



CHARLESTON DAM PROJECT

Water Supply Augmentation for Georgetown and Forsayth

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Economic Impact/ Benefit Cost Analysis

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Abbreviations

| | |
|-----------|--|
| GDR | Gulf Developmental Road |
| GSD | Gulf Savannah Development (organisation) |
| ABS..... | Australian Bureau of Statistics |
| TNQ | Tropical North Queensland |
| GRP | Gross Regional Product |
| Qld | Queensland |
| IFED..... | Integrated Food and Energy Development |

1. INTRODUCTION

1.1 General

The water supply systems for Georgetown and Forsayth in Etheridge Shire has reached a point where it is not efficiently providing a quality adequate water supply to the townships. It is certainly not in a position to cater for any growth.

To meet growth in economic activity now starting to take place in the Shire, Etheridge Shire Council is proposing the Charleston Dam project to overcome the problems and cater for future growth.

The following is an economic analysis of the project in terms of Economic Efficiency (Benefit Cost Analysis) and Economic Impact.

1.2 Methodology

Economic benefit cost analysis of a project involves comparison of a Base Case involving no change to the existing situation against the Project Case of what will happen if the project goes ahead.

It is normal to adopt a project period. Use of a project period of 30 years is fairly standard but in this case, the dam structure itself could be taken to have a 100-year life. Future benefits and costs are discounted at a discount rate. Infrastructure Australia requires analysis at discount rates of 4%, 7% and 10% real (7%, 10% and 13% nominal).

Analysis of public projects is normally looked at in two ways – Economic Efficiency and Economic Impact.

The Economic Efficiency in this case relates to the benefits accruing to the process of meeting a need for water in the relevant communities.

Economic Impact measures the impact on economic activity in the area in question that results from the efficiency improvements. It is normally measured in terms of impact on growth of Gross Regional Product and Employment that results from the adoption of the Project Case over the Base Case.

Economic Efficiency analysis is the main form of analysis required by Infrastructure Australia.

2. BACKGROUND TO THE ETHERIDGE SHIRE ECONOMY

2.1 General

Etheridge Shire covers an area in the Far North Queensland region south-west of Cairns and the Tablelands mainly comprised of a geographic area known as the Einasleigh Uplands – the eastern portion of the McBride Volcanic Tablelands, the northern end of the Chudleigh volcanic tablelands, and the Newcastle Range area.

The Shire also covers areas west and north into the Gulf plains, drained by the Einasleigh, Etheridge and Gilbert Rivers.

The area's vegetation is predominantly tropical savannah woodland. The area experiences a heavy wet season, usually December to April, followed by an annual drought through the winter and early summer months.

2.2 Historical Development

Historically the area was taken up for cattle grazing from the 1860s on, followed quickly by mining activities predominantly gold but also copper and other base metals. The cattle industry has remained the mainstay of the Shire's economy. While mining was very important through to about the early 1920s, it subsequently declined except for sporadic upsurges (eg. Kidston gold 1980s and 1990s).

More recently, tourism has become an important contributor to the economy with main features being the Undara Lava Tubes, Cobbold Gorge, the old railway from Mt Surprise to Forsayth via the Newcastle Range and the Terrestrial gemstone mineral centre in Georgetown.

Georgetown on the Etheridge River is the main commercial centre and Shire headquarters. There are small townships at Mt Surprise at the junction of the Development Road and the Cairns Forsayth railway, Einasleigh (a former copper mining township) and Forsayth (a former gold mining town) at the railway terminus.

2.3 Current Structure

Major industries underpinning the economy of the Shire are cattle with an output of \$117m (ABS, 2010-11), mining \$5m (Qld Mines Department, 2012-13) and tourism approximately \$16m (overnight visitors plus some day visitation, Tourism Research Australia, 2013-14).

Population of the shire is distributed as follows.

Table #1: Population, Etheridge Shire, 2011 Census

| | <u>Usual Place of Residence</u> | <u>Visitors</u> | <u>Total</u> |
|---|-------------------------------------|-----------------|--------------|
| Georgetown (SA1) 3139701 | 243 | 66 | 309 |
| Einasleigh/Mt Surprise area (SA1) 3139703 | 305 | 529 | 834 |
| Gilbert/Etheridge area (SA1) 3139704 | 347 | 227 | 574 |
| Total | 895 | 822 | 1,717 |

Source: Cummings Economics from ABS Census 2011 Data.

The indications are that Georgetown accounts for about 25-30 per cent of the Shire's residential population. During the tourist season (the 2011 Census was conducted in August), visitors almost double the Shire's population with large numbers scattered throughout the Shire.

Residential population in the Shire in 2011 was similar to that recorded in 1981.

Table #2: Population Growth, Estimated Residential Population, Etheridge Shire

| | |
|------|-------|
| 1981 | 920 |
| 1986 | 1,065 |
| 1991 | 1,037 |
| 1996 | 967 |
| 2001 | 1,016 |
| 2006 | 883 |
| 2011 | 929 |

Source: Cummings Economics from ABS Cat. 3218.

Population has bounced around between about 900 and 1,050. It is likely that sporadic mining activity has caused this. The latest period 2006-2011 saw a bounce back from a low of 883 in 2006 to a level about the same as 1981. However there has been an upward trend in visitor population.

Table #3: Visitor Population Growth, Etheridge Shire

| | |
|------|-----|
| 2001 | 376 |
| 2006 | 731 |
| 2011 | 822 |

Source: Cummings Economics from ABS Census Data.

The data shows very strong growth with numbers almost doubling from 2001 to 2006, following the completion of sealing the road section from Normanton to the Gilbert River. An additional 11 per cent growth was recorded 2006 to 2011, ie. an average of 2.1 per cent per annum.

Table #4: Industry Composition of Workforce, Etheridge Shire (usual place of residence), Census 2011

| | Etheridge Shire | Georgetown |
|-----------------------------------|------------------------|-------------------|
| Agriculture, Forestry and Fishing | 185 | 13 |
| Mining | 95 | 6 |
| Manufacturing | 0 | 0 |
| Electricity, Gas and Water | 5 | 0 |
| Construction | 29 | 6 |
| Wholesale | 4 | 0 |
| Retail | 20 | 15 |
| Accommodation, Food and Drink | 55 | 9 |
| Transport | 8 | 3 |
| Communications | 0 | 0 |
| Financial services | 0 | 0 |
| Professional services | 0 | 6 |
| Administrative support services | 10 | 3 |
| Public administration and safety | 45 | 38 |
| Education and training | 25 | 15 |
| Health and Community services | 13 | 3 |
| Cultural, Sport and Recreation | 5 | 0 |
| Other services | 11 | 3 |
| Total | 511 | 137 |

Source: Cummings Economics from ABS Census 2011 Data.

The economy of the Shire has strong links with the Tablelands/Cairns area which provides the nearest major shopping opportunities and services to tourism, mining and agriculture. This is supplemented by a relationship with Charters Towers and Townsville, especially from the south-eastern sections of the Shire.

