Response Paper

Queensland Competition Authority – Rural Irrigation Price Review 2020–24 Draft Report

Burdekin District Cane Growers Ltd

1 November 2019

Contents

1. Cover Letter

Attention: Queensland Competition Authority

As a grower in the Giru Benefitted Area I put forward my support for this submission by the Burdekin District Cane Growers Organisation Limited. Further to this the data, issues and conclusions put forward are consistent across and region and also directly impacts my operation and property. I also reinforce the importance placed on this submission to maintain the natural yield entitlement for irrigation.

I encourage the Queensland Competition Authority to assess the import of these changes on the economic and business environment to build a long team and sustainable agricultural sector. This relates to the following section:

> *Queensland Competition Authority Act*
> *Sec 26 Matters to be considered by authority for investigation*
> *(1) In conducting an investigation under this division, the authority must have regard to the following matters:*
> *(g) the impact on the environment of prices charged by the government agency or other person carrying on the monopoly business activity*

For all and any further consultation or negotiation relating to the Giru Benefitted Area I request that all interaction and correspondence be undertaken with the Giru Benefitted Area Subcommittee. This subcommittee represents my interests as a grower in this region.

I attach as part of this statement my signature to the following document.

Regards,

GBA Grower

To Queensland Competition Authority.

The Below Irrigators —

Which to advise that we want any negotiations on the matter of pricing to be conducted with the

Manager of the Invicta suppliers committee and Manger of CBL growers committee in consultation with The GBA Sub-committee members

Name	Signature	Date
GLEN PARISE		11/10/19.
JOHN PARISON		11/10/19
PRIMO-PILLA		11/10-19
JOHN KERSH		11-10-19
S+D.P. Pappalardo		11-10-19.
Rod Cogill		11-10-19
William Huston		11-10-19
Daniel Smith		11-10-19
WILLIAM HORSFALL		11-10-19
Robert Poletto	R.A. Poletto.	11-10-19.
John Bahr		11/10/19
Mary Dixon		11/10/19.
DINO POLETTO		11/10/19
IAN FLETCHETT		11/10/19.
John Centrusco		11/10/19.
MARK FRANETTOVICH		11/10/19
Andrew Cross		11/10/2019
ARMIN WESSEL		11. 10. 2019
ROBERT STOCKHAM		11-10-2019
ANTHONY WHELAN		11/10/2019

To Queensland Competition Authority.

The Below Irrigators –

Which to advise that we want any negotiations on the matter of pricing to be conducted with the

Manager of the Invicta suppliers committee and Manger of CBL growers committee in consultation with The GBA Sub-committee members

Name	Signature	Date
Steven Pilla		11/10/19
Darryl Stockman		12/10/19
Mary Lyons		12/10/19.
Gary Lyons.		12/10/19
John Pierotti		12/10/19
Anton Zebeda		15/10/19.
Bruno Todeschino		15/10/19.
Francis Scarabel		15/10/19

To Queensland Competition Authority.

The Below GBA Irrigators –

advise that we want any negotiations on the matter of pricing to be conducted with the

Manager of the Invicta suppliers committee and Manger of CBL canegrowers committee in consultation with The GBA Sub-committee members

Name	Signature	Date
Neil Strother		15/10/2019
GARY MARCHESINI		24/10/2019

2. Executive Summary

Burdekin District Cane Growers Ltd (BDCG) represents jointly the interests of irrigators who are member of the Invicta Cane Growers Organisation, Pioneer Cane Growers Organisation and Kalamia Cane Growers Organisation.

Based on the evidence put forward as part of this proposal and a comprehensive analysis of all reports and consultation including the draft reports provided by the Queensland Competition Authority (QCA) we make the following recommendations:

1. Current data and analysis on which pricing changes have been based be reviewed and critically analysed in light of demonstrated inconsistencies and inaccurate reports
2. Current pricing for all BDCG irrigators in the Burdekin Channel, Burdekin-Giru Groundwater and Burdekin-Gladys Lagoon Tariff Groups be assessed in relation to the capacity to pay and absorb additional costs
3. Current arrangement for Giru Benefitted Groundwater Area (GBGA) irrigators be retained recognising the use of natural yield and encouraging the utilisation of groundwater
4. Arrangements for the GBGA be recognised in regulatory instruments to prevent ongoing and continual assessment by the QCA during each price pathway
5. Recognition that different water supply products are provided to GBGA irrigators and channel irrigators with different infrastructure and maintenance costs
6. Independent and appropriate analysis be undertaken by a hydrogeologist in relation to the presence of aquifer and rising groundwater
7. Costs associated with the dam safety upgrade should not be placed upon irrigators

BDCG welcomes and encourages more assessment of this response and other vital instruments utilised to make determinations for the QCA draft report. GBGA has identified significant concerns, data inconsistencies and inaccurate conclusions put forward by the QCA in relation to the management of pricing for rural irrigation. While these issues have been highlighted during various consultation processes this paper seeks to document the relevant evidence and put forward a case for further review and analysis prior to final decision-making and recommendation to Government.

