Recycling Enterprise Precinct Location Strategy

E3 Advisory

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In the spirit of reconciliation, E3 Advisory acknowledges the Traditional Custodians of country throughout Queensland and their connection to land, sea and sky. We pay our respects to their Elders past, present and emerging and extend that respect to all Aboriginal and Torres Strait Islander people today.

Executive Summary

Recycling Enterprise Precincts should be established in Queensland as places that transform and remanufacture recovered materials into new products with a commercial value. When established, these precincts aim to generate new jobs, increase investment in research and development, encourage positive environmental outcomes, support a transition to a low carbon future, and support the creation of sustainable markets for remanufactured end products.

Through these precincts, government and industry are working to establish Queensland as a leader in recycling, advanced manufacturing and innovation. By doing this, Queensland businesses are being supported to look for new, commercial opportunities and maximise the potential of the circular economy.

There is the opportunity for precincts to be located throughout the state where there are sufficient quantities of material for recovery such as glass, plastics and e-waste. The size of a precinct and the type of activities which may occur within it will vary from region to region. There is no one-size-fits-all precinct and what is developed in a region will depend on the specific needs and characteristics of the region.

Queensland's ambition of a zero-waste society has strong community and industry support, and momentum continues to grow. This Recycling Enterprise Precinct Location Strategy ("Strategy") helps continue that journey by identifying potential locations for Recycling Enterprise Precincts that minimise impacts to sensitive land uses and urban amenity. This Strategy has been designed to be responsive to the needs of industry and be sensitive to community requirements, while focussing on key factors to ensure a successful precinct. It provides a framework to support the establishment of precincts in locations that minimise impact to the community and maximise opportunity to generate jobs and new enterprises.

Precincts are enablers of a circular economy and economic and industry development

Recycling Enterprise Precincts support Queensland's path to decarbonisation and a low carbon future, and the transition to a circular economy. Queensland already has a circular economy industry with companies re-manufacturing materials to meet a market need. Precincts will be focused on industry growth, generating new markets and new economic opportunities for Queensland with new products and partnerships expected to emerge.

By working to ensure the ongoing development of markets for recycled and repurposed materials through investment in modern and efficient facilities and processes, opportunities to support the creation of new jobs, upskilling opportunities for the workforce, as well as building capacity and new markets in regional areas across Queensland will be realised.

Critical to the success and value of precincts is co-location of research and industry to collaborate, share knowledge and drive innovation, supporting greater value adding and industry development through reuse, recycling and remanufacturing. This may include advancing new technologies such as new processes, improving value of materials and innovations to see an increased diversion from landfill to new high value products. Research facilities are more likely to be located in larger precincts undertaking transformational activities as they will be focused on high value adding processes. Success will require a concerted effort from industry, the state and local government, and the research and development sector.

To reduce the volume of waste disposed in landfills, Recycling Enterprise Precincts may include the co-location of resource recovery and energy from waste activities as innovative solutions to transition towards the circular economy. In accordance with Queensland's Energy from Waste Policy, any facilities will be located away from sensitive land uses to reduce the risk of harm and unintended impacts.

Precincts are places focussed on use of recovered materials

Recycling Enterprise Precincts look to extend the 'waste' value chain by diverting waste from landfill and adding value to these materials. This is critical to the circular economy model and a low carbon future, and an important step in becoming a zero-waste society. Rather than following a 'take-make-use-dispose' model, precincts will process and transform materials to retain and circulate resources in the economy at their highest value for as long as possible.

Precincts will cluster and maximise efforts to work with recovered materials to get the best possible use from them. Materials suitable for recycling and remanufacturing can be recovered from a range of sources including households, businesses, institutions and organisations. From these sources, there is a range of material that can be recovered and recycled including, glass, paper and cardboard, metals, textiles, e-waste and solar panels, mattresses, food and garden organics, plastics, timber, tyres, and masonry, aggregate and soils.

Preparation and transformation of recovered materials

There will be a range of preparatory and transformational activities which may occur within a Recycling Enterprise Precinct. Both preparation and transformation activities involve the need for input material and end markets for products that are prepared, altered, reused, remanufactured, or recycled in a precinct.

Preparatory activities add value to a material or 'commodity' by converting it from waste into something of higher value, ready to be transformed into new products and extend its life. Specific preparatory activities will depend on the recovered material or 'commodity' type but may including sorting, washing, crushing and preparing for transportation. These early-stage processes are industrial in nature, add value to the recovered materials, and reduce the amount of material going into landfill.

Transformation activities focus on creating valuable products as new outputs, sending material back out into the market and extending its life for as long as possible. This is where more significant value adding occurs and includes a wide array of processes such as heating and moulding of glass, shredding and extrusion of new plastics, pulping and making new paper products, transformation of organics into soil conditioners, remanufacturing or reskinning of solar panels, for example, and typically involve higher capital costs and investment. These activities are typically higher impacting industries in nature, are likely to require more capital intensive processes, and some of them can be hard to locate.

A network of precincts

Different regions in Queensland have different recoverable material profiles. The task of value adding to recoverable material across Queensland can be managed through a mix of "prepare" precincts which manage a broad spectrum of preparation activities, and more specialised "transform" precincts where both preparation and transformation processes can be carried out.

'Prepare precincts' focus on preparatory activities.

'Transform precincts' focus on transformation activities and undertake preparation activities.

"Prepare" precincts can leverage off existing or planned local government or private sector resource recovery infrastructure and are scalable. These precincts can be developed by any entity including local governments or the private sector. These precincts can handle all commodities to varying degrees. The amount of material being handled in a precinct will be dependent on the catchment population and industry mix. Ideally, material handled in these precincts will be reused locally or prepared for transport to large transformation precincts or other end users where further value adding processes can be undertaken. These precincts are likely to be smaller in scale and more suited to smaller, lower impact, industrial use.

"Transform" precincts are more likely to include larger facilities and harder to locate activities. These are likely to be suited to industrially zoned areas that can be well buffered from surrounding land uses. These may be well suited to areas where existing planning and land use systems contemplate hard to locate industrial activities. They also lend themselves to being located near areas where existing infrastructure investment and capital investments have already been made or are planned. These precincts would also be expected to attract co-location of research and development organisations, and high value adding processes. Due to their scale, transport connections and power and water infrastructure will be important.

The identification of likely locations for Recycling Enterprise Precincts is underpinned by a process that examines economic impacts, social impact, environmental impact, amenity impact and the efficiency of land and infrastructure use. The objectives of the location of these precincts focus on economic development opportunities, the co-location of industries, maximising sustainability outcomes, minimising environmental impacts, creating quality industrial places and developing quality infrastructure.

Based on extensive consultation and analysis, a network of precincts serving the State can be established. The materials handled in each region and the characteristics of precincts in each region is set out below.

Region	Preparatory Activities	Transformation Activities												Special Uses		
		Glass	Organics	Paper and Cardboard	Plastics	Metal	Timber	Textiles	Masonry, Aggregates and Concrete	E-Waste	Tyres	Mattresses	Solar Panels	EFW	Research	Centre of Excellence
Cairns	✓		✓						✓							
Townsville	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	
Mackay-Isaac-Whitsunday	✓		✓						✓		✓					
Central Queensland	✓		✓			✓					✓		✓			Ferrous and Non Ferrous Metals
Wide Bay Burnett	✓		✓						✓				✓			
Darling Downs – Maranoa	✓		✓						✓				✓		✓	Ag organics and solar panels
Outback	✓		✓						✓		✓					
SEQ - North	✓	Transformation activities not yet determined														
SEQ –East	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓			✓	Glass, plastics, mattresses, textiles
SEQ – South	✓		✓				✓	✓			✓		✓	✓	✓	Organics, tyres
SEQ - West	✓		✓				✓		✓						✓	

A broad indication of the likely potential locations for precincts across the state is set out below. Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

While the location for some prepare precincts has been identified through consultation and included in the mapping and text in this document, these locations are in no way intended to be exhaustive. Prepare precincts could be located on any site that meets the location guidance outlined in this document and in the accompanying "how to" guide. Some existing local government or private sector infrastructure may already be undertaking "prepare" activities and may already fit the definition of prepare as outlined in these documents.

Region	Potential Transform Precincts	Potential Prepare Precincts
Cairns	Cairns	Mareeba
Townsville	Townsville	Charters Towers
Mackay-Isaac-Whitsunday	Mackay	
Central Queensland	Gladstone	Gracemere, Biloela
Wide Bay Burnett	Bundaberg	Cherbourg, Curra
Darling Downs – Maranoa	Toowoomba	
Outback	Mount Isa	
SEQ – North		Caloundra
SEQ – East	Port of Brisbane	
SEQ – South	Bromelton	North Gold Coast
SEQ - West	Willowbank	

1 Purpose of Recycling Enterprise Precinct Location Strategy

This *Recycling Enterprise Precinct Location Strategy* ('this strategy") has been prepared by E3 Advisory for the Department of State Development, Infrastructure, Local Government and Planning. It is intended to provide guidance on potential locations for the establishment of a network of Recycling Enterprise Precincts across Queensland. It is intended to provide information on recovered materials streams and activities across the State in order to maximise locational opportunities for industry development and recovered materials based activities.

This strategy has been developed in conjunction with *Recycling Enterprise Precinct Guideline* (the guideline) – which provides guidance on the key actions, activities and matters to consider when locating and developing a recycling enterprise precinct.

This strategy has been informed by a high-level assessment of waste and economic profiles of regions, existing waste and supporting infrastructure, as well as the opportunities and challenges presented in each region. This helps to identify the type, scale and activities likely to occur in the potential precincts.

Neither the guideline nor this strategy are statutory documents. They are designed to provide guidance for industry, and local and state governments. Additionally, this work is intended to take a state-wide view and be complementary to the Regional Waste Management Plans (RWMPs) being developed at the time of publication of this document. The RWMPs are understood to be taking a more detailed perspective below the Statistical Area 4 (SA4) level. Their aim is to identify regional actions and actions for individual local governments to improve waste and resource recovery outcomes.

The data and projections contained in this report are based on the data provided by the Queensland Government as well as the Queensland government's *Recycling and Waste in Queensland Report* (years 2017 to 2022). This was supported by data obtained from the *Queensland Waste and Resource Recovery Infrastructure Report 2019* prepared by Arcadis for the Department of Environment and Science (DES).

This data was confirmed and supplemented by DES. Population and population growth data is based on information from the Australian Bureau of Statistics and Queensland Government Statistician's Office. Some rounding and aggregation have been applied to the data and projections presented in this report to ensure that total SA4 level data aligns with State wide level data.

The data and projections contained within this report do not reflect the impacts of any recent or future policy implementation, investment, or behavioural change. The long term impacts of current policies and initiatives as well as the impacts of future policies and initiatives will impact the projections contained in this report.

2 Recycling Enterprise Precincts

2.1 What is a Recycling Enterprise Precinct?

Recycling Enterprise Precincts are intended to be places focussed on the use and re-use of resources recovered from waste ("recovered materials"). Importantly, industrial and manufacturing processes associated with recovered materials will be co-located with support facilities and research opportunities that allow greater value adding to occur and advanced manufacturing opportunities to flourish.

Although resource recovery deals with waste as an input, Recycling Enterprise Precincts are **not** landfill sites. They are enablers of industrial processes that transform recovered materials into new products.

A recycling enterprise precinct should be developed as a place primarily for industrial and economic development, where the core purpose is to use recovered materials to create new value-added products.

These places are enhanced through innovation, business co-location, infrastructure development, job creation, resource efficiency, and sustainability practices.

In practice, some of the key elements of a recycling enterprise precinct are likely to include:

- Preparation and transformation of material recovered from waste into new products
- Reuse, reprocessing and recycling of recovered materials
- Facilities and operations for sorting and processing waste into separate materials streams
- Facilities and operations to extract materials from each waste stream
- Access to research and innovation capability that use material inflows and co-location with industry to develop new information and processes in materials recovery
- Storage facilities and space for extracted materials
- Public sector and private sector presence with a mix of anchor enterprise tenants, production facilities and environmental land to provide buffering from sensitive uses if this is needed
- Good connections to transport infrastructure to support supply chains and facilitate the movement of goods in and out of the precinct
- Energy from waste operations that use any residual waste from processes inside the precinct as well as raw waste from outside the precinct.

Precincts have two distinct purposes. The first is preparation of material where value adding is done to a material or 'commodity' by converting it from waste into something of higher value, ready to be transformed into new products and extend its life. Preparatory activities depend on the recovered material but may include cleaning, crushing, baling and other preparatory activities. These early stage processes are industrial in nature and add value to the recovered materials and reduce the amount of material going into landfill.

The second is transformation of material into new products. This is where more significant value adding occurs and includes a wide array of processes such as heating and moulding of glass, shredding and extrusion of new plastics, pulping and making new paper products, transformation of organics into soil conditioners, remanufacturing or reskinning of solar panels, for example, and typically involve higher capital costs and investment. Both preparation and transformation activities involve the need for input material and end market for products that are prepared, altered, reused, remanufactured or recycled in a recycling enterprise precinct.

2.2 Why are Recycling Enterprise Precincts Important?

Development and operation of a recycling enterprise precinct provides opportunity for sustainable economic development based on use and reuse of materials that would otherwise be discarded to landfill.

The co-location of complementary industry activities can develop places that are dedicated to contributing to a circular economy.

Precincts are not intended to be established to 'manage' waste. The purpose is to develop and attain resources from waste material, and to create industrially based places where that can happen. In doing this they facilitate decarbonisation and the transition to a circular economy and a cleaner-energy future. They should also:

- Cater for a range of recovered materials-based use, reuse and remanufacturing processes
- Facilitate linkages between research institutions and industry to drive innovation
- Act as collaboration hubs to enable interoperability
- Have large enough scale to allow industry growth and development.

2.3 Recycling Enterprise Precinct Guidelines

As outlined in Section 1, this Strategy has been developed in conjunction with the *Recycling Enterprise Precinct Guidelines* ("the Guidelines"). These were developed to provide guidance on the key actions, activities and matters to consider when locating and developing a precinct and are intended to provide contextual, informative, and strategic guidance on how to establish an innovative precinct that enables industrial development based on the use and re-use of recovered materials and recycling processes.

The Guidelines contain a set of 'Guiding Principles' as well as 'Precinct Location Guidance'. These both form the foundation of the approach taken in developing this Location Strategy and are summarised below.

2.3.1 Recycling Enterprise Precinct Guiding Principles

The Guiding Principles are an expression of what is being sought from precincts. They encapsulate what should be achieved through the development of precincts, and what should be expected as minimum standards. They establish a platform to drive the growth and development of precincts, which is evident through how a precinct is located, how it is developed and how it is operated over time.

The Guiding Principles establish the fundamental character of a precinct as a place for development based on the use of recovered materials. Precincts should be enablers for the circular economy, and should foster sustainable job creation, higher levels of collaboration, research and innovation, and place making. Figure 1 outlines the Recycling Enterprise Guiding Principles.

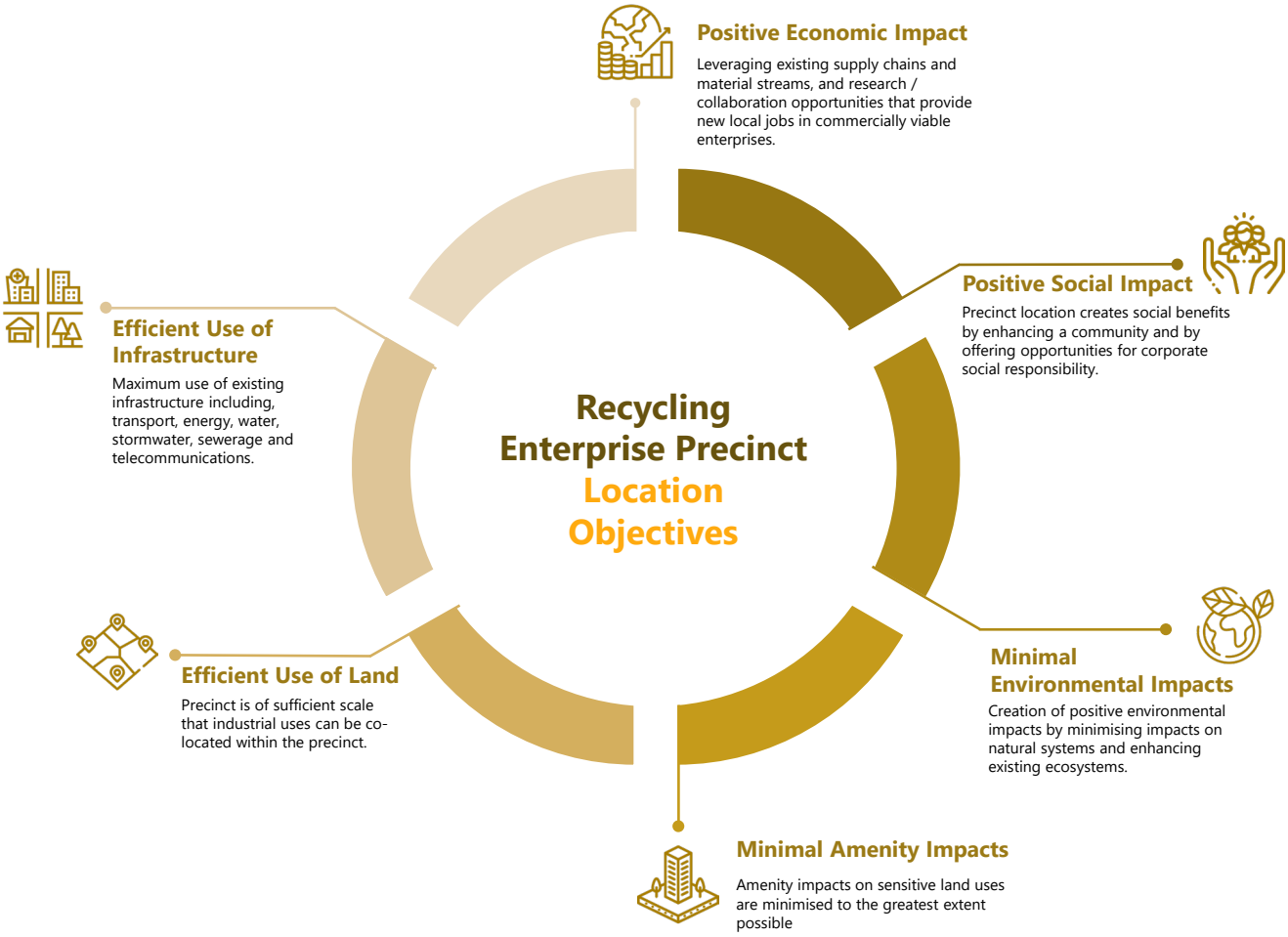
Figure 1: Recycling Enterprise Precinct Guiding Principles

2.3.2 Recycling Enterprise Precinct Location Guidance

A large element of ensuring the successful establishment of a Recycling Enterprise Precinct is the location and siting of the precinct. This is outlined in the *Precinct Location Guidance* contained in the Guidelines.

Location guidance is central to understanding *where* a precinct can be developed. Based on analysis of other exemplar precincts, location objectives were developed to guide the location and siting of future Recycling Enterprise Precincts. These are set out in Figure 2.

Figure 2: Recycling Enterprise Precinct Location Objectives



The Guidelines take these location objectives and develop them further into detailed *Location Guidance*, which helps informed decisions to be made about whether a particular place is suited for use as a recycling enterprise precinct, or what size and type of recycling enterprise precinct would be best suited for a specific location.

3 State-wide Precinct Locations

There is the opportunity for Recycling Enterprise Precincts to be located throughout the state where there are sufficient materials to be recovered. The size of a precinct and the type of activities which occur in it will vary from region-to-region. There is no one-size-fits-all precinct and what is developed in a region will depend on the specific needs and characteristics of that region. The identification of likely locations for Recycling Enterprise Precincts is underpinned by an examination of economic, social, environmental and amenity impacts and the efficiency of land and infrastructure use. The location of precincts focus on economic development opportunities, the co-location of industries, maximising sustainability outcomes, minimising environmental impacts, creating quality industrial places, and developing quality infrastructure. The need for precincts, their location, their scale and focus areas are a function of the population they serve, the surrounding economic base and the transportation costs of different materials.

3.1 Recoverable Materials in Queensland

The total material generated in Queensland in 2021 is shown below in Figure 3. Of the 9.3 million tonnes in 2021, approximately 75% was generated in South East Queensland.

Figure 3: Queensland Summary Materials Tonnage Totals 2021

Total	Cairns	Townsville	Mackay	Central Qld	Wide Bay	SEQ	Darling Downs - Maranoa	Outback Qld
Food Organics	31000	39000	42000	34000	43000	640000	34000	24000
Garden organics	73000	94000	88000	95000	160000	950000	100000	29000
Paper & Cardboard	24000	39000	54000	35000	45000	820000	25000	24000
Plastics	8400	15000	17000	13000	16000	230000	12000	11000
Glass	3500	8000	16000	9500	6900	140000	8500	6000
Ferrous metals	21000	19000	24000	20000	18000	920000	21000	13000
Non-ferrous metals	1900	2700	3500	4800	4700	120000	4500	1500
Timber	26000	30000	28000	23000	83000	580000	31000	22000
Textiles	6500	13000	13000	11000	13000	150000	11000	8400
Masonry, aggregate, soils	59000	62000	63000	27000	34000	2300000	34000	12000
Other	17000	4400	13000	14000	17000	330000	18000	4400
Total	**271300**	**326100**	**361500**	**286300**	**440600**	**7180000**	**299000**	**155300**

Note - the information contained in this table is based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total data aligns with Statewide level data.

Different regions have different recovery rates for different materials. This is shown below in Figure 4. Areas of low current recovery rate present opportunities for early intervention. Organics, plastics, and textiles have low recovery rates across the state and should be areas of priority intervention. Other materials with higher recovery rates can be examined to drive further movement up the value chain. The remote Queensland area presents unique challenges due to the cost of transporting material for processing. This is reflected in the low recovery rates for most materials in that region.

Figure 4: Material Recovery Rates by Region 2021

Total	Cairns Recovery Rate	Townsville Recovery Rate	Mackay Recovery Rate	Central Qld Recovery Rate	Wide Bay Recovery Rate	SEQ Recovery Rate	Darling Downs - Maranoa Recovery Rate	Outback Qld Recovery Rate
Food Organics	34%	2%	1%	1%	13%	7%	7%	1%
Garden organics	74%	64%	81%	71%	72%	59%	75%	18%
Paper & Cardboard	26%	34%	33%	34%	39%	52%	21%	6%
Plastics	84%	4%	9%	5%	7%	13%	6%	0%
Glass	49%	48%	69%	63%	31%	55%	61%	18%
Ferrous metals	75%	69%	78%	73%	68%	89%	80%	41%
Non-ferrous metals	64%	50%	82%	78%	69%	88%	68%	11%
Timber	9%	15%	46%	10%	70%	16%	33%	4%
Textiles	0%	1%	22%	1%	1%	1%	1%	1%
Masonry, aggregate, soils	74%	89%	87%	82%	78%	88%	92%	57%
Other	**0%**	**35%**	**20%**	**10%**	**23%**	**10%**	**17%**	**7%**

Looking ahead, population growth is likely to drive growth in material production, unless policy changes see reductions in per capita recoverable material production. Assuming production of material per capita stays the same as it is in 2021, by 2041 the tonnage of material that will be produced is shown below in Figure 5.

Current data does not yet show a significant change as a result of policy intervention, however future policy intervention and longer-term impacts of current policies may impact these rates in the future.