Estimates of origin/destination of traffic moving along the GDR are about 60 – 70 per cent originating from or destined to the north (Tablelands/Cairns) and 30 – 40 per cent south (Charters Towers/Townsville). This is confirmed by road count figures which record 230 AADT counts on the Kennedy Developmental Road north of the Gulf Development Road turnoff and 187 AADT counts south of it. If account is taken of through traffic along the Kennedy Development Road, the ratios turning to and from the GDR indicate a 60 – 70 per cent to and from the north.

Tourism flow links are very heavily with the Cairns/Tablelands region.

Georgetown acts as the major shire centre including providing the Shire's main:

- Government services - Council, schools, police, hospital;
- Commercial services – retail and business; and
- Substantial accommodation – hotels, motel, caravan parks, etc.

Georgetown's economy is heavily related to economic and population levels throughout the shire. Analysis of census population data indicates that Georgetown's population count in the 2001 and 2011 Census was as follows.

Table #5: Population Count, Georgetown, 2001 and 2011 Census

| | <u>Residents counted at home</u> | <u>Visitors</u> |
|------|----------------------------------|-----------------|
| 2001 | 241 | 76 |
| 2011 | 217 | 66 |

Source: Cummings Economics from ABS Census Data.

The higher figure in 2001 was consistent with the upsurge in Shire population due to sporadic mining activity.

Forsayth's population was traditionally related to mining but more recently to its position as the terminus of the Cairns Forsayth railway line, with line maintenance crew located there. Separate ABS statistics are difficult to access for Forsayth. Population is estimated at about 80 – 90. There is also a retiree element in the community. More recently, tourism has become a growing element in the economy, especially with the development of the Cobbold Gorge attraction.

2.4 Likely Future Economic Growth

2.4.1 General

Importantly for this project, at this time, new dimensions are opening up in the Shire's economy. The following analyses likely future trends under the following headings.

- Cattle (assuming no impact of cropping development)
- Cropping
- Tourism
- Mining
- Energy
- Other

2.4.1 Cattle industry

The cattle industry has remained the long-term base industry for the Shire.

The following table of cattle numbers in the Etheridge/Croydon area indicates that there has been a long-term underlying growth trend in herd numbers in the area of 1.65 per cent per annum.

Table #6: Growth in Cattle Numbers, Etheridge/Croydon Area

| | |
|------------------|----------|
| 1981 | 262,664 |
| 2010-11 | 425,645 |
| Av Annual Growth | 1.65% pa |

Source: Cummings Economics from ABS Data.

Underlying this long-term growth has been improvements in cattle breeds, more intensive management (fencing and water points), use of supplements like urea and molasses, and in dry periods, supplementary fodder. The emergence of markets for live cattle and beef in Asia has also been a key factor.

As is spelt out in the Northern Australia White Paper and other reports, there is confidence that the market for live cattle and beef is likely to continue growing strongly. With investment in the industry, a continuing growth into the future of herd and output could be expected.

There can thus be an underlying assumption that the growth in cattle turnover over the next 30 years could be expected to show the sort of growth rate achieved over the past 30 years.

As discussed below under the heading "Cropping", the potential market is such that an acceleration of turn-off could be expected if water resources of the area are developed to support cropping that included cattle fattening as part of the farming system.

It is important to recognise however, that the increased cattle turnover in the region has been able to be achieved without increase in workforce employed and indeed with a decrease in workforce. This trend could be expected to continue.

2.4.3 Cropping developments

Small scale cropping has been sporadically developed on the excellent alluvial soils along the Gilbert River using water for irrigation drawn from aquifers in the river bed under the sand.

This has been expanding especially in the form of extensive plantings of mangoes that have a market slot in between the Northern Territory and Bowen/Tablelands crops. Other sporadic small scale crops include sorghum, maize and hay, especially for Tablelands' markets.

The potential water resources of the Etheridge Shire area are substantial. **Table #6** gives river basin mean annual runoff for the Gilbert River Basin compared with some other river systems in which important irrigation schemes have been developed.

Table #7: Mean Annual Water Runoff

| | |
|--|--------------|
| Gilbert River Basin (including Etheridge River and Einasleigh River tributaries) | 4,375,000 ml |
| Ord Basin | 4,700,000 ml |
| Burdekin River Basin | 8,170,000 ml |
| Fitzroy River Basin | 5,380,000 ml |

Source: *Cummings Economics from Australian Land & Water Atlas.*

Three major projects are underway to use the area's water resources.

Strathmore

Strathmore Station is located along the lower reaches of the Gilbert River and where the Einasleigh/Etheridge tributary joins the Gilbert. It has large areas of flat suitable soils.

Strathmore Station currently is the most advanced of the three potential projects. It is in a programme of clearing 60,000 ha by 2020 and planting to sorghum to supply major markets on the Tablelands and for export.

It is envisaged that apart from sorghum production, the area will be used for cattle fattening, with a route developed to bring cattle down from the Peninsula across the Mitchell and Staaten Rivers. Cattle turnoff would be transported for live export, especially via Karumba or east coast ports or to meatworks.

Photo 1



Harvested sorghum, Strathmore Station

The project is likely to create over time, substantial additional employment in the Gilbert River area underpinning an increase in population in that area with an impact on Georgetown.

Eventual production that seems likely to develop is:

- Irrigated 30,000 ha with a yield of 5 tonnes/ha, ie. 150,000 tonnes.
- Dry land sorghum 60,000 ha with average 2.5 tonnes/ha, ie. 150,000 tonnes, but allowing for some years of no or lower crops, average 100,000 tonnes pa.
- Total output when fully developed is 250,000 tonnes per annum, with a current market value of the order of \$60 million.

Apart from employment in producing the crop, there would be substantial employment involved in transporting the crop and inward movements of inputs of fuel, fertilisers and the like.

Strathmore currently turn off about 20,000 head of cattle for transport south to markets. Additional cattle from the Peninsula could be fattened on the stubble on a feedlot.

Cotton growing could be a possible further development.

Direct workforce when fully developed is envisaged at 200 to be housed on the station. Estimated addition to Shire population on-station is of the order of 400. This would increase population in the Shire by about 40 per cent.

It is assumed that this would work through to an increase in services out of Georgetown that would increase workforce and population by the order of 40 per cent, ie. approximately 100 requiring of the order of 40 extra residences.

Gilbert River dam proposal

The second prospective development is defined by the 2013 CSIRO report on a proposal for an instream dam on the Gilbert River at Green Hill Station and dam on the Einasleigh. Use of water resources of the Einasleigh River is covered by the IFED project outlined below and in this section only the Gilbert River Green Hill part of the project is covered.

Cropping development envisaged along the Gilbert would include horticulture (mangoes and other), maize, pulses and sorghum.