BDCG holds the view that the current draft report is not based on factual, verifiable data and therefore does not accurately indicate the critical, local issues in this region that impact on potential changes to pricing.

3. Key Issue Areas

The Burdekin District Cane Growers Ltd (BDCG) is responding to a number of conclusions that have been reached by the Queensland Competition Authority (QCA) in its assessment of the pricing path arrangements for irrigators in the Burdekin Channel, Burdekin-Giru Groundwater and Burdekin-Gladys Lagoon Tariff Groups. The attached submission does not support any proposed price increases for Parts A, B, C or D as set out in Table 126 – Draft recommended Prices – distribution systems ($$/ML, Nominal) and nor does it support any irrigator contribution toward a dam safety upgrade being considered for a subsequent pricing path period.

The QCA draft report also includes conclusions (6.5.2. Part B, Burdekin – Haughton Distribution System – Giru Benefitted Area) contained in the draft include:

- "Given that the Water Solutions hydrological advice indicates that the natural yields in the GBA are immaterial, we consider that it is not appropriate to continue the 2006 – 2011 pricing path arrangements in the 2020 – 2024 pricing period
- "As the costs of supplying the GBA tariff group customers are not materially different to the costs of supplying Burdekin Channel tariff group customers, we consider that the cost-reflective prices should be the same for both tariff group customers"
- "We note the difference between the revenue and costs of supply to the GBA tariff group will not be recovered from other tariff groups and will instead be covered by the Government's CSO"

The BDCG puts forward this response to specifically address the above conclusions and ensure the QCA has a clear understanding and awareness of the historical, local and practical operational issues that impact on water supply in this region and the GBGA.

The BDCG believes that the advice provided by Water Solutions is incorrect and has been based on data that is incorrect, incomplete and inappropriate for pricing purposes. It is our view that this was a limited scope review conducted on a desktop basis from Brisbane without the consultant ever visiting the designated GBGA region. The conclusions drawn from the review and the advice given to the QCA should not be relied upon and regarded as not appropriate as a basis to set aside current pricing path arrangements which have been established for decades on sound hydrogeological principles.

Of deeper concern is the approach that has been taken to arrive at the current conclusions, in particular the use of and heavy reliance on data contained in the 2017 Kavanagh Report and also the OD Hydrology Report. SunWater has confirmed that the data in the Kavanagh Report was never intended to be used for pricing purposes. Coupled with that is the discovery that both the SunWater engaged Hydrologist and the QCA engaged Hydrologist relied on analysis of data from bores that were located outside of the defined GBGA in Schedule 3 of the Water Plan (Burdekin Basin) 2007, a subordinate legislative instrument gazetted under the Water Act 2000, to arrive at the conclusions that we believe are in error.

As the existence and assessment of the aquifer and the two Weirs (Val Bird Weir and Giru Weir) that were designed and constructed as bulk water assets to enhance the availability of groundwater located within the GBGA, it is important that we revisit the historical context and subsequent relevant information that provides compelling evidence in support of a conclusion that the GBGA is appropriately defined under the relevant Water Plan and that the longstanding assessment that the groundwater aquifer supply

augmented by the Val Bird Weir and the Giru Weir has available on average 19700 ML to contribute towards the GBGA's annual allocation of 40,242ML.

In addition, this submission seeks to challenge the apparent misconception that costs of supplying the GBGA tariff group customers are not materially different to the costs of supplying Burdekin Channel tariff group customers. It is our view that there are significant differences in costs borne between a GBGA irrigator and a channel irrigator in supplying water.

Finally, we believe that the 19,700ML, expressed in terms of a 49% free water allocation should continue to be recognised as a free water allocation and as such does not represent a discount that other irrigators are required to subsidize.

The following critical issues have been determined through an in-depth analysis of available reports including the Olzard hydrogeologist report (commissioned by the GBGA irrigators to assess the veracity of conclusions drawn by Water Solutions) and participation in consultations offered by the QCA and where relevant discussions/communication with other stakeholders. These issues are viewed by BDCG as significant and contributing to the potential for inaccurate assessments by the QCA in the determination of pricing for irrigators in this region. BDCG has also provided relevant evidence to support these claims.

BDCG encourages the QCA to conduct a comprehensive and thorough assessment of these issues before making a final determination moving forward to Government.