Figure 5: Projected Waste Tonnage Totals by Region 2041

Total	Cairns	Townsville	Mackay	Central Qld	Wide Bay	SEQ	Darling Downs -	Outback Qld
Food Organics	40000	51000	53000	42000	50000	900000	39000	24000
Garden organics	94000	120000	110000	120000	180000	1400000	120000	30000
Paper & Cardboard	32000	51000	68000	42000	53000	1200000	29000	24000
Plastics	11000	20000	22000	16000	19000	330000	14000	11000
Glass	4500	11000	20000	12000	8100	190000	9900	6100
Ferrous metals	27000	25000	31000	24000	22000	1300000	25000	13000
Non-ferrous metals	2400	3600	4500	5800	5600	170000	5200	1500
Timber	33000	40000	36000	28000	98000	820000	36000	22000
Textiles	8300	17000	17000	13000	16000	210000	13000	8500
Masonry, aggregate, soils	76000	82000	80000	33000	40000	3300000	39000	12000
Other	22000	5800	17000	16000	20000	470000	20000	4400
Total	350200	426400	458500	351800	511700	10290000	350100	156500

Note - the information and projections contained in this table are based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

3.2 Preparation and Transformation Activities and Precincts

These projections provide an indication of the material recovery challenge. The different regions in Queensland continue to have different recoverable material profiles. The task of value adding to recoverable material across Queensland can be managed through a mix of "prepare" precincts which manage a broad spectrum of preparation activities, and more specialised "transform" precincts where both preparation and transformation processes can be carried out. As such, material recovery in Queensland lends itself to be being managed through a network of scalable Recycling Enterprise Precincts.

The input values and activity types for different materials in preparation and transformation phases are set out in Table 3.1.

'Prepare precincts' focus on preparatory activities.

'Transform precincts' focus on transformation activities and undertake preparation activities.

Table 3.1 - Activities and Values by Material Type

Material	Raw input value	Preparatory Activities	Transformation Activities
Glass	Low	Collection, washing, sorting, removing labels, removing plastics, some crushing for transportation purposes.	Heating, melting, crushing, and turning into coarse and fine sand, turning in insulation.
Organics	Low	Collection, sorting, decontamination, shredding and screening.	Mulching, anerobic digestion (AD) processing, composting, screening and grading, recycling organics, material reuse into animal feed, fertiliser, soil additives, biogas and biofuels.
Paper and cardboard	Medium	Collection, sorting and shredding, flotation tank.	Shredding and pulping, floatation tank/de-inking, drying, and finishing for reuse.

Material	Raw input value	Preparatory Activities	Transformation Activities
Plastics	Low - High	Collection, washing, sorting, removing labels, removing plastics, some palletisation for transportation purposes.	Shredding, melting, processing and materials recovery and transformation processes including extruding and compounding, material reuse into asphalt, road base and other plastic products.
Metals	High	Collection, crushing and shredding, separation (magnetic drums).	Fine component removal, impurity removal (hot air), melting and purification.
Timber	Low	Collection, sorting, cleaning, and some chipping/grinding for transportation purposes.	Chipping, grinding, decontamination of treated timbers, removal of impurities, material reuse and biomass energy production.
Textiles	Low	Sorting and shredding.	Cleaning, shredding, re-spinning, and reuse.
Masonry, aggregate and soils	Low	Collection, sorting and cleaning, and crushing/shredding for transportation.	Removal of impurities, material reuse, crushing and shredding.
E waste	Medium	Device collection, disassembly, and sorting (metals and plastics separation).	Lead parts into smelting furnace, separation of impurities and ingots, removal of critical minerals, material reuse activities, metallurgy and electrochemical processes.
Tyres	Medium	Collection and sorting.	Shredding, crumbing, and pyrolysis.
Mattresses	Low	Collection.	Shredding, separating materials, and reprocessing.
Solar Panels	Medium	Collection and dismantling.	Shredding, crushing, and separating materials.

Low value input commodities such as organics and concretes aggregates and soils are best handled close to source. Commodities such as glass, which has a low raw value but can become more valuable with some preparation, will be able to be transported for transformation processes. Materials like plastics, cardboard, metals, and e-waste have a higher value and are more likely to be transported greater distances for transformation activities. Some materials that require specialised handling may best be packaged in Queensland and transported interstate to more advanced processing facilities - soft plastics and certain types of e-waste fall into this category.

Solar panels present a unique opportunity for Queensland to establish itself as a national hub for reprocessing. Toowoomba is suggested as the location for this, to take advantage of inland rail as a way of bringing panels from the vast solar farms being developed in the renewable energy zones along the inland rail route in NSW and from central Queensland.

Based on consultation and analysis, a network of “prepare” and “transform” precincts serving Queensland can be established.

3.2.1 Prepare Precincts

“Prepare” precincts can leverage off existing or planned local government or private sector resource recovery infrastructure and are scalable. These precincts can be developed by any entity including local governments or the private sector. These precincts can handle all commodities to varying degrees. The amount of material being handled in a precinct will be dependent on the catchment population and industry mix. Ideally, material handled in these precincts will be reused locally or prepared for transport to large transformation precincts or other end users where further value adding processes can be undertaken. These precincts are likely to be smaller in scale and more suited to smaller, lower impact, industrial use.

While the location for some prepare precincts has been identified through consultation and included in the mapping and text in this document, these locations are in no way intended to be exhaustive. Prepare precincts could be located on any site that meets the location guidance outlined in this document and in the accompanying "how to" guide. Some existing local government or private sector infrastructure may already be undertaking "prepare" activities and may already fit the definition of prepare as outlined in these documents.

3.2.2 Transform Precincts

"Transform" precincts are more likely to include larger facilities and harder to locate activities. These are likely to be suited to industrially zoned areas that can be well buffered from surrounding land uses. These may be well suited to areas where existing planning and land use systems contemplate hard to locate industrial activities. They also lend themselves to being located near areas where existing infrastructure investment and capital investments have already been made or are planned. These precincts would also be expected to attract co-location of research and development organisations, and high value adding processes. Due to their scale, transport connections and power and water infrastructure will be important.

3.3 Precinct Location

The indicative locations for potential Prepare Precincts and Transform Precincts (which can also handle preparation activities) is summarised in Table 3.2 below.

Table 3.2 - Summary of Potential Precinct Locations in Queensland

Region	Potential Transform Precincts	Potential Prepare Precincts
Cairns	Cairns	Mareeba
Townsville	Townsville	Charters Towers
Mackay-Isaac-Whitsunday	Mackay	
Central Queensland	Gladstone	Gracemere, Biloela
Wide Bay Burnett	Bundaberg	Cherbourg, Curra
Darling Downs – Maranoa	Toowoomba	
Outback	Mount Isa	
SEQ - North		Caloundra
SEQ – East	Port of Brisbane	
SEQ – South	Bromelton	North Gold Coast
SEQ - West	Willowbank	

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

A broad indication of the likely location for precincts and the materials to be handled in each precinct is set out below in Table 3.3. These indicative locations are based on extensive consultation and analysis. They represent possible prepare and transform precinct locations. Site specific industry activities or aspirations have not been considered.

Table 3.3 - Queensland Recycling Enterprise Precincts Summary

Region	Precinct Locations		Preparatory Activities	Transformation Activities												Special Uses		
	Transform Precinct	Prepare Precinct		Glass	Organics	Paper and Cardboard	Plastics	Metal	Timber	Textiles	Masonry, Aggregates and Concrete	E-Waste	Tyres	Mattresses	Solar Panels	EFW	Research	Centre of Excellence
Cairns	Cairns	Mareeba	✓		✓						✓							
Townsville	Townsville	Charters Towers	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓	✓	✓	
Mackay-Isaac-Whitsunday	Mackay		✓		✓						✓		✓					
Central Queensland	Gladstone	Gracemere, Biloela	✓		✓			✓					✓		✓			Ferrous and Non Ferrous Metals
Wide Bay Burnett	Bundaberg	Cherbourg, Curra	✓		✓						✓				✓			
Darling Downs – Maranoa	Toowoomba		✓		✓						✓				✓		✓	Ag organics and solar panels
Outback	Mount Isa		✓		✓						✓		✓					
SEQ - North		Caloundra	✓	Transformation activities not yet determined														
SEQ –East	Port		✓	✓	✓	✓	✓	✓		✓	✓	✓		✓			✓	Glass, plastics, mattresses, textiles
SEQ – South	Bromelton	North Gold Coast	✓		✓				✓	✓			✓		✓	✓	✓	Organics, tyres
SEQ - West	Willowbank		✓		✓				✓		✓						✓	

Note – suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

3.4 Materials Key Insights

Glass – preparation should occur at any precinct. Basic processing will increase its value making it commercial to transport to South East Queensland for transformation using existing facilities near Brisbane. There may be value in establishing a second remanufacturing facility in Townsville to service northern Queensland and take advantage of new technologies to produce new products like glass fibre for insulation.

Organics – preparation should occur close to source due to decomposition of the material and low value. Given the high volume of material and low value, there is little commercial value in transporting the material long distances. Precincts should enable both preparation and transformation activities to be carried out in each region. Bromelton lends itself to be being a centre of excellence for handling organics, while Toowoomba lends itself to be a centre of excellence for handling agricultural organics particularly associated with livestock production.

Paper and Cardboard – preparation should occur at any precinct. Given the volume of material, the relatively low value of remanufactured products, and relatively low cost of transporting material, establishing two facilities for transformational activities – one in the north of Queensland and one in the South – would be the best approach to maximise commercial outcomes. Townsville and the Port of Brisbane lend themselves as ideal locations for precincts that undertake transformation activities for paper and cardboard, given the access to existing infrastructure with the Port locations supporting export to overseas end user markets.

Plastics – preparation of plastics should occur at any precinct, particularly with plastics and container recycling schemes already in place across the State. Given the ability to process some plastics into easily transportable pellets and the relatively low transportation cost, it is suggested that two facilities for transformation activities – one in north Queensland and one in the south of Queensland would support the best commercial outcomes. Given that equipment and infrastructure requirements for the transformation of plastics is similar to that of paper and cardboard, Townsville and Brisbane are suggested as locations for precincts were transformational activities take place. Port of Brisbane lends itself to being a centre of excellence for plastics.

Metals – preparation of metals can take place at any precinct, with extensive container recycling schemes already set up across the state. Given the higher levels of metal waste coming out of the mining and agricultural centres of Queensland, it is suggested that transformational activities for metals take place at a precinct established in Gladstone. Port of Brisbane is suggested as a precinct in the south of Queensland to undertake transformational activities for the large volume of other metals that are produced as waste.

Timber – preparation of timber should occur close to source, due to the relatively low value and high transportation costs and the potential for timber to decompose quickly (depending on the level of treatment). Given the relatively low volume of timber end products, there is less commercial benefit from transporting timber over long distances. It is suggested that precincts to undertake transformation activities for timber be established in the north or central Queensland and one in the south of Queensland.

Textiles – preparation of textiles can occur at any precinct. Given the relatively low volumes and easily transportable nature of textiles, it is suggested that a transformational precinct be established in the Port of Brisbane. The Port provides easy access to overseas end user markets. This precinct lends itself to being a centre of excellent for textiles.

Masonry, aggregate and soils – basic preparation and transformation processes can occur in any precinct. Given its relatively low value and high volumes, processing is best done close to the source. Opportunities should be explored for moving remanufacturing opportunities further up the value chain rather than simply crushing material and reusing it in aggregates.

E-waste – e-waste presents a highly variable and complex material input, with some components having very high recovered material values. While basic preparatory activity can occur in precinct, the more specialised nature of processing facilities lends this material to a model where it is transported to processing facilities in Townsville to service north Queensland and an area around the Port of Brisbane to service southern Queensland. A location near the Port of Brisbane will provide synergies with plastics, metals, and glass processing capability likely to also locate near the Port.

Tyres – tyres are a problematic material throughout Queensland and some preparation activities such as baling can occurring in any precinct. Products from tyres are ideally suited for re-use in transport infrastructure, fuels, and carbon black products. Due to the specialised nature of tyre processing, transformation should be focused on large tyres first while capability to handle passenger car tyres is developed. Mackay lends itself to being a centre of excellence for tyres in the north, Mount Isa lends itself to a processing facility for the Outback and Bromelton lends itself to processing tyres for the south of the State.

Mattresses – basic preparation should occur in any precinct. Given the low value, and complex material mix in the products, transformation activity should be focused into Townsville to service the North Queensland market and into Willowbank to service the southern part of the State and to provide synergies with the processing of textiles and timber.

Solar Panels – basic preparation activities can occur in any precinct. Given its higher value, and complex material mix, coupled with the likelihood that most solar panels are likely to be collected in SEQ, the Darling Downs and Central Queensland, transformation processes should be focused into major precincts in Gladstone, Toowoomba and Bromelton. Given Toowoomba's position on the Inland Rail route, and the vast number of panels likely to be built in renewable energy zones in central west NSW and southern Queensland, there is merit in seeking to establish Toowoomba as a national centre for solar panel remanufacturing.

4 Regional Precinct Location

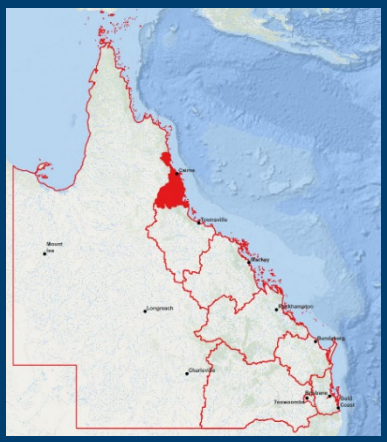
To assist in the view of a network approach to precincts across the state, profiles have been developed for each ABS Statistical Area 4 (SA4) region across the state:

- Cairns
- Townsville
- Mackay-Isaac-Whitsunday
- Central Queensland
- Wide Bay Burnett
- Darling Downs-Maranoa and Toowoomba (covering Darling Downs-Maranoa and Toowoomba SA4s)
- Queensland Outback
- South-East Queensland (covering ABS SA4 Brisbane – East, Brisbane Inner City, Brisbane – North, Brisbane – South, Brisbane – West, Gold Coast, Ipswich, Logan – Beaudesert, Moreton Bay – North, Moreton Bay – South, and Sunshine Coast).

A range of factors have been considered in developing the regional profiles, and proposals have been made regarding the type and location of Recycling Enterprise Precincts for each region.

The regional profiles outline the waste profile, the expected future projection of waste to be produced and recovered in the areas, as well as looking at wider issues that impact the region such as the economic and growth profile, transport infrastructure, supporting infrastructure and existing recovered materials-based activities being undertaken in each region. The location guidance developed as part of the Guidelines has also been applied for each region.

Cairns SA4 Region Profile



Overview

The Cairns SA4 region encompasses six local government areas (LGAs) with a total land area of 21,338 km^2. The current population is 265,000, forecasted to grow to 340,000 by 2041. The main population centre is the city of Cairns, housing 60% of total population. Cairns has a wet, tropical climate and receives up to 4 metres of rain annually. There are diverse environmental and ecological conditions present within the region, including the Great Barrier Reef.

Key Insights

Economic and Growth Profile - the key industries for the Far North include agriculture, tourism, and higher education and research.

Materials Profile

- The Cairns SA4 region accounts for 3% of Queensland's total waste, producing approximately 270,000 tonnes per year.
- At a headline level, 53% of waste is currently being recovered. Construction and demolition waste (C&D) recovery is leading the way with an 88% recovery rate, followed by commercial and industrial waste (C&I) with 48% and municipal solid waste (MSW) is lagging with a 31% recovery rate.
- The key waste categories for Cairns are garden organics and building waste (masonry, aggregate, soils) which produce almost 50% of the total waste and both have a recovery rate of 74%.
- Local stakeholder feedback from the region indicates that within those waste categories, those requiring the most attention include biosolids, organics, solar panels, and tyres. Opportunities have been identified for reuse of materials from the tourism sector in particular textiles, mattresses, towels, and linen. Cairns also deals with a large segment of waste from Cape York and the Torres Strait including old car bodies and whitegoods.
- There is interest in establishing an energy from waste facility and working with the local research sector to further establish innovation and collaboration opportunities.

Materials Projections

- **Organics -** set to increase to 134,000 tonnes per year by 2041. Given the challenges of transporting organics, high volume, and local markets, it is most feasible to process locally.
- **Masonry aggregate and soils -** set to increase to 76,000 tonnes per year by 2041. Given the relatively small volume, and local markets, it is most feasible to process locally.
- **Paper and Cardboard -** set to increase to 32,000 tonnes per year by 2041. Paper and cardboard have a variety of post-recovery uses and markets, however transport costs are moderate to high. A feasible option is to transport this resource to Townsville for processing.

Transport - key transport networks include the North Cost Rail line and the Bruce Highway to move paper and cardboard, plastic and glass to Townsville and ferrous and non-ferrous metals to Gladstone for processing.

Land Use and Infrastructure – Industrial areas such as the Cairns South State Development Area offer land for higher impact uses. This area has some infrastructure and buffering surrounding the site. Existing industrial areas also exist in Mareeba.

Potential Precincts and Handling of Materials

There is the potential to establish a recycling enterprise precinct in the Cairns region, potentially in Portsmith, and for it to be used for the processing of all varieties of organics, masonry, aggregate and soils, and timber, servicing the Cairns region exclusively. Plastics, paper & cardboard and glass should be transported to Townsville and ferrous and non-ferrous metal to Gladstone or Brisbane for processing respectively.

A smaller recycling enterprise precinct could be established in Mareeba to undertake preparatory activities for waste streams.

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Cairns Region Potential Recycling Enterprise Precincts

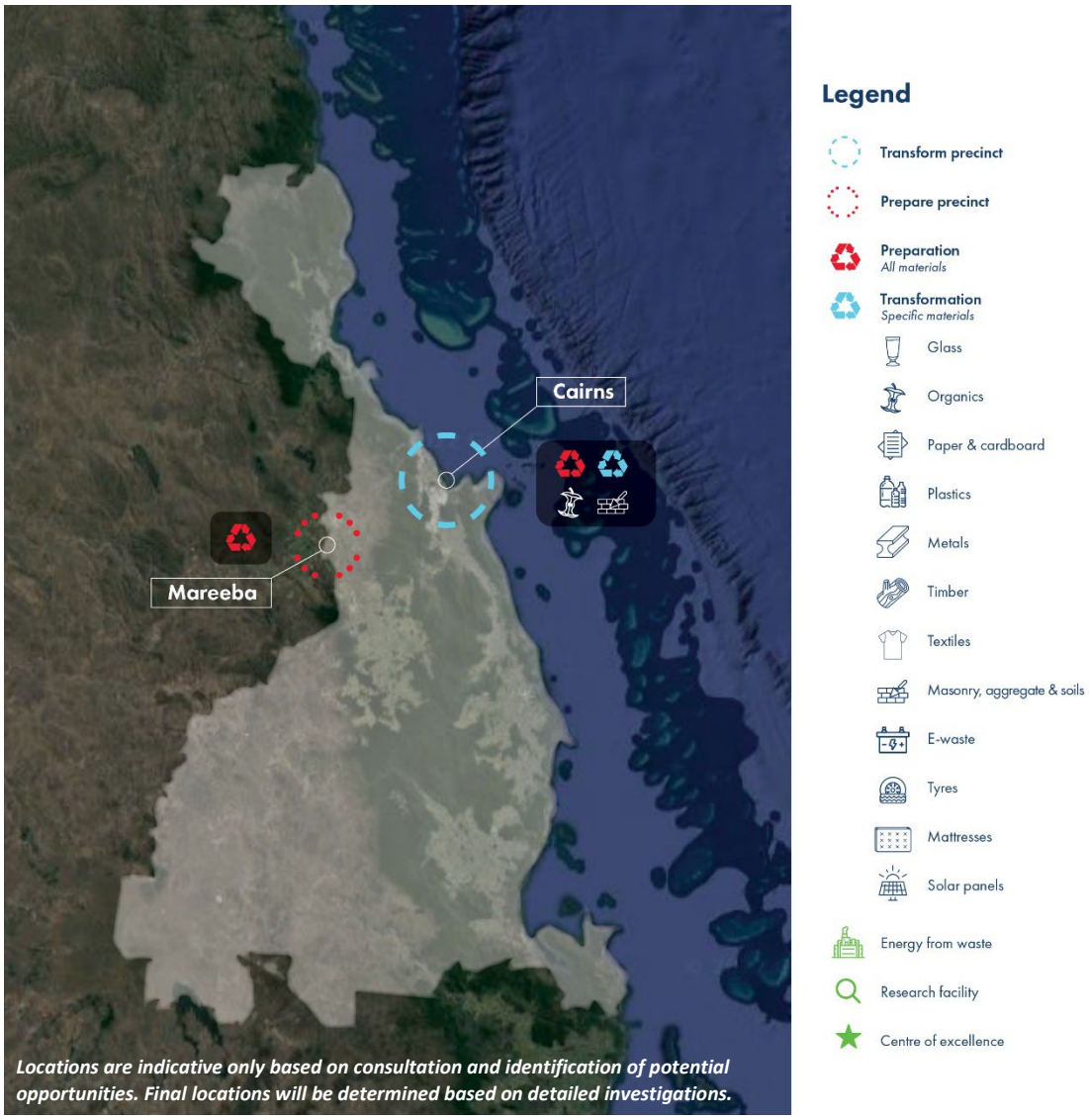


Table 4.1 – Cairns region projected waste tonnage and recovery rate by category for 2031 and 2041

	2021		2031		2041	
	Total Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste at 2030 Target[1]	Total Waste (Projected)	Recovered Waste at 2040 Target[2]
Food Organics	31,000	34%	35,000	21,000	40,000	26,000
Garden organics	73,000	74%	83,000	50,000	94,000	61,000
Paper & Cardboard	24,000	26%	28,000	17,000	32,000	21,000
Plastics	8,400	84%	9,600	5,800	11,000	7,100
Glass	3,500	49%	4,000	2,500	4,500	3,000
Ferrous metals	21,000	75%	24,000	20,000	27,000	23,000
Non-ferrous metals	1,900	64%	2,100	1,800	2,400	2,000
Timber	26,000	9%	29,000	19,000	33,000	23,000
Textiles	6,500	0%	7,400	4,400	8,300	5,400
Masonry, aggregate, soils	59,000	74%	68,000	59,000	76,000	66,000
Other	17,000	0%	20,000	12,000	22,000	15,000
Total	**270,000**	**53%**	**310,000**	**210,000**	**350,000**	**250,000**

[1] *Projection considers the 2030 overall recycling target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*
[2] *Projection considers the 2040 overall recycling target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*

Cairns SA4 Region Background

Economic and Growth Profile

The economy of Cairns is key to Far North Queensland. It is built on education, hospitality, retail, health, and agriculture industries. The tourism market within the region supports visitors to the Great Barrier Reef Marine Park and surrounding World Heritage tropical rainforest. Other markets such as logistics and agricultural products (sugar cane and cattle) are prevalent due to existing infrastructure, fertile land, and regional climate.

Some research and development facilities exist in the Cairns region with capability coming from Central Queensland University, James Cook University, including the Cairns Institute and CSIRO Cairns, all of which are located around the city of Cairns.

Currently 1% of the population work within the energy and waste services sector (electricity, gas, water, and waste). Waste management and resource recovery operations occur at a standard level, with an abundance of transfer stations to facilitate waste transfer from regional and remote areas. There is potential for further expansion of waste management in the northern regions of Queensland, however Cairns will require further development in this space.

Based on projections from the Queensland Government Statistician's Office, the population of Cairns is set to increase as described in Table 4.2.

Table 4.2 – Cairns region projected population growth (QGSO, 2022)

	2021	2031	2041
Cairns	260,000	300,000	340,000

Waste Composition Overview

The Cairns region accounts for 3% of Queensland's total waste, producing approximately 270,000 tonnes per year.

At a headline level, 53% of waste is currently being recovered. Construction and demolition waste (C&D) recovery is leading the way with an 88% recovery rate, followed by commercial and industrial waste (C&I) with 48% and municipal solid waste (MSW) is lagging with a 31% recovery rate.

By assessing Cairns' recovery on a waste category level, the lower C&I recovery is evident due to reduced recycling rates of key industrial waste categories such as paper & cardboard and glass. The key waste categories for Cairns are garden organics and building waste (masonry, aggregate, soils) which produce almost 50% of the total waste and both have a recovery rate of 74%.