The CSIRO report indicates that the Green Hill project will allow expansion of irrigated agriculture along the Gilbert River of the order of 30,000 ha, again with substantial ramifications for workforce and population in the area.

While part of this water resource seems likely to underpin development at Strathmore, the scheme would have the potential to increase output of other properties along the Gilbert River frontage.

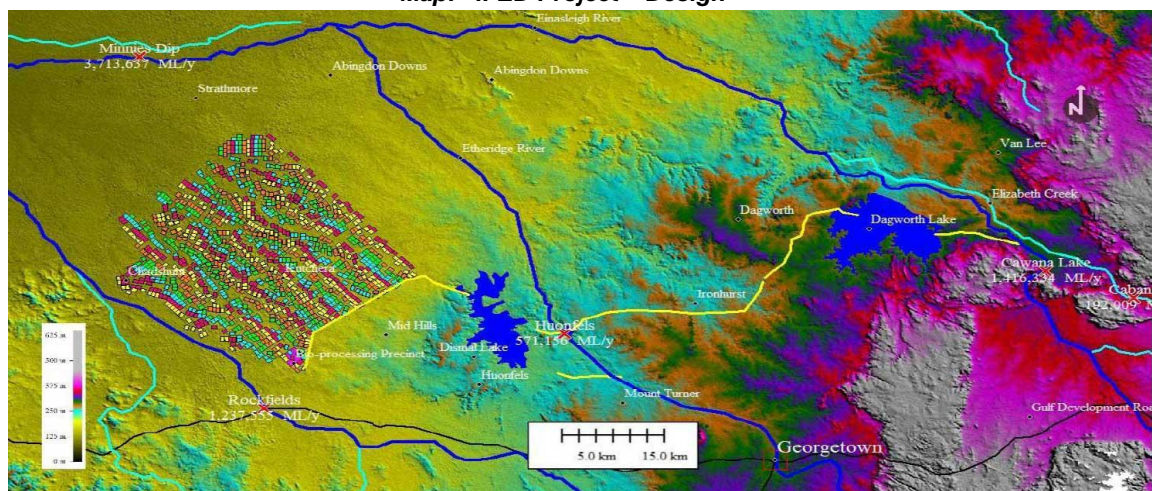
The Green Hill's dam would be dependent on government funding and is very uncertain. However over a 30-year period, it is envisaged that it could occur with an area brought into production in addition to Strathmore, but in crops more intensive than sorghum, creating additional employment of the order of 75, and resulting in additional population in the Shire of 15 per cent with rub off on Georgetown of an additional population of 40.

IFED Project

The IFED (Integrated Food and Energy Development) group is proposing the Integrated Etheridge Agricultural Project that will harvest water resources of the Einasleigh and Etheridge Rivers for irrigated production of sugar cane, guar and associated cattle turnoff. The project involves diversion of wet season flood waters from the Einasleigh River into a large off-stream storage on Dagworth Station and the diversion of wet season flood waters of the Etheridge River into a further off-stream storage named Lake Dismal. Water from the Dagworth Lake will gravitation feed by channel west from Dagworth Lake at 265 meters above sea level into Lake Dismal at 210 metres and thence to cropping areas east of the Gilbert River on Kuchera, Chadshut and Mid Hills Stations at about 160 metres above sea level.

A processing plant area is proposed to be established on Kuchera Station with a seasonal camp in an area east of the Gulf Developmental Road crossing of the Gilbert River.

Map: IFED Project – Design



Source: ABARE's Outlook, 2014.

The processing is proposed to include a sugar mill, ethanol production plant, guar processing stockfeed plant, power station and meatworks. Capital expenditure is estimated at almost \$2bn.

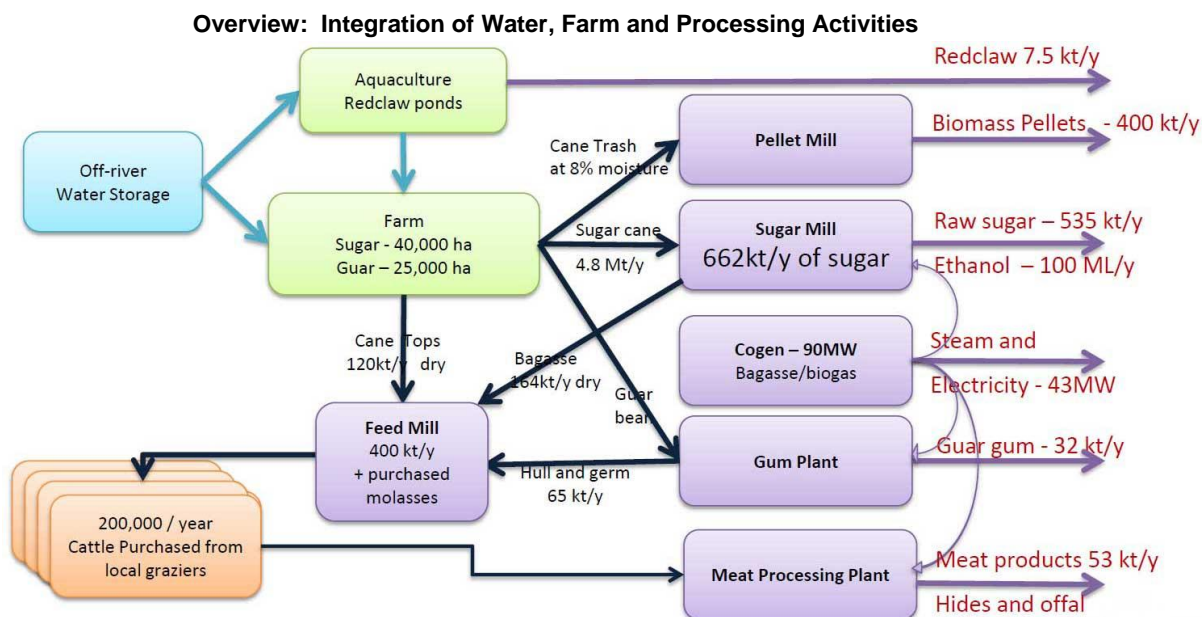
Table #8: IFED Project Cost Estimate

| <u>Item</u> | <u>Cost estimate - \$m</u> |
|-------------------------------------|----------------------------|
| Land acquisition plus costs | \$67 m |
| Water infrastructure and allocation | \$497 m |
| Farm – Land preparation | \$123 m |
| Farm – Irrigation development | \$367 m |
| Sugar mill | \$371 m |
| Ethanol refinery | \$126 m |
| Guar mill | \$52 m |
| Stock feed plant | \$36 m |
| Power station | \$159 m |
| Meat processing | \$63 m |
| Infrastructure and accommodation | \$62 m |
| Plant and equipment | \$54 m |
| Capital expenditure | \$1,977 m |

Source: ABARE's Outlook, 2014..