3.1 Existence and extent of the Giru Benefited Area Groundwater Area

3.1.1 Relevant History

In 1920, the Invicta Mill was transferred from Bundaberg to commence operations in Giru. In 2020 it will celebrate its centenary year of operation. Cane was already growing in the GBGA and it is understood that the decision to establish the Mill in the Giru area was largely based on the potential for cane to be grown in the region and the known existence of an underground water supply close by.

In 1967, the Water Resources Commission report on groundwater investigations described the aquifer within the Haughton River and Mount Elliott and recommended it be declared a sub artesian supply under the Water Act. It was further recommended that surface storage be established to provide an additional 10,000 acre feet. The original intention of this process was to provide a temporary solution supported by surface water storage from various weirs. In 1971 61 farms using aquifer groundwater and surface water needed approximately 19,736 ML. However, the aquifer only had capacity for 13,568 ML. The weirs increased capacity to 19,700 ML. From 1982 to 1986 the average volume pumped was 13,896 ML with a maximum of 17,914 ML.

The acknowledgement and quantification of the volume of the aquifer in the GBGA has been ongoing since 1967 and more so following the infrastructure works carried out to augment the groundwater storages.

An example which recognises the existence and significance of the GBGA groundwater benefitted supply is found in the letter below which recognises the GBGA contribution, at the time of the introduction of the Water Act in 1990 required to be paid when benefiting from the Haughton River supplementation:

Water Resources Commission

Your reference
In reply please quote
Our reference
When enquiring
please ask for:

Quay Road, Ayr
P.O. Box 1158, Ayr, Q. 4807
Facsimile (077) 83 4180
Telephone (077) 83 4577, 83 4341

I have enclosed with this letter a leaflet outlining changes to the operation and management of the Irrigation Area following commencement of the Water Resources Act on 1st February 1990.

The new Act provides for the issue of a licence to a landowner who has a holding in the Irrigation Area and is allocated water from any one source. This was previously known as Water Right, Water Agreement or Sales of Water. This allocation, to be known as a "Nominal Allocation" will be shown on the Licence documents along with details of the holding and the management arrangements for the Area. I intend that your licence showing all these details will be issued as soon as possible.

A further change that will affect you is the new structure for the charging of interest. These changes are as follows:-

1) the annual charge will attract interest if unpaid after six (6) months of the due date not seven (7) months as at present
2) sales of water will attract interest if unpaid after one (1) month of the due date.

Annual invoices will be issued on 2nd April, 1990 and will show the above particulars. The water charges for 1990 are as follows:

Burdekin River Irrigation Area - Supply from Channels	- $30.45
Giru Benefitted Area - When benefitted from Haughton River Supplementation	- $13.90
Private diversion from regulated streams	- $ 9.70

A copy of Sections 10.13 and 10.14 of the new Act is enclosed for your information and if you have any questions please do not hesitate to contact this Office.

Yours faithfully,

E.P. DONOHUE
DISTRICT ENGINEER,
AYR.

Water Resources

Through the IROL the allocation of groundwater in the GBGA was 40,242 ML in 2000. This combined groundwater of 19,700 ML and BR of 20,549 ML. Measures were implemented to lock in a system where there was a real incentive to continue use of the groundwater through equal arrangements within the Giru Benefitted Groundwater Area (GBGA) as a strategy to stop rising groundwater affecting properties as has now happened elsewhere in the BRIA by encouraging continued use of the good quality groundwater. We understand that this was achieved by limiting supply to only half. The continued use of the GBGA aquifer and ongoing contribution by the Val Bird Weir and Giru Weir to supply water by irrigators demonstrates that the original function and purpose of these facilities has not changed. In recent years, it appears that the basis for these arrangements has been lost.

In a letter provided by the former regional engineer for the Water Resources Commission, we were advised that infrastructure was developed and implemented to ensure that all irrigators that had been contributing to the scheme had equal access to water.

Lower Burdekin Water (LBW) has a legislated free water entitlement. This allocation is a legacy from several deliberate, considered and consistent Government policy and regulatory decisions. Similarities are drawn between this entitlement and the current arrangements for the GBGA. If there were to be a loss of the free water entitlement as per the LBW water agreement and GBGA water plan there would be a significant increase in cost and irrigators would not have the capacity to pay.

Recent statistics released by SunWater indicates extremely low releases between the February flood event in this region and 30 June 2019 of approximately 300 ML. This statistic indicates that the groundwater supply would be capable of supplying the GBGA for at least six months for irrigation purposes even after water losses. It also proves the conclusion in the Water Solutions report on page VII and 49 that GBGA irrigators receive little contribution from natural Haughton River flows in dry period is inconsistent with recent observations and other data included in report.

