal being done within the 20yr period (5.26km by 8.3m).
Tablelands Regional Council	Tolga-Kairi Road (Kennedy Highway to Atherton – Malanda Road) 6.46 km	<ul style="list-style-type: none"> Major North/South regional B-Double Route. Heavy vehicle route for road transport companies. Major freight access route for rural and agricultural producers. Provides access to Tinaroo Dam. Connects Tolga to Kairi. 	<ul style="list-style-type: none"> sealed over its entire length to a width of 6.5 - 8.3m. The entire length (100%) of the road has a formation, pavement and seal width less than the vision standard; The entire length (100%) of the road has a formation, pavement and seal width that meets the fit for purpose standard. 	<ul style="list-style-type: none"> 10m Formation 8m Pavement 8m Seal 	<ul style="list-style-type: none"> 8m Formation 6.5m Pavement 6.5m Seal 	<ul style="list-style-type: none"> Widen formation, pavement and seal for identified sections; Rehabilitate pavement as required due to excessive roughness, rutting or fatigue; Undertake reseals as required; Undertake routine maintenance as required; Respond to flood events as required. 	<ul style="list-style-type: none"> Annual routine maintenance \$10k Reseals \$270k (based on \$6.5/m² with 1 reseal being done within the 20yr period (6.46km by 6m).
Cairns Regional Council	Airport Avenue (Captain Cook Highway to Approximately 150m north of Saltwater Creek) 1.07km	<ul style="list-style-type: none"> Provides exclusive access to the Cairns International and Domestic Airports which is a critical transport infrastructure asset for the Far North Queensland region. The road is critical to the economic and 	<ul style="list-style-type: none"> a two-lane sealed road with an 11m pavement sealed full width. The pavement and seal are good condition. flat road on a sweeping bend for most of its length, with one 	<ul style="list-style-type: none"> Current Standard possibly moving to 4 lane facility in 10years 		<ul style="list-style-type: none"> New intersection and link to Lake St. 	<i>No information available</i>

Local government	Road	Heavy Vehicle Link Function	Current Link Status	Vision	Fit for Purpose	Scope of works	Work description
		social benefit of the FNQ region.	intersection only (Captain Cook Highway). <ul style="list-style-type: none"> Includes a 3 span prestressed concrete bridge (51m long) across Saltwater Creek. The key gap is Intersection capacity 				
Cairns Regional Council	Aumuller Street (Mulgrave Road to Tingira Street) 2.25km	<ul style="list-style-type: none"> Regionally significant B-double route through Cairns and to industrial precinct Probable 'regional' road in the longer term 	<ul style="list-style-type: none"> Bitumen seal width varies from street to street with a minimum sealed width of 7.1m to a maximum of 14m. The key gap is cross section, pavements below standard 	<ul style="list-style-type: none"> 4 lane divided road 		<ul style="list-style-type: none"> *Pavement reconstruction *Additional carriageway and median construction 	<ul style="list-style-type: none"> \$10million in 2010
Cairns Regional Council	Cook Street (Draper Street to Aumuller)	No information available					
Cairns Regional Council	Draper Street (Comport Street to Cook Street)	No information available					
Cairns Regional Council	Redlynch Intake Road (Stratford Connection Road to Crystal Cascades) 10.85km	<ul style="list-style-type: none"> Access to natural resources. 	<ul style="list-style-type: none"> Sub-Arterial Road – 4 Lane Median Divided 0.31 km; Sub-Arterial Road – 2 Lane Median Divided 0.64 km; Major Collector Road 9.4 km; Low Density Residential Road 0.5 km. 	<ul style="list-style-type: none"> Continuing to provide same link function as current. Future bikeway/ pedestrian footway to connect to the eastern 		<ul style="list-style-type: none"> Increase in transport demand resulting in upgrade of roads, intersections, drainage structures. Upgrade to 4 lane between Michaelangelo Dr and Jungara Rd to meet the transport demand. 	No information available

Local government	Road	Heavy Vehicle Link Function	Current Link Status	Vision	Fit for Purpose	Scope of works	Work description
				suburban area.			
Cassowary Coast Regional Council	Bingil Bay Road and Alexander Drive Start and finish - El Arish - Mission Beach Road 10.41km	<ul style="list-style-type: none"> Provides access for agriculture Local freight route 	<ul style="list-style-type: none"> Two lane seal width (6.5m) in reasonable condition Unsealed shoulders throughout Occasional farm accesses Limited overtaking Abutting land use in Bingil Bay is urban and rural residential, remainder is agricultural (cattle & banana's) Seawalls adjacent to road, protecting infrastructure The key gaps are alignment and informal access control. 	<ul style="list-style-type: none"> Maintain current level of service 		<ul style="list-style-type: none"> Maintain current level of service: <ul style="list-style-type: none"> Pavement Rehabilitation Curve Re-alignment Culvert Replacement/Rehabilitation Reseals (as required) 	<i>No information available</i>
Cassowary Coast Regional Council	Butler Street – Morris Street – Bryant Street Bruce Highway to Dean Road 2.50km	<ul style="list-style-type: none"> Provides access to Old Tully Road Local freight, local access and commuter route 	<ul style="list-style-type: none"> Two lane seal width (8m) in reasonable condition Unsealed shoulders and K&C throughout Abutting land use is mostly urban residential and commercial properties The key gaps are intersection improvement works at Butler/Morris Streets and drainage improvements 	<ul style="list-style-type: none"> Maintain current level of service 		<ul style="list-style-type: none"> Maintain current level of service: <ul style="list-style-type: none"> Pavement Rehabilitation Culvert/Pipe Replacement/Rehabilitation Reseals (as required) Drainage improvements of Butler/Bryant/Morris 	<i>No information available</i>

Local government	Road	Heavy Vehicle Link Function	Current Link Status	Vision	Fit for Purpose	Scope of works	Work description
Cassowary Coast Regional Council	Dean Road and Tully Gorge Road (Bruce Highway to Kareeya Power Station) 51.51km	<ul style="list-style-type: none"> Provides access for agriculture Local freight 	<ul style="list-style-type: none"> Two lane seal width (6-7.5m) in reasonable condition Unsealed shoulders throughout Occasional farm accesses Limited overtaking Abutting land use is rural residential, remainder is agricultural (cane, cattle & banana's) The key gaps are deteriorating structures (Bridges/Culverts) and informal access control 	<ul style="list-style-type: none"> Maintain current level of service 		<ul style="list-style-type: none"> Maintain current level of service: <ul style="list-style-type: none"> Pavement Rehabilitation Bridges/Culvert Replacement/Rehabilitation Reseals (as required) 	<i>No information available</i>
Cassowary Coast Regional Council	Kennedy Creek Road & Kirrama Range Road (Bruce Highway to Tablelands / Cassowary Coast Boundary) 25.48km	<ul style="list-style-type: none"> Provides access through to Tablelands Regional Council 	<ul style="list-style-type: none"> Two lane seal width (6.5m) for 11.55km and unsealed width (5.5m) for 13.93km in reasonable condition Unsealed shoulders throughout with a small section of K&C Occasional farm accesses Limited overtaking Abutting land use is rural residential, agricultural (cane & banana's) and parklands Bridges and Culverts throughout The key gap is the road pavement 	<ul style="list-style-type: none"> Maintain current level of service 		<ul style="list-style-type: none"> Maintain current level of service: <ul style="list-style-type: none"> Pavement Rehabilitation Resheeting (as required) Culvert Replacement/Rehabilitation Reseals (as required) 	<i>No information available</i>

12. Infrastructure deficiency analysis

Identifying the infrastructure deficiencies on each route has been through desktop assessment of road infrastructure and traffic data provided by TMR/FNQROC and with other resources available to Jacobs. Assumptions have been made where data has been unavailable, and it is noted there is likely some disparity between the assumptions and actual road conditions, traffic demand and vehicle types.

While the focus is largely on the heavy vehicle network, the analysis also applies to passenger vehicles. There are subsequently three elements to the deficiency analysis:

- Sealed road roughness/rutting which impact all vehicles
- Structures condition which impact all vehicles
- Road and structures width deficiencies which impact on safe heavy vehicle use

12.1 Road profile

Jacobs has developed the road profile covering over 6,000 kms of the FNQROC road network in 100 metre segments. Key elements are:

- Surface type
- Seal and formation width
- Roughness and rutting counts
- Gazetted heavy vehicle access level
- AADT
- Urban/rural classification
- Terrain type

The SCR roads included in the analysis are based on data provided by TMR, covering 70 roads⁸⁸ across the region.

The local roads analysis has largely adopted the road identified within road condition LIDAR survey undertaken by ARRB in 2017. While ARRB identified 114 roads within the defined Local Roads of Regional Significance (LRRS) network at the time of the survey, only those that had greater than 50% seal were surveyed with LIDAR. Furthermore, the survey did not collect road width data.

Table 12-1 Road network profile

Parameter	Data sources	Number of roads	Kms assessed
SCR	TMR, HVIR	70	4,018
Surveyed Council roads	ARRB survey (roughness and rutting only) FNQROC	84	508
Other Council roads	FNQROC	30	1,501

The road network profile relies on provided TMR and FNQROC data. While TMR data is somewhat detailed, the ability of Councils to collect infrastructure data is often hampered by resourcing constraints. The data that is collected is often for high volume roads, taking priority of over low volume roads. This immediately presents a challenge, as it is low volume roads that are more likely to be accessed by the larger HPVs. Where data is not available, assumptions have been developed e.g. road conditions and annual average daily traffic (AADT) are assumed to equal the available data for road links within close vicinity.

⁸⁸ Defined by unique road identification codes.

Future infrastructure investment planning can be significantly improved with the following measures:

- A joint asset management system that sees data collated and presented in a consistent format, allowing investment principles to be applied across FNQROC in a uniform manner
- Regular traffic counts to identify travel patterns across individual roads, allowing for demand to be managed from a whole-of-network perspective
- Regular collection and validation of infrastructure data through onsite inspection

12.2 Road roughness and rutting

Roughness and rutting have direct impacts on:

- Safe vehicle operating speed which influences travel time
- Vehicle operating costs (particularly fuel consumption, repairs and maintenance costs, tyre wear and lubricating oil)
- Vehicle controlling and steering capabilities
- Increased dynamic loading effects on heavy vehicles caused by uneven pavements

Minimum standards for roughness and rutting are determined by road agencies as part of their broader asset management practices and interventions for rehabilitation or reconstruction. There is also opportunity to rehabilitate or reconstruct a road at the same time as rectifying other deficiencies.

The sealed road network has been assessed for its rehabilitation and reconstruction needs based on assumed intervention triggers presented in Table 12-2. The assumption of linear degradation is a simplification, noting that pavements generally deteriorate much quicker as they near the end of their useful life.

Table 12-2 Sealed road rutting and roughness intervention triggers

Parameter	Value
Roughness rehabilitation trigger (NRM)	130
Roughness reconstruction trigger (NRM)	160
Roughness annual progression (NRM)	Long run average progression if available, otherwise 3
Rutting rehabilitation trigger (mm)	40
Rutting reconstruction trigger (mm)	60
Rutting annual progression (mm)	1

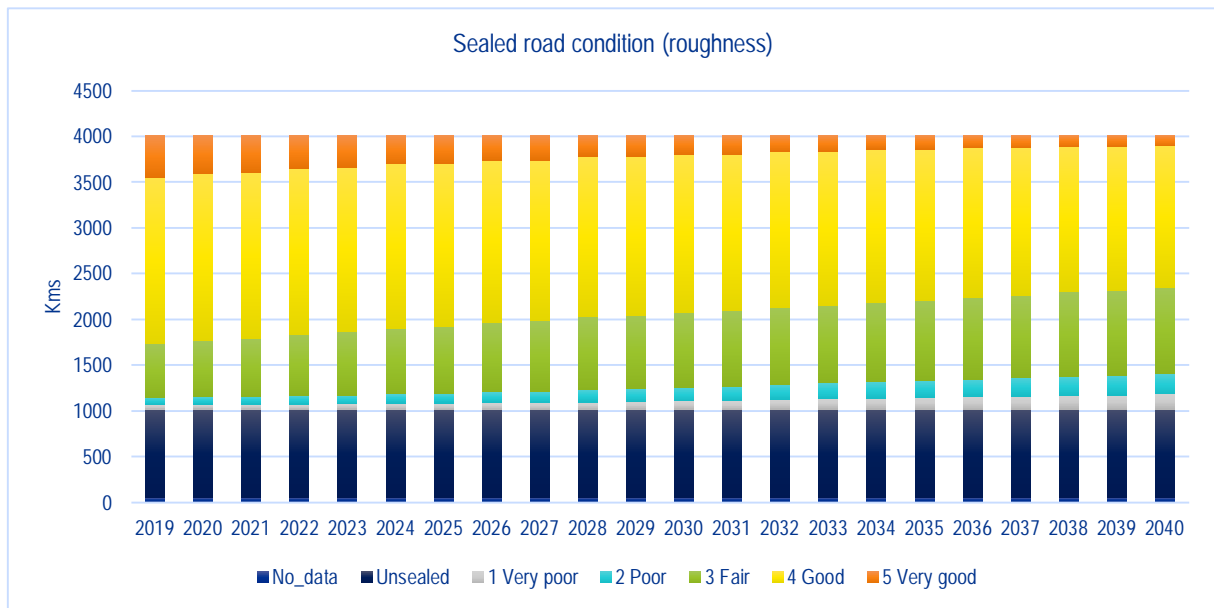
For unsealed roads, recent Austroads research⁸⁹ shows that deterioration is caused mainly by rainfall and time, and that traffic is not a statistically significant factor. This means that rehabilitation/reconstruction interventions based on roughness are unable to be predicted. Unsealed roads are identified and illustrated separately within the following figures.

12.2.1 SCR roughness and rutting

From a roughness perspective, over 70% of the SCR is currently in fair to very good condition. Applying the progression without any asset improvement sees this reduce to around 65% around by 2040.

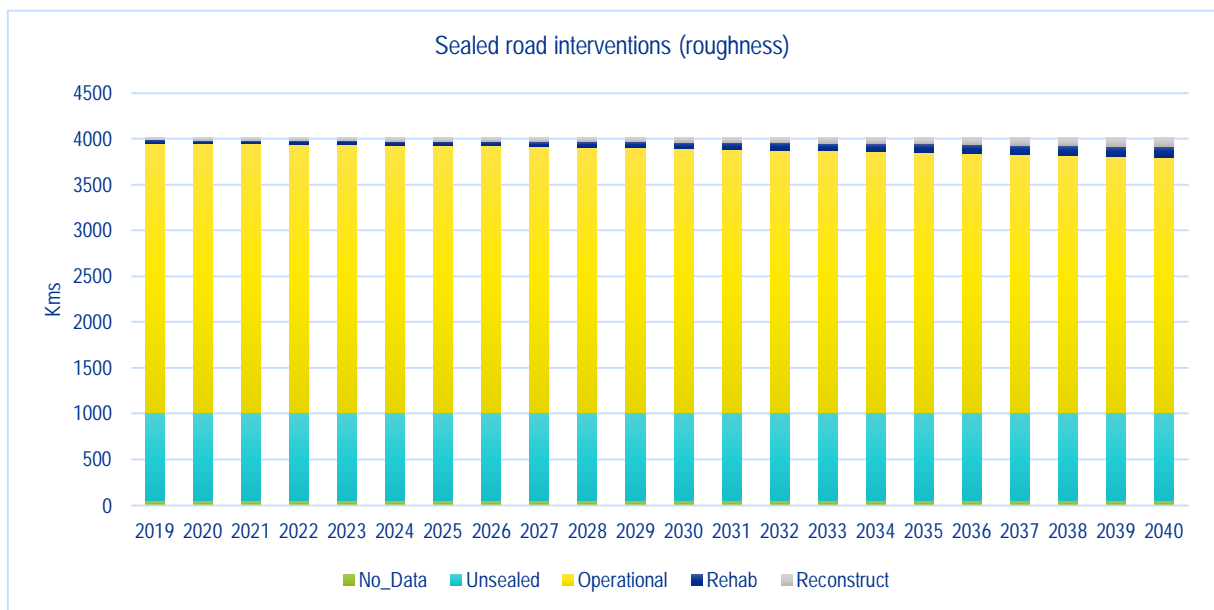
⁸⁹ Austroads (2016), Unsealed Road Maintenance and Deterioration Performance, Technical Report AP-TP314-16, Sydney

Figure 12-1 SCR sealed road condition (roughness)



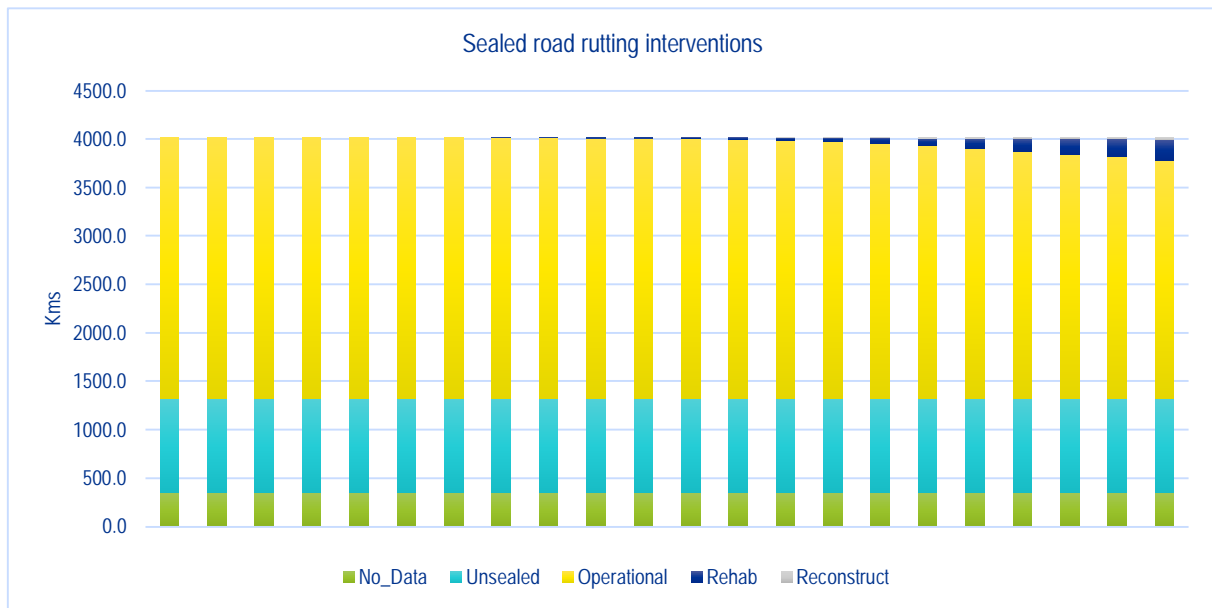
Around 1.5% of the network currently triggers annual rehabilitation or reconstruction, which increases to 5.5% by 2040.

Figure 12-2 SCR sealed road interventions (roughness)



Unlike roughness, rutting is not defined within condition categories e.g. fair. The analysis shows that it has a later impact on the SCR, with interventions only required from 2026. By 2040, nearly 6% of the network requires rehabilitating or reconstructing if there is no asset improvement undertaken.

Figure 12-3 SCR sealed road interventions (rutting)



12.2.2 Surveyed Council roads roughness and rutting

The analysis of sealed roads shows a significant difference in condition to the SCR. Although around 80% is currently very good to fair, this reduces to around 10% of the network by 2040 without any asset improvement.

