Etheridge Integrated Agricultural Project

Initial Advice Statement

December 2013

Integrated Food and Energy Developments Pty Ltd
ABN: 16 163 430 233
www.i-fed.com.au

ABBREVIATIONS

3D	-	Three dimensions
ABN	-	Australian Business Number
aka	-	also known as
DNRM	-	Department of Natural Resources and Mines
DOTE	-	Department of the Environment
eg	-	for example (exempli gratia)
IDAS	-	Integrated Development Assessment System
IFED	-	Integrated Food and Energy Developments Pty Ltd
km	-	kilometres
kt/Mt	-	Kilotonnes / million tonnes
L	-	Lake
ML	-	Megalitres
Mths	-	Months
MW	-	Megawatts
Qld	-	Queensland
Pty Ltd	-	Proprietary Limited
R	-	River
SDWPO	-	*State Development and Public Works Organisation Act 1971*
WSF	-	Water Storage Facility

Contents

0 Executive summary

0.1 Background

Integrated Food and Energy Developments Pty Ltd (IFED) has been established to develop a world leading, large scale, vertically integrated, privately funded, broad-acre irrigated cropping, grazing and primary processing business in the Etheridge Shire, North Queensland, Australia. The business will have an initial focus on producing sugar, guar gum, cattle and associated by-products such as stock feed, energy, ethanol and meat products.

Since the 1950's, the Gulf Savannah region in North Queensland, Australia have been recognised for its enormous potential for large scale irrigated farming due to its climate, soil, topography and abundant and reliable water. The Gilbert River system is the 6th largest river system in Australia in terms of annual average flow and is 35% larger than that of the Ord River in Western Australia.

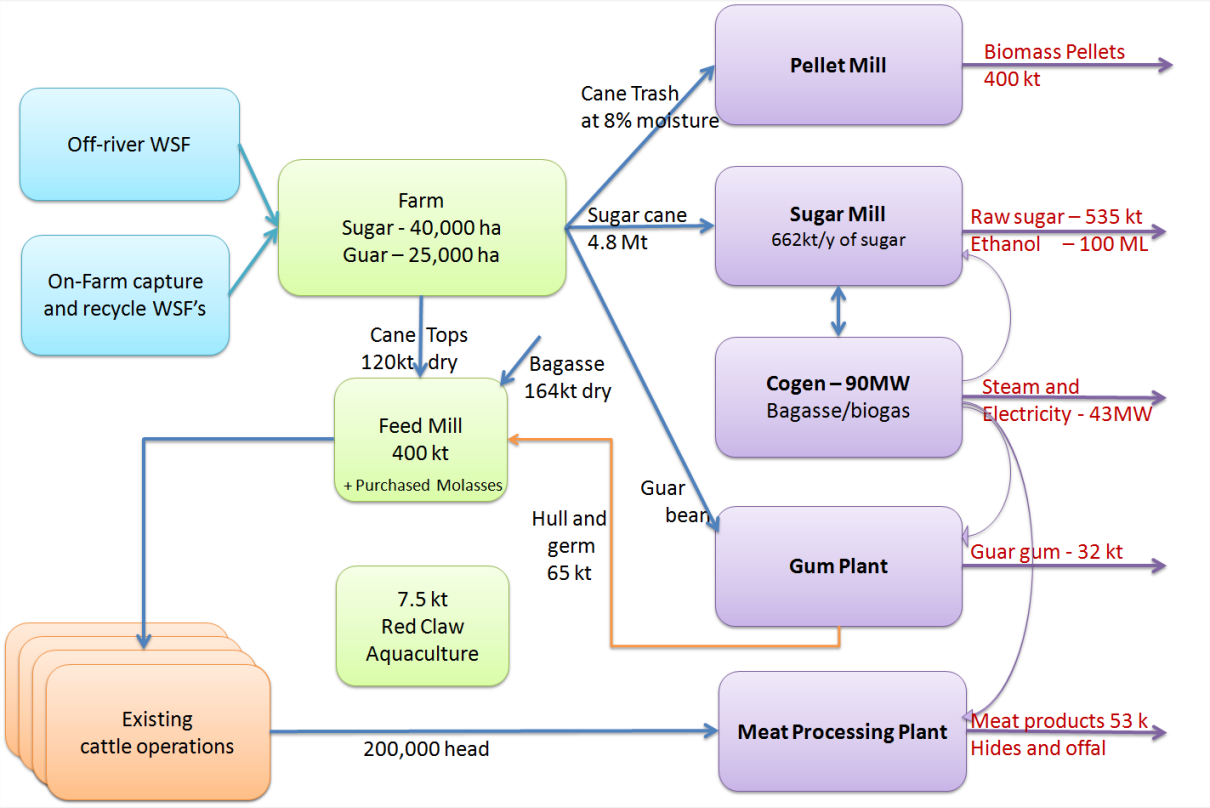

Figure 1 - Integrated Agri-processing

IFED has spent over 12 months assessing the commercial and technical viability for large scale water capture, water storage, water distribution and irrigated cropping in the region. Our analysis has been very positive and we believe there is a significant opportunity for the development of a profitable, large scale, integrated agribusiness.

IFED has identified the prime sites in the region for water diversion, water storage and cropping, met with regional stakeholders and government agencies and completed the preliminary design of key

facilities including river flow modelling, three dimensional design of water facilities, farm design, location of housing and accommodation facilities, Bioprocessing Precinct layout and market studies.

The Etheridge Integrated Agricultural Project represents sustainable development. Unlike extractive Projects which are non-renewable and have a finite life, farming such as this is forever. Further, due to the production of substantial quantities of renewable energy (electricity and bio-ethanol) the Project will reduce national greenhouse emissions. Also, the sophisticated farming techniques employed will reduce land degradation, sediment run-off and feral pest populations.

Sugar production in Northern Australia is based on proven best practice irrigation and farming techniques, processing technology, export logistics, world markets and forward pricing structures.

The Project will deliver substantial economic, social and environmental benefits. Agri-based economic benefits are widely distributed and community-building especially where large scale processing is involved.

Figure 2 - Bushfire damage is minimal due to sparse vegetation

0.2 Purpose of the Initial Advice Statement

The Initial Advice Statement provides information on the Project which consists of the development of a new integrated agri-processing precinct in the vicinity of the Gilbert River system in inland North Queensland.

The purpose of this Initial Advice Statement is to:

- Inform the public and government departments about the Project for each entity to assess their level of interest in the Project, as stated under the *State Development and Public Works Organisation Act 1971*;

- Provide information to enable a Terms of Reference to be established for an Environmental Impact Statement; and
- Supports an application to the Coordinator-General seeking a declaration of the proposal as 'coordinated project' for which an Environmental Impact Statement is required under the *State Development and Public Works Organisation Act 1971*.

0.3 Scope of the Initial Advice Statement

The scope of assessment covers the construction and operation of Project facilities and associated social, environmental and economic impacts and mitigation measures. Project facilities include:

- Water diversion, storage, channels and associated infrastructure (eg roads and easements);
- Farm preparation and farm operations ;
- Bioprocessing Precinct assets and operational requirements; and
- Infrastructure including accommodation, roads and transmission lines.

Cellulosic ethanol, biodiesel and red claw farming – components of the Bioprocessing Precinct - will be included in the scope although construction is not expected to occur until completion of the core process elements shown in the diagram above.

The scope of assessment excludes warehouse, road and power line upgrades where those upgrades relate to existing facilities and reflect business as usual matters or can be more effectively assessed under existing local regulatory processes.

Installation and operation of a site pipe manufacturing facility is included although this is a temporary facility required during the construction phase of the Project to reduce truck traffic.

The option of exporting via the Port of Karumba will also be investigated during Project studies, however, assessment of Karumba Port is not included in the scope of this Initial Advice Statement.

0.4 The proponent

The proponent is Integrated Food and Energy Developments Pty Ltd ABN 16 163 430 233.

The company was established specifically for the purpose of developing, financing and constructing large scale agri-processing Projects in Northern Australia. Contact details are:

General Manager
Phone: +61 7 3129 3530
Email: stewart.peters@i-fed.com.au

0.5 Nature and scope of the proposed Project

The Project is located on grazing land, some of which has previously been extensively mined for gold and copper and explored for uranium and other resources. The region has been largely modified by former mining operations and long term impacts of grazing, large scale pest infestations and seasonally arid climatic conditions associated with the Dry Tropics.

An average annual flow of 555,000 megalitres per year will be flood harvested during the short monsoonal wet season from the Einasleigh and Etheridge rivers and channelled into off-stream constructed lakes with a combined capacity of 2.0 million megalitres. Rainfall intensity (ie quantity

of rain received in a short period of time) in Northern Australia is amongst the highest in the world and creates high run-off and high stream flows for short periods of the year.

Water is transferred to Dismal Lake from Dagworth Lake via an overland gravity channel. A second overland gravity channel supplies water to pumping stations that deliver water under pressure through pipelines to a state-of-the-art trickle tape irrigation system. Sufficient water is available from the lakes to irrigate in excess of 65,000 hectares of cropping land (1,625 x 40 hectare farm blocks). The farming enterprise will grow sugar cane and guar bean.

The Bioprocessing Precinct will be located on-farm to produce a diverse range of products including raw sugar, ethanol, electricity, native and modified guar gum, stock feed and processed meat and red claw and other products. It comprises:

- 5.76 million tonnes of cane, tops and trash receival;
- Cane billet, trash and tops separation;
- 4.8 million tonne sugar mill configured to produce 535,000 to 600,000 tonnes of raw sugar;
- 100 megalitres of ethanol refinery configured to minimize crystal recycle;
- 100 megalitres cellulosic ethanol refinery using excess biomass;
- 90 megawatt cogeneration plant ;
- 32,000 tonnes native and modified guar gum plant producing hydroxy propylated guar gum;
- 400,000 tonnes stockfeed mill based on by-products from farming, processing and purchased additives;
- 400,000 tonnes biomass pellet plant using excess biomass;
- Improved pasture eg leucaena;
- 200,000 head meat processing plant;
- 1,000 hectare red claw farm producing 7,500 tonnes of red claw;
- Bio-ammonia plant; and
- Biodiesel plant.

By-products are re-used to make other high value products. For example:

- Cane tops and trash will be beneficially used to produce stock feed, biomass pellets and cellulosic ethanol compared to the current approach of either burning or decomposing in-field to produce carbon dioxide and methane;
- Process water from the ethanol and meat processing within the Bioprocessing Precinct will be used to produce biogas before being used to feed red claw before irrigating cropping land. This will recycle nitrogen, phosphorous and mineral nutrient in the water and reduce fertiliser consumption;
- Biogas will be converted to bio-ammonia and used on-farm to displace fertiliser produced from non-renewable fuels;
- Tallow from the meat processing plant will be converted to biodiesel and offset carbon emissions; and
- Red Claw farm using by-products such as dunder from ethanol production, bagasse bales and biogas plant water. Discharge water from the aquatic facility can be reused as irrigation water for cropping.

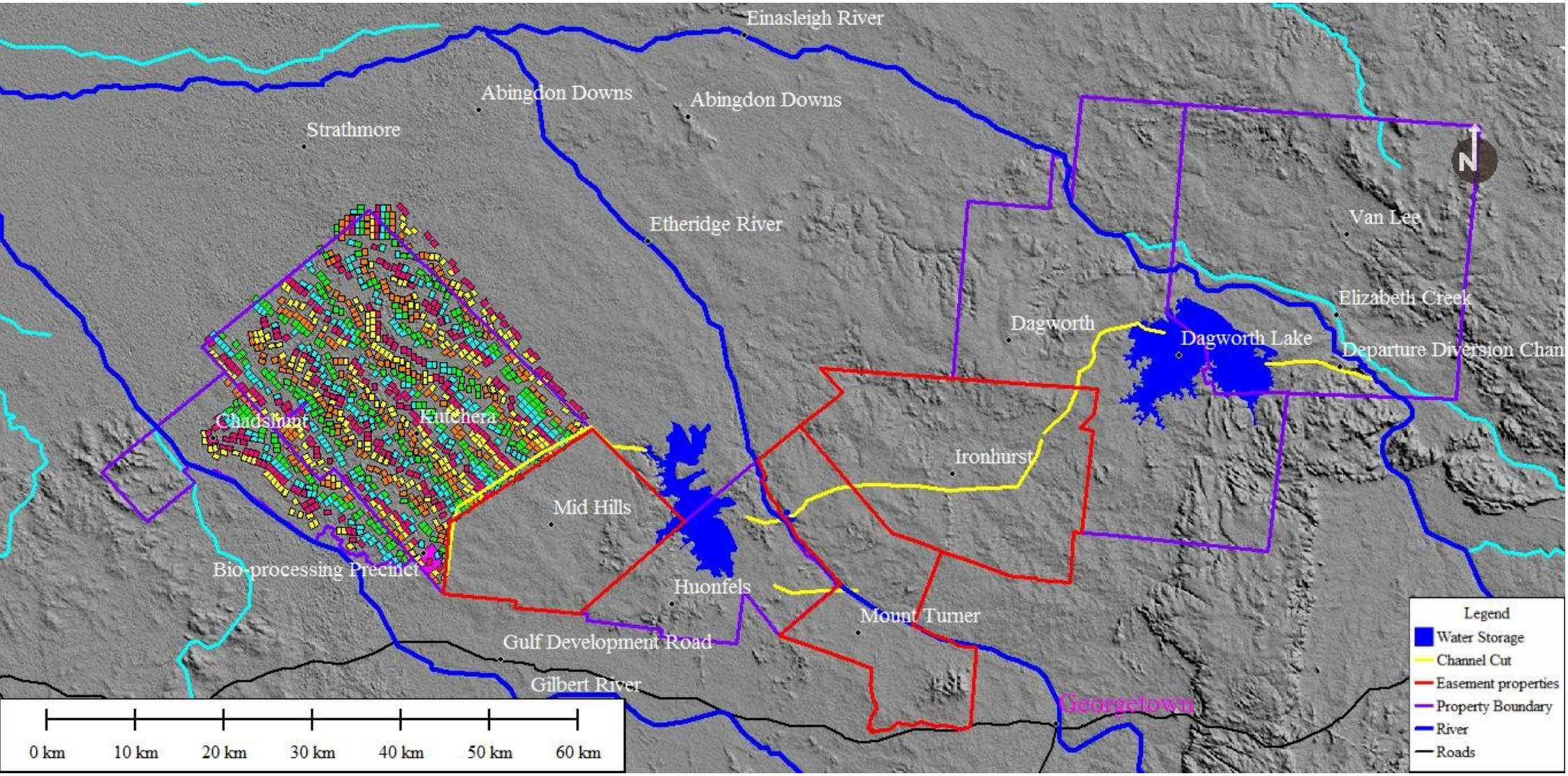

Figure 3 – Site layout and topography of the surrounding area.

0.6 Location of the Project

The Project is located in the Etheridge Shire. Georgetown, the administrative headquarters of Etheridge Shire, is located 277 kilometres from Cairns in a straight line and 412 kilometres by road. It is 300 kilometres from the Gulf port of Karumba.

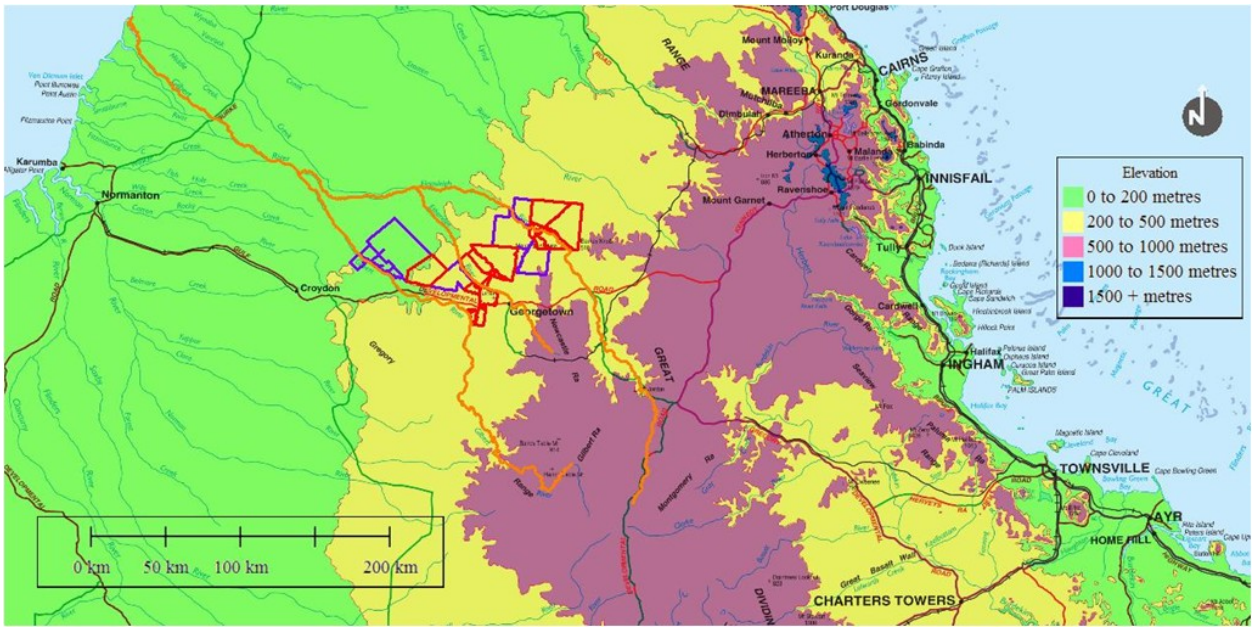

Figure 4 - Site location in North Queensland

Export will occur through the Port of Townsville with product delivered to the port via road trains. Domestic deliveries will rely on road freight. The road train route is via Charters Towers. The distance from the Bioprocessing Precinct to Townsville is 620 kilometres.

The Bioprocessing Precinct is located 78 kilometres west of Georgetown (less than 50 minutes drive) along the Gulf Developmental Road.

0.7 Key environmental issues

The Project has the potential to impact on existing environmental values including:

- Reduced average annual river flow (~8.8% at discharge);
- Downstream wetlands and its aquatic communities;
- Fishing industry in the vicinity of the Gilbert River mouth;
- Groundwater in the vicinity of the off-stream lakes;
- Return to the region of a large population centred on Georgetown and seasonal workers village near the former township of New Chadshunt located along the Gilbert River;
- Increases in traffic volumes and heavy trucks;
- Potential impact on currently unknown cultural heritage sites;
- Potential quarantining of small orebodies including uranium; and
- Impact to soils and landform during and after construction of facilities; and
- Disturbance to habitats and removal of remnant “not of concern” vegetation .

The Project will also introduce other changes which may provide beneficial outcomes:

- Increased bird and fish-life as a result of the establishment of large scale tropical lakes;
- Reduced sediment loss to rivers as a result of increasing grass cover and reduced cattle grazing;

- Reduction in the population of pests such as wild pigs, donkeys and feral cats and dogs;
- Increased carbon dioxide emissions during construction followed by a substantial reduction in carbon dioxide; and
- Substantial impact on local businesses with increased wealth and skills accumulation.

0.8 Key approvals

The Project will require a diverse range of approvals to enable the Project. The approval framework and relevant legislative requirements for the Project are tabulated in Section 8. However, some of the key approvals are:

- An allocation of water for the Project;
- In-river diversion structures;
- Water storage embankments;
- Overland and stream flow capture of water;
- Inundation of land and vegetation to hold water creating new lakes;
- River and creek crossings;
- Quarrying and explosives;
- Clearing of native vegetation;
- River sand extraction;
- Easement for access and transmission lines to site;
- Road closures, upgrades and new roads;
- Construction approval;
- Operational approvals;
- On and off-site chemicals handling;
- Conversion of land from pastoral lease to freehold or perpetual leasehold;
- Housing and village approvals;
- Indigenous Land Use Agreement and compensation agreement; and
- Federal approval under the *Environmental Protection and Biodiversity Conservation Act*.

0.9 Key reasons for seeking coordinated project declaration

A preliminary feasibility assessment of the Project demonstrates:

- The region has substantial water resources and land suitability for large scale irrigated agriculture;
- The financial viability and economic and ecological sustainability of the Project requires substantial investment in infrastructure and processing using state-of-the art technologies (construction investment $1,977 million);
- The consequence of the large scale investment is that increased regulatory hurdles need to be addressed. These approval requirements, especially with respect to water allocation involve complex approval requirements, involving local, state and federal governments;
- Provision of substantial employment opportunities (direct employment of 1,780 full time jobs at construction peak and 1,034 full time equivalents in Operations); and
- The Project – by virtue of its integrated industrial architecture – enables a viable meat processing plant to be constructed which is of major strategic significance to the region.

Consequently, IFED is seeking declaration of the proposed Etheridge Integrated Agricultural Project as a "coordinated project" under section 26(1) of the *State Development and Public Works Organisation Act 1971*.

IFED considers that the Project is of such substantial scale and of such significant regional and state importance that it justifies a coordinated project declaration to enable a contemporaneous whole of government assessment.

Furthermore, unlike mining and oil and gas projects which have a well-defined development path, large scale agricultural projects do not have a clear pathway. Past irrigation projects have been developed through government infrastructure and other powers which are not available to private development of irrigation infrastructure.

1 Introduction

1.1 Project Background

Much has been written and said about the growing world-wide demand for food driven largely by the burgeoning middle class and urbanisation of China and India. With the softening in prices for hard commodities such as iron ore and coal, the capital markets are turning their sights on soft commodities, particularly those commodities with well established international trading markets, such as sugar and other forms of carbohydrate.

Government aspirations to expand agriculture to meet this need have been formally recognised in the Four Pillars and 2040 Agriculture Strategy which seeks to double agricultural output by 2040.

The IFED Directors also believe that there is an enormous and rare opportunity to capitalise on these international dynamics by development in North Queensland where there is abundant water and suitable land. Equally however, the Directors believe that to deliver strong returns from agriculture, the business needs to be: large scale and vertically integrated along the value chain, including privately held: water, cropping, processing, logistics facilities and by-products optimisation.

In order to realise the potential of the region, primary processing facilities must be built near the cropping zone. To be commercially viable, primary processing facilities such as a sugar mill need to be built and operate at an economic scale. Furthermore, surety of feedstock is critical in justifying the initial investment in a primary processing facility and in its ongoing commercial viability. To ensure sufficient and reliable feedstock, a minimum level of water and cropping land is crucial, below which the whole development is not viable.

For anything of any real consequence and long-term viability to occur in the region it needs to be done at scale, integrated along the value chain with sufficient water and land, **under the operator's control**, to guarantee sufficient feedstock for the primary processing facilities.

The Project is based on growing sugar cane and guar bean and producing raw sugar and guar along with associated by-products such as ethanol, electricity, stock feed and meat.

1.1.1 Why Sugar?

- The forecast for global demand growth, particularly out of the major Asian markets is strong;
- The forecast for raw sugar pricing is also strong;
- Sugar has an established global trading market and is a hedgeable commodity;
- The co-generation of electricity in the sugar mill provides an industrial architecture that underpins the commercial viability of other processing activities (e.g. meat) and helps diversify revenue streams;
- North Queensland is a major sugar producer and has excess sugar handling capacity at its key ports;
- Sugar growing and processing, including integrated co-generation and ethanol production, is technically low risk with well established expertise and technologies;
- North Queensland is recognised globally as a major producer of high quality sugar and ideally suited to meet the growing demand for sugar in Asia;

- The capital markets, including institutional investors, major traders and food manufacturers are interested in investment opportunities in sugar; and
- The bio-mass waste from sugar processing creates tremendous opportunity for future product diversification and value added revenue streams.

1.1.2 Why Guar?

- World-wide demand and prices for guar gum are expected to stay strong due to its use in fracking and growing demand for gluten free products;
- Asian buyers of guar gum are seeking to manage their supply risk by developing alternative, high volume, reliable sources of supply outside India and Pakistan. IFED's discussions with Asia buyers in terms of off-take agreements have been encouraging;
- As a legume, guar bean is an excellent rotational crop for sugar cane and is being grown in the region;
- Guar bean is robust, high yielding and suitable to the dry tropic climate of North Queensland; and
- The bio-mass by-product from guar gum production delivers high volumes of high protein stock-feed.

1.1.3 Key reasons for seeking coordinated project declaration

IFED is seeking declaration of the proposed Etheridge Integrated Agricultural Project as a "coordinated project" under section 26(1) of the *State Development and Public Works Organisation Act 1971* because:

IFED considers that the Project is of such substantial scale and of such significant regional and state importance that it justifies a coordinated project declaration to enable a contemporaneous whole of government assessment.

The Project capital cost is estimated at $1,977 million. The size of the investment requires regulatory certainty to enable private equity and institutional finance to be obtained.

Furthermore, unlike mining and oil and gas projects which have a well-defined development path, large scale agricultural projects do not have a clear pathway. Past irrigation projects have been developed through government infrastructure and other powers which are not available to private development of irrigation infrastructure.

An example of the complex nature of the legislative approval process is the Legislative process for the regional allocation of water where the State's own evaluation of the Gulf Savannah Water Resource Plan process (2008) found that the planning framework was not appropriate for the Gulf Savannah.

"the water planning framework had been developed to correct the legacy of over-allocated systems and state investment in water resources. In the Gulf Savannah, where there has been limited cultivation of water resources... the application of the framework was not as appropriate"[1]

[1] Executive Summary, TRaCK, Collaborative Water Planning: Retrospective Case Studies: Water Planning in the Gulf of Carpentaria, May 2008

1.2 Purpose and scope of the Initial Advice Statement

1.2.1 Purpose

The Initial Advice Statement provides information on the Project which consists of the development of a new integrated agri-processing precinct in the vicinity of the Gilbert River system in inland North Queensland. The purpose of this Initial Advice Statement is to:

- Inform the public and government departments about the Project for each entity to assess their level of interest in the Project, as stated under the State Development and Public Works Organisation Act *1971;*
- Allow information in the Initial Advice Statement and feedback from stakeholders and the general public to be used to develop a Terms of Reference for an Environmental Impact Statement; and
- Support an application to the Coordinator-General seeking a declaration of the proposal as 'Coordinated Project' for which an Environmental Impact Statement is required under the *State Development and Public Works Organisation Act 1971.*

1.2.2 Scope of the Initial Advice Statement

The scope of assessment covers the construction and operations of all Project facilities and associated impact mitigation measures. This includes:

- Water diversion, storage and channels and associated infrastructure (eg roads and easements);
- Farm preparation and farming including pasture improvement eg leucaena;
- Bioprocessing Precinct assets;
- Infrastructure including accommodation, roads and transmission lines;
- Construction matters including employment, construction hours, traffic, implementation timeframe, and social engagement plan; and
- Operations matters including employment, traffic, emissions and air quality, chemicals, products, dust, run-off, waste, noise and odours and housing.

Manufacture of glass reinforced plastic pipe will occur at site during construction and will be included in the scope. This will also entail raw material supply of around 46,000 to 75,000 tonnes depending on the balance of site manufactured pipe versus pre-fabricated irrigation pipe.

Cellulosic ethanol, biodiesel, bio-ammonia and red claw farming – components of the Bioprocessing Precinct - will be included in the scope although construction is not expected to occur until completion of the core process elements shown in the Figure 1.

The scope of assessment excludes warehouse, road and power line upgrades where those upgrades relate to existing facilities and reflect business as usual matters or can be more effectively assessed under existing local regulatory processes.

The option of exporting via the Port of Karumba will also be investigated during Project studies; however, assessment of Karumba Port is not included in the scope of this Initial Advice Statement.

2 The Proponent

The proponent is a Queensland company - Integrated Food and Energy Developments Pty Ltd . The Australian Business Number is 16 163 430 233.

The company was established on 23 April 2013 specifically for the purpose of developing, financing and constructing large scale agri-processing Projects in Northern Australia. It was created to:

- ensure that Projects are demand-driven by identifying international market dynamics and trends for agricultural produce, conceiving and designing Projects that meet those demands;
- identify and secure specific properties for aggregation and development, including water, energy and logistics infrastructure;
- oversee technical research, trials, cost estimates, due diligence and feasibility studies for the fully integrated solutions (i.e. land, water, energy, labour and logistics);
- manage government approvals and community expectations; and
- bring all the elements together to secure funding for the Project including structuring financial arrangements such as debt and equity participants, arranging joint venture partnerships and securing off-take agreements.

Web site is www.i-fed.com.au

Contact details are:
Stewart Peters
General Manager
Phone: +61 7 3129 3530
Email: stewart.peters@i-fed.com.au

The Environmental Consultant is Opus International Consultants (PCA) Pty Ltd in conjunction with ERM - a recognised international leader in fields of environmental impact assessment and environmental management.

Opus International Consultants is predominately a structural, civil, hydraulic and architectural engineering consultancy with offices distributed regionally throughout Queensland, Northern Territory, Victoria, South Australia and Western Australia. Opus' Environment and Sustainability Division specialises in providing environmental support and approvals for engineering Projects.

ERM's team provides sound environmental management strategies to improve and minimise the costs of compliance whilst helping its clients reduce risks to investors. ERM has a long track record of developing Environmental Impact Statements and approval strategies for major Projects in Australia and will work directly with Opus environmental scientists and design engineers and with IFED representatives to undertake the environmental assessment.

Sub-consultants include:

- Owen Droop, OD HYDROLOGY Pty Ltd;
- CSIRO;
- Tropwater;
- Economic Associates; and
- Acquatic Biopassage Services

3 The nature of the proposal

3.1 Scope of the Project

The key assets to be constructed include:

- Water assets;
- Farming assets;
- Processing facilities;
- Infrastructure and logistics; and
- Other items.

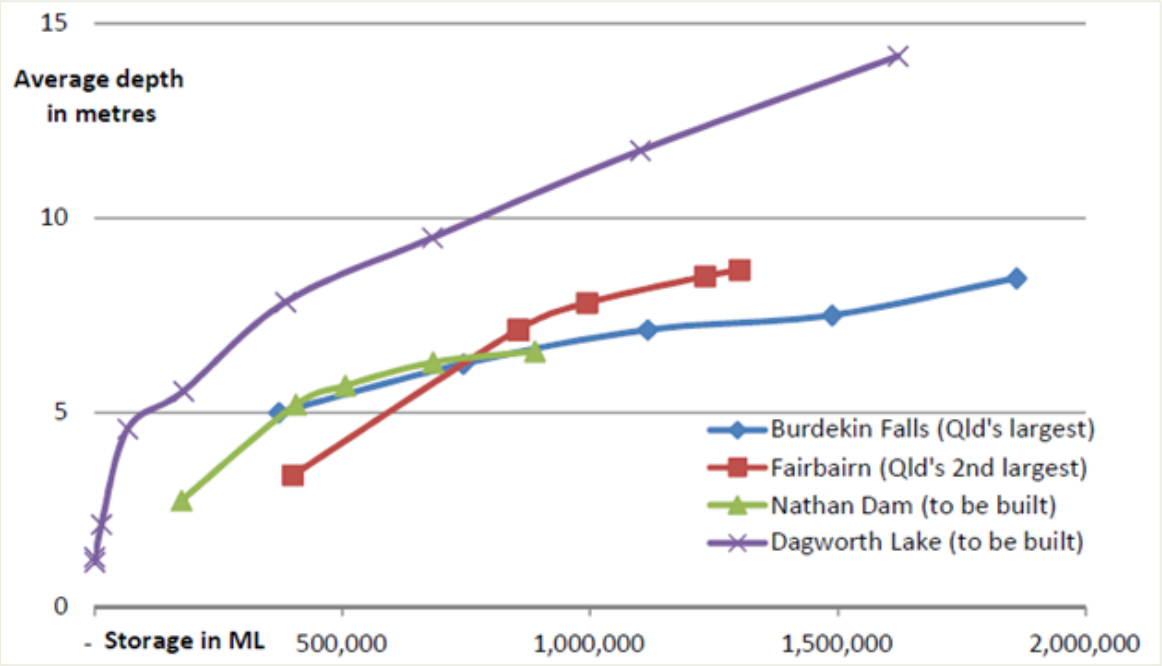

Figure 5 - Comparison of Queensland water storages - constructed and proposed.