Table 4.3 and Table 4.4 represent the baseline waste tonnage and recovery rates by headline stream and category.

Table 4.3 – Cairns region derived total baseline waste tonnage and recovery rate by headline waste stream for 2020-21

	Total Managed	Landfilled	Recovered	Recovery Rate
MSW	82,000	56,000	25,000	31%
C&I	120,000	64,000	61,000	48%
C&D	64,000	7,800	56,000	88%
Total	**270,000**	**130,000**	**140,000**	**53%**

Table 4.4 – Cairns region derived total waste tonnage baseline and recovery rate by waste category for 2020-21

	Total Managed	Landfilled	Recovered	Recovery Rate
Food Organics	31,000	20,000	11,000	34%
Garden organics	73,000	19,000	54,000	74%
Paper & Cardboard	24,000	18,000	6,300	26%
Plastics	8,400	1,300	7,100	84%
Glass	3,500	1,800	1,700	49%
Ferrous metals	21,000	5,200	15,000	75%
Non-ferrous metals	1,900	680	1,200	64%
Timber	26,000	23,000	2,300	9%
Textiles	6,500	6,500	0	0%
Masonry, aggregate, soils	59,000	15,000	44,000	74%
Other	17,000	17,000	0	0%
Total	**270,000**	**130,000**	**140,000**	**53%**

Note - the information contained in this table is based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Waste Projection

Table 4.5 projects total waste production and recovery based on factors listed below:

- **Population growth** according to Queensland Government Statisticians Office;
- **Current recovery rate** as baselined in Table 4.4; and
- **Waste recycling targets** as outlined in Queensland Government Waste Management and Resource Recovery Strategy. These targets have been broken down from headline stream to category.

Table 4.5 – Cairns region projected total waste tonnage and recovery rate by waste category for 2031 and 2041

Cairns Current and Projected Waste Recovery by Waste Category (Tonnes)									
	2021			2031			2041		
	Total Waste (Actual)	Recovered Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2030 Recycling Target)[1]	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2040 Recycling Target)[2]
Food Organics	31,000	11,000	34%	35,000	12,000	21,000	40,000	14,000	26,000
Garden organics	73,000	54,000	74%	83,000	61,000	50,000	94,000	69,000	61,000
Paper & Cardboard	24,000	6,300	26%	28,000	7,300	17,000	32,000	8,200	21,000
Plastics	8,400	7,100	84%	9,600	8,100	5,800	11,000	9,100	7,100
Glass	3,500	1,700	49%	4,000	2,000	2,500	4,500	2,200	3,000
Ferrous metals	21,000	15,000	75%	24,000	18,000	20,000	27,000	20,000	23,000
Non-ferrous metals	1,900	1,200	64%	2,100	1,300	1,800	2,400	1,500	2,000
Timber	26,000	2,300	9%	29,000	2,700	19,000	33,000	3,000	23,000
Textiles	6,500	-	0%	7,400	-	4,400	8,300	-	5,400
Masonry, aggregate, soils	59,000	44,000	74%	68,000	50,000	59,000	76,000	56,000	66,000
Other	17,000	-	0%	20,000	-	12,000	22,000	-	15,000
Total	**270,000**	**140,000**	**53%**	**310,000**	**160,000**	**210,000**	**350,000**	**180,000**	**250,000**

1. Projection considers the 2030 overall recycling waste reduction target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

2. Projection considers the 2040 overall recycling waste reduction target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

Note - the information and projections contained in this table are based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Existing Waste Infrastructure

The existing waste infrastructure in Cairns is well distributed throughout the region, with significant transfer station presences. Materials Recovery Facilities (MRF) are in key centres and landfill sites make up the largest total volume of waste processing.

Table 4.6 – Cairns region existing waste infrastructure quantity and size

	Plant Quantity	Typical Size
MRF/Recycling Station	4	Medium
Metals	3	Small
Organics	4	Small
C&D	0	Small
Transfer Stations	34	Medium
Landfill – Inert	9	Small
Landfill – Putrescible	3	Large
Total	**57**	

Existing Support Infrastructure

Cairns has suitable transport infrastructure throughout the region to facilitate markets for logistics, agriculture, and tourism. The region has good power, water and telecommunications infrastructure to support industrial development around existing major urban centres. Table 4.7 highlights the critical transport infrastructure available in the Cairns region.

Table 4.7 – Cairns region transport overview

Transport Mode	Routes	Description
Road	Bruce Highway Kennedy Highway	The main throughfares are the Bruce Highway and Kennedy Highway, which connect the region to the south and west respectively.
Rail/Freight	North Coast Line	There is a freight rail connection from Cairns to Brisbane which is currently the transport medium for goods recycled in the south of Queensland.
Port	Port of Cairns Port of Mourilyan	Cairns Port is typically used for tourism, general cargo, fishing, defence purposes with no involvement in transferring industrial material. Mourilyan offer access for some bulk commodities.

Land Use Availability

Land uses in the Cairns region vary. The economy is particularly focussed on tourism, with the majority of land uses assigned to conservation, residential and accommodation, emerging communities, and rural facilities. Portsmith offers high impact industry land uses, however, is limited in space due to current utilisation. This location provides access to the City of Cairns which makes MSW transport low cost and easy, however provision of surrounding buffers may be a challenge. Industrial land uses within Cassowary Coast are largely surrounded by residential/accommodation land uses, reflecting a low supply of high-impact industry land supply.

Mareeba represents an opportunity for a precinct with some resource recovery activities already taking place there, however transport of material from the City of Cairns, where the majority is produced, to Mareeba may be difficult for large volumes.

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Challenges and Opportunities

The key areas for consideration in Cairns are outlined in Table 4.8. Some of these will pose a challenge to the implementation of materials recovery, whereas others create opportunities for enhanced development.

Table 4.8 – Cairns region challenges and opportunities

Challenges	Opportunities
Environmental Concerns **The Great Barrier Reef is located on the coast of the region, reflecting the need for strict environmental protection measures. The environment has a high water table, which can result in leakages polluting water bodies.**	**Abundance of Green Waste** Green waste production is relatively large in Cairns, providing a sufficient level of organic waste feedstock. These products can be further used for conservation purposes and resold to local farmers.
Access and Transport Cost **Cairns is over 1600km from Brisbane which currently hosts most of the commodity markets for recycled materials. Cairns requires material recovery in neighbouring cities to reduce costs and boost econom**ic activity**.**	**Landfill Scarcity and Sparsity** Transport of waste to the closest landfills is expensive – there is an opportunity to supplement Cairns with material recovery which has council support and creates mutually beneficial solutions for industry.

Application of Recycling Enterprise Precinct Location Guidance

The Recycling Enterprise Precinct Location Guidance outlines the matters that should be considered when seeking to identify likely candidate places for a recycling enterprise precinct.

This guidance has been applied to the region to provide a high-level assessment of the suitability of Recycling Enterprise Precincts for the region.

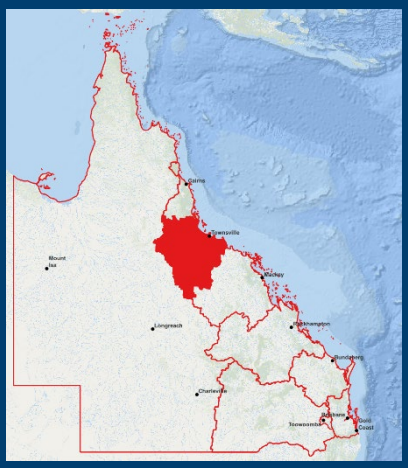
Table 4.9 – Cairns region – application of recycling enterprise precinct location guidance

Focus Area	Aims	Application for Region
Economic impact	• Precincts should maximise access to supply chains.	• Current road and rail transport infrastructure in the region is extensive. Port infrastructure largely accommodates small logistics and tourism. • There are some waste management organisations present in the region. There are industrial precincts to be leveraged, however land supply may be constrained.
	• Precincts should facilitate knowledge transfer and maximise research collaboration opportunities.	• There is a presence of multiple universities and the CSIRO in the Cairns region, which reflects potential for research collaboration.
	• Precincts should have access to sufficient locally sourced labour.	• Roughly 1% of the workforce works in the energy/services industries (incl. waste). There may be

Focus Area	Aims	Application for Region
	• Precincts should have access to training to meet future skilled and specialised labour requirements.	some constraints regarding workforce availability within the area. • There is some materials recovery industrial presence in the region.
Social impact	• Precincts should seek to enhance social outcomes.	• Some areas in the region such as Portsmith and Mareeba may have appropriate buffers in place for high-impact industry.
Environmental impact and sustainability	• Precincts should minimise environmental impacts. • Precincts should maximise sustainability outcomes.	• Coastal facilities will be required to be dry facilities to avoid possible pollutant run-off into the Great Barrier Reef. • Current waste is likely transported to other regions, therefore local facilities will reduce greenhouse gases due to a reduction in transport.
Amenity	• Precincts should minimise impact on sensitive land uses. • Precincts should minimise impact on urban amenity.	• Considering large residential and conservation areas, significant constraints may be present in establishing high-impact industry operations. • Current dedicated high-impact industry land may already be at high utilisation.
Land needs	• Precincts should be of sufficient scale to allow an ecosystem of resource recovery and recycling industries to develop and to have impact.	• Current dedicated high-impact industry land in Portsmith is at high utilisation and is located on the coast. Land supply and existing infrastructure may require investigation. This limits the opportunity for extensive and large-scale operations within the region.
Infrastructure	• Precincts should have good access to existing enabling infrastructure. • Precincts should minimise impacts on local government infrastructure.	• Current road and rail infrastructure is extensive and developed within the region. • Energy and water infrastructure is sufficient in major towns/cities however this could become scarce if the precinct location were to be inland.

Note – suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Townsville SA4 Region Profile



Overview

The Townsville SA4 region consists of five local government areas (LGAs). The city of Townsville is considered the commercial hub of North Queensland and has a population of 250,000 people forecasted to increase to 320,000 by 2041. The Great Barrier Reef lies on the coast of the region so managing environmental impacts within the reef catchments is critical. The region is the second largest in Queensland, both commercially and industrially, which drives regional economic growth.

Key Insights

Economic and Growth Profile - the key industries for the Townsville SA4 region includes agriculture, resources, research, and hospitality. The current population of the Townsville region is 250,000 and is set to grow to 320,000 by 2041.

Materials Profile

- The Townsville region accounts for 3% of Queensland's total waste, producing approximately 330,000 tonnes per year.
- At a headline level, 47% of waste is currently being recovered. Construction and demolition (C&D) recovery is leading the way with an 78% recovery rate, followed by commercial and industrial (C&I) with 53% and municipal solid waste (MSW) is lagging with a 23% recovery rate.
- The key waste categories for Townsville are garden waste and building waste (masonry, aggregate, soils) which produce almost 50% of the total and have a recovery rate of 64% and 89% respectively.
- Local stakeholder feedback from the region indicates that within those waste categories, tyres, plastics, organics, and glass required the most attention. Opportunities have been identified by local stakeholders for reuse in bio futures, pellets, soils, compost and biodiesel.

Materials Projections

- **Organics -** set to increase to 171,000 tonnes per year by 2041. Given the challenges of transporting organics, high volume, and local markets, it is most feasible to process locally.
- **Masonry aggregate and soils -** set to increase to 82,000 tonnes per year by 2041. Given the relatively small volumes and local uses and markets, it is most feasible to process locally.
- **Paper and cardboard -** set to increase to 51,000 tonnes per year by 2041. Paper and cardboard have a variety of post-recovery uses and markets, and a precinct in Townsville could be used to service local and regional demand.

Transport - key transport networks include the North Cost Rail line and the Bruce Highway to bring paper & cardboard, plastic and glass to Townsville and send ferrous and non-ferrous metals to Gladstone for processing.

Land Use and Infrastructure - Townsville SDA provides significant industrial land supply. Land supply outside of Townsville includes dedicated industrial lands near Ayr, Charters Towers and Ingham. Areas of interest include Lansdown, the Bohle Industrial Precinct and Zinc Road, Stuart which has an existing engineered landfill and green waste recovery site. Both locations have ample buffers to nearby residences and easy access to the Bruce Highway for feedstock transport.

Potential Precincts and Handling of Materials

There is potential to establish a transform precinct in Townsville and for it to be used for the processing of all varieties of organics, masonry, aggregate and soils, timber, paper & cardboard, plastic, glass, solar panels and tyres. This precinct would service materials from Cairns, Townsville, Mackay, and Central Queensland Regions. Ferrous and non-ferrous metals should be transported to Gladstone or Brisbane for processing. This Precinct has the potential to be a centre of excellence, with a potential energy from waste facility and research collaborations established within the precinct.

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Townsville Region Potential Recycling Enterprise Precincts

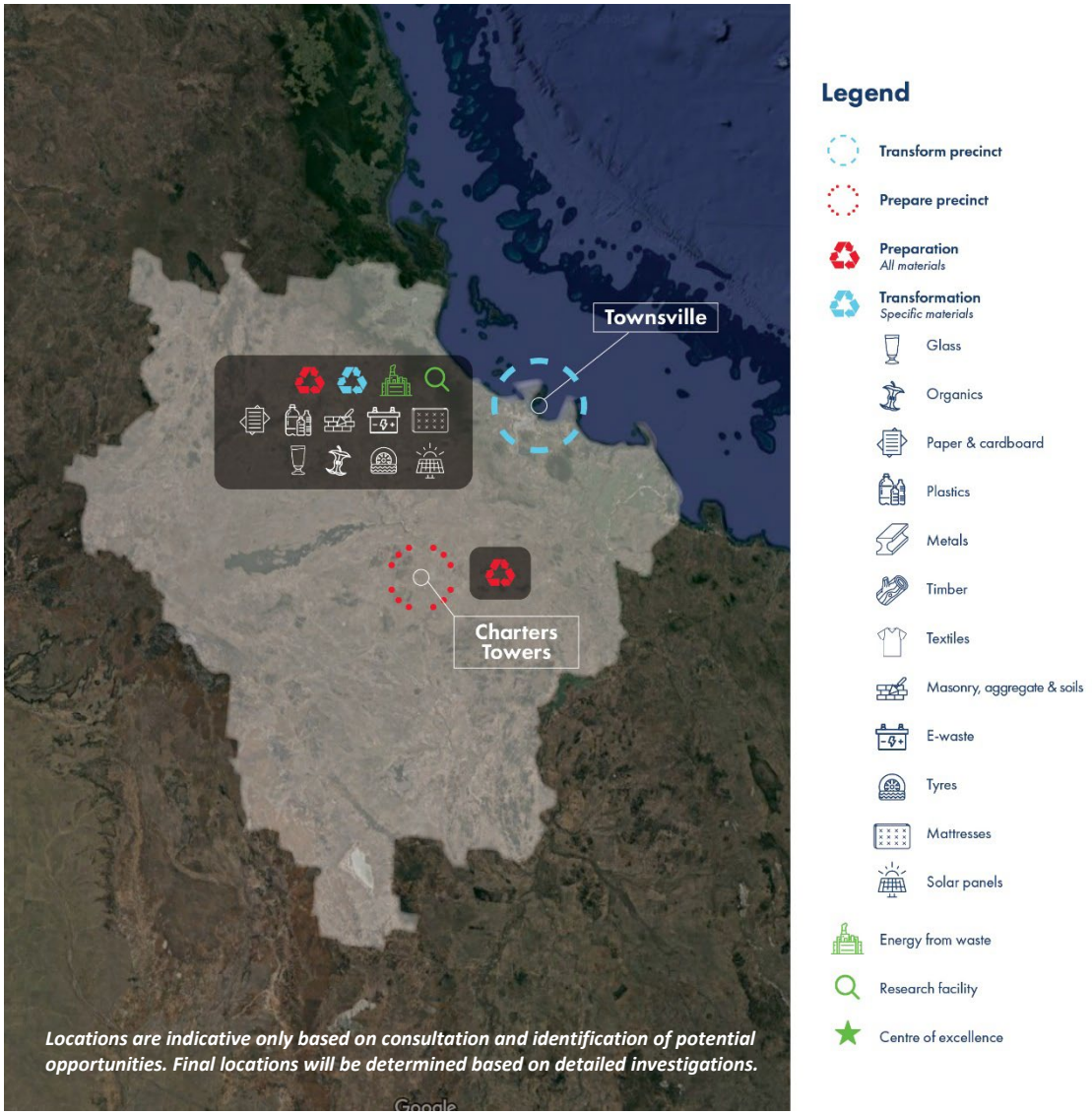


Table 4.10 – Townsville region projected waste tonnage and recovery rate by category for 2031 and 2041

	2021		2031		2041	
	Total Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste at 2030 Target[3]	Total Waste (Projected)	Recovered Waste at 2040 Target[4]
Food Organics	39,000	2%	45,000	27,000	51,000	33,000
Garden organics	94,000	64%	110,000	65,000	120,000	81,000
Paper & Cardboard	39,000	34%	45,000	27,000	51,000	33,000
Plastics	15,000	4%	17,000	10,000	20,000	13,000
Glass	8,000	48%	9,300	5,700	11,000	7,000
Ferrous metals	19,000	69%	22,000	19,000	25,000	22,000
Non-ferrous metals	2,700	50%	3,100	2,600	3,600	3,000
Timber	30,000	15%	35,000	22,000	40,000	27,000
Textiles	13,000	1%	15,000	8,900	17,000	11,000
Masonry, aggregate, soils	62,000	89%	72,000	62,000	82,000	71,000
Other	4,400	35%	5,100	3,200	5,800	3,900
Total	**330,000**	**47%**	**380,000**	**250,000**	**430,000**	**300,000**

[3] *Projection considers the 2030 overall recycling target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*
[4] *Projection considers the 2040 overall recycling target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*

Townsville SA4 Region Background

Economic and Growth Profile

The economy of the Townsville region is the largest by value and workforce outside of the south-eastern corner of Queensland. The region is known as a regional economic hub with a range of industries and markets in operation. The main industries include hospitality, education, health, defence, and public administration, with professionals occupying the largest portion of the workforce. 1.5% of the workforce is currently employed by the electricity, gas, water, and waste services sector.

Areas outside of Townsville have an economy focussed on agriculture and resources, and use Townsville as the supply chain for exporting products nationally and internationally. There is a strong presence of heavy industry including minerals processing, manufacturing, and defence within the region. The Great Barrier Reef enhances the tourism market in Townsville.

Research and development opportunities in the Townsville region are significant relative to other regions. Educational and scientific research institutions include James Cook University, Central Queensland University, CSIRO Australian Tropical Sciences and Innovation Precinct (ATSIP) and CSIRO Woodstock. James Cook University has an extensive sustainability program and conducts research on biomass pyrolysis.

Resource recovery operations in the Townsville region are diverse yet small in volume. There is minimal presence of large waste management organisations, however, the Port of Townsville has the capability and currently exports recycled materials internationally, reflecting an established export supply chain.

Based on projections from the Queensland Government statistician's Office, the population of the Townsville region is set to increase as described in Table 4.11.

Table 4.11 – Townsville region projected population growth (QGSO, 2022)

	2021	2031	2041
Townsville	250,000	280,000	320,000

Waste Composition Overview

The Townsville region accounts for 4% of Queensland's total waste, producing approximately 330,000 tonnes per year.

At a headline level, 47% of waste is currently being recovered. Construction and demolition (C&D) recovery is leading the way with an 78% recovery rate, followed by commercial and industrial (C&I) with 53% and municipal solid waste (MSW) is lagging with a 23% recovery rate.

By assessing Townsville's recovery on a waste category level, the lack of MSW recovery is evident due to low recovery rates of MSW glass and plastics. The key waste categories for Townsville are garden waste and building waste (masonry, aggregate, soils) which produce almost 50% of the total waste and have a recovery rate of 64% and 89% respectively.

Table 4.12 and Table 4.13 represent the baseline waste tonnage and recovery rates by headline stream and category.

Table 4.12 – Townsville region derived total baseline waste tonnage and recovery rate by headline waste stream for 2020-21

	Total managed	Landfilled	Recovered	Recovery rate
MSW	110,000	87,000	26,000	23%
C&I	150,000	71,000	79,000	53%
C&D	64,000	14,000	50,000	78%
Total	**330,000**	**170,000**	**150,000**	**47%**

Table 4.13 – Townsville region derived total waste tonnage baseline and recovery rate by waste category for 2020-21

	Total managed	Landfilled	Recovered	Recovery rate
Food Organics	39,000	38,000	600	2%
Garden organics	94,000	34,000	60,000	64%
Paper & Cardboard	39,000	26,000	13,000	34%
Plastics	15,000	14,000	630	4%
Glass	8,000	4,200	3,900	48%
Ferrous metals	19,000	6,100	13,000	69%
Non-ferrous metals	2,700	1,400	1,400	50%
Timber	30,000	26,000	4,400	15%
Textiles	13,000	13,000	130	1%
Masonry, aggregate, soils	62,000	6,900	55,000	89%
Other	4,400	2,800	1,600	35%
Total	**330,000**	**170,000**	**150,000**	**47%**

Note – the information contained in this table is based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Waste Projection

Table 4.14 projects total waste production and recovery based on factors listed below:

- **Population growth** according to Queensland Government Statisticians Office;
- **Current recovery rate** as baselined in Table 4.13; and
- **Waste recycling targets** as outline in Queensland Government Waste Management and Resource Recovery Strategy. These targets have been broken down from headline stream to category.

Table 4.14 – Townsville region projected total waste tonnage and recovery rate by waste category for 2031 and 2041

Townsville Region Current and Projected Waste Recovery by Waste Category (Tonnes)									
	2021			2031			2041		
	Total Waste (Actual)	Recovered Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2030 Recycling Target)[1]	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2040 Recycling Target)[2]
Food Organics	39,000	600	2%	45,000	690	27,000	51,000	790	33,000
Garden organics	94,000	60,000	64%	110,000	70,000	65,000	120,000	79,000	81,000
Paper & Cardboard	39,000	13,000	34%	45,000	15,000	27,000	51,000	18,000	33,000
Plastics	15,000	630	4%	17,000	720	10,000	20,000	820	13,000
Glass	8,000	3,900	48%	9,300	4,500	5,700	11,000	5,100	7,000
Ferrous metals	19,000	13,000	69%	22,000	15,000	19,000	25,000	17,000	22,000
Non-ferrous metals	2,700	1,400	50%	3,100	1,600	2,600	3,600	1,800	3,000
Timber	30,000	4,400	15%	35,000	5,100	22,000	40,000	5,800	27,000
Textiles	13,000	130	1%	15,000	150	8,900	17,000	170	11,000
Masonry, aggregate, soils	62,000	55,000	89%	72,000	64,000	62,000	82,000	73,000	71,000
Other	4,400	1,600	35%	5,100	1,800	3,200	5,800	2,000	3,900
Total	**330,000**	**150,000**	**47%**	**380,000**	**180,000**	**250,000**	**430,000**	**200,000**	**300,000**

1. Projection considers the 2030 overall recycling waste reduction target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

2. Projection considers the 2040 overall recycling waste reduction target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

Note – the information and projections contained in this table are based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Existing Waste Infrastructure

The existing waste infrastructure in the Townsville region is limited and predominantly located in city of Townsville. Transfer stations are spread across the coastline and a materials recovery facility (MRF) is located in Garbutt. Landfill sites make up the largest volume of waste processing. All other recovery sites are limited and are peppered throughout the region.

Table 4.15 – Existing waste infrastructure quantity and size

	Plant Quantity	Typical Size
MRF/Recycling Station	1	Medium
Metals	3	Small
Organics	3	Small
C&D	1	Small
Transfer Stations	12	Medium
Landfill – Inert	4	Small
Landfill – Putrescible	5	Large-Small
Total	**29**	

Existing Support Infrastructure

The Townsville region has an established network of transport infrastructure as it plays a key role in the supply chain for import-export markets through the Port of Townsville. The road and freight networks have been developed to facilitate these markets, and further service the large regional population that resides and works in the region. The region has good power, water and telecommunications infrastructure to support industrial development around existing major urban centres. There are current water supply upgrades underway for Townsville improving access to key supporting infrastructure. Table 4.16 provides a summary of the transport infrastructure currently available to the Townsville region.