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Economic Impact / Benefit Cost Analysis

The following diagramises the production processes envisaged.



Source: ABARE's Outlook, 2014.

Output in terms of quantity and value is estimated as follows, generating a total of almost \$900 million per annum.

Table #9: IFED Project Forecast Financials

| Products | Units | Quantity | Sell price \$/unit | Revenue \$M | Cost \$M | EBITDA Margin \$M |
|--------------------|--------|-------------|--------------------|-------------|------------|-------------------|
| Farming | | | | | | |
| sugar cane | Tonnes | 4,800,000 | | | 109 | -109 |
| guar bean | Tonnes | 98,000 | | | 25 | -25 |
| Raw sugar | Tonnes | 535,000 | 487 | 261 | 66 | 195 |
| Ethanol | Litres | 100,000,000 | 1.15 | 115 | 25 | 90 |
| Guar gum | Tonnes | 32,000 | 4,871 | 156 | 33 | 123 |
| Stock feed | Tonnes | 404,000 | 173 | 70 | 17 | 53 |
| Electricity | MWH | 358,000 | 106 | 38 | 15 | 23 |
| Meat & co-products | Head | 200,000 | 1,140 | 228 | 208 | 20 |
| Indirect Overheads | | | | | 22 | -22 |
| Total | | | | 868 | 520 | 348 |

Source: ABARE's Outlook, 2014.

The following table estimates the likely impact on employment and population in the Shire including directly in Georgetown.

Table #10: Etheridge Shire, IFED Agricultural Development Scheme – Projected Impact on Employment, Construction Period, Years 1 to 3

| | <u>Construction</u> | <u>Operation</u> | <u>Total</u> |
|--------|---------------------|------------------|--------------|
| Year 1 | 1,240 | 180 | 1,420 |
| Year 2 | 2,580 | 326 | 2,900 |
| Year 3 | 2,290 | 801 | 3,091 |

Much of this workforce would be housed in camps without dependents and be fly-in/fly-out.

While there would be an impact on Georgetown's population, especially with suppliers and contractors, longer-term impact would be during operational phases from Year 4 on.

These are estimated to involve the following workforce.

Table #11: Etheridge Shire, IFED Agricultural Development Scheme, Operation Phase, from Year 4 – Workforce Location

| | <u>FIFO</u> | <u>Residential</u> | <u>Total</u> |
|-------------------|-------------|--------------------|--------------|
| Georgetown | 135 | 166 | 301 |
| Kuchera Camp | 255 | 849 | 1,104 |
| Dagworth Camp | 75 | - | 75 |
| Townsville/Cairns | - | 128 | 128 |
| Total | 565 | 1,143 | 1,708 |

Thus, estimated impact on workforce residing in Georgetown is 300 including 166 residential and 135 FIFO. Increased population is estimated at a total of 550 (including the 135 FIFO and dependents of residential workforce).

This is direct impact of employment involved in the IFED scheme. There is likely to be additional flow-on employment generated.

While much of this will flow outside Etheridge Shire, it should be noted that residential population in the Shire could be expected, based on an IFED residential workforce of 1,143, to increase by over 2,000, trebling the Shire's population.

In the normal course of events, this could be expected to result in an increase in Georgetown's population as the main Shire centre. Thus, apart from the direct impact, a major flow-on increase of the order of 400 population could be expected on top of the direct impacts.

The indications are that the direct and flow-on population impacts on Georgetown would be of the order of 1,000, resulting in an increase in population from about 300 to about 1,300.

Overall Impacts

While the timing and extent of impact of major development of cropping in the region is still uncertain, it indicates that, if the water resources of the Gilbert Basin are fully exploited, there will almost certainly be a major impact on employment and population in Georgetown as the Shire and main government and commercial service centre.

2.4.4 Tourism

Examination of past trends in Section 2.3, indicates that tourism is a growth industry in the Shire.

The completion of sealing of the Gulf Developmental Road led to a doubling of visitor numbers between 2001 and 2006, with a further growth averaging about 2 per cent per annum, 2006 to 2011. Average over the 10 years was 8 per cent per annum.

It is highly likely that over the project period, there will be a number of developments that will enhance tourism prospects in the area.

- 1) The sealing of the 53km of remaining one lane old Beef Roads' section of the Gulf Developmental Road will enhance its attractiveness as a tourism route, especially for caravans.
- 2) The sealing of the Hann Highway section of the Kennedy Developmental Road, Hughenden to Lynd, will result in a substantial increase in visitors coming into the south-eastern section of the Shire, enhancing the prospect of visitors completing a circuit to Einasleigh, Forsayth, Georgetown and back along the GDR, especially if at some time in the future, Lynd Einasleigh road is sealed or the GDR to Einasleigh link is sealed.
- 3) The remaining unsealed link between Georgetown and Forsayth is sealed.

There is thus every prospect that a long-term growth will be sustained into the future at about 2 per cent per annum with some one-off jumps due to road developments. It is believed that under these circumstances, forward projection over the project period at 3 per cent per annum could be justified.

At present, Georgetown itself does not feature strongly as an overnight visitation centre with Census 2011 recording only 66 visitors. At 3 per cent per annum over a 30-year project period, this would increase to 160.

Again, growing tourism employment in other parts of the Shire will contribute to the growth of Georgetown as the district centre.

At present, tourism income contributes about 12 per cent of the Shire's total outside earnings of \$140 million. It can be inferred that it supports some 30 of the population in Georgetown as a Shire centre. At a 3 per cent growth rate, this would increase to 70 or 40 more over a 30-year period.

2.4.5 Mining

It can be seen from the analysis of historical population statistics that sporadic mining activity has played a role in causing limited period surges in population in the Shire.

The Shire is highly mineralised but deposits are generally small and worked out over relatively short periods.

Current prospects include the following.

- Gold – Georgetown area
- Gold – Forsayth area
- Base metals – Lynd area
- Zinc and copper – Einasleigh area
- High grade silica – Einasleigh area
- Uranium – Mt Surprise area
- Gemstone – Agate Ck and Elizabeth Ck areas
- Thermal power – Mt Surprise area

There is nothing prospective at present that would indicate any change to the long-term pattern. Indeed, there are a number of trends that reduce prospective impact on Shire employment and population including:

- 1) Increasing mechanisation;
- 2) Importation of input over better roads as opposed to local supply;
- 3) Trends towards FIFO workforce.

On the other hand, there is a trend favourable to Georgetown as the major Shire centre and that is towards having centralised processing supplied by ore from small dispersed deposits.

Against the foregoing background, it is appropriate to regard sporadic upsurges as being temporary in their impact on Georgetown as a Shire centre in the long term and not contributing substantially to long-term growth.

However what needs to be recognised is that these sporadic upsurges must be accommodated and there is an argument that the water supply system at Georgetown needs to have an inbuilt capacity margin to deal with them when they occur.

Forsayth is located close to a substantial mineralised area and this factor is potentially of substantial importance.