3.1.1 Water assets

- Departure Diversion Bank across the Einasleigh River at a height of 3 to 8 metres and a length (river width) of 200 metres;
- Departure Channel to Dagworth Lake at a depth of 0 to 45 metres, base width of 70 metres and a length of 12.2 kilometres including flow control gates;
- Dagworth Lake rock and earth embankment up to 47.5 metres high and a length of 11.3 kilometres;
- Dagworth Lake Western Saddle up to 15 metres high and a length of 2.2 kilometres;
- Dagworth to Fiery Creek Channel at a depth of 5 to 45 metres and a length of 17.1 kilometres including a flow control gate ;
- Fiery Creek Channel at a typical depth of 5 metres and a length of 8.1 kilometres including a syphon across Fiery Creek ;
- Fiery to Etheridge Channel at a typical depth of 5 metres and a length of 20.9 kilometres ;
- A syphon under the Etheridge River with a length of 900 metres and a capacity of 4,000 to 6,000 megalitres per day;
- A channel through Dismal Hill to Dismal Lake with a typical depth of 5 metres and a length of 900 metres ;
- A rock barrage across the Etheridge River with a height of 3 to 8 metres and a length of 200 metres;

Figure 6 - Comparison of water storage facilities

- Aurora to Dismal Channel with a typical operating depth of 5 metres and a length of 8.9 km ;
- Dismal Lake Embankment with a depth of up to 25 metres and a length of 650 metres; and
- Farm Supply Channel with an operating depth of 5 metres and a length of 23.9 km including a flow control gate.

3.1.2 Farming assets

- 326,469 ha of land;
- 16 to 32 pump stations, 5,100 kilometres of plastic pipe, 542,000 kilometres of drip tape;
- 65,000 hectares of trickle- irrigated cropping land of which;
    - 40,000 hectares is irrigated for sugar cane; and
    - 25,000 hectares is irrigated guar bean.
- Additional land - to be determined - prepared for improved pasture and dryland cropping
- Tractors, harvesters, infield transporters, utility vehicles and assorted heavy earth moving equipment;
- 1,000 hectares of red claw ponds producing 7,500 tonnes of red claw; and
- 200,000 head cattle feeding and laneway system spread across 240,000 hectares of grazing land.

3.1.3 Processing facilities

- 4.8 M tonnes per year sugar cane mill producing 535,000 tonnes per year of raw sugar;
- 100 megalitres per year ethanol refinery;
- 400,000 tonne per year biomass pellet plant
- 90 megawatt Power Station (2 x 45 megawatt + 3 megawatt gas engine) exporting 43 megawatts;
- 400,000 tonnes per year of stockfeed - blending 230,000 tonnes per year of steamed bagasse and cane tops, 100,000 tonnes per year of molasses (purchased), 62,000 tonnes per year of guar protein meal plus dunder (mineral supplement) and other additives;
- 32,200 tonnes per year of native and modified hydroxy propylated guar gum;
- Meat processing - 200,000 head / year; and
- Biogas plant 10 megawatts thermal energy produced as methane.

3.1.4 Infrastructure & logistics assets

- Access roads for construction and ongoing maintenance
- 45 km of 66/33/11 kilovolt power line;
- Storage shed – 250,000 tonnes of raw sugar;
- 7km road into site;
- Weighbridge;
- Laboratories;
- Stockpiles for bagasse, stockfeed plus pits for molasses and cane juice (ethanol refinery);
- Solar drying pond for drying dunder stock feed;
- Fleet of purpose built Heavy Mass Vehicles for transport of sugar and other products to and from the port;
- Aircraft for crop survey, general transport, safety;
- Port warehouse upgrades to permit truck unload; and
- Third party development of accommodation villages and residential developments

3.1.5 Other items

Environmental and development approval will be sought for items below that comprise part of the staged development of facilities:

- 100 megalitre per year cellulosic ethanol refinery;
- Biodiesel - capacity to be determined - using tallow from the meat processing facility; and

- Plastic pipe manufacturing plant operating during construction phase with a crossover into operations.

3.1.6 Summary

3.1.6.1 Water diversion

Water will be diverted - during periods of high flow - from the Einasleigh River and Etheridge River and channelled into off-river lakes built for the purpose of water storage.

The preliminary design for off-takes proposes an eight metre high diversion structure on the Einasleigh River which will divert an average of 400,000 megalitres per year of high flows during the wet season (1,285,000 megalitres mean annual flow), into a 12 kilometre channel leading to Dagworth Lake.

The channel will be 70 metres wide at the base and cut up to 30 metres into the underlying rock. Dagworth Lake will be formed by two embankments on the northern (11.5 kilometres) and western (2.2 kilometres) side, 10 metres at the crest 40 metres high at maximum.

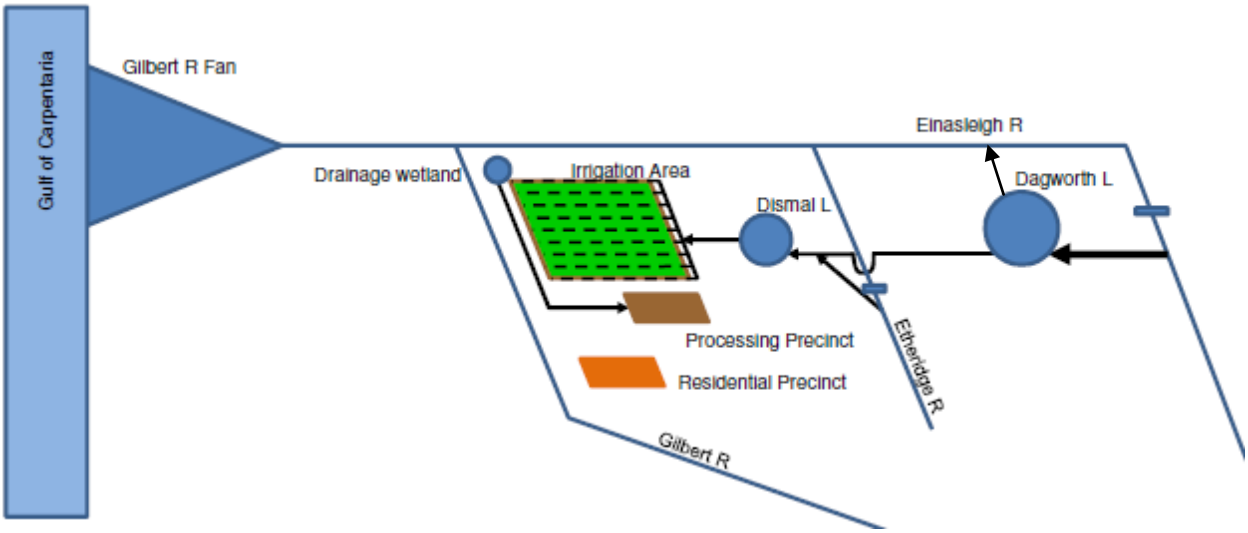

Figure 7 - Schematic model of water diversion, storage and channels

The lake will have an approximate storage volume of 1,600,000 megalitres.

The diversion channel will include floodgates to prevent water draining back into the Einasleigh River during the dry season.

Dagworth Lake will provide water for irrigation through a combination of new channels and an existing creek channel over a total of 37.3 kilometres requiring a 10 metre wide channel cut in places up to 35 metres, toward the Etheridge River.

A syphon will convey water beneath the Etheridge River, with a 900 metre long channel then discharging into Dismal Lake (400,000 megalitres capacity). Additional syphon crossings of major creeks (eg Fiery Creek) may be required to avoid overland water flow capture.

A diversion rock barrage 2-3 metres high will divert an additional 155,000 megalitres per year from the Etheridge River (390,000 megalitres mean annual flow) into Dismal Lake. A smaller irrigation supply channel will convey water from Dismal Lake to the irrigation area, where a combination of pumps and gravity will supply pressurised water to the underground trickle irrigation system.

Undeveloped flow in the Einasleigh River downstream of the Etheridge Confluence is estimated as 2,550,000 megalitres per year and 5,450,000 megalitres per year at the Gilbert River at end of system.

The Einasleigh River diversion structure is intended to have raiseable gates to allow dry season base flows to travel unimpeded to prevent impacts to downstream riverine pools.

The irrigation area and processing facilities are planned to be completely self-sufficient, with no generation of unused waste. A collection wetland for water will provide water for recycling before re-use in the process plants. Only storm runoff in excess of the design capacity of the wetland will enter the river downstream.

The Project will require an annual average water diversion of 555,000 megalitres per year including allowances for evaporation losses and to provide water security. This is equivalent to approximately 8.8% of the Gilbert River average annual discharge as measured by the Queensland Government's Integrated Quality and Quantity Model for the Gilbert catchment.

The construction period is less than 12 months for the Dismal Lake and the Etheridge River diversion – an early project deliverable. The diversion from the Einasleigh River, Dagworth Lake and the channel connecting Dagworth Lake with Dismal Lake will take around 18 months to construct.

3.1.6.2 Water distribution system and irrigation zones

Pump and fertiliser stations will be installed along the Farm Supply Channel located along the top of the farm site to provide pressurised water for irrigation. Power supply to each pump station will be supplied by overhead high voltage transmission lines delivering self-generated renewable electricity from the Bioprocessing Precinct.

The region receives average rainfall of 800 millimetres per year which is equivalent to 8 megalitres per hectare. This is supplemented by irrigation during the dry season. An average annual irrigation application of 6.5 megalitres per hectare of sugar cane will be supplied which is equivalent to 650 mm of rainfall. Based on the delivery capacity of 10 millimetres per day, each hectare can receive an average of 65 days of irrigation each year.

Based on 40,000 hectares of irrigated sugar cane at 6.5 megalitres per hectare and 25,000 hectares of guar bean at 3 megalitres per hectare, the annual water requirement is 395,000 megalitres per year which is in accordance with the available extractable yield after evaporation and other losses. Guar is a short season crop, planted for the wet season, therefore supplementary irrigation for the guar will be minimal, hence the expected usage of 3ML per hectare.

The water distribution system will be constructed over a 48 month period matched to development of farm land over the same period.

3.1.6.3 Farm

The 65,000 hectare farm will use best available irrigation technology with buried trickle tape for maximum water efficiency, minimum run-off and fertiliser application to the root zone in small doses.

Land preparation requires chain clearing, raking, ripping and re-raking and burning. Where required machinery will be used to stick and stone pick. Field preparation requires heavy cultivation and, where necessary, levelling to enable rain water to flow from the field to grassed headlands and grassed drains.

Trickle tape, grassed headlands and controlled drainage significantly minimises sediment loss compared to other irrigation methods. Overall sediment loss will be lower as a consequence of converting from grazing to cropping land.

Sugar cane will be grown on the irrigated land over a five year rotation. Around 20% of the irrigated area is not used for cane in any one year due to the rotation system required to sustain land for optimum cane production. A single crop of guar bean will be grown on the fallow cane land prior to replanting with sugar cane. Guar provides nitrogen and organic matter back into the soil. Its large tap root is very effective at improving soil health at depth.

Delivery of sugar cane to the sugar mill is a major logistical exercise. Around 4.8 million tonnes of cane billets and 0.96 million tonnes of cane tops (green leaf) and trash (dry leaf) are harvested by 26 crews over a 25 to 30 week period. The cane billets are delivered to the sugar mill by a system which comprises:

- 26 harvesters (2.4m row width);
- 80 in-field transporters; and
- A road based cane haulage system.

Figure 8 - Cane harvester

Mill mud and dunder (ethanol by-product) is returned to the fields as fertilizer. Other fertilizers (30,000 tonnes of NPK fertiliser, 50,000 tonnes of gypsum) and other chemicals (herbicides, fungicide) are purchased and trucked (backload) to site via the Port of Townsville.

Vehicle maintenance facilities will be established on-site.

Early crops of sugar cane deliver high yields which decline with each ratoon (yearly new shoot); therefore, the initial requirement for irrigated farm land is significantly less than a fully established

crop cycle. The farm areas will be constructed over a 48 month period rather than the 30 month construction period for the Bioprocessing Precinct.

3.1.6.4 Sugar mill

The sugar mill will process around 4.8 million tonnes of sugar cane each season (190 to 210 days) to produce around 535,000 to 600,000 tonnes of raw sugar. Raw sugar will be held in a 250,000 tonne storage shed prior to being trucked to the Port of Townsville for shipping. On-site storage will enable sugar to be transported year round to minimize port holding costs and truck fleet.

Karumba will be evaluated as a potential export port.

Sugar cane is separated into its components; billets, cane tops and trash. Tops are used to produce stock feed and the dry trash is used to produce biomass pellets.

The billets are shredded which breaks apart the cane and ruptures the juice cells. Rollers are used to separate sugar juice from the fibrous material, called bagasse. The bagasse is recycled as a fuel for the mill furnaces which produce steam and electricity.

Juice from the sugar cane is purified and concentrated by boiling in an evaporator. The concentrated juice or syrup is concentrated even further and is seeded with small sugar crystals in a process called crystallisation. IFED will use two stages of crystallisation with the residual juice diverted to the ethanol refinery.

The residual juice can be held in underground bladder storage for later fermentation into ethanol.

Bagasse is conveyed to the power station for combustion. Excess bagasse is conveyed to the feed mill and/or outdoor stockpile. The stockpile is built using front end loaders and wheeled dozers. Sufficient bagasse will be stock-piled to feed to power station all year round.

The sugar mill is tightly integrated with the ethanol refinery, power station, stock feed mill and meat processing plant as it supplies juice to the ethanol refinery and bagasse to the power plant and feed mill.

3.1.6.5 Guar Gum plant

The guar bean is dried in the field before harvesting using a header which separates the bean seed from the bean pod and plant. The bean seeds are transferred into a truck and transported to the guar gum plant for processing. Following further cleaning and screening, the seed is split with the endosperm separated and processed into guar gum and modified guar gum. The husk and germ are conveyed to the feed mill for blending and protein fortification in stock feed.

Figure 9 - Guar bean showing bean pods

The modified guar gum is produced by gently mixing and reacting chemicals with the cleaned

and flaked endosperm at ambient temperature. Hydroxy propylated guar gum uses large amounts of propylene oxide which requires careful handling and licensed storage facilities.

Guar Gum is generally used as an excellent thickener and stabilizer. Several studies have found significant decrease in cholesterol levels after administration of guar gum in human consumption.

Food Applications include:

- **Baking -** Small quantities of guar gum powder added to the dough increase the yield, give greater resiliency, improve texture and give longer shelf life;
- **Dairy** - It is used in the production of ice-creams, sherbets, cheese, liquid milk products and others to stabilise and retard ice formation giving smoothness;
- **Meat** - Guar is used as lubricant and excellent binder for various meat products. It allows storing with less loss of weight and can decrease the filling time for cans;
- **Dressing and sauces** - Guar is used as a thickener to improve the stability and appearance of salad dressings, barbecue sauces, relishes, tomato sauce and others;
- **Beverages** - Guar is used as a stabiliser for chocolate drinks, fruit nectars, and juices where it imparts body and mouth feel especially to dietary concoctions;
- **Miscellaneous food applications** - Dry soups, sweet dessert, canned fish in sauce, frozen food items and others. Guar gum imparts properties of texture, chewiness and body;
- **Cosmetics and pharmaceuticals** - Guar Gum can be used as a thickener, softener or to add lubricity in hair and skin products, toothpaste and other cleansing and bathing products. In compressed tablets, it is used as a binder and disintegrator.

Industrial applications include:

- **Textile industry** - Guar gum's excellent thickening properties are used for textile sizing, finishing and printing;
- **Paper industry** - Guar is used as a wet end additive where it provides very high strength paper strength as well as improved formation and capture of ionic trash;
- **Mining industry** – Guar is used a selective flotation agent;
- **Explosive industry** - Guar is mixed in ammonium nitrate, nitroglycerine and oil explosives where it acts as a binder and helps maintain the explosive properties of the product even in wet conditions;
- **Oil and gas recovery** – Guar gum is used as flow modifier to create a gel suspension to hold sand and water, reduce friction and mobility control. Many polymers are used for this purpose but the most widely used polymers for this purpose is guar gum where it accounts for possibly 90% of all gelled fracturing fluids;
- **Pharmaceutical industry** – as binder or as disintegrator in tablets; main ingredient in some bulk-forming laxatives;
- **Cosmetics and toiletries industries** – thickener in toothpastes, conditioner in shampoos (usually in a chemically modified version);
- **Hydroseeding** – formation of seed-bearing "guar tack";
- **Medical institutions**, especially nursing homes - used to thicken liquids and foods for patients with dysphagia;
- **Fire retardant industry** - as a thickener.

3.1.6.6 Ethanol

The ethanol refinery, adjacent to the sugar mill, ferments the clarified residual juice to around 7-10% ethanol. The low alcohol "beer" that is produced is distilled to produce hydrous ethanol (94% ethanol) and various by-products such as dunder and glycerol, both of which are useful stock feed additives. The remaining water in the ethanol is removed to produce anhydrous ethanol using

molecular sieves. The ethanol refinery is designed to produce 100 million litres per year of anhydrous ethanol which includes some petrol to "denature" the ethanol and render it unsuitable for potable purposes.

Dunder (vinasse) is produced as a by-product of the fermentation process and contains high organic and mineral content. The organics are treated in a biogas plant (see below) which biologically converts the organics to a methane-rich gas. The methane is used to generate electricity via a gas engine. It is also used in the boiler and to generate heat in the meat processing plant.

The dunder can be used as a mineral supplement in stock feed or essential minerals can be recovered by bleeding it into the irrigation system.

3.1.6.7 Biomass pellets

Cane trash is received at 8% moisture from the field. It can be pelleted without any drying costs using semi-dried dunder as a binder with minimal processing costs and low capital. Around 400,000 tonnes per year of biomass pellets can be produced.

The biomass pellets are exported and used to co-fire with coal in large base load power stations to reduce greenhouse gas. Pellets are also widely used in house heaters.

3.1.6.8 Stock Feed mill

The feed mill receives:

- Steamed bagasse and cane tops from the sugar mill;
- Protein meal from the guar gum plant;
- Dunder from the ethanol refinery, if required;
- Molasses is purchased from other sugar mills; and
- Urea is purchased as a protein supplement, if required.

The blended stock feed is stored in outdoor stock piles and is compressed using sheep pad rollers to remove oxygen. The stock pile is covered and a further fermentation reaction takes place leading to enhanced digestibility. Once the stockpiles are opened, stock feed is recovered and baled for delivery to customers.

3.1.6.9 Power station

The power station generates renewable electricity and steam and is designed to provide:

- Internal electricity and steam requirements which are highly seasonal due to sugar mill and irrigation demands – estimated internal peak demand is 40 megawatts; and
- External markets for renewable electricity –around 43 megawatts.

Feedstock for power generation is supplied by bagasse from the sugar mill with biogas also available for combustion. The proposed configuration of the power station is:

- Single boiler with bagasse and biogas burning capabilities operating at 510 degrees Celscius, 85 bar steam conditions and around 400 tonnes per hour of steam;
- Two x 45 megawatts condensing steam turbo generators. Each turbine will be capable of delivering process steam at high pressure and medium pressure;
- A steam by-pass station to provide high pressure and medium pressure process steam; and
- A 3 megawatt biogas fired engine.

3.1.6.10 Meat processing plant

The meat processing plant is intended to produce frozen carcass products using the latest high efficiency hot boning technology. By-products include hides and offal. Blood and bone will be separated, dried and pulverized to be applied as fertilizer for farmed areas intended for organic production.

Tallow will be recovered and converted to biodiesel for site blending with diesel. Wastewater containing high organic matter is pumped to the biogas plant for treatment and recovery of biogas.

3.1.6.11 Biogas plant

A biogas plant will be installed to accept process water from each of the process plants. Water is blended and neutralised in a pre-acidification tank before being pumped to the covered biogas pond. The pond holds process water in anaerobic conditions for around 45 days and is capable of reducing organics expressed as Chemical Oxygen Demand from around 80,000 milligrams per litre to 1,000 milligrams per litre.

The pond is covered with a membrane to facilitate gas collection and is sealed with geotextile membrane to eliminate ground water infiltration. The methane-rich gas is treated to remove moisture/water vapour and hydrogen sulfide (H_2S) to make it suitable for the boiler and gas engine. A back-up flare is installed to burn excess biogas that cannot be consumed.

3.1.6.12 Red claw farm

Red Claw is native to the Gilbert River and is well adapted to the harsh dry tropical climate.

The crayfish feeds on plankton, bacteria and protozoans as well as conventional chicken feed. Unlike prawns and fish, it is not reliant on high protein feedstock and is remarkably suited to co-location with a biogas plant which produces substantial micro-biological by-product.

Commercial production is estimated at 7.5 to 10 tonnes of red claw annually per hectare based on large scale, intensive production systems. The 2,040 pond system has the potential to yield 7,500 tonnes to 10,000 tonnes of red claw annually.

Commercial grow-out uses ½ hectare earthen ponds with sloping bottoms (1.3-1.8m deep) to facilitate drain harvesting. Similar sized juveniles are stocked in prepared ponds at 5-15 animals per square metre. The stock and pond water is carefully managed to maximise growth and animal health.

The ponds are covered about 2.5 metres above ground with netting to eliminate losses due to predation by birds.

Like all crustaceans, red claw moult or shed their shell as they grow. Immediately after moulting, red claw have soft shells and are vulnerable to predation by other crayfish in their pond. Shelter is essential.

Aeration increases the carrying capacity of the ponds, enhances biological growth and feed availability thereby increasing growth rates. Temperature control of water during the cooler winter also offers potential yield increases.

Much of the nutritional requirements can be obtained from natural pond production (e.g. plankton, bacteria and protozoans). This natural production is enhanced by organic and inorganic fertilisation, as long as ammonia (<0.05mg/L) and oxygen levels (>5.0mg/L) remain within the acceptable range.

Red claw are harvested using flow trapping which draws on the animal's natural behaviour. A current of water is directed into the pond through a ramp. Red claw will move into the current, up the ramp and into a harvest box.

Ponds are regularly drained with the nutrient loaded water being recycled to the farm and bled into the irrigation system to act as biologically rich organic fertiliser.

Broodstock selection ensures that individuals displaying desirable characteristics, such as fast growth rate, are able to contribute their genes to the successive generations.

3.1.6.13 Cellulosic ethanol

Environmental and project approval will also be sought for cellulosic ethanol. Significant biomass is available in the traditionally discarded sugar cane tops and trash. This fibrous cellulosic feedstock is available for conversion to ethanol or higher alcohols like butanol.

Current technology consumes 4 tonnes of biomass to produce 1,000 litres of ethanol. Potential exists to produce around 100 megalitres per year of cellulosic ethanol from the excess bagasse and collected tops and trash (400,000 dry tonnes).

Preliminary discussions have taken place with recognised world leaders in cellulosic ethanol technologies with a view to selecting an appropriate technology for implementation in the Bioprocessing Precinct.

3.1.6.14 Biodiesel from tallow

The meat processing plant can generate a tallow by-product which is suitable for biodiesel production.

The farming operation consumes a large amount of diesel which is either imported from Singapore or trucked from refineries in Brisbane. Farm tractors are certified to be able to utilise biodiesel up to a blending limit which opens up the possibility to blend biodiesel and use biodiesel internally to reduce costs.

3.2 Land use

The existing land use in the project area is cattle grazing. The dominant land use in the future will largely remain the same with potential for improved pasture.

Intended changes to land use include:

- Cropping land comprising 1,625 x 40 hectare blocks - 65,000 hectares
- Headlands around each 40 hectare block - 9,750 hectares
    - roads are included
    - drainage lines are included
- Channels - 1,500 hectares
- Bioprocessing Precinct - 240 hectares
- Red claw ponds including embankments and access road - 1,210 hectares
- An additional inundation area of:

- Dagworth Lake - 11,400 hectares
- Dismal lake - 6,000 hectares

The total cleared area is estimated to be around 77,700 hectares excluding land for intensive cattle feeding and dry land cropping (to be determined) and 17,400 hectares under inundation excluding sediment capture and run-off ponds (to be determined) which will undergo intermittent inundation and would not be cleared.

Cropping will comprise around 65,000 hectares concentrated on Kutchera and Chadshunt Stations.

The next largest use will be water storage on Van Lee and Dagworth Stations as well as Huonfels Station. Additional cropping land may be established adjacent to these purpose built lakes.

3.3 Project need, justification and alternatives considered

3.3.1 Project objectives

The objective of the Project is to design, construct and operate the facilities noted in Section 3.1.

3.3.2 Project feasibility studies

IFED has completed preliminary studies and has established a design basis for the Project. The Studies have reviewed:

- Water availability using the Queensland Government's Integrated Quality and Quantity Model for the Gilbert River system.
- Water diversion, storage and channels has been topographically modelled in 3D to enable cut and fill volumes to be estimated. This has been subsequently reviewed on the ground and flyovers.
- Farm design has been based on state of the art trickle irrigation systems developed in the Burdekin on sugar cane and based around two row harvesting - also a state of the art technology - preliminary topographic and aerial photography and ground investigations. A combination of software tools have been integrated to design the farm layout:
  - Global Mapper - geographical information systems;
  - Spatialite - spatial data base management system;
  - EPANET - hydraulic evaluation tool developed by the US EPA; and
  - Aquaflow - trickle tape modelling tool.
- Soil suitability data from prior government surveys has identified various soil types in the project area and highlighted areas for ongoing assessment.
- The Bioprocessing Precinct design and integration of processes is based on conventional sugar milling and downstream processing technologies that are commonly applied in Australia and other tropical and sub-tropical regions of the world.
- Infrastructure including electricity, roads and accommodation options have been reviewed and concepts established for project development.
- Discussions with Council and other community groups such as Ewamian People, Gulf fisherman, CSIRO, Australian Sugar Milling Council, state and federal agencies, townsfolk and property owners have provided further evidence of the project feasibility.

3.3.3 Objectives and priorities of government policies and strategies

The Queensland Government has recognised that the agriculture industry is central to Queensland's economy, employment and food supply. The following are extracts from Queensland Government's

discussion paper - "Queensland's Agriculture Strategy - A 2040 Vision to Double the Value of Production":

*"The Queensland Government is committed to growing agriculture as one of the four pillars of the Queensland economy. We have set a clear and ambitious target to **double production** by 2040 and are determined to meet this commitment."*

*"…**vertical integration** in business models and increased capital investment will be important for future growth".*

*"Four pathways are essential to doubling the value of Queensland's production by 2040..." including, "increasing resource availability …. **Land, Water, Labour, Capital**"*

*"**Regulation** will be **streamlined** to enable long term growth, and our regulatory frameworks will facilitate industry development.."*

*"We have an opportunity to take advantage of underdeveloped land and water resources by identifying **greenfield** development sites…"*

The Discussion Paper envisages a doubling of Queensland's sugar production by 2040, from the current 4.2m tonnes per year to 8.4m tonnes per year. This increase equates to new raw sugar cane production of approximately 30,000,000 tonnes per year. To achieve this new production Queensland will need at least; 300,000 hectares of new land under sugar cane, 3,000,000 megalitres of new water allocations to irrigate it and four new mills to process it. These resources are not available in the traditional cane growing areas. This ambitious but achievable target can only be realised through the creation of greenfield precincts such as the EIAP.

The *State Planning Policy December 2013* protects the resources on which agriculture depends and supports the long-term viability and growth of the agricultural sector.

Other policies supported include:

- Federal - *Australia in the Asian Century* and *National Food Plan;*
- Federal LNP - Northern Australia Development; and
- Federal - White Paper on Northern Development under development.

The *Gulf Regional Development Plan* established in 2000 by the Gulf Regional Planning Advisory Committee proposed an Economic Development Strategy with the following aims:

- promote sustainable economic developments which have a strong competitive advantage;
- establish a regional and coordinated approach to the development of the tourism industry which is ecologically and socially and culturally appropriate whilst supporting the economic development of the region;
- maintain and expand sustainable natural resource based industries consistent with ecological and traditional values;
- sustainable development of small businesses and industries to meet community, tourist and other industry demands;
- establishment of viable and sustainable horticulture and cropping industries for export and to meet local community needs for fresh produce; and
- the establishment of viable and sustainable Indigenous-managed industries.

Strategies and actions proposed included:

- Coordinate a regional approach to economic development by regional economic development officers, and the Indigenous development corporations;
- Develop and implement strategies that will improve the competitive advantage of industries and economic activities in the region;
- Develop a regional tourism strategy that is representative of all interests, including Indigenous groups and the wider community. A priority should be given to utilising existing organisational structures such as the Gulf Savannah Tourism Organisation;
- Promote the timely delivery of land, buildings, infrastructure and services for economic development in each of the Gulf towns; and
- Encourage representation of all interests in the development of the regional economy.

3.3.4 Alternatives to the Project

Alternatives to the proposed Project include:

- Develop along the Gilbert River based on construction of the Green Hills dam;
- Growing other crops;
- Fragmented water allocation;
- Doing nothing.

3.3.4.1 Green Hills Dam

The Green Hills Dam on the Gilbert River and was studied in detail by Sunwater and the Etheridge Shire Council. The Project was initiated by this option but IFED was unable to secure land to undertake the development. Recent efforts by other parties to motivate landowners to promote the Green Hills Dam proposal have also been unable to proceed for the same reasons. Consequently, this Project opportunity is not viable without the resumption of Green Hills Station.

Following IFED's failure along the Gilbert River, the Etheridge Shire Council recommended IFED investigate the current Project area. IFED was able to demonstrate that the current option produced a better outcome with:

- Access to significantly greater average annual flows from the Einasleigh and Etheridge rivers;
- Access to greater and more concentrated, off-river cropping land (reduces Project footprint); and
- World class off-river storage options (eliminates dams).

The Green Hills Dam project and variants on this scheme remain feasible and are to be encouraged. But this project is subject to land resumption. It will be highly compatible with the Etheridge Integrated Agricultural Project.

3.3.4.2 Other crops

Broad-acre cropping in the tropics is limited to a few crops that fit within the agronomic operating window imposed by the harsh dry tropical climate which is characterised by short but intense wet seasons and nutrient deficient soils.