Table 4.16 – Townsville region transport overview

Transport Mode	Routes	Description
Road	Bruce Highway Flinders Highway	The main throughfares are the Bruce Highway and Flinders Highway, which connect the region to the south and west respectively.
Rail/Freight	North Coast Line Mount Isa Line	The freight rail connection from Townsville to Brisbane is used to transport recyclable commodities and continues further north to Lucinda and Cairns. The Mount Isa rail line utilised for agricultural and minerals transport.
Port	Port of Townsville Port of Lucinda	The Port of Townsville facilitates the supply chain for metal fertiliser, sugar, and recycled materials entering and existin Queensland.

Land Use Availability

Current uses driving land demand in the Townsville region include agriculture, retail, manufacturing, and mining. Potential land use constraints include the Great Barrier Reef due to environmental concerns, and military facilities. Existing industrially zoned land including the Townsville State Development Area (SDA) provides an option for industrial land supply and precinct development options as does Lansdown, south of Townsville.

An area of interest includes the Industrial precinct located in Bohle. The 'second stage' Bohle industrial precinct beginning on Shaw Road and currently being developed on Tompkins Road presents a potential location for the precinct. It is located near the city without being too close to impact urban use, is close to key road networks including the Bruce Highway which provides access to the Port of Townsville and has close access to the railway line.

Land supply outside of Townsville includes dedicated industrial areas in Ayr, Charters Towers, and Ingham.

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Challenges and Opportunities

The key areas for consideration regarding the Townsville region are outlined in Table 4.17. Some of these will pose a challenge to the implementation of resource recovery, whereas others create opportunities for enhanced development.

Table 4.17 – Townsville region challenges and opportunities

Challenges	Opportunities
Decentralised Population **The decentralised population within the Townsville region presents a significant issue in establishing the upstream supply chain of resource recovery. This includes collection of waste in a commercially feasible manner accounting for the quantity and quality of waste produced and transportation costs.**	**Developed Transport Infrastructure** Current transport infrastructure can facilitate the full supply chain from collection through to export. The Port of Townsville exports recycled materials currently, reflecting precedence and established process in exporting these products.
Environmental Concerns **The Great Barrier Reef is located on the coast of the region, reflecting the need for strict environmental protection measures.**	**Agricultural Waste** Regional areas of the Townsville region have an agricultural focus on sugar cane, horticulture, and livestock. These present an opportunity for organic waste products to be recycled and sold back to farmers as feasible for the market. This can be further processed with other organic material from municipal and commercial waste.

Application of Recycling Enterprise Precinct Location Guidance

The Recycling Enterprise Precinct Location Guidance outlines the matters that should be considered when seeking to identify likely candidate places for a recycling enterprise precinct.

This guidance has been applied to the region to provide a high-level assessment of the suitability of Recycling Enterprise Precincts for the region.

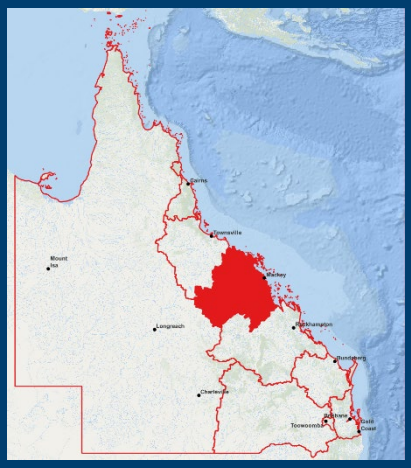
Table 4.18 – Townsville region – application of recycling enterprise precinct location guidance

Focus Area	Aims	Application for Region
Economic impact	• Precincts should maximise access to supply chains.	• Road, rail, and port infrastructure can facilitate required supply chains. These networks are connected to the coastal freight line, and to regional and rural populations. • The Port of Townsville facilitates the supply chain for metals, fertiliser, sugar, and recycled materials making it an asset for resource recovery transport.

Focus Area	Aims	Application for Region
		• There is limited presence of large-scale waste management organisations in the region. • There is access to a direct market for organic waste.
	• Precincts should facilitate knowledge transfer and maximise research collaboration opportunities.	• James Cook University and CSIRO have educational programs to elaborate on waste management and recycling processes.
	• Precincts should have access to sufficient locally sourced labour. • Precincts should have access to training to meet future skilled and specialised labour requirements.	• 1.5% of the current workforce in the Townsville region are employed within the energy, gas, water, and waste services industry. This is ~1400 people as of 2016. • There is a presence of university and vocational training services available in the city of Townsville.
Social impact	• Precincts should seek to enhance social outcomes.	• There are key clusters of economic and industrial activity, considering it is the largest regional area by economy and population. Considering the existence of industrial markets such as mining and manufacturing, a Recycling Enterprise Precinct provides industrial growth. • Current industrial developments and planned areas such as the Townsville SDA can provide existing buffers.
Environmental impact and sustainability	• Precincts should minimise environmental impacts. • Precincts should maximise sustainability outcomes.	• The Great Barrier Reef poses a major environmental risk - it can be managed through current environmental plans and industrial developments in the region. • Transport greenhouse gas emissions can be reduced for exporting recycled products due to proximity of the port.
Amenity	• Precincts should minimise impact on sensitive land uses. • Precincts should minimise impact on urban amenity.	• There will be an impact on road infrastructure due to increased truck activity, however a likely transition to rail/freight infrastructure will ease pressure. • Sensitive land uses can be avoided by establishing the precinct in existing industrial areas with appropriate buffers and planning.
Land needs	• Precincts should be of sufficient scale to allow an ecosystem of resource recovery and recycling industries to develop and to have impact.	• Existing waste management sites outside of Townsville could be prospective locations for a precinct. • There have been economic and industrial developments across the region. This includes the Townsville SDA, Ingham, Ayr, and Charters Towers. Suitable land supply is likely available.
Infrastructure	• Precincts should have good access to existing enabling infrastructure. • Precincts should minimise impacts on local government infrastructure.	• Current transport infrastructure is extensive and suitable for a resource recovery supply chain. • Water supply may be a concern during shortages. • Water infrastructure supply is sufficient in and near the City of Townsville, however, may be limited further in more regional areas. • Outer regional areas may require the establishment of supporting transport, water and energy infrastructure for industrial uses.

Note - suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Mackay-Isaac-Whitsunday SA4 Region Profile



Overview

The Mackay-Isaac-Whitsunday (Mackay) SA4 region consists of three local government areas (LGAs). The Mackay region has a population of 180,000 people forecasted to increase to 230,000 by 2041 with the major centres projected to grow steadily. Key industries include mining, agriculture, and tourism.

Key Insights

Economic and Growth Profile - the key industries for the Mackay region include mining, agriculture, aquaculture, horticulture and tourism. The current population of is 180,000 and is set to grow to 230,000 by 2041.

Materials Profile

- The Mackay region accounts for 4% of Queensland's total waste, producing approximately 360,000 tonnes per year.
- At a headline level, 54% of waste is currently being recovered. Construction and demolition waste (C&D) recovery is at 87% recovery rate, commercial and industrial waste (C&I) at 45% and municipal solid waste (MSW) at 42% recovery rate.
- There are lower recovery rates of industrial waste categories such as paper & cardboard and plastics. The key waste categories are garden organics and building waste (masonry, aggregate, soils) which produce almost 50% of the total waste and have a recovery rate of 81% and 87% respectively.
- Local stakeholder feedback from the region indicates that within those waste categories, tyres and metal waste from the mining sector, plastics, solar panels, and organics require the most attention.

Materials Projections

- **Organics -** set to increase to 163,000 tonnes per year by 2041. Given the challenges of transporting organics, high volume, and local markets, it is most feasible to process locally.
- **Masonry aggregate and soils -** set to increase to 80,000 tonnes per year by 2041. Given the relatively small volumes and local uses and markets, it is most feasible to process locally.
- **Paper & Cardboard -** set to increase to 68,000 tonnes per year by 2041. Paper and cardboard have a variety of post-recovery uses and markets, however transport costs are moderate to high. A feasible option is to transport this resource to Townsville for processing.

Transport - key transport networks include the North Cost Rail line and the Bruce Highway to move paper & cardboard, plastic and glass to Townsville and ferrous and non-ferrous metals to Gladstone for processing and commodity export.

Land Use and Infrastructure – the Mackay region has limited waste management sites which have challenges posed by proximity to residential areas (transfer station land supply) and transport distance to landfills.

Potential Precincts and Handling of Materials

There is an opportunity for local sorting and preparation of recovered resources, and some processing of organics, masonry, aggregate and soils, and tyres from mining operations. Due to lack of existing infrastructure, limited land use opportunities and existing high waste recovery, it is recommended that any initial establishment of a recycling enterprise precinct be moderate, with organics, timber, glass, paper & cardboard, and plastics be transported to Townsville and ferrous and non-ferrous metals to Gladstone for processing. The Paget Estate in Mackay provides a potential for further investigation.

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Mackay Isaac Whitsunday Region Potential Recycling Enterprise Precincts

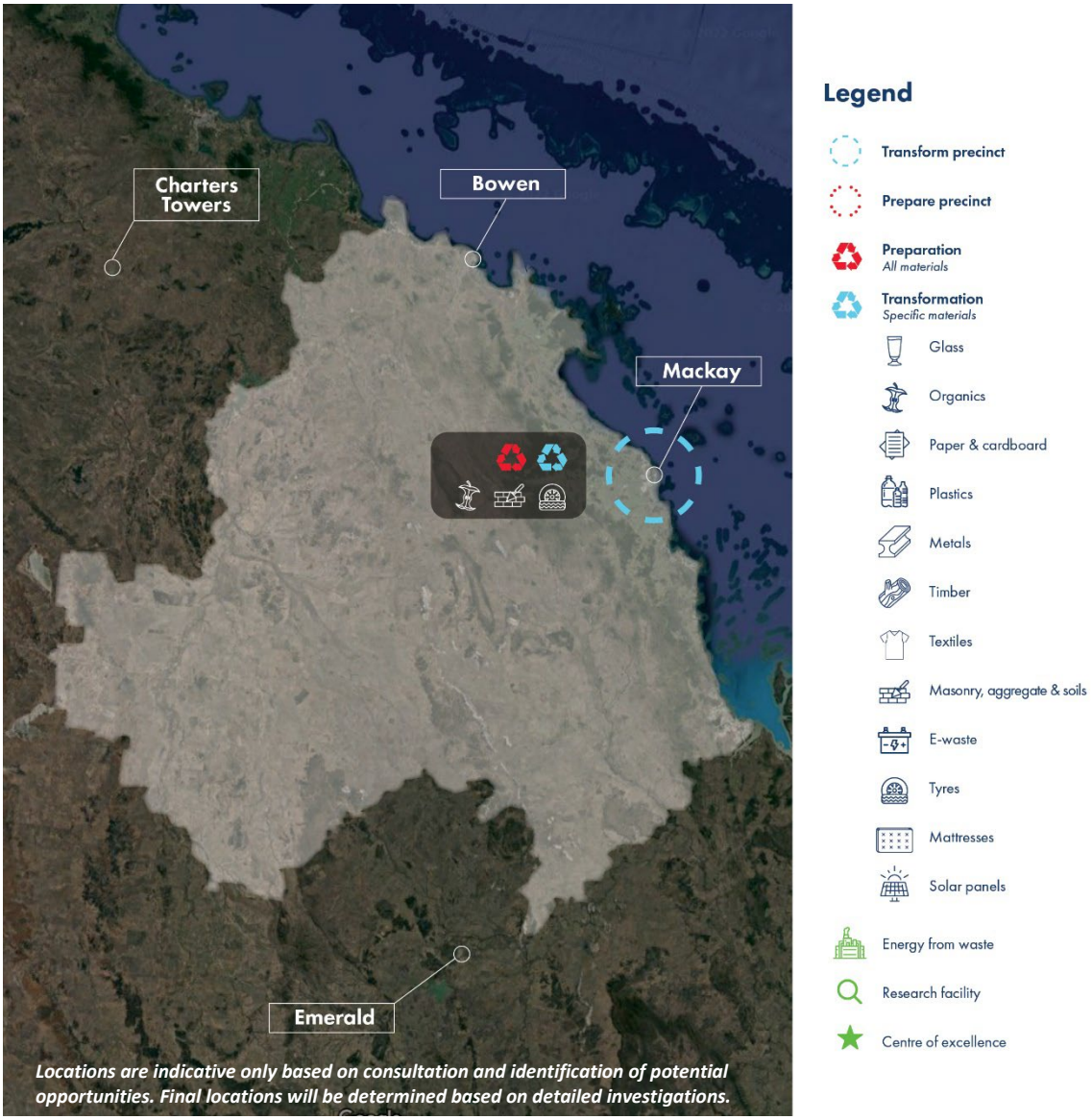


Table 4.19 – Mackay region projected waste tonnage and recovery rate by category for 2031 and 2041

	2021		2031		2041	
	Total Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste at 2030 Target[5]	Total Waste (Projected)	Recovered Waste at 2040 Target[6]
Food Organics	42,000	1%	47,000	28,000	53,000	35,000
Garden organics	88,000	81%	99,000	59,000	110,000	73,000
Paper & Cardboard	54,000	33%	61,000	36,000	68,000	44,000
Plastics	17,000	9%	19,000	12,000	22,000	14,000
Glass	16,000	69%	18,000	11,000	20,000	13,000
Ferrous metals	24,000	78%	27,000	24,000	31,000	27,000
Non-ferrous metals	3,500	82%	4,000	3,300	4,500	3,800
Timber	28,000	46%	32,000	21,000	36,000	25,000
Textiles	13,000	22%	15,000	8,900	17,000	11,000
Masonry, aggregate, soils	63,000	87%	70,000	61,000	80,000	69,000
Other	13,000	20%	15,000	9,500	17,000	11,000
Total	**360,000**	**54%**	**410,000**	**270,000**	**460,000**	**330,000**

[5] *Projection considers the 2030 overall recycling target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*
[6] *Projection considers the 2040 overall recycling target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*

Mackay-Isaac-Whitsunday SA4 Region Background

Economic and Growth Profile

Mining is the largest economic driver in the Mackay region, making up nearly 50% of the total output value. The Galilee, Bowen and Surat Basins produce coal, energy, and gas with further investigation into the mining of critical minerals. Mackay is the primary service hub and staging point for mining workers and equipment storage and the region is Australia's most advanced in Mining Equipment, Technology and Services (METS).

Agriculture is a thriving industry in the Mackay region. It is the largest sugar producer in Australia with nearly 8 million tonnes produced per year in the region. Other agriculture includes beef production, forestry (including eucalyptus and algae) and commercial fishing off the coast.

Other economic drivers include tourism from national parks, the Great Barrier Reef and Whitsundays, construction in residential, commercial and transport developments, manufacturing, real estate, and transport.

Based on projections from the Queensland Government Statistician's Office, the population of the Mackay region is set to increase as described in Table 4.20.

Table 4.20 – Mackay region projected population growth (QGSO, 2022)

	2021	2031	2041
Mackay	180,000	200,000	230,000

Waste Composition Overview

The Mackay region accounts for 4% of Queensland's total waste, producing approximately 360,000 tonnes per year.

At a headline level, 54% of waste is currently being recovered. Construction and demolition waste (C&D) recovery is leading the way with an 87% recovery rate, followed by commercial and industrial waste (C&I) at 45% and municipal solid waste (MSW) at a 42% recovery rate.

By assessing Mackay's recovery on a waste category level, the lower C&I recovery is evident due to reduced recycling rates of key industrial waste categories such as paper and cardboard and plastics. The key waste categories for Mackay are garden organics and building waste (masonry, aggregate, soils) which produce almost 50% of the total waste and have a recovery rate of 81% and 87% respectively.

Table 4.20 and Table 4.21 represent the baseline waste tonnage and recovery rates by headline stream and category.

Table 4.21 – Mackay region derived total baseline waste tonnage and recovery rate by headline waste stream for 2020-21

	Total Managed	Landfilled	Recovered	Recovery Rate
MSW	120,000	71,000	52,000	42%
C&I	150,000	83,000	68,000	45%
C&D	87,000	11,000	76,000	87%
Total	**360,000**	**160,000**	**200,000**	**54%**

Table 4.22 – Mackay region derived total waste tonnage baseline and recovery rate by waste category for 2020-21

	Total Managed	Landfilled	Recovered	Recovery Rate
Food Organics	42,000	42,000	430	1%
Garden organics	88,000	17,000	71,000	81%
Paper & Cardboard	54,000	36,000	18,000	33%
Plastics	17,000	16,000	1,500	9%
Glass	16,000	4,900	11,000	69%
Ferrous metals	24,000	5,500	19,000	78%
Non-ferrous metals	3,500	610	2,900	82%
Timber	28,000	15,000	13,000	46%
Textiles	13,000	10,000	3,000	22%
Masonry, aggregate, soils	63,000	7,900	55,000	87%
Other	13,000	11,000	2,700	20%
Total	**360,000**	**160,000**	**200,000**	**54%**

Note - the information contained in this table is based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Waste Projection

Table 4.23 projects total waste production and recovery based on factors listed below:

- **Population growth** according to Queensland Government Statisticians Office;
- **Current recovery rate** as baselined in Table 4.22; and
- **Waste recycling targets** as outline in Queensland Government Waste Management and Resource Recovery Strategy. These targets have been broken down from headline stream to category.

Table 4.23 – Mackay region projected total waste tonnage and recovery rate by waste category for 2031 and 2041

Mackay Current and Projected Waste Recovery by Waste Category (Tonnes)									
	2021			2031			2041		
	Total Waste (Actual)	Recovered Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2030 Recycling Target)[1]	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2040 Recycling Target)[2]
Food Organics	42,000	430	1%	47,000	480	28,000	53,000	540	35,000
Garden organics	88,000	71,000	81%	99,000	80,000	59,000	110,000	90,000	73,000
Paper & Cardboard	54,000	18,000	33%	61,000	20,000	36,000	68,000	22,000	44,000
Plastics	17,000	1,500	9%	19,000	1,700	12,000	22,000	2,000	14,000
Glass	16,000	11,000	69%	18,000	12,000	11,000	20,000	14,000	13,000
Ferrous metals	24,000	19,000	78%	27,000	21,000	24,000	31,000	24,000	27,000
Non-ferrous metals	3,500	2,900	82%	4,000	3,300	3,300	4,500	3,700	3,800
Timber	28,000	13,000	46%	32,000	15,000	21,000	36,000	17,000	25,000
Textiles	13,000	3,000	22%	15,000	3,300	8,900	17,000	3,800	11,000
Masonry, aggregate, soils	63,000	55,000	87%	70,000	62,000	61,000	80,000	70,000	69,000
Other	13,000	2,700	20%	15,000	3,000	9,500	17,000	3,400	11,000
Total	**360,000**	**200,000**	**54%**	**410,000**	**220,000**	**270,000**	**460,000**	**250,000**	**330,000**

1. Projection considers the 2030 overall recycling waste reduction target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

2. Projection considers the 2040 overall recycling waste reduction target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

Note – the information and projections contained in this table are based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Existing Waste Infrastructure

The existing waste infrastructure in the Mackay region is predominantly located in Mackay and Proserpine. Transfer stations are spread along the coast and material recovery facilities (MRF) exist in Mackay. Landfill sites are spread amongst local government areas and make up the largest total volume of waste processing. Waste processing is highly concentrated along the coast with little coverage inland.

Table 4.24 – Mackay region existing waste infrastructure quantity and size

	Plant Quantity	Typical Size
MRF/Recycling Station	2	Small
Metals	5	Small
Organics	6	Small
C&D	3	Small
Transfer Stations	27	Small
Landfill - Inert	0	
Landfill - Putrescible	8	Large
Total	**51**	

Existing Support Infrastructure

The Mackay region has an established network of transport infrastructure as it plays a key role in the supply chain for import-export markets through the Port of Mackay. The road and freight networks have been developed to facilitate this and service the large regional population that resides and works in the region. The region has good power, water and telecommunications infrastructure to support industrial development around existing major urban centres. Table 4.25 provides a summary of the transport infrastructure currently available in the Mackay region.

Table 4.25 - Mackay Region transport overview

Transport Mode	Routes	Description
Road	Bruce Highway Peak Downs Highway Mackay Ring Road	The Bruce highway provides a key thoroughfare north and south of Mackay, connecting it to Townsville and Brisbane. The Peak Downs highway heads southeast towards mining areas and connects to the Mackay Ring Road for access to the Port of Mackay. Roads have been developed to support the transport of heavy industry materials in large quantities.
Rail/Freight	North Coast Rail Line	North Coast Rail Line connects Mackay to SEQ with smaller freight lines running inland.
Port	Port of Mackay Port of Abbot Point Port of Hay Point	These ports facilitate the export of the mining and agriculture industries. The Port of Mackay is a multi-commodity bulk port.

Land Use Availability

The Mackay region has limited waste management sites which have challenges posed by transfer station proximity to residential areas and transport distance to landfills. The main landfill for the area is in Eton which could be a potential location for a recovery precinct. However, this site is isolated and appears to

have significant land supply constraints. The Paget estate in Mackay has also been identified as a potential location for the establishment of a recycling enterprise precinct building off established uses already operating in the estate and its buffering from sensitive land uses.

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Challenges and Opportunities

The key areas for consideration regarding the Mackay region are outlined in Table 4.26. Some of these will pose a challenge to the implementation of resource recovery, whereas others create opportunities for enhanced development.

Table 4.26 – Mackay region challenges and opportunities

Challenges	Opportunities
Mining – Fluctuating Cycles. **With the unpredictable nature of the mining industry and impacts on the population, it is difficult to predict future trends in waste production.**	**Mining Waste Management** The mining industry is looking to work more closely with councils to find more efficient ways to handle waste including an increased focus on resource recovery.
Land Use Limitations **Existing infrastructure and land supply for the development of a recovery precinct are limited. Current waste management sites have small buffers and limited scope for such a precinct.**	**Appetite for Resource Recovery** In the light landfill constraints, there is an emphasis on diverting more industrial and mining waste to resource recovery and away from landfill. Councils have support for key industries including mining and agriculture.

Application of Recycling Enterprise Precinct Location Guidance

The Recycling Enterprise Precinct Location Guidance outlines the matters that should be considered when seeking to identify likely candidate places for a recycling enterprise precinct.

This guidance has been applied to the region to provide a high-level assessment of the suitability of Recycling Enterprise Precincts for the region.

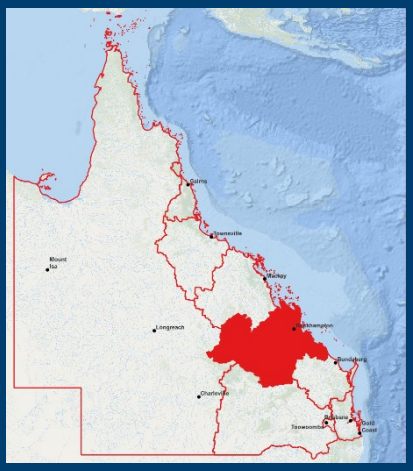
Table 4.27 – Mackay region – application of recycling enterprise precinct location guidance

Focus Area	Aims	Application for Region
Economic impact	• Precincts should maximise access to supply chains.	• Road, rail, and port infrastructure can facilitate supply chains. These networks are connected to the coastal freight line, and further to regional and rural populations. • Ports facilitate export of mining and agriculture industries with the Port of the Mackay being a multi-commodity bulk port.
	• Precincts should facilitate knowledge transfer and maximise research collaboration opportunities.	• CQU has a strong presence in the region offering collaboration opportunities. • There are limited large waste management organisations in the Mackay region.
	• Precincts should have access to sufficient locally sourced labour. • Precincts should have access to training to meet	• Precincts can be located within proximity of major centres, making transport efficient and creating jobs for urban and suburban residents.