Figure 12-4 Council roads sealed road condition (roughness)

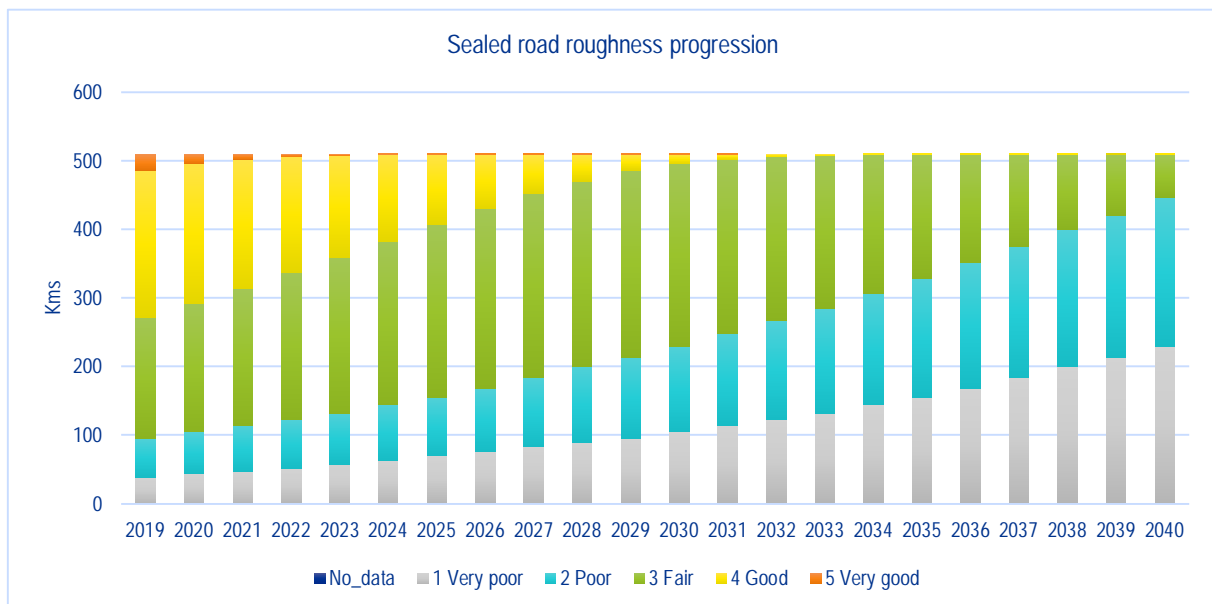
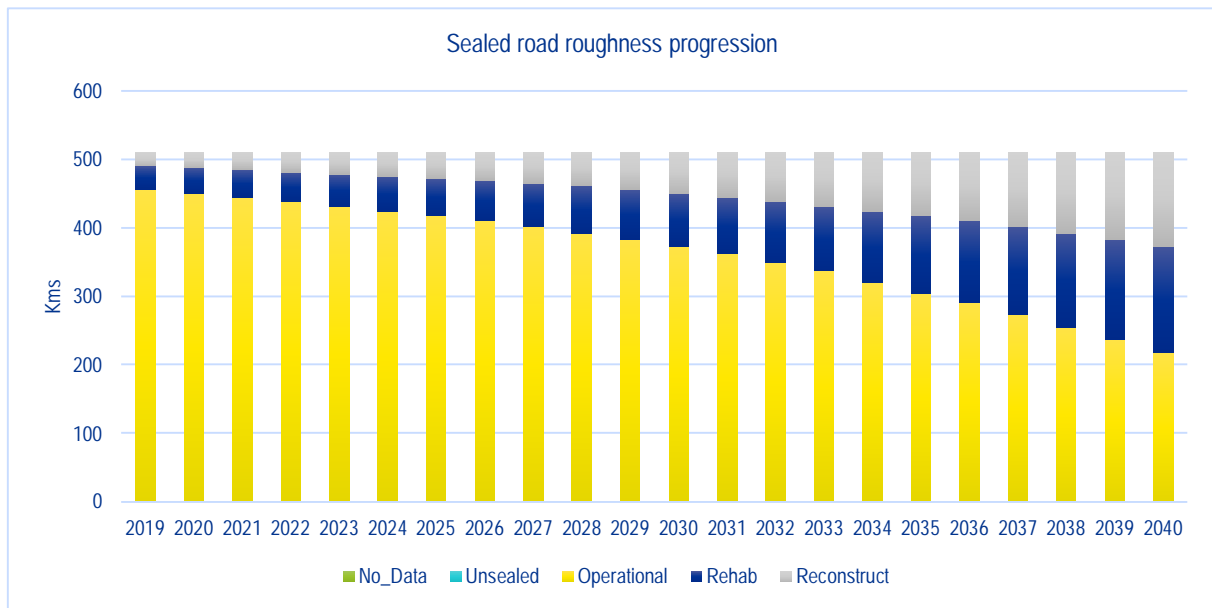
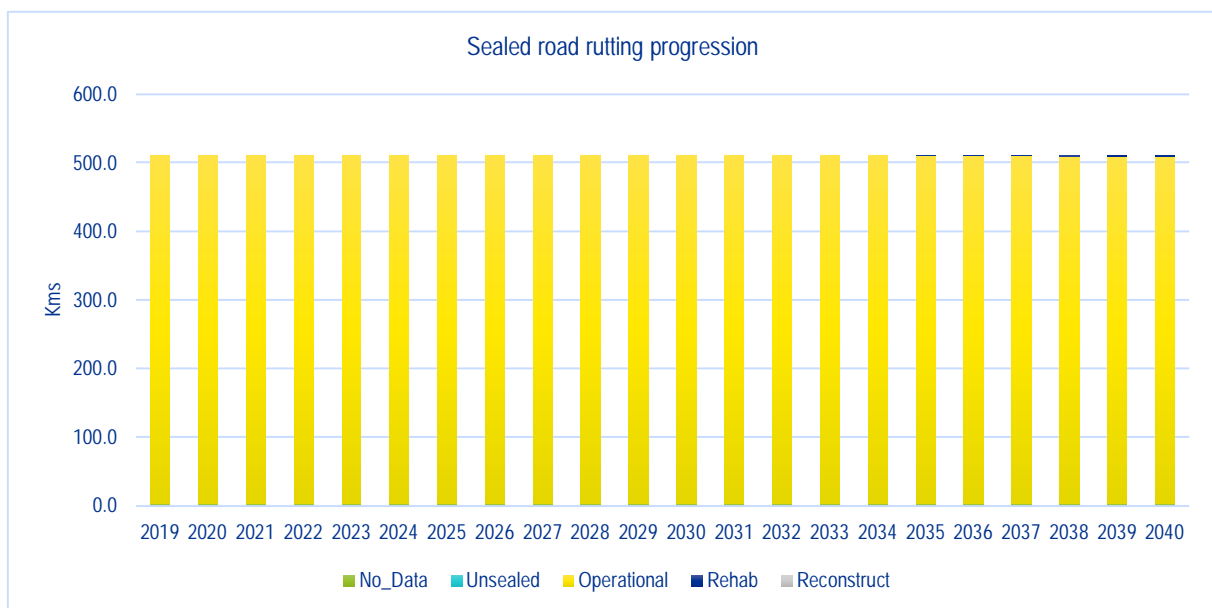


Figure 12-5 Council roads sealed road interventions (roughness)



Rutting practically has no impact on the Council road network, with around 0.1% requiring rehabilitating if there is no asset improvement undertaken.

Figure 12-6 Council roads sealed road interventions (rutting)



12.3 Width deficiencies

The width deficiency assessment is guided by the Performance Based Standards Scheme - Network Classification Guidelines⁹⁰, originally developed by the National Transport Commission and now administered by the National Heavy Vehicle Regulator. The Guidelines recommend the minimum standard of infrastructure required in order to match the desired level of access for each type of HPV.

⁹⁰ <https://www.nhvr.gov.au/road-access/performance-based-standards/guidelines-and-rules>

The Guidelines provide the uniform method to classify a route by PBS level based on its geometric / load-bearing capacity and traffic volume. This enables a match between a vehicle's performance and its required road characteristics and avoids excessive engineering design.

The Guidelines state the purpose of defining minimum lane or road widths is to provide sufficient carriageway for vehicles to operate without a heavy vehicle imposing a risk to other road users by impinging on adjacent lanes or encroaching on limited or no shoulders⁹¹.

The levels of PBS classification for roads and vehicles generally able to use each type is summarised in Table 12-3.

Table 12-3 Vehicle Types and PBS Road Classification

Vehicle performance level	Network access by vehicle length		Applicable routes
	Class A	Class B	
Level 1	L ≤ 20 (General access)		All roads in Queensland
Level 2	L ≤ 25-26m (B-Double routes)	L ≤ 30m (Specially assessed routes)	B-double and road train routes as published by TMR
Level 3	L ≤ 36.5m (Type 1 roadtrain routes)	L ≤ 42m (Specially assessed routes)	
Level 4	L ≤ 53.5m (Type 2 roadtrain routes)	L ≤ 60m (Specially assessed routes)	

The Guidelines promote a minimum standard of infrastructure for each PBS access level and reflect a broad application of standard road design. The Guidelines subsequently are unable to incorporate the individual characteristics a particular route may have, and acknowledge that applying the technical benchmarks should be considered along with engineering judgement based on local knowledge and experience.

Where the Guidelines are either (a) not definitive or (b) undeliverable from a constructability perspective, we have developed 'rules' to supplement the Guidelines. The rules are based on engineering experience and construction practicality, and importantly do not undermine the safety aspects of the Guidelines. The following assumptions have been adopted:

- A route's existing heavy vehicle access level (by PBS) dictates if there are width deficiencies triggered. Each PBS access level has differing minimum width requirements, reflecting the different size of vehicles within each PBS level.
- A route that is gazetted as general heavy vehicle access (i.e. PBS1) does not have minimum width requirements, therefore width deficiencies are not triggered. This is particularly the case for the Council road network.
- Routes are assessed on their current gazetted heavy vehicle access even if higher access is offered through permits. Although route fitness-for-purpose can be managed through limiting heavy vehicle access with permits, the objective is to seek permanent arrangements.
- General Mass Limits are adopted as the regulated gross vehicle mass as to allow consistent comparison between routes. Routes assessed for Higher Mass Limits generally require physical inspection and testing of pavement condition prior to granting or removing Higher Mass Limits access.
- Where a width deficiency is identified, a minimum deficiency of 1 metre has been adopted to allow for the smallest drum roller used for road construction.
- Any seal widening also requires a new formation due to the uncertainty of the existing formation's quality.

⁹¹ National Transport Commission (2007), *PBS Scheme - Network Classification Guidelines*, Australian Transport Commission, p. 3

- Additional width allowances have been made for Council roads to adhere to local asset management principles.
- Curves have been assessed within a GIS platform to estimate the radius. The additional width required for a road's PBS level have been added accordingly.

Appendix C presents the minimum widths applied within the analysis.

12.4 Structures

Bridges and culverts have been assessed for structural integrity and width deficiency.

Structural integrity has been assessed through the conditions ratings data provided by TMR and FNQROC. Bridges and culverts rated as being in poor or very poor condition have been identified for replacement.

Bridge width deficiencies follow the same process for road. Minimum widths stipulated by the PBS Guidelines are compared with actual widths as provided by Councils.

Table 12-4 PBS Guidelines minimum bridge width requirements on rural roads

Parameter	AADT	Minimum width (m)	Comment
PBS level 2 to PBS level 4	< 150	4	Meeting requirements for single-lane bridges
	< 500	7.2	Meeting requirements for two-lane bridges
	> 500	8.4	

The PBS Guidelines recommend that bridge width should reflect the approach sight distance, ability of drivers on a bridge approach to see vehicles on the opposing approach, and willingness of drivers to adjust trajectory or entry onto a bridge to accommodate the width needs of large vehicles. Each bridge would benefit from a site visit/road safety audit to determine the ideal width that incorporates its surrounding environment.

12.5 Intersections

Rural intersections have been assessed through applying turning templates developed by Austroads⁹². The templates have been overlaid on relevant intersections within a GIS platform to determine where a deficiency occurs according to PBS level. The additional area required to correct a deficiency has been identified through visual assessment.

Urban intersections have not been assessed due to the high level of complexity in understanding the costs and impacts of property resumptions and relocation of public utilities.

12.6 Unsealed roads

While unsealed roads are not technically a deficiency, there are benefits from sealing where it is cost-effective and economic to do so:^{93,94}

- Accessible to a wider variety of vehicles and increased quantity of people willing to use a route
- Improves travel times and vehicle operating costs
- Safer road conditions and lower crash probability
- Increased resilience and flood immunity
- Can be an economic enabler if connected to productive areas e.g. natural resources, larger communities with more employment prospects, potential agricultural areas, ports

⁹² Austroads (2013), Design Vehicles and Turning Path Templates Guide (2013). <https://austroads.com.au/publications/road-design/ap-g34>

⁹³ TMR (2015), Technical Note 118- Sealing of Unsealed Roads with Low Traffic

⁹⁴ Economic Development Australia (2018), Taking a Bigger Picture Approach to Evaluating Road Projects in Regional & Remote Australia

- Reduced risk of damaging freight

Sealing costs generally depend on whether the existing road pavement and formation is insufficient and requires either drainage improvements (raising), changes to the roads shape or pavement upgrade¹.

The maintenance costs of sealed roads are typically much higher than unsealed road. Unsealed road requires regular grading and gravel replacement, in comparison, sealed road require period resealing which is more expensive. However, these resealing costs can be minimised if the original construction is of a higher quality (i.e. increased quality of the pavement material). This opportunity can provide large benefits on rural roads as they tend to be constructed using the marginal non-standard pavement materials which are prone to degrade faster because they are sensitive to moisture.

Sealing of rural roads should be considered on a case-by-case basis, reflecting the strategic value and suitability of the road for the upgrade. The analysis of the roads suitability for an upgrade should consider geometric, moisture and geotechnical conditions as they will affect the maintenance costs of the project.

The assessment has not specifically considered completely unsealed surfaces as a deficiency. Narrow seals have been assessed as a deficiency if less than 4.5 metres.

12.7 Deficiency costs

Costs have been estimated from unit rates within the Local Government Association of Queensland's Road Asset Valuation Toolbox⁹⁵. Rates have been adjusted to current year prices and are based on a range of factors including regions as illustrated in Figure 12-7. Costs have subsequently been developed according to each Council's region.

The rates are presented in Appendix D.

⁹⁵ <https://www.lgaq.asn.au/road-asset-valuation-toolbox>

Queensland Government

SmartCost Regions compared to local government (LG) areas

Legend

- SmartCost Region Boundary
- LG Boundary
- BUNDABERG TGO Office
- TPO/COO Towns

The map displays the following SmartCost Regions:

- Tropical North**: Includes Cairns, Townsville, and Atherton.
- Central Inland**: Includes Longreach, Barcaldine, Emerald, and Roma.
- Southern Inland**: Includes Mildura, Renmark, and Swan Hill.
- Central Coast**: Includes Rockhampton, Gladstone, and Bundaberg.
- South East**: Includes Toowoomba, Ipswich, and Brisbane.
- Southern Inland**: Includes Melbourne, Geelong, and Ballarat.

The map also shows the boundaries of various Local Governments (LGs) across Queensland. Key towns and offices are marked, including Bundaberg TGO Office, TPO/COO Towns, and other regional centers. The map includes a scale bar (0-200 km), a north arrow, and an inset map showing the location of Queensland within Australia.

13. SCR costed deficiencies

The SCR analysis has identified \$636 m of works over the next 20 years. Figure 13-1 illustrates the costs by work type. Road width and structures condition/width are already deficient and should be considered for funding in the near future. The width deficiencies correspond to heavy vehicle routes that are PBS2 and above. General access routes do not have minimum requirements under the PBS Network Classification Guidelines.

Roughness and rutting funding are based on road segments reaching intervention triggers over the next 20 years and is illustrated in Figure 13-2.

Figure 13-1 SCR 20 year funding requirements

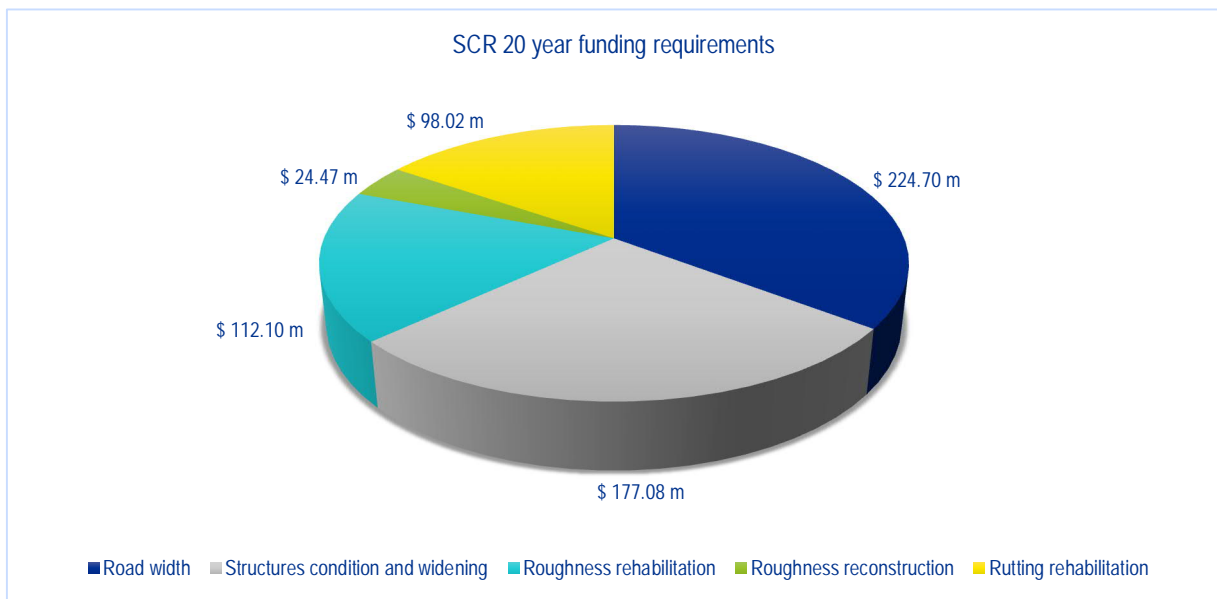


Figure 13-2 SCR 20 year roughness/rutting funding requirements

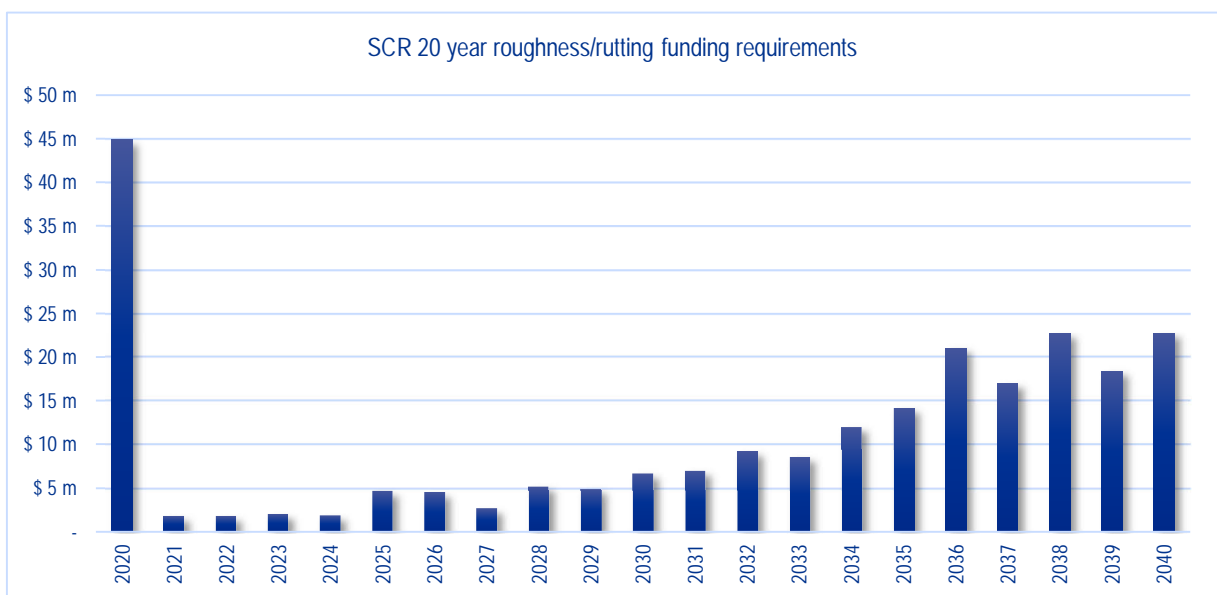


Table 13-1 presents the costs for each road by works type. It is important to note that roads with extreme terrains are omitted as they require more detailed analyses to avoid understating of costs. These are Gillies

Range Road, Kennedy Highway (Cairns – Mareeba), Palmerston Highway (Innisfail-Ravenshoe) and Mossman - Mt Molloy Road.