Cotton – a well established, inland crop – has been proposed for northern regions. Despite substantial efforts, cotton has generally failed to reach the potential achieved in southern growing regions. It is a high risk product

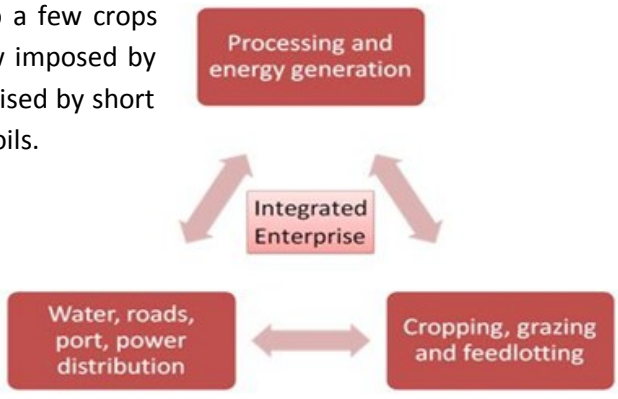

Figure 10 - Linkages between key project elements

given recent Northern Australian experience.

Upland rice has also been proposed for tropical regions. Soils in the Project are well drained and are unsuitable for rice which requires a heavier, slow draining soil type.

Other crops such as **maize and soya bean** can be grown successfully. Significant value can be added through conversion to starch and protein products and other by-products. Substantial advantage can also accrue to the existing pastoral industry with stock feed by-products.

Unlike genuine tropical crops like cane and cassava, very little biomass is generated which creates an infrastructure conundrum. Without co-product biomass, cost effective steam and electricity is unavailable to irrigate the farm and manufacture products.

Cotton, rice, maize and soya bean farming and value-added processing is not considered feasible as a foundation farming venture due to the lack of basic infrastructure. Once IFED establishes the Bioprocessing Precinct, the feasibility of other crops will be enhanced.

3.3.4.3 Fragmented water allocation

Fragmented water allocation is readily achieved by allocating water to land-owners based on a nominal price established through an auction process.

This exercise was recently completed with the allocation of 15,000 megalitres of water along the Gilbert River. Expansion of irrigated land using this water has yet to occur despite the region facing a dire water shortage and water being available in bed sands but the license conditions do not allow the water to be extracted when needed for irrigation.

Creating further water requires large scale investment in the structures such as the Green Hills Dam. Allocating water from a “Green Hills Dam” to numerous land owners (ie fragmented allocation) will not enable the Green Hills Dam to be built since no landowner will be able to justify the construction of the facility on a single allocation.

Fragmented allocation creates a situation where no one group is able to develop water supply facilities or primary processing facilities in the region which are required for sustainable project development.

3.3.4.4 Doing nothing

Doing nothing is not a status quo. External taxpayer-supported funding will be required to maintain regions in the North due to their “remote and disadvantaged” status.

3.3.5 Project advantages

The project delivers a range of economics, social and environmental benefits.

3.3.5.1 Economic benefits

The Project is estimated to deliver an overall net annual benefit to the Australian economy of more than $2.5 billion.

Commonwealth Government stands to benefit from the nation building nature of the Project; expansion of Australia's productive capacity, economic growth, a strengthened current account,

regional and aboriginal employment outcomes; company and Income tax revenue and reduced social outlays.

The Project is fundamental to State Government's four pillars strategy for economic development, and obligations to regional and remote Queensland. State Government stands to benefit from freehold conversion fees, payroll taxes and other duties, water, port and other charges, and reduced local government grants and social support obligations for the disadvantaged region.

This Project will lead to substantially increased Council rate revenue, economic activity, investment, business and employment opportunities, and support for social/community programs.

3.3.5.2 Natural and Social benefits

- Employment of more than 1,000 people and supportive of small business operators and contractors;
- An indigenous employment strategy
- Underwriting economics of existing cattle industry with local market and stockfeed
- Mitigating weather extremes with better bushfire control
- Community facilities developed to support a larger community

3.3.5.3 Environmental benefits

- Sustainable industry – farming, unlike mining, is forever;
- Ecologically sustainable – pest reduction, state of the art irrigation technologies, tropical lake habitat created;
- Reversal of Land degradation and Improved river health due to pest controls and reduced sediment loss
- Reduction in greenhouse emissions through ethanol and renewable electricity

More information on local, state and federal benefits with respect to pest management, employment, investment and industry development is provide in chapter 9.

3.4 Components, developments, activities and infrastructure that constitute the project to be declared a coordinated project

The Project components to be included in the declared coordinated project include:

Water infrastructure comprising diversion, channels, syphons and lakes:

- Departure Diversion Bank
- Departure Channel Gate
- Dagworth Lake Embankment
- Dagworth Lake Discharge Gate
- Etheridge River Barrage
- Dismal Creek Embankment
- Dismal Lake Discharge Gate
- Departure Channel to Dagworth Lake
- Dagworth Lake Western Saddle
- Dagworth to Fiery Creek Channel
- Fiery Creek Channel
- Fiery to Etheridge Channel
- Etheridge Right Bank WSF
- Etheridge River Syphon
- Etheridge Left Bank WSF
- Dismal Hill Channel
- Aurora to Dismal Channel
- Farm Supply Channel

Farm comprising upgraded grazing facilities, broad-acre irrigated cropping facilities:

- Fencing
- Water distribution
- Pest control
- Farm roads including culverts and stream crossings
- Road closures
- Fire breaks
- Vegetation clearing
- Land preparation

- Drainage lines
- Sediment controls
- Water supply channels
- Overland water recycle pits
- Pumps, filtrations and piping systems
- Transmission lines
- Block trickle tape irrigation system
- Dry cropping zones
- Machinery and Machinery sheds
- Fertiliser storage and makedown facilities
- Red Claw ponds
- Red Claw processing shed
- Administration offices
- Canteen and visitor centre
- On-farm accommodation
- Water recycling system

Major process plant

- Sugar mill
- Ethanol refinery
- Cellulosic Ethanol Plant
- Guar mill
- Biogas plant
- Biomass pellet plant
- Stockfeed mill
- Meat processing plant
- Cogeneration plant

Minor process packages

- Cane fibre separation plant
- Cane milling line
- Guar bean silos
- Chemicals storage (C3H6O, NH3,H2SO4, etc)
- Lime handling
- Molasses storage
- Bagasse stockpile
- Cane tops stockpile
- Cane trash stockpile
- Dunder storage, drying and load-out
- Anhydrous ethanol and denaturant facility
- Biodiesel plant

Water, Services and Utilities

- Process raw water supply
- Process filtered water supply
- Process RO water
- Process demineralised water
- Process potable water
- Process gland seal water
- Process cooling water
- Process run-off water sediment pond
- Process sewage treatment
- Process fire water
- Process treated water discharge
- Farm and Process diesel tank farm
- Auxiliary boiler
- Electricity transmission lines off-site
- Plant air
- Process air
- Instrument air
- Process mobile equipment

Process Plant Infrastructure

- Plant roads and drainage
- Precinct Bulk earthworks and drainage
- Office - admin and engineering, lab, control room
- Canteen and change room
- Workshops
- Spare parts storage shed
- Process maintenance facilities
- Vehicle, truck and tractor maintenance facilities
- Chemical storage
- Raw sugar shed
- Guar been storage shed
- Lab
- Control room
- Maintenance equipment fit-out
- Truck weighbridge
- Fire truck station and fire truck
- Container holding yard
- Truck Stop
- Diesel load-out
- Truck fuelling station
- Vehicle fuelling station

General Infrastructure

- Bulk earthworks and drainage for the village
- Roads off-site
- Village units including admin office, mess hall
- Construction camp/s incl power, water, sewage
- Social and community
- Communications and data infrastructure
- Water assets, Farm and Process Plants control system
- Village fire water system
- Village sewage connection

- Municipal Waste disposal
- Security building, fences, process plant and village

Construction Services Support

- Construction offices
- Common contractor facilities
- Survey
- Medical Services
- Geotech , soil testing
- Warehouse operations
- Project security
- Vendor rep costs
- Major construction cranage
- Road and building maintenance
- Camp management and catering
- HSE
- Commissioning support
- Construction camps in the Farm and water storage facility areas
- Fuel for construction

3.5 External infrastructure requirements

External infrastructure requirements outside of the Project Approvals include:

- Road upgrades to permit trucks to stay on the bitumen in both directions ie fully sealed road;
- High voltage transmission lines upgraded to permit export of renewable electricity from the region;
- Barge landing facility at Karumba or Normanton to unload pre-assembled modules of up to 3,700 tonnes;
- Sugar terminal and Port upgrade; and
- Community infrastructure.

3.5.1 Roads

On-going road upgrades to support road trains:

- Gulf Developmental Road, sections not fully sealed;
- Forsyth and Einasleigh Roads (upgrade to road train routes), sections not sealed; and
- Gregory Developmental Road, sections not fully sealed.

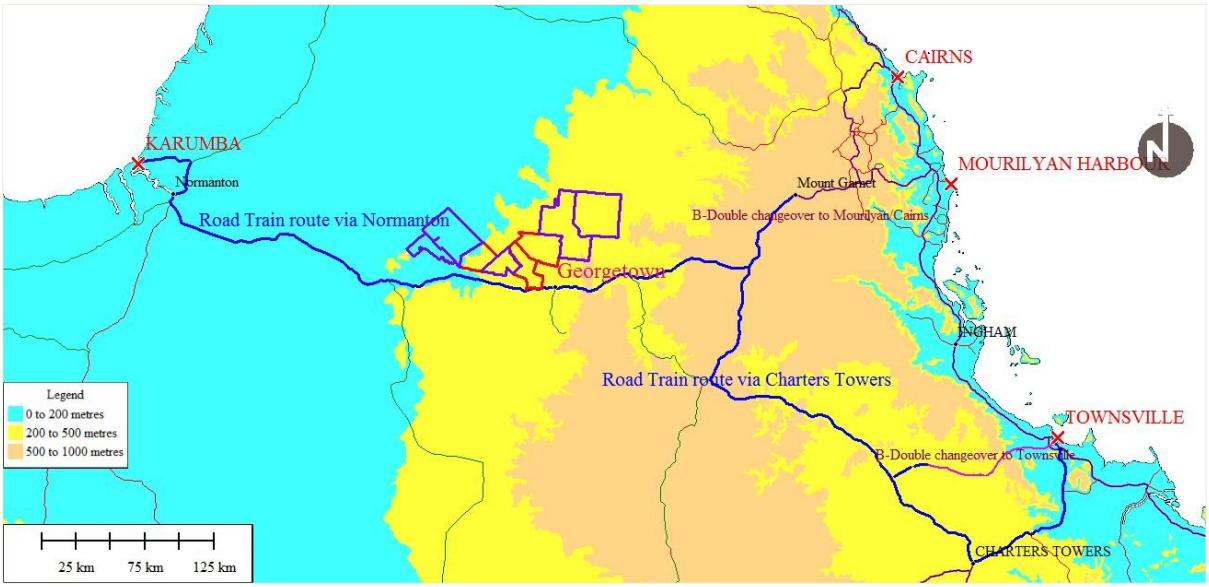

Figure 11 - Key road routes supporting road trains and B-doubles.

3.5.2 High voltage transmission lines

A 66 kilovolt transmission line connects to a 132 kilovolt transmission line at a sub-station near Georgetown. The power line needs to be upgraded from 66 kilovolt to 132 kilovolt from the Project Bioprocessing Precinct to the substation to enable full export of renewable electricity.

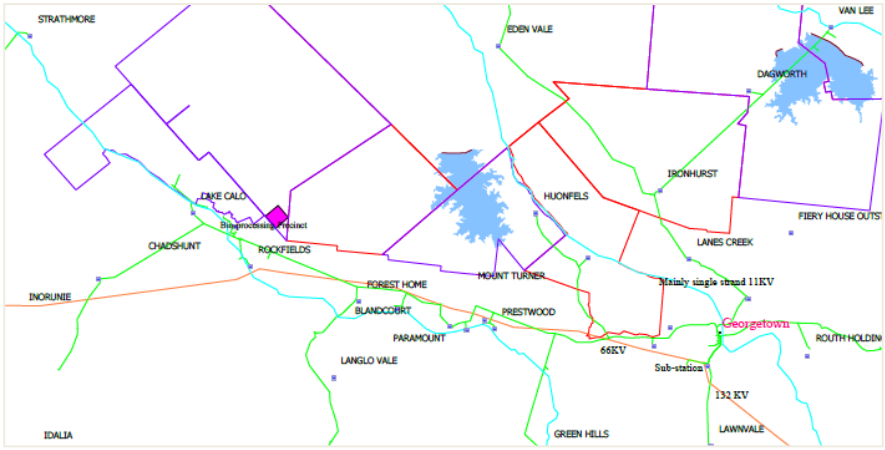

Figure 12 - High voltage power lines (red is 66/132KV, green is 11KV, single strand)

3.5.3 Community infrastructure

Etheridge Shire Council has identified a range of investments that would facilitate the viability and growth of irrigated agriculture in the region and facilitate broader regional development outcomes.

Item	Rationale
Replacement of Gilbert River bridge	Improves access into and out of the northern Gulf Savannah region and the Port of Karumba during the wet season
Upgrade of Gilbert River Power Supply	Provision of 3-phase power to irrigators to improve the economics of irrigated agriculture
Upgrade of Hann Highway	To improve access into southern markets for Gulf Savannah products
Establishment of Gulf Savannah Agricultural College	A 'virtual' college to develop appropriate skills among the local community in terms of irrigated agriculture and grazing and promote retention of youth in the region
Upgrade of Health Services	To support the increase in population likely to result from irrigated agriculture
Nursing Home	To meet a need across the Gulf Savannah for aged care services
Secondary School	To meet a need across the Gulf Savannah for a local middle and secondary school.
Police station upgrade	To meet a need across the Gulf Savannah for increased policing
Improved Housing Supply	Private investment to meet regional expansion and public investment for teacher, police and other non-resident, non-permanent service providers.
Georgetown Airport Upgrade	Expanded tarmac to enable larger aircraft to be able to land and take-off.
Indigenous Training and Employment Initiatives	To facilitate indigenous participation in the agricultural economy
Upgrade of Port Karumba/Normanton airport	To facilitate export of product from the Gulf Savannah and improve the international competitiveness of Gulf

Item	Rationale
	Savannah product
Mobile Phone coverage at Gilbert River	To improve operational efficiency of Gilbert River producers
Rail connections	To reduce road maintenance, lower logistics cost and increase port productivity
Port of Karumba	To enable the rich northern mining province to be exploited and avoid shipping through the Great Barrier Reef and reduce shipping times to key growth markets like Indonesia.

3.5.4 Northern Australian Development

Rail connections and port upgrades are needed for northern development but are not included in this Project.

Karumba port has the potential to reduce around 1,200 kilometres of road and sea travel. This will also reduce shipping along the East Coast through the Great Barrier Reef.

Figure 13 - Shipping options via Townsville and Karumba

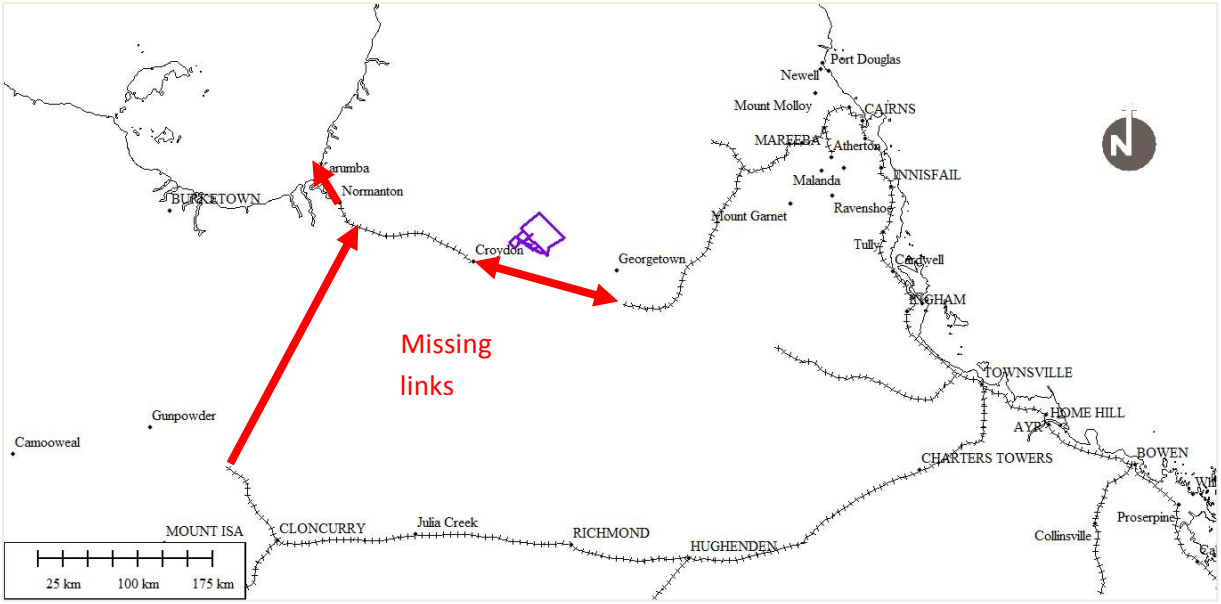

Figure 14 - Rail options are limited due to missing links

3.6 Timeframes for the Project

Subject to government approvals and funding, it is intended to commence Project site works in mid 2015, with sugar products being produced from mid 2018. Further works will include:

- Completion of farm development – 2019
- Installation of biodiesel refinery – 2019
- Installation of cellulosic ethanol refinery – subject to partnering and financing arrangements
- Installation of the Red Claw farm – subject to partnering and financing arrangements

3.7 Construction and operational processes

3.7.1 Key construction processes

Key construction processes that will need to be considered include:

- Aerial photography
- Digital elevation model
- Safety and health
- Office establishment
- Community integration and impact management
- Handling and transport of pre-assembled modules from a landing port to site
- Local road upgrades, installation and on-going maintenance to enable construction workers and machinery to be delivered to/from site
- Truck fuelling and maintenance depots
- Dust management
- Access to water for civil works construction – early works to create minor water storages
- Access to river sand for construction works
- Vegetation clearing and burning to recover nutrient
- Access to water for farm start-up – Dismal Lake development
- Widespread earthworks to create channels and water storage
- Stream crossings and culverts
- Sourcing and transport of construction materials including equipment, fabricated steel structures, cement, pipes and raw materials for in-situ pipe fabrication
- Port clearance
- Personnel travel and accommodation
- Communication system installation
- Construction power systems for construction and accommodation
- Re-location of power lines
- Water Quality Management
- Air quality/dust management
- Soil management and run-off during the wet season
- Site management during cyclonic and flooding events
- Waste management and disposal
- Emergency services access
- Training
- Indigenous support
- Construction offices
- Common contractor facilities
- Survey
- Medical Services
- Geotechnical drilling, soil testing and interpretation
- Warehouse operations
- Project security
- Major construction cranage
- Camp management and catering
- Container holding yard
- Truck weighbridge
- Fire truck station and fire truck

3.7.2 Key operational processes

Key operational processes that will need to be considered include:

- Safety and health
- Community integration and impact management
- Local road upgrades, installation and on-going maintenance including flood repair
- Truck fuelling and maintenance depots
- Dust management
- Maintenance of stream crossings and culverts and weed management
- Pest management
- Sourcing and transport of operating materials especially propylene oxide
- Personnel travel and accommodation
- Water Quality Management
- Soil management and run-off during the wet season
- Site management during cyclonic and flooding events
- Waste management and disposal
- Emergency services access
- Training

- Indigenous support
- Medical Services
- Warehouse operations
- Site security
- Seasonal village management and catering
- Container holding yard
- Truck weighbridge
- Fire truck station and fire truck
- Potable water supply and fire fighting
- Sewerage and waste disposal
- Power from/to HV mains and back up supply
- Transport and delivery of goods and produce
- Daily transport and/or parking for the work force.
- Transport and parking for visitors to the Visitor Centre
- Water quality management
- Stormwater drainage management
- Air quality and dust management

3.7.3 Rehabilitation

Unlike mining, farming goes on forever. If shutdown occurs, then land will be seeded and returned to pasture to support pre-existing grazing land use.

Sugar mill shutdowns have occurred after many decades of operation and following consolidation into larger units. Examples of a recent sugar mill shutdown in Bundaberg show that farms transition to higher value crops and alternative uses for the sugar mill are found. For example, parts of Bingera Mill have been converted to macadamia processing.

3.8 Workforce requirements during construction and operation

Construction takes around four years for completion of the farm whilst other facilities are completed and operations within three years. The estimate of total jobs at construction peak is 1,780 and 1,034 during operations.

3.8.1 Employment opportunities

Construction personnel are expected to be:

Area	Year 1	Year 2	Year 3	Year 4
Water Assets	450	450	100	
Land preparation	150	250	250	150
Farming during construction	50	150	250	300
Bioprocessing Precinct	450	850	850 (6 mths)	
Infrastructure	40	80	40	40
total	**1,140**	**1,780**	**1,490**	**490**

Operating personnel are expected to include:

Area	Year 1	Year 2	Year 3	Year 4
Farm operations				
workers/contractors	100	150	350	400
management	35	65	90	99
Process plants				
workers/contractors	0	0	76	76

management	10	25	31	31
Meat processing				
workers/contractors	0	0	75	275
management	5	10	25	25
Freight	25	35	50	103
Corporate	5	10	25	25
Total	**180**	**295**	**722**	**1034**

3.8.2 Worker accommodation

Three tiers of accommodation will be required to meet construction and long term needs.

- Temporary construction camps will house around 1,250 workers at peak
- Seasonal village which will also be used for construction and seasonal activities will house around 500 people
- Residential development in Georgetown will house a further 450 workers

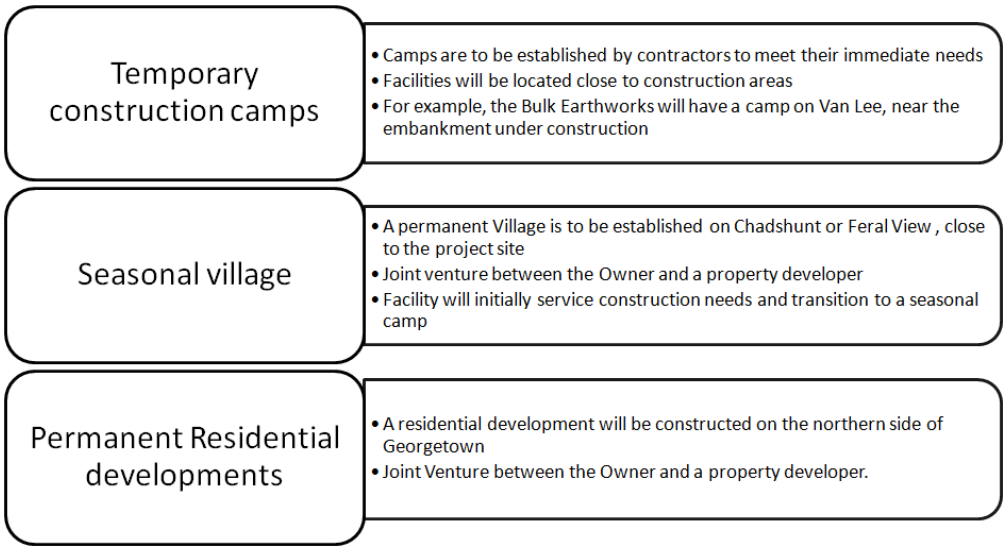

Figure 15 - Accommodation options proposed for the Project

3.8.2.1 Temporary accommodation

Temporary construction accommodation will be constructed at:

- Van Lee Station in the vicinity of the existing homestead;
- Kutchera Station where a number of small contractor camps will be established; and
- Chadshunt or Feral View Station initially established for construction workers but will be converted to a permanent village for seasonal workers, tourists, backpackers and other visitors eg consultants, inspectors, etc.

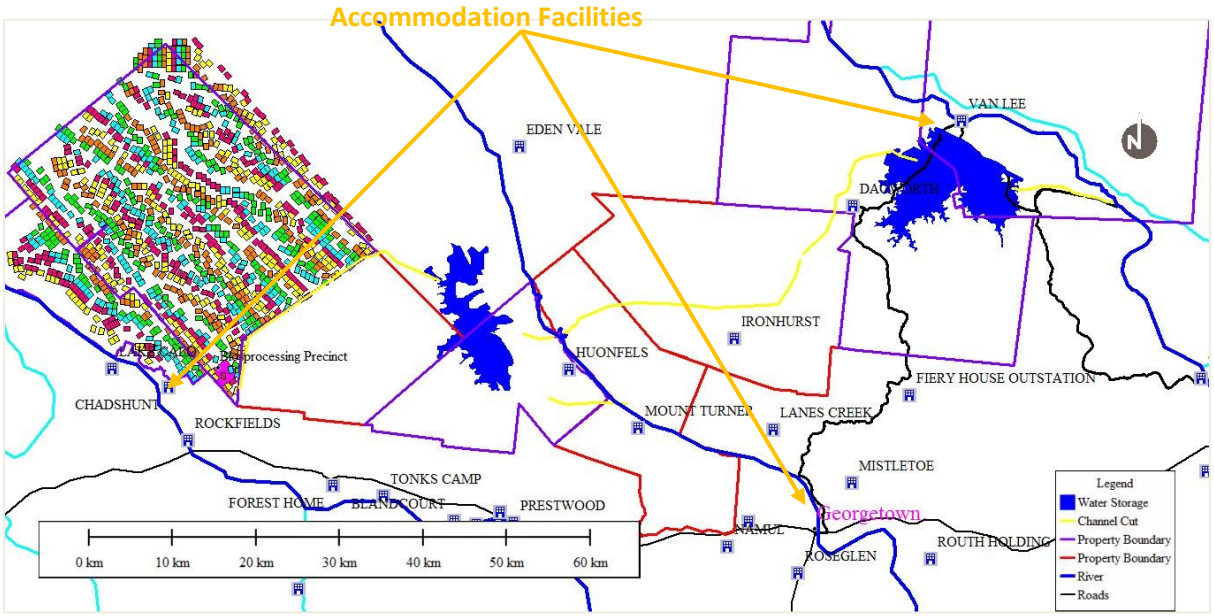

Figure 16 - Project facilities including accommodation locations, property boundaries and existing homesteads.

Two landowners have put forward property development options:

- Georgetown Residential Development; and
- Site village for seasonal workers at Feral View Station

3.8.2.2 Residential development in Georgetown

Georgetown is located 43 minutes drive from the Project site. Permanent staff are expected to be located in Georgetown and an increasing number of contractors will also locate in Georgetown.

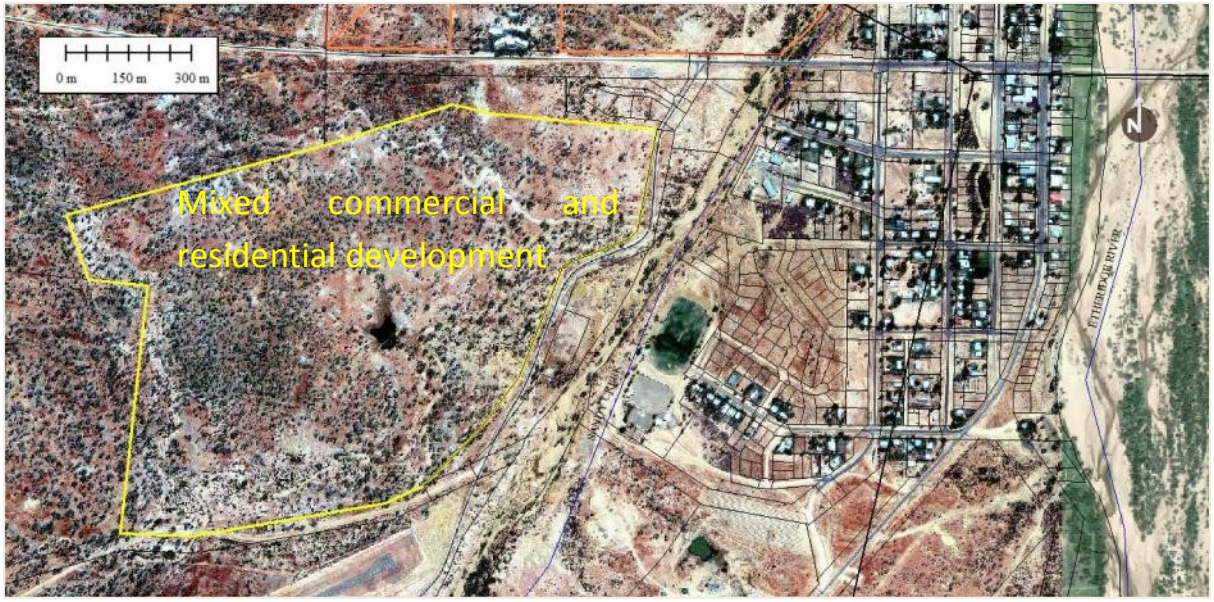

Figure 17 - Site of potential Georgetown mixed commercial and residential development

The township is limited in its ability to expand due to its location between two streams – Etheridge River and Sandy Creek – which constrain land availability.

A large number of town blocks are available, however, lack sewage and water. The cost of developing these blocks will be a constraint to their development until the town – as a whole – is converted to sewered systems.

Preliminary discussions with an architect indicate that conceptual designs can be produced and used to attract investment from an appropriate partner.

3.8.2.3 Chadshunt/Feral View Seasonal Village

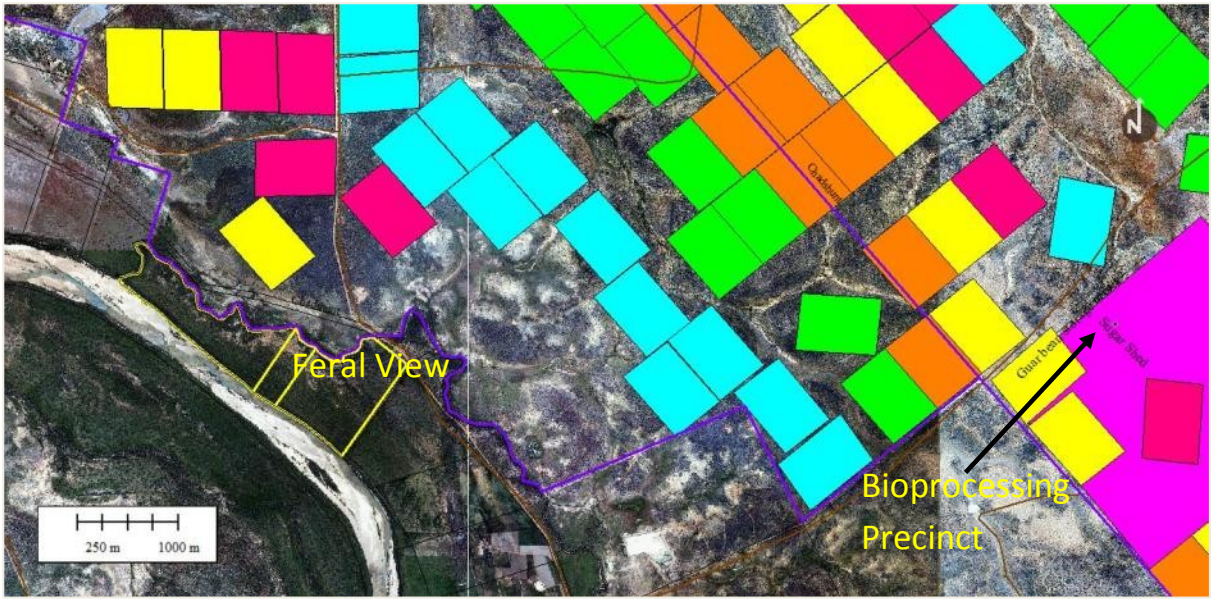

Figure 18 - Feral View Station Seasonal Village location relative to the Bioprocessing Precinct and 40 hectare farm blocks

A large seasonal village is required to hold:

- Farming contractors – around 100;
- Meat workers - around 300; and
  Other contractors – around 100.
-

The proposed site (yellow outer boundary) at Chadshunt or Feral View Station is also suitable to be used as a construction village. A private road to the Bioprocessing Precinct will be established.