2.4.6 Energy

There are two energy development proposals in the Shire area.

The first involves establishment of a wind farm in the Newcastle Range area. The project will involve the construction of wind turbines to feed into the grid and especially power lines coming from the Townsville region through to Normanton and Karumba.

Transmission losses from the power stations in Central Queensland are very high providing a premium for local generation. The project has environmental approvals and is negotiating a power purchase agreement with a retail outlet.

Envisaged employment in construction is average 80 and up to 100 for 18 months to be located on site and at Forsayth. Employment during operation is expected to be 6 to 8. Forsayth will be the closest town and a go ahead is likely to result in an increase in population, especially during the construction phase, but when operational 6 to 8 employees, with impact on population of the order of 15 – 20.

The second energy project relates to use of old water storages created by the Kidston Mine operations in the 1980s and 1990s that are at different levels. The scheme will involve provision of higher priced peak load renewable power through release of water from the upper storage into the lower storage in peak load hours and pumping back during non-peak hours at lower priced off peak tariffs.

Employment will be generated in construction and operation. It is likely however, that the workforce will use the old Kidston mine-site workers' accommodation north of Einasleigh and not impact directly on the population of Georgetown or Forsayth. Some impact can be expected on Georgetown as the main shire and services centre.

2.4.6 Summary of Future Likely Population Growth

From the foregoing, it can be inferred that without cropping development, the Shire's population and that of Georgetown will remain about the same with tourism growth and cattle numbers growth offsetting a tendency for:

- Employment in the pastoral industry to fall due to efficiency gains;
- Town services to tend to decline with better roads leading to relocation of shopping and provision of services into the larger service centres, especially the Tablelands.

The water supply system for Georgetown and Forsayth needs to be such that there is room for short-term upsurges in mining employment.

If the Newcastle Range wind farm project goes ahead, there will be a small increase in population in Forsayth.

Cropping development is likely to add to population in Georgetown. The Strathmore project is underway and seems likely to add to the Shire's workforce by about 40 per cent. Potential indirect rub off on Georgetown population as the Shire centre would be about a 40 per cent increase, ie. about 100 population and about 40 households.

It is suggested that an increase in population due to a modest increase in cropping can be conservatively modelled into the demand for water in Georgetown at a 1 per cent per annum growth over the project period to be eventually 35 per cent larger than at present.

The impact of the major development of the Shire's water resources is less certain but it is suggested that it could be conservatively modelled into the growth in population and demand for water in Georgetown over the project period at a rate of 4 per cent per annum that would see Georgetown's population at the end of the project period at 3.2 times its current size.

3. The Project

3.1 General

Georgetown is situated on the west bank of the Etheridge River just downstream of its junction with the Delaney River.

It draws its water supplies from an aquifer in the bed of the Etheridge River. The river only runs for a number of months during the wet season.

However under an extensive sandy bed lies a substantial pool of water that is tapped by a number of bore 'spear' pumps. **Photo 2** shows one of the spears in the bed of the river.

Photo 2



The water is pumped to a treatment plant and then to a water storage tank on a small rise from which it feeds into the town water supply system (see **Photos 3 and 4**).

Photo 3



Photo 4



The capacity of the Georgetown storage is at a limit resulting in a need for severe water restrictions each year and episodes in some years where water has had to be carted by truck. Special arrangements needed to be made recently when a substantial road crew was located in the town.

When the water in the aquifer at Georgetown gets low, problems occur with quality that makes it more difficult to filter and treat.

Forsyth water supply comes from the old Big Reef dam, 6 km west of the township (see **Photo 5**) from which it is pumped to a filtration and storage tank for distribution into the town's water supply system (see **Photo 6**).

Photo 5



Photo 6



The water treatment facility at Forsyth is old and in need of replacement at significant capital cost.

The Charleston Dam project aims to solve the water supply availability for both townships by constructing a storage dam on the Delaney River near Forsyth adjacent to the old mining township site (now abandoned) of Charleston. The site is efficient for water storage development being close to existing road and electricity services.

The water from the dam will supply Forsyth via a new water treatment plant. To supply Georgetown, water will be released as required to flow down the Delaney River to supplement water in the aquifer pool at Georgetown.

The new dam will provide sufficient water for strong expansion of population in both centres up to about 5,000.

The dam will also have a recreational value.

4. CAPITAL COSTS, OPERATING AND MAINTENANCE COSTS

4.1 Project Case

Capital costs of the project are estimated as

| | |
|---|------------------|
| <u>Dam</u> | \$10.000 m |
| <u>Maintenance Costs</u> (NPV over 100 years @ 4% real discount rate) | |
| Annual | \$0.337 m |
| Annual Inspection..... | \$0.179 m |
| Major Maintenance..... | \$0.363 m |
| Total | \$0.879 m |
| <u>Water Treatment Plant</u> | |
| Capital Cost..... | \$1.500 m |
| <u>Maintenance Costs</u> (NPV over 30 years @ 4% real discount rate) | |
| Annual | \$0.337 m |
| Major Maintenance..... | \$0.109 m |
| Total | \$0.441 m |
| <u>Construct New Amenities (recreation area)</u> | |
| Capital Cost..... | \$1.500 m |
| <u>Maintenance Costs</u> (NPV over 50 years @ 4% real discount rate) | |
| Annual | \$0.017 m |
| Annual Inspection..... | \$0.096 m |
| Major Maintenance..... | \$0.036 m |
| Total | \$0.149 m |
| <u>Construct New Reservoir</u> | |
| Capital Cost..... | \$1.500 m |
| <u>Maintenance Costs</u> (NPV over 75 years @ 4% real discount rate) | |
| Annual | \$0.050 m |
| Annual Inspection..... | \$0.179 m |
| Major Maintenance..... | \$0.054 m |
| Total | \$0.484 m |
| <u>Construct New Pipeline</u> | |
| Capital Cost..... | \$2.000 m |
| <u>Maintenance Costs</u> (NPV over 75 years @ 4% real discount rate) | |
| Annual | \$0.067 m |
| Annual Inspection..... | \$0.179 m |
| Major Maintenance..... | \$0.726 m |
| Total | \$0.973 m |

Summary

Table #12: Summary

| | <u>Capital</u> | <u>NPV Maintenance</u> |
|-----------------|-------------------|------------------------|
| Dam | \$10.000 m | \$0.879 m |
| Water Treatment | \$1.500 m | \$0.445 m |
| Amenities | \$0.500 m | \$0.149 m |
| New Reservoir | \$1.500 m | \$0.484 m |
| Pipeline | \$2.000 m | \$0.973 m |
| Total | \$15.500 m | \$2.930 m |

Total project costs including NPV maintenance comes to \$18.430 million assuming all works in Year 1.

4.2 Base Case

If the project does not proceed, the Shire is facing the need to replace the water treatment plant at Forsayth at a cost of \$0.450 million.