Table 13-1 SCR costs (in alphabetical order)

Road	Council	Start	End	Immediate		Future	Total
				Structural Deficiency (Capital Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	
Anderson Street	Cairns	-	2.5	-	\$ 0.72 m	\$ 1.02 m	\$ 1.74 m
Atherton - Herberton Road	Tablelands	-	18.4	-	\$ 0.12 m	\$ 0.23 m	\$ 0.35 m
Boogan Road	Cassowary Coast	-	3.0	\$ 0.34 m	\$ 0.09 m	\$ 0.35 m	\$ 0.78 m
Bruce Highway (Ingham – Innisfail)	Cassowary Coast, Hinchinbrook	-	50.0	\$ 22.98 m	\$ 0.14 m	\$ 4.18 m	\$ 27.29 m
Bruce Highway (Ingham – Innisfail)	Cassowary Coast	50.0	100.0	\$ 10.36 m	-	\$ 5.71 m	\$ 16.06 m
Bruce Highway (Ingham – Innisfail)	Cassowary Coast	100.0	147.4	\$ 5.84 m	\$ 0.47 m	\$ 4.27 m	\$ 10.58 m
Bruce Highway (Innisfail – Cairns)	Cairns, Cassowary Coast	-	50.0	\$ 3.64 m	\$ 0.36 m	\$ 3.66 m	\$ 7.66 m
Bruce Highway (Innisfail – Cairns)	Cairns	50.0	85.3	\$ 1.43 m	-	\$ 0.92 m	\$ 2.34 m
Bruce Highway (Townsville – Ingham)	Hinchinbrook	78.7	100.0	\$ 0.83 m	-	\$ 0.93 m	\$ 1.76 m
Bruce Highway (Townsville – Ingham)	Hinchinbrook	100.0	120.4	\$ 6.70 m	-	\$ 4.22 m	\$ 10.92 m
Burke Dev Road (Cloncurry – Normanton)	Carpentaria	195.3	200.0	\$ 0.57 m	-	\$ 0.47 m	\$ 1.04 m
Burke Dev Road (Cloncurry – Normanton)	Carpentaria	200.0	250.0	\$ 5.02 m	\$ 0.43 m	\$ 6.52 m	\$ 11.97 m
Burke Dev Road (Cloncurry – Normanton)	Carpentaria	250.0	300.0	\$ 7.33 m	\$ 0.20 m	\$ 3.65 m	\$ 11.18 m
Burke Dev Road (Cloncurry – Normanton)	Carpentaria	300.0	350.0	\$ 5.92 m	\$ 0.66 m	\$ 5.64 m	\$ 12.21 m
Burke Dev Road (Cloncurry – Normanton)	Carpentaria	350.0	378.2	\$ 3.10 m	-	\$ 1.96 m	\$ 5.06 m
Burke Dev Road (Normanton – Dimbulah)	Carpentaria	-	50.0	\$ 3.70 m	\$ 0.21 m	\$ 0.63 m	\$ 4.53 m
Burke Dev Road (Normanton – Dimbulah)	Carpentaria	50.0	100.0	\$ 1.16 m	\$ 0.10 m	\$ 0.69 m	\$ 1.95 m
Burke Dev Road (Normanton – Dimbulah)	Carpentaria	100.0	150.0	\$ 0.49 m	\$ 0.04 m	\$ 0.12 m	\$ 0.65 m

Road	Council	Start	End	Immediate		Future	Total
				Structural Deficiency (Capital Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	
Burke Dev Road (Normanton – Dimbulah)	Carpentaria	150.0	200.0	\$ 0.09 m	-	-	\$ 0.09 m
Burke Dev Road (Normanton – Dimbulah)	Carpentaria	200.0	250.0	\$ 0.08 m	-	-	\$ 0.08 m
Burke Dev Road (Normanton – Dimbulah)	Carpentaria	250.0	300.0	\$ 0.23 m	\$ 0.03 m	\$ 0.03 m	\$ 0.29 m
Burke Dev Road (Normanton – Dimbulah)	Carpentaria, Mareeba	300.0	350.0	\$ 1.70 m	-	-	\$ 1.70 m
Burke Dev Road (Normanton – Dimbulah)	Mareeba	350.0	400.0	\$ 1.11 m	-	-	\$ 1.11 m
Burke Dev Road (Normanton – Dimbulah)	Mareeba	400.0	450.0	\$ 1.81 m	\$ 0.05 m	-	\$ 1.86 m
Burke Dev Road (Normanton – Dimbulah)	Mareeba	450.0	500.0	\$ 3.85 m	-	-	\$ 3.85 m
Burke Dev Road (Normanton – Dimbulah)	Mareeba	500.0	550.0	\$ 5.99 m	\$ 0.07 m	-	\$ 6.06 m
Burke Dev Road (Normanton – Dimbulah)	Mareeba	550.0	600.0	\$ 2.76 m	\$ 0.14 m	\$ 0.39 m	\$ 3.29 m
Burke Dev Road (Normanton – Dimbulah)	Mareeba	600.0	650.0	\$ 12.46 m	\$ 0.74 m	\$ 1.26 m	\$ 14.46 m
Burke Dev Road (Normanton – Dimbulah)	Mareeba	650.0	654.7	\$ 0.11 m	-	-	\$ 0.11 m
Cairns Western Arterial Road	Cairns	-	14.0	\$ 18.55 m	\$ 0.55 m	\$ 2.12 m	\$ 21.22 m
Captain Cook Highway (Cairns – Mossman)	Cairns, Douglas	-	50.0	\$ 42.53 m	\$ 0.52 m	\$ 7.62 m	\$ 50.68 m
Captain Cook Highway (Cairns – Mossman)	Douglas	50.0	74.9	\$ 13.39 m	\$ 0.04 m	\$ 2.88 m	\$ 16.31 m
Davidson Road	Cassowary Coast	-	18.9	\$ 0.17 m	\$ 0.81 m	\$ 1.02 m	\$ 2.00 m
East Evelyn Road	Tablelands	-	10.7	\$ 0.31 m	\$ 0.04 m	\$ 1.31 m	\$ 1.66 m
El Arish - Mission Beach Road	Cassowary Coast	-	18.4	\$ 0.69 m	\$ 0.05 m	\$ 1.92 m	\$ 2.65 m
Endeavour Valley Road	Cook	-	34.7	\$ 3.93 m	\$ 0.42 m	\$ 1.60 m	\$ 5.95 m
Forsayth Road	Etheridge	-	40.4	\$ 3.13 m	\$ 0.29 m	\$ 0.12 m	\$ 3.54 m
Gillies Range Road	Cairns, Tablelands	-	50.0	Requires detailed analysis	\$ 0.58 m	\$ 4.10 m	\$ 4.68 m
Gillies Range Road	Tablelands	50.0	55.7	Requires detailed analysis	-	\$ 0.12 m	\$ 0.12 m

Road	Council	Start	End	Immediate		Future	Total
				Structural Deficiency (Capital Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	
Gregory Developmental Road (Charters Twrs-The Lynd)	Etheridge	237.9	250.0	\$ 1.46 m	-	\$ 0.91 m	\$ 2.37 m
Gregory Developmental Road (Charters Twrs-The Lynd)	Etheridge	250.0	258.8	\$ 0.99 m	\$ 0.09 m	\$ 0.69 m	\$ 1.77 m
Gregory Developmental Road (The Lynd-Quartz Blow Ck)	Etheridge	-	50.0	\$ 4.99 m	\$ 0.08 m	-	\$ 5.07 m
Gregory Developmental Road (The Lynd-Quartz Blow Ck)	Etheridge	50.0	100.0	\$ 2.25 m	-	-	\$ 2.25 m
Gulf Dev Road (Croydon – Georgetown)	Croydon, Etheridge	-	50.0	\$ 3.73 m	\$ 0.04 m	\$ 0.59 m	\$ 4.36 m
Gulf Dev Road (Croydon – Georgetown)	Etheridge	50.0	100.0	\$ 5.75 m	\$ 0.26 m	\$ 2.06 m	\$ 8.07 m
Gulf Dev Road (Croydon – Georgetown)	Etheridge	100.0	147.4	\$ 7.92 m	\$ 0.86 m	\$ 3.07 m	\$ 11.85 m
Gulf Dev Road (Georgetown - Mt Garnet)	Etheridge	-	50.0	\$ 13.30 m	\$ 0.62 m	\$ 1.32 m	\$ 15.23 m
Gulf Dev Road (Georgetown - Mt Garnet)	Etheridge	50.0	100.0	\$ 14.28 m	\$ 0.23 m	\$ 2.22 m	\$ 16.73 m
Gulf Dev Road (Georgetown - Mt Garnet)	Etheridge, Mareeba, Tablelands	100.0	148.1	\$ 5.83 m	-	\$ 1.11 m	\$ 6.94 m
Gulf Dev Road (Normanton – Croydon)	Carpentaria, Croydon	-	50.0	\$ 6.67 m	\$ 0.08 m	\$ 2.58 m	\$ 9.33 m
Gulf Dev Road (Normanton – Croydon)	Croydon	50.0	100.0	\$ 0.38 m	-	\$ 0.63 m	\$ 1.01 m
Gulf Dev Road (Normanton – Croydon)	Croydon	100.0	147.8	\$ 2.00 m	\$ 0.79 m	\$ 1.77 m	\$ 4.56 m
Halifax - Lucinda Point Road	Hinchinbrook	-	9.1	\$ 0.58 m	\$ 0.21 m	\$ 0.71 m	\$ 1.50 m
Henderson Drive	Cassowary Coast	-	6.6	\$ 0.88 m	\$ 0.17 m	\$ 0.86 m	\$ 1.92 m
Herberton - Petford Road	Mareeba, Tablelands	-	50.0	-	\$ 0.81 m	\$ 0.90 m	\$ 1.71 m
Herberton - Petford Road	Mareeba	50.0	69.6	-	\$ 0.03 m	-	\$ 0.03 m
Ingham - Abergowrie Road	Hinchinbrook	-	39.5	-	\$ 1.48 m	\$ 2.94 m	\$ 4.43 m
Ingham - Forrest Beach Road	Hinchinbrook	-	18.8	\$ 3.59 m	\$ 0.31 m	\$ 0.88 m	\$ 4.78 m
Ingham - Halifax - Bemerside Road	Hinchinbrook	-	26.9	\$ 1.14 m	\$ 0.25 m	\$ 0.80 m	\$ 2.19 m
Innisfail - Japoon Road	Cassowary Coast	-	25.4	\$ 0.38 m	\$ 1.86 m	\$ 2.96 m	\$ 5.20 m
Karumba Dev Road	Carpentaria	-	41.0	\$ 4.97 m	\$ 0.08 m	\$ 2.79 m	\$ 7.84 m

Road	Council	Start	End	Immediate		Future	Total
				Structural Deficiency (Capital Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	
Kennedy Dev Road (Mt Garnet - The Lynd)	Tablelands	-	50.0	\$ 3.12 m	-	-	\$ 3.12 m
Kennedy Dev Road (Mt Garnet - The Lynd)	Etheridge	50.0	100.0	\$ 3.84 m	\$ 0.04 m	\$ 1.91 m	\$ 5.79 m
Kennedy Dev Road (Mt Garnet - The Lynd)	Etheridge	100.0	104.9	\$ 0.60 m	-	-	\$ 0.60 m
Kennedy Dev Road (The Lynd-Hughenden)	Etheridge	-	50.0	\$ 2.95 m	\$ 0.06 m	\$ 0.78 m	\$ 3.79 m
Kennedy Dev Road (The Lynd-Hughenden)	Etheridge	50.0	90.8	\$ 3.25 m	\$ 0.12 m	\$ 0.24 m	\$ 3.61 m
Kennedy Highway (Cairns – Mareeba)	Cairns, Mareeba	-	48.8	Requires detailed analysis	\$ 0.98 m	\$ 5.57 m	\$ 6.55 m
Kennedy Highway (Mareeba – Ravenshoe)	Mareeba, Tablelands	-	50.0	\$ 6.37 m	\$ 0.68 m	\$ 6.11 m	\$ 13.15 m
Kennedy Highway (Mareeba – Ravenshoe)	Tablelands	50.0	82.2	\$ 2.63 m	\$ 0.87 m	\$ 1.75 m	\$ 5.25 m
Kennedy Highway (Mt Garnet - The Lynd)	Mareeba, Tablelands	-	50.0	\$ 8.67 m	\$ 0.04 m	\$ 0.04 m	\$ 8.75 m
Kennedy Highway (Mt Garnet - The Lynd)	Mareeba, Tablelands	50.0	67.5	\$ 1.98 m	-	\$ 0.39 m	\$ 2.37 m
Kennedy Highway (Ravenshoe - Mt Garnet)	Tablelands	-	44.6	\$ 4.26 m	\$ 0.12 m	\$ 2.99 m	\$ 7.38 m
Kurrimine Beach Road	Cassowary Coast	-	9.9	-	-	\$ 0.61 m	\$ 0.61 m
Longlands Gap - Herberton Road	Tablelands	-	15.0	-	\$ 0.21 m	\$ 0.35 m	\$ 0.56 m
Malanda - Atherton Road	Tablelands	-	16.2	\$ 2.88 m	-	\$ 0.10 m	\$ 2.98 m
Malanda - Lake Barrine Road	Tablelands	-	12.0	-	\$ 0.04 m	-	\$ 0.04 m
Malanda - Upper Barron Road	Tablelands	-	13.5	\$ 0.01 m	-	\$ 0.04 m	\$ 0.05 m
Mareeba - Dimbulah Road	Mareeba	-	48.0	\$ 8.75 m	\$ 0.58 m	\$ 2.45 m	\$ 11.77 m
Mareeba Connection Road	Mareeba	-	0.7	\$ 0.23 m	-	\$ 1.22 m	\$ 1.45 m
Millaa Millaa - Malanda Road	Tablelands	-	22.6	\$ 2.83 m	\$ 1.18 m	\$ 3.93 m	\$ 7.94 m
Mossman - Daintree Road	Douglas	-	35.3	-	\$ 0.32 m	\$ 1.73 m	\$ 2.05 m
Mossman - Mt Molloy Road	Douglas, Mareeba	-	28.4	Requires detailed analysis	\$ 0.31 m	\$ 0.73 m	\$ 1.04 m
Mourilyan Harbour Road	Cassowary Coast	-	9.1	\$ 0.19 m	\$ 0.24 m	\$ 0.57 m	\$ 1.00 m

Road	Council	Start	End	Immediate		Future	Total
				Structural Deficiency (Capital Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	
Mulgrave Road	Cairns	-	5.9	-	\$ 0.64 m	\$ 4.47 m	\$ 5.11 m
Mulligan Highway (Lakeland – Cooktown)	Cook	-	50.0	\$ 0.99 m	-	\$ 9.51 m	\$ 10.50 m
Mulligan Highway (Lakeland – Cooktown)	Cook	50.0	78.2	\$ 2.18 m	\$ 0.47 m	\$ 1.41 m	\$ 4.07 m
Mulligan Highway (Mareeba - Mount Molloy)	Mareeba	-	38.4	\$ 2.69 m	\$ 0.61 m	\$ 1.60 m	\$ 4.91 m
Mulligan Highway (Mount Molloy – Lakeland)	Mareeba	-	50.0	\$ 16.13 m	\$ 0.72 m	\$ 4.93 m	\$ 21.77 m
Mulligan Highway (Mount Molloy – Lakeland)	Cook, Mareeba	50.0	100.0	\$ 21.50 m	\$ 0.04 m	\$ 2.08 m	\$ 23.62 m
Mulligan Highway (Mount Molloy – Lakeland)	Cook	100.0	144.4	\$ 5.01 m	\$ 0.26 m	\$ 3.16 m	\$ 8.43 m
Palmerston Highway (Innisfail-Ravenshoe)	Cassowary Coast, Tablelands	-	50.0	Requires detailed analysis	\$ 0.77 m	\$ 2.97 m	\$ 3.75 m
Palmerston Highway (Innisfail-Ravenshoe)	Tablelands	50.0	78.6	Requires detailed analysis	\$ 12.75 m	\$ 0.84 m	\$ 13.59 m
Peninsula Dev Road (Coen – Weipa)	Cook	-	50.0	\$ 2.78 m	\$ 0.32 m	\$ 0.04 m	\$ 3.14 m
Peninsula Dev Road (Coen – Weipa)	Cook	50.0	100.0	\$ 0.79 m	\$ 0.23 m	\$ 0.09 m	\$ 1.11 m
Peninsula Dev Road (Coen – Weipa)	Cook	100.0	150.0	\$ 0.77 m	-	-	\$ 0.77 m
Peninsula Dev Road (Coen – Weipa)	Cook	150.0	200.0	\$ 0.46 m	-	-	\$ 0.46 m
Peninsula Dev Road (Coen – Weipa)	Cook	200.0	217.8	\$ 0.61 m	-	-	\$ 0.61 m
Peninsula Dev Road (Lakeland – Laura)	Cook	-	50.0	\$ 4.44 m	\$ 0.08 m	\$ 4.72 m	\$ 9.24 m
Peninsula Dev Road (Lakeland – Laura)	Cook	50.0	61.2	\$ 0.15 m	\$ 0.14 m	\$ 0.17 m	\$ 0.46 m
Peninsula Dev Road (Laura – Coen)	Cook	-	50.0	\$ 2.42 m	\$ 0.44 m	\$ 0.59 m	\$ 3.44 m
Peninsula Dev Road (Laura – Coen)	Cook	50.0	100.0	\$ 1.82 m	-	\$ 0.10 m	\$ 1.92 m
Peninsula Dev Road (Laura – Coen)	Cook	100.0	150.0	\$ 0.42 m	\$ 0.24 m	-	\$ 0.66 m

Road	Council	Start	End	Immediate		Future	Total
				Structural Deficiency (Capital Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	
Peninsula Dev Road (Laura – Coen)	Cook	150.0	200.0	\$ 2.12 m	-	-	\$ 2.12 m
Peninsula Dev Road (Laura – Coen)	Cook	200.0	246.4	\$ 2.39 m	\$ 0.17 m	\$ 0.04 m	\$ 2.59 m
Pine Creek - Yarrabah Road	Cairns	-	27.1	-	\$ 0.36 m	\$ 0.84 m	\$ 1.20 m
Port Connection Road	Cairns	-	1.8	\$ 0.33 m	-	\$ 0.21 m	\$ 0.54 m
Port Douglas Road	Douglas	-	5.9	-	\$ 0.86 m	\$ 2.10 m	\$ 2.96 m
Shiptons Flat Road	Cook	-	7.5	-	\$ 0.53 m	\$ 1.33 m	\$ 1.86 m
Silkwood - Japoon Road	Cassowary Coast	-	14.8	-	\$ 1.97 m	\$ 2.00 m	\$ 3.97 m
South Johnstone Road	Cassowary Coast	-	5.4	\$ 0.91 m	\$ 0.19 m	\$ 0.93 m	\$ 2.03 m
South Mission Beach Road	Cassowary Coast	-	3.3	-	\$ 0.10 m	\$ 0.15 m	\$ 0.25 m
Stone River Road	Hinchinbrook	-	25.5	-	\$ 0.07 m	\$ 0.32 m	\$ 0.40 m
Stratford Connection Road	Cairns	-	7.2	-	\$ 1.03 m	\$ 0.31 m	\$ 1.34 m
Tinaroo Falls Dam Road	Tablelands	-	14.9	\$ 0.44 m	\$ 0.42 m	\$ 0.38 m	\$ 1.24 m
Topaz Road	Tablelands	-	16.9	-	\$ 4.12 m	\$ 1.82 m	\$ 5.94 m
Tully - Hull Road	Cassowary Coast	-	13.0	-	\$ 0.04 m	\$ 0.36 m	\$ 0.40 m
Tully - Mission Beach Road	Cassowary Coast	-	23.0	\$ 2.07 m	\$ 0.30 m	\$ 1.64 m	\$ 4.01 m
Tumoulin Road	Tablelands	-	21.3	\$ 0.13 m	\$ 0.43 m	\$ 0.51 m	\$ 1.07 m
Wills Dev Road (Julia Creek-Burketown)	Carpentaria	277.0	300.0	\$ 2.08 m	\$ 0.30 m	\$ 1.80 m	\$ 4.17 m
Wills Dev Road (Julia Creek-Burketown)	Carpentaria	300.0	315.9	\$ 2.24 m	\$ 0.13 m	\$ 1.54 m	\$ 3.92 m

14. Council roads costed deficiencies

The Council road analysis has identified \$203 m of works over the next 20 years. Figure 14-1 illustrates the costs by work type. Road width and structures condition/width are already deficient and should be considered for funding in the near future. Roughness and rutting funding are based on road segments reaching intervention triggers over the next 20 years and is illustrated in Figure 14-2.