3.8.3 Transport proposals

3.8.3.1 Construction phase

Although Georgetown is centrally located with respect to key facilities, daily travel time to work sites is likely to be excessive. Large scale construction requires personnel to be close to site for maximum effective working hours.

The large workforce will require a fly in, fly-out capability to enable suitable personnel to be efficiently transported to site. Details of arrangements will be developed during the Study Phase of the Environmental Impact Study but will look at the option of a temporary upgrade of an existing station landing strip (Dagworth/Van Lee) as well as utilisation of the existing Georgetown airport.

Personnel will be bussed to site-based accommodation and transferred to work using site-based vehicles.

3.8.3.2 Operations phase

Subject to commercial viability, Bioprocessing Precinct workers will have the option of a bus at the start and end of shift to Feral View and Georgetown.

3.9 Economic indicators

3.9.1 Capital cost

Capital cost is estimated at $1,977 million. Key components of the Project will start production in 30 months. Farm construction will take up to four years.

3.9.2 Revenue and Exports

The Project revenue is expected to be approximately $1,000 million although will vary with commodity prices, especially sugar.

Major Products	Units	Quantity	Market
Raw sugar	Tonnes	535,000	Export
Ethanol	Litres	100,000,000	Domestic
Cellulosic ethanol	Litres	100,000,000	Domestic
Guar gum	Tonnes	32,000	Export/domestic
Stock feed	Tonnes	404,000	Domestic
Electricity	megawatts	358,000	Domestic
Meat & co-products	Head	200,000	Export
Red Claw crayfish	Tonnes	1,000	Export

3.9.3 Contribution to the Local, State and National Economy

The economy of the Gulf Savannah is heavily reliant upon natural resource-based industries, particularly agriculture. Agriculture is the second most important industry in the North Queensland economy on the basis of contribution to the value of gross regional product. Most of the revenue generated remains in the regional economy.

Agriculture is by far the most important employer in the Gulf Savannah and is, therefore, even more important socially than economically. The relatively high employment multipliers of agricultural sectors (particularly when compared to mining) mean that revenue changes in that sector have a large impact on other sectors of the economy. The larger the agricultural sector relative to region's economy, the effect will be disproportionately greater.

Based on multipliers derived from the 2003 report "Natural Resource Management in the Burdekin Dry Tropics: Social and Economic Issues Report for the Burdekin Dry Tropics", the output multipliers and relevant outputs are shown below.

- Local region multiplier : 1.5
- Queensland multiplier : 2.3
- Australian multiplier : 2.7

Year	Project expenditure $M	Sales Revenue $M	Total $M	Gulf Savannah multiplier at 1.5 $M	Qld multiplier at 2.3 $M	Australian Multiplier at 2.7 $M
2016	420	-	420	630	966	1,134
2017	986	-	986	1,479	2,268	2,663
2018	427	433	859	1,289	1,977	2,321
2019	137	868	1,005	1,507	2,311	2,713
2020	14	885	899	1,349	2,069	2,429
2021	15	902	917	1,376	2,110	2,476
2022	15	920	935	1,403	2,151	2,525
2023	15	938	954	1,430	2,193	2,575
2024	16	957	972	1,459	2,237	2,626
2025	16	976	992	1,487	2,281	2,677
2026	16	995	1,011	1,517	2,326	2,730
2027	16	1,015	1,031	1,547	2,372	2,784
2028	17	1,035	1,051	1,577	2,418	2,839
2029	17	1,055	1,072	1,608	2,466	2,895
2030	17	1,076	1,093	1,640	2,515	2,952
2031	18	1,097	1,115	1,672	2,564	3,010
2031	18	1,119	1,137	1,705	2,615	3,070

3.9.4 Indirect Employment

Row intensive, broad-acre farming has a very successful track record in building rural communities. Farming operations are amenable to small business operators.

For example, approximately 26 sugar cane harvesting crews will be established. Each contractor will employ approximately five personnel to carry out the operations. Similar outcomes will also occur with planting, cultivation and other farm activities.

Detailed estimates for indirect employment will be established during the Environmental Impact Study.

3.9.5 Synergies with other businesses and industries

The Project will enable a region-wide improvement in the economic position and stability of existing cattle stations. Production of stock feed and the meat processing facility will benefit the wider community by:

- Shared benefit from lower delivery costs for cattle;
- Sell-down of lower value, older cattle which currently die in the field;
- Age distribution of cattle lowered leading to higher weaner rates (a major driver of profitability);
- Stock feed availability reduces or eliminates dry season weight loss enabling out of season sales and higher prices (ie avoid the peak sales and lowest prices in May /June after the wet season);
- Net benefit from weight gain using stock feed – based on 1,000 head of cattle – is around $770 per day over the dry season;
- Diminishes dependency on live exports and long hauls to southern processing centres; and
- Higher property valuations (increased rates) due to preferred location with access to market and stock feed.

Supply of electricity will improve the economics of mining in the region which is regarded as the mot prospective and underdeveloped in Queensland.

Local electricity production will reduce the cost of subsidies for the regional supply of electricity which provides further encouragement to state government to promote mineral development in the Gulf province.

The Project contributes to the viability of the Port of Karumba - a key Queensland port to remove freight traffic from the East Coast.

3.10 Financing requirements and implications

3.10.1 Capital cost

The capital cost is estimated to be approximately $1,977 million financed from shareholder equity, operating cashflow and debt.

Further capital will be spent on cellulosic ethanol following start-up and confirmation of available cellulosic material and an appropriate investment partner. Recent cellulosic ethanol projects have cost in the order of $350,000 per megalitre and have been strongly supported by government "pioneer" funding.

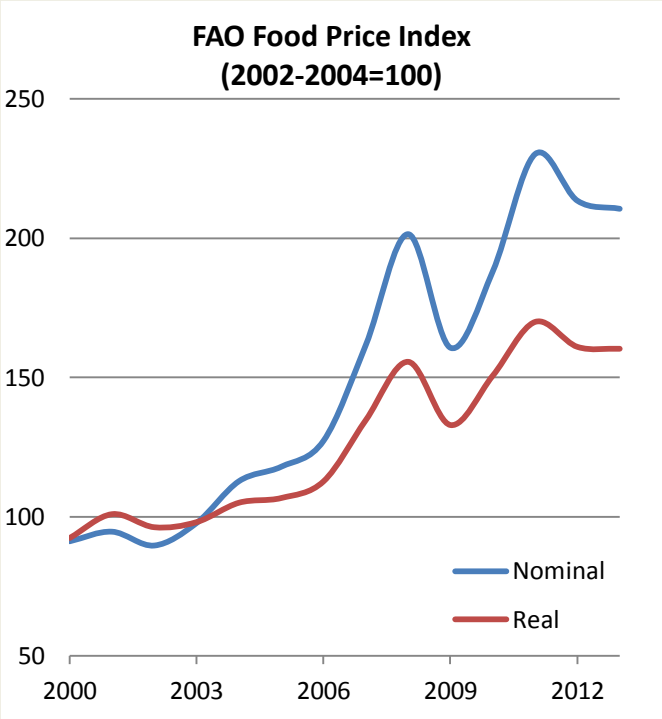

Figure 19 - FAO Food Price Index

3.10.2 Funding

IFED has received advice that equity financing is feasible due to the strong demand for carbohydrate, ethanol and other co-products. This is supported by recent takeovers of Australian agri and food companies.

The Queensland sugar industry has undergone a major transformation through a series of takeovers in recent years reflecting global interest in carbohydrate.

More recently, the attempted takeover of Graincorp and other iconic Australian agricultural infrastructure, food and trading enterprises highlights a precarious global food position.

This has been fuelling aggressive mergers and acquisitions and Greenfield investment in food and agri assets.

Australia is the only developed country in the tropical world located in the fast growing Asian region that can substantially increase agricultural output to meet the growing net regional deficits in carbohydrate and protein.

4 Location of Project elements

4.1 Location

4.1.1 Address

IFED's address is:
PO Box 2406
Ascot Qld 4007

4.1.2 Lot/Plan details

Lot on Plan details reflect the Queensland Digital Cadastral Database which do not correlate with fenced areas. Fence lines are generally accepted as the correct property boundary.

Property	County	Locality	Parish	Lot	Plan	Area Ha	Plan Area Ha
Van Lee	Einasleigh	Abingdon Downs	Dwella	5026	PH251	3,679	
Van Lee	Bolwarra	Abingdon Downs	Aylesbury	5026	PH251	2,395	
Van Lee	Bolwarra	Abingdon Downs	Aylesbury	5026	PH251	29,527	
Van Lee	Einasleigh	Abingdon Downs	Dwella	5026	PH251	95	
Van Lee	Bolwarra	Abingdon Downs	Aylesbury	5026	PH251	1,583	
Van Lee	Einasleigh	Abingdon Downs	Dwella	5026	PH251	4,769	
Van Lee	Einasleigh	Abingdon Downs	Dwella	5026	PH251	14,269	
Van Lee	Bolwarra	Abingdon Downs	Anglesey	5026	PH251	39,214	
Van Lee	Tate	Abingdon Downs	Cumbana	5026	PH251	3	**96,600**
Van Lee	Bolwarra	Abingdon Downs	Aylesbury	507	CP865042	9	**9**
Dagworth	Byerley	Abingdon Downs	Ancaster	5	EI813291	16,118	
Dagworth	Einasleigh	Abingdon Downs	Dynan	5	EI813291	45,581	
Dagworth	Einasleigh	Abingdon Downs	Yataga	5	EI813291	29,325	
Dagworth	Einasleigh	Abingdon Downs	Yataga	5	EI813291	6,397	**97,600**
Ironhurst	Einasleigh	Georgetown	Lane Creek	4533	PH1199	1,832	
Ironhurst	Einasleigh	Georgetown	Lane Creek	4533	PH1199	18	
Ironhurst	Einasleigh	Georgetown	Lane Creek	4533	PH1199	11,268	
Ironhurst	Einasleigh	Georgetown	Lane Creek	4533	PH1199	38,226	
Ironhurst	Einasleigh	Georgetown	Lane Creek	4533	PH1199	918	
Ironhurst	Einasleigh	Georgetown	Lane Creek	4533	PH1199	68	**52,500**
Mt Turner	Gilbert	Georgetown	Georgetown	28	EI3	4,451	
Mt Turner	Gilbert	Georgetown	Georgetown	28	EI3	11,128	
Mt Turner	Einasleigh	Georgetown	Lane Creek	28	EI3	17,269	
Mt Turner	Einasleigh	Georgetown	Lane Creek	28	EI3	2,308	**35,600**
Mt Turner	Gilbert	Georgetown	Darcy	19	GB74	1	**1**
Huonfels	Gilbert	Georgetown	Darcy	214	PH2125	26,013	
Huonfels	Gilbert	Georgetown	Darcy	214	PH2125	797	**26,400**
Midhills	Etheridge	Georgetown	Forest Home	2034	PH568	31,873	**31,300**
Kutchera	Etheridge	Strathmore	Kutchera	2248	PH2034	80,387	**81,300**
Chadshunt	Etheridge	Gilbert River	Cobran	38	ET813287	6,424	
Chadshunt	Etheridge	Gilbert River	Cobran	38	ET813287	6,466	

Property	County	Locality	Parish	Lot	Plan	Area Ha	Plan Area Ha
Chadshunt	Etheridge	Gilbert River	Cobran	38	ET813287	3,093	
Chadshunt	Etheridge	Gilbert River	Cobran	38	ET813287	82	
Chadshunt	Etheridge	Gilbert River	Cobran	38	ET813287	1,108	
Chadshunt	Etheridge	Gilbert River	Cobran	38	ET813287	41	
Chadshunt	Etheridge	Gilbert River	Cobran	38	ET813287	7,408	**24,500**

Note: The shaded properties represent easement properties.

4.1.3 Project Areas

The total area of the five core properties is 326,460 hectares. Cropping properties are located in the lower elevation areas whilst water is captured and efficiently supplied from a higher elevation.

Property	Core Use	Area Hectares	Available Cropping Area Hectares
Chadshunt	Cropping	24,554	15,000 to 17,000
Kutchera	Cropping	81,000	55,000 to 70,000
Dagworth	Water storage	97,600	5,000 to 10,000
Van Lee	Water diversion/storage	96,906	5,000 to 10,000
Huonfels	Water diversion/storage	26,400*	5,000 to 10,000
Ironhurst	Channel Easement		
Mid Hills	Water storage/Channel easement		
Total		**326,460**	**85,000 to 117,000**

The properties include a 46km stretch of the Einasleigh River near the town of Georgetown in North Queensland's Gulf Savannah region. It also straddles 17 km of the Etheridge River and 32 kilometres of the Gilbert River.

There is potential that this land area will increase with lease boundary re-alignments schedule for finalisation in 2015.

The total cropping zone is estimated to be between 85,000 to 117,000 hectares. The Project is targeting 65,000 hectares for irrigation. Potential beyond this will be explored in the course of further studies.

4.1.4 Major and secondary urban centres

The Shire of Etheridge is a local government area in Far North Queensland, Australia in what is known as the Gulf Savannah region. Its economy is based around cattle grazing and mining. It covers an area of 39,332 square kilometres and has existed as a local government entity since 1882. Etheridge Shire is roughly 2/3 the size of mainland Tasmania.

Georgetown is a town on the Etheridge River in Far North Queensland, Australia. It is the administrative headquarters of the Shire of Etheridge, a local government area encompassing the nearby settlements of Mount Surprise, Forsayth and Einasleigh. At the 2006 census, Georgetown had a population of 254. The town has a public library, racecourse, swimming pool and a tourist information centre and camping/caravan park.

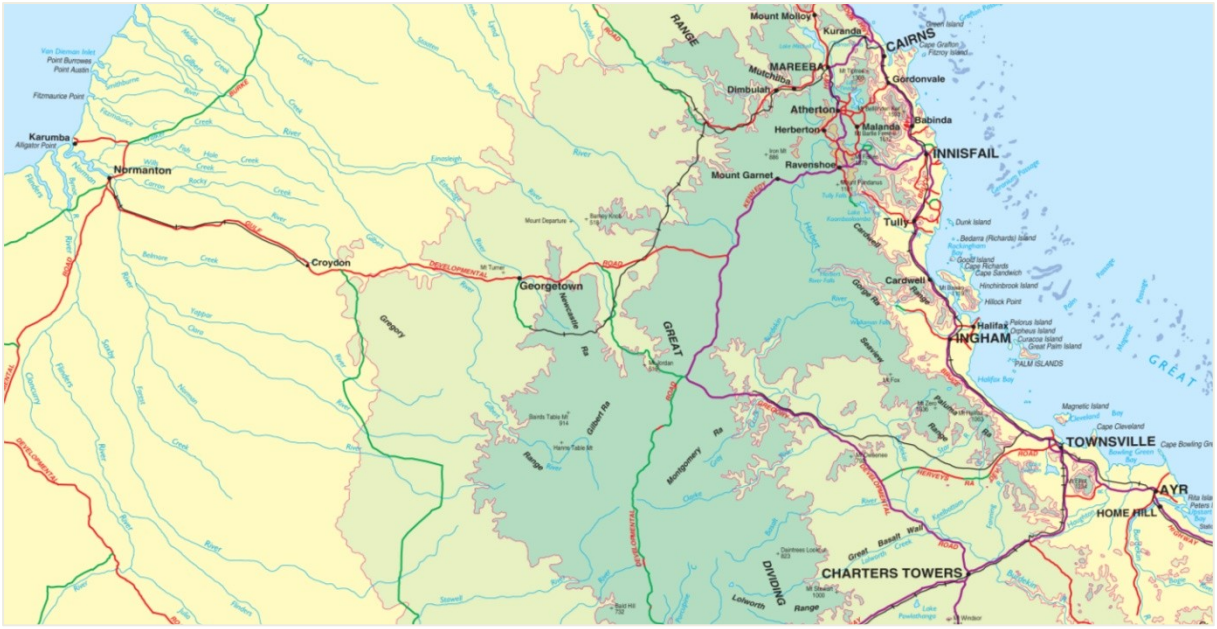

Figure 20 - Regional Map

4.1.5 Access

The Gulf Developmental Road passes through the town, linking Cairns - 412 km to the east - and Normanton - 301 km to the west. Distances and travel times to major centres and ports:

From Georgetown to	By Road		By Air
	Distance Kms	Time - hrs	Time - Hrs
Cairns	450	5	1
Townsville	540	5.5	1
Mourilyn Port / Innisfail	410	4.5	1
Karumba	320	3.5	1
Brisbane	1,800	21.5	3

There is a small airport at Croydon and Georgetown operated by the Etheridge Shire Council. Further discussion on management and operation of the airport will be undertaken during the pre-construction phase of the project to upgrade the airport and encourage scheduled flights.

Rail lines link Croydon to Normanton and Forsayth, Einasleigh and Mount Surprise to the east coast. The Croydon to Normanton rail line is often the only land-based connection between these two towns during the Wet Season, as the road is closed before the rail line. The rail line from Forsayth to the east coast is in poor condition and incapable of transporting bulk goods.

4.1.6 Natural features in the vicinity of the Project

The key natural feature of the region is the Gilbert River catchment. The Gilbert River drains into the Gulf of Carpentaria. The catchment is characterised by large seasonal rivers:

- Etheridge River – tributary of the Einasleigh River;
- Einasleigh River – tributary of the Gilbert River; and
- Gilbert River.

The Smithburne - Gilbert Fan Aggregation is a wetland that commences around 50 kilometres below the junction of the Einasleigh and Gilbert River. The Burke Development Road bisects the southern end of the wetland area.

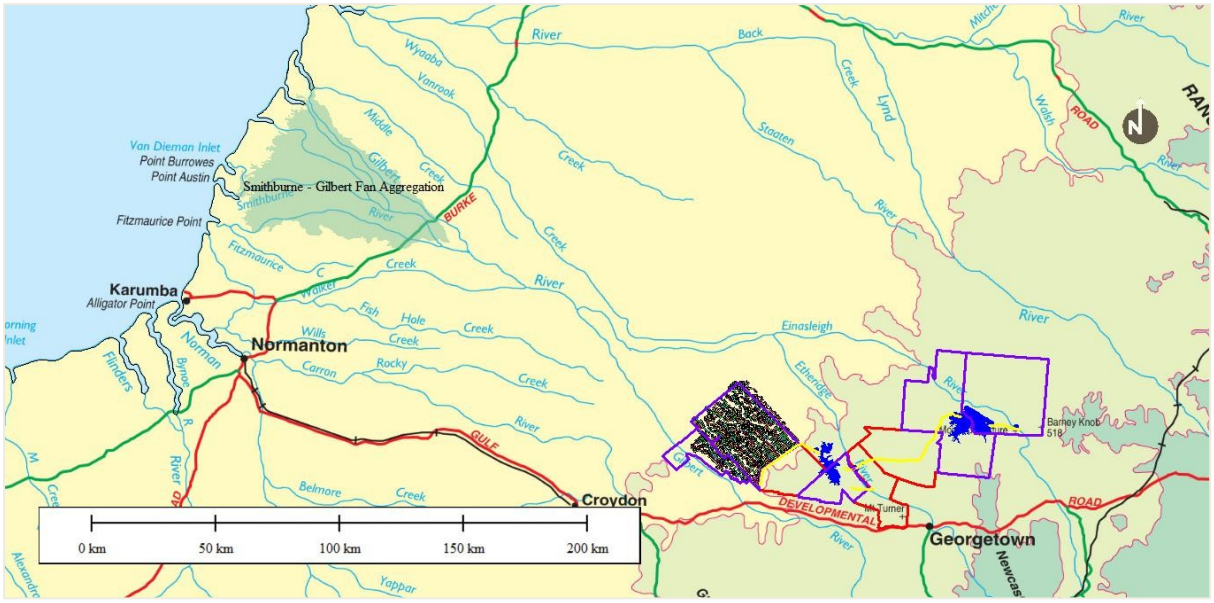

Figure 21 - Location of the Smithburne - Gilbert Fan

Whilst disturbance associated with grazing is moderately high, very heavy infestations of Rubber Vine occur along the watercourses and adjacent flats and extensive local infestations of Calotropis gigantean and feral pigs are numerous. Despite this, it contains ecologically valuable alluvial plain wetlands.

Coastal floodplain lagoonal wetlands provide important dry season habitat especially for species such as the green pygmy goose (Nettapus pulchellus) and wandering whistling-duck (Dendrocygna arcuata). The seasonally rich shallow wetlands provide important breeding and post breeding habitat for cranes and several waterfowl species. It is thought to be the most important breeding area for the sarus crane (Grus antigone) in Australia.

4.2 Tenure

The primary land use throughout the Project area is agriculture, mainly beef cattle farming, with some small areas used for cropping and mining. The predominant tenure types to be purchased by the Project are pastoral lease.

These land parcels will be converted to freehold to provide the Project investors with full security over land. Consequently, cadastral survey and cultural heritage will be undertaken to support the conversion process from leasehold to freehold.

Property	Current Tenure	Purpose	Future status/tenure
Van Lee	Pastoral Lease	Water diversion and storage	Freehold
Dagworth	Pastoral Lease	Water storage and channel	Freehold
Ironhurst	Pastoral Lease	Channel	Easement
Mt Turner	Pastoral Lease	Channel	Easement
Huonfels	Pastoral Lease	Water storage and channel	Freehold

Property	Current Tenure	Purpose	Future status/tenure
Mid Hills	Pastoral Lease	Channel	Easement
Kutchera	Pastoral Lease	Cropping/ and Bio-processing	Freehold
Chadshunt	Pastoral Lease	Cropping	Freehold
Rocky View	Pastoral Lease	Corridor along the boundary	Easement

4.3 Shire Planning Scheme

Relevant land use and planning aspects of the Project will be assessed against the Etheridge Shire Planning Scheme. The scheme pre-dates the *Sustainable Planning Act 2009*. Should an updated draft Planning Scheme be available for public comment at the time of preparing the Environmental Impact Statement, the relevant provisions of this document will be given consideration in assessing the land use impacts of the Project.

The Project properties are zoned as Rural which is intended to provide for, and accommodate, a range of agricultural (predominantly cattle grazing) uses.

A material change of use will be required reflecting the change to Intensive Agriculture which is code assessable A defined use or use class identified as code assessable requires an application and a Development Permit before building work can commence.

Defined uses or use classes subject to code assessment will be assessed against the applicable Codes. Where the Probable Solutions in a Code are not complied with, applicants shall provide evidence that the Specific Outcomes of the Codes can be achieved.

Figure 22 - Etheridge Shire Council

The Planning Rural Zone objectives for Intensive Agriculture notes that Intensive Agricultural uses, whether temporary or of short duration, will be considered ancillary to an Animal Husbandry use. Long term or permanent Intensive Agriculture will only be supported where there is an economic benefit to the Shire and the environmental impacts of such use can be managed satisfactorily and the use can be demonstrated to be ecologically sustainable;

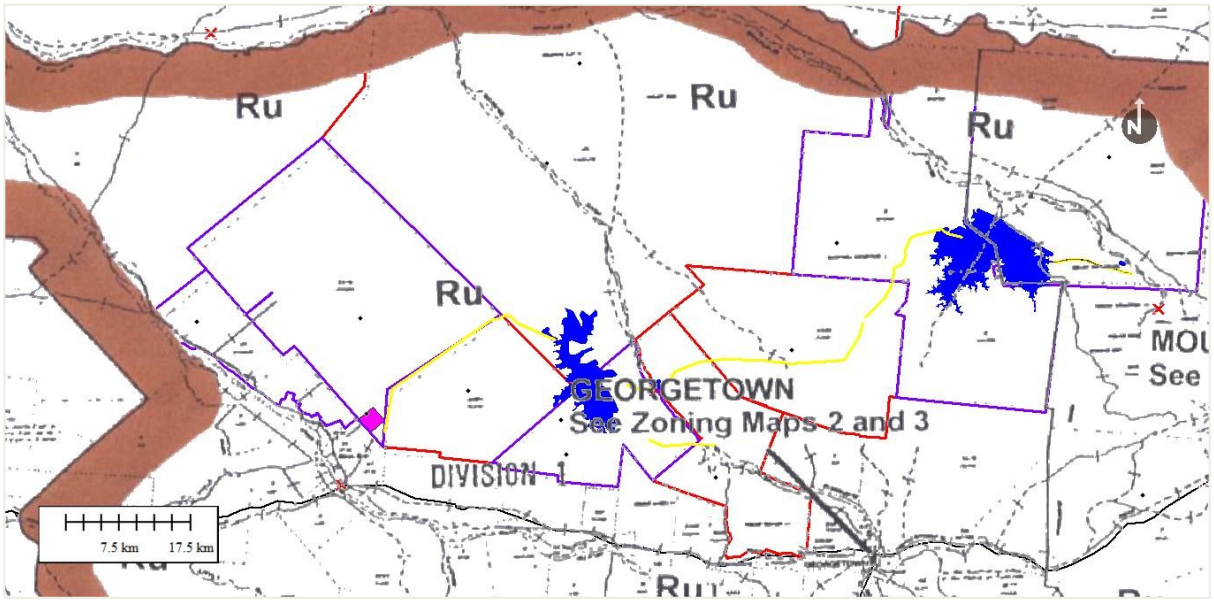

Figure 23 - Etheridge Shire Council Planning Zones

5 Description of the existing environment

5.1 Natural environment

The Gulf is a diverse region of developing economic importance with mining operations, prosperous grazing and fishing industries and strong tourism growth.

5.1.1 Land

The Project area is representative of the broader region which has been highly modified for mining, grazing and agricultural activities. The study area extends from the Einasleigh River at an elevation of 290 metres (Australian Height Datum) to the Gilbert River plains with an elevation of 140 metres (Australian Height Datum).

The study area is located completely within the Gilbert River catchment which flows into the Gulf of Carpentaria.

5.1.1.1 Topography

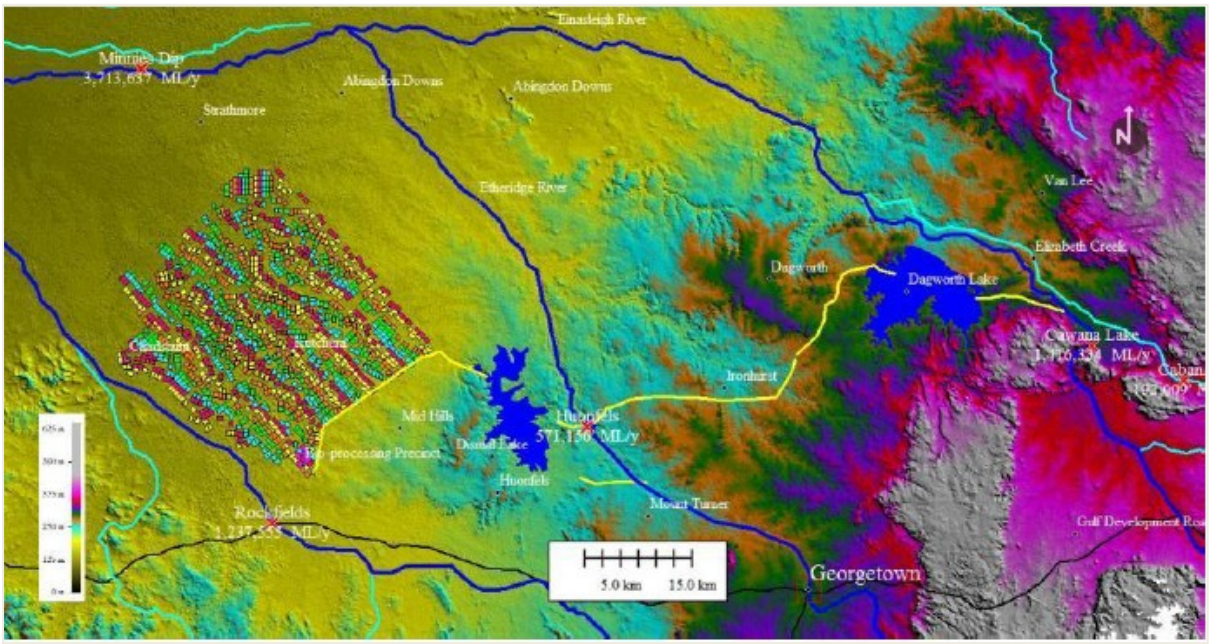

Figure 24 - Project facilities and regional topography

The diversion point on the Einasleigh River is around an elevation of 290 metres. Water is channelled from Dagworth Lake at an elevation of 265 metres. The syphon under the Etheridge River is at 245 metres, similar to the elevation at which water is diverted from the Etheridge River. Lake Dismal operates at around 210 metres and the farm site drops from around 200 metres to around 160 metres.

A key feature of the Project is using gravity to divert and channel water. Pumping is required at the Farm to elevate pipeline pressure to enable best available trickle tape irrigation technology to be used. The pump station and pipeline design uses gravity to maintain pressure in the pipelines down the farm blocks which significantly reduces pumping energy.

5.1.1.2 Land use

The project area is representative of a broader region, which is generally highly modified for mining, grazing and agricultural activities. Existing land uses within the Project area and surrounds are:

- Biophysical elements (such as the Einasleigh and Etheridge rivers);
- Exploration activities with a focus on gold, uranium and copper;
- Agricultural activities such as:
  - cattle grazing;
  - cropping;
  - farming infrastructure (access tracks, fences, stockyards and sheds).
- Residential and urban land uses, that include:
  - several rural residential dwellings (homesteads);
  - rural residential dwellings (homesteads) that are located in the surrounding rural area;
  - nearby urban development, namely Georgetown.

5.1.1.3 Soils

The Queensland Department of Primary Industries has conducted extensive soil surveys along the Gilbert River which has demonstrated highly suitable cropping zones. Adjacent areas in Chadshunt and Kutchera are closely related and topographic assessment has identified areas of suitably flat cropping land. These creek flats provide substantial alluvial and colluvial soils transported from up-river escarpments.