Focus Area	Aims	Application for Region
	future skilled and specialised labour requirements.	• Education and training may be challenging to provide in the Mackay region given labour shortages although there is the option to leverage of existing workforces.
Social impact	• Precincts should seek to enhance social outcomes.	• Inland sites have significant buffers to maintain distance from residential areas, however this raises transport costs. • The existing Paget estate offers opportunities for further development as a precinct.
Environmental impact and sustainability	• Precincts should minimise environmental impacts. • Precincts should maximise sustainability outcomes.	• Locating Recycling Enterprise Precincts inland reduces the risk of Great Barrier Reef pollution. • This may mitigate emissions because mining waste requires shorter transport distance to facilities.
Amenity	• Precincts should minimise impact on sensitive land uses. • Precincts should minimise impact on urban amenity.	• The Mackay region contains satellite towns creating potential for facilities in close vicinity to major highways if land acquisition is possible. • Strategic location of these precincts reduces the impact on residents significantly.
Land needs	• Precincts should be of sufficient scale to allow an ecosystem of resource recovery and recycling industries to develop and to have impact.	• The Paget estate has been identified as a potential location for the establishment of a recycling enterprise precinct.
Infrastructure	• Precincts should have good access to existing enabling infrastructure. • Precincts should minimise impacts on local government infrastructure.	• Current road and rail infrastructure in Mackay is developed and well-connected with other regions. • There is suitable port infrastructure available to the region. • Energy and water infrastructure are sufficient in major towns and cities however become scarce if precinct location were to be further inland.

Note - suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Central Queensland SA4 Region Profile



Overview

The Central Queensland SA4 region contains six local government areas (LGAs) and a population of 230,000 people as of 2021. It is forecasted that the population will grow to 305,000 by 2041. The main population centres are the cities of Rockhampton – the beef capital of Queensland, Livingstone, and Gladstone which house over 70% of the total population. These cities are all expected to have moderate growth in the next 20 years.

Key Insights

Economic and Growth Profile - the key industries for Central Queensland include resources, agriculture, tourism, and higher education/research. The current population is 230,000 and is set to grow to 280,000 by 2041.

Materials Profile

- Central Queensland accounts for 3% of Queensland's total waste, producing approximately 290,000 tonnes per year.
- At a headline level, 45% of waste is currently being recovered. Construction and demolition waste (C&D) recovery is leading the way with a 51% recovery rate, followed by municipal solid waste (MSW) with 50% and commercial and industrial waste (C&I) with 37%.
- There are lower recovery rates of industrial waste categories such as paper and cardboard and plastics. The key waste category for Central Queensland is garden organics which makes up 32% of the total waste and a 71% recovery rate.
- Local stakeholder feedback from the region indicates that within those waste categories, those requiring the most attention include organics, batteries (including both domestic and commercially used batteries), tyres, solar panels, and cardboard.

Materials Projections

- **Organics -** set to increase to 162,000 tonnes per year by 2041. Given the challenges of transporting organics, high volume, and local markets, it is most feasible to process locally.
- **Paper and cardboard -** set to increase to 42,000 tonnes per year by 2041. Paper and cardboard have a variety of post-recovery uses and markets, however transport costs are moderate to high. A feasible option is to move this resource to Brisbane for processing.
- **Timber -** set to increase to 28,000 tonnes per year by 2041. Given the challenges of transporting timber, high volume, and local markets, it is most feasible to process locally.

Transport - key transport networks include the North Cost Rail line and the Bruce Highway to move paper and cardboard, plastic and textiles to Brisbane and ferrous and non-ferrous metals to Gladstone for processing and commodity export.

Land Use and Infrastructure – Gladstone and Gracemere have been identified as a potential location for precincts. They have buffers from residential areas, have access to major thoroughfares and create export and reuse markets. Biloela has been identified as another location for the establishment of a precinct, with more compatible land uses, and the potential to use previously contaminated mining land.

Potential Precincts and Handling of Materials

There is the potential to establish a transform precinct in or near Gladstone, to process ferrous and non-ferrous metals from the Cairns region through to the Wide Bay Burnett region for a high value export product. The precinct could also process organics, timber, building waste, and glass, servicing the waste from the Central Queensland region exclusively. Precincts could be established in Gracemere and Biloela to undertake sorting and preparatory activities. Paper & cardboard, textiles and plastics should be transported to Brisbane for transformation activities.

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Central Queensland Region Potential Recycling Enterprise Precincts

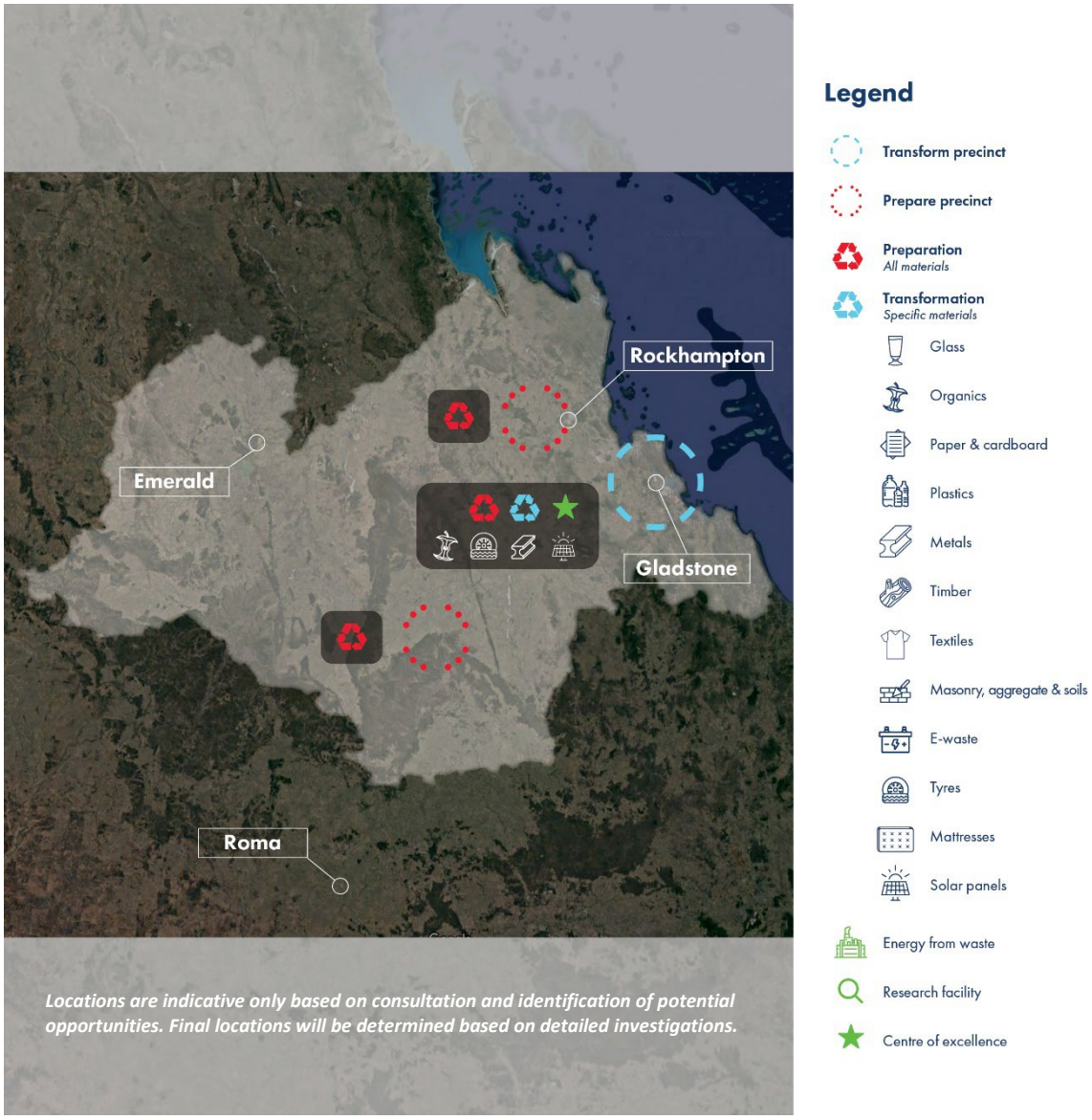


Table 4.28 – Central Queensland region projected waste tonnage and recovery rate by category for 2031 and 2041

	2021		2031		2041	
	Total Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste at 2030 Target[7]	Total Waste (Projected)	Recovered Waste at 2040 Target[8]
Food Organics	34,000	1%	38,000	23,000	42,000	27,000
Garden organics	95,000	71%	100,000	63,000	120,000	75,000
Paper & Cardboard	35,000	34%	38,000	23,000	42,000	27,000
Plastics	13,000	5%	15,000	9,000	16,000	11,000
Glass	9,500	63%	10,000	6,400	12,000	7,600
Ferrous metals	20,000	73%	22,000	19,000	24,000	21,000
Non-ferrous metals	4,800	78%	5,300	4,500	5,800	4,900
Timber	23,000	10%	26,000	17,000	28,000	19,000
Textiles	11,000	1%	12,000	7,100	13,000	8,500
Masonry, aggregate, soils	27,000	82%	30,000	26,000	33,000	28,000
Other	14,000	10%	15,000	9,500	16,000	11,000
Total	**290,000**	**45%**	**310,000**	**210,000**	**350,000**	**240,000**

[7] *Projection considers the 2030 overall recycling target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*
[8] *Projection considers the 2040 overall recycling target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*

Central Queensland SA4 Region Background

Economic and Growth Profile

The economy of the Central Queensland region has a focus on resource and agricultural output. The other key industries are education, mining, hospitality, and retail. The region accounts for 11% of Queensland's agricultural production, which includes cattle, pork, grain, cotton, and horticulture. Resources are another driver for Central Queensland's economy through coal, liquified natural gas, and power. The Bowen Basin contributes 40% of Queensland's coal production through its 34 mines.

There are research and development institutions available within the Central Queensland region, which is home to Central Queensland University (CQU), offering opportunity and access to knowledge and technology for research purposes. CQU has multiple campuses across the region.

Currently 2.7% of the workforce is employed within electricity, gas, water, and waste services. Large resource recovery operations in the region are minimal, with a small yet diverse group of facilities. Unlike other regions, there are chemical recycling facilities due to mining output.

Based on projections from the Queensland Government statistician's Office, the population of Central Queensland is set to increase as described in Table 4.29.

Table 4.29 – Central Queensland region projected population growth (QGSO, 2022)

	2021	2031	2041
Central Queensland	230,000	250,000	280,000

Waste Composition Overview

Central Queensland accounts for 3% of Queensland's total waste, producing approximately 290,000 tonnes per year.

At a headline level, 45% of waste is currently being recovered. Construction and demolition waste (C&D) recovery is leading the way with a 51% recovery rate, followed by municipal solid waste (MSW) with 50% and commercial and industrial (C&I) is lagging with a 37% recovery rate.

By assessing Central Queensland's recovery on a waste category level, the lower C&I recovery is due to reduced recycling rates of key waste categories such as paper and cardboard, and plastics. The key waste category for Central Queensland is garden organics which makes up 32% of the total waste and has a recovery rate of 71%.

Table 4.30 and Table 4.31 represent the baseline waste tonnage and recovery rates by headline stream and category.

Table 4.30 – Central Queensland region derived total baseline tonnage flow and recovery rate by headline waste stream for 2020-21

	Total Managed	Landfilled	Recovered	Recovery Rate
MSW	150,000	76,000	76,000	50%
C&I	100,000	65,000	38,000	37%
C&D	32,000	16,000	16,000	51%
Total	**290,000**	**160,000**	**130,000**	**45%**

Table 4.31 – Central Queensland region derived total waste tonnage baseline and recovery rate by waste category for 2020-21

	Total Managed	Landfilled	Recovered	Recovery Rate
Food Organics	34,000	34,000	350	1%
Garden organics	95,000	28,000	67,000	71%
Paper & Cardboard	35,000	23,000	12,000	34%
Plastics	13,000	13,000	660	5%
Glass	9,500	3,500	6,000	63%
Ferrous metals	20,000	5,400	14,000	73%
Non-ferrous metals	4,800	1,100	3,700	78%
Timber	23,000	21,000	2,200	10%
Textiles	11,000	11,000	110	1%
Masonry, aggregate, soils	27,000	4,700	22,000	82%
Other	14,000	12,000	1,300	10%
Total	**290,000**	**160,000**	**130,000**	**45%**

Note - the information contained in this table is based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Waste Projection

Table 4.32 projects total waste production and recovery based on factors listed below:

- **Population growth** according to Queensland Government Statisticians Office;
- **Current recovery rate** as baselined in Table 4.31; and
- **Waste recycling targets** as outline in Queensland Government Waste Management and Resource Recovery Strategy. These targets have been broken down from headline stream to category.

Table 4.32 – Central Queensland region projected total waste tonnage and recovery rate by waste category for 2031 and 2041

Central Queensland Current and Projected Waste Recovery by Waste Category (Tonnes)									
	2021			2031			2041		
	Total Waste (Actual)	Recovered Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2030 Recycling Target)[1]	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2040 Recycling Target)[2]
Food Organics	34,000	350	1%	38,000	380	23,000	42,000	420	27,000
Garden organics	95,000	67,000	71%	100,000	74,000	63,000	120,000	81,000	75,000
Paper & Cardboard	35,000	12,000	34%	38,000	13,000	23,000	42,000	14,000	27,000
Plastics	13,000	660	5%	15,000	730	9,000	16,000	800	11,000
Glass	9,500	6,000	63%	10,000	6,600	6,400	12,000	7,300	7,600
Ferrous metals	20,000	14,000	73%	22,000	16,000	19,000	24,000	17,000	21,000
Non-ferrous metals	4,800	3,700	78%	5,300	4,100	4,500	5,800	4,500	4,900
Timber	23,000	2,200	10%	26,000	2,500	17,000	28,000	2,700	19,000
Textiles	11,000	110	1%	12,000	120	7,100	13,000	130	8,500
Masonry, aggregate, soils	27,000	22,000	82%	30,000	24,000	26,000	33,000	27,000	28,000
Other	14,000	1,300	10%	15,000	1,500	9,500	16,000	1,600	11,000
Total	**290,000**	**130,000**	**45%**	**310,000**	**140,000**	**210,000**	**350,000**	**160,000**	**240,000**

1. Projection considers the 2030 overall recycling waste reduction target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

2. Projection considers the 2040 overall recycling waste reduction target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

Note - the information and projections contained in this table are based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Existing Waste Infrastructure

Current waste infrastructure in Central Queensland primarily consists of transfer stations and landfills. Resource recovery operations in are minimal, however there is a range of facilities. The region has chemical processing plants which are a key differentiator.

Table 4.33 – Central Queensland existing waste infrastructure quantity and size

	Plant Quantity	Typical Size
MRF/Recycling Station	4	Small
Metals	5	Small
Organics	3	Small
C&D	2	Small
Chemicals	3	Medium
Transfer Stations	47	Small
Landfill – Inert	3	Small
Landfill – Putrescible	10	Large
Total	**73**	

Existing Support Infrastructure

Transport infrastructure in Central Queensland is developed, suiting the current needs of the regional economy. The various modes of transport are key in supporting the supply chains of agriculture and mining. The region has good power, water and telecommunications infrastructure to support industrial development around existing major urban centres. Table 4.34 below provides a description of key transport infrastructure in the region.

Table 4.34 – Central Queensland transport overview

Transport Mode	Routes	Description
Road	Capricorn Highway Bruce Highway Leichhardt Highway Burnett Highway Carnarvon Highway Gregory Highway	Road infrastructure in the region is extensive in the region, connecting South-East Queensland, Queensland Outback, Darling Downs-Maranoa, and Mackay regions. This allows the transportation of agricultural, manufactured and mining products.
Rail/Freight	Aurizon System Central Western System North Coast Line	Rail infrastructure connects to central western regions of Queensland, coastal northern regions, and South-East Queensland. They are primarily used for mining and agriculture transport.
Port	Port of Gladstone	Port of Gladstone is key to commodity exporting, being one of the world's largest coal terminals.

Land Use Availability

Due to its central location and existing infrastructure, Central Queensland could be home to a transform and more than one prepare precincts serving the central part of Queensland.

The existing State Development Area and the large supply of industrial land for higher impact uses in and around Gladstone presents an opportunity for precinct development. Gladstone has a strong framework of industrial land planning and provision. Similarly, well located industrial land around Rockhampton may present an opportunity.

A precinct for locally handling materials in Central Queensland could also be located in Gracemere and Biloela.

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Challenges and Opportunities

Central Queensland houses small and dispersed communities, posing the practical viability of setting up further resource recovery. However, with the large amounts of agricultural and energy/resources waste, there is an opportunity for additional industry through energy from waste facilities. This could be fed by the C&I and C&D waste of the resources sector with a cement kiln in Gladstone that produces high-quality feedstock. This energy could be put back into the plants in the area to reduce environmental impact.

Table 4.35 – Central Queensland challenges and opportunities

Challenges	Opportunities
Decentralised Population **The decentralised population presents a significant issue in establishing the upstream supply chain of resource recovery. This includes collection of waste in a commercially feasible manner accounting for waste quality and quantity.**	**Energy from Waste** The strong agriculture and heavy industry mean there is significant waste from organics and metals which can be processed locally and even used as feedstock for an EfW plant.
Location and Transport **At the midpoint between Townsville and Brisbane, transportation of feedstock to and from Central Queensland will be challenging and potentially expensive.**	**Appetite for Energy Recovery** With energy intensive industry in Central Queensland, there is appetite for energy recovery from cement kilns and other forms of dry C&D and C&I waste out of Gladstone. Councils have support from key industries who are seeking mutual benefit.

Application of Recycling Enterprise Precinct Location Guidance

The Recycling Enterprise Precinct Location Guidance outlines the matters that should be considered when seeking to identify likely candidate places for a recycling enterprise precinct.

This guidance has been applied to the region to provide a high-level assessment of the suitability of Recycling Enterprise Precincts for the region.

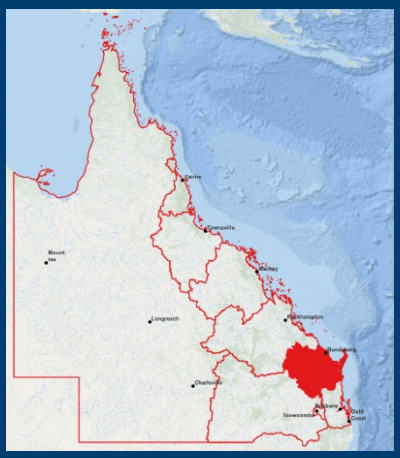
Table 4.36 – Central Queensland region – application of recycling enterprise precinct location guidance

Focus Area	Aims	Application for Region
Economic impact	• Precincts should maximise access to supply chains.	• Central Queensland region has strong road, rail and port presence connecting it in all directions. • Multiple markets operating in the region, including mining, agriculture and energy present a diverse range of feedstock – particularly metals.
	• Precincts should facilitate knowledge transfer and maximise research collaboration opportunities.	• CQU has multiple campuses across the Central Queensland region, providing opportunities for research and development. • Other research institutions are limited in this area.
	• Precincts should have access to sufficient locally sourced labour.	• Central Queensland has a high labour force participation rate compared to other regions. However, its labour force size has been declining since 2014.

Focus Area	Aims	Application for Region
	• Precincts should have access to training to meet future skilled and specialised labour requirements.	• The percentage of population with tertiary qualifications in Central Queensland (10%) is lower than the Queensland average (18%).
Social impact	• Precincts should seek to enhance social outcomes.	• Inland sites have significant buffers to maintain distance from residential areas. • Locations can be established within proximity to mining and agricultural hubs to minimise waste transport. • Use of existing industrial land established for hard to locate uses may be an opportunity.
Environmental impact and sustainability	• Precincts should minimise environmental impacts. • Precincts should maximise sustainability outcomes.	• The implementation of resource recovery should result in the closure of a few large landfill sites. • Current waste is likely transported to other regions, therefore local facilities will reduce greenhouse gases due to a reduction in transport.
Amenity	• Precincts should minimise impact on sensitive land uses. • Precincts should minimise impact on urban amenity.	• There are areas currently dedicated to industrial activity which could be used for resource recovery. • Sparsity of townships provides ideal buffers for recovery sites with heavy industry being adequately distanced.
Land needs	• Precincts should be of sufficient scale to allow an ecosystem of resource recovery and recycling industries to develop and to have impact.	• Land use needs should be considered, especially regarding the State Development Areas and other higher impact industrial land in and around Gladstone. Selecting land with adequate capacity and reduced transport distance to provide feedstock for the smelter is advised.
Infrastructure	• Precincts should have good access to existing enabling infrastructure. • Precincts should minimise impacts on local government infrastructure.	• There is extensive infrastructure in Central Queensland – predominately in the form of transfer stations that could form the base for precinct development. • Transport infrastructure is strong in road, rail, and port – which can supply waste to SEQ and Townsville. • Power, water and telecommunications infrastructure is robust.

Note - suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Wide Bay SA4 Region Profile



Overview

The Wide Bay Burnett (Wide Bay) SA4 region consists of six local government areas (LGAs) with major hubs consisting of Bundaberg, Gympie, and Hervey Bay. Wide Bay has a population of 310,000 people forecasted to increase to 360,000 by 2041 with the major centres set to grow steadily. Key industries for Wide Bay include agriculture, forestry, and tourism.

Key Insights

Economic and Growth Profile - the key industries for Wide Bay include agriculture, manufacturing, tourism, and education. The current population is 310,000 and is set to grow to 360,000 by 2041.

Materials Profile

- Wide Bay accounts for 5% of Queensland's total waste, producing approximately 440,000 tonnes per year.
- At a headline level, 56% of waste is currently being recovered. Construction and demolition waste (C&D) recovery is at a rate of 72%, followed by Commercial and Industrial waste (C&I) with 69% and municipal solid waste (MSW) is lagging with a 37% recovery rate.
- Wide Bay has strong recovery rates across all waste categories. Key categories are garden organics and timber, with recovery rates of 72% and 70% respectively. These make up 55% of the total waste flow for the region.
- Local stakeholder feedback from the region indicates that within those waste categories, organics, agricultural plastics and glass require the most attention.

Materials Projections

- **Organics -** set to increase to 230,000 tonnes per year by 2041. Given the challenges of transporting organics, high volume, and local markets, it is most feasible to process locally.
- **Timber -** set to increase to 98,000 tonnes per year by 2041. Given the high volume, and local markets, it is most feasible to process locally.
- **Paper and cardboard -** set to increase to 53,000 tonnes per year by 2041. Paper and cardboard have a variety of post-recovery markets. While transport costs are moderate, a feasible option is to move this resource to South East Queensland for processing so product can be sold at a premium price.

Transport - key transport networks include the North Coast Rail line and Bruce Highway which are the key thoroughfares for moving waste to Gladstone and Brisbane for processing and export.

Land Use and Infrastructure – Bundaberg SDA has been identified as a potential location for the establishment of a precinct with available suitably zoned land and proximity to the Port.

Potential Precincts and Handling of Materials

There is the potential to establish a recycling enterprise precinct in Bundaberg possibly using land in the State Development Area (SDA) near the Port. This could be used for processing organics, timber, building waste, glass, and textiles. This precinct would service materials from Wide Bay exclusively. All other waste streams, including metals, paper & cardboard and plastics should be transported to Brisbane and Gladstone for processing. There is also potential to establish precincts at Cherbourg or Curra.