The unavailability of surveyed roughness and rutting data for most local roads suggests there is significant underestimating of costs of maintaining sealed roads. While these roads were not surveyed by ARRB because of being greater than 50% unsealed, those segments that are sealed are potentially in poor condition.

As previously noted, the Council road network is predominantly general access for heavy vehicles i.e. PBS1. Because the width rules developed from the PBS Guidelines apply to PBS2 and above, no width deficiencies are triggered. Consequently, there are relatively few width-related costs.

It is likely that Councils allow HPVs to operate on some roads currently gazetted as general access. It is expected in these cases that Councils have undertaken a fitness-for-purpose assessment and deemed that HPV access is acceptable. If so, gazetting the road at a level higher than general access is recommended to be considered. Immediate opportunities have been identified within the complementary Heavy Vehicle Productivity Technical Report.

Figure 14-1 Council 20 year funding requirements

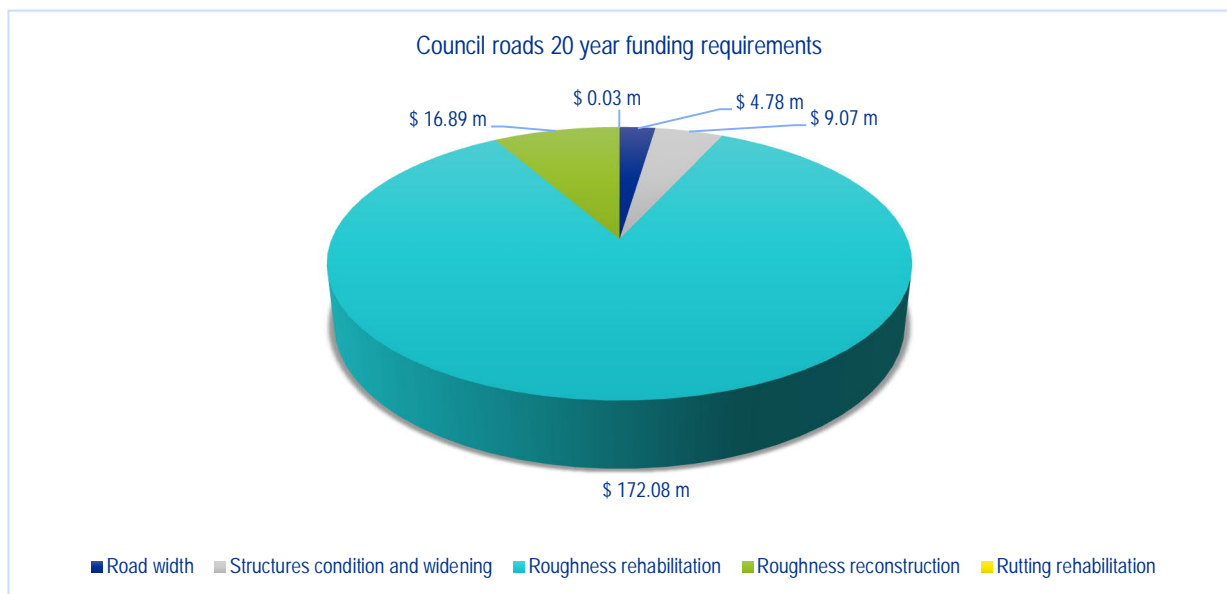


Figure 14-2 Council roads 20 year roughness/rutting funding requirements

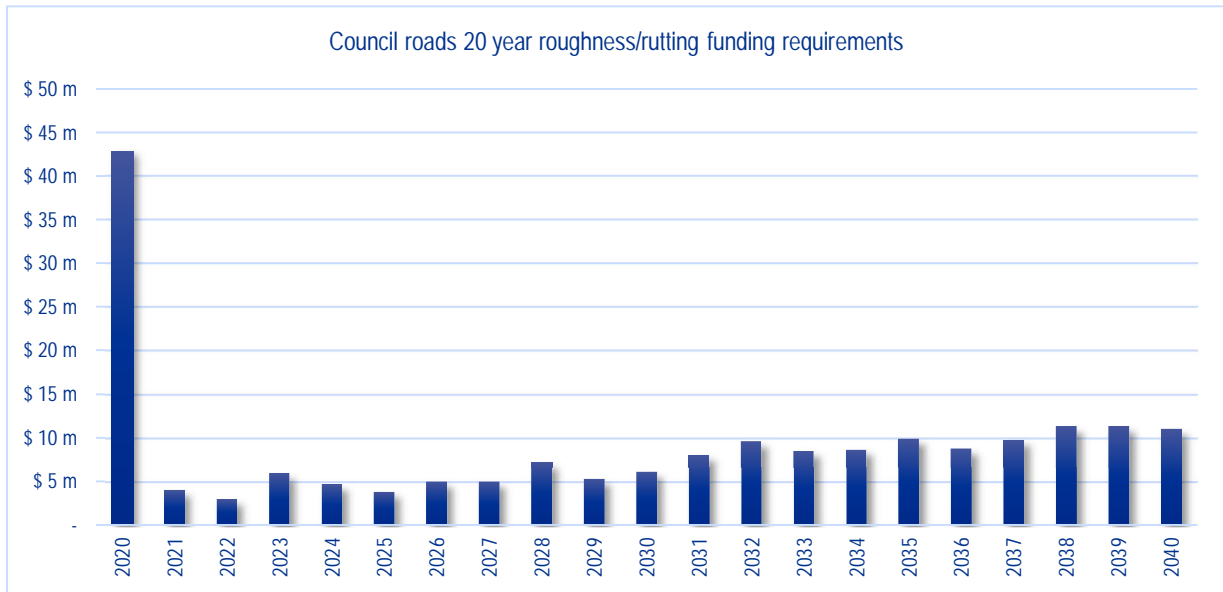


Table 14-1 Council road costs (in alphabetical order)

Road	Council	Start	End	Immediate		Future	Total
				Structural Deficiency (Capital Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	
Abbott Street	Cairns	-	1.0	-	\$ 1.05 m	\$ 1.95 m	\$ 3.01 m
Aerodrome Road	Cassowary Coast	-	1.3	-	\$ 0.15 m	\$ 0.16 m	\$ 0.31 m
Agate Creek Road	Etheridge	-	12.6	\$ 0.01 m	-	-	\$ 0.01 m
Airport Avenue	Cairns	-	0.7	-	-	\$ 0.20 m	\$ 0.20 m
Alexander Drive	Cassowary Coast	-	2.6	\$ 0.26 m	\$ 0.04 m	\$ 0.60 m	\$ 0.91 m
Aumuller Street	Cairns	-	2.4	-	\$ 3.06 m	\$ 7.32 m	\$ 10.38 m
Barron Gorge Road	Cairns	-	3.9	-	\$ 1.01 m	\$ 0.20 m	\$ 1.21 m
Bingil Bay Road	Cassowary Coast	-	7.5	\$ 0.65 m	\$ 0.10 m	\$ 1.41 m	\$ 2.16 m
Boar Pocket Road	Tablelands	-	6.2	-	\$ 0.17 m	\$ 1.16 m	\$ 1.32 m
Brooks Road	Tablelands	-	4.0	-	\$ 1.14 m	\$ 0.64 m	\$ 1.78 m
Bryant Street	Cassowary Coast	-	1.5	\$ 0.12 m	-	\$ 1.39 m	\$ 1.51 m
Butler Street	Cassowary Coast	-	0.6	\$ 0.63 m	\$ 0.36 m	\$ 0.76 m	\$ 1.74 m
Cape Tribulation Road	Douglas	-	39.8	\$ 1.14 m	\$ 8.25 m	\$ 8.36 m	\$ 17.75 m
Cashmere Kirrama Road	Tablelands	-	64.5	\$ 0.62 m	-	-	\$ 0.62 m

Road	Council	Start	End	Immediate		Future	Total
				Structural Deficiency (Capital Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	
Chettle Road	Mareeba	-	7.5	\$ 1.36 m	\$ 0.15 m	\$ 0.66 m	\$ 2.17 m
Chewko Road	Mareeba	-	19.3	-	\$ 0.70 m	\$ 5.09 m	\$ 5.79 m
Cook Street	Cairns	-	1.0	-	\$ 4.28 m	\$ 1.83 m	\$ 6.11 m
Cooks Lane	Hinchinbrook	-	8.4	-	\$ 0.06 m	\$ 0.29 m	\$ 0.34 m
Curtain Fig Tree Road	Tablelands	-	4.4	-	\$ 0.21 m	\$ 1.20 m	\$ 1.41 m
Danbulla Road	Tablelands	-	25.8	\$ 1.07 m	-	-	\$ 1.07 m
Dean Road	Cassowary Coast	-	1.2	\$ 0.05 m	\$ 0.12 m	\$ 0.46 m	\$ 0.63 m
Draper Street	Cairns	-	0.3	-	\$ 0.61 m	\$ 1.22 m	\$ 1.83 m
East Barron Road	Tablelands	-	7.7	-	\$ 0.34 m	\$ 1.72 m	\$ 2.06 m
Einaleigh - Forsayth Road	Etheridge	-	66.9	\$ 0.09 m	-	-	\$ 0.09 m
Elphinstone Pocket Road	Hinchinbrook	-	2.7	-	-	\$ 0.07 m	\$ 0.07 m
Euluma Creek Road	Mareeba	-	11.6	-	\$ 1.59 m	\$ 2.62 m	\$ 4.21 m
Fitzgerald Esplanade	Cassowary Coast	-	0.7	-	\$ 1.09 m	\$ 0.55 m	\$ 1.64 m
Florence Street	Cairns	-	0.4	-	\$ 0.16 m	\$ 0.48 m	\$ 0.64 m
Flying Fish Point Road	Cassowary Coast	-	5.1	\$ 0.01 m	\$ 0.64 m	\$ 2.92 m	\$ 3.57 m
Four Mile Road	Hinchinbrook	-	1.6	\$ 0.50 m	\$ 0.03 m	\$ 0.22 m	\$ 0.75 m
Furber Road	Hinchinbrook	-	0.2	-	\$ 0.03 m	\$ 0.03 m	\$ 0.06 m
Glendinning Road	Tablelands	-	3.0	-	\$ 0.05 m	\$ 0.37 m	\$ 0.41 m
Grace Street	Cassowary Coast	-	0.9	-	\$ 1.02 m	\$ 1.71 m	\$ 2.73 m
Grove Street	Tablelands	-	1.1	-	\$ 0.48 m	\$ 1.51 m	\$ 2.00 m
Gunnawarra Road	Tablelands	-	51.2	\$ 0.03 m	-	-	\$ 0.03 m
Hansen Road	Tablelands	-	5.8	\$ 0.01 m	-	\$ 1.11 m	\$ 1.12 m
Hastie Road	Tablelands	-	2.3	-	\$ 0.35 m	\$ 0.95 m	\$ 1.30 m
Hawkins Creek Road	Hinchinbrook	-	26.9	-	\$ 0.17 m	\$ 2.23 m	\$ 2.40 m
Hoare Street	Cairns	-	1.5	-	-	\$ 2.78 m	\$ 2.78 m
Hussey Road	Cairns	-	3.2	-	\$ 0.07 m	\$ 0.11 m	\$ 0.18 m
Johnston Road	Douglas	-	1.0	-	\$ 0.07 m	\$ 0.24 m	\$ 0.31 m
Junction Road	Tablelands	-	3.4	-	\$ 1.94 m	\$ 0.07 m	\$ 2.02 m
Kamerunga Road	Cairns	-	1.6	-	\$ 0.20 m	\$ 2.03 m	\$ 2.23 m
Kennedy Creek Road	Cassowary Coast	-	6.7	\$ 0.01 m	\$ 0.09 m	\$ 0.32 m	\$ 0.43 m
Kenny Street	Cairns	-	0.4	\$ 0.34 m	-	\$ 2.00 m	\$ 2.34 m

Road	Council	Start	End	Immediate		Future	Total
				Structural Deficiency (Capital Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	
Kirrama Range Road	Cassowary Coast, Tablelands	-	45.3	\$ 0.02 m	-	-	\$ 0.02 m
Lake Eacham Road	Tablelands	-	2.3	-	-	\$ 0.28 m	\$ 0.28 m
Lake Morris Road	Cairns	-	15.3	-	\$ 4.42 m	\$ 3.73 m	\$ 8.15 m
Lake Placid Road	Cairns	-	1.2	-	-	\$ 0.44 m	\$ 0.44 m
Lake Street	Cairns	-	2.9	-	\$ 1.49 m	\$ 3.01 m	\$ 4.50 m
Lannercost Extension Road	Hinchinbrook	-	5.9	-	\$ 0.10 m	\$ 0.69 m	\$ 0.79 m
Lawson Street	Tablelands	-	0.5	-	-	\$ 0.05 m	\$ 0.05 m
Leadingham Creek Road	Mareeba	-	13.0	-	\$ 1.01 m	\$ 1.54 m	\$ 2.55 m
Maitland Road	Cairns	-	3.5	-	\$ 0.03 m	\$ 0.12 m	\$ 0.15 m
Marks Lane	Tablelands	-	5.4	\$ 0.01 m	\$ 0.05 m	\$ 0.61 m	\$ 0.68 m
Mcilwraith Street	Hinchinbrook	-	1.2	-	\$ 1.56 m	\$ 2.28 m	\$ 3.84 m
Menzies Street	Hinchinbrook	-	0.4	-	\$ 0.95 m	-	\$ 0.95 m
Middle Murray Road	Cassowary Coast	-	6.2	-	\$ 0.31 m	\$ 1.16 m	\$ 1.48 m
Monument Street	Tablelands	-	0.5	-	\$ 0.20 m	\$ 0.05 m	\$ 0.24 m
Morris Street	Cassowary Coast	-	0.4	\$ 0.04 m	-	\$ 0.84 m	\$ 0.89 m
Mossman Gorge Road	Douglas	-	4.2	-	\$ 0.53 m	\$ 1.42 m	\$ 1.95 m
Mount Fox Road	Hinchinbrook	-	23.1	-	\$ 2.95 m	\$ 1.92 m	\$ 4.87 m
Mount Peter Road	Cairns	-	0.5	-	\$ 0.03 m	\$ 0.03 m	\$ 0.06 m
Mourilyan Road	Cassowary Coast	-	2.5	-	-	\$ 4.69 m	\$ 4.69 m
Mundoo Road	Cassowary Coast	-	0.5	-	-	\$ 0.25 m	\$ 0.25 m
Munro Street	Cairns	-	1.2	-	\$ 0.07 m	\$ 0.32 m	\$ 0.39 m
Murray Falls Road	Cassowary Coast	-	3.2	-	\$ 0.22 m	\$ 0.66 m	\$ 0.88 m
Myola Road	Mareeba	-	4.3	-	\$ 0.63 m	\$ 6.06 m	\$ 6.69 m
North Head Road	Etheridge	-	43.1	\$ 0.04 m	-	-	\$ 0.04 m
North Walsh Road	Mareeba	-	2.0	-	\$ 0.19 m	\$ 0.48 m	\$ 0.67 m
Palm Avenue	Hinchinbrook	-	0.3	-	-	\$ 0.27 m	\$ 0.27 m
Pine Creek Road	Yarrabah	-	6.4	-	\$ 2.79 m	\$ 7.32 m	\$ 10.11 m
Redlynch Intake Road	Cairns	-	9.6	\$ 0.18 m	\$ 1.82 m	\$ 8.55 m	\$ 10.55 m
Sawmill Road	Yarrabah	-	0.7	-	\$ 0.17 m	\$ 0.87 m	\$ 1.05 m
Sluice Creek Road	Tablelands	-	3.7	-	\$ 0.12 m	\$ 0.45 m	\$ 0.57 m

Road	Council	Start	End	Immediate		Future	Total
				Structural Deficiency (Capital Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	Fatigue Deficiency (Routine Maintenance Expenditure Needs)	
Springmount Road	Mareeba	-	22.8	\$ 1.13 m	\$ 1.07 m	\$ 2.76 m	\$ 4.96 m
Taylor's Beach Road	Hinchinbrook	-	6.6	-	\$ 0.20 m	\$ 1.24 m	\$ 1.45 m
The Boulders Road	Cairns	-	5.4	-	\$ 0.19 m	\$ 0.89 m	\$ 1.08 m
Theresa Creek Road	Tablelands	-	15.2	-	\$ 0.75 m	\$ 2.54 m	\$ 3.29 m
Tolga-Kairi Road	Tablelands	-	6.7	-	\$ 0.10 m	\$ 0.88 m	\$ 0.98 m
Tully Falls Road	Tablelands	-	38.6	\$ 0.20 m	-	-	\$ 0.20 m
Tully Gorge Road	Cassowary Coast	-	50.3	\$ 5.26 m	\$ 1.24 m	\$ 7.60 m	\$ 14.10 m
Undara Road	Etheridge	-	14.1	\$ 0.01 m	\$ 0.35 m	\$ 0.14 m	\$ 0.49 m
Upper Murray Road	Cassowary Coast	-	8.3	-	-	\$ 0.96 m	\$ 0.96 m
Valmadre Street	Cairns	-	0.4	-	\$ 0.14 m	\$ 0.28 m	\$ 0.42 m
Venables Crossing Road	Hinchinbrook	-	0.7	-	\$ 0.10 m	\$ 0.05 m	\$ 0.16 m
Wallaman Falls Road	Hinchinbrook	-	34.7	-	\$ 0.34 m	\$ 4.25 m	\$ 4.59 m
Walter Lever Estate Road	Cassowary Coast	-	6.2	-	\$ 0.64 m	\$ 0.86 m	\$ 1.50 m
Wharf Street	Cairns	-	0.6	-	\$ 0.41 m	\$ 1.42 m	\$ 1.83 m
Wongabel Road	Tablelands	-	7.0	-	\$ 0.39 m	\$ 1.55 m	\$ 1.93 m
Workshop Road	Yarrabah	-	1.2	-	\$ 0.35 m	\$ 0.87 m	\$ 1.22 m

Appendix A. Economic indicators by Council

The following figures illustrate the impacts for the below freight-orientated industries:

- Accommodation and Food Services
- Agriculture, Forestry and Fishing
- Mining
- Manufacturing
- Construction
- Wholesale Trade
- Retail Trade
- Transport, Postal and Warehousing

All data has been sourced from Economy ID and is for the financial year 2018/19.