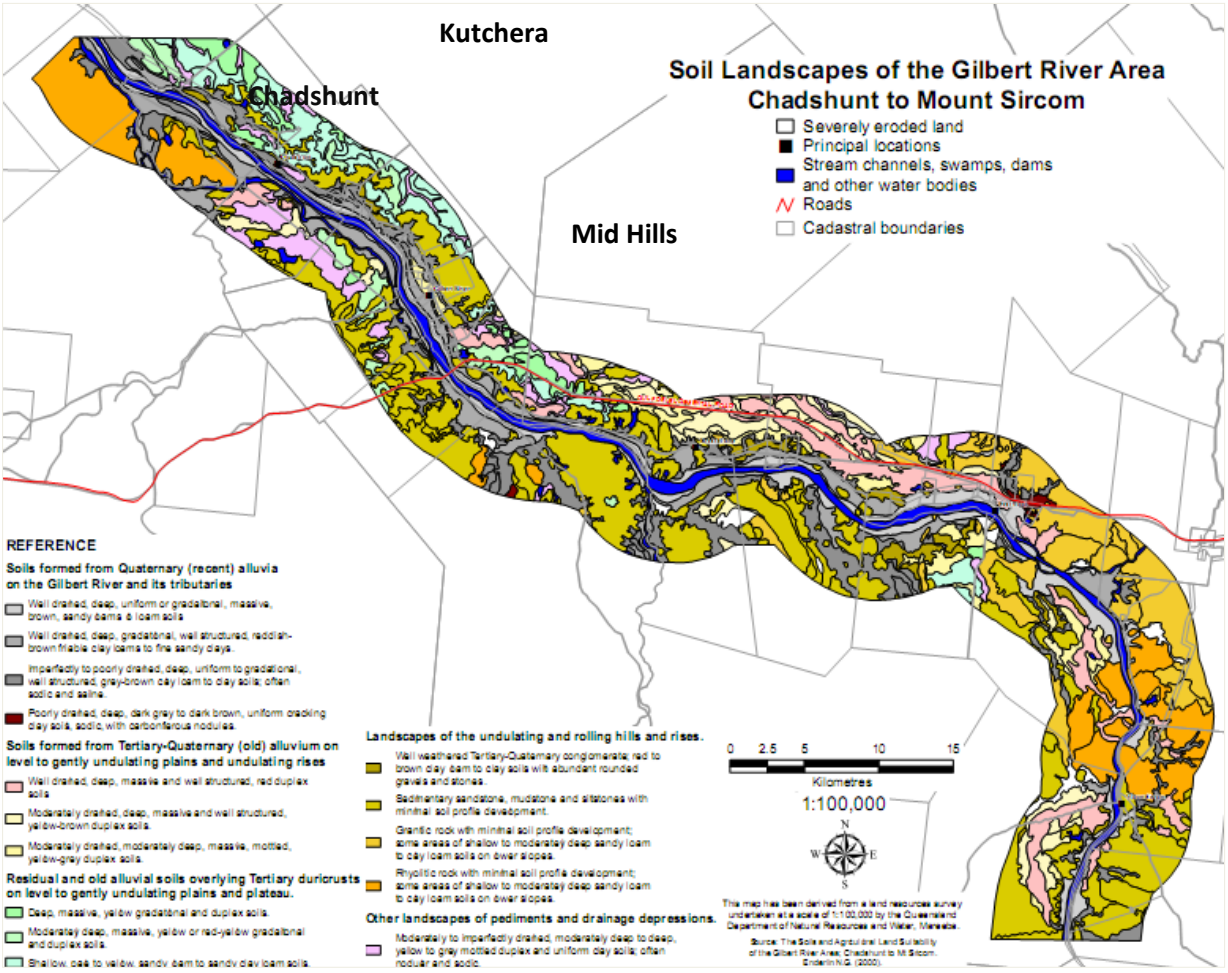

Figure 25 - Soil landscapes

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Soils maps of the Gilbert River demonstrate typical features of soils in the region. The highly prospective loamy blue-green zones are typical of the downstream landscapes of the proposed cropping areas.

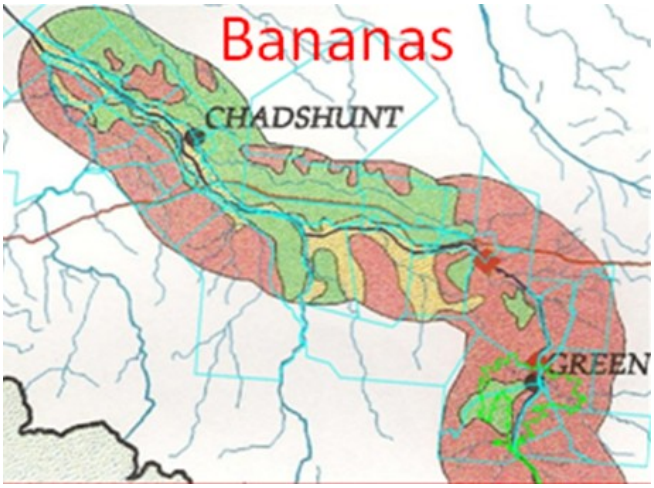
The use of trickle tape irrigation enables up to 107,000 hectares to be suitable for cropping across the project properties with Kutchera and Chadshunt being used for irrigation.

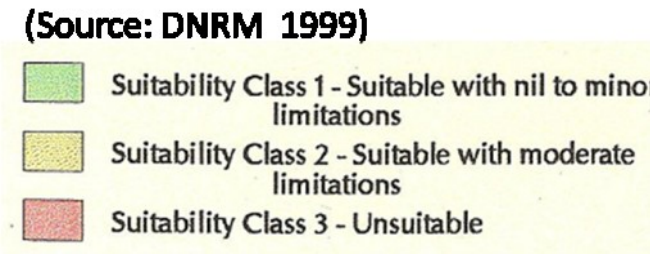
Substantially larger areas are available in adjacent properties along the Gilbert, Einasleigh and Etheridge Rivers and may support future expansion.

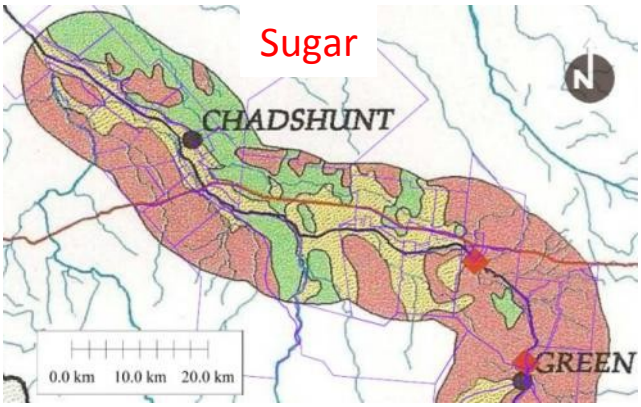
5.1.1.4 Crop Suitability

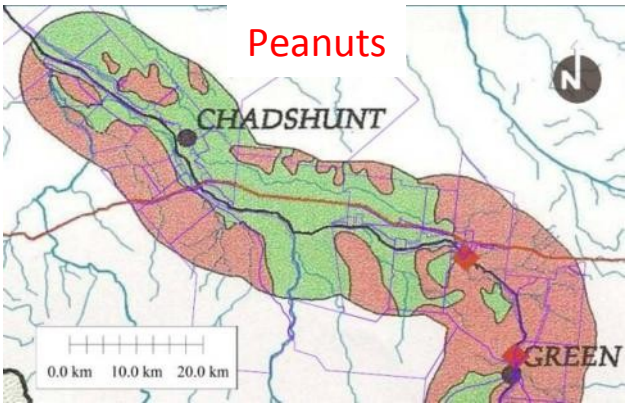
Considerable research and surveys along the Gilbert River have also assessed the suitability of various crops. This research has confirmed that topography and soils along the Gilbert River are suitable to a wide range of irrigated and dryland cropping. Using state of the art trickle tape irrigation enhances the viability of marginal cropping country identified in the government studies.

The diagrams below summarise the crop suitability analysis conducted by the Department of Natural Resources and Mines in 1999. As the above analysis indicates, large tracks of land in the target area are suitable for a wide variety of crops. Plantation mangoes are already successfully grown on some of the properties adjacent to the project properties.









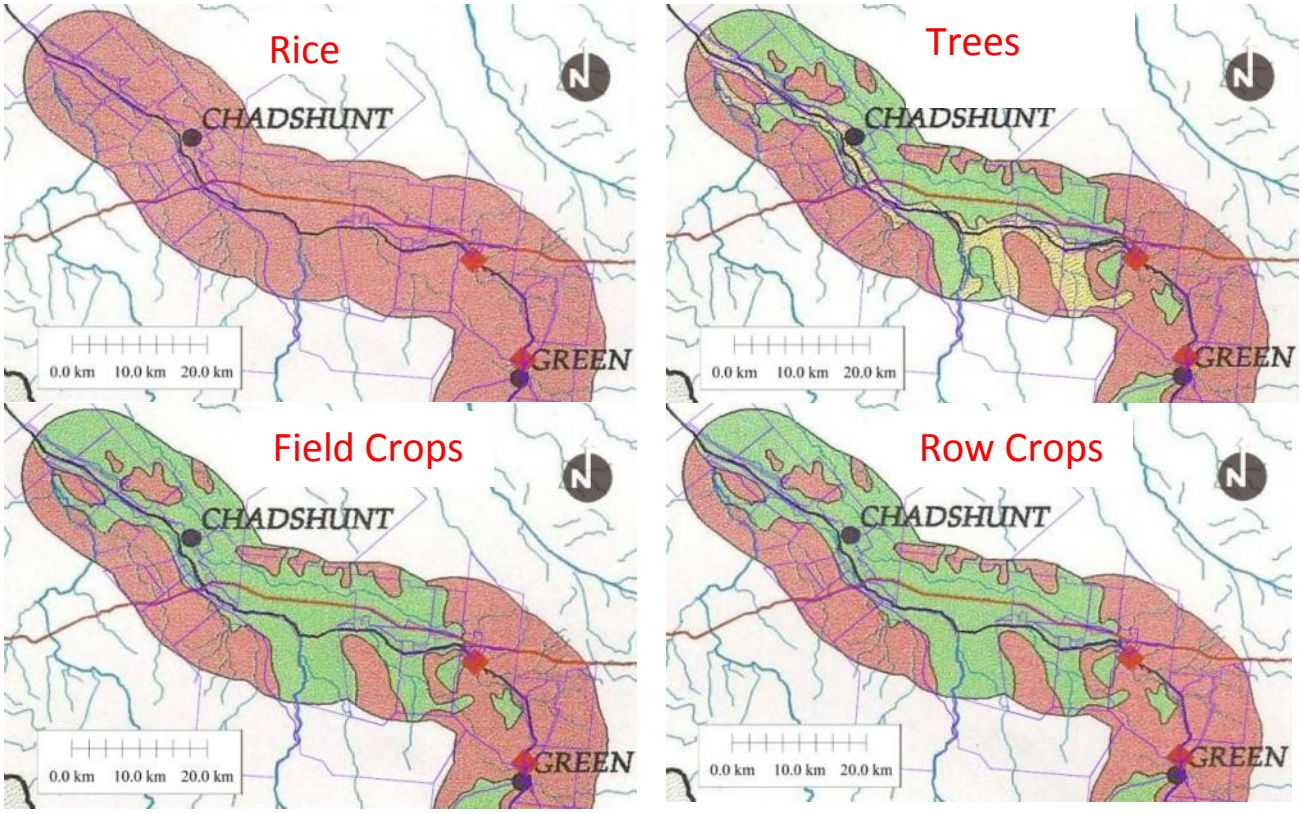


Figure 26 - Soil Suitability Classes

5.1.1.5 Salinity Assessment

Irrigation can cause salinisation of soil and water by increasing the amount of recharge to groundwater. Once the groundwater is within a few metres of the surface, capillary action will draw water to the surface, concentrating salt in the root zone. Irrigation also adds salt to the soil; even good quality water contains some salt.

A key feature of Chadshunt and Kutchera properties is the presence of a shallow Quarternary flood plain alluvium above a Tertiary nodular/ferruginised ironstone layer underlain by Late Cretaceous sandstone layer. There is no groundwater table above the ironstone cap and water cannot build-up as it drains freely to shallow surface drains.

Consequently, the region is highly suited to irrigated agricultural development with low risk of salinity.

Mapping by Nelson and Webb (Department of Natural Resources and Mines) in “Salinity in the Northern Gulf Region Condition report for the Northern Gulf Regional Management Group” provides salinity risk charts – see below.

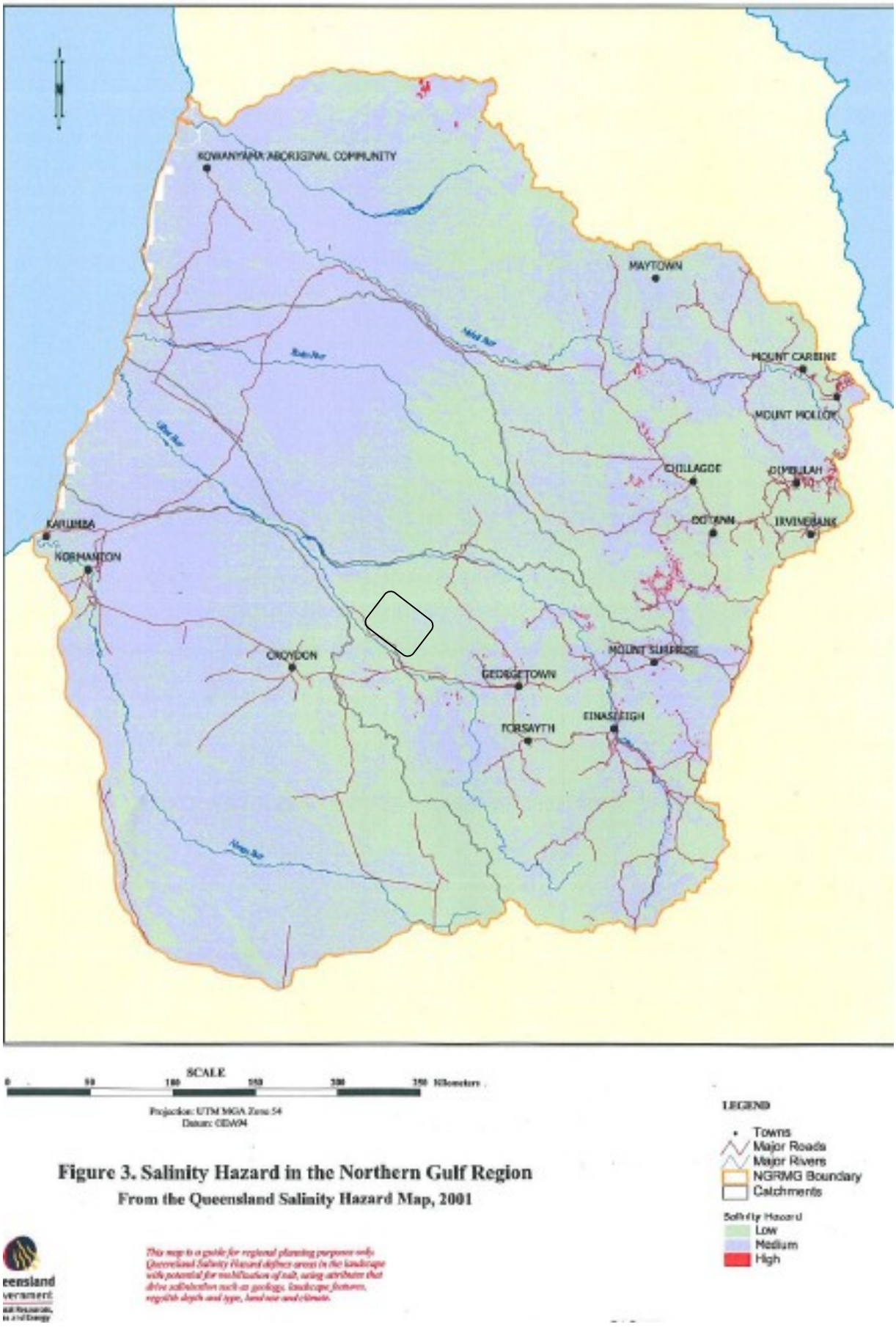


Figure 3. Salinity Hazard in the Northern Gulf Region

From the Queensland Salinity Hazard Map, 2001

This map is a guide for regional planning purposes only. Queensland Salinity Hazard defines areas in the landscape with potential for mobilisation of salt, using attributes that drive salinisation such as geology, landscape features, regolith depth and type, land use and climate.

Figure 27 -Soil salinity mapping

5.1.1.6 Geology

The geology varies across the Project area from the Einasleigh Uplands through the toe slopes and into Gulf colluvial plains. Mining is an important industry in the Gulf region's development reflecting its position as one of the densest mineralised regions on earth.

The Einasleigh Uplands to the East comprise exposed granites and metamorphic rocks. The southern outliers are buried under a succession of very recent (150,000 years) basalt flows with cinder cones and exceptionally large lava tubes forming natural tunnels in old creek beds.

For example, in the vicinity of Mt Departure, the right bank is basalt formed from ancient lava flow. The left bank comprise granites.

The picture also shows granite rocks protruding from the river base.

The exposed granite landscape along the toe slopes of the Newcastle Range give way to strong weathered clays. The clays retain water and are used successfully by graziers as watering points for cattle.

The Landforms on Huonfels and Mid Hills change. Escarpments are deeply weathered remnants of a more recent landscape, formed during the Cretaceous period from 65 to 5 million years ago. These are characteristically rocky areas with shallow soils above a layer of caprock or “silcrete”. Larger escarpments can also be covered with sand plains or even clay soils.

Kutchera and Chadshunt Stations complete the transition to gently sloping plains with a well-defined and highly visible soil and sub-soil structure.

The upper layer is most recently formed from Quarternary flood plain colluvium.

The example to the left shows a shallow Tertiary nodular/ferruginised ironstone layer. It forms the base of a creek having eroded the upper Quarternary colluvial surface.

The collluvial and ironstone layers are under-capped by a Late Cretaceous sandstone layer. The picture to the left shows sandstone in a creek bed. Some nodular ironstone is present a well cemented to the upper surface of the sandstone.

5.1.1.7 Nature conservation reserves

The Smithburne–Gilbert Fan Aggregation is in the Directory of Important Wetlands in Australia. It is supported by river and overland flows in the southern section and coastal estuary and high rainfall overland flooding in its northern extent. The impact on this area will be examined in the assessment of river flows.

5.1.2 Water

5.1.2.1 Surface water

The Gilbert River catchment is located on the western side of Cape York in Queensland, Australia. The Gilbert River drains into the Gulf of Carpentaria with total annual flows averaging 5,450,000 megalitres.

The Gilbert River catchment is located in North West Queensland and covers an area of approximately 47,000 square kilometres. The river rises in the Great Dividing Range approximately 150 kilometres southeast of Georgetown. The river flows in a northwesterly direction and is joined by its major tributary, the Einasleigh River, downstream of Strathmore, before finally entering the Gulf of Carpentaria in a river delta 100 kilometres wide.

The other main tributary, the Etheridge River, joins the Einasleigh River downstream of Georgetown, which is the only town in this vast catchment.

Streamflow in the Gilbert rivers is extremely seasonal with the vast majority (greater than 90%) of total annual flow occurring during the wet season (November to April).

The aquatic ecosystems of these river systems are adapted to the prevailing conditions, responding to both extreme wet-season high flows and extended periods with low or zero flow during the dry season. Many aquatic biota in the region survive the long dry season by using ponds and in-stream pools. These ponds are sustained by water flowing through the bed sands, hitting rock or other barriers and surfacing.

5.1.2.2 Ground water

Basement rocks in the Gulf consist of tough, mineralised granitic and/or metamorphic rocks. These rocks outcrop in the east of the region around Georgetown and Croydon. Very few productive groundwater supplies are associated with the rocks.

The quality of the water is generally mediocre to poor. Hence there is little development potential for groundwater in these rocks. Sediments of the Carpentaria Basin underlie the majority of the region. The water from these deep sediments is moderately saline but suitable for the watering of stock.

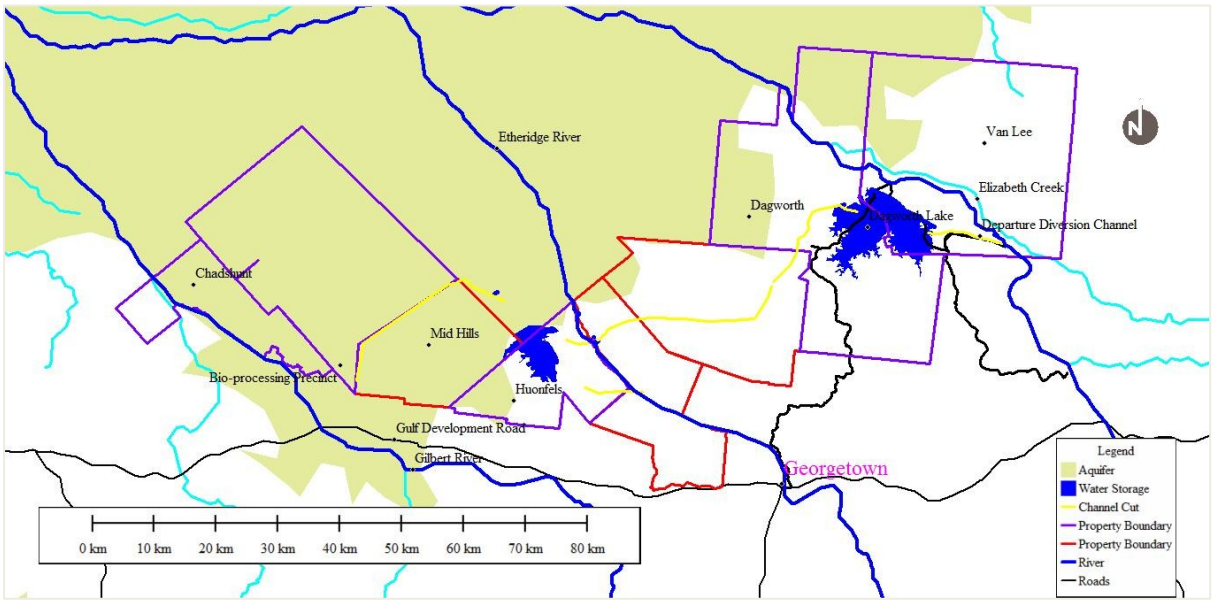


Figure 28 - Great Artesian Basin

The Great Artesian Basin is one of the largest underground water reservoirs in the world. It underlies approximately 22 per cent of Australia — occupying an area of over 1.7 million square kilometres beneath the arid and semi-arid parts of Queensland, New South Wales, South Australia and the Northern Territory.

Recharge is believed to occur in the Gilbert River region and underlies the cropping areas of the site.

Uncontrolled flow from bores and open earth bore drains in the Great Artesian Basin threatens the health of important groundwater-dependant ecosystems and continued access to artesian water by pastoralists.

The Project does not intend to use the Basin as a source of water.

Additional recharge may occur at the northern end of Dismal Lake.

5.1.2.3 Marine

The Gulf of Carpentaria has a strong fishing and prawning industry. The Catch is thought to be linked to wind, temperature, rainfall and time of rainfall within the year which contributes to nutrient delivery and impacts on the food chain.

CSIRO have investigated catches in the Gulf and have created a highly successful model which is used to establish sustainable harvest limits. Consequently, detailed Catch information is available through CSIRO.

Whilst the prawning industry is worth more than $60 million to the Gulf region, much of the processing and supplies are based around mother ships that work in the Gulf. Hence the dollar return coming directly from this industry into the Gulf is relatively low.

However, Karumba is being used as a support centre for the prawning industry as it services a large proportion of the commercial fleet.

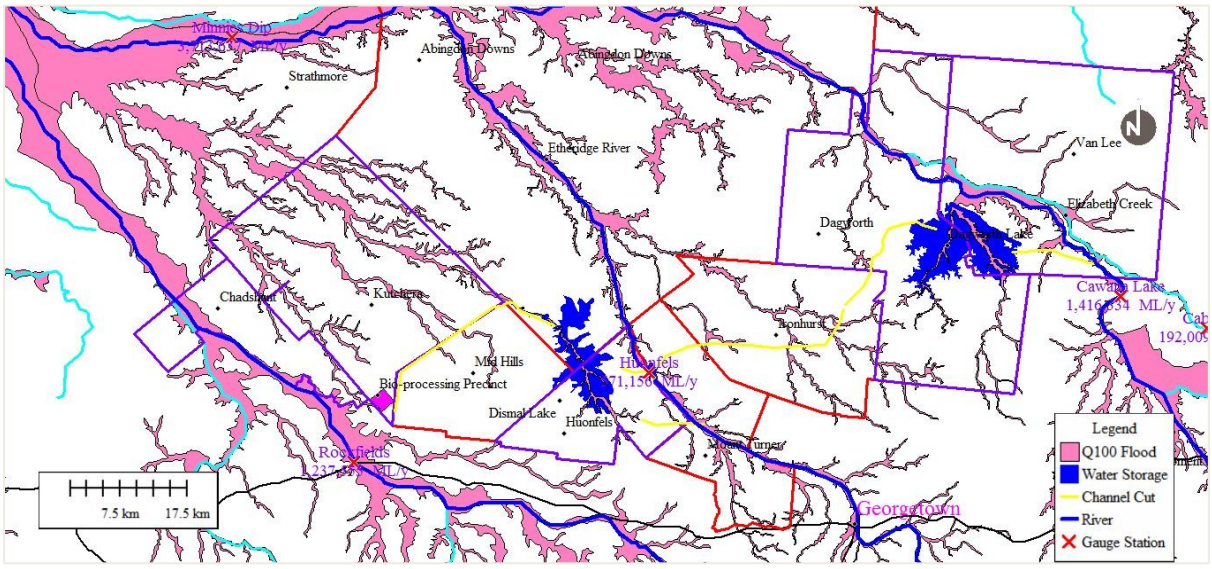


Figure 29 - Extent of Q100 Flood inundation

5.1.2.4 Flood Risk

Floods normally develop in the headwaters of the Gilbert and Einasleigh Rivers, however general heavy rainfall situations can develop from monsoonal and cyclonic influences which can result in widespread flooding, particularly in the lower reaches below Strathmore.

The record major flood of January 1974 and the floods of February 1991 and in January and February 2009, caused widespread road closures and inundation of properties throughout the catchment.

The Bureau of Meteorology operates a flood warning system for the Gilbert River based on rainfall and river height observations network as shown on the map. The network consists of a combination of a number of volunteer rainfall and river height observers who forward observations by telephone when the initial flood height has been exceeded at their station, as well as automatic telephone telemetry stations at Spanner Waterhole, Kidston Dam, Einasleigh, Mount Surprise, Routh River, Roseglen and at Rocky View, which are operated by the Queensland Department of Environment and Resource Management.

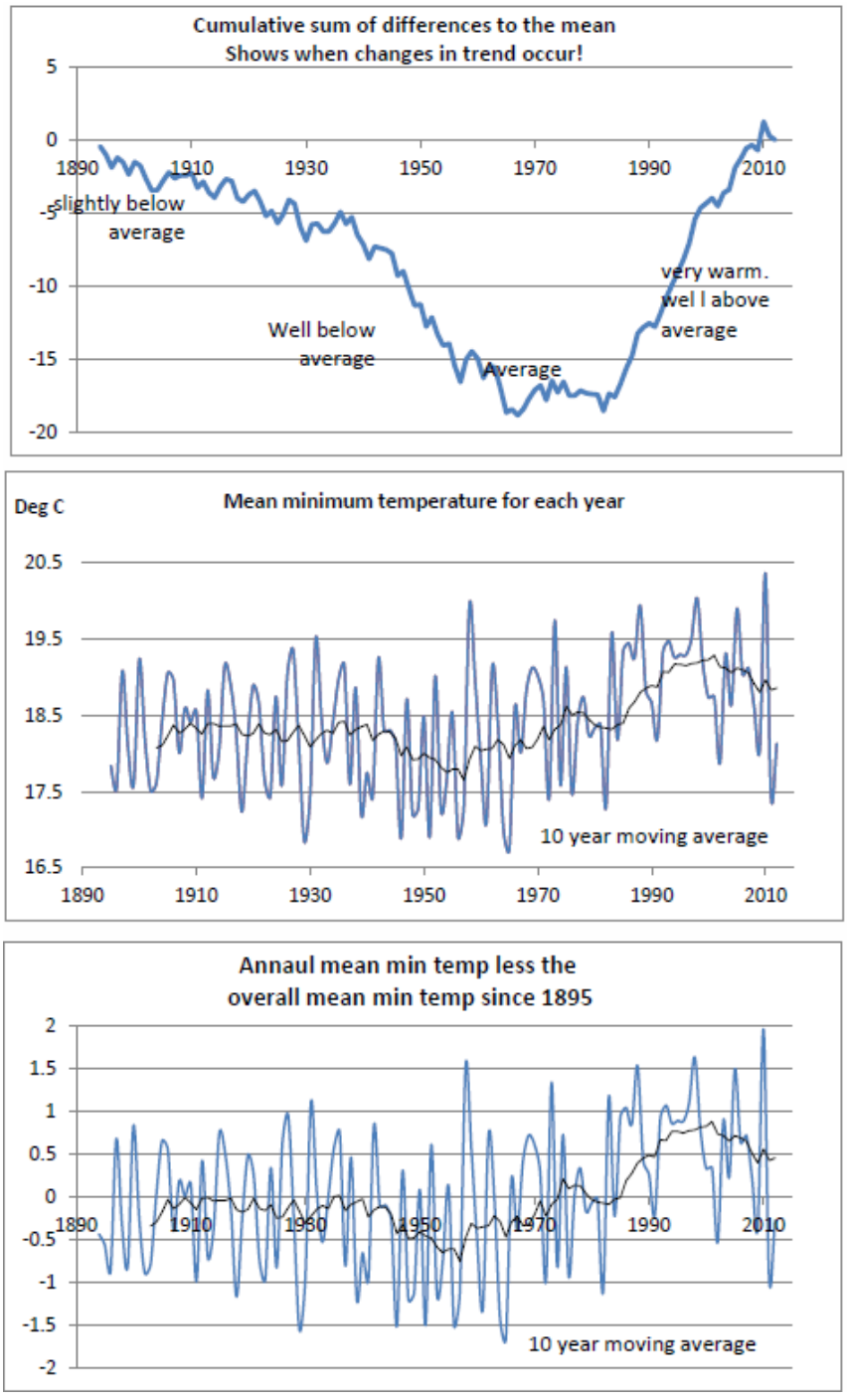


Figure 30 - Long term annual minimum temperature trends

The Bureau's Flood Warning Centre issues Flood Warnings and River Height Bulletins for the Gulf Savannah Rivers, including the Gilbert River, during flood events. Qualitative flood forecasts are issued when moderate flood levels are likely to be exceeded.

Construction is based on 9 months available time with construction largely suspended during the wet season. Flood events are unlikely to impose additional impacts on neighbouring properties, roads or other infrastructure.

5.1.3 Air

Air quality in the region is mainly influenced by pastoral activities, fires towards the end of the dry season and extent of traffic on rural dirt roads. Additional dust will be generated during the construction phase and beyond due to increased traffic and generic cropping processes.

Receptors include isolated homesteads and cottages.

The Environmental Impact Statement will investigate a range of air quality issues and will identify potential receptors. An air quality model will be developed to support the impact assessment process.

5.1.4 Climate Change

Georgetown minimum temperatures have risen by about 0.5^{o}C since the late 1970's.

A higher average minimum temperature at these latitudes has the potential to reduce cane content of sugar which is onset by low winter temperatures.

An APSIM plant model will also look at the impact of climate change on sugar cane growth.