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Wide Bay Burnett Region Potential Recycling Enterprise Precincts

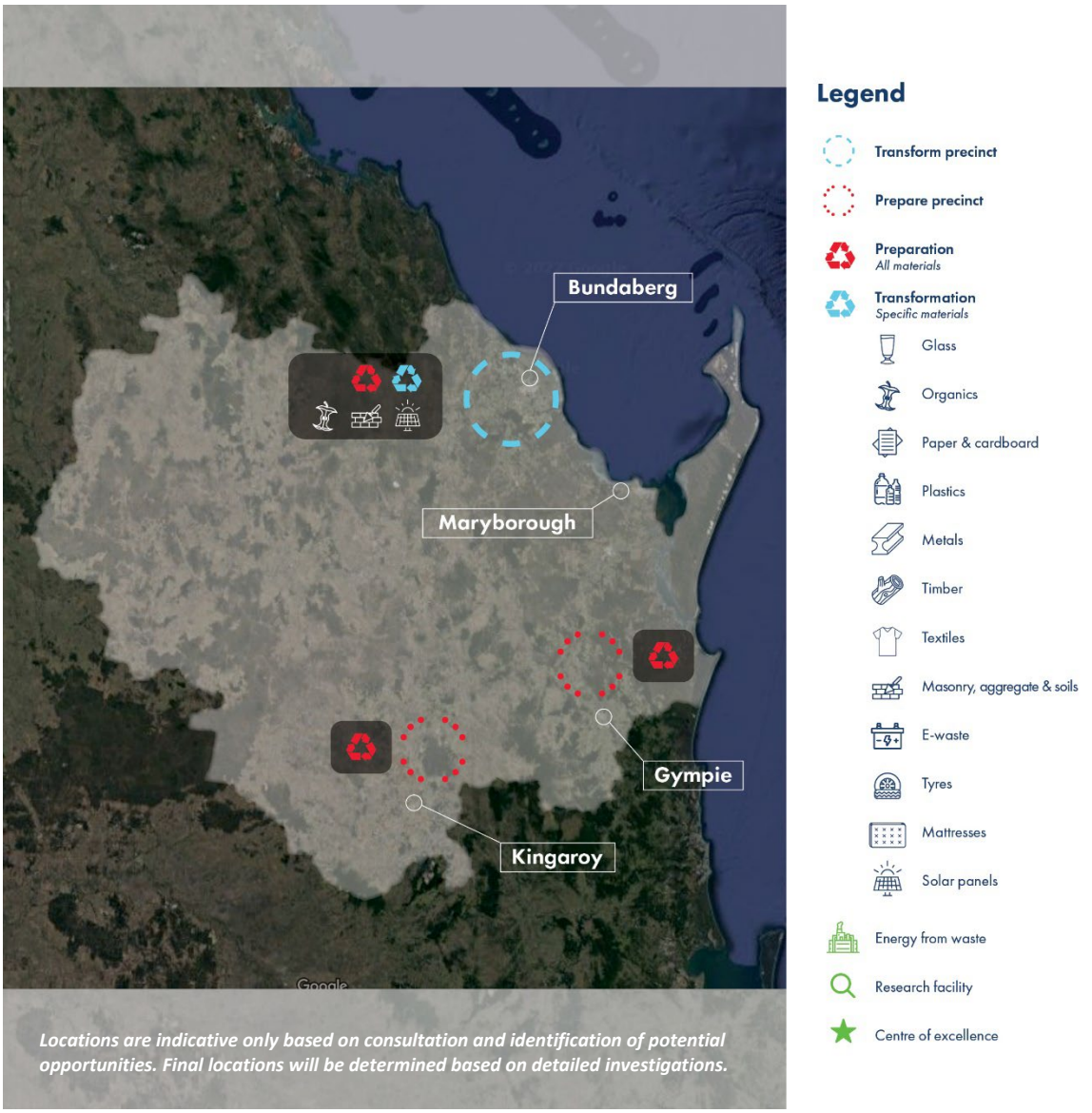


Table 4.37 – Wide Bay region projected waste tonnage and recovery rate by category for 2031 and 2041

	2021		2031		2041	
	Total Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste at 2030 Target[9]	Total Waste (Projected)	Recovered Waste at 2040 Target[10]
Food Organics	43,000	13%	47,000	28,000	50,000	33,000
Garden organics	160,000	72%	170,000	100,000	180,000	120,000
Paper & Cardboard	45,000	39%	49,000	29,000	53,000	34,000
Plastics	16,000	7%	18,000	11,000	19,000	12,000
Glass	6,900	31%	7,500	4,600	8,100	5,300
Ferrous metals	18,000	68%	20,000	17,000	22,000	19,000
Non-ferrous metals	4,700	69%	5,200	4,400	5,600	4,700
Timber	83,000	70%	91,000	58,000	98,000	66,000
Textiles	13,000	1%	15,000	8,700	16,000	10,000
Masonry, aggregate, soils	34,000	78%	37,000	32,000	40,000	35,000
Other	17,000	23%	19,000	12,000	20,000	14,000
Total	**440,000**	**56%**	**480,000**	**300,000**	**510,000**	**350,000**

[9] *Projection considers the 2030 overall recycling target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*
[10] *Projection considers the 2040 overall recycling target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*

Wide Bay SA4 Region Background

Economic and Growth Profile

Agriculture and forestry are the key economic drivers for Wide Bay – it is a food-bowl for livestock, sugar, fruit, nuts, vegetables, and seafood. Due to the subtropical climate and water supply, it is the perfect location for natural produce to thrive and houses some of the state's largest timber plantations and processing facilities. There is a well-established dairy industry and over 100 farms which house 300,000 animals and 25 cattle feedlots.

Education is an important source of human capital and economic growth for Wide Bay. There are three university campuses for University of Southern Queensland (USQ), Central Queensland University (CQU) and the University of the Sunshine Coast (USC) which educated local, domestic, and international students.

Manufacturing is another driver with machinery, equipment, and manufacturing for defence (aviation and marine), construction and food occurring in Wide Bay. Other important industries include construction for the growing population, tourism, offshore fishing and emerging mining and minerals projects.

Based on projections from the Queensland Government Statistician's Office, the population of Wide Bay is set to increase as described in Table 4.38.

Table 4.38 – Wide Bay region projected population growth (QGSO, 2022)

	2021	2031	2041
Wide Bay	310,000	330,000	360,000

Waste Composition Overview

Wide Bay accounts for 5% of Queensland's total waste, producing approximately 440,000 tonnes per year.

At a headline level, 56% of waste is currently being recovered. Construction and demolition waste (C&D) recovery is at a rate of 72%, followed by Commercial and Industrial waste (C&I) with 69% and municipal solid waste (MSW) is lagging with a 37% recovery rate. On a waste category level, Wide Bay has strong recovery rates across all streams. Key waste categories are garden organics, with a recovery rate of 72% and Timber, with a recovery rate of 70%. These make up 55% of the total waste tonnage for Wide Bay.

Table 4.39 and Table 4.40 represent the baseline waste tonnage and recovery rates by headline stream and category.

Table 4.39 – Wide Bay region derived total baseline waste tonnage and recovery rate by headline waste stream for 2020-21

	Total Managed	Landfilled	Recovered	Recovery Rate
MSW	190,000	120,000	71,000	37%
C&I	180,000	56,000	130,000	69%
C&D	63,000	17,000	45,000	72%
Total	**440,000**	**190,000**	**240,000**	**56%**

Table 4.40 – Wide Bay region derived total waste tonnage baseline and recovery rate by waste category for 2020-21

	Total Managed	Landfilled	Recovered	Recovery Rate
Food Organics	43,000	37,000	5,400	13%
Garden organics	160,000	44,000	110,000	72%
Paper & Cardboard	45,000	27,000	18,000	39%
Plastics	16,000	15,000	1,100	7%
Glass	6,900	4,800	2,100	31%
Ferrous metals	18,000	5,800	12,000	68%
Non-ferrous metals	4,700	1,500	3,300	69%
Timber	83,000	25,000	58,000	70%
Textiles	13,000	13,000	130	1%
Masonry, aggregate, soils	34,000	7,600	27,000	78%
Other	17,000	13,000	4,000	23%
Total	**440,000**	**190,000**	**240,000**	**56%**

Note - the information contained in this table is based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Waste Projection

Table 4.41 projects total waste production and recovery based on factors listed below:

- **Population growth** according to Queensland Government Statisticians Office;
- **Current recovery rate** as baselined in Table 4.40; and
- **Waste recycling targets** as outline in Queensland Government Waste Management and Resource Recovery Strategy. These targets have been broken down from headline stream to category.

Table 4.41 – Wide Bay region projected total waste tonnage and recovery rate by waste category for 2031 and 2041

Wide Bay Current and Projected Waste Recovery by Waste Category (Tonnes)									
	2021			2031			2041		
	Total Waste (Actual)	Recovered Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2030 Recycling Target)[1]	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2040 Recycling Target)[2]
Food Organics	43,000	5,400	13%	47,000	6,000	28,000	50,000	6,400	33,000
Garden organics	160,000	110,000	72%	170,000	120,000	100,000	180,000	130,000	120,000
Paper & Cardboard	45,000	18,000	39%	49,000	19,000	29,000	53,000	21,000	34,000
Plastics	16,000	1,100	7%	18,000	1,200	11,000	19,000	1,200	12,000
Glass	6,900	2,100	31%	7,500	2,300	4,600	8,100	2,500	5,300
Ferrous metals	18,000	12,000	68%	20,000	14,000	17,000	22,000	15,000	19,000
Non-ferrous metals	4,700	3,300	69%	5,200	3,600	4,400	5,600	3,800	4,700
Timber	83,000	58,000	70%	91,000	64,000	58,000	98,000	69,000	66,000
Textiles	13,000	130	1%	15,000	150	8,700	16,000	160	10,000
Masonry, aggregate, soils	34,000	27,000	78%	37,000	29,000	32,000	40,000	31,000	35,000
Other	17,000	4,000	23%	19,000	4,400	12,000	20,000	4,700	14,000
Total	**440,000**	**240,000**	**56%**	**480,000**	**260,000**	**300,000**	**510,000**	**280,000**	**350,000**

1. Projection considers the 2030 overall recycling waste reduction target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

2. Projection considers the 2040 overall recycling waste reduction target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

Note – the information and projections contained in this table are based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Existing Waste Infrastructure

The existing waste infrastructure in Wide Bay is moderate and well distributed throughout the region. This includes landfills, transfer stations, organics processing and metals recycling. Table 4.42 reflects the location of these facilities.

Table 4.42 – Wide Bay region existing waste infrastructure quantity and size

	Plant Quantity	Typical Size
MRF/Recycling Station	5	Small
Metals	2	Small
Organics	12	Medium
C&D	0	
Transfer Stations	40	Medium
Landfill - Inert	0	
Landfill - Putrescible	19	Large
Total	**78**	

Existing Support Infrastructure

Wide Bay has an established network of road and rail infrastructure that contributes to import-export markets through the Port of Bundaberg. The road and freight networks have been developed to facilitate these markets, and further service the large regional population that resides and works in the region. The region has good power, water and telecommunications infrastructure to support industrial development around existing major urban centres. Table 4.43 provides a summary of the transport infrastructure currently available to Wide Bay.

Table 4.43 - Wide Bay region transport overview

Transport Mode	Routes	Description
Road	Bruce Highway Burnett Highway	These throughfares provide the region with comprehensive north-south coverage.
Rail/Freight	North Coast Rail Line	This rail line connects Wide Bay to the north and the south of Queensland.
Port	Port of Bundaberg	Port of Bundaberg is important for the region, being a part of the supply chain for international ships, agriculture, and industrial products. This port is an exporter for raw sugar, rum, and molasses.

Land Use Availability

Wide Bay has existing waste management sites on University Drive in Branyan, near Bundaberg and on Bonnick Road in Gympie, however both these sites have buffer challenges posed by proximity to residential areas. The preferred site is located within the Bundaberg State Development Area (SDA) to make the most of the nearby Port and existing industrially zoned land within the area. Other areas also emerge as options and these include Cherbourg and Curra, near Gympie

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Challenges and Opportunities

The key areas for consideration for Wide Bay region are outlined in Table 4.44. Some of these will pose a challenge to the implementation of resource recovery, whereas others create opportunities for enhanced development.

Table 4.44 – Wide Bay region challenges and opportunities

Challenges	Opportunities
Limited Infrastructure **Economic growth has been slower for Wide Bay than other similar regions due to poorly coordinated and untimely provision of land and infrastructure activities and investment.**	**Recovered Materials Infrastructure** To help boost the economy, lower unemployment, and rejuvenate Wide Bay, resource recovery would be of benefit to councils, citizens, and the market.
Labour Shortage **There is a skilled labour shortage in Wide Bay due to the aging population and tendency for young adults to leave the area. There is a higher-than-average unemployment rate.**	**Agriculture** Opportunities exist to specialise in agricultural materials and materials such as agricultural plastics which have been highlighted as an issue in the region.

Application of Recycling Enterprise Precinct Location Guidance

The Recycling Enterprise Precinct Location Guidance outlines the matters that should be considered when seeking to identify likely candidate places for a recycling enterprise precinct.

This guidance has been applied to the region to provide a high-level assessment of the suitability of Recycling Enterprise Precincts for the region.

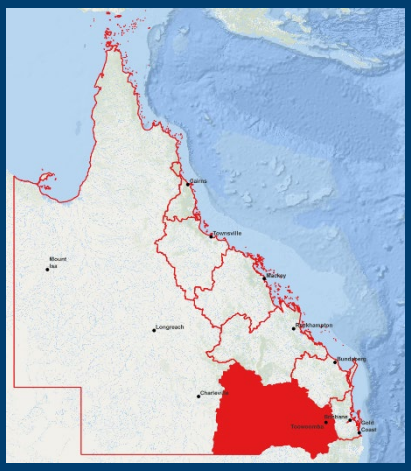
Table 4.45 – Wide Bay region – application of recycling enterprise precinct location guidance

Focus Area	Aims	Application for Region
Economic impact	• Precincts should maximise access to supply chains.	• Supply chains in organics will be significant with strong plant and animal agriculture in the area. • There are adequate transport networks via road, rail and port which will aid the movement or raw or processed material.
	• Precincts should facilitate knowledge transfer and maximise research collaboration opportunities.	• Campuses for CQU, USC and USQ are in the Wide Bay, providing potential partnerships for research. • Other research institutions are limited in this area.
	• Precincts should have access to sufficient locally sourced labour. • Precincts should have access to training to meet future skilled and specialised labour requirements.	• There is a significant skills and labour shortage, creating a challenge for the workforce. • There are tertiary institutions in the Wide Bay that have capability to provide high-level training.
Social impact	• Precincts should seek to enhance social outcomes.	• Increase in jobs, both skilled and unskilled, can boost the incoming workforce and therefore the livelihood of the area.

Focus Area	Aims	Application for Region
		• Resource recovery precincts can reduce the landfill sites required to process waste flow.
Environmental impact and sustainability	• Precincts should minimise environmental impacts. • Precincts should maximise sustainability outcomes.	• Precincts in proximity of the coastline should be dry facilities and have waste control systems to avoid pollution of surrounding area. • Current waste is likely transported to other regions, therefore local facilities will reduce greenhouse gases due to a reduction in transport.
Amenity	• Precincts should minimise impact on sensitive land uses. • Precincts should minimise impact on urban amenity.	• Animal and plant agriculture prominence creates opportunities for land use partnerships. • Sparsity of townships provides ideal buffers for recovery sites with heavy industry being adequately distanced.
Land needs	• Precincts should be of sufficient scale to allow an ecosystem of resource recovery and recycling industries to develop and to have impact.	• The Bundaberg SDA, near the Port, has been identified as a potential location for a precinct. • The existing MRF at Cherbourg has been identified as an opportunity which can be leveraged for a “prepare” precinct.
Infrastructure	• Precincts should have good access to existing enabling infrastructure. • Precincts should minimise impacts on local government infrastructure.	• There is extensive waste infrastructure in the form of transfer stations that could be for a foundation for precinct development. • Resource recovery infrastructure in the Wide Bay region can be improved. • Transport infrastructure is moderate in road, rail, and port – which can supply waste to SEQ, Central Queensland, and Townsville. • Power, water and telecommunications are all well provided to service the area around the Port of Bundaberg.

Note - suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Darling Downs-Maranoa SA4 and Toowoomba SA4 Region Profile



Overview

The Darling Downs-Maranoa SA4 and Toowoomba SA4 (Darling Downs) region contains three local government areas (LGAs) and a population of 290,000 people in 2021 forecasted to grow 340,000 by 2041. The main population centre is Toowoomba. The area has a temperate climate and is rich in coal seam gas and has a strong agricultural industry.

Key Insights

Economic and Growth Profile - the key industries for the Darling Downs region include agriculture, retail, heath, education. The current population is 290,000 and is set to grow to 340,000 by 2041.

Materials Waste Profile

- Darling Downs-Maranoa and Toowoomba accounts for 3% of Queensland's total waste, producing approximately 300,000 tonnes per year.
- At a headline level, 51% of waste is currently being recovered. Commercial and Industry waste (C&I) is at 68% followed by construction and demolition waste (C&D) recovery with 59%, and municipal solid waste (MSW) is lagging with 31%.
- The lack of MSW recovery is evident due to low recovery rates of MSW food organics, paper and cardboard and plastics. The key waste category for the Darling Downs is garden organics which makes up 33% of the total waste and has a recovery rate of 75%.
- Local stakeholder feedback from the region indicates that within those waste categories, FOGO (Food Organics, Garden Organics) and other organic waste, such as paunch, agricultural waste, and livestock waste require the most attention. "Renewable" waste, such as solar panels and components from wind farms, was also identified as areas requiring attention for the region.

Waste Projections

- **Organics -** set to increase to 159,000 tonnes per year by 2041. Given the challenges of transporting organics, high volume, and local markets, it is most feasible to process locally.
- **Masonry aggregate and soils -** set to remain steady at around 39,000 tonnes per year by 2041. Given the volume, and local markets, it is most feasible to process locally.
- **Paper and cardboard -** set to increase to 29,000 tonnes per year by 2041. Paper and cardboard have a variety of post-recovery markets. While transport costs are moderate, a feasible option is to move this resource to Brisbane for processing so product can be sold at a premium.

Transport - key transport networks include the Western Rail line and Warrego Highway which are key thoroughfares for moving waste and commodities from Toowoomba to Brisbane for processing and export.

Land Use and Infrastructure – Toowoomba offers a strong location for a precinct due to its existing infrastructure, land availability, buffering from residential and retail areas and proximity to the Toowoomba Bypass and Inland Rail.

Potential Precincts and Handling of Materials

There is potential to establish a transform precinct in Toowoomba, with the processing of household and agricultural organics, as well as masonry, aggregate and soils. Toowoomba has also been identified as an ideal location for the location of agriculturally based research opportunities, with organics research already underway in the region. Toowoomba also lends itself to becoming a centre of excellence or national hub for the processing of solar panels.

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Darling Downs Maranoa SA4 and Toowoomba SA4 Region Potential Recycling Enterprise Precincts

Table 4.46 – Darling Downs region projected waste tonnage and recovery rate by category for 2031 and 2041

	2021		2031		2041	
	Total Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste at 2030 Target[11]	Total Waste (Projected)	Recovered Waste at 2040 Target[12]
Food Organics	34,000	7%	37,000	22,000	39,000	25,000
Garden organics	100,000	75%	110,000	67,000	120,000	77,000
Paper & Cardboard	25,000	21%	27,000	16,000	29,000	19,000
Plastics	12,000	6%	13,000	7,800	14,000	9,100
Glass	8,500	61%	9,200	5,700	9,900	6,600
Ferrous metals	21,000	80%	23,000	20,000	25,000	21,000
Non-ferrous metals	4,500	68%	4,900	4,100	5,200	4,400
Timber	31,000	33%	33,000	21,000	36,000	24,000
Textiles	11,000	1%	12,000	7,200	13,000	8,300
Masonry, aggregate, soils	34,000	92%	36,000	32,000	39,000	34,000
Other	18,000	17%	19,000	12,000	20,000	14,000
Total	**300,000**	**51%**	**320,000**	**210,000**	**350,000**	**240,000**

[11] *Projection considers the 2030 overall recycling target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*
[12] *Projection considers the 2040 overall recycling target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*

Darling Downs-Maranoa and Toowoomba Region Background

Economic and Growth Profile

The region is heavily invested in agriculture, with a range of produce including cattle, poultry, piggeries, flour, and dairy. Other industries include retail, health, education, manufacturing, and mining. Toowoomba is the commercial hub of the region.

There are multiple research institutions located within the Darling Downs region, including the University of Queensland (UQ), Griffith University, University of Southern Queensland (USQ), and CSIRO (Toowoomba Site and Gatton Site). USQ research capability presents an opportunity to leverage existing technology and knowledge of organic materials to establish resource recovery operations.

2.1% of the workforce is currently employed within the energy, gas, water, and waste industries across the region. There are significant waste management services within the region, primarily comprised of landfill sites, transfer stations and a small amount of resource recovery activity.

Based on projections from the Queensland Government Statistician's Office, the population of Darling Downs-Maranoa and Toowoomba is set to increase as described in Table 4.47.

Table 4.47 - Projected population growth for Darling Downs-Maranoa and Toowoomba (QGSO, 2022)

	2021	2031	2041
Darling Downs-Maranoa and Toowoomba	290,000	310,000	340,000

Waste Composition Overview

The Darling Downs region accounts for 3% of Queensland's total waste, producing approximately 300,000 tonnes per year.

At a headline level, 51% of waste is currently being recovered. Commercial and Industry waste (C&I) is leading with 68% followed by construction and demolition waste (C&D) recovery with 59%, and municipal solid waste (MSW) is lagging with 31%.

By assessing the Darling Downs region recovery on a waste category level, the lack of municipal (MSW) recovery is evident due to low recovery rates of MSW food organics, paper and cardboard and plastics. The key waste category for the Darling Downs is garden organics which makes up 30% of the total waste and has a recovery rate of 75%.

Table 4.48 and Table 4.49 represent the baseline waste tonnage and recovery rates by headline stream and category.

Table 4.48 – Darlinmg Downs region derived total baseline waste tonnage and recovery rate by headline waste stream for 2020-21

	Total Managed	Landfilled	Recovered	Recovery Rate
MSW	130,000	89,000	41,000	31%
C&I	140,000	44,000	92,000	68%
C&D	37,000	15,000	22,000	59%
Total	**300,000**	**150,000**	**150,000**	**51%**

Table 4.49 – Darling Downs region derived total waste tonnage baseline and recovery rate by waste category for 2020-21

	Total Managed	Landfilled	Recovered	Recovery Rate
Food Organics	34,000	33,000	2,300	7%
Garden organics	100,000	25,000	77,000	75%
Paper & Cardboard	25,000	20,000	5,400	21%
Plastics	12,000	11,000	760	6%
Glass	8,500	3,400	5,200	61%
Ferrous metals	21,000	4,200	17,000	80%
Non-ferrous metals	4,500	1,400	3,100	68%
Timber	31,000	21,000	10,000	33%
Textiles	11,000	11,000	110	1%
Masonry, aggregate, soils	34,000	2,800	31,000	92%
Other	18,000	15,000	2,900	17%
Total	**300,000**	**150,000**	**150,000**	**51%**

Note - the information contained in this table is based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Waste Projection

Table 4.50 projects total waste production and recovery based on factors listed below:

- **Population growth** according to Queensland Government Statisticians Office;
- **Current recovery rate** as baselined in Table 4.49**:** and
- **Waste recycling targets** as outline in Queensland Government Waste Management and Resource Recovery Strategy. These targets have been broken down from headline stream to category.