Figure 14-3 Cairns Output

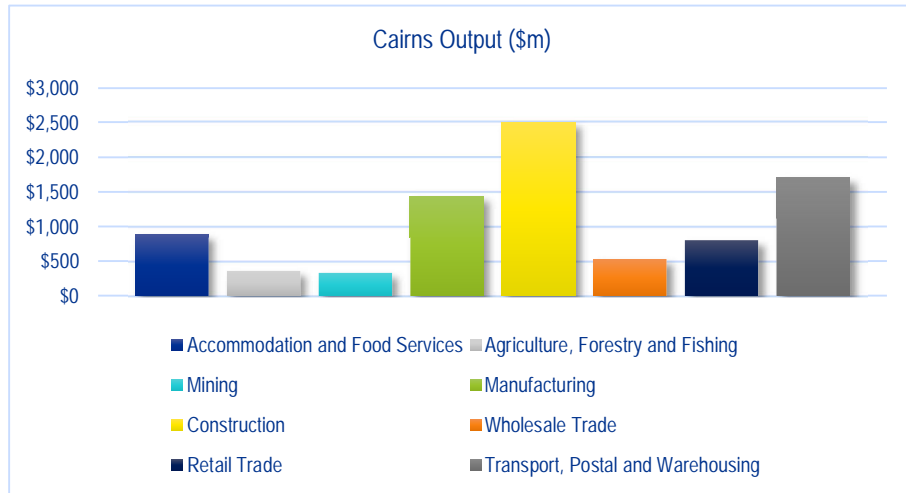


Figure 14-5 Cairns Imports

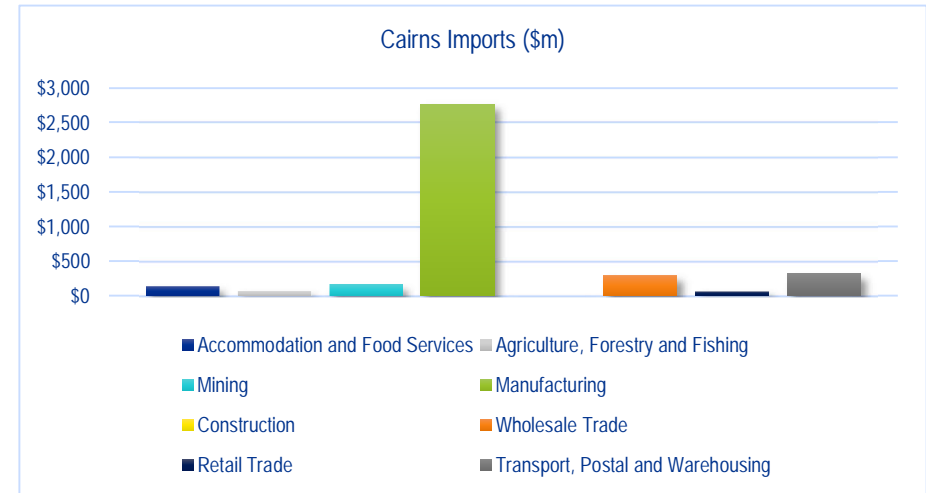


Figure 14-4 Cairns Local Sales

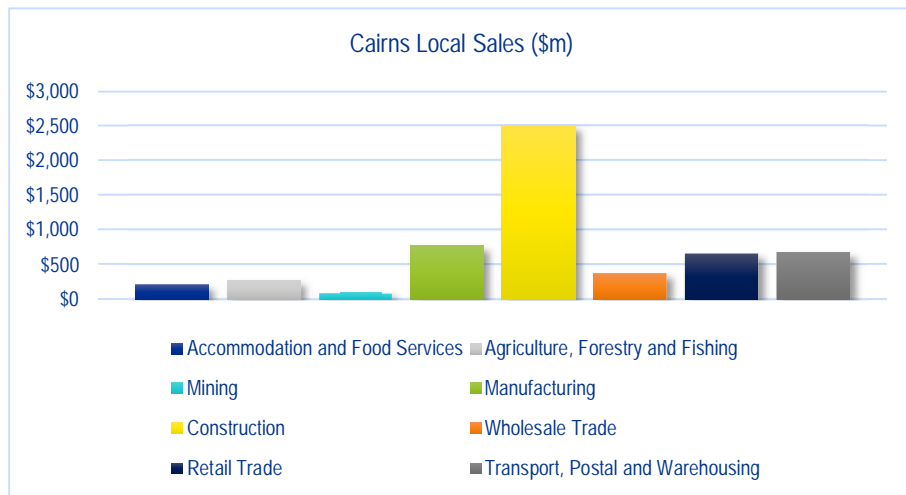


Figure 14-6 Cairns Exports



Figure 14-7 Cassowary Output (\$m)

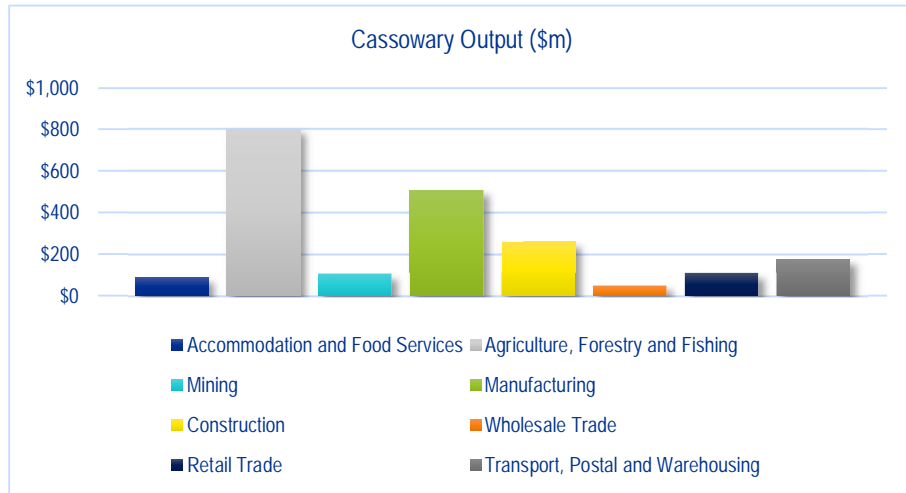


Figure 14-9 Cassowary Imports (\$m)

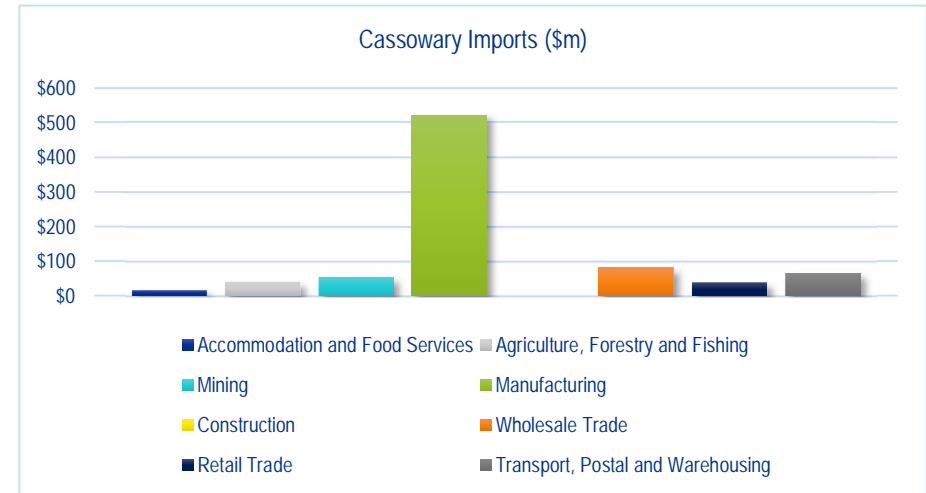


Figure 14-8 Cassowary Local Sales (\$m)



Figure 14-10 Cassowary Exports (\$m)

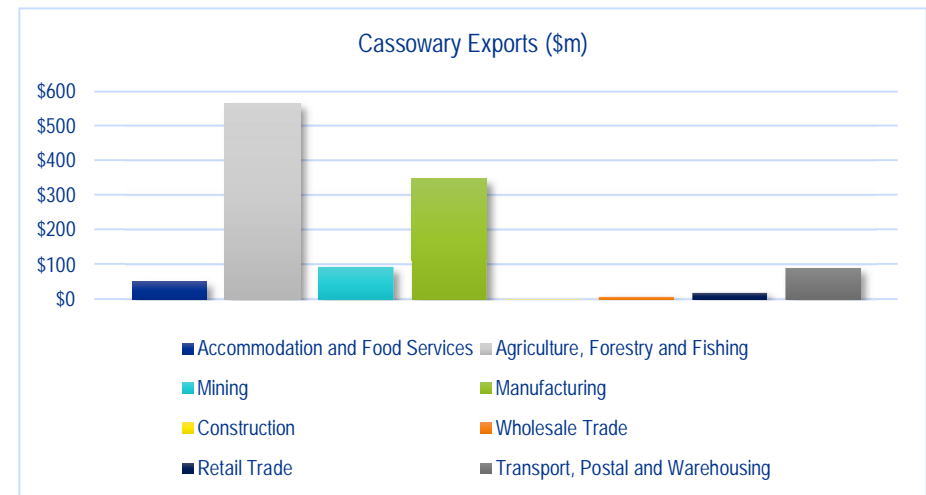


Figure 14-11 Carpentaria Output (\$m)

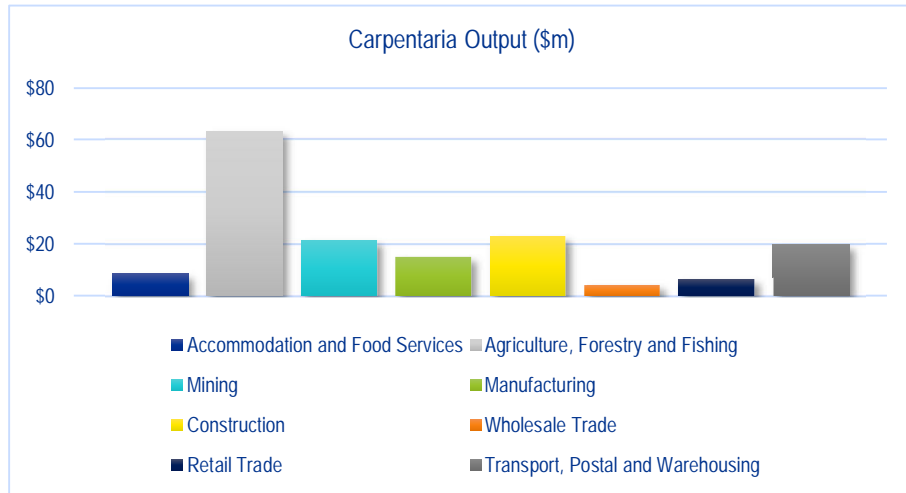


Figure 14-13 Carpentaria Imports (\$m)

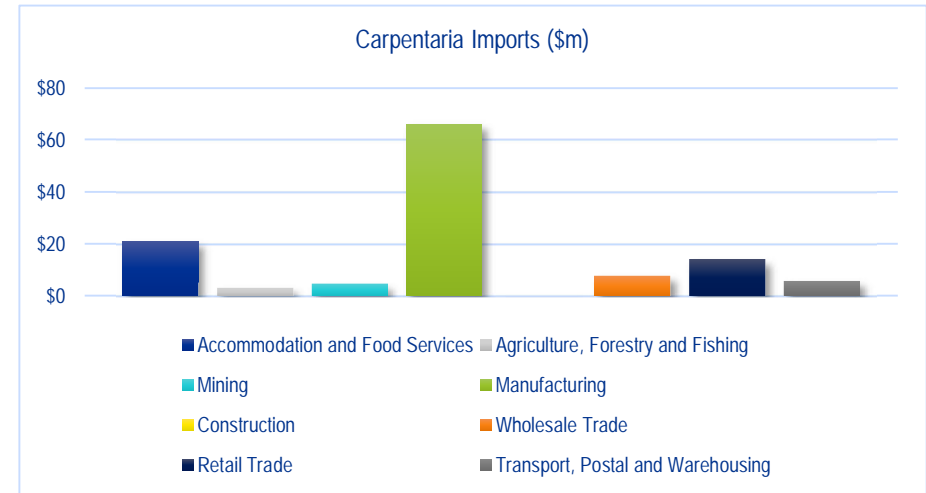


Figure 14-12 Carpentaria Local Sales (\$m)

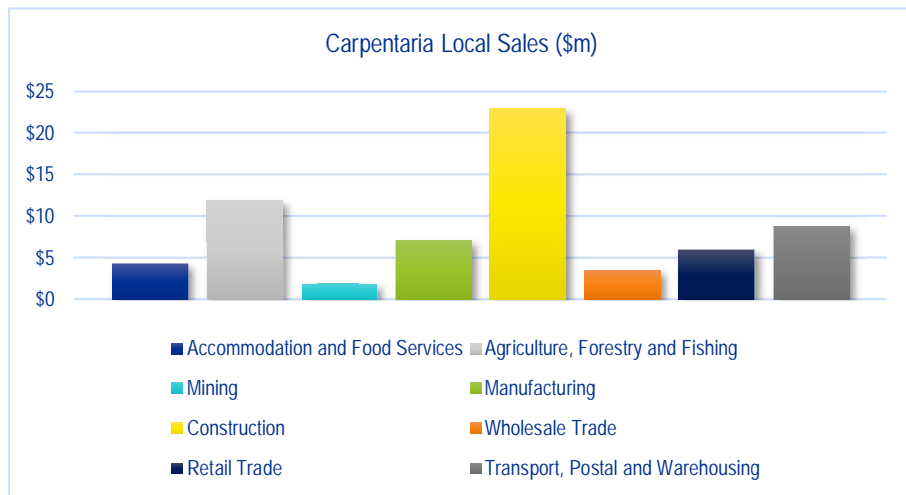


Figure 14-14 Carpentaria Exports (\$m)

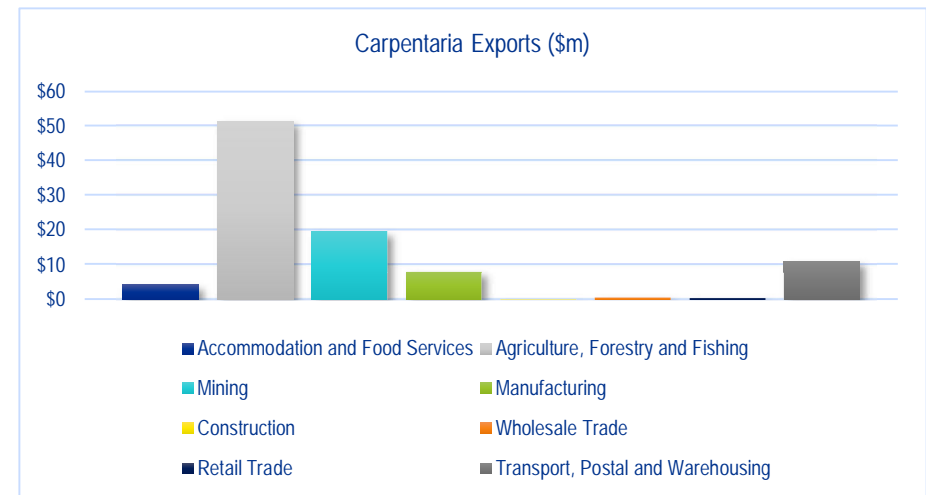


Figure 14-15 Cook Output (\$m)

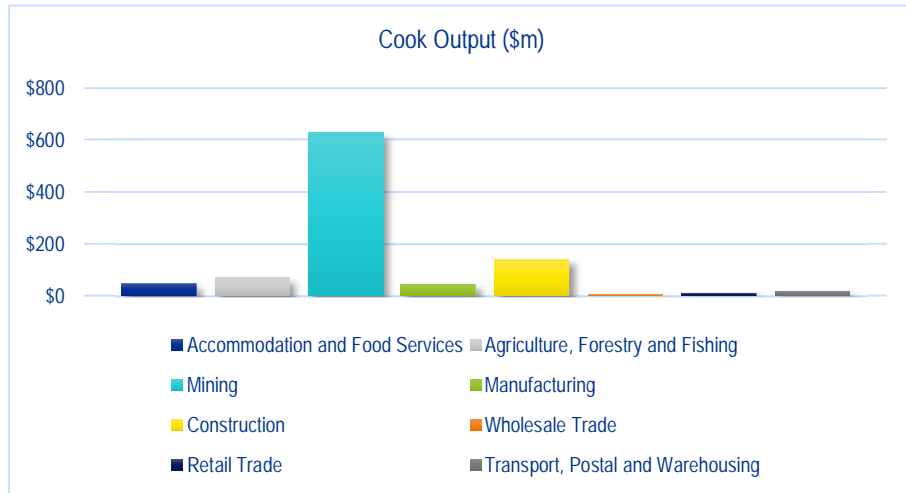


Figure 14-17 Cook Imports (\$m)

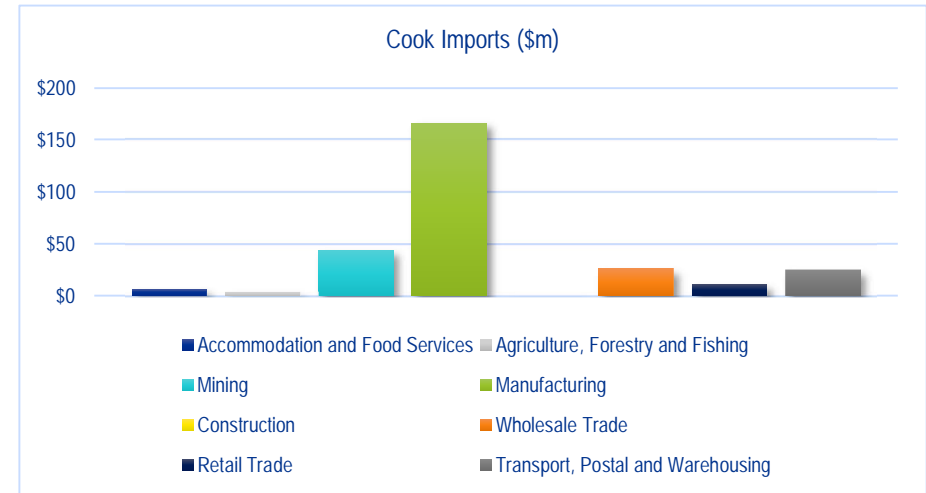


Figure 14-16 Cook Local Sales (\$m)

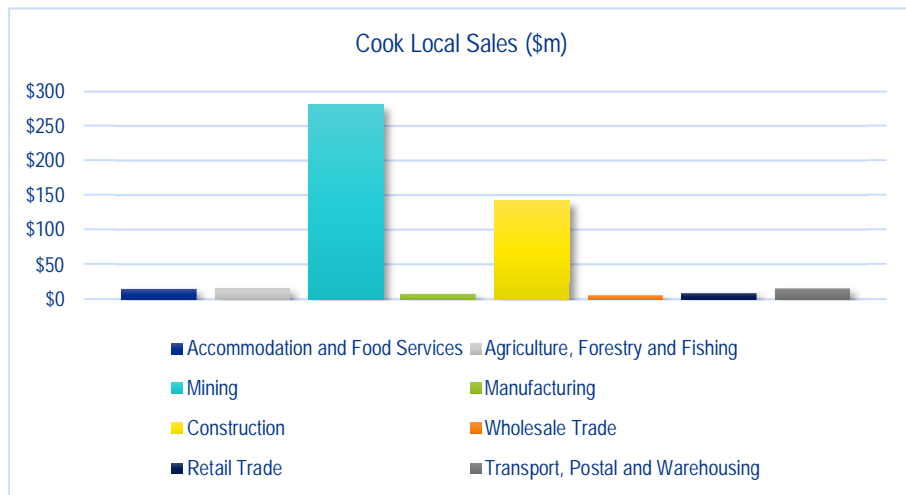


Figure 14-18 Cook Exports (\$m)