The Project's vulnerabilities to climate change will be addressed by conducting a risk assessment on the impacts of changes in rainfall, temperatures, rainfall intensity, storm severity, number of windy days, and likelihood of flooding.

5.1.5 Ecosystems

5.1.5.1 Terrestrial

The vegetation of the region is mostly open woodland dominated by:

- Eucalyptus spp. and Corymbia spp. with grasses in the understorey which occurs in areas with heavier soils, generally located on Van Lee and Dagworth Station;
- Melaleuca spp. dominated open woodlands which occurs widely through the study area;
- Lancewood (Acacia shirleyi) dominated gravelly ridges within open woodlands which occurs in Kutchera Station and Chadshunt Station ;
- Spinifex grassland (with scattered trees) which occur in drier upland areas; and
- Riparian woodland and forest that occur along the more permanent watercourses.

5.1.5.2 Aquatic

Stream flows are correspondingly highly variable and seasonal, resulting in flooding during summer and very low flows during the rest of the year.

Many of the fish species found in the Gilbert River migrate along (at least part of) the length of the river and some species (e.g. Barramundi) migrate upriver after spawning.

Dry season ponds and pools are very important for species survival. These are sustained by river sands flow, some of which is forced to the surface by granite dykes and intrusions to create these ponds.

5.1.5.3 Wetlands

The Gilbert-Smithburne fan aggregation and Macaroni Swamp at the mouth of the Gilbert River are listed in the Directory of Important Wetlands in Australia. These wetlands are sustained by flows from:

- Flood flows from the Gilbert River
- Overland flows
- Estuary flows

5.1.5.4 Marine and coastal processes

The marine flora of the Gulf is made up of three communities:

- Saltpan communities – These constitute more than 50% of the areal extent of overall intertidal plant communities and may extend for 20 kilometres or more from the coast.
- Mangroves - There are extensive mangrove areas throughout the Gulf with up to 12 species in some areas
- Seagrasses - Eleven species of seagrasses occur in the area. The main areas are to the west of the Wellesley Islands, but smaller areas are found along the coast in protected estuaries and lagoons.

Large numbers of birds regularly migrate between catchments within the region and from outside the region, following seasonal rain and flooding. These birds congregate in permanent headwaters, river mouths, scattered waterholes and lagoons during the dry.

Rich and diverse marine fauna is also found in the near-shore marine and estuarine waters in the Gulf of Carpentaria. Consequently a sustainable fishing, prawning and crabbing industry has developed along with increasing tourist numbers attracted to the region's fishing opportunities.

5.1.5.5 Protected areas and protected communities

The Project area does not have any protected areas or communities.

5.1.5.6 Regional ecosystems/endangered, ecological communities/wetlands and environmentally sensitive areas

An 8.47 hectare area on Kutchera Station located adjacent to waterholes is classified as RE 2.3.16 where:

- the "2" refers to location being the Gulf Plains;
- the "3" is the Landzone being alluvial creeks and river flats;
- the "16" is the Vegetation type being Eucalyptus spp. dominated open-forest and woodlands drainage lines and colluvial plains.

The biodiversity status is "OC" meaning "of Concern". The vegetation management class is "O" meaning "of Concern". A regional ecosystem is listed as 'Of concern' under *Vegetation Management Act 1999* if:

- remnant vegetation is 10–30 per cent of its pre-clearing extent across the bioregion, or
- more than 30 per cent of its pre-clearing extent remains and the remnant extent is less than 10,000 hectares.

In addition to the criteria listed for an 'Of concern' regional ecosystems under the *Vegetation Management Act 1999*, for biodiversity planning purposes a regional ecosystem is listed with a Biodiversity Status 'Of concern' if 10–30 per cent of its pre-clearing extent remains unaffected by moderate degradation and/or biodiversity loss.

The remainder of the Project area is non-remnant (roads) and remnant vegetative communities. The remnant communities are classified as being of least concern.

5.1.5.7 Flora and fauna[2]

Grazing and the spread of pest species have impacted on the condition of land-based biological communities in the region. As a result, some species are presumed extinct across parts of their former range (e.g. the Western quoll - *Dasyurus geoffroii*). Despite some limited knowledge regarding a few specific losses, little is presently known regarding rare and restricted species within the region, or the extent to which they are threatened.

Some 58 species of marine and terrestrial vertebrate species are thought to be of conservational significance in the region.

- 1 is extinct;
- 7 are endangered;
- 18 are vulnerable; and
- 32 are rare.

Common name	Species name	Habitat
EXTINCT		
Western Quoll	*Dasyurus geoffroii*	Woodlands
ENDANGERED		
Carpentaria Rock Rat	*Zyzomys palatalis*	Thickets on Sandstone ranges
Star Finch	*Neochmia Ruficauda*	Grasslands near water
Golden Shouldered Parrot	*Psephotus chrysopterygius*	Woodlands
Olive Ridley Turtle	*Lepidochelys olivacea*	Marine
Red Goshawk	*Erythrotriorchis radiatus*	Forests, woodlands
Loggerhead Turtle	*Caretta caretta*	Marine
Gouldian Finch	*Erythrura gouldiae*	Savanna woodlands
VULNERABLE		
Lesser Wart-nosed Horseshoe bat	*Hipposideros stenotis*	Diverse habitat
Masked Owl - northern subsp.	*Tyto novaehollandiae kimberli*	Forests, woodlands
Orange Horseshoe Bat	*Rhinonicteris aurantius*	Open woodlands
Red-tailed Tropicbird	*Phaethon rubricauda*	Tropical seas
Common Sheathtail Bat	*Taphozous georgianus*	Rocky country
Little Tern	*Stema albifrons*	Coastal waters, lakes
Dugong	*Dugong dugon*	Marine
Estuarine Crocodile	*Crocodylus porosus*	Marine, waterways
Beach Thick-knee	*Esacus neglectus*	Beaches, tidal mudflats
Flatback Turtle	*Natator depressus*	Marine
Grey Falcon	*Falco hypoleucos*	Open woodlands
Hawksbill Turtle	*Eretmochelys imbricata*	Marine
Purple-crowned Fairy Wren	*Malurus conronatus macgillivrayi*	Thickets fringing watercourses
Green Turtle	*Chelonnia mydas*	Marine
Yellow Chat	*Epthianura crocea*	Rushes on wetlands

[2] Gulf Regional Planning Advisory Committee, Gulf Regional Development Plan, November 2000

Common name	Species name	Habitat
Yakka Skink	*Egemia rugosa*	Open woodlands
Crimson Finch	*Neochmia phaeton*	Tall grass near water
Red finned blue eye	*Schaturiginichthys vermeilipinnis*	Freshwater streams
RARE		
Mareeba Rock Wallaby	*Petrogale mareeba*	Rocky country
Great Crested Grebe	*Podiceps cristatus*	Wetlands, bays
Ghost Bat	*Macroderma gigas*	Diiverse habitat
Painted Snipe	*Rostratula benghalensis*	Wetlands,open woodlands
Pygmy Long-eared Bat	*Nyctophilus walkeri*	Watercourses
Rajah Shellduck	*Tadoma radjah*	Wetlands, estuaries
Irrawaddy River Dolphin	*Orcaella brevirostris*	Marine, estuaries
Common Death Adder	*Acanthophis antarcticus*	Forests/woodlands
Indo-Pacific Humpback Dolphin	*Sousa chinensis*	Marine
Skink	*Ctenotus schevilli*	Grasslands
Black-necked Stork	*Ephippiorhynchus asiaticus*	Coastal wetlands
Skink	*Ctenotus zebrilla*	Open woodlands
Sooty Oystercatcher	*Haematopus fuligionosus*	Beaches, tidal mudflats
Skink	*Lerista ameles*	Woodlands
Square-tailed Kite	*Lophictinia isura*	Forests, woodlands
Skink	*Lerista Karlschmidti*	Forest, woodlands
Carpentarian Grasswren	*Amytomis dorotheae*	Spinifex, woodlands
Skink	*Lerista Storri*	Woodlands
Zitting Cisticola	*Cisticola juncidis*	Tall grass on coastal plains
Sea Snake	*Hydrophis belcheri*	Marine
Sea Snake	*Hydrophis atriceps*	Marine
Ground Cuckoo Shrike	*Coracina maxima*	Open grasslands
Painted Honeyeater	*Grantiella picta*	Forests, woodlands
Fierce Snake /Western Taipan	*Oxyuranus microlepidotus*	Open grasslands, floodplains
Black-chinned Honeyeater	*Melithreptus gularis*	Forests, woodlands
Collett's Snake	*Pseudechis colletti*	Open grasslands
Pictorella Mannikin	*Lonchura punctulata*	Grasslands near water
Unnamed blind snake	*Ramphotyphlops broomi*	Woodlands
Rufous Owl /southern subsp.	*Ninox rufa queenslandica*	Vine forests, woodlands
Unnamed striped or banded snake	*Simoselaps warro*	Forest, woodlands
Eastern Curlew	*Numenius madagascariensis*	Estuaries, tidal mudflats
Rusty Monitor	*Varanus semiremex*	Mangroves
COMMON		
Echidna	*Tachyglossus aculeatus*	Forest, woodlands, grasslands
Koala	*Phascolarctus cinereus*	woodlands

There are 71 species of protected plants that have been identified as occurring in the Gulf region and are listed in the Table below:

- 9 species considered vulnerable under the Nature Conservation Act;
- 35 species considered rare under the Nature Conservation Act; and
- 12 species considered common but protected (species subject to commercial exploitation) by the *Nature Conservation Act*.

Vulnerable plants	Rare plants	Common plants	Provisional plants
Chamaesyce carissoides	Grevillea singuliflora	Cymbidium madidum	Fimbristylis carolinii
Acacia guymeri	Dodonaea oxyptera	Cymbidium canaliculatum	Lamprolobium grandiflorum
Solanum carduiforrme	Brachychiton collinus	Xanthorrhoea johnsonii	Lepturus sp. (M. Godwin C2576)
Acacia crombiei	Argyreia queenslandica	Dockrillia linguiformis	Eragrostiella bifaria var. Bifaria
Tephrosia leveillei	Alectroyon tropicus	Dendrobium trilamellatum	Fimbristylis distincta
Acacia ramiflora	Wrightia versicolor	Dockrillia mortii	Goodenia heteroptera
Cycas cairnsiana	Cycas brunnea	Davallia denticulata var. Dennticulata	Oldenlandia spathulata
Ectrosia blakei	Ipomoea antonschmidii	Banksia aquilonia	Cycas desolata
Cycas platyphylla	Atalaya calcicola	Dockrillia bowmanii	Fimbristylis micans
	Brachychiton albidus	Sarcochilus minutiflos	Goodenia stirlingii
	Cycas couttsiana	Dicranopteris linearis	Drummondita calida
	Ipomeoa saintronanensis	Platycerium veitchii	Keraudrenia adenolasia
	Trianthema rhynchocalyptra		Fimbristylis odontocarpa
	Rhamphicarpa australiensis		Santalum lanceolatum
	Aponogeton queenslandicus		
	Eucalyptus pachycalyx subsp. Pachycalyx		
	Trachymene glandulosa		
	Aponogeton elongatuus		
	Peripleura sericea		
	Eucalyptus hoowittiana		
	Labichea brassii		
	Fimbristylis vagans		
	Vallisneria nana		
	Phyllodium pulchellum		
	Lobelia douglasiana		
	Desmodium macrocarpum		
	Acacia armitii		
	Sesbania erubescens		
	Lepturus xerophilus		
	Acacia meiosperma		
	Acacia jackesiana		
	Myriophyllum implicatum		
	Leptospermum pallidum		
	Corymbia gilbertensis		
	Acacia longipedunculata		

5.2 Social and economic environment

The communities of the Gulf region recognise that they have significant common issues - economic, social, and environmental - that may be addressed at a broad, strategic level. In addition, the Gulf region continues to experience increasing pressures associated with growth in industries such as eco-tourism and mining, as well as seeing restructuring in established industries such as pastoralism and commercial fishing[3].

General characteristics of the Gulf communities include:

- Welfare reliance
- Low skills levels
- Low education, minimal education facilities
- Low income levels
- Low levels of home and land ownership
- 55% plus of population indigenous.

The Gulf Savannah Shires are classified as disadvantaged and the 2007 Financial Sustainability Review by the Queensland Treasury Corporation, classified Carpentaria as 'Very Weak' and Etheridge as 'Moderate', emphasizing their delicate and unsustainable financial position.

5.2.1 Economic and demographic characterisation

The Gulf communities are classified as "very remote and disadvantaged" due to[4]:

- Welfare reliance
- Low skills levels
- Low education, minimal education facilities
- Low income levels
- Low levels of home and land ownership
- 55% plus of population indigenous.

As at 30 June 2011, the estimated resident population of the region was 931 persons with approximately 23% less than 14 years and 62% from 15 to 64 years old leaving 13% greater than 64 years old.

At the time of the 2011 Census, the region had 277 persons aged 15 years and over who stated their total personal weekly income was less than $400, representing 37.8 per cent of all persons aged 15 years and over.

The number of unemployed persons aged 15 years and over (based on a smoothed series) in the region in March quarter 2012 was 94. This represented an unemployment rate of 16.2 per cent.

5.2.2 Accommodation and housing

At the time of the 2011 Census, the region had 344 occupied private dwellings. Of these private dwellings, 288 were separate houses, 3 were semi-detached and 3 were apartments.

Nearly half of the occupied private dwellings in the region were fully owned, 15.7 per cent were being purchased and 26.5 per cent were being rented.

[3] Gulf Development Plan
[4] Gilbert River Irrigation Area Investment Report 2009

5.2.3 Social and recreational services

Georgetown has a golf course, swimming pool and substantial recreation facilities including a sports grounds, horse racing park and rodeo.

The town has a childcare centre, primary school and nursing facilities. A flying doctor service operates along with visiting doctor and dentist.

5.2.4 Cultural heritage (Indigenous and non-Indigenous)

5.2.4.1 Indigenous

As part of the Environmental Impact Statement, assessment of the Aboriginal cultural heritage values of the project site will be undertaken in consultation with the Ewamian People cultural heritage groups.

Cultural heritage management plans will be prepared jointly with the Ewamian People to address survey and monitoring requirements and mitigation of impacts and management of cultural heritage material during the construction and operation of the mining activity.

5.2.4.2 Non-Indigenous

The Environmental Impact Statement will also survey and evaluate the significance of any non-Indigenous heritage sites that may be present within the project site.

Figure 31 - Ewamian Logo

5.3 Built environment

5.3.1 Local and regional Infrastructure and major developments

Key regional infrastructure is the Gulf Development Road which supports the pastoral, mining and tourist industries. Further development of regional transport routes offers significant savings to users through increased operating efficiencies and productivity.

For example, a key development currently in construction is the upgrading of the Forsyth and Einasleigh roads to road train status which will deliver substantial and widespread savings by reducing the travel time to connect to the critical inland Hann Highway (Kennedy Developmental Road).

5.3.2 Other local and regional declared significant projects

There are no declared significant projects in the vicinity of the Project.

5.3.3 Other non-declared Infrastructure and private sector projects

Strathmore Station, downstream of the Project area – has proposed a cropping and pastoral development based on water diverted from Dismal Creek which flows through Kutchera Station - one of the intended Project properties.

Dismal Creek enters the Einasleigh River, 29 kilometres upstream from its confluence with the Gilbert River. It is also 24 kilometres downstream of a gauging station at Minnies Dip, 240 kilometres downstream of the Project's diversion point in the Einasleigh River (40 kilometres more than the driving distance from Brisbane to Dalby) and 130 kilometres from the diversion point on the Etheridge River (same as the driving distance from Brisbane to Toowoomba).

Whilst details of the proposed development are not publically available, the Gilbert River system provides ample water for this and other projects. The vast distance between the source points for each project emphasizes the practicality of large scale agricultural development in the Gilbert River system.

Discussions with the property owner confirmed that the IFED project will not impact on the intended design or development of the Strathmore project despite the creation of Dismal Lake in the headwaters of Dismal Creek.

Substantial synergies between the Strathmore project and the Etheridge Integrated Agricultural Project exist including, but not limited to:

- Increased availability of finished cattle adjacent to Kutchera Station.
- Concentration of cropping skills, machinery and machinery servicing
- A grain source for blending into stockfeed
- A consumer of renewable electricity
- Increased demand for shipping services into and out of Karumba Port

5.3.4 Potential conflicts with existing and proposed infrastructure and projects[5]

Other developments, if proposed, will be dependent on water availability. Preliminary river modelling using the state government's Integrated Quality and Quantity Model demonstrates that significant capacity is available to support additional beneficial uses, subject to appropriate diversion, storage and application technologies.

There is no single percentage of total flow or any other statistic that is universally agreed as a sustainable level of water take. In 2002, Jones reported on the Healthy Working river concept. This was then used by Jones et al (2002) for determining environmental flows for the River Murray on behalf of the Murray Darling Basin Commission (MDBC). The concept recognised that rivers which provided significant benefits to society through providing water for agriculture, industry or other human benefits, should not be expected to be entirely "natural" but should still remain healthy. They suggested 2/3rd natural (66.66%) as a "guidance value" or "rule of thumb" (Jones (2002b)) at which key flow indictors needed to be set that would result in a high probability of obtaining a healthy working river. The Murray Darling Basin Plan uses this figure as an end of system flow target, though it can vary at any particular point throughout the basin based on local circumstances.

Two thirds natural is undoubtedly a conservative guideline since the 2/3rd natural benchmark had been based on a technically incorrect and conservative interpretation of referenced reports.

Those reports, where they provided any numbers, provided numbers lower than 2/3rd natural, that is, more water could be extracted and a healthy working river would still result. The number was not based on any empirical evidence but on expert opinion which had actually misinterpreted earlier

[5] Dr Lee Benson, "Sustainable Level of Take", July 2013

expert opinion. Actual data reported as part of the MDB Sustainable Rivers Audit shows no clear or consistent relationship between the measures of river health and the level of extraction.

The Lower Balonne for example has a level of take at 53% (CSIRO 2008) yet is consistently reported as one of the healthiest rivers in the basin. It is suggested that because this is a water harvesting system so flows are extracted in natural sequence and the immediate catchment is not strongly affected by other factors that can harm river health (urbanisation, industrialisation, river regulation, thermal pollution, commercial fishing, introduced fish, snag removal etc). As such, the sustainable level of take can be higher than in systems (such as much of the Murray Darling Basin) which suffer the cumulative impacts of multiple forms of development.

Sustainability is not simply related to how much water is taken, but how it is taken.

In Queensland "the water resource planning process is designed to plan for the allocation and sustainable management of water to meet Queensland's future water requirements. Water resource plans strive to achieve a sustainable balance between meeting human needs and those of the environment." As such, the planning process includes a scientific technical advisory panel and a community consultation process which both serve as inputs. The outcomes of those processes in the various working catchments have resulted in levels of extraction often higher than 1/3rd natural flow although the concept is commonly used.

For example, it is the basis of the strategy in the Condamine Balonne and Border Rivers while in the Barron it applies only to low flows. This river is a good example of tailoring the level of take to local circumstances. The headwaters have flow regime targets near natural but the node directly below Tinaroo Dam shows mean annual flow reduced to just 27% of natural to allow extraction to support the Mareeba Dimbulah Irrigation Area. Downstream of the irrigation area further natural incoming flows show the flow regime recovering to over 67% near Kuranda. By the river mouth, all flow statistics are above 2/3rd natural.

All systems with irrigation areas or areas of major extraction show similar, locally specific environmental flow objectives. In the Border Rivers for example the beneficial flooding flow and 1 in 2 year flow at Mungindi on the Barwon River deviate by 63% and 56% respectively. Similarly the Weir River prior to its junction with the McIntyre shows the same statistics each varying by 71% while the McIntyre River at Kanowa shows beneficial flooding reduced by 44%. Overall however, the end of system targets 2/3rd natural for key flow statistics.

The Fitzroy Basin is the most recent plan released for a major catchment and two locations will be discussed, being the lower end of the Dawson Valley Water Supply Scheme (Boolburra) and the Fitzroy river mouth. Seasonal baseflow objectives at Boolburra may be reduced between 36 and 73% while at the river mouth the figures are 12 and 53%. Mean annual flow at Boolburra may be reduced by 35% while at the river mouth this figure is 23%. Several other flow parameters, up to a 1 in 5 year event, may be reduced at Boolburra by between 31 and 55% while at the river mouth the equivalent figures are 13 to 45%.

Estimates of the sustainable level of take vary considerably and must take into account the balancing needs of society and the environment in the particular catchment or parts of catchments in question. The 2/3rd natural concept is a very conservative starting point for river planning and if

irrigation schemes are developed "from scratch" today and they take into account holistic approaches to catchment management from Day 1, there is little doubt that the level of extraction could be increased with little risk to achieving a healthy working river.

5.3.5 Traffic and transport

The Bioprocessing Precinct will be accessed from the Gulf Developmental Road connecting Croydon and Georgetown.

5.3.5.1 Personnel

It is anticipated that at the start and end of rostered periods, around 30% of staff will transit through Georgetown Airport with the remainder transferring by car and bus to other centres, north to Croydon and Normanton and east to the Tablelands and coastal locations.

Workers will be transported via bus from Townsville, Cairns and the Tablelands to the seasonal village at Chadshunt or Feral View Stations.

Other staff will live locally and drive to work or use a contracted bus service at shift changes.

5.3.5.2 Raw materials in

All transport will be via road. Major raw materials include:

Major item	Tonnes	Form of transport	Sourced from/via
Fertiliser	30,000	Truck - bulk back load	Imported/Townsville
Plant chemicals	700	Truck – Back loaded	Imported/Townsville
Lime/limestone	5,000/10,000	Truck	North Queensland
Propylene oxide	3,300	Truck – Back loaded	Imported/Townsville
Sodium sulphate	850	Truck – Back loaded	Imported/Townsville
Sodium hydroxide	1,000	Truck – Back loaded	Imported/Townsville
Molasses (for stockfeed)	110,000	Tanker	NQ coastal mills
Cattle	200,000 head	Cattle trains	North Queensland
Packing materials	To be determined		
Bulka bags		Truck – Back loaded	Imported - Townsville
Plastic wrap		Truck – Back loaded	Domestic – Townsville
Pallets			On-site fabrication

5.3.5.3 Product out

Product will be used domestically and exported. Most exports are planned to occur through the Port of Townsville for bulk cargoes. Containerised cargoes are expected to be shipped through the Port of Brisbane. Products include:

Major item	Tonnes	Form of transport	Supplied to/via
Raw sugar	530,000 to 600,000	Truck - bulk back load	Imported/Townsville
Ethanol			
Sugar based	100,000 megalitres	Road Tanker	Domestic – Brisbane
Cellulosic	100,000 megalitres	Road Tanker	Domestic – Brisbane
Modified guar gum	5,000/10,000	Truck	North Queensland
Meat products	50,000	Truck	Imported/Townsville

Stock feed	400,000	Truck – regional/T'ville	NQ regional/Exported
Red Claw	10,000	Truck to Brisbane/Cairns	Exported Frozen/live via Cairns airport
Biodiesel	To be advised	Road tanker	NQ regional

5.3.6 Community amenities

The communities of the Gulf region recognise that, despite growth in eco-tourism and mining and ongoing restructuring in established industries such as pastoralism and commercial fishing, amenities and services are limited.

The Project will overload all available social amenities and service providers. This will support third party – private and public – investment into amenities.

The Environmental Impact Statement will include a Social Impact Assessment which will integrate with existing project mitigation measures and commitments in the region.

The Plan will include details of the existing community infrastructure, including the social amenities and community services that may be affected by the Project.

5.4 Land use and tenures

The Project has identified nine cattle stations that will be impacted through cropping, channel easement or water storage. The tenure for each property is pastoral lease.

More information is available in Section 4 above.

5.4.1 Key local and regional land uses

5.4.1.1 Size

The Etheridge Shire population (1,280 persons counted in 1996) is centred on the communities of Georgetown (300 people), Mt Surprise (65 people), Forsayth (65 people) and Einasleigh (40 people). Etheridge has a scattered population on relatively small rural properties.

5.4.1.2 European settlement

Europeans first explored the Etheridge Shire area in the 1840's and pastoral settlement began in the 1860's. Much of the development of the Shire can be accredited to mining when copper was first discovered in the mid 1860's. Gold rushes followed and saw the settlement of numerous towns, including Georgetown in 1870.

The Etheridge Goldfield was proclaimed in 1872 but it had fluctuating fortunes over the next 30-40 years resulting in decline in the 1920's. However, fresh interest was shown in the 1970/1980's when world prices for gold and other base metals increased dramatically. This saw a resurgence of exploration activity and Kidston Gold Mine commenced production in 1984.

Local Government commenced in the area when the Einasleigh Divisional Board was constituted in the late 1870's. This board became Einasleigh Shire Council in 1902 and later the Etheridge Shire Council in 1919.

5.4.1.3 Significant features

The Gulf tourism industry is built largely on nature based activities such as sightseeing, camping, bird watching, bushwalking, fishing, heritage and fossicking. Between 70% and 90% of tourists are independent travellers, more than half of them are retired and most are over 45 years of age.

Tourism in the Gulf has grown rapidly over the past ten years. This is particularly as a result of conservation and promotion of natural and cultural resources accompanied by improvements to the regional road network.

The region comprises four broadly defined areas each of which provides tourists with a distinctive blend of tourism experience in terms of character and features –

- Etheridge Fossicking;
- Central Gulf Heritage;
- Southern Coastal Gulf; and
- Western Gulf Savannah.

Etheridge Fossicking area includes the townships of Mt Surprise, Einasleigh, Forsayth and Georgetown. The area is rich in minerals such as agate, topaz, garnet, aquamarine and gold and attracts amateur prospectors, with the most notable destinations being the O'Briens Creek Gemfield and Agate Creek Mineral Reserve. Other attractions include Undara lava tubes, Kidston Resort, Cobbold Gorge, Tallaroo Hot Springs, the Cumberland Chimney, old mines and Forsayth Caves. Langlo Lake is the bird watching centre of the Eastern Gulf Savannah. The historic Savannahlander train journey operates weekly between Cairns and Forsayth.

Heritage attractions at Croydon include the Old Courthouse and Mining Warden's Office, the Working Mine Museum, the Club Hotel, the Croydon General Store and Museum, the old Police Station, Gaol and Hospital. Other attractions in Croydon include the Homeward Bound Dam Wall and Lake Belmore.

A search was carried out to determine whether there are any Category A and Category B Environmentally Sensitive Areas within the likely impact area of the Project. Search results indicate that there are no Environmentally Sensitive Areas.

A search was carried out to determine whether there are any Category A and Category B Environmentally Sensitive Areas within or the Impact Area of the Project. Search results indicate that there are no Environmentally Sensitive Areas.

A wider search will be undertaken in the Environmental Impact Statement and will be highlighted in the relevant section in the report.

A regional ecosystem community was identified on Kutchera Station.

A Mining Lease was identified on border of Dagworth and Van Lee Stations.

5.4.2 Key local and regional land tenures

Project parcels comprise the following Lots:

Station	Lot on plan	Tenure	Shire planning scheme	Project purpose

Dagworth	Lot 5 EI813291	Pastoral Lease	Rural	Lake and channel easement, minor cropping
Kutchera	Lot 2248 PH2034	Pastoral Lease	Rural	Cropping
Chadshunt	Lot 38 ET813287 Lot 40 ET16	Pastoral Lease	Rural	Cropping
Station	**Lot on plan**	**Tenure**	**Shire planning scheme**	**Project purpose**
Huonfels	Lot 214 PH2125	Pastoral Lease	Rural	Lake and channel easement and minor cropping
Abingdon Downs	Lot 171 EI835473	Pastoral Lease	Rural	Cropping, water capture and storage and channel easement
Van Lee	Lot 5026PH251	Pastoral Lease	Rural	Construction camp-site, water capture, channel easement and lake
Ironhurst	Lot 4533 PH119	Pastoral Lease	Rural	Overland water capture and channel easement
Mid Hills	Lot 2034 PH568	Pastoral Lease	Rural	Channel easement
Mt Turner	Lot 28 EI3	Pastoral Lease	Rural	Channel easement
Feral View	Lot 13 ET17	Pastoral Lease	Rural	Seasonal village
Georgetown Heights	Lot 9 GB75	Freehold	Rural	Residential village

5.4.3 Native title

A Determination in favour of the Ewamian People was confirmed on 25 November 2013 in Georgetown.

5.5 Planning instruments, government policies

5.5.1 Local planning instruments

The Project is within the Etheridge Shire. The lands within the Environmental Impact Study area are zoned for 'rural use' under the Shire Plan.

Co-development activities such as the proposed residential development and Feral View Seasonal village will be fully assessed under the Shire Plan.

5.5.2 Sustainable Planning Act

The principal land use planning legislation in Queensland is the *Sustainable Planning Act*. The *Sustainable Planning Act* seeks to achieve sustainable planning outcomes through:

- managing the process by which development takes place;
- managing the effects of development on the environment;
- continuing the coordination and integration of local, regional and state planning;

The Sustainable Planning Act emphasises the coordination and integration of planning at the 3 levels at which it occurs in Queensland, namely:

- local (government) planning;

- regional planning;
- state planning.

Coordination of planning refers to the linking of planning activities within differing levels of government and the linking of different aspects of planning such as natural resource planning, land use planning and infrastructure planning. Integration refers to the combination and rationalisation of planning outcomes and presenting them in an integrated and logical fashion.

Under the Sustainable Planning Act, state land use planning policy is implemented though state planning instruments, comprising:

- state planning regulatory provisions (such as supporting the regional planning process and providing for infrastructure charge mechanisms);
- State Planning Policies;
- regional plans such as the Gulf Regional Development Plan 2000;
- standard planning scheme provisions (that will become evident in the form and content of planning schemes prepared since the advent of the *Sustainable Planning Act* in December 2009).

5.5.3 State planning regulatory provisions

The State Planning Regulatory Provisions are planning instruments that the planning minister can introduce as required for specific issues and are generally used to:

- implement a regional plan;
- implement structure plans for master planned areas;
- allow the planning minister to respond to environmental, cultural, economic or social issues in local areas by affecting the operation of planning schemes;
- apply state infrastructure charges within master planned areas.

There are no State Planning Regulatory Provisions that directly relate to the Project.

5.5.4 State planning policies

A number of State Planning Policies and associated guidelines have been developed and support the implementation of the provisions of *Sustainable Planning Act*.

State Planning Policies hold statutory weight and establish state government's requirements regarding planning and development matters.

The *State Planning Policy December 2013* will be assessed as part of the Environmental Impact Statement.

6 Potential impacts of the Project

6.1 Natural environment

6.1.1 Land

6.1.1.1 Land use

Land use will change according to the facilities installed. Lakes will be established on Dagworth/Van Lee and Huonfels Stations. Other uses may develop including irrigated and dryland cropping, tourism such as fishing, bird-watching and recreational boating and aquaculture.

Cropping rather than grazing will become the dominant land use on Kutchera and Chadshunt Stations. Processing and aquaculture will also displace land currently used for grazing on Kutchera Station. Residential and commercial facilities will be located on Feral View Station and adjacent to Georgetown.

Grazing may increase in intensity due to the availability of stockfeed enabling year round fattening to occur.

The Environmental Impact Study will include the assessment of the compatibility of the Project with surrounding land uses, description of possible impacts on surrounding land uses and human activities as a result of the proposed uses and associated structures.