On advice from Etheridge Shire, it is estimated that current annual maintenance costs are:

| | |
|-------------------|---------------------|
| Forsayth | \$167,000 pa |
| Georgetown..... | \$200,000 pa |
| Total..... | \$367,000 pa |

Net Present Value of savings of current maintenance costs at discount rate of 4 per cent real would be \$6.346 million.

4.3 Summary of Capital and Maintenance Costs

The following summarises net capital and operating cost funds.

| | |
|--|-------------------|
| NPV Project Costs including NPV Maintenance..... | \$18.430 m |
| Less Replacement of Forsayth Water Treatment Plant | \$0.450 m |
| Less NPV Savings in Operating Maintenance Costs | \$6.346 m |
| NPV Costs | \$11.634 m |

5. ECONOMIC EFFICIENCY BENEFITS

5.1 General

The current situation means that the Shire is facing substantial dis-benefits especially during dry years at current population levels. The situation is impinging on households at present through restricting availability of water through restrictions that come at an expense of not having sufficient water for activities like garden maintenance and cleaning. In ultra-dry years, water carting is taking place to maintain minimal supplies.

Unless the project proceeds, providing water for any increase in consumption through increased population would come at a cost of either

- a) Carting water from other supply points during dry periods, or
- b) Requiring residents to install their own water collection tanks.

5.2 Cost of Current Inefficiencies to Households and Businesses

Limitations of the current system lead to inefficiencies due to severe water restrictions. In effect, it means that residents and businesses are severely restricted in not being able to maintain gardens and use water freely for cleaning. This affects willingness to live in the area. Measuring this cost is difficult.

The major efficiency cost relates to time loss in maintaining clean conditions and gardening, to that available in major centres with adequate water infrastructure.

There are standard measures of value of time used in road benefit cost analysis that can be applied to this situation.

| | <u>2015 prices</u> |
|---------------|--------------------|
| Private | \$14.90 per hour |
| Business..... | \$47.60 per hour |

Assuming that the average house would need to spend two hours a week (households) and one hour a week (business) to maintain gardens and clean conditions for 20 weeks of the year would result in an estimated cost as follows.

Table #13: Estimated Cost, Hand Held Watering, Etheridge Shire

| | <u>Properties</u> | <u>Cost per property</u> | <u>Total</u> |
|-------------------|-------------------|--------------------------|------------------|
| <u>Georgetown</u> | | | |
| Residential | 100 | \$596 | \$59,600 |
| Business | 30 | \$952 | \$28,560 |
| <u>Forsyth</u> | | | |
| Residential | 30 | \$596 | \$17,880 |
| Business | 10 | \$952 | \$9,520 |
| Total | 170 | | \$115,560 |

With no population growth, estimated Net Present Value of costs is \$1.998 million.

On the basis of population growth of 1 per cent, Net Present Value at 4 per cent real discount rate would be \$2.265 million. At a 4 per cent population growth rate, it would work out at \$3.467 million.

5.3 Cost of Water Cartage Episodes

In extreme circumstances, even to maintain supplies of drinking water, the Shire Council has been obliged to cart water.

The last episode was between 1st October 2013 and 3rd February 2014. Cost was of the order of \$200,000, being \$156,000 contractor plus Council overheads, or \$2,100 per day for 50 kilolitres a day. It involved cartage 20km from Jenkins Creek Station. Cost per kilo litre was about \$40.00. It should be noted that this \$200,000 approximately doubles operating costs for Georgetown water supply.

Insufficient information is available to estimate likely occurrences at current consumption levels. It could be expected that this would happen sporadically over a 30-year project period. However 5 such occurrences over 30 years would cost the Council \$1 million and if spaced over years 5, 10, 15, 20, 25, have a Net Present Value of \$0.763 million.

With the increase in population scenarios, meeting the additional needs through cartage of water would cost heavily.

The previous minimal cartage worked out at 4.4 cents a litre. The additional water was drawn from a location 20 km distant. Supplies from this source would be limited and large supplies would need to be sourced from more distant locations pushing costs higher.

At 4.4 cents a litre, cost for each person of a daily supply of 894 litres would be \$39.00. Current cost Georgetown per person per day is \$3.35.

Presumably during the periods of the year when the river was flowing, additional water could be taken to meet population growth.

The following estimates additional cost based on 240 days a year and unit cost increasing by 2 per cent per annum due to additional distances needed to be hauled.

Estimated NPV of meeting additional needs through water cartage would be:

Modest cropping development \$36.387 m
Population growth 1% pa

Strong cropping development..... \$96.880 m
Population growth 4% pa

5.4 Installation of Rainwater Tanks

An alternative to the project would be to require all new developments, residential and businesses, to construct rainwater storage of sufficient capacity to meet annual needs.

Based on current average consumption, such households would need to cater for consumption of 330,000 litres (894 litres per day) per person.

In the Georgetown and Forsayth situation, rainfall is very seasonal and it is estimated that in only 3 months of the year could rainfall be relied upon to exceed consumption need.

In this situation, storage for up to 9 months consumption would be needed. This would work out at a storage need per person of 236,000 litres at average per person Etheridge Shire consumption rates.

Part of this consumption would be at businesses and part households. Assuming 60 per cent is households, the indications are that households (average 2.5 persons) would need storage capacity to be of the order of 350,000 litres.

Estimated cost of a 350,000 litre tank per household would be of the order of \$150,000.

Such tanks would need to be filled by dwelling roof runoff. Average household roof area is estimated at 160 sq metres. Based on average rainfall in the area, it is estimated that yield would be 131,000 litres. The indications are that a further roof rainwater collection area of the order of 430 sq metres would be needed. At a cost of \$150-\$200 a sq metre, total cost is estimated to be of the order of \$70,000.

Thus, we are looking at a capital cost of the order of \$220,000 per household. If costs to businesses are added, additional cost per additional household, would be of the order of \$140,000 per annum, making a total of \$360,000 per extra household or \$144,000 per additional person.

A further point is relevant. This size storage and additional roof structure would have great difficulty fitting on an ordinary house block and additional land cost would be involved. Water storage systems of this nature involve some health risks and there would probably be additional inspection/compliance costs. Total cost per additional household is estimated to be of the order of \$380,000, being of the order of \$150,000 per additional person.

At a 1 per cent per annum growth rate, ie. 33 per cent over 30 years, this would involve an addition of 1.1 households per annum and would have a NPV of \$8.2 million.

At a 4 per cent real discount rate, Net Present Value of cost of installing tanks at \$350,000 per household would have a NPV of the order of \$50.16 million.

It should be noted that the need to spend an extra amount to provide water self-sufficiency would be a major barrier to attracting population.

5.5 Recreation Uses

5.5.1 General

There are three potential benefits involved for recreation purposes:

- 1) Benefits for residents of having the lakeside recreational area;
- 2) Benefits for recreational fishermen;
- 3) Benefits from an Increase in visitors' length of stay in the area.