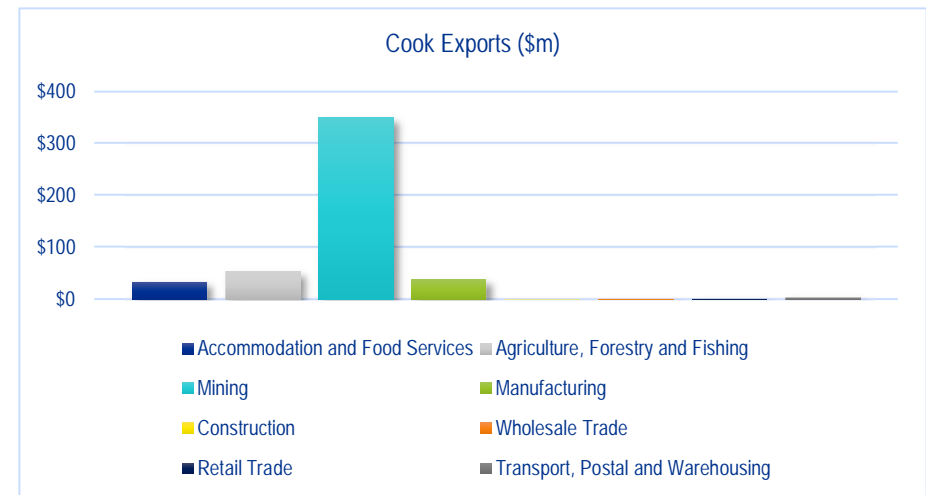


Figure 14-19 Douglas Output (\$m)

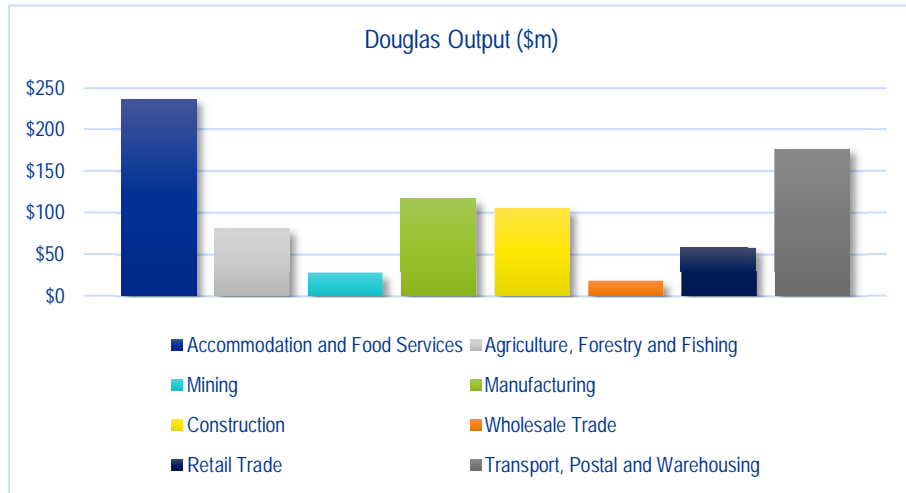


Figure 14-21 Douglas Imports (\$m)

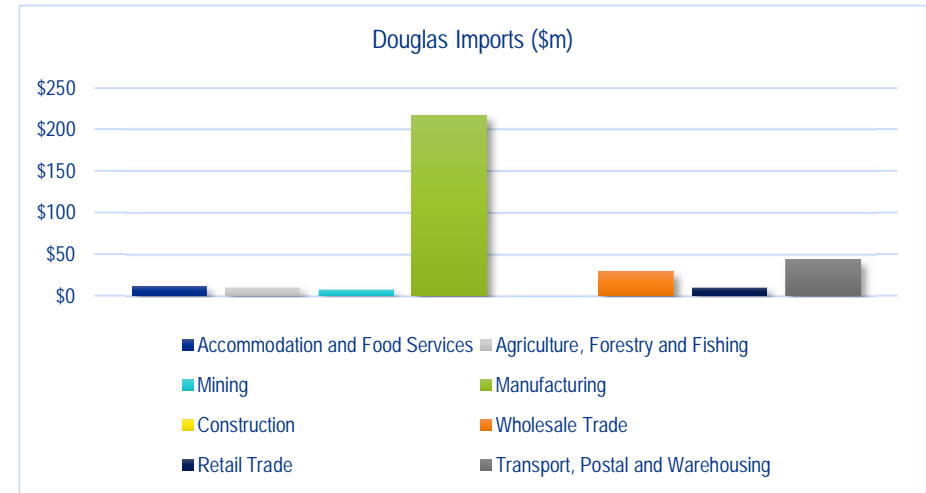


Figure 14-20 Douglas Local Sales (\$m)

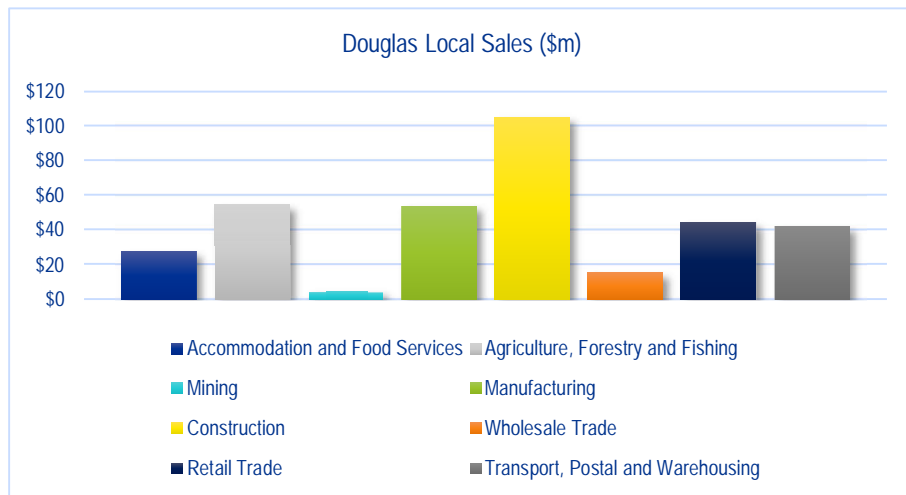


Figure 14-22 Douglas Exports (\$m)

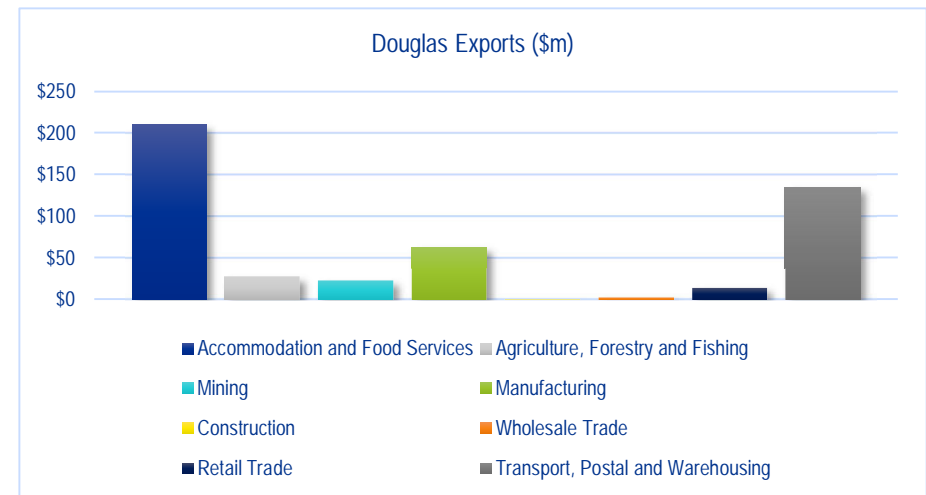


Figure 14-23 Etheridge Output (\$m)

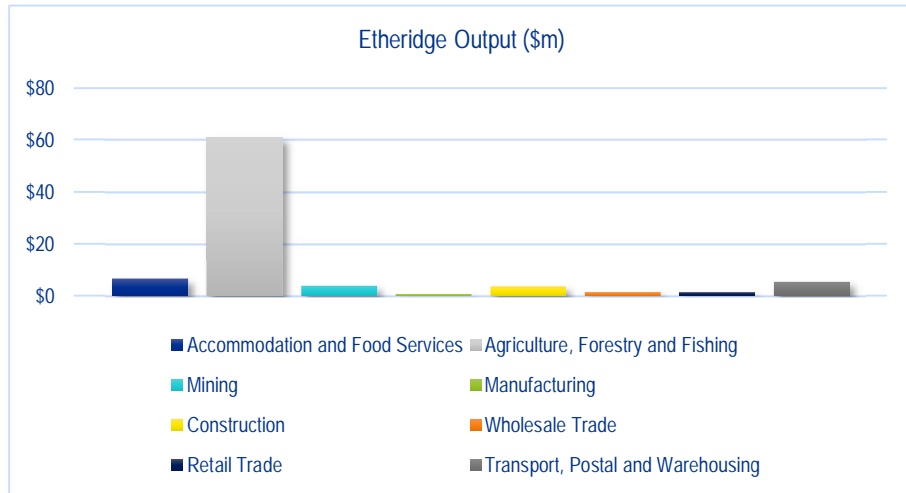


Figure 14-25 Etheridge Imports (\$m)

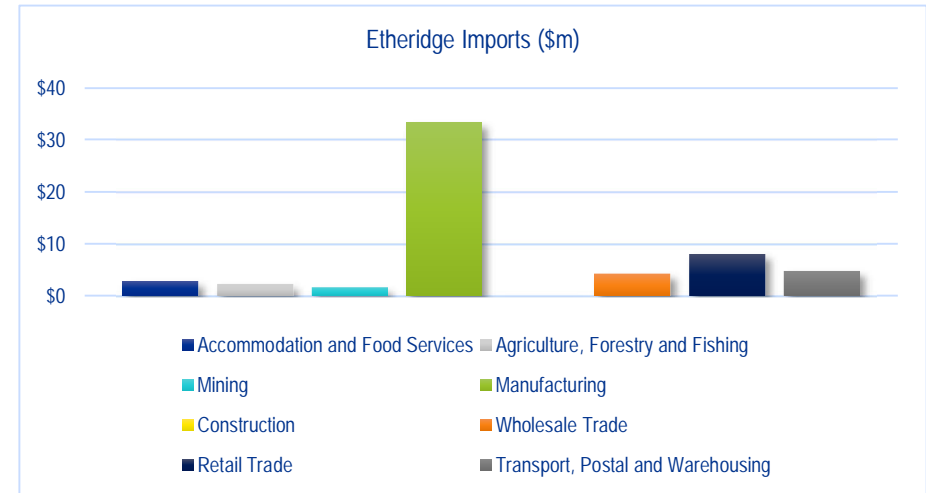


Figure 14-24 Etheridge Local Sales (\$m)

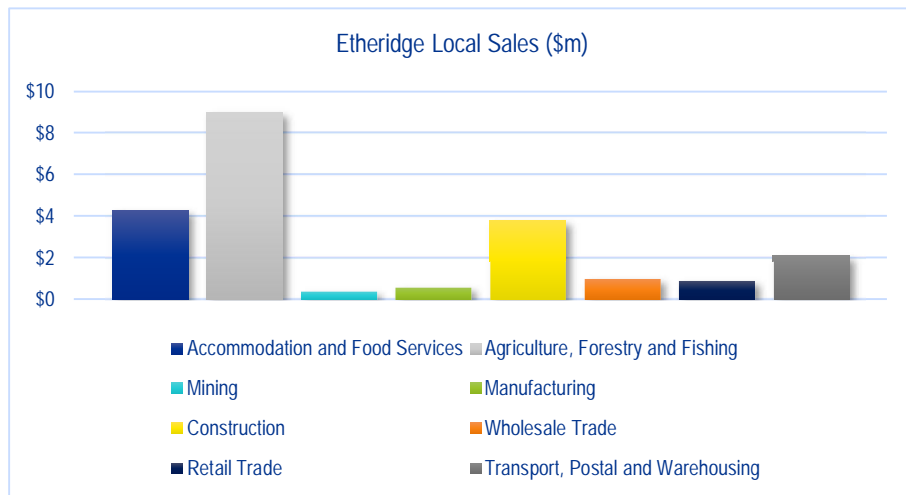


Figure 14-26 Etheridge Exports (\$m)



Figure 14-27 Hinchinbrook Output (\$m)

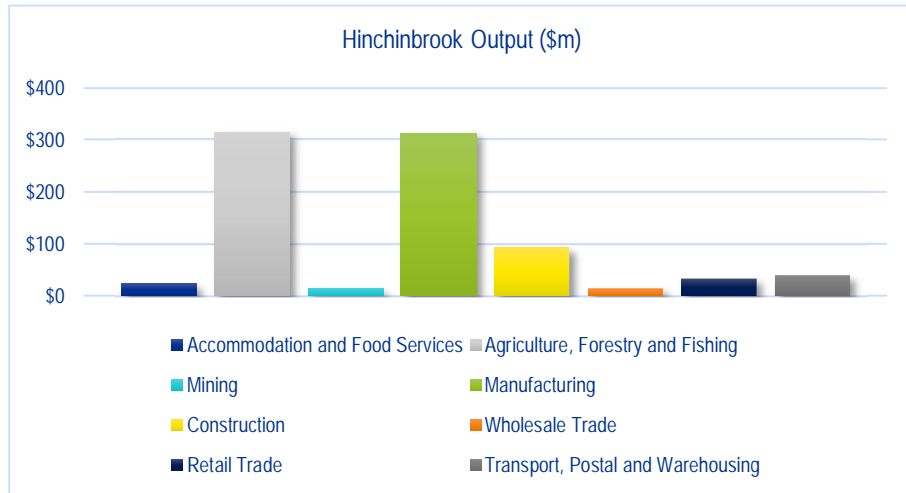


Figure 14-29 Hinchinbrook Imports (\$m)

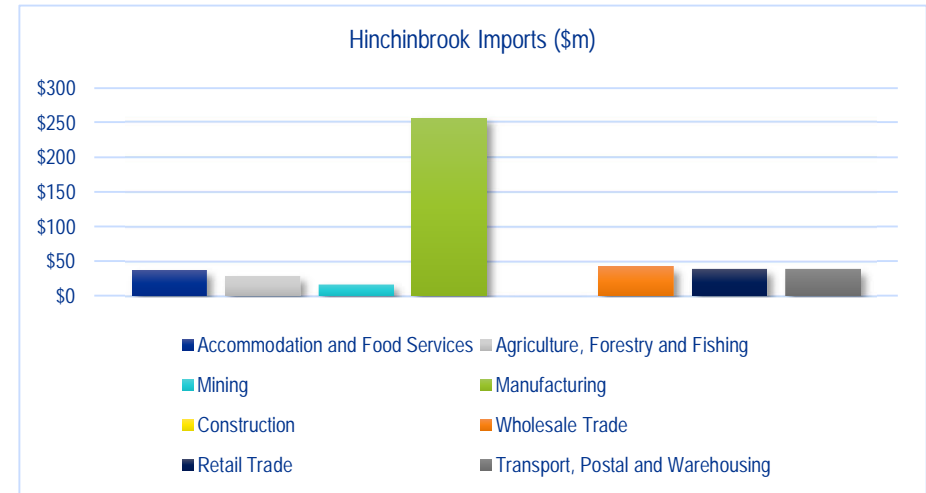


Figure 14-28 Hinchinbrook Local Sales (\$m)

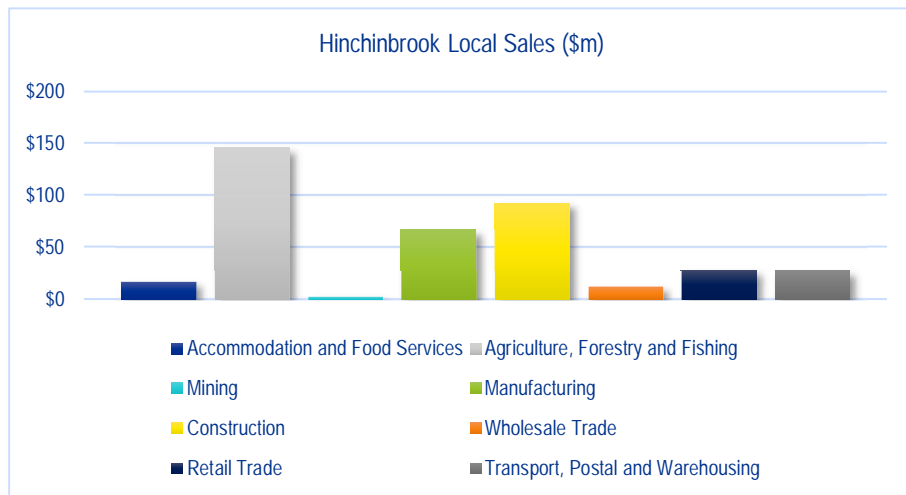


Figure 14-30 Hinchinbrook Exports (\$m)



Figure 14-31 Mareeba Output (\$m)

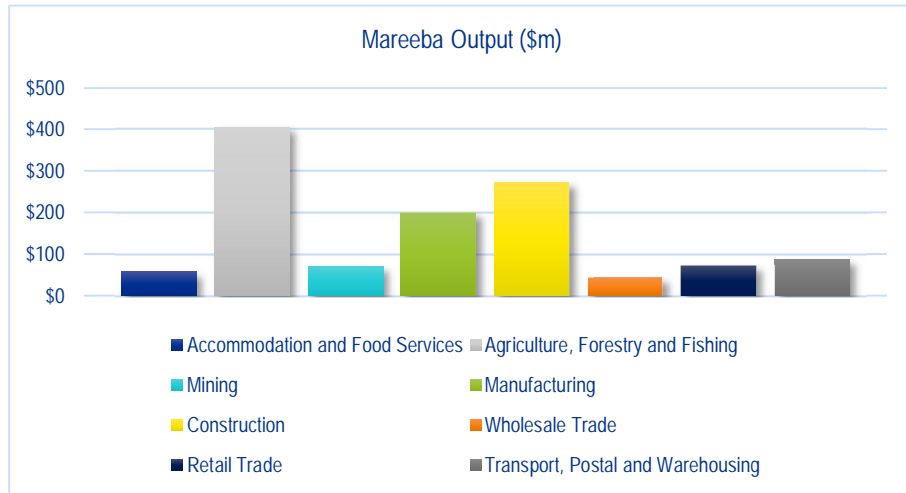


Figure 14-33 Mareeba Imports (\$m)