3.1.2 Conclusions

BDCG seeks to outline factors that are considered critical to ongoing irrigation pricing in this region and specifically the Giru Benefitted Groundwater Area (GBGA). These issues are consistently raised through various reports and highlighted by irrigators outside of the GBGA where impact is minimal. The following conclusions can be drawn from available documentation and legislation:

- The existence of an aquifer in the Giru Benefited Groundwater Area (GBGA) has been officially recognised since 1967 before the existence of the Burdekin Falls Dam and the Haughton Burdekin Water Supply Scheme
- The GBGA is recognised in the Water Plan (Burdekin Basin) 2007 Schedule 3 as at June 2019
- The aquifer has been measured at 10,000 acre feet or 13,568 ML
- The Val Bird and Giru Weirs were constructed to enhance the availability and reliability of the aquifer and the groundwater supply in the GBGA by a further 6,132 ML bringing the groundwater supply to a total of 19,700 ML meeting the assessed irrigation needs in 1971 of 19,736 ML
- The GBGA is a separate area from the Haughton Zone A and should continue to be recognised as such
- Evidence continues to be shown through the IROL in 2000 for a capped allocation in the GBGA set to 40,249 ML with 19,700 ML groundwater and 20,549 ML BR

- Evidence of the existence of the aquifer can be found in usage data supplied by SunWater where the annual usage has significantly exceeded the annual release quantity adjusted for transmission losses
- Recent and compelling evidence of the continuing existence of an aquifer and enhanced availability of groundwater from the two weirs is evidenced in the GBGA water release and using data supplied by SunWater for the period 1 April 2019 to 30 September 2019 (awaiting formal confirmation of period 1/7-30/9 but known usage data for period 1/4/19-30/9/19 is 13,322 ML and releases for the period 7/2-30/6 totalled 300ML)
- Arrangements were initially established in 1987 to require the usage of equal parts of groundwater and surface water to deliberately provide an incentive for the use of groundwater in the GBGA to stop impact of rising groundwater affecting properties as evidenced in the BRIA region
- The GBGA free water entitlement is equivalent to the free water entitlement for the Lower Burdekin Water Board in terms of the aquifer's historical existence, regulatory precedents in the form of the Water Plan (Burdekin Basin) 2007, which recognises in Schedule 3 the GBGA and the fact that the 19,700 ML availability existed before both the Burdekin Falls Dam and the Burdekin Haughton Water Supply Scheme

3.1.3 Recommendations

As a result of the conclusions and in the context of current evidence of an aquifer and supporting weirs in the GBGA the following recommendations are put forward on this issue:

- The full entitlement of 19,700 ML be formally recognised in the Water Plan (Burdekin Basin) 2007 and be declared to incorporate the groundwater aquifer and the Val Bird Weir and the Giru Weir which serve to enhance the availability of the groundwater supply
- The Treasurer be requested to incorporate into future referral letters, an instruction to the QCA that provides ongoing security to the Giru Benefited Groundwater Area (GBGA) irrigators through the recognition of the free water entitlement of 19,700 ML or 49% reduction in price, which has been assessed and recognised since 1987 (pre-BHWSS and pre-BFD) and for it not to be subject to further scrutiny by the QCA in future pricing path negotiations
- In the context of the above recommendation and similar to the GBGA entitlement, the Burdekin District Cane Growers Ltd (BDCG) recommends the entitlement of 185,000 ML in existence before the Burdekin Falls Dam and before the Burdekin Haughton Water Supply Scheme for the Lower Burdekin Water Board be recognised and retained in perpetuity and continue not to be subject to further scrutiny by the QCA in future pricing path negotiations

3.2 Queensland Competition Authority Hydrologist Report – 2019

Burdekin District Cane Growers Ltd (BDCG) has identified and can clearly articulate a number of significant concerns relating to shortcomings in the reports provided on behalf of SunWater and the Queensland Competition Authority (QCA). These concerns relate to basic errors and inconsistencies that have a significant impact on pricing and the viability of farming in this region. BDCG questions the selection of a hydrologist, rather than the expected engagement of a hydrogeologist, who would be more appropriately qualified and experienced in order to conduct an assessment of a groundwater system. Combined with a reliance on inconsistent and unreliable data the underlying basis for the QCA review and conclusions which then give rise to proposed changes to irrigation pricing arrangements appears flawed. The following significant issues have been identified with the data presented by the QCA and SunWater as the basis for the pricing review.