Insufficient information is available to accurately assess these benefits. The following seeks to give some idea of what those benefits might be.

5.5.2 Benefits for local residents

The recreation facility provided is for that part of the Shire's population living west of the Newcastle Range, ie. approximately 500.

Alternative lakes provided by dams for recreation purposes are Copperfield Dam, 75km from Forsayth (round trip 150km), Belmore Dam (Croydon), 150km from Georgetown (round trip 300km) and Tinaroo 300 km from Georgetown (round trip 600km).

Travel time and vehicle operating costs as per national road travel guidelines for 2015 per vehicle are estimated at:

Table #14: Travel Time and Vehicle Operating Costs

| | <u>Belmore</u> <u>300km round trip</u> <u>(3 hours)</u> | <u>Copperfield</u> <u>150km round trip</u> <u>(2 hours)</u> | <u>Tinaroo</u> <u>300km round trip</u> <u>(6 hours)</u> |
|-----------------------------------|---|---|---|
| <u>Travel Time</u> | | | |
| (Saving per hour per person) | (\$15.74) | (\$15.74) | (\$15.74) |
| Saving per person | \$47.22 | \$31.48 | \$96.20 |
| <u>Vehicle Operating Cost</u> | | | |
| (Saving per vehicle km) | (30.45 cents) | ⁽¹⁾ (40.00 cents) | (30.45 cents) |
| Saving per vehicle | \$91.35 | \$60.00 | \$184.00 |
| Saving per person (2 per vehicle) | \$45.68 | \$30.00 | \$92.00 |
| Total Savings per person | \$92.90 | \$61.48 | \$188.00 |

⁽¹⁾ *Note: Involves steep winding poor roads.*

Assuming the trips are evenly split, average is \$113 per trip.

Obviously at that cost, such trips are limited. Local opinion suggests that many families/persons living in the area would take about 5 trips a year to Belmore, Copperfield or Tinaroo. The average for the population is probably substantially less than this.

It was suggested that local availability at Charleston Dam would result in many using the facility on weekends of the order of 26 times a year.

Georgetown area residents would still have a 40km distance to travel bringing average cost per person down to about \$88.

Assuming across the whole population, 12 visits a year with an average time and vehicle operating cost saving of \$100, the additional trips would be generated and brought to account at one half. Estimated total efficiency saving in accessing the type of recreational facility involved is estimated at approximately \$264,000 a year and with an estimated Net Present Value, at 4% real discount rate:

No growth..... \$4.6 m
1% growth \$5.0 m
4% growth 7.9 m

In terms of economic impact, the benefit would be keeping this type of expenditure within the Shire and stimulating some additional expenditure among residents that do not currently take these types of trips because of the cost in terms of time and money.

It is difficult to assess what the likely additional spending generated would be over and above expenditure that would take place otherwise in the area. For those travelling outside the Shire for this type of activity, it would be substantial.

At 12 trips per annum per head of population (ie. 6,000 visits), with a diversion to local spending of \$25, the diversion would be \$150,000 per annum with an NPV of \$2.6 million at no growth, \$2.9 million at 1% population growth and \$4.5 million at 4% population growth.

5.5.3 Fishing

Water storages like the Charleston Dam when stocked, generate significant fishing activity from outside the local area.

Efficiency benefits are difficult to measure, however there would clearly be an economic impact.

A high proportion of visitors to the area of the order of one third are observed to be towing boats.

Studies by Gregg and Rolfe of Central Queensland University, "An Economic Assessment of the Value of Recreation Angling in Queensland Dams Involved in the Stocked Impoundment Permit Scheme", 2013, found that fishermen using this facility made an average of 2.15 trips per year for an average of 2.13 days. Expenditure per trip was found to average, non-travel \$411 and travel \$165 and about half accruing to regional areas. This works through at \$135 per fishing day.

It is not known accurately how many fishing days would be attracted to the Charleston Dam by residents from outside the immediate area. However based on observations at Belmore, the following works on a conservative estimate at an average of one per day implying at peak weekends of the order of 4 or 5. This would result in an expenditure generated of \$50,000 a year.

It seems likely that this activity would grow more in line with regional population and tourism growth at 2% per annum.

Net Present Value of additional expenditure generated is estimated at \$1.08 million.

5.5.4 Visitors

Tourism Research Australia data indicates that there is something of the order of 40,000 visitors a year stay overnight in the Etheridge Shire area spending of the order of \$19 million per annum and spend per night approximately \$140. Of this, a substantial proportion would be spent:

- At Undara and Mt Surprise area;
- By business and non-business traffic passing through.

It is estimated that something of the order of 10,000 visitors a year pass through the Forsyth area with a substantial number visiting Cobbold Gorge.

It would appear that the major impact of the Charleston Dam would be to help extend visitor nights in the area. Current average visitor night in the Shire is about 2.5 nights.

It is estimated that the dam would result in an extension of visitor nights by 1,000 (excluding those fishing), of the 10,000 travelling into that section of the Shire, by one night. Estimated rate of expenditure for visitors not staying in hotel/motel type accommodation of \$100 would yield an additional expenditure of \$100,000 and at a long-term growth rate of 2% per annum, would have a Net Present Value of \$2.2 million.

5.6 Summary of Economic Efficiency Benefits

The current system is already causing substantial inefficiencies, especially due to water restrictions and need to cart water in extremely low rainfall years. A dam in the area would also provide recreation efficiency benefits.

Based on a range of assumptions and no growth in population, benefits are estimated to be of the order of NPV Est Efficiency Benefits – No Population Growth:

| | |
|--------------------------------------|----------------|
| Reduction in water restrictions..... | \$2.0 m |
| Avoidance of water carting..... | \$0.8 m |
| Recreation benefits | \$4.6 m |
| Total..... | \$7.4 m |

The following looks at NPVs of benefits if Georgetown grows at a scenario of 1 per cent per annum and a scenario of 4 per cent per annum.

Additional Supplies Met by Water Carting

If it is assumed that population in Georgetown grows by about 1 per cent per annum, Net Present Value of benefits are estimated:

| | |
|--|-----------------|
| Reduction in water restrictions existing households..... | \$2.3 m |
| Avoidance of water carting..... | \$36.4 m |
| Recreation benefits | \$5.0 m |
| Total..... | \$43.7 m |

At a 4 per cent per annum growth rate, the benefits are estimated to be:

| | |
|--|------------------|
| Reduction in water restrictions existing households..... | \$3.5 m |
| Avoidance of water carting..... | \$96.9 m |
| Recreation benefits | \$7.9 m |
| Total..... | \$108.3 m |

Additional Supplies Through Rainwater Tanks

Total Net Present Value of benefits under a 1 per cent per annum growth scenario would be:

| | |
|--|-----------------|
| Reduction in water restrictions existing households..... | \$2.3 m |
| Water carting existing households..... | \$0.8 m |
| Cost of water tank storage | \$8.2 m |
| Recreation benefits | \$5.0 m |
| Total..... | \$16.3 m |

At a 4 per cent per annum population growth rate, Net Present Value of benefits would be:

| | |
|--|-----------------|
| Reduction in water restrictions existing households..... | \$3.5 m |
| Water carting existing households..... | \$0.8 m |
| Cost of water tank storage | \$50.7 m |
| Recreation benefits | \$7.9 m |
| Total..... | \$62.9 m |

The water carting option is obviously much more costly than the rainwater tank option.