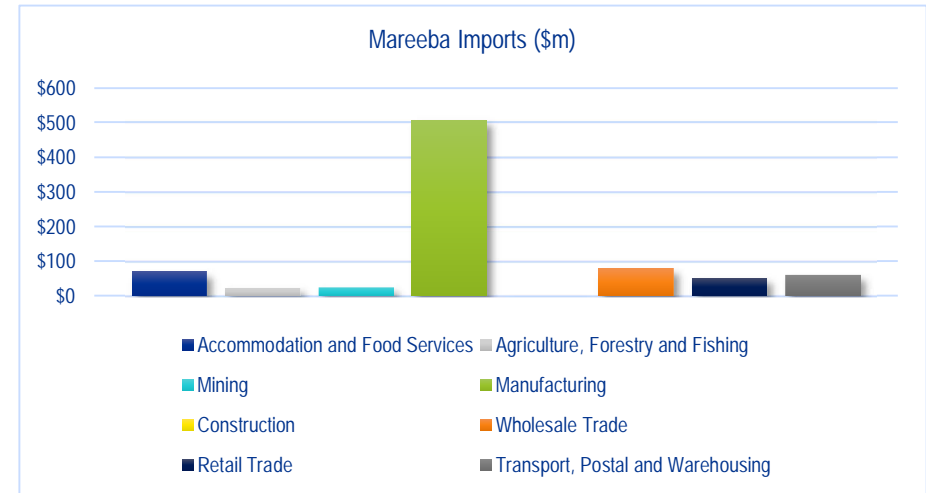


Figure 14-32 Mareeba Local Sales (\$m)

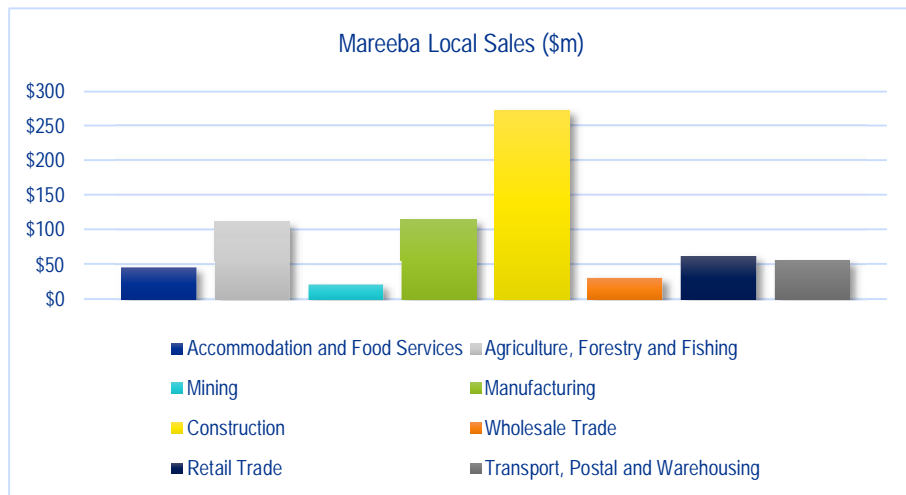


Figure 14-34 Mareeba Exports (\$m)

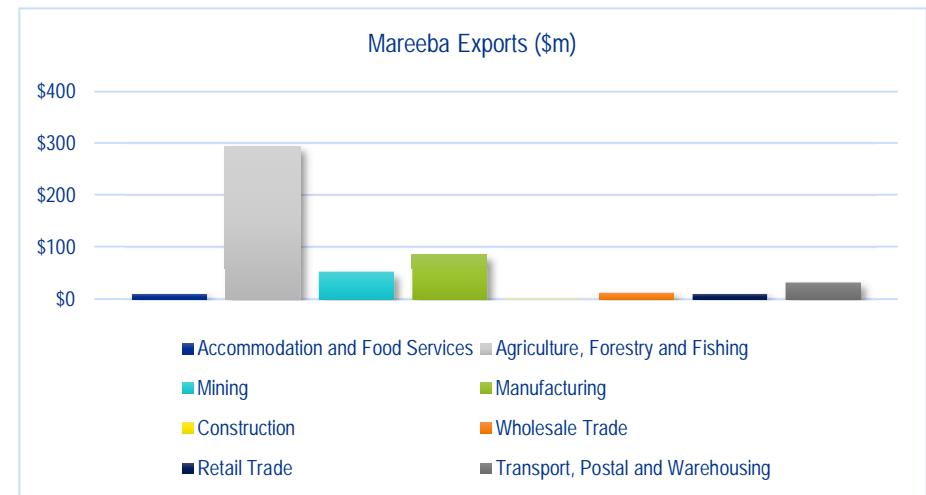


Figure 14-35 Tablelands Output (\$m)

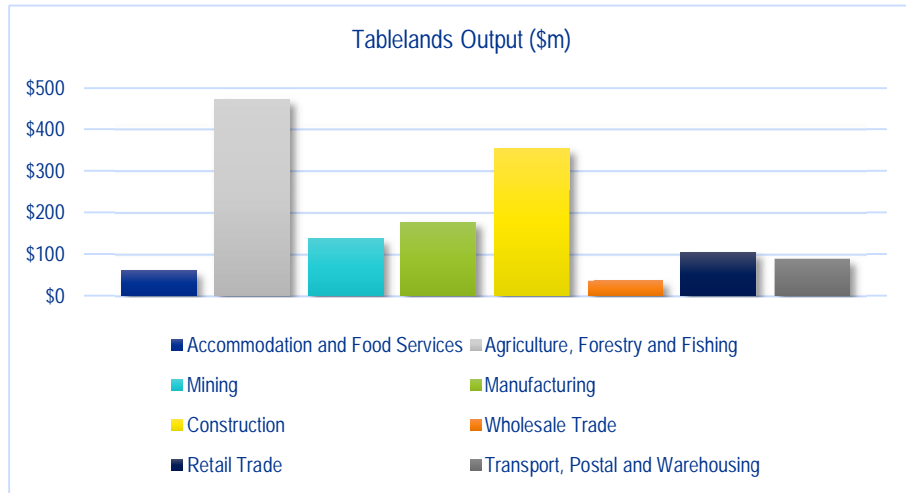


Figure 14-37 Tablelands Imports (\$m)

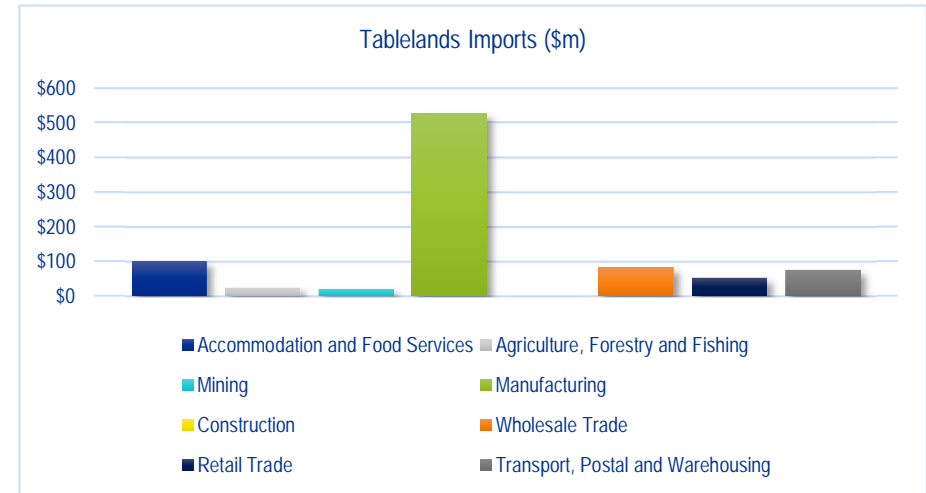


Figure 14-36 Tablelands Local Sales (\$m)

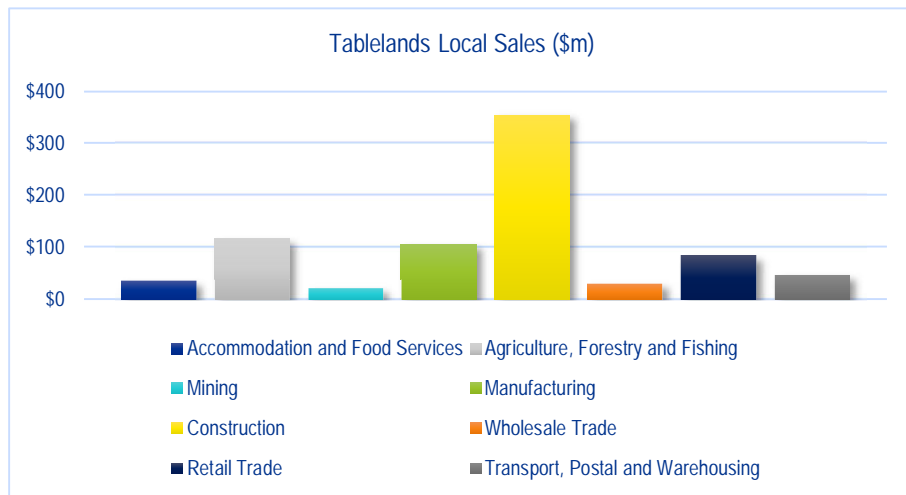


Figure 14-38 Tablelands Exports (\$m)

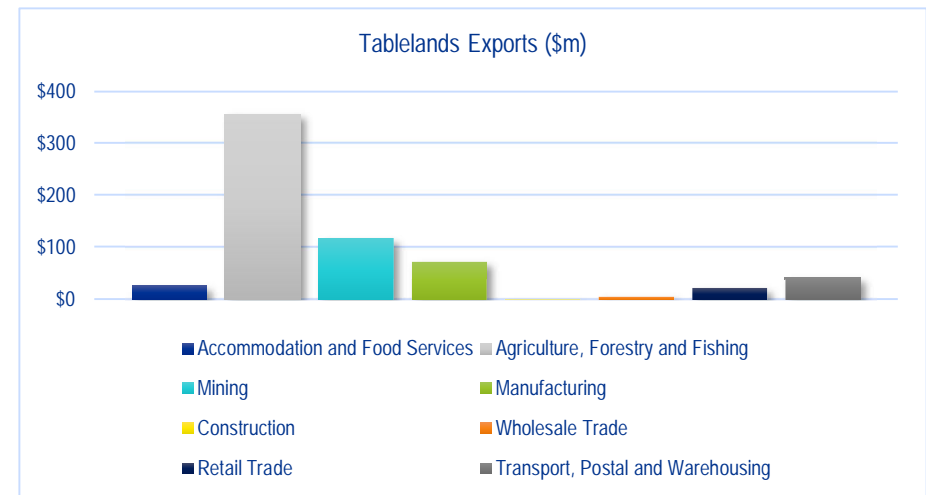


Figure 14-39 Remaining Councils Output (\$m)

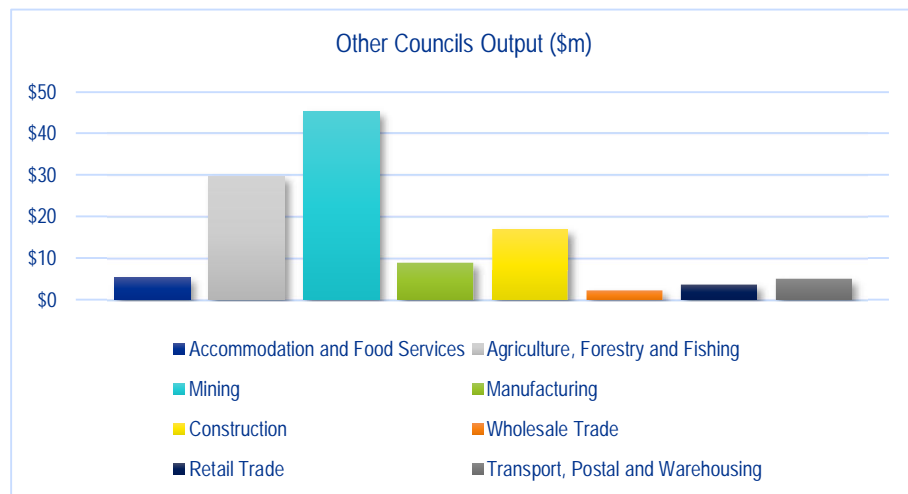


Figure 14-41 Remaining Councils Imports (\$m)

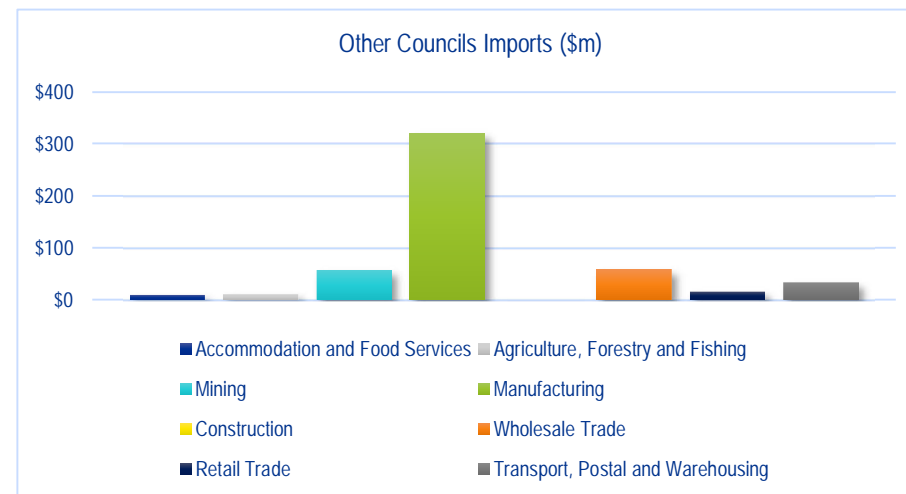


Figure 14-40 Remaining Councils Local Sales (\$m)

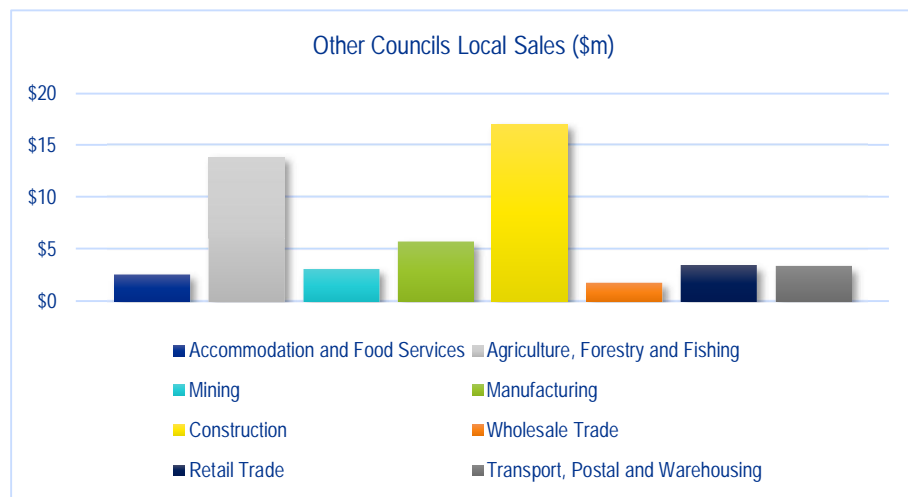
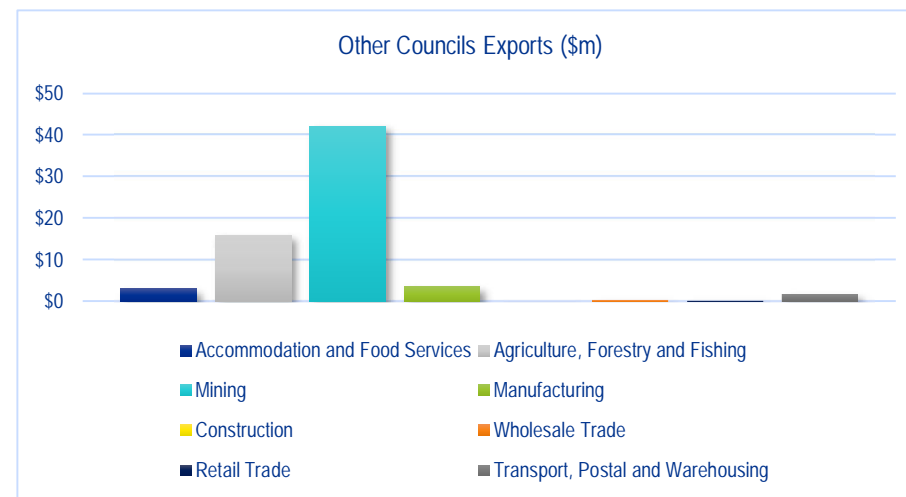


Figure 14-42 Remaining Councils Exports (\$m)



Appendix B. Current and potential locations of key agricultural commodities

The following maps are derived from the latest datasets available from the Queensland Department of Agriculture and Fisheries:

- Bananas (2018)
- Tree crops (2015-2018)
- All other datasets (2013)

Appendix C. Road width rules

SCR minimum widths for sealed rural roads

PBS level and AADT Range	Total lanes seal width	Total formation width
Rural sealed PBS2 (AADT 0-149)	3.4	7.2
Rural sealed PBS2 (AADT 150-449)	5.6	7.6
Rural sealed PBS2 (AADT 500-1499)	6.2	8.6
Rural sealed PBS2 (AADT 1500-2999)	6.4	9.4
Rural sealed PBS2 (AADT >3000)	7.0	10.0
Rural sealed PBS3 (AADT 0-149)	3.6	7.6
Rural sealed PBS3 (AADT 150-449)	5.8	8.2
Rural sealed PBS3 (AADT 500-1499)	6.4	8.8
Rural sealed PBS3 (AADT 1500-2999)	6.6	9.6
Rural sealed PBS3 (AADT >3000)	7	9.6
Rural sealed PBS4 (AADT 0-149)	4	8.1
Rural sealed PBS4 (AADT 150-449)	6	8.6
Rural sealed PBS4 (AADT 500-1499)	6.6	9.6
Rural sealed PBS4 (AADT 1500-2999)	7.2	10.8
Rural sealed PBS4 (AADT >3000)	7.8	11.4

Council minimum widths for sealed rural roads

PBS level and AADT Range	Total lanes seal width	Total formation width
Rural sealed PBS2 (AADT 0-149)	6.5	8.5
Rural sealed PBS2 (AADT 150-449)	6.5	8.5
Rural sealed PBS2 (AADT 500-1499)	6.5	8.5
Rural sealed PBS2 (AADT 1500-2999)	7.0	9.0
Rural sealed PBS2 (AADT >3000)	7.0	10.0
Rural sealed PBS3 (AADT 0-149)	7.0	9.0
Rural sealed PBS3 (AADT 150-449)	7.0	9.0
Rural sealed PBS3 (AADT 500-1499)	7.0	9.0
Rural sealed PBS3 (AADT 1500-2999)	7.0	9.0
Rural sealed PBS3 (AADT >3000)	7.0	9.6
Rural sealed PBS4 (AADT 0-149)	8.0	10.0
Rural sealed PBS4 (AADT 150-449)	8.0	10.0
Rural sealed PBS4 (AADT 500-1499)	8.0	10.0
Rural sealed PBS4 (AADT 1500-2999)	8.0	10.0
Rural sealed PBS4 (AADT >3000)	7.8	11.4

Minimum widths for unsealed rural roads

PBS level and AADT Range	SCR roads	Council roads
Rural unsealed PBS2 (AADT 0-99)	7.2	8.5
Rural unsealed PBS2 (AADT 100-1000)	7.7	8.5
Rural unsealed PBS3 (AADT 0-99)	7.6	9.0
Rural unsealed PBS3 (AADT 100-1000)	8.1	9.0
Rural unsealed PBS4 (AADT 0-99)	8.1	10.0
Rural unsealed PBS4 (AADT 100-1000)	8.6	10.0