6.1.1.2 Soils

Construction activities occur during the dry season and will involve clearing and cutter barring, land contouring to control overland flows and run-off, stone and stick-picking and sediment control. Road and headland construction, trenching and pipe-laying occur within this construction window. Grass seeding occurs as non-planting areas are freed of construction activity.

Farming activities comprise discing, cultivation, rowing-up, fertilising, planting and harvesting. Cropping activities - over time - will amend soil characteristics due to application of ameliorants such as dunder, sugar mill mud, dried blood and bone, gypsum, fertilisers and land contouring.

Sediment loss will be reduced due to installation of controlled drainage systems. These systems are designed to discharge water overland at low velocity to encourage sediment to settle out.

Unlike furrow irrigation, trickle irrigation applies fertiliser in small quantities adjacent to the root zone. The lack of an accessible aquifer below the crop zone further reduces nutrient loss.

Soils issues addressed in the Environmental Impact Statement will include:

- Maps of soil types within the project area;
- Assessment of the suitability of soils for the proposed development;
- Availability of sand and clay soils for use in construction;
- Risk assessment and constraints analysis; and
- Definition of site-based management plans to minimise environmental harm and land degradation.

6.1.1.3 Landscape and visual amenity

Whilst most of the landscape remains as grazing land, large areas are altered due to the removal of vegetation in cropping areas and the creation of lakes in other areas. Channel lines will provide

access roads for cattle, stockfeed and maintenance which will create additional road network infrastructure across the project properties.

Cropping is already established in the region. Expansion of the area under cropping is compatible with the rural amenity that current land uses provide.

Above ground infrastructure associated with the Project that may have adverse impacts on the visual amenity include the Bioprocessing Precinct and accommodation village which creates an industrial architecture.

6.1.2 Water

6.1.2.1 Surface Water

Water will be diverted from the Einasleigh and Etheridge River which will reduce the annual average water flow into the Gilbert River and the annual average volume of water discharged at the river mouth.

The current and projected changes in average annual flow are summarised in the table below and are based on the Queensland Government's Integrated Quality and Quantity Model. The reduction in the average annual end-of-river flows is 8.8%.

Location	Pre-Development megalitres	After existing entitlements megalitres	Retained flow megalitres	Diversion Impact %
Einasleigh R downstream of diversion	1,285,000	1,270,000	870,000	31.1%
Etheridge R downstream of diversion	390,000	390,000	235,000	39.7%
Einasleigh at Minnies Dip	2,550,000	2,530,000	2,055,000	18.6%
Gilbert R at End of System	5,450,000	5,400,000	4,920,000	**8.8%**

Potential impacts of the Project on surface water resources may include:

- disturbance to the Einasleigh, Etheridge and Gilbert rivers and Dismal Creek through reduced flow during the Wet Season;
- runoff from disturbed areas such as the farm impacting on Dismal Creek water quality and quantity;
- diversion of drainage lines and minor creeks on Kutchera and Chadshunt Station to control overland water flows.

The Environmental Impact Statement will include an assessment of the following:

- assessment methodologies for water quality characterisation, flooding, geomorphology and water management;
- baseline (existing) surface water environment and associated environmental values;
- assessment of the proposed project to identify and evaluate potential impacts on the surface water regime;
- proposed mitigation measures.

6.1.2.2 Ground water

Great Artesian Basin recharge zones are mapped below the proposed farm site. State of the art trickle tape irrigation technology results in low water application which is largely constrained to the surface. An ironstone cap underlying the site will further constrain infiltration.

The impact on recharge will be assessed during project studies. It is intended to:

- Develop a conceptual model of the groundwater flow systems (a hydrogeological conceptual model) to inform and support the hydrological modelling;
- Provide an order of estimate groundwater balance to input to the water balance.

6.1.2.3 Marine water

Flows from the Gilbert River contribute to salinity dilution within the near-shore of the river mouth. Mixing is highly modified by significantly greater daily tidal events leading to negligible impacts.

Impacts on fishery catch are discussed below in the Coastal and Marine Life section.

6.1.2.4 Flood risk

Construction is based on 9 months available time with construction largely suspended during the wet season. Operationally, the Project will marginally reduce downstream flooding. Flood events are unlikely to impose additional impacts on neighbouring properties, roads or other infrastructure.

6.1.3 Air

Air quality will be discussed below in Section 6.2.2.

6.1.4 Greenhouse Gas

The Project will increase carbon dioxide at a local level, initially due to clearing and construction but also due to the ongoing use of non-renewable diesel and combustion of biomass to generate electricity.

At a global level, the Project will deliver a reduction in methane and carbon dioxide through displacement of non-renewable fuels by ethanol and electricity generated using coal and coal seam methane.

A description of the various project activities, including utilisation of CO_2 through photosynthesis in the crops produced, processing and utilisation of the by-products for provision of energy and production of bio-ethanol, animal feed and electricity, plant fertiliser will be undertaken. An assessment of the emission of greenhouse gas from the project will be developed to provide an overview of the projects potential to influence state and national emission inventories.

6.1.5 Flora and fauna

6.1.5.1 Terrestrial

Flora and fauna will be impacted as a result of land inundation to create lakes and vegetation clearing of farmland.

Additional habitat will be created supporting a substantial increase in native wildlife. Reduction in pests especially pigs and weeds will reduce damage to existing landscapes. Reduction in bush fires will also reduce habitat loss.

Field-based survey will complement review of existing biodiversity databases. Ecological communities will be compared to:

- Listed threatened species under the *Nature Conservation Act 1992*;
- Protected vegetation communities under the *Vegetation Management Act1999*;
- Listed threatened species, communities and migratory species (Matters of National Environmental Significance) under the *Environment Protection and Biodiversity Conservation Act 1999*;
- Weed and pest species identified under the *Plant Protection Act 1989* and *the Land Protection (Pest and Stock Route Management) Regulation 2003* Desk Based Assessment.

Potential impacts on flora and fauna during construction and operations will be identified including the significance of those impacts.

6.1.5.2 Aquatic

The aquatic ecology study will collate available datasets and study reports from the Einasleigh River, Etheridge River, Gilbert River and Gilbert River Fan to identify and describe likely impacts.

A field survey will evaluate dry season aquatic life. Changes in river flow and nutrient delivery as a consequence of the project will be modelled to determine potential impacts. The Aquatic surveys will investigate sites by sampling aquatic plants, fish, macroinvertebrates, and water quality in large pools within the river bed downstream from the diversion point to the Smithburne - Gilbert Fan.

The field survey will be conducted by TropWATER. TropWATER is currently providing the same service to CSIRO to assess the ecology of the river system upstream of the proposed diversion points, as part of the CSIRO Flinders and Gilbert Agricultural Resource Assessment.

The sampling strategy has been designed to duplicate the information compiled for the existing CSIRO project to allow a comprehensive impact assessment, drawing on data from nearby locations where applicable.

Data from field studies, supported by additional literature will be important contributors to understanding the aquatic ecology of the Project area and downstream.

6.1.5.3 Wetlands

Potential indirect impacts associated with the reduced flow will be evaluated with respect to the Smithburne Gilbert Fan wetland downstream of the project. Sampling will occur in parallel with other aquatic surveys.

6.1.5.4 Coastal and Marine

Work will be undertaken in the Environmental Impact Study to:

- Describe the fishery, value, species biology and ecosystem production;
- Describe the projected changes in estuarine and coastal environments resulting from the project, in wet, normal, and dry years; and
- Provide a model of potential impacts of the project on the fishery.

The methodology uses previous studies by CSIRO in the Ord River downstream of the Ord Irrigation Area, Great Barrier Reef coastal fisheries, and in the tropical Pacific region as well as independent studies by CSIRO to develop a model of the fishery in Albatross Bay (Weipa) to the north.

The scope of this study will include all channels draining to the coast through the Gilbert River fan, to account for differential effects of changes in flow, nutrient delivery, and primary production to support fisheries across the delta.

The scope will include direct fisheries catches within the data grids immediately adjacent to the Gilbert River fan, as well as assessing indirect changes for species such as barramundi and prawns that use the fan for breeding, but are caught in data grids outside the immediate vicinity of the fan.

6.2 Amenity

6.2.1 Noise and vibration

Project noise during construction will come from:

- large scale earthworks which is associated with blasting, ripping and heavy machinery;
- Clearing and land preparation for farming;
- Structural and mechanical construction of facilities;
- Road traffic.

Operational noise and vibration will continue from farm operations and irrigation (pump motors), Bioprocessing Precinct operations and road traffic.

Due the nature of project, its remote location and distance to receptors, assessment will involve a desktop noise and vibration study of project activities. Impact assessment will consider noise and vibrations associated with the project and assess potential risk of impacts on local people and wildlife.

The assessment will consider construction blasting as well as operating noise from farming and processing and road traffic.

6.2.2 Air quality

The Project will impact on air quality through:

- Increased dust emissions from earthworks, land preparation and farming;
- Air emissions from the power station based on combustion of bagasse and bio-methane from the biogas plant;
- Odour from meat processing and bagasse stockpiles;
- Reduced bush fire emissions.

Work undertaken for the Environmental Impact Statement will describe air and odour impacts and these will be assessed using a qualitative and quantitative model for process activities. The methods proposed include:

- Odour dispersion modelling and odour concentration criterion with reference to the methodology in the Guideline for Odour Impact Assessment from Development of Environment and Heritage Protection;
- Describe how the performance objective of Schedule 5, Table 3 of the Environmental Protection Regulation will be met.

6.2.3 Visual amenity

A study will be carried out to provide a landscape analysis and concept layout, utilising aerial photography, satellite images and contour mapping in order to plot the likely visual catchment of the key project facilities extending above ground level.

Potential observers will be identified and a description of the likely sensitivity of those receptors to the project facilities will be outlined and illustrated, where appropriate.

6.3 Social environment

The project will impact on the social environment due to:

- the introduction of large numbers of personnel during the construction phase;
- a large permanent and seasonal workforce;
- substantial private investment in housing and community facilities;
- restructuring of the grazing sector to include cattle finishing rather than breeding;
- growth in adjacent cropping precincts

6.3.1 Social Impact Assessment

A social impact assessment is a key feature of the Environmental Impact Study. The social impact study will include:

- A comprehensive Project description (e.g. workforce numbers, traffic routes, vehicle movements). The Project description will help determine the activities likely to contribute to socio-economic impacts and the people likely to be impacted by the Project;
- Preparation of a socio-economic baseline analysis in discussion with the Etheridge Shire Council;
- Assessment of positive and negative socio-economic impacts and analysis of the direct, indirect and cumulative impacts. The assessment will take into consideration the vulnerability of community members and the magnitude of the impact.

The assessment is structured in accordance with the Queensland Government Guidelines for undertaking social impact assessment:

- demographic (e.g. changes in gender or age distributions, the number of resident versus non-resident workers);
- economic (e.g. local employment and business opportunities and economic conditions, availability and affordability of housing);
- health and wellbeing (e.g. social, economic, lifestyle and behaviours, access to services);
- environmental (e.g. dust, noise, lighting and water-quality impacts on social amenity/liveability and health and wellbeing); and
- institutional (e.g. capacity, capability and membership of community organisations and governance mechanisms).

6.4 Economic effects

The depth and breadth of the Project delivers diverse local, state and national economic benefits.

The area surrounding the Project supports agriculture, tourism and mining. The Georgetown community will be subject to the greatest level of economic transformation. Potential impacts and benefits will also be experienced at wider regional levels due to the spread of employees and increased tourism.

Impacts and opportunities to enhance the benefits of the Project will be identified during the Environmental Impact Study.

Benefits will include:

- employment opportunities within the region;
- creating opportunities for existing farmers to grow their business;
- wealth and skills accumulation leading to further business growth;
- boosting the state and national economies;

- increasing the tax revenue for both the state and federal governments;
- replacement of publically funded research with privately funded research;
- creating opportunities to diversify rural and regional economies in a manner that will help sustain their long-term viability, including providing financial contributions towards social and environmental (eg pest reduction) improvements; and
- generating further local economic spending through the purchase of local resources, goods and services during the implementation and operation of the Project.

To ensure these economic impacts are well understood the community will be consulted as part of the Environmental Impact Statement process (see Section 10).

6.5 Built environment

The Project is to be constructed in a location which requires no additional infrastructure with the exception of transmission lines connecting the existing 66 kilovolt transmission line to the Bioprocessing Precinct.

Potential improvements in regional infrastructure could include a northern port at Karumba and road upgrades.

Community infrastructure is required including:

- Town sewerage and treatment;
- Reliable electricity;
- Middle and secondary school;
- Old aged care and respite centre; and
- Medical facilities.

IFED will work with the Etheridge Shire Council and State government departments, land owners, government-owned corporations and community groups to identify potential impacts on existing external infrastructure, to develop solutions to minimise potential impacts.

6.6 Matters of National Significance under the Environmental Protection and Biodiversity Conservation Act

Potential impacts to listed threatened species and ecological communities include:

- clearing for the construction of facilities including cropping;
- disturbance to habitat from noise, light and general activity; and
- reduction in feral and invasive species.

An *Environmental Protection and Biodiversity Conservation Act* Protected Matters Report provides general guidance on matters of national environmental significance and other matters protected by the *Environmental Protection and Biodiversity Conservation Act*. The results of the report are:

Item	Result
Matters of National Environmental Significance	
World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None

Item	Result
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	7
Listed Migratory Species:	10
Other Matters Protected by the Environmental Protection and Biodiversity Conservation Act	None
Commonwealth Land:	None
Commonwealth Heritage Places:	11
Listed Marine Species:	None
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None
Extra Information	
Place on the Register of the National Estate:	None
State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	14
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Name		Status	Presence
Listed threatened species			
Birds			
Red Goshawk [942]	*Erythrotriorchis radiatus*	Vulnerable	Species or species habitat likely to occur within area
Gouldian Finch [413]	*Erythrura gouldiae*	Endangered	Species or species habitat known to occur within area
Australian Painted Snipe [77037]	*Rostratula australis*	Vulnerable	Species or species habitat likely to occur within area
Mammals			
Greater Large-eared Horseshoe Bat [66890]	*Rhinolophus philippinensis (large form)*	Endangered	Species or species habitat may occur within area
Plants			
[8635]	*Cajanus mareebensis*	Endangered	Species or species habitat may occur within area
Cooktown Orchid [10306]	*Dendrobium bigibbum*	Vulnerable	Species or species habitat may occur within area
Sharks			

Name		Status	Presence
Freshwater Sawfish [66182]	*Pristis microdon*	Vulnerable	Species or species habitat likely to occur within area
Listed migratory species			
Migratory marine birds			
Fork-tailed Swift [678]	*Apus pacificus*	Threatened	Species or species habitat likely to occur within area
Migratory terrestrial species			
Gouldian Finch [413]	*Erythrura gouldiae*	Endangered	Species or species habitat known to occur within area
White-bellied Sea-Eagle [943]	*Haliaeetus leucogaster*		Species or species habitat known to occur within area
Rainbow Bee-eater [670]	*Merops ornatus*		Species or species habitat may occur within area
Migratory wetlands species			
Great Egret, White Egret [59541]	*Ardea alba*		Species or species habitat known to occur within area
Cattle Egret [59542]	*Ardea ibis*		Species or species habitat likely to occur within area
Latham's Snipe, Japanese Snipe [863]	*Gallinago hardwickii*		Species or species habitat may occur within area
Oriental Pratincole [840]	*Glareola maldivarum*		Species or species habitat may occur within area
Sarus Crane [904]	*Grus antigone*		Species or species habitat likely to occur within area
Painted Snipe [889]	*Rostratula benghalensis (sensu lato)*	Vulnerable	Species or species habitat likely to occur
Other Matters Protected by the Environmental Protection and Biodiversity Conservation Act			
Listed Marine Species			
Birds			
Magpie goose (978)	*Anseranas semipalmata*		Species or species habitat may occur within area
Fork-tailed Swift [678]	*Apus pacificus*		Species or species habitat likely to occur within area
Great Egret, White Egret [59541]	*Ardea alba*		Species or species habitat known to occur within area
Cattle Egret [59542]	*Ardea ibis*		Species or species habitat likely to occur within area

Name		Status	Presence
White-bellied Sea-Eagle [943]	*Haliaeetus leucogaster*		Species or species habitat known to occur within area
Rainbow Bee-eater [670]	*Merops ornatus*		Species or species habitat may occur within area
Osprey [952]	*Pandion haliaetus*		Species or species habitat likely to occur within area
Reptiles			
Freshwater Crocodile, Johnston's Crocodile, Johnston's River Crocodile [1773]	*Crocodylus johnstoni*		Species or species habitat may occur within area

Invasive species noted in the *Environmental Protection and Biodiversity Conservation Act's* Protected Matters Report are Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Donkeys appear to be missing.

Invasive plants include Prickly Acacia, Gamba Grass, Rubber Vine and Parkinsonia (aka Jerusalem Thorn, Jelly Bean Tree, Horse Bean).

7 Environmental management and mitigation measures

7.1 Natural environment

7.1.1 Land

7.1.1.1 Land use

The Project will introduce changes to land use that are compatible with current land uses.

Pastoralists will benefit from the availability of stock feed and a local market for cattle. It offers increased incomes which will assist in funding improved land management eg reduced pests, higher weaning rates, etc

Tourism will also be advantaged by providing several new regional attractions including:

- Bioprocessing Precinct visitor centre;
- Red claw visitor centre;
- Increased accommodation and accommodation village; and
- Large lakes creating opportunities for water activities, fishing and bird watching tours.

The Environmental Impact Study will assess impacts to existing land resources, including a search of the Environmental Management Register and Contaminated Land Register and will present any relevant mitigation measures that may be required.

7.1.1.2 Soils

Soils will vary in quality with depth, rock content, sodicity, texture and nutrient content. Changes in level and drainage conditions also impact on crop performance. A variety of mitigation measures are available to improve growing conditions and over time, the quality of soil.

Numerous mitigation measures are available for soils reflecting Australian technical leadership in soil management and multi-generational experience in dealing with soils that are – by world standards – nutrient deficient.

Appropriate mitigation measures will be drawn from soil suitability surveys which form the agronomic engineering component of the Project. An example of one measure is the use of buried trickle tape. This delivers nutrient directly to roots to optimise plant growth.

7.1.1.3 Landscape and visual amenity

Project facilities are remote compared to east coast farming precincts. Architectural design of the Bioprocessing Precinct will promote the integrated and sustainable nature of the facility with recycling and re-use of products.

A visitor centre will be established to provide a deeper insight into modern integrated bio-processing and as well as the broader region.

Further mitigation measures will be developed from the project visual model during the Environmental Impact Study.

7.1.2 Water

7.1.2.1 Surface Water

The project delivers high value for the water diverted from the Einasleigh and Etheridge Rivers and minimises the impact by using off-river storage - a mitigation measure which eliminates damming of the river. This enables the river downstream of the diversion to retain its natural characteristics.

The diversion point has been chosen because it is close to the entry of a major creek (Elizabeth Creek) into the Einasleigh River. This creek enters 300 metres downstream of the diversion point and recharges the river with additional water flows.

Initial surface water and overland flows on the farm will be captured as part of the project's run-off and sediment management program. This water will be either recycled back on-farm or used to create a wetland.

Further mitigation measures will be assessed in parallel with the Environmental Impact Study.

7.1.2.2 Ground water

The Project is potentially adding to the ground water. Mitigation measures for this situation usually involve selective water extraction and reuse on the farm. These and other mitigation measures will be explored in the scope of works covering groundwater modelling.

Ground water assessment is an ongoing operational task and the modelling will be used to identify appropriate groundwater monitoring sites.

7.1.2.3 Marine water

Water is diverted during wet season high flows. The amount of water diverted is proportionally lower when the rainfall is low compared to normal or high rainfall years. This design is intended to secure an average annual diversion where the most of the water diverted is obtained during higher flow years.

The water storage is designed to hold sufficient water for 3 to 4 years of operation. The storage is also designed to be deep to minimise evaporative loss.

Further mitigation measures will be evaluated during the Environmental Impact Study and parallel engineering study.

7.1.2.4 Flood risk

Lakes, channels, farm and the Bioprocessing Precinct are located outside of flood zones, however, construction can be impacted by floods.

Consequently a nine month construction period is scheduled for major earthworks activities. Other flood risk management options will be explored.

Flooding will also occur along the Gulf Developmental Road and the site access road at:

- Jamtin Creek (road from the Site to the Seasonal Village);
- Rocky Creek (site access road off Gulf Development road);
- Somerset Creek along the Gulf Development Road;
- Log Creek along the Gulf Development Road;
- Sandy creek in Georgetown.

7.1.3 Flora and fauna

7.1.3.1 Terrestrial

The project will provide a range of mitigation measures to protect threatened flora and fauna.

The Project has a registered regional ecosystem which has a biodiversity and vegetation classification of "Of Concern" which will be protected.

Examples of mitigation measures include:

- Reduction in pests especially pigs and weeds will reduce damage to existing landscapes;
- Reduction in bush fires will also reduce habitat loss; and
- Lakes established by the project will also support a wide variety of tropical life. Lake Kununurra on the Ord River in Western Australia is now listed in the Directory of Important Wetlands in Australia.

Further mitigation measures will be assessed following surveys.

7.1.3.2 Aquatic

The Einasleigh River is characterised by high wet season flows and low or no flow during the dry season. Aquatic life is sustained in permanent rock pools along the length of the river.

Compared to a dam which periodically releases very cold water to the river impacting on natural ecological behaviour, the Project uses off-river storage. Off-river storage avoids downstream dry season disturbance of river ponds and pools which are critical to sustain river flow during annual no-flow periods.

In-river diversion structures are also designed to incorporate "fish ladders' to permit passage upstream and downstream of the river. These structures are designed empty following wet season flows and do not act as reservoir and do not add to ponding within the river.

Creation of Dagworth and Dismal lakes will also provide additional off-river habitat for aquatic life leading to a substantial increase in aquatic fauna.

7.1.3.3 Wetlands

Water is diverted from the Einasleigh River at a point which is 270 kilometres upstream of the confluence with the Gilbert River. The Smithburne Gilbert Fan commences another 60 kilometres downstream from the confluence and forms the northern boundary of the Fan.

Project studies will investigate potential impacts on Wetland flora and fauna and evaluate mitigation measures, if required.

7.1.3.4 Coastal and Marine

Coastal impacts due to reduced flood flows will be reviewed with respect to fish and prawn catch.

A key measure to mitigate the impact of fish catch is deep off-stream storage to efficiently hold three to four years of water. This allows significantly more water to be diverted during high rainfall years and reduces dependency on diversion during low rainfall years when less water is available for flushing of the river.

Deep storage also reduces evaporation losses which are essential for long term water storage in the Dry Tropics. This reduces the overall requirement for water.

Another mitigation measure is the method of diversion. Unlike an in-river dam or weir, IFED's design does not impede natural river flows and water supply to dry season water holes along the river. This maintains the natural function of the river and retains the same capacity to generate migrating fish.

Dagworth and Dismal Lakes will also provide additional fish habitat and may be expected to increase fish release during the wet season into the river and, for migratory fish, increased fish catch in the Gulf.

Other mitigation measures such as sediment reduction may also increase fish catch by retaining or increasing water holes which have been lost to rising river sand levels.

7.1.4 Noise and vibration

The construction of facilities will contribute to noise or vibration at isolated homesteads, some of which will be owned or managed by IFED.

Receptors will be confirmed during the Environmental Impact Study. A noise model will be developed to support the impact assessment process. Mitigation steps will be taken during construction and subsequently during operations, if required.

7.1.5 Air quality and odour

Air quality in the region is mainly influenced by pastoral activities including road transportation – cattle and feed trucks - which is a major generator of dust emissions. The potential dust sources during construction will include earthworks and increased traffic movements.

The anticipated dust sources during farm operations are expected to be substantial as a consequence of mechanised farming processes.

Odour from the Bioprocessing Precinct will occur from meat processing, bagasse storage and recycling of nutrient from meat processing.

Mitigation measures include:

- running water trucks and dozer crews during construction to maintain dirt roads;
- bituminising key traffic areas;
- no cane burning prior to harvesting; and
- cover bagasse stockpiles.

Receptors will be confirmed during the Study but are expected to be isolated homesteads. Mitigation measures will be assessed during studies.

7.1.6 Greenhouse gases

The EIS will estimate the quantity of greenhouse gases (including direct and indirect emissions) attributable to the Project.

Mitigation measures designed into the project include:

- production of ethanol to offset gasoline;
- conversion of cellulosic by-product to ethanol;
- generation of biogas as source of energy from soluble organics in by-product process water;

- reuse of by-product bio-dunder from ethanol production and meat processing plant by-product as fertiliser to displace synthetic nitrogen;
- production of biodiesel to offset diesel;
- stockfeed from cane tops, steamed bagasse, molasses and dunder will reduce cattle emissions;
- local meat processing precinct which reduces trucking distances for cattle;
- gravity movement of water to reduce pumping costs; and
- generation, consumption and export of renewable electricity.

7.2 Built environment

The Project will construct:

- water diversion, channels and water storage facilities;
- a 65,000 hectares of irrigated cropping land and dry land cropping, where appropriate;
- a Bioprocessing Precinct with facilities to produce raw sugar, ethanol, guar gum, stockfeed and meat products and recycle by-products; and
- infrastructure to support the Project facilities.

The Enterprise will expand accommodation and commercial facilities at Feral View Station and Georgetown. An increase in lifestyle and recreational opportunities such as:

- Supermarket;
- Lake activities – sailing , fishing, swimming;
- Hospitality; and
- Sporting events – golfing, cricket, rodeo, etc;

The Built Environment will be strengthened by:

- more secure electricity supply with less outages due to local electricity generation;
- Community amenities will be improved as a result of increased population leading to more support for sports and recreation activities and regional events;
- Medical and health facilities will be enhanced; and
- Increased children attending school may be sufficient to justify a middle school.

Increased accommodation facilities, local tourist sites, retail and hospitality options will provide greater tourist stopover time which will benefit local business interests.

7.3 Social impact assessment

Consultation with community and stakeholders will take place jointly with the council and state agencies in accordance with social impact assessment guidelines.

The strategy needs to be an inclusive and continuous process between the proponent and the communities of interest that identifies social opportunities and impacts that are directly related to the project.

Key elements include:

- holding information meetings at which the communities of interest are advised of the project details, the expected social impacts and opportunities, and the possible mitigation strategies identified to date;
- consultation with the communities of interest to verify social impacts and opportunities and to formulate mitigation strategies based on the responses from the communities of interest;
- seeking responses from communities of interest and the transparent integration of these responses in the project's social impact assessment.

Engagement with communities, local governments and government agencies will be ongoing to ensure that their input is appropriately reflected in the development of the Project.

7.3.1 Community and stakeholder engagement

Unlike mining, farming creates broad communities which, in turn, elect broadly-based councils. Increased community size and greater depth and breadth of interests across the community will require an expanded council.

The existing grazing and mining fraternity will be joined by an expanded resident and business base as well as cropping and processing orientated sections.

IFED will engage with council and community groups as well as business interest groups.

7.3.2 Workforce management

7.3.2.1 Construction workforce

The Project will be constructed using a series of large packages which go out to tender. The selected Contractor will provide and manage their workforce. Workforce and accommodation management plans are assessed in the tender process.

Workforce management outside of working hours is a community issue that requires liaison and coordination with police, council and major contractors on a regular basis to ensure that areas of concern are addressed. A Management Plan will be agreed with Council and Police to provide guidelines for the workforce.

7.3.2.2 Operating workforce

Farming systems, unlike mining, are heavily reliant on small business contractors for services. A substantial element of the project is expansion of small business operators. Management of part of the workforce is devolved to these business owners who are familiar with operating in rural communities.

Management measures to increase small owner-operators are discussed below in Section 7.3.4 which deals with local business.

Seasonal workers will be largely located at Feral View Seasonal village located adjacent to Project areas.

These mitigation measures seek to create a permanent workforce which is a hallmark of rural farming communities.

7.3.3 Housing and accommodation

Mitigation measures have identified a range of accommodation developments including:

- temporary site-based construction camps complete with fly in, fly-out capability capable of handling around 1,250 workers;
- a privately-owned residential village conveniently located adjacent to the Bioprocessing Precinct suitable for construction and seasonal workers, tourists and other visitors capable of handling 500 workers;
- a privately-owned residential and commercial development in Georgetown, adjacent to the Gulf Development Road capable of handling 450 workers.

7.3.4 Local business and industry content

Sub-contracting of services is a core element of the project's operating structure. Most farming tasks are subcontracted on structured agreements.

IFED will encourage the creation of new small contracting businesses by providing mobile equipment leasing arrangements for trucks, harvesters, tractors and spray rigs and other equipment. This overcomes bank lending constraints that stop new contractors from getting established in the industry.

These mitigation measures will enable local business to grow and, out of this growth, accumulation of wealth and skills will create further opportunities.

An Australian Industry Participation Plan has been developed to be used to measure local content performance.

7.3.5 Health and community wellbeing.

Expanded health services are essential to Georgetown and the broader Gulf community. Increased population and diversity of occupational activities will require provision of facilities.

IFED will support expansion of health services with funding for:

- fire fighting facilities;
- a range of company community support programs such as day care;
- additional sporting and recreational facilities;
- education and cultural initiatives.

7.4 Cultural heritage management plan (Indigenous)

The Ewamian People are establishing a world class natural heritage facility at Tallaroo Station located along the Einasleigh River. Combining culturally significant carvings, natural hot springs and bordering on Dagworth Lake, the facility will be uniquely positioned to exploit Dagworth Lake to carry out themed ecotours including:

- bird watching;
- fishing tours; and
- pest management.

Cultural heritage management plans will be prepared jointly with the Ewamian People to address survey and monitoring requirements and mitigation of impacts and management of cultural heritage material during the construction.

7.5 Non-Indigenous cultural heritage management

The Environmental Impact Statement will evaluate the significance of any non-Indigenous heritage sites that may be present within the project site.

The Project is located on the popular Savannah Way tourist route to Normanton and Karumba. Site visitors will be encouraged to explore the environmental attributes of integrated agri-processing.

Small on-site business opportunities such as a boutique rum distillery will be explored to complement local beef, barramundi, red claw, boar, kangaroo and crocodile and other wild catch experiences.

These mitigation measures will expand the opportunity for tourism in the region.

7.6 Greenhouse gas management plan

Greenhouse gas generation and reduction will be assessed on an on-going basis. Consideration will be given to the following sources and greenhouse gas sinks:

- direct and indirect sources of emissions from the development and operation of project facilities;
- cattle methane reduction;
- ethanol – gasoline reduction; and
- biodiesel – diesel reduction.

IFED will focus on on-going measures to further reduce greenhouse gas and promote further expansion of greenhouse gas reducing activities within the Region.

7.7 Waste management

The Project will generate commercial and industrial waste products which may include:

- regulated waste (hydrocarbon waste, detergents, solvents, batteries and tyres);
- general waste (food scraps, paper, rags, cans and glass);
- scrap metal and off-cuts from maintenance activities and from construction;
- sewage effluent and sludge.

A Waste Management Plan will be prepared in accordance with *Waste Reduction and Recycling Act 2011* (WRR Act). This will ensure that all wastes are managed appropriately during the construction and operation phases.