Table 4.50 – Darling Downs region projected total waste tonnage and recovery rate by waste category for 2031 and 2041

Darling Downs-Maranoa and Toowoomba Current and Projected Waste Recovery by Waste Category (Tonnes)									
	2021			2031			2041		
	Total Waste (Actual)	Recovered Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2030 Recycling Target)[1]	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2040 Recycling Target)[2]
Food Organics	34,000	2,200	7%	37,000	2,400	22,000	39,000	2,600	25,000
Garden organics	100,000	77,000	75%	110,000	83,000	67,000	120,000	90,000	77,000
Paper & Cardboard	25,000	5,400	21%	27,000	5,800	16,000	29,000	6,200	19,000
Plastics	12,000	760	6%	13,000	830	7,800	14,000	890	9,100
Glass	8,500	5,200	61%	9,200	5,600	5,700	9,900	6,000	6,600
Ferrous metals	21,000	17,000	80%	23,000	18,000	20,000	25,000	20,000	21,000
Non-ferrous metals	4,500	3,100	68%	4,900	3,300	4,100	5,200	3,600	4,400
Timber	31,000	10,000	33%	33,000	11,000	21,000	36,000	12,000	24,000
Textiles	11,000	110	1%	12,000	120	7,200	13,000	130	8,300
Masonry, aggregate, soils	34,000	31,000	92%	36,000	33,000	32,000	39,000	36,000	34,000
Other	18,000	2,900	17%	19,000	3,200	12,000	20,000	3,400	14,000
Total	**300,000**	**150,000**	**51%**	**320,000**	**170,000**	**210,000**	**350,000**	**180,000**	**240,000**

1. Projection considers the 2030 overall recycling waste reduction target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

2. Projection considers the 2040 overall recycling waste reduction target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

Note - the information and projections contained in this table are based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Existing Waste Infrastructure

Current waste infrastructure in the Darling Downs region primarily consists of transfer stations and landfills. There is a range of resource recovery plants within the region. Organics recycling being the largest in response to the local agriculture economy. Other types of resource recovery are minimal.

Table 4.51 – Darling Downs region existing waste infrastructure quantity and size

	Plant Quantity	Typical Size
MRF/Recycling Station	3	Small
Metals	3	Small
Organics	6	Medium
C&D	3	Small
Transfer Stations	12	Medium
Landfill - Inert	1	Small
Landfill - Putrescible	35	Large
Total	**63**	

Existing Support Infrastructure

Transport infrastructure in the region is well developed for rail and road systems throughout the region, accommodating the major industries. The region has good power, water and telecommunications infrastructure to support industrial development around existing major urban centres. Table 4.52 provides a description of key transport routes.

Table 4.52 - Darling Downs region transport overview

Transport Mode	Routes	Description
Road	Warrego Highway Carnarvon Highway Leichhardt Highway Gore Highway Balonne Highway New England Highway Cunningham Highway	Road infrastructure in the region is extensive, connected in a grid-like formation allowing direct access to SEQ, Queensland Outback, Central Queensland, and northern regions of NSW. This allows the transportation of agricultural, manufactured and mining products.
Rail/Freight	West Moreton System Southwestern System Western System Inland Rail	Rail infrastructure connects to southwestern, southern, and south-eastern regions of Queensland to Darling Downs-Maranoa and Toowoomba. They are primarily used by major industries for goods transport.

Land Use Availability

Land use within the Darling Downs region is particularly used by agricultural industries. Priority Agricultural Areas have been established for agricultural land use and create a significant constraint to industrial land supply within the region.

Waste processing areas exist around Toowoomba and provide potential locations for precincts. O'Mara Road in Wellcamp has an existing waste management centre which backs onto the Toowoomba Bypass and is located outside the proximity of residential and retail areas. Hermitage Road in Cranley, has an existing waste management centre with proximity to the Toowoomba Bypass. However, the site is located closer to

residential areas which may cause a buffering constraint. Both options provide feasible precinct sites with access to move processed commodities by road to Brisbane for export.

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Challenges and Opportunities

There are multiple challenges and opportunities for the Darling Downs region. The current industries and economy provide significant and diverse waste feedstock, however the limitations such as potentially constrained expertise need to be considered.

Table 4.53 – Darling Downs region challenges and opportunities

Challenges	Opportunities
Labour Market Proximity **The region has small and dispersed communities which suits the key industry of agriculture and farming. Key expertise and skills are lacking for full scale multi-Recycling Enterprise Precincts (there are skills available for organics processing).**	**Inland Rail** The construction of Inland Rail provides an opportunity for transportation of goods including waste. The feasibility of exporting or importing waste products from the region needs to be examined.
Land Availability **Industrial land supply is a constraint in the area due to dedicated areas for farming and agriculture. This affects the scalability of materials recovery activities.**	**Volume of Agricultural Waste** Agricultural waste production is large in volume, providing a sufficient level of organic waste feedstock. These products can be sold and used for conservation and retails purposes.

Application of Recycling Enterprise Precinct Location Guidance

The Recycling Enterprise Precinct Location Guidance outlines the matters that should be considered when seeking to identify likely candidate places for a recycling enterprise precinct.

This guidance has been applied to the region to provide a high-level assessment of the suitability of recycling enterprise precincts for the region.

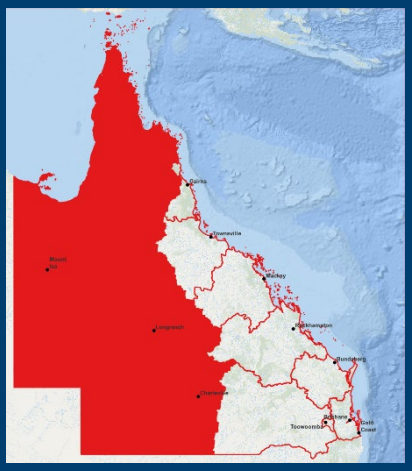
Table 4.54 – Darling Downs region – application of recycling enterprise precinct location guidance

Focus Area	Aims	Application for Region
Economic impact	• Precincts should maximise access to supply chains.	• Large agricultural presence within the region presents opportunities for collaboration around plant and animal organics. • Extensive road and rail infrastructure connection to Brisbane, however, no port infrastructure available to the region.
	• Precincts should facilitate knowledge transfer and maximise research collaboration opportunities.	• USQ headquarters available in the region. Supported by other research institutions. • Presence of large waste management organisations lacking.
	• Precincts should have access to sufficient locally sourced labour. • Precincts should have access to training to meet	• Local labour is spread across the region with a focus on skills relating to agriculture. • There is a small yet diverse presence of skills in Toowoomba.

Focus Area	Aims	Application for Region
	future skilled and specialised labour requirements.	• Proximity to educational facilities is lacking for locals outside of Toowoomba.
Social impact	• Precincts should seek to enhance social outcomes.	• Precincts would require significant land, which is primarily allocated to agriculture industries within the region.
Environmental impact and sustainability	• Precincts should minimise environmental impacts. • Precincts should maximise sustainability outcomes.	• The introduction of Inland Rail could entice more waste from NSW and SEQ to be brought to the Darling Downs- for recovery rather than going to landfill.
Amenity	• Precincts should minimise impact on sensitive land uses. • Precincts should minimise impact on urban amenity.	• Current land uses are dedicated to agricultural industries. Town centres in regional areas may not possess adequate buffering for high-impact industry due to the proximity to educational, health and residential areas.
Land needs	• Precincts should be of sufficient scale to allow an ecosystem of resource recovery and recycling industries to develop and to have impact.	• There are good opportunities for the establishment of precincts in the Darling Downs region, however some issues may arise due to Prioritised Agricultural Areas, spread of population, and limited planning for high-impact industry.
Infrastructure	• Precincts should have good access to existing enabling infrastructure. • Precincts should minimise impacts on local government infrastructure.	• Current road and rail infrastructure is suitable for resource recovery operations. • Water and electricity infrastructure is currently sufficient.

Note - suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Queensland Outback SA4 Region Profile



Overview

The Queensland Outback SA4 (Outback) region consists of 34 local government areas with Mount Isa being the most significant commercial hub. Queensland Outback has a population of 80,000 people as of 2021 which is forecasted to remain constant through to 2041. The region's dispersed population and distance from key markets in SEQ and Townsville create major challenges for the area.

Key Insights

Economic and Growth Profile - the key industries for the Outback are sparsely located and include agriculture, tourism and mining. The current population is 80,000 and is set to remain steady until 2041.

Materials Profile

- The Outback accounts for 2% of Queensland's total waste, producing approximately 150,000 tonnes per year.
- At a headline level, 14% of waste is currently being recovered. Commercial and industry (C&I) recovery rate is at 24%, followed by construction and demolition (C&D) recovery and municipal solid waste (MSW) both at 7%.
- The Outback lacks meaningful recovery rates and quantities due to its size and spacing of facilities. This is evident with very low C&I and MSW rates for paper & cardboard, plastics, and glass.
- Local stakeholder feedback from the region indicates that within those waste categories, organic waste and metal, particularly container recycling, require the most attention. It was identified that the region presents a unique issue due to the lower volumes of waste as well as its significant distance and transport costs from end user markets.

Materials Projections

- **Organics -** set to increase to 54,000 tonnes per year by 2041. Given the challenges of transporting organics, high volume, and sparsity of communities, it is most feasible to process locally.
- **Paper and cardboard -** set to increase to 24,000 tonnes per year by 2041. Paper and cardboard have a variety of post-recovery uses and markets, despite transport distance and cost being high, it is most feasible to transport this material to Townsville or SEQ for processing.

Transport - One of the challenges for the Outback region is the transportation of material across vast distances. Due to the large geographical area, some urban centres may be closer in distance to other regions identified in this Strategy (for example Charleville may be closer to the Darling Downs-Maranoa and Toowoomba region). It may be more economically viable to transport waste from those areas into another region, to be determined at later stages of investigations. Key transport networks include the Mount Isa and Longreach Rail lines and the Landsborough Highway to move small volumes of higher value commodities like plastic and ferrous metals to Townsville and Gladstone respectively for processing.

Land Use and infrastructure – There is limited waste infrastructure in the region, mostly being landfills and smaller recycling and materials recovery centres. There is an abundance of land that could be suitably zoned for future resource recovery activities.

Potential Precincts and Handling of Materials

There is potential to establish a recycling enterprise precinct in Mount Isa for the processing of all varieties of organics, masonry, aggregate and soils, timber and tyres. Other high value waste streams from the north (plastics, paper, metals) could be transported to Townsville and Gladstone for processing in small quantities. Similar flows of material could occur in the centre and south feeding into a hub and spoke model.

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Queensland Outback Region Potential Recycling Enterprise Precincts

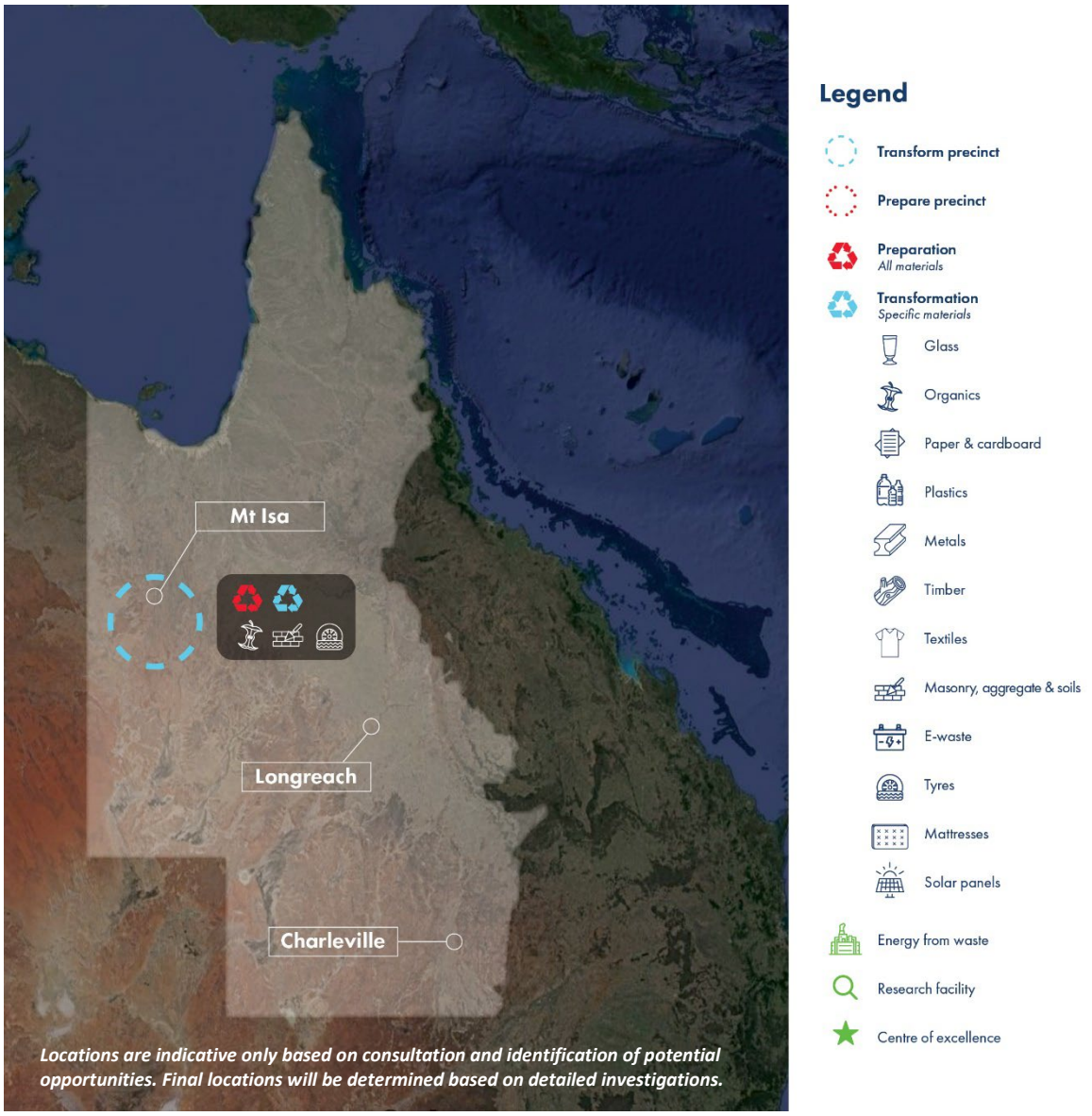


Table 4.55 – Outback region projected waste tonnage and recovery rate by category for 2031 and 2041

	2021		2031		2041	
	Total Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste at 2030 Target[13]	Total Waste (Projected)	Recovered Waste at 2040 Target[14]
Food Organics	24,000	1%	24,000	14,000	24,000	16,000
Garden organics	29,000	18%	29,000	18,000	30,000	19,000
Paper & Cardboard	24,000	6%	24,000	14,000	24,000	16,000
Plastics	11,000	0%	11,000	6,500	11,000	7,000
Glass	6,000	18%	6,000	3,700	6,100	4,000
Ferrous metals	13,000	41%	13,000	11,000	13,000	11,000
Non-ferrous metals	1,500	11%	1,500	1,300	1,500	1,300
Timber	22,000	4%	22,000	14,000	22,000	15,000
Textiles	8,400	1%	8,400	5,100	8,500	5,500
Masonry, aggregate, soils	12,000	57%	12,000	11,000	12,000	11,000
Other	4,400	7%	4,400	2,800	4,400	3,000
Total	**150,000**	**14%**	**160,000**	**100,000**	**160,000**	**110,000**

[13] *Projection considers the 2030 overall recycling target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*
[14] *Projection considers the 2040 overall recycling target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*

Queensland Outback SA4 Region Background

Economic and Growth Profile

The economy of the Outback is driven by agriculture, mining and tourism. There are ports, including Karumba and Weipa, exporting key commodities such as zinc, bauxite and silica sand. The region is a producer of beef and cattle. Other industries include mining, public administration, healthcare, and social assistance.

There are minimal resource recovery operations in the Outback with the major challenge being the transport distance and logistics. There is the presence of a container refund scheme, however the major focus should be on small scale recovery that can be used locally.

Based on projections from the Queensland Government Statistician's Office, the population of the Outback is set to remain roughly constant as described in Table 4.56.

Table 4.56 - Projected population growth for Queensland Outback (QGSO, 2022)

	2021	2031	2041
Queensland Outback	80,000	81,000	81,000

Waste Composition Overview

The Outback accounts for 2% of Queensland's total waste, producing approximately 150,000 tonnes per year.

At a headline level, 14% of waste is currently being recovered. Commercial and industry (C&I) recovery rate is at 24%, followed by construction and demolition (C&D) recovery and municipal solid waste (MSW) both at 7%.

By assessing the Outback's recovery on a waste category level, the lack of recovery in C&I and MSW is evident with very low rates for paper and cardboard, plastics and glass. The Outback lacks meaningful recovery rates and quantities due to its size and spacing of facilities.

Table 4.57 and Table 4.58 represent the baseline waste tonnage and recovery rates by headline stream and category.

Table 4.57 – Outback region derived total baseline waste tonnage and recovery rate by headline waste stream for 2020-21

	Total Managed	Landfilled	Recovered	Recovery Rate
MSW	49,000	45,000	3,300	7%
C&I	66,000	51,000	16,000	24%
C&D	40,000	37,000	2,900	7%
Total	**150,000**	**130,000**	**22,000**	**14%**

Table 4.58 – Outback region derived total waste tonnage baseline and recovery rate by waste category for 2020-21

	Total Managed	Landfilled	Recovered	Recovery Rate
Food Organics	24,000	23,000	240	1%
Garden organics	29,000	24,000	5,200	18%
Paper & Cardboard	24,000	23,000	1,500	6%
Plastics	11,000	11,000	35	0%
Glass	6,000	4,900	1,100	18%
Ferrous metals	13,000	7,500	5,200	41%
Non-ferrous metals	1,500	1,300	170	11%
Timber	22,000	21,000	890	4%
Textiles	8,400	8,300	84	1%
Masonry, aggregate, soils	12,000	5,300	7,000	57%
Other	4,400	4,100	310	7%
Total	**150,000**	**130,000**	**22,000**	**14%**

Note - the information contained in this table is based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Waste Projection

Table 4.59 projects total waste production and recovery based on factors listed below:

- **Population growth** according to Queensland Government Statisticians Office;
- **Current recovery rate** as baselined in Table 4.58; and
- **Waste recycling targets** as outline in Queensland Government Waste Management and Resource Recovery Strategy. These targets have been broken down from headline stream to category.

Table 4.59 – Outback region projected total waste tonnage and recovery rate by waste category for 2031 and 2041

Queensland Outback Current and Projected Waste Recovery by Waste Category (Tonnes)									
	2021			2031			2041		
	Total Waste (Actual)	Recovered Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2030 Recycling Target)[1]	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2040 Recycling Target)[2]
Food Organics	24,000	240	1%	24,000	240	14,000	24,000	240	16,000
Garden organics	29,000	5,200	18%	29,000	5,200	18,000	30,000	5,200	19,000
Paper & Cardboard	24,000	1,500	6%	24,000	1,500	14,000	24,000	1,500	16,000
Plastics	11,000	35	0%	11,000	36	6,500	11,000	36	7,000
Glass	6,000	1,100	18%	6,000	1,100	3,700	6,100	1,100	4,000
Ferrous metals	13,000	5,200	41%	13,000	5,200	11,000	13,000	5,200	11,000
Non-ferrous metals	1,500	170	11%	1,500	170	1,300	1,500	170	1,300
Timber	22,000	890	4%	22,000	890	14,000	22,000	900	15,000
Textiles	8,400	84	1%	8,400	84	5,100	8,500	85	5,500
Masonry, aggregate, soils	12,000	7,000	57%	12,000	7,000	11,000	12,000	7,100	11,000
Other	4,400	310	7%	4,400	320	2,800	4,400	320	3,000
Total	**150,000**	**22,000**	**14%**	**160,000**	**22,000**	**100,000**	**160,000**	**22,000**	**110,000**

1. Projection considers the 2030 overall recycling waste reduction target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

2. Projection considers the 2040 overall recycling waste reduction target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

Note - the information and projections contained in this table are based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Existing Waste Infrastructure

The existing waste infrastructure in the Outback is limited and dispersed over a large area. This is principally made up of landfills, with only 12 transfer stations and a single scrap metal consolidation site.

Table 4.60 – Outback region existing waste infrastructure quantity and size

	Plant Quantity	Typical Size
MRF/Recycling Station	1	Small
Metals	1	Small
Organics	0	
C&D	0	
Transfer Stations	12	Medium
Landfill - Inert	2	Small
Landfill - Putrescible	76	Medium
Total	**92**	

Existing Support Infrastructure

The Outback has a basic network of transport infrastructure connecting the regions to major ports in the east coast. Mount Isa has good power, water and telecommunications infrastructure to support industrial development. Other parts of the region do not have reliable or at scale supporting infrastructure to support significant industrial scale precincts. Table 4.61 provides a summary of the transport infrastructure in the Outback.

Table 4.61 - Outback region transport overview

Transport Mode	Routes	Description
Road	Mitchell Highway Landsborough Highway Warrego Highway Barkly Highway Flinders Highway	These throughfares connect the region to the west, southwest, southeast, east and north respectively.
Rail/Freight	Mount Isa Line Longreach Line	There are freight rail lines connecting the coast to Mount Isa and Longreach which are used for agricultural and minerals transport.
Port	Port of Karumba Port of Weipa	Port Karumba's main export is lead and zinc whereas Port Weipa exports bauxite.

One of the challenges for the Outback region is the transportation of material across vast distances. Due to the large geographical area, some urban centres may be closer in distance to other regions identified in this Strategy (for example Charleville may be closer to the Darling Downs-Maranoa and Toowoomba region). It may be more economically viable to transport waste from those areas into another region, to be determined at later stages of investigations depending on the distance of the closest established REP, the type of waste being prepared and transformed at that REP and the cost to transport the material.

Land Use Availability

The Outback is a sparsely populated region with very few regional centres. Mount Isa represents and an urban centre where a precinct of scale is likely to be feasible. There are existing industrial and recycling facilities located within the region that have the opportunity to grow and utilise suitably zoned land.

Suggested potential precinct locations are indicative only, based on consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Challenges and Opportunities

The key areas for consideration regarding Queensland Outback are outlined in Table 4.62. Some of these will pose a challenge to the implementation of resource recovery, whereas others create opportunities for enhanced development.

Table 4.62 – Outback region challenges and opportunities

Challenges	Opportunities
Decentralised Population **The decentralised population within the Outback presents a significant issue in establishing the upstream supply chain of resource recovery. This includes collection of waste in a commercially feasible manner accounting for the quantity and quality of waste produced and high transportation costs.**	**Developed Transport Infrastructure** The current transport infrastructure can facilitate the full supply chain from collection through to export. The Port of Townsville exports recycled materials currently, reflecting precedence and established process in exporting these products. The road network is extensive and use of tyres as a product to help build and maintain roads is a matter that should be considered to help reduce the need for raw materials to be transported to job sites.
Access and Transport Cost **Mount Isa is over 1800km from Brisbane which currently hosts most of the commodity markets for recycled materials. The Outback requires significant assistance for materials to be commercially viable to transport to major centres for processing.** **The Outback region presents a uniquely large geographical area. Some urban centres located within the Outback region may be closer in distance to other regions identified in this Strategy (for example Charleville may be closer to the Darling Downs-Maranoa and Toowoomba region as identified in this Strategy).**	**Community Recycling** Due to the nature of the region, councils are looking into opportunities to create resource recovery as a community-based endeavour. Waste streams include food and garden organics but could be broadened to others in the future. **Transport to other Regions** It may be more economically viable to transport waste from those areas into another region, to be determined at later stages of investigations depending on the distance of the closest established REP, the type of waste being prepared and transformed at that REP and the cost to transport the waste.

Application of Recycling Enterprise Precinct Location Guidance

The Recycling Enterprise Precinct Location Guidance outlines the matters that should be considered when seeking to identify likely candidate places for a recycling enterprise precinct.

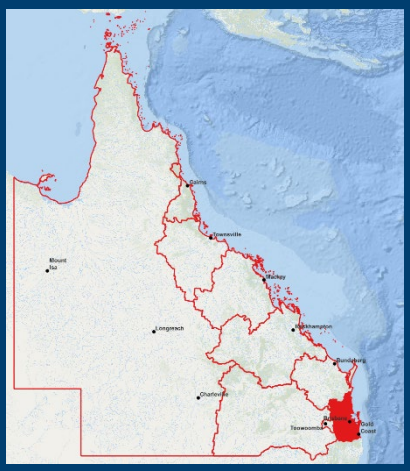
This guidance has been applied to the region to provide a high-level assessment of the suitability of Recycling Enterprise Precincts for the region.