3.2.1 Kavanagh Report 2017

The reports commissioned by SunWater (carried out by ODH) and by QCA (carried out by Water Solutions) relies heavily on the data provided within the Kavanagh Report. This data is considered to be incomplete, inaccurate and unreliable. The Kavanagh Report was never intended for irrigation pricing purposes yet forms a significant part of both reports prepared by consultants on behalf of SunWater and the QCA. SunWater specifically advised that the Kavanagh data was not intended for pricing purposes. The tables presented on page 12 of section 7,1 of the Kavanagh Report are impacted by estimated data and several key assumptions and qualifications including a failure to take into account system inefficiencies arising from water transmission losses. The failure to exclude water removed upstream above the GBGA and the use of water from this allocation for irrigation outside of the GBGA. The non-identification of temporary transfers and failure to exclude these from both the releases and usage data together with end of scheme loses at Healeys Lagoon results in data that appears to be misleading.

The omission of scheme efficiencies and loss of water between the supplier and customer is a significant error. In data put forward by SunWater for scheme identified efficiency in 2010 to 2011 at 55%. In real terms if SunWater supplies 10,000 ML to a customer approximately 5500 ML would be delivered. Based on this efficiency if a customer was to request 10,000 ML SunWater would have to release 18,181 ML to achieve this outcome. The scheme efficiency between the 2006 / 2007 and 2017 / 2018 for channel users was 65% and therefore had average loses of 35%.

	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019
Total Scheme efficiency %	71.3%	65.9%	60.4%	65.9%	55.0%	62.9%	61.4%	58.8%	71.0%	72.6%	78.9%	83.7%	84.5%

Total Scheme Efficiency, SunWater

Issues begin to arise when applying the Kavanagh data to actual usage by irrigators. The Kavanagh data highlights an annual release of more than 40,000ML yet irrigators used significantly less. BDCG highlights that the causes of transmission inefficiencies includes evaporation and channel leakage or seepage. Further contributing factors to losses include:

- Poor recording of releases through manual estimates; for example if a water gate is used and water release is estimated by way of the time the gate is opened then if weed was to be partially blocking the gate then the amount of release would be less than the volume recorded
- Losses of water out of Healeys Lagoon at the end of the system which are not trapped and are unrecorded
- Environmental flows when the Val Bird Weir is kept full and rain events are lost over the top of the weir instead of being captured.
- Water releases when weed control measures are being employed

Further evidence of this issue can be seen through a report completed on the efficiencies of the GBGA by the Department of Natural Resources (see below snapshot). This report prepared by GH&D dated April 2001 assessed the Haughton River (GBGA) efficiencies for the two years at 58.7% and 33.4% for 1996 to 1997 and 1997 to 1998 respectively as per the table below. It is also noted the assessor had issues with the availability of reliable release data for almost the entire review period during 1991/92 – 1997/98.

5.4.2 *Haughton River - Giru Benefited Area*

Releases are made from the Haughton balancing storage to supplement flows in the Haughton River, which supplies water to the Giru Benefited (groundwater) Area (GBA).

Val Bird and Giru Weirs regulate the Haughton River, with bulk water extractions made directly to Healey's Lagoon and in turn Reed Beds Lagoon. The area is primarily operated to maximise infiltration to the groundwater delta. All bores in the GBA are metered, with water use volumes available from the WERD database. Due to the availability of release data, however, the water balance analysis has been limited to the 1996/97 and 1997/98 water years only, as shown in Table 5.6 below.

It can be seen from Table 5.6 that annual efficiencies were calculated at 59% and 33% for the two years investigated.

The water balance analysis has also been undertaken on a quarterly time step, with the results included in Appendix D.2. A plot of quarterly releases and metered use has been shown in Figure 5.7.

In general it would appear that the return on releases to the Haughton River is relatively consistent, although the impacts of losses during dry periods appear to be considerable.

Table 5.6
Haughton River (GBA) Annual Water Balance

Annual Water Balance	Water Year	
	1996/97	1997/98
Regulated Release - Haughton Balancing Storage (ML)	38,528	22,895
Recorded Water Use (ML)	22,612	7,655
Operational Efficiency (%)	58.7	33.4

The above data adds further evidence to the importance of accounting for system efficiencies when calculating water usage in the GBGA.

The data within the Kavanagh Report appears not to have been checked or interrogated for accuracy by ODH or Water Solutions. Significant inconsistencies and inaccuracies included not taking into account known adjustments such as transmission losses that would materially impact on conclusions.

Burdekin District Cane Growers Ltd (BDCG) highlights these issues with the Kavanagh Report and concludes that the underlying data used by SunWater and QCA appears inaccurate and unreliable. This data was based on estimates, assumptions and has not been checked for validity and completeness. This data is potentially misleading and undermines the reports commissioned by both agencies.