7.8 Hazard and risk, and health and safety

The key activities of the construction phase which may be considered a health and safety risk are:

- transport of personnel, equipment and materials to and from site (including air travel);
- transport, storage and use of dangerous goods on site;
- impacts on local services and entertainment facilities;
- construction of infrastructure;
- clearing vegetation, stripping and removal of soil;
- equipment maintenance;
- plant and equipment commissioning;
- construction of buildings, accommodation facilities and infrastructure;
- water, waste, chemical and oil handling, storage and management activities;
- drilling and blasting for construction purposes;
- construction or upgrading of waste water treatment plants and potable water treatment plants;
- transport of regulated waste off site;
- flood risk during wet season;
- bushfires; and
- drought risk and access to water during the dry season.

The key activities of the operational phase which may be considered a health and safety risk are:

- transport of personnel, equipment and materials to and from site (including air travel);
- transport, storage and use of dangerous goods on site;
- equipment maintenance;
- farm traffic movement;
- flood, drought and bushfires;

- fire risk from raw sugar, bagasse and other stockpiles;
- subsidence of land surface;
- water management, including water storages;
- biogas flaring; and
- remote workforce impacts on local services, such as doctors, hospitals, ambulances, medicine supplies.

Construction and operational risks are managed through a detailed pre-construction planning process using specialist engineering consultancies. Early Contractor involvement also provides greater understanding of risks and mechanisms for dealing with risk.

Other mitigation measures are captured in the design and location of facilities such as off-river storage which avoids major flood mitigation works.

Co-planning with local council, government agencies and authorities and research groups such as CSIRO early in the Project also provides access to specialised risk management and bio-security skills.

7.9 Environmental management

The Environmental Impact Statement will describe the measures that will be undertaken to prevent or mitigate any potential adverse impacts on the environment. The environmental management requirements will cover:

- Environmental values likely to be affected by water diversion, storage and distribution, vegetation clearing, farming and processing activities;
- Potential adverse and beneficial impacts of activities on these environmental values;
- Environmental protection objectives aligned to Environmental Approval conditions;
- Control strategies including a water diversion protocol adopted to achieve the environmental protection objectives;
- Measurable and reported key performance measures aligned with Environmental Approval conditions;
- Control measures to maintain performance measures or trigger corrective actions to maintain measures within acceptable limits;
- Format, timing and responsibility for reporting and auditing of monitoring results;
- Procedures for complaints and inquiries;
- Roles and responsibilities in relation to environmental management, monitoring and corrective actions; and
- Requirements for training and competence of workers.

An application for an Environmental Approval for the Project will need to be made under the *Environmental Protection Act*.

Temporary and permanent water allocations will be required under the *Water Act*.

8 Approvals required for the Project

This section describes the approval framework and relevant legislative requirements for the Project.

Given the depth and breadth of the Project, there will be a need for various approvals from Commonwealth, State and Local Government departments in accordance with relevant environmental legislation, including but not limited to those outlined in Table 1.

The Project will also be subject to the requirements of other Commonwealth, State and Local Government legislation and regulations. The approval process, if the Project is a coordinated project, will comprise:

1. Develop a terms of reference based on Public feedback of the Initial Advice Statement;
2. A draft Environmental Impact Statement released to the Public for review;
3. Public feedback to the Coordinator-General;
4. Review by the Coordinator-General and, if required, additional information will be supplied by IFED; and
5. An environmental impact assessment administered by the Coordinator-General.

Approval under the *Sustainable Planning Act* is met by the Coordinator-General's report on the Environmental Impact Statement. The Integrated Development Assessment Processes of information, referral and notification stages do not apply.

The following key policies and guidelines will also be considered as part of the Environmental Impact Statement process:

- Australian Government *Environmental Protection and Biodiversity Conservation Act* Environmental Offsets Policy Consultation Draft, August 2011;
- Ecoaccess Guideline - *Planning for Noise Control Guideline 2004*;
- *Environmental Protection (Air) Policy 2008*;
- *Environmental Protection (Noise) Policy 2008;*
- *Environmental Protection (Water) Policy 2009*;
- *Major Resource Projects Housing Policy*: Core principles to guide social impact assessment, August 2011;
- *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*, February 2012;
- *Queensland Biodiversity Offsets Policy* (NRM, 2011);
- *Queensland Government Environmental Offsets Policy* EPA, 2008;
- *Queensland Government Policy for Vegetation Management Offsets Version 3*, September 2011;
- *Queensland Water Quality Guidelines, Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000;*
- *Social impact assessment guideline*, July 2013;
- *State Planning Policy December 2013.*

Compliance with the *Native Title Act 1993* is required for the creation of non-farming rights where native title may exist. The right to negotiate process may be required for several areas affected by the Project.

Table 1 – Relevant Federal, State and Local Government legislation, policies, and regulations.

Legislation	Administering authority	Approval trigger	Approval	Relevance to the Project
Environment Protection and Biodiversity Conservation Act 1999	Commonwealth Department of the Environment (DOTE)	Endangered Species	Development conditions may be imposed by DOTE. These conditions may make the Project uneconomic or impractical to proceed.	The *Environmental Protection and Biodiversity Conservation Act* identify "nationally threatened species and communities" and "listed migratory species" are likely to have relevance to the Project. IFED will be referring the Project to the Commonwealth in relation to these potential impacts on Matters of National Environmental Significance and expects that, due to the scale of the Project, that it will require further assessment under the *Environmental Protection and Biodiversity Conservation Act.*
Native Title Act 1993	National Native Title Tribunal	Activities subject to Native Title and not covered under the existing Pastoral Lease conditions	Either an Indigenous land Use Agreement and Cultural Heritage Management Plan for land under lease or a Compensation Agreement for lease land converted to freehold.	Discussions have commenced with the Ewamian Aboriginal Corporation who have a Native Title Claim registered over the Project Area. Alongside cultural heritage surveys through impacted Project areas, ILUA and compensation agreements will occur in parallel with the Environmental Impact Statement.
Aboriginal and Torres Strait Islander	Department of the Environment	Identification of significant Aboriginal artifacts	Either an Indigenous land Use Agreement and	This Act allows for the protection of significant Aboriginal areas and objects

Legislation	Administering authority	Approval trigger	Approval	Relevance to the Project
Heritage Protection Act 1984	(DOTE)		Cultural Heritage Management Plan for land under lease or a Compensation Agreement for lease land converted to freehold.	declared as such under the Act. The Act also requires the discovery of Aboriginal remains to be reported to the relevant minister for heritage.
Queensland				
Water Act 2000 - **IDAS**	Department of Natural Resources and Mines	Take water (including groundwater) and/or interfere with flow within a watercourse. Disturb bed and banks of a watercourse.	Temporary allocation during construction for farm development and construction purposes. Quantity to be determined during the Environmental Impact Statement. Permanent allocation permitting an average annual diversion of 550,000 megalitres per year.	The Environmental Impact Statement will assess impacts on watercourses and water resources. IFED will consult with Department of Natural Resources and Mines in relation to groundwater and surface water matters. Consultation with Department of Natural Resources and Mines and Department of Agriculture, Forestry and Fisheries for design and construction of facilities in waterways.
Land Act 1994 ***Land Titles Act 1994*** - **Non-IDAS**	Department of Natural Resources and Mines	Conversion of pastoral lease to freehold by a corporation. Road closure and new road access	Issue of freehold title by the Department of Natural Resources and Mines. Land subdivision for new road.	IFED will seek approval to convert pastoral lease to freehold. IFED will seek approval for road closures and new road subdivision.
State Development and Public Works	Department of State Development Infrastructure and	Declaration as a Coordinated Project for which an Environmental Impact Statement	Completion of an Environmental Impact Statement to the	IFED is seeking declaration of the Project and has prepared this Initial Advice Statement in support of this application.

Legislation	Administering authority	Approval trigger	Approval	Relevance to the Project
Organisation Act 1971 - **IDAS**	Planning	is required	satisfaction of the Coordinator-General and sustainable conditions for development.	
Sustainable Planning Act 2009 - **IDAS**	Department of Local Government, Community Recovery and Resilience and Etheridge Shire Council	Development Application for incidental Infrastructure related to the Project.	Council approval including terms and conditions associated with the proposed development.	The Project may require additional approvals for accommodation facilities and associated infrastructure outside the area to be covered in the Environmental Impact Statement. The Project will also need to be assessed against State Planning Policies established under the *Sustainable Planning Act 2009* and may seek designation as community infrastructure.
Environmental Protection Act 1994 and Environmental Protection Regulation 2008 - **IDAS**	Department of Environment and Heritage Protection	Duty of care to avoid environmental harm.	Completion of an Environmental Impact Statement to the satisfaction of the Coordinator-General and sustainable conditions for development.	The Environmental Impact Statement will assess environmental values and potential impacts against environmental protection policies established under the *Environmental Protection Act 1994.* The Project will also require approvals for activities that may cause environmental harm, including Environmentally Relevant Activities and activities that may cause land contamination.
Vegetation	Department of Natural	Clearing of native vegetation,	Approval to clear	The Environmental Impact Statement

Legislation	Administering authority	Approval trigger	Approval	Relevance to the Project
Management Act 1999 and the ***Vegetation Management Framework Amendment Act 2013*** - **IDAS**	Resources and Mines	excluding grasses and mangroves	vegetation in the Coordinator-General's assessment report and subsequent approval from Department of Natural Resources and Mines.	will assess the occurrence and extent of potential impacts on native vegetation and vegetation on State land. Assessment against policies and codes established under the *Vegetation Management Act 1999* will be required.
Nature Conservation Act 1992 and the ***Nature Conservation (Wildlife) Regulation 2006*** - **IDAS**	Department of Environment and Heritage Protection	Taking or destruction of certain listed flora and fauna species or any vegetation on State land.	Approval to clear vegetation in the Coordinator-General's assessment report and subsequent approval from Department of Environment and Heritage Protection.	The Environmental Impact Statement will assess the extent of the potential impact on relevant areas and species of conservation significance under the *Nature Conservation Act 1992* and *Nature Conservation (Wildlife) Regulation 2006*.
Aboriginal Cultural Heritage Act 2003 - **Non-IDAS**	Department of Aboriginal and Torres Strait Islander and Multicultural Affairs	Duty of care to avoid harm to cultural heritage.	Acceptance of the Cultural Heritage Management Plan and cultural surveys.	A separate, parallel assessment of the occurrence of and extent of the Aboriginal cultural heritage items and places will be undertaken and a Cultural Heritage Management Plan prepared. The overall assessment process and management requirements will be documented in the Environmental Impact Statement.
Fisheries Act 1994 - **IDAS**	Department of Agriculture, Forestry and Fisheries	Interfering with fish habitat or marine plants or undertaking waterway barrier works.	Approved design and construction of a barrier works.	Waterway barrier works are proposed across creeks and rivers to divert and channel water to lakes. IFED will consult with Department of Agriculture, Forestry and Fisheries in

Legislation	Administering authority	Approval trigger	Approval	Relevance to the Project
				relation to fish passage and potential impacts on fish habitat. An assessment of potential impacts on fisheries and fish habitat will be included in the Environmental Impact Statement.
Transport Infrastructure Act 1994 - **IDAS**	Department of Transport and Main Roads	Utilisation and modification of State Controlled roads	Acceptance with conditions, if proposed, by the Department of Transport and Main Roads to the satisfaction of the Coordinator-General.	The traffic impact assessment will be based on Department of Transport and Main Roads' *Guidelines for Assessment of Road Impacts of Development*. Discussions will be held with Department of Transport and Main Roads to review assessment outcomes and appropriate mitigation measures.
Explosives Act 1999 - **Non-IDAS**	Department for Natural Resources and Mines	A licence is required to use, possess, store and transport explosives	Acceptance with conditions, if proposed, by the Department of Natural Resources and Mines.	Required for construction of channels and embankments.
Fire and Rescue Services Act 1990 - **Non-IDAS**	Fire Services Authority	This Act sets out a number of requirements for buildings and storage of dangerous goods in relation to fire safety.	A certificate of compliance from the Fire Services Authority.	A certificate of compliance is required if a workplace is located more than one floor above ground level.
Land Protection (Pest and Stock Route Management) Act 2002 - **IDAS**	Department of Agriculture, Forestry and Fisheries	Approval is required for temporary or permanent closure of roads and stock routes where required. Management of declared weeds is also required.	Subdivision for new roads and notice of approval for road closures.	Permanent and temporary road closures and amended road alignments (eg flooding of lakes permanently closes some roads).

Legislation	Administering authority	Approval trigger	Approval	Relevance to the Project
Electricity Act 1994 - **Non-IDAS**	Department of Energy and Water Supply, Ergon Energy, Relevant public entity, Relevant road authority, Australian Energy Market Operator.	Approval may be required for: an internal distribution network work likely to come into contact or disturb overhead powerlines, soil or other material supporting or covering the entities work; Electricity works if that work is likely to interfere with soil, vegetation, sewer, drain or tunnel, temporarily stop or divert traffic or interfere with a publicly controlled place; Connection to a High Voltage transmission line Sale of electricity through the national electricity market.	Notice of approval	Construction of internal grid and external connection, connection to and upgrading of Ergon system, temporary and permanent removal of transmission line, and sale of electricity through the national electricity market.
Local Government Act 2009 - **IDAS**	Department of Local Government, Community Recovery and Resilience and Etheridge Shire Council.	Approval will be required where works are to be undertaken on a local government road or reserve.	Approval notice	Agreement for IFED to upgrades roads and maintain dust control during construction.
Transport Operations Road Use Management Act 1995 - **IDAS**	Department of Transport and Main Roads	Approval is required if a road is temporarily or permanently closed. Approval may also be required for the transportation of dangerous goods.	Approval notice	Transport of oversize construction equipment and transport of hazardous chemicals – propylene oxide and ethanol.

Legislation	Administering authority	Approval trigger	Approval	Relevance to the Project
Plumbing and Drainage Act 2002 - **IDAS**	Etheridge Shire Council	Approval will be required for installation of any on site sewerage systems, toilet and shower facilities.	Plumbing approval	Approvals required for project facilities and temporary and permanent accommodation facilities.
Building Act 1975 - **Non-IDAS**	Department of Housing and Public Works	A development permit for building works is required for 'assessable development', where the structure or building work is of a fixed nature (as defined under the *Building Act 1975*.	Building Permit	Relate to building construction and use. It is linked substantially to fire evacuation and fire fighting.
Food Act 2006 - **Non-IDAS**	Etheridge Shire Council	A licence is required to carry on a licensable food business. However, a licence is not required where a third party operates the food business.	License to supply food	Prior to third party operation of on-site food business, IFED may, due to remoteness, establish an in-house cafe for internal staff and site visitors.
Liquor Act 1992 - **Non-IDAS**	Liquor Licensing Division of Queensland Treasury and Trade	A licence is required to sell liquor. However, a licence will not be required where a third party operates the premises selling liquor.	Liquor license	Prior to third party operation of on-site food business, IFED may, due to remoteness, establish an in-house cafe for internal staff and site visitors.
Sugar Industry Act 1999 - **Non-IDAS**	Commissioner and Land court	Agreement for supply and milling of cane and access easements to facilitate harvesting of cane.	Agreement	External growers may wish to supply cane to the Sugar Mill. Access may be required to facilitate harvesting and cane delivery.

Legislation	Administering authority	Approval trigger	Approval	Relevance to the Project
Plant Protection Act 1989 and Plant Protection Regulation 2002 - **IDAS**	Department of Agriculture, Forestry and Fisheries	Transport of sugar cane across zone boundaries	Approval to transport cane billets	The Project will require substantial cane billets (8 to 10 tonnes per hectare) to commence operations. Disease free material is critical to ensure the district benefits from its current clean status.
Local				
Etheridge Shire Plan - **IDAS**	Etheridge Shire Council	Code assessable development	Development Approval	Subject to the Coordinator-General's report
Development permit for Operational Work - **IDAS**	Etheridge Shire Council	Operational works	Operational works approval	Approval required to start construction

9 Costs and benefits

The Etheridge Integrated Agricultural Project represents sustainable development. Unlike extractive Projects which are non-renewable and have a finite life, farming such as this is forever. Further, due to the production of substantial quantities of renewable energy (electricity and bio-ethanol) the Project will reduce national greenhouse emissions. Also, the sophisticated farming techniques employed will reduce land degradation, sediment run-off and feral pest populations.

Sugar production in Northern Australia is based on proven best practice irrigation and farming techniques, processing technology, export logistics, world markets and forward pricing structures. The Etheridge Integrated Agricultural Project will be privately funded and subject to open markets.

The Project will deliver substantial economic, social and environmental benefits.

9.1 Economic benefits

Unlike mining Projects, agri-based economic benefits are widely distributed and community-building especially where large scale processing is involved.

Figure 32 - Cropping area near the Bioprocessing Precinct

9.1.1 Australia

Commonwealth Government policy supports agricultural development in Northern Australia and this is underpinned in two recent Federal Government white papers - Australia in the Asian Century, and Feeding the Future (joint Australia-China Report on Strengthening Investment and Technological Cooperation in Agriculture to Enhance Food Security) and future white paper regarding Northern Australian Development.

Commonwealth Government stands to benefit from the nation building nature of the Project; expansion of Australia's productive capacity, economic growth, a strengthened current account, regional and aboriginal employment outcomes; company and Income tax revenue and reduced social outlays.

9.1.2 Queensland

The Project is fundamental to State Government's four pillars strategy for economic development and obligations to regional and remote Queensland. State Government stands to benefit from freehold conversion fees, payroll taxes and other duties, water, port and other charges, and reduced local government grants and social support obligations for the disadvantaged region.

The Queensland Government's *State Planning Policy December 2013* has recognized that the agriculture industry is central to Queensland's economy, employment and our food and timber supply. Planning for and promoting agriculture opportunities will enable the growth and sustainability of the agriculture industry, and its contribution to the growth of the Queensland economy.

The *State Planning Policy* requires that planning schemes consider the strategic economic significance of important agricultural areas by promoting and optimising agricultural development opportunities and enabling increased agricultural production in these areas.

9.1.3 Local government

The Etheridge Shire and other Gulf Savannah shires are amongst the most **remote and disadvantaged** in Australia. Shire income is insufficient to meet Shire expenses on a sustainable long term basis.

This Project will lead to substantially increased Council rate revenue, economic activity, investment, business and employment opportunities, and support for social/community programs.

The Project and coincidental development will help to make the Etheridge Shire a financially viable community.

9.2 Natural and Social benefits

The Gulf Savannah communities are classified as "very remote and disadvantaged" due to[6]:

- Welfare reliance;
- Low skills levels;
- Low education, minimal education facilities;
- Low income levels;
- Low levels of home and land ownership; and
- 55% plus of population indigenous.

9.2.1 Employment

Substantial employment opportunities in construction, farming and facilities operations and maintenance. Anticipated personnel when fully operational will exceed 1,000.

[6] Gilbert River Irrigation Area Investment Report 2009

9.2.2 Indigenous employment strategy

Targets will be set for local and indigenous employment. The indigenous population in the region based on Census data is:

- Etheridge Shire - 31
- Croydon Shire - 78
- Carpentaria Shire - 758
- Tablelands Shire - 715

A specific strategy will be developed to recruit, train, employ and mentor indigenous workers including:

- During the **development phase**, specialized training will be provided to selected representatives for ground truthing and cultural heritage survey of the impacted Project areas;
- Training programs established during the **construction phase** in Georgetown and Croydon will provide appropriate skills for a suite of construction, farming and factory jobs; and
- **On-going** training programs can be developed for the region to meet the long term needs of the community.

9.2.3 Underwriting economics of existing cattle industry

Region-wide **improvement in the economic position and stability** of existing cattle stations. Production of stock feed and the meat processing facility will benefit the wider community by:

- Shared benefit from lower delivery costs for cattle;
- Sell-down of lower value, older cattle which currently die in the field;
- Age distribution of cattle lowered leading to higher weaner rates (a major driver of profitability);
- Stock feed availability reduces or eliminates dry season weight loss enabling out of season sales and higher prices (ie avoid the peak sales and lowest prices in May /June after the wet season); **Net benefit** from weight gain using stock feed – based on 1,000 head of cattle – is estimated at around **$770 per day** over the dry season;
- Diminishes dependency on live exports and long hauls to southern processing centres;
- Access to water and stockfeed will help manage weather extremes such as drought and bushfires; and
- Higher property valuations (increased rates) due to preferred location with access to market and stock feed.

9.2.4 Mitigating weather extremes

The region is not likely to change significantly due to climate change compared to southern regions, however, the long dry season and heavy flooding rains provide constraints on existing grazing operations. Especially damaging is the high risk of bushfires arising from lightning strikes around the change of seasons from dry to wet.

- The Project delivers enhanced capacity to detect and react to bushfires such as aerial surveillance and detection using company aircraft;
- Investment in fire-fighting equipment provides protection to communities;
- heavy machinery creating firebreaks will be available along with the manpower to coordinate and deliver a quick and effective response over a wide area;
- Availability of stock feed overcomes the impact of loss of grass cover and avoids cattle dying due to lack of feed; and
- The meat processing plant offers an immediate opportunity to dispose of cattle.

9.2.5 Community facilities

Community facilities will be enhanced or created through Project investments in health facilities, and ambulance services, flood management, fire-fighting equipment and aerial fire detection, improved access roads and sports sponsorship. Increased membership and utilization of sporting and recreation facilities will generate additional income leading to upgraded facilities (eg sand greens converted to grass greens).

9.3 Environmental benefits

Environmental benefits are diverse and substantial.

9.3.1 Sustainable industry

Development is based on the sustainable production of electricity and ethanol from crop residues allowing the Etheridge Integrated Agricultural Project to reduce Australia's emission of **carbon dioxide**.

Land being acquired for the Project is existing grazing land and has been subject to well documented impacts such as **land and forest degradation**, bio-diversity loss and declared weed and introduced animal infestations. Recent large-scale losses through uncontrolled bushfires has seen 750,000 hectares burnt generating carbon dioxide emissions equivalent to around 10% of emissions from Australia's coal-fired power stations[7].

9.3.2 Ecologically sustainable

Ecological sustainability is enhanced through removal of densely populated animal and weed pests.

- Substantial (greater than 95%) reduction in wild dog and pig populations especially along sensitive river banks and creeks. The vicinity of the Project carries an estimated 30,000 wild pigs leading to widespread impacts on wild-life and natural vegetation;
- Feral pigs damage crops, stock, property, natural habitat (through trampling, rooting for ground parts of plants and invertebrates and wallowing) and native wildlife through eating eggs as well as predation on, competition with or disturbance of a range of native animals, and destroying habitat; and
- They transmit disease and could spread exotic diseases such as foot and mouth disease if this was introduced to Australia through Cape York. Diseases carried which are likely to affect people are: Sparganosis, Brucellosis, Melioidosis, Leptospirosis and Q Fever.

9.3.3 Nutrient run-off controlled

Precision application of nutrients through trickle tape irrigation will **eliminate nutrient run-off**. State-of-the-art irrigation technology based on trickle tape enables fertilizer to be applied in micro-doses through the growing season.

- Other widely-practiced methods such as furrow irrigation require all the fertilizer to be applied at planting. This has led to issues regarding nutrient run-off to the Great Barrier Reef along the East Coast; and
- The Project is located inland of the Great Dividing Range. This eliminates river discharge to the Great Barrier Reef. The Gilbert River flows into the Gulf of Carpentaria.

[7] http://theconversation.edu.au/fact-check-do-bushfires-emit-more-carbon-than-burning-coal-11543

9.3.4 Reversal of Land degradation

Land being acquired for the Project is existing grazing land and has been subject to well documented impacts such as **land and forest degradation**, bio-diversity loss and declared weed and introduced animal infestations.

9.3.5 Improved river health

Reduced sediment loss and improved river "health" due to:

- Drainage system designed for soil retention with grassed headlands and drains, water retention and sediment ponds and rock-reinforced entry into creeks. Post wet season maintenance to eliminate erosion points;
- Elimination of feral pigs – a major cause of creek bed and river bank damage;
- Reduction of cattle grazing along large areas of the river bank and adjacent paddocks;
- Better cattle management practices such as increased calf turnoff which is currently very low can reduce total herd numbers by 20 to 30% whilst retaining the same overall cattle turn-off. This reduces overgrazing pressures on native grasslands during the late dry season.

Figure 33 - A sounder of boars (30 or more) roaming through the bush

9.3.6 Pest control

Figure 34 - Widespread Belly-ache bush along the Gilbert River

Substantial reduction in pest population (see above for wild dogs and pigs) and weed populations along river banks and creeks. The Etheridge Shire has a Pest Management Plan but is underfunded to achieve the core tasks needed to deal with the depth and breadth of pests impacting on large

areas of the Shire. In particular, Rubber Vine has invaded much of Etheridge Shire, especially along waterways.

Impacts include:

- Invasion and replacement of native flora and wildlife habitat;
- Prevention of cattle accessing watering points along rivers and creeks;
- Prevention of mustering, as cattle hide in thick infestations and are impossible to move;
- Poisonous to stock; and
- Reducing access to fishing holes and camping areas.

9.3.7 Reduction in greenhouse emissions

The Project will reduce Australia's emissions of carbon dioxide. In addition to carbon tied up in products:

- Exported renewable electricity will displace non-renewable coal and gas fired electricity (see above);
- Bio-ethanol (100 megalitres per year) produced by the Project will displace non-renewable gasoline (10% ethanol in fuel) used by motorists. The Project will generate around 9 times the fuel (equivalent energy basis) used by the Project;
- Stock feed reduces methane (22 times carbon dioxide warming potential) production by cattle in two ways:
    - Digestion is more efficient when compared to grazing on native grasses leading to reduced methane production per kilogram gained; and
    - Calf turn-off rates increase (currently around 60% - Swans Lagoon Research Station in the dry tropics of north Queensland, a demonstration of efficient herd management in a herd of about 1000 5/8 Brahman cows has produced a 15-year average branding rate of 83%). Increased turn-off rates means that the number of breeders can be reduced to deliver the same revenue. Costs and methane production is substantially reduced; and
- The Meat Processing Plant eliminates long distance trucking of cattle to South Queensland for processing.

9.3.8 Renewable electricity generation

Renewable electricity generation will significantly reduce government subsidies and carbon emissions due to:

- Eliminating large transmission losses (supply is via Townsville's Ross Substation);
- Displacement of non-renewable coal/gas based electricity; and
- Reinforcing of the grid reduces losses from electrical power outage and back-up diesel generator operation.

9.3.9 Renewable liquid fuel

The Project will generate renewable fuel in the form of ethanol using sugar milling by-products.

- Bio-ethanol (100 megalitres per year) produced by the Project will displace non-renewable gasoline (10% ethanol in fuel) used by motorists. The Project will generate around 9 times the fuel (equivalent energy basis) used by the Project; and
- Biodiesel from tallow will be produced on-site and used internally in tractors and trucks.

10 Community and stakeholder consultation

10.1 Introduction

The overall purpose of the community and stakeholder consultation process is to provide opportunities for the community and other stakeholders to identify issues, impacts (potential or perceived) and mitigation measures of the Project and for these to be documented for consideration as part of the Environmental Impact Statement process.

10.2 Context

In 2000, a Social Issues Report was prepared by the Department of Natural Resources to allow for the scanning of social issues that would require further assessment and analysis in later stages of planning for water infrastructure associated with the Gilbert River. The report put forward a range of recommendations "that should be used to develop terms of reference for the social impact assessment component of any future impact assessment study"[8].

The report found that:

- there is broader local community support for the (Green Hills) dam options due to the perceived development and recreational opportunities;
- the dam options will inundate some areas of pastoral leases and will potentially inundate the Green Hills homestead;
- the resumption of land will be required with the dam options with no resumption of land required with the weir option;
- some local landholders have raised concerns over the compulsory resumption of land around the potential irrigation area;
- concerns associated with the options include the environmental impact including the impacts on fisheries located in the Gulf of Carpentaria; and
- the current local availability of labour in the Etheridge Shire is limited and a strategy would be required on labour market requirements during the associated operational phases.

10.3 Proponent Discussions

Subsequent discussions with the community in 2009 indicate that landholders within the irrigation area are concerned that their land may be compulsory acquired if they do not wish to pursue cropping.

Other Shires have been supportive of further investigations into the Gilbert River given perceived broader regional benefits from the Project.

The Project proponents commenced negotiations to secure land for the Project in September 2012 based on the Green Hills Dam concept and cropping along the Gilbert River. Land owners expressed support for the Project but were largely unwilling to come to an agreement over their land.

Following discussions with the Etheridge Shire Council and several landowners, the Project was redesigned to avoid in-river water storage and to secure alternative cropping land. An alternative water supply and storage arrangement was designed based on the adjacent Einasleigh River and its tributaries diverting water to lakes. Natural topography is able to be used to channel water to suitable cropping areas.

8 Department of Natural Resources, Water Infrastructure Planning; Gulf Savannah Region Social Issues Report, page 4, February 2000

Sufficient interest was obtained from these landowners to finalise agreement for securing land.

10.4 Stakeholder Engagement Plan

A Stakeholder Engagement Plan has been prepared for the Project and will be refined during the Environmental Impact Statement to guide the consultation activities during the environmental assessment process and inform the development of the Project.

Engagement and consultation is intended to:

- Establish a high level of community understanding of the Project to encourage direct and indirect involvement in development, construction and operation of facilities;
- Encourage members of the community and other stakeholders to undertake co-development leading to skills and wealth creation;
- Ensure all parties affected by the Project are identified and informed about its scope, timing and potential impacts and benefits;
- Obtain early identification of potential stakeholder issues and implement appropriate mitigation strategies;
- Engage stakeholders and the community to capture their views and issues and ensure they are understood by the Project team and considered in decision making;
- Create channels and networks to proactively respond to and work with stakeholders to develop appropriate solutions to minimise negative impacts associated with the Project; and
- Provide feedback to stakeholders about their issues and how their feedback has been used.

10.4.1 Engagement

Consultation and communication activities have been expansive within the region and at a broader industry and government level. Consultation activities that have been implemented during the course of the Project include:

- Town hall meeting in Georgetown to provide an initial overview of the Project;
- Council meetings – ongoing discussions on Project matters and impacts on town planning;
- Organisations such as Gulf Savannah Development and Northern Gulf Resource Management Group;
- Landowners - ongoing discussions regarding Project information and access to land for environmental and engineering investigations;
- Owners of neighbouring properties – Tallaroo, Abingdon Downs, Strathmore and Rocky View Station;
- Ewamian People to discuss Project and potential Project impacts (neighbouring property), Native Title rights and cultural heritage interests;
- Pub meetings and discussions with local contractors and townsfolk;
- Gulf Fishery groups to discuss the Project and intended impact assessment;
- State and federal agency meetings including Department of Natural Resources and Mines, Department of State Development Infrastructure and Planning , Department of Emergency Services, Regional Police, Federal Department of Sustainability, Environment, Water, Population and Communities , Office of North Australia;
- CSIRO – detailed discussions of Project design and layout;
- Sugar industry bodies – millers and representative organisations;
- Peak farm bodies – National Farmers Federation;
- Townsville Port Authority;
- Journalists and other media ; and
- Website – www.i-fed.com.au.

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