Table 4.63 – Outback region – application of recycling enterprise precinct location guidance

Focus Area	Aims	Application for Region
Economic impact	• Precincts should maximise access to supply chains.	• The sparsity of townships in the Outback makes it difficult to consolidate waste streams. • The volume of waste is considerably lower than all other regions of Queensland.
	• Precincts should facilitate knowledge transfer and maximise research collaboration opportunities.	• There is limited access to universities and/or other research institutions in this region.
	• Precincts should have access to sufficient locally sourced labour. • Precincts should have access to training to meet future skilled and specialised labour requirements.	• Opportunities for local labour is possible for community-based initiatives whereby waste is managed on a town-by-town scale. • Small recovery centres could provide a demand for some skilled labour in these towns.
Social impact	• Precincts should seek to enhance social outcomes.	• Community level precincts could enhance education and awareness about resource recovery in remote communities.
Environmental impact and sustainability	• Precincts should minimise environmental impacts. • Precincts should maximise sustainability outcomes.	• Due to the likely sparsity of precincts, there will be little environmental benefit as large quantities of greenhouse gases will be emitted through the construction of precincts and transport of waste.
Amenity	• Precincts should minimise impact on sensitive land uses. • Precincts should minimise impact on urban amenity.	• There are limited urban areas with options for locations to house recovery precincts. Large buffers can be used for these developments. • Existing facilities in Mount Isa could be used to develop a fit for purpose precinct.
Land needs	• Precincts should be of sufficient scale to allow an ecosystem of resource recovery and recycling industries to develop and to have impact.	• Resource recovery scale will be a challenge due to the limited feedstock in the region. • A viable location for a preparatory precinct with some transformation capability would be Mount Isa, which could process light materials such as cardboard and paper, plastics, metals and tyres.
Infrastructure	• Precincts should have good access to existing enabling infrastructure. • Precincts should minimise impacts on local government infrastructure.	• There is limited existing waste infrastructure. • Transport infrastructure is scarce with only road networks spanning the region. However, large distances need to be covered to transport waste to recovery locations.

Note - suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

South-East Queensland Region Profile



Overview

The South-East Queensland (SEQ) region contains eleven local government areas (LGAs), with some of the largest local government areas in the country. Current population is 3.7 million and is forecasted to grow to 5.2 million by 2041. The area contains Australia's third largest city, with a diverse industrial, cultural, and economic profile that underpins the progress of the state of Queensland.

Key Insights

Economic and Growth Profile - the key industries for SEQ include tourism, agriculture, construction, retail, and education. The current population is 3,700,000 and is set to grow to 5,200,000 by 2041.

Materials Profile

- SEQ accounts for 77% of Queensland's total waste, producing approximately 7,200,000 tonnes per year.
- At a headline waste stream level, 58% of that waste is currently being recovered. Construction and demolition (C&D) recovery is at an 81% recovery rate, commercial and industrial waste (C&I) with 56% and municipal solid waste (MSW) is at 25% recovery rate.
- By assessing SEQ's recovery on a waste category level, the lack of MSW recovery is evident due to low recovery rates of food organics, household plastics and other MSW waste. The key waste categories for SEQ are metals (ferrous and non-ferrous) and building waste (masonry, aggregate, soils) which produce 46% of the total waste and have a recovery rate of 88 and 89% respectively.
- Local stakeholder feedback from the region indicates that there is keen interest to ensure that exiting infrastructure is maximised, any precinct establishment promotes industry collaboration and that opportunities for colocation of complementary uses and the research sector are maximised. There is also a strong awareness that land availability and social licence may be an issue in the region.

Materials Projections

- **Organics -** set to increase to 2,300,000 tonnes per year by 2041. Given the challenges of transporting organics, high volume, and local markets, it is most feasible to process locally.
- **Masonry aggregate and soils -** set to remain steady at around 3,300,000 tonnes per year by 2041. Given the high volume, and local markets, it is most feasible to process this material locally.
- **Paper and cardboard -** set to increase to 1,200,000 tonnes per year by 2041. Paper and cardboard have a variety of post-recovery markets. While transport costs are moderate, a feasible option is to move this resource to a "transform" precinct in the region for processing so the product can be sold for a premium price.

Transport - key transport networks include the excellent urban motorway system and various rail connections running into and through the region. The Region also has significant port and aviation capacity.

Land Use and Infrastructure – with the complex waste recovery profile and volumes of waste within SEQ, it is proposed that there be a series of transform and prepare precincts established for the region. Issues regarding social licence, proximity to incompatible land uses and availability of suitably zoned land will be more likely to occur in SEQ than other regions.

Potential Precincts and Handling of Materials

There is the potential to establish transform precincts around the Port of Brisbane, Bromelton, and Ebeneezer/Willowbank. Prepare precincts that undertake sorting and preparatory activities could be located in Caloundra and Coomera.

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

South East Queensland Region Potential Recycling Enterprise Precincts

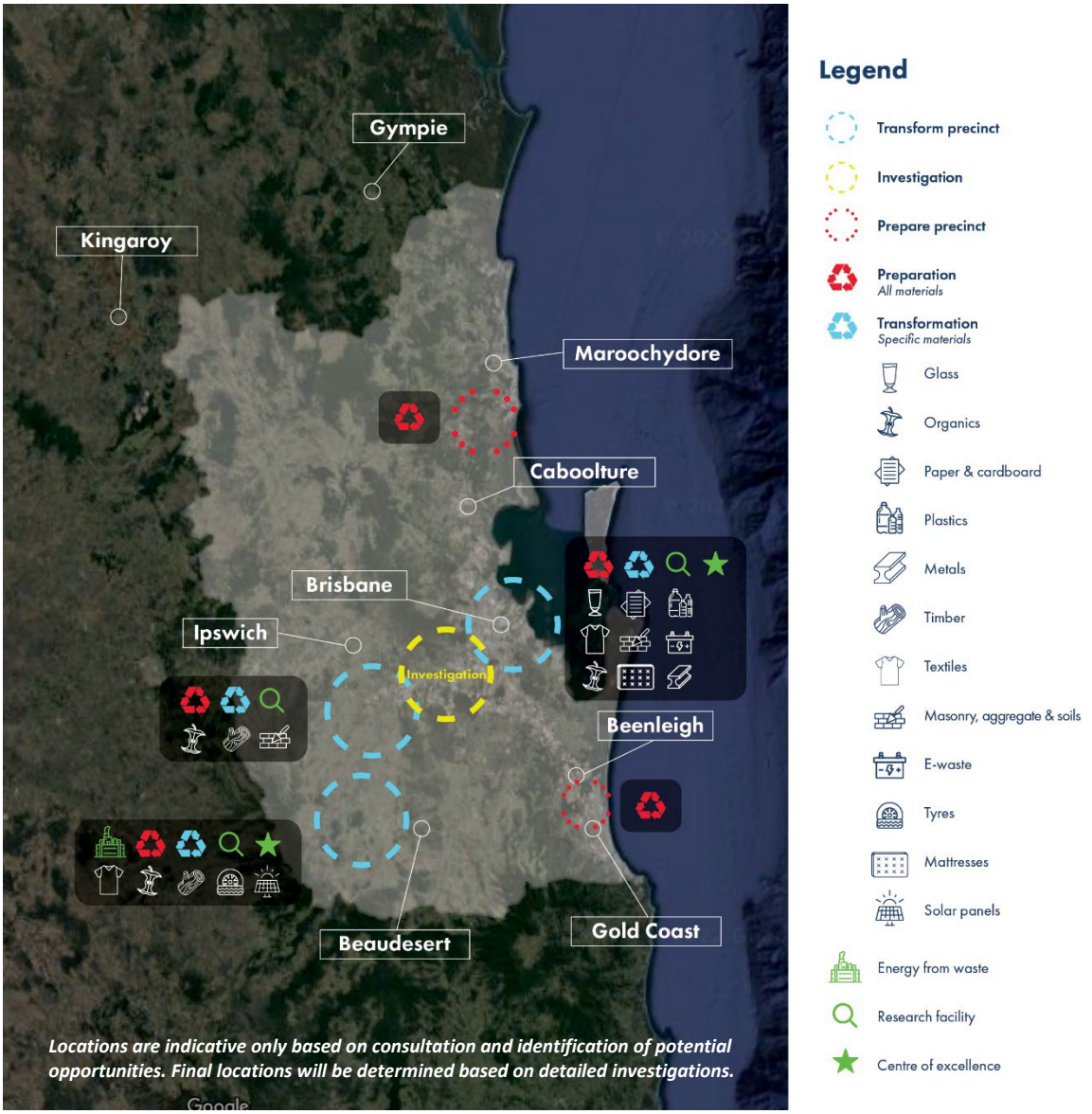


Table 4.64 – SEQ region projected total waste tonnage and recovery rate by category for 2031 and 2041

	2021		2031		2041	
	Total Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste at 2030 Target[15]	Total Waste (Projected)	Recovered Waste at 2040 Target[16]
Food Organics	640,000	7%	770,000	460,000	900,000	590,000
Garden organics	950,000	59%	1,200,000	690,000	1,400,000	880,000
Paper & Cardboard	820,000	52%	990,000	600,000	1,200,000	760,000
Plastics	230,000	13%	280,000	170,000	330,000	220,000
Glass	140,000	55%	160,000	100,000	190,000	130,000
Ferrous metals	920,000	89%	1,100,000	960,000	1,300,000	1,100,000
Non-ferrous metals	120,000	88%	140,000	120,000	170,000	140,000
Timber	580,000	16%	700,000	450,000	820,000	560,000
Textiles	150,000	1%	180,000	110,000	210,000	140,000
Masonry, aggregate, soils	2,300,000	88%	2,800,000	2,400,000	3,300,000	2,800,000
Other	330,000	10%	400,000	260,000	470,000	320,000
Total	**7,200,000**	**58%**	**8,700,000**	**6,300,000**	**10,000,000**	**7,600,000**

[15] *Projection considers the 2030 overall recycling target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*
[16] *Projection considers the 2040 overall recycling target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.*

South-East Queensland Region Background

Economic and Growth Profile

The economy of South-East Queensland (SEQ) has a significant impact on Queensland, with the presence of large organisations and an extensive workforce in the area. Food and hospitality, education, professional and technical services, retail, and health are the largest employers by industry, with professional services occupying the largest portion of the workforce.

There are multiple markets which contribute to the growth of the SEQ economy. These include:

- Coastal areas such as Gold Coast, Sunshine Coast, and Noosa, which are known for their beaches, pristine waterways, and culture, that attracts significant tourism to SEQ.
- Fertile land and established supply chains in regional areas of SEQ, which generate economic growth through agriculture.
- Increased construction and development activity in recent years, resulting in significant employment within the construction sector.

The SEQ region has significant research and development capacity. There are multiple research institutions based within the area that possess world-class knowledge and technological capability. This provides an avenue for high-quality and innovative research and development. Table 4.65 presents the research institutions located in SEQ.

Table 4.65 – SEQ region research and development institutions

University of Queensland	TAFE Queensland	James Cook University
Queensland University of Technology	Bond University	Ecosciences Precinct
Griffith University	Southern Cross University	
University of Sunshine Coast	CSIRO (multiple sites)	

Waste operations in SEQ are relatively significant in comparison to other regions. There are established operations, and natural precincts that have developed overtime for waste and recycling in the region. There is presence of large organisations and developed areas such as Swanbank facilitating the current supply chain of waste and resource recovery. The region has opportunities for industrial development and growth, which are explored in the sections below.

Based on projections from the Queensland Government Statistician's Office, the population of SEQ is set to increase as described in Table 4.66.

Table 4.66 – SEQ region projected population growth (QGSO, 2022)

	2021	2031	2041
South-East Queensland	3,700,000	4,400,000	5,200,000

Waste Composition Overview

SEQ accounts for 77% of Queensland's total waste, producing approximately 7,200,000 tonnes per year.

At a headline waste stream level, 58% of that waste is currently being recovered. Construction and demolition (C&D) recovery is leading the way with an 81% recovery rate, followed by commercial and industrial waste (C&I) with 56% and municipal solid waste (MSW) is lagging with a 25% recovery rate.

By assessing SEQ's recovery on a waste category level, the lack of MSW recovery is evident due to low recovery rates of food organics, household plastics and other MSW waste. The key waste categories for SEQ are metals (ferrous and non-ferrous) and building waste (masonry, aggregate, soils) which produce 46% of the total waste and both have a recovery rate of 88% and 89%.

Table 4.67 and Table 4.68 represent the baseline waste tonnage and recovery rates by headline stream and category.

Table 4.67 – SEQ region derived total baseline waste tonnage and recovery rate by headline waste stream for 2020-21

	Total Managed	Landfilled	Recovered	Recovery Rate
MSW	1,800,000	1,300,000	450,000	25%
C&I	2,500,000	1,100,000	1,400,000	56%
C&D	2,900,000	540,000	2,300,000	81%
Total	**7,200,000**	**3,000,000**	**4,200,000**	**58%**

Table 4.68 – SEQ region derived total waste tonnage baseline and recovery rate by waste category for 2020-21

	Total Managed	Landfilled	Recovered	Recovery Rate
Food Organics	640,000	590,000	46,000	7%
Garden organics	950,000	390,000	560,000	59%
Paper & Cardboard	820,000	400,000	420,000	52%
Plastics	230,000	200,000	30,000	13%
Glass	140,000	62,000	74,000	55%
Ferrous metals	920,000	110,000	810,000	89%
Non-ferrous metals	120,000	14,000	100,000	88%
Timber	580,000	480,000	92,000	16%
Textiles	150,000	150,000	1,500	1%
Masonry, aggregate, soils	2,300,000	280,000	2,000,000	88%
Other	330,000	300,000	35,000	10%
Total	**7,200,000**	**3,000,000**	**4,200,000**	**58%**

Note - the information contained in this table is based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Waste Projection

Table 4.69 projects total waste production and recovery based on factors listed below:

- **Population growth** according to Queensland Government Statisticians Office;
- **Current recovery rate** as baselined in Table 4.68 and
- **Waste recycling targets** as outline in Queensland Government Waste Management and Resource Recovery Strategy. These targets have been broken down from headline stream to category.

Table 4.69 – SEQ region projected total waste tonnage and recovery rate by waste category for 2031 and 2041

South-East Queensland Current and Projected Waste Recovery by Waste Category (Tonnes)									
	2021			2031			2041		
	Total Waste (Actual)	Recovered Waste (Actual)	Recovery Rate % (Actual)	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2030 Recycling Target)[1]	Total Waste (Projected)	Recovered Waste (Projected at 2021 Recovery Rate)	Recovered Waste (Projected at 2040 Recycling Target)[2]
Food Organics	640,000	46,000	7%	770,000	56,000	460,000	900,000	66,000	590,000
Garden organics	950,000	560,000	59%	1,200,000	670,000	690,000	1,400,000	790,000	880,000
Paper & Cardboard	820,000	420,000	52%	990,000	510,000	600,000	1,200,000	600,000	760,000
Plastics	230,000	30,000	13%	280,000	36,000	170,000	330,000	42,000	220,000
Glass	140,000	74,000	55%	160,000	90,000	100,000	190,000	110,000	130,000
Ferrous metals	920,000	810,000	89%	1,100,000	980,000	960,000	1,300,000	1,200,000	1,100,000
Non-ferrous metals	120,000	100,000	88%	140,000	120,000	120,000	170,000	150,000	140,000
Timber	580,000	92,000	16%	700,000	110,000	450,000	820,000	130,000	560,000
Textiles	150,000	1,500	1%	180,000	1,800	110,000	210,000	2,100	140,000
Masonry, aggregate, soils	2,300,000	2,000,000	88%	2,800,000	2,400,000	2,400,000	3,300,000	2,900,000	2,800,000
Other	330,000	35,000	10%	400,000	42,000	260,000	470,000	50,000	320,000
Total	**7,200,000**	**4,200,000**	**58%**	**8,700,000**	**5,000,000**	**6,300,000**	**10,000,000**	**6,000,000**	**7,600,000**

1. Projection considers the 2030 overall recycling waste reduction target of 65% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

2. Projection considers the 2040 overall recycling waste reduction target of 70% as outlined in the Queensland Government Waste Management and Resource Recovery Strategy.

Note - the information and projections contained in this table are based on data received from the Queensland government. Some rounding and aggregation has been applied to ensure that total SA4 level data aligns with Statewide level data.

Existing Waste Infrastructure

The existing waste infrastructure in SEQ is diverse and extensive, with multiple facilities of different types operating in the region. The centralised population, technological capability, and support available within the area allows the operation of these facilities.

Table 4.70 – SEQ region existing waste infrastructure quantity and size

	Plant Quantity	Typical Size
MRF/Recycling Station	30	Small
Metals	34	Large
Organics	20	Medium
C&D	30	Large
Transfer Stations	6	Medium
Landfill - Inert	73	Large
Landfill - Putrescible	5	Large
Total	**150**	

Existing Support Infrastructure

SEQ has a developed transport infrastructure system, with planning and construction occurring for further developments - there are multiple routes available for each transport type within the region. Due to the presence of multiple industries, these modes of transport are heavily utilised in transporting tourists, workers, commodities, waste, fresh produce and other goods and services applicable to the area.

The region has extensive power, water and telecommunications infrastructure to support industrial development in the region.

Table 4.71 highlights the current transport modes, major routes, and a description of what is available within the region.

Table 4.71 – SEQ region transport overview

Transport Mode	Routes	Description
Road	Pacific Highway Logan Motorway Brisbane Valley Highway Cunningham Highway Warrego Highway Bruce Highway Mount Lindesay Highway	Considering Brisbane is the capital of Queensland, there is extensive regional road networks connecting to all other areas of the state. This includes the Pacific Highway, Bruce Highway and Logan Motorway connecting Sydney, Gold Coast, and Northern regions. The region has an extensive and high-quality urban motorway network that can facilitate movement of materials to and between precincts.
Rail/Freight	Acacia Ridge Freight Terminal North Coast Line Inland Rail Project Southeast Queensland Network	The rail freight network is extensive as SEQ is connected centrally to all other major rail networks.
Aviation	Brisbane Airport Gold Coast Airport Sunshine Coast Airport	Aviation infrastructure, although not primarily used for waste transportation, is available within the region. It can support movement of high value goods.

Port	Port of Brisbane	The Port of Brisbane is one of the busiest ports in Australia, responsible for importing and exporting goods internationally, including waste-recovered commodities.

Land Use Availability

The diverse economy of SEQ results in a range of land uses across the region. The existence of various markets such as tourism, professional services, industrial operations accompanied by large residential zones results significant land use constraints in the region. As a result of these constraints, there are identified industrial and enterprise areas, regional economic clusters (RECs) and state development areas dedicated to industrial development. These areas include the Southwest Industrial Corridor REC, Australia TradeCoast REC, Ipswich REC, Bromelton SDA, and the multiple industrial areas between Caloundra and Noosa. Given the land use pattern and industrial land uses in SEQ, areas of potential opportunity for a precinct of scale include areas in and area SDAs and the RECs including at Bromelton, Willowbank/Ebeneezer, and the Port of Brisbane.

Suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

Challenges and Opportunities

The SEQ region presents a range of opportunities and challenges within the waste industry. As discussed, the region has a well-established economy, with advanced technological capability, and a large workforce to facilitate the growth of the area. There is efficient transport, water, and energy infrastructure in place to facilitate industrial development. However, certain environmental, social and community issues need to be considered to avoid negative impacts on the surrounding areas of a precinct.

Table 4.72 below discusses the current challenges and opportunities available in developing a precinct within the SEQ region.

Table 4.72 – SEQ region challenges are opportunities

Challenges	Opportunities
Land Availability **Land availability constraints are a significant challenge in developing precincts at scale within the SEQ region. This is due to a centralised population near existing industrial and business hubs, and the perception of waste and resource recovery facilities as being harmful and noxious.**	**Developed Transport Infrastructure** The current transport infrastructure can facilitate the full supply chain from collection through to export. The Port of Brisbane exports recycled materials currently, reflecting precedence and established process in exporting these products. The high quality motorway and rail network is a distinct advantage.
	Developed Research Capability There is significant research and technological capability available in the City of Brisbane and surrounding LGAs based on the concentration of research institutions. The presence of large waste management organisations means partnerships can be facilitated to enhance innovation and industrial development.

Application of Recycling Enterprise Precinct Location Guidance

The Recycling Enterprise Precinct Location Guidance outlines the matters that should be considered when seeking to identify likely candidate places for a recycling enterprise precinct.

This guidance has been applied to the region to provide a high-level assessment of the suitability of Recycling Enterprise Precincts for the region.

Table 4.73 – SEQ region – application of recycling enterprise precinct location guidance

Focus Area	Aims	Application for Region
Economic impact	• Precincts should maximise access to supply chains.	• The SEQ region has extensive connectivity to other cities and towns due to established trade routes and transport infrastructure. • There is a presence of large organisations from various industries co-located within the region. • There are multiple markets operating in the region which present a diverse types of waste feedstock (tourism, mining, construction, agriculture)
	• Precincts should facilitate knowledge transfer and maximise research collaboration opportunities.	• There is significant potential for research and development within SEQ due the presence of large organisations, existing waste and recycling operations, and the presence of large research institutions within the state.
	• Precincts should have access to sufficient locally sourced labour. • Precincts should have access to training to meet future skilled and specialised labour requirements.	• The labour force in SEQ is the largest and most diverse of Queensland. 12% trade workers and 6% machine operators/drivers. • There is a presence of waste and recycling precincts which have existing labour capability. • Training facilities across all levels are available within the region. This includes vocational training, tertiary training, and other industry-led initiatives.
Social impact	• Precincts should seek to enhance social outcomes.	• With significant opportunities for materials recovery centres, diversion of waste from landfills will allow better living standards, and less impacts on the livelihood of citizens. • There are multiple areas currently dedicated to industrial activity, which have existing buffers in place.
Environmental impact and sustainability	• Precincts should minimise environmental impacts. • Precincts should maximise sustainability outcomes.	• There are potential locations for precincts to exist which minimise impacts to the environment. This includes already dedicated areas for industrial activity. • There is a large waste feedstock in SEQ. Precincts in SEQ provide an efficient supply chain, minimising impacts of hauling waste, and reducing vehicular greenhouse gases.
Amenity	• Precincts should minimise impact on sensitive land uses. • Precincts should minimise impact on urban amenity.	• There are multiple areas currently dedicated to industrial activity, which are suitable locations for a recycling enterprise precinct. These locations will help minimise impacts on sensitive land uses. • There will be an impact on road infrastructure due to increased truck activity, however a likely transition to rail/freight infrastructure with the construction of Inland Rail will ease pressure on parts of the road network. • High-impact industry land uses near residential and commercial areas will need to be assessed. There are current planning schemes with appropriate buffers that may avoid negative impacts on such areas, however current community impacts and consequences need to be considered.

Focus Area	Aims	Application for Region
Land needs	• Precincts should be of sufficient scale to allow an ecosystem of resource recovery and recycling industries to develop and to have impact.	• Current regional plans and planning schemes designate large areas of land for industrial activity. Land availability estimates will be required to understand complete scalability of precincts.
Infrastructure	• Precincts should have good access to existing enabling infrastructure. • Precincts should minimise impacts on local government infrastructure.	• Extensive and developed transport infrastructure is available in the SEQ region. • Developed services infrastructure such as water supply and energy supply are available in the SEQ region. • The location of precincts will determine the need for new services and amenities. Current industrial areas have established systems in place. • The SEQ region generates the largest amount of waste by tonnage in Queensland. This allows for better proximity to waste feedstock.

Note - suggested potential precinct locations are indicative only, based on local consultation and identification of potential opportunities. Final locations will be determined based on detailed investigations.

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