Data Analysis: Kavanagh Report

Burdekin District Cane Growers Ltd (BDCG) has conducted an additional analysis of the Kavanagh report to examine the influence of efficiency on water usage and final data. The current Kavanagh Review was compiled by SunWater and the BRIA committee. There are number of errors and inconsistencies in the data presented within this report.

These inconsistencies are highlighted below and included within the additional analysis undertaken to demonstrate the impact of these factors and enclosed within this section.

1. Table 1 Estimation of Anticipated and Achieved Water Balance

Under the Column "Delivered" and the column "Efficiency of total usage Haughton Zone A"

2005/06	33,125	103%
2006/07	37,937	120%

There is an inconsistency with data recorded in Table 2 Diversion and Usage Figures for Haughton Zone A. Under the Column "Total Water Use Haughton Zone A SW & GW" and the Column "Efficiency of total usage in Haughton Zone A.

2005/06	33,994	106%
2006/07	37,985	120%

2. Table 2

Note (a) notes that efficiency does not take into account transmission efficiencies. This note does not appear under Table 1 or Table 9

3. Total Allocation in GBA:

- Appears as 40,249 twice on page 5
- Appears as HZA 40,184 on page 9 Table 5
- Appears as HZA 40,184 on page 10 Table 6

4. Table 2 Diversion and Usage Figures for Haughton Zone A

Under Column "Total Water Use Haughton Zone A SW & GW" and column "All Haughton Zone A SW Metered Usage" "efficiency of total usage"

Average Printed:	35,781	24,678	102%
Recalculated with existing figures:			114%
Recalculated with amended figures:	30,559	19,455	95%

5. The data that appears in Table 9 does not account for the Imported Temporary Transfers brought in from outside of the Haughton Zone A

- Sunwater provided 10 years data and advised that the data was indicative of the seasonal trends in ITTs
- For the purposes of testing the Kavanagh data only 7 years out of the 10 was used and for those years an average of 5,335ML resulted
- If we were to use the whole 10 years as indicative then the average of the 10 years was 6,448. We used in our calculations the lower figure

6. The data does not account for Transmission losses/system inefficiencies

- For the purposes of applying a comparable system in efficiency percentage it was determined that the efficiency percentage for the channel should be used
- Sunwater provided 10 years of channel efficiency data which showed an average of 64% efficiency as shown earlier in this submission

- In the attached spreadsheet it was determined to use actuals where known ad then apply the average percentage

7. Calculation of an Estimated Net Water Available after removal of ITTs and Transmission losses

Net Available water was calculated as 17,009 on average over the 19 year period

8. Calculation of an adjusted usage after removal of ITTs was 27,439

9. Calculation of an Estimated Efficiency percentage was 161%

There is still no allowance in the calculations for:

- Inaccuracies due to manual estimates of releases up until October 2015
- Losses out of the back end of the system of Healey's lagoon
- Environmental flows

In 2019, this efficiency is expected to be in excess of 200% based on preliminary release and usage data.

BDCG has attempted where possible to adapt the available data to the Kavanagh Report and produce results that are more accurate and more closely aligned with actual operations in the GBGA. This data analysis clearly demonstrates it is essential to incorporate inefficiency, transmission losses and temporary transfers to ensure an accurate and consistent analysis of water usage in the GBGA.

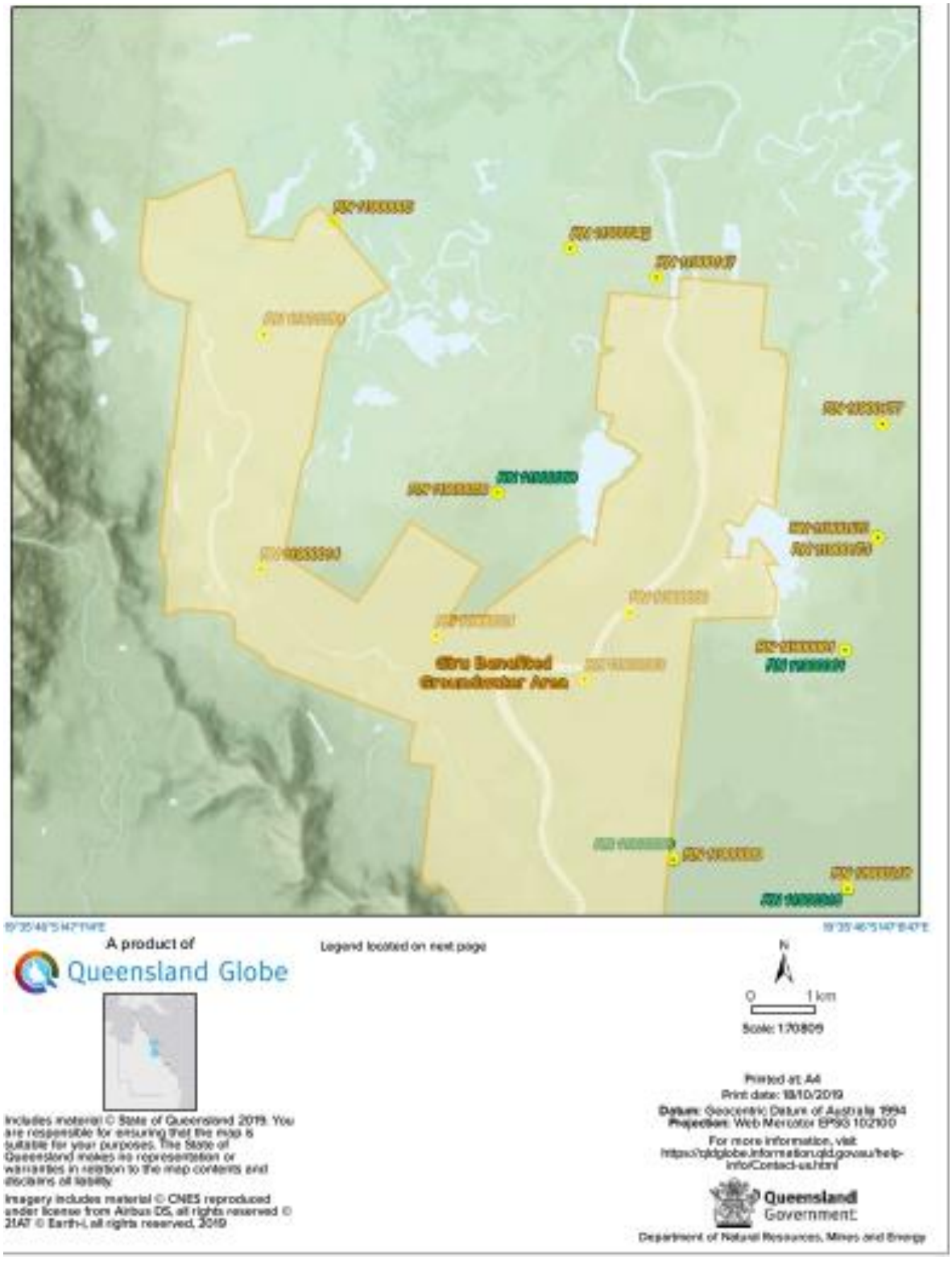
Year	Released to Haughton River	Used in Zone A (ML)	%						Released to Haughton River	Temporary Transfers in ML	Net Release available In GBA	Channel Equivalent Transmission Efficiencies	Net Water available after distribution losses	Used in Zone A (ML)	Temporary Transfers in ML	Used in GBA	% of Used to released
1997/98	22,873	28,297	81					1997/98	22873	Not Supplied	Not Available	Not Supplied	Not Available	28297	Not Supplied	Not Available	Not Available
1998/99	4,406	18,618	24					1998/99	4406	Not Supplied	Not Available	Not Supplied	Not Available	18618	Not Supplied	Not Available	Not Available
1999/00	25,138	22,832	110			over supply		1999/00	25138	Not Supplied	Not Available	Not Supplied	Not Available	22832	Not Supplied	Not Available	Not Available
2000/01	14,160	27,315	52					2000/01	14160	Not Supplied	Not Available	Not Supplied	Not Available	27315	Not Supplied	Not Available	Not Available
2001/02	43,685	48,059	91		drought			2001/02	43685	Not Supplied	Not Available	Not Supplied	Not Available	48059	Not Supplied	Not Available	Not Available
2002/03	60,037	51,253	117		drought	over supply		2002/03	60037	Not Supplied	Not Available	Not Supplied	Not Available	51253	Not Supplied	Not Available	Not Available
2003/04	42,453	42,485	100		drought			2003/04	42453	Not Supplied	Not Available	Not Supplied	Not Available	42485	Not Supplied	Not Available	Not Available
2004/05	45,257	48,609	93		drought			2004/05	45257	Not Supplied	Not Available	Not Supplied	Not Available	48609	Not Supplied	Not Available	Not Available
2005/06	32,136	33,125	97		drought			2005/06	32136	Not Supplied	Not Available	Not Supplied	Not Available	33125	Not Supplied	Not Available	Not Available
2006/07	31,556	37,937	83					2006/07	31556	Not Supplied	Not Available	71%	Not Available	37937	Not Supplied	Not Available	Not Available
2007/08	22,018	30,742	72					2007/08	22018	Not Supplied	Not Available	66%	Not Available	30742	Not Supplied	Not Available	Not Available
2008/09	19,101	27,061	71					2008/09	19101	Not Supplied	Not Available	60%	Not Available	27061	Not Supplied	Not Available	Not Available
2009/10	38,465	35,571	108			over supply		2009/10	38465	6283	32182	66%	21208	35571	6283	29288	138%
2010/11	5,872	6,677	88			prolonged rains		2010/11	5872	485	5387	55%	2963	6677	485	6192	209%
2011/12	29,603	20,387	145			over supply		2011/12	29603	1484	28119	63%	17687	20387	1484	18903	107%
2012/13	26,873	20,610	130			over supply		2012/13	26873	1032	25841	61%	15866	20610	1032	19578	123%
2013/14	44,671	29,668	151		drought	over supply		2013/14	44671	2883	41788	59%	24571	29668	2883	26785	109%
2014/15	47,405	46,422	102		drought	over supply		2014/15	47405	11815	35590	71%	25269	46422	11814	34608	137%
2015/16	47,019	47,031	100		drought	over supply		2015/16	47019	13364	33655	73%	24434	47031	13364	33667	138%
Average	**31723**	**32774**	97					**Average**	**31723**	5335	**26387**	64%	**17009**	**32774**	5335	**27439**	161%
									1997/98 - 2015/16	2009/10 - 2015/16	2009/10 - 2015/16	2006/07 - 2015/16	2009/10 - 2015/16	1997/98 - 2015/16	2009/10 - 2015/16	2009/10 - 2015/16	2009/10 - 2015/16
	red = exceeds annual allocation	red = exceeds annual allocation													Estimated Minimum Average number of days water supplied by Groundwater Aquifer	1997/98 - 2015/1	135

3.2.2 Water Solutions Report

The report prepared by Water Solutions on behalf of the QCA has a number of significant shortcomings and inconsistencies and delivers conclusions based on inaccuracies and unreliable data. As evidenced above the use of data from the Kavanagh Report undermines the completeness and integrity of any conclusion put forward within this report.

BDCG would initially like to highlight that the assessment of the aquifer and groundwater supply is a complex process that should be undertaken by an experienced and qualified hydrogeologist and not a hydrologist. As put forward in the report supplied by Kelvin Olzard, Groundwater Australia there is significant evidence to indicate that both the QCA and SunWater have not engaged an appropriate and qualified individual to conduct the required studies, see page 3 of attached report. Further to this the integrity of this report is undermined as the Water Solution hydrologist did not visit the site. In comments put forward as part of the consultation the hydrologist noted that a site visit was out of the scope provided by QCA. This significantly undermines the integrity of this report and questions the qualifications and capability of this organisation to draw conclusions that impact on data and pricing for irrigators.

Secondly, and of equally significant concern is an admission by the hydrologist from water solutions that a key focus was on one of the eight bores chosen by ODH for analysis instead of throughout the region. It has now been identified that this bore was outside of the GBGA. The result is that data extracted from this bore is not relevant to the GBGA. This finding significantly undermines the Water Solutions report and indicates that any analysis undertaken by this consultant is based, in part, on data from outside of the area. The primary bore (11900058) selected was not in GBGA as shown below: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Printed at: A4
Print date: 18/10/2019
Datum: Geocentric Datum of Australia 1994
Projection: Web Mercator EPSG 102100
For more information, visit:
https://qldglobe.information.qld.gov.au/help-info/Contact-us.html
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A number of other inconsistencies and issues are identified with this report. The conclusions put forward by the hydrologist are inconsistent and contain concerns about their internal process and data. Conflicting statements are made throughout the report in relation to the use and application of data for this purpose.

Of concern is the hydrologist's admission that the use of averaging data over a short period of time is not an appropriate way to assess the benefits of a supplemented scheme. However, the data utilised within this report was over a period of 11 years which included a three-year dry period. The hydrologist made the following statements: "the supplemented release data tends to indicate that it is unlikely that natural flows provide a large contribution to the water security of GBA irrigators". This statement appears to be sourced from averaging data despite a declaration on page 48 stating the following: "Using the average delivery over a period of average years will generally not be an appropriate way to assess the benefit of a supplemented scheme". Following this statement the report also stated: "This data also was subject to a host of real-world issues such as measurement errors and the GFC". The consultant went on to say: "It is recognised that a hydrology model should have been used to measure natural flow in this environment" This approach was not adopted by the Kavanagh Report, ODH or Water Solutions.

As indicated within the Kavanagh Report, Water Solutions also failed to acknowledge water distribution inefficiencies and