The following summarises identified economic efficiency benefit cost ratios against rainwater tank storage option for additional households.

Table #14: Summary of Benefit Cost Ratios, Charleston Dam Compared with Alternative of Rainwater Storage and Recreation Benefits

| | No population growth | 1% per annum population growth | 4% per annum population growth |
|--------------|---------------------------------|---|---|
| NPV Benefits | \$7.4 m | \$16.3 m | \$62.9 m |
| NPV Costs | \$11.6 m | \$11.6 m | \$11.6 m |
| Ratio | 0.64 | 1.41 | 5.42 |

6. ECONOMIC IMPACT

6.1 General

There are two levels of economic impact.

- 1) The major long-term impact comes from the need to improve the water supply.
- 2) The second relates to the recreation use of the lake created.

6.2 Impact of Improving the Water Supply

This project will not, of itself, create a great deal of additional economic activity except during the construction phase.

Rather, the position is one, that failure to provide Georgetown especially with an efficient and adequate water supply system, has the potential to cramp any economic development in the area that involves a need for expansion of population in Georgetown.

The situation is one that government investment in an adequate water supply system in Georgetown and Forsayth to support modern living requirements will help encourage major private enterprise investment in the region.

In relation to Georgetown, it will be essential if the full development of the water resources of the Gilbert Basin is to occur. In particular, the IFED project as proposed would involve an investment of \$2 billion in the area and the long-term creation of jobs that would directly increase the workforce and population in the Shire about four-fold, with an annual direct income generation of about \$900 million.

In the case of Forsayth, the project will have two important economic benefits.

First, the recreation area provided by the dam lake will increase the attractiveness of this small centre tucked in the hills at the headwaters of the Delaney River.

The town already has a special atmosphere and is on the tourist map due to:

- Its terminus position at the end of the scenic and historic Savannahlander trip from Mt Surprise;
- Its gateway role to the well established tourist attraction of Cobbold Gorge.

Secondly, it will help support and give confidence to investment in the proposed wind farm project nearby on the Newcastle Range that will need to accommodate 80 workers during construction and 6-8 when operational.

6.3 Recreation

First, the development of a lake-side recreation area will improve the attractiveness of the area as a place to live.

However there is likely to be a range of economic impacts as estimated in Section 5.5 totaling \$300,000 per annum with a Net Present Value of \$5 million to \$8 million a year depending on population growth.

7. CONCLUSION

Many of the western shires of Queensland dependent on the pastoral industry have experienced a long-term decline in population. However, Etheridge Shire has managed to hold its population.

While the cattle industry, due to on-farm efficiencies, has generally supported less on-farm workforce in Etheridge Shire, this has to some extent been moderated by increasing herd numbers due to improved breeds and investments leading to higher carrying capacity.

A tendency for smaller service towns to decline as services shift to larger district towns has been offset by a doubling of tourist numbers, partly due to the improvements in the Gulf Developmental Road.

Mining upsurges have led to short-term sporadic upward boosts.

These trends are expected to continue and support a stable residential population in the area. However, it is clear that the area is entering a new economic era.

The water runoff of the Gilbert Basin, including its major Einasleigh and Etheridge Shire tributaries, is equivalent to the Ord Basin, over half that of the Burdekin Basin and 80 per cent of the Fitzroy Basin.

There has long been small scale irrigated farming along the Gilbert River drawing on riverbed aquifers. This irrigation farming activity promises to expand rapidly over the next decade.

Strathmore Station is currently in a programme to develop up to 60,000 ha in the lower Gilbert area for sorghum production, beef fattening and potentially other crops.

CSIRO have identified 30,000 ha along the middle reaches of the Gilbert that could be irrigated from an instream dam on the upper Gilbert at Green Hills station. This is likely to support development of higher value cropping along the higher grade alluvial soils along the river.

However in the wings and undergoing an EIS process under agreement with the Queensland Government, is the giant IFED scheme involving harvesting flood waters of the Einasleigh and Etheridge tributaries into off-stream storages and the development of a major new sugar producing district along with cattle fattening and other crops and also involving development of a new sugar mill and meatworks in the region. The requirements of this project alone would bring with it an investment of \$2 billion and additional direct workforce and population three times that of the Shire at present.

Against this background, three scenarios have been analysed over a 30-year project period.

- 1) No sustained cropping developed and population held at current levels;
- 2) Modest cropping development and 1 per cent per annum population growth;
- 3) Major cropping development and 4 per cent per annum population growth.

The Georgetown Forsayth water supply systems are currently stretched to cater for the needs of these townships.

Water restrictions in dry times are heavy, and at times, expensive carting of water has needed to be resorted to. Water treatment equipment at Forsayth especially is aging and needs replacing.

While the estimated Net \$11.6 million investment in the Charleston Dam project could not be justified on current population levels, even without cropping development, there can be confidence that population in the area will not decline and there will be substantial recreation benefits that contribute substantially to justification for the project.

Meeting future growth through carting water is clearly uneconomic compared with the proposed Charleston Dam, even with only modest growth of cropping in the region and population in Georgetown.

Requiring new households and businesses to put in their own rainwater catchment and storage systems, is estimated to add something of the order of \$350,000 per additional household, plus costs to additional business developments.

Even if only modest population growth occurs due to limited expansion of cropping, when recreation benefits are added in, the Charleston Dam project shows a substantial benefit cost ratio compared with this option.

However, a strong expansion in cropping in the region that involved major developments such as that proposed by IFED would result in very high benefit cost ratios of the order of 5.4.

It should also be noted that requirements on households and businesses to supply their own major rainfall water storage system at a cost of about \$350,000 per household would be a major disincentive to population locating in Georgetown.

Investment in the project would give confidence to potential investors in expansion of cropping projects. It would demonstrate that governments will play their role in providing supporting infrastructure. The proposed cropping investments involved are very large and, apart from benefits to Etheridge Shire, would see major benefits flow through to the Cairns/Tablelands and Townsville regions.

Apart from positive impacts in relation to Forsayth's existing population, the project will support a proposed investment in wind farm development in the area, and the lakeside recreation facilities complement the town's already established tourism role as an historic goldfield centre and terminus of the historic and scenic Savannahlander rail trip from Mt Surprise.

It is estimated that the recreation benefits would add of the order of \$300,000 a year additional spending in the area.