Minimum widths for urban roads

PBS and road type	PBS Level	Posted Speed	SCR roads	Council roads
2 lane basic undivided no separation line	PBS2	60-70	6.4	6.5
2 lane basic undivided no separation line	PBS2	80-100	6.6	6.6
2 lane undivided with separation line	PBS2	60-70	7.0	7.0
2 lane undivided with separation line	PBS2	80-100	7.2	7.2
2 lane undivided on road cyclists	PBS2	60-70	9.4	9.4
2 lane undivided on road cyclists	PBS2	80-100	9.6	9.6
2 lane undivided regular parallel parking	PBS2	60-70	11.4	11.4
2 lane undivided regular parallel parking	PBS2	80-100	11.6	11.6
2 lane undivided angle parking	PBS2	60-70	18.4	18.4
2 lane undivided angle parking	PBS2	80-100	18.6	18.6
2 lane basic divided no separation line	PBS2	60-70	7.0	7.0
2 lane basic divided no separation line	PBS2	80-100	7.2	7.2
2 lane divided on road cyclist	PBS2	60-70	10.0	10.0
2 lane divided on road cyclist	PBS2	80-100	10.2	10.2
2 lane divided regular parallel parking	PBS2	60-70	12.0	12.0
2 lane divided regular parallel parking	PBS2	80-100	12.2	12.2
2 lane divided angle parking	PBS2	60-70	19.0	19.0
2 lane divided angle parking	PBS2	80-100	19.2	19.2
4 lane divided and undivided basic no separation line	PBS2	60-70	19.2	19.2
4 lane divided and undivided basic no separation line	PBS2	80-100	19.8	19.8
4 lane divided and undivided on road cyclists	PBS2	60-70	25.2	25.2
4 lane divided and undivided on road cyclists	PBS2	80-100	25.8	25.8
4 lane divided regular parallel parking	PBS2	60-70	29.2	29.2
4 lane divided regular parallel parking	PBS2	80-100	29.8	29.8
6 lane divided basic no separation line	PBS2	60-70	28.2	28.2
6 lane divided basic no separation line	PBS2	80-100	28.5	28.5
6 lane divided on road cyclists	PBS2	60-70	37.2	37.2
6 lane divided on road cyclists	PBS2	80-100	37.5	37.5
2 lane basic undivided no separation line	PBS3	60-70	6.6	6.6
2 lane basic undivided no separation line	PBS3	80-100	7.0	7.0
2 lane undivided with separation line	PBS3	60-70	7.2	7.2

PBS and road type	PBS Level	Posted Speed	SCR roads	Council roads
2 lane undivided with separation line	PBS3	80-100	7.6	7.6
2 lane undivided on road cyclists	PBS3	60-70	9.6	9.6
2 lane undivided on road cyclists	PBS3	80-100	10.0	10.0
2 lane undivided regular parallel parking	PBS3	60-70	11.6	11.6
2 lane undivided regular parallel parking	PBS3	80-100	12.0	12.0
2 lane undivided angle parking	PBS3	60-70	18.6	18.6
2 lane undivided angle parking	PBS3	80-100	19.0	19.0
2 lane basic divided no separation line	PBS3	60-70	7.2	7.2
2 lane basic divided no separation line	PBS3	80-100	7.6	7.6
2 lane divided on road cyclist	PBS3	60-70	10.2	10.2
2 lane divided on road cyclist	PBS3	80-100	10.6	10.6
2 lane divided regular parallel parking	PBS3	60-70	12.2	12.2
2 lane divided regular parallel parking	PBS3	80-100	12.6	12.6
2 lane divided angle parking	PBS3	60-70	19.0	19.0
2 lane divided angle parking	PBS3	80-100	19.2	19.2
4 lane divided and undivided basic no separation line	PBS3	60-70	19.8	19.8
4 lane divided and undivided basic no separation line	PBS3	80-100	21.0	21.0
4 lane divided and undivided on road cyclists	PBS3	60-70	25.8	25.8
4 lane divided and undivided on road cyclists	PBS3	80-100	27.0	27.0
4 lane divided regular parallel parking	PBS3	60-70	29.8	29.8
4 lane divided regular parallel parking	PBS3	80-100	31.0	31.0
6 lane divided basic no separation line	PBS3	60-70	29.1	29.1
6 lane divided basic no separation line	PBS3	80-100	30.3	30.3
6 lane divided on road cyclists	PBS3	60-70	37.5	37.5
6 lane divided on road cyclists	PBS3	80-100	38.7	38.7
2 lane basic undivided no separation line	PBS4	60-70	7.2	7.2
2 lane basic undivided no separation line	PBS4	80-100	7.6	7.6
2 lane undivided with separation line	PBS4	60-70	7.8	7.8
2 lane undivided with separation line	PBS4	80-100	8.2	8.2
2 lane undivided on road cyclists	PBS4	60-70	10.2	10.2
2 lane undivided on road cyclists	PBS4	80-100	10.6	10.6
2 lane undivided regular parallel parking	PBS4	60-70	12.2	12.2
2 lane undivided regular parallel parking	PBS4	80-100	12.6	12.6
2 lane undivided angle parking	PBS4	60-70	19.2	19.2
2 lane undivided angle parking	PBS4	80-100	19.6	19.6
2 lane basic divided no separation line	PBS4	60-70	7.8	7.8
2 lane basic divided no separation line	PBS4	80-100	8.2	8.2
2 lane divided on road cyclist	PBS4	60-70	10.8	10.8
2 lane divided on road cyclist	PBS4	80-100	11.2	11.2
2 lane divided regular parallel parking	PBS4	60-70	12.8	12.8

PBS and road type	PBS Level	Posted Speed	SCR roads	Council roads
2 lane divided regular parallel parking	PBS4	80-100	13.2	13.2
2 lane divided angle parking	PBS4	60-70	19.6	19.6
2 lane divided angle parking	PBS4	80-100	19.8	19.8
4 lane divided and undivided basic no separation line	PBS4	60-70	20.8	20.8
4 lane divided and undivided basic no separation line	PBS4	80-100	22.4	22.4
4 lane divided and undivided on road cyclists	PBS4	60-70	26.8	26.8
4 lane divided and undivided on road cyclists	PBS4	80-100	28.4	28.4
4 lane divided regular parallel parking	PBS4	60-70	30.8	30.8
4 lane divided regular parallel parking	PBS4	80-100	32.4	32.4
6 lane divided basic no separation line	PBS4	60-70	30.0	30.0
6 lane divided basic no separation line	PBS4	80-100	31.8	31.8
6 lane divided on road cyclists	PBS4	60-70	39.0	39.0
6 lane divided on road cyclists	PBS4	80-100	40.2	40.2

Appendix D. Unit Rates

Rehabilitation costs

Model Road State	Option	Terrain	Tropical North	Central Inland
3,4	Re-sheeting	Level	\$10.92	\$11.10
3,4	Re-sheeting (rolling)	Rolling	\$13.10	\$13.33
5 to 14 (Rural)	Granular Overlay / 2-chip sealing (7/14)	All	\$49.05	\$49.08
15 (Rural)	Deep lift asphalt pavement / Resurfacing	All	\$200.54	\$199.52
8 and above (Urban)	Deep lift asphalt pavement / Resurfacing	All	\$217.73	\$216.62

Reconstruction costs

Model Road State	Option	Assumed Pavement Depth (mm)	Tropical North			Central Inland		
			Reconstruction (\$/m ²)	Reseal / Resurfacing (\$/m ²)	Total Recon Costs (\$/m ²)	Reconstruction (\$/m ²)	Reseal / Resurfacing (\$/m ²)	Total Costs (\$/m ²)
3,4 Level	Re-sheeting	180	\$70.35	\$0.00	\$70.35	\$70.35	\$0.00	\$70.35
3,4 Rolling	Re-sheeting	180	\$84.41	\$0.00	\$84.41	\$84.41	\$0.00	\$84.41
5 to 8 Level	Granular Overlay / 2-chip sealing (7/14)	280	\$89.42	\$13.41	\$102.83	\$90.46	\$13.57	\$104.03
5 to 8 Rolling	Granular Overlay / 2-chip sealing (7/14)	280	\$94.75	\$13.38	\$108.13	\$96.98	\$13.69	\$110.67
9 to 14 (Rural) Level	Granular Overlay / 2-chip sealing (7/14)	360	\$100.59	\$13.41	\$114.00	\$101.77	\$13.57	\$115.34
9 to 14 (Rural) Rolling	Granular Overlay / 2-chip sealing (7/14)	360	\$111.47	\$13.38	\$124.85	\$114.10	\$13.69	\$127.79
8 and above (Urban)	Deep lift asphalt pavement / Resurfacing	380	\$204.74	\$17.80	\$222.54	\$208.06	\$18.09	\$226.15
15 (Rural)	Deep lift asphalt pavement / Resurfacing	490	\$234.09	\$33.44	\$267.53	\$239.60	\$34.23	\$273.83

Widening costs

Model Road State	Option	Assumed Pavement Depth (mm)	Tropical North			Central Inland		
			Reconstruction (\$/m ²)	Reseal / Resurfacing (\$/m ²)	Total Recon Costs (\$/m ²)	Reconstruction (\$/m ²)	Reseal / Resurfacing (\$/m ²)	Total Costs (\$/m ²)
3,4 Level	Re-sheeting	180	\$84.41	\$0.00	\$84.41	\$84.41	\$0.00	\$84.41
3,4 Rolling	Re-sheeting	180	\$101.73	\$0.00	\$101.73	\$101.73	\$0.00	\$101.73
5 to 8 Level	Granular Overlay / 2-chip sealing (7/14)	280	\$107.30	\$15.65	\$122.95	\$108.55	\$15.83	\$124.38
5 to 8 Rolling	Granular Overlay / 2-chip sealing (7/14)	280	\$113.70	\$15.61	\$129.31	\$116.38	\$15.97	\$132.35
9 to 14 (Rural) Level	Granular Overlay / 2-chip sealing (7/14)	360	\$120.71	\$15.65	\$136.36	\$122.12	\$15.83	\$137.95
9 to 14 (Rural) Rolling	Granular Overlay / 2-chip sealing (7/14)	360	\$133.77	\$15.61	\$149.37	\$136.92	\$15.97	\$152.89
8 and above (Urban)	Deep lift asphalt pavement / Resurfacing	380	\$244.80	\$21.14	\$265.94	\$248.77	\$21.48	\$270.25
15 (Rural)	Deep lift asphalt pavement / Resurfacing	490	\$280.91	\$40.13	\$321.04	\$287.52	\$41.07	\$328.60

Reinforced concrete box culvert costs

Reinforced concrete box culvert	Per metre cost	End structure
Supply and installation of concrete box culvert components, 450mm x 150mm	\$788	\$2,659
Supply and installation of concrete box culvert components, 450mm x 225mm	\$908	\$2,659
Supply and installation of concrete box culvert components, 450mm x 300mm	\$955	\$2,919
Supply and installation of concrete box culvert components, 600mm x 225mm	\$1,040	\$3,203
Supply and installation of concrete box culvert components, 600mm x 300mm	\$1,096	\$3,527
Supply and installation of concrete box culvert components, 600mm x 450mm	\$1,185	\$4,404
Supply and installation of concrete box culvert components, 750mm x 225mm	\$1,232	\$3,736
Supply and installation of concrete box culvert components, 750mm x 300mm	\$1,288	\$3,736
Supply and installation of concrete box culvert components, 750mm x 450mm	\$1,341	\$4,721

Reinforced concrete box culvert	Per metre cost	End structure
Supply and installation of concrete box culvert components, 750mm x 600mm	\$1,411	\$4,855
Supply and installation of concrete box culvert components, 900mm x 300mm	\$1,367	\$4,269
Supply and installation of concrete box culvert components, 900mm x 450mm	\$1,465	\$4,483
Supply and installation of concrete box culvert components, 900mm x 600mm	\$1,555	\$4,632
Supply and installation of concrete box culvert components, 1200mm x 300mm	\$1,731	\$4,611
Supply and installation of concrete box culvert components, 1200mm x 450mm	\$1,844	\$5,564
Supply and installation of concrete box culvert components, 1200mm x 600mm	\$1,958	\$5,817
Supply and installation of concrete box culvert components, 1200mm x 900mm	\$2,143	\$11,521
Supply and installation of concrete box culvert components, 1500mm x 600mm	\$2,247	\$6,147
Supply and installation of concrete box culvert components, 1500mm x 750mm	\$2,329	\$8,674
Supply and installation of concrete box culvert components, 1500mm x 900mm	\$2,468	\$11,200
Supply and installation of concrete box culvert components, 1500mm x 1200mm	\$2,696	\$12,224
Supply and installation of concrete box culvert components, 1500mm x 1500mm	\$2,930	\$13,320
Supply and installation of concrete box culvert components, 1800mm x 600mm	\$2,491	\$6,462
Supply and installation of concrete box culvert components, 1800mm x 750mm	\$2,594	\$9,734
Supply and installation of concrete box culvert components, 1800mm x 900mm	\$2,715	\$13,006
Supply and installation of concrete box culvert components, 1800mm x 1200mm	\$2,945	\$14,316
Supply and installation of concrete box culvert components, 1800mm x 1500mm	\$3,186	\$15,529
Supply and installation of concrete box culvert components, 1800mm x 1800mm	\$3,421	\$22,892
Supply and installation of concrete box culvert components, 2100mm x 600mm	\$2,924	\$7,183
Supply and installation of concrete box culvert components, 2100mm x 750mm	\$3,043	\$9,893
Supply and installation of concrete box culvert components, 2100mm x 900mm	\$3,176	\$12,603
Supply and installation of concrete box culvert components, 2100mm x 1200mm	\$3,368	\$13,877
Supply and installation of concrete box culvert components, 2100mm x 1500mm	\$3,618	\$15,007
Supply and installation of concrete box culvert components, 2100mm x 1800mm	\$3,876	\$32,125
Supply and installation of concrete box culvert components, 2100mm x 2100mm	\$4,157	\$34,257
Supply and installation of concrete box culvert components, 2400mm x 600mm	\$3,376	\$8,526
Supply and installation of concrete box culvert components, 2400mm x 750mm	\$3,504	\$10,985
Supply and installation of concrete box culvert components, 2400mm x 900mm	\$3,641	\$13,443
Supply and installation of concrete box culvert components, 2400mm x 1200mm	\$3,912	\$15,391
Supply and installation of concrete box culvert components, 2400mm x 1500mm	\$4,189	\$15,634
Supply and installation of concrete box culvert components, 2400mm x 1800mm	\$4,471	\$30,548
Supply and installation of concrete box culvert components, 2400mm x 2100mm	\$4,761	\$32,539
Supply and installation of concrete box culvert components, 2400mm x 2400mm	\$5,053	\$28,162
Supply and installation of concrete box culvert components, 2700mm x 750mm	\$4,164	\$8,244
Supply and installation of concrete box culvert components, 2700mm x 900mm	\$4,368	\$13,691
Supply and installation of concrete box culvert components, 2700mm x 1200mm	\$4,684	\$15,799
Supply and installation of concrete box culvert components, 2700mm x 1500mm	\$5,004	\$16,911
Supply and installation of concrete box culvert components, 2700mm x 1800mm	\$5,327	\$38,458
Supply and installation of concrete box culvert components, 2700mm x 2100mm	\$5,656	\$41,021

Reinforced concrete box culvert	Per metre cost	End structure
Supply and installation of concrete box culvert components, 2700mm x 2400mm	\$5,990	\$43,489
Supply and installation of concrete box culvert components, 2700mm x 2700mm	\$6,330	\$43,489
Supply and installation of concrete box culvert components, 3000mm x 1200mm	\$5,250	\$16,752
Supply and installation of concrete box culvert components, 3000mm x 1500mm	\$5,596	\$17,728
Supply and installation of concrete box culvert components, 3000mm x 1800mm	\$5,947	\$25,417
Supply and installation of concrete box culvert components, 3000mm x 2100mm	\$6,302	\$33,106
Supply and installation of concrete box culvert components, 3000mm x 2400mm	\$6,664	\$33,106
Supply and installation of concrete box culvert components, 3000mm x 2700mm	\$7,031	\$33,106
Supply and installation of concrete box culvert components, 3000mm x 3000mm	\$7,389	\$33,106
Supply and installation of concrete box culvert components, 3300mm x 1200mm	\$5,801	\$33,106
Supply and installation of concrete box culvert components, 3300mm x 1500mm	\$6,172	\$33,106
Supply and installation of concrete box culvert components, 3300mm x 1800mm	\$6,544	\$33,106
Supply and installation of concrete box culvert components, 3300mm x 2100mm	\$6,923	\$33,106
Supply and installation of concrete box culvert components, 3300mm x 2400mm	\$7,308	\$33,106
Supply and installation of concrete box culvert components, 3300mm x 2700mm	\$7,696	\$33,106
Supply and installation of concrete box culvert components, 3300mm x 3000mm	\$8,093	\$33,106
Supply and installation of concrete box culvert components, 3300mm x 3300mm	\$8,492	\$33,106
Supply and installation of concrete box culvert components, 3600mm x 1200mm	\$6,355	\$33,106
Supply and installation of concrete box culvert components, 3600mm x 1500mm	\$6,840	\$33,106
Supply and installation of concrete box culvert components, 3600mm x 1800mm	\$7,242	\$33,106
Supply and installation of concrete box culvert components, 3600mm x 2100mm	\$7,650	\$33,106
Supply and installation of concrete box culvert components, 3600mm x 2400mm	\$8,059	\$33,106
Supply and installation of concrete box culvert components, 3600mm x 2700mm	\$8,477	\$33,106
Supply and installation of concrete box culvert components, 3600mm x 3000mm	\$8,897	\$33,106
Supply and installation of concrete box culvert components, 3600mm x 3300mm	\$9,324	\$33,106
Supply and installation of concrete box culvert components, 3600mm x 3600mm	\$9,679	\$33,106

Reinforced concrete pipe costs

Reinforced concrete pipes	Per metre cost	End structure
Supply and installation of concrete pipe culvert components, Class 2 225mm diameter	\$232	\$1,833
Supply and installation of concrete pipe culvert components, Class 2, 300mm diameter	\$275	\$1,833
Supply and installation of concrete pipe culvert components, Class 3, 375mm diameter	\$357	\$1,842
Supply and installation of concrete pipe culvert components, Class 3, 450mm diameter	\$439	\$1,850
Supply and installation of concrete pipe culvert components, Class 3, 525mm diameter	\$517	\$2,233
Supply and installation of concrete pipe culvert components, Class 3, 600mm diameter	\$580	\$2,410
Supply and installation of concrete pipe culvert components, Class 3, 675mm diameter	\$789	\$2,300
Supply and installation of concrete pipe culvert components, Class 3, 750mm diameter	\$898	\$2,448
Supply and installation of concrete pipe culvert components, Class 3, 825mm diameter	\$1,007	\$2,684
Supply and installation of concrete pipe culvert components, Class 3, 900mm diameter	\$1,171	\$2,925

Reinforced concrete pipes	Per metre cost	End structure
Supply and installation of concrete pipe culvert components, Class 3, 1050mm diameter	\$1,433	\$5,894
Supply and installation of concrete pipe culvert components, Class 3, 1200mm diameter	\$1,749	\$6,380
Supply and installation of concrete pipe culvert components, Class 3, 1350mm diameter	\$2,127	\$9,159
Supply and installation of concrete pipe culvert components, Class 3, 1500mm diameter	\$2,534	\$10,266
Supply and installation of concrete pipe culvert components, Class 3, 1650mm diameter	\$2,941	\$13,416
Supply and installation of concrete pipe culvert components, Class 3, 1800mm diameter	\$3,428	\$13,798
Supply and installation of concrete pipe culvert components, Class 3, 1950mm diameter	\$4,003	\$14,734
Supply and installation of concrete pipe culvert components, Class 3, 2100mm diameter	\$4,764	\$15,034
Supply and installation of concrete pipe culvert components, Class 3, 2400mm diameter	\$6,160	\$15,034
Supply and installation of concrete pipe culvert components, Class 3, 2700mm diameter	\$7,668	\$15,034
Supply and installation of concrete pipe culvert components, Class 3, 3000mm diameter	\$8,773	\$15,034

Bridge costs

Bridges	Per m ² cost
Bridges	\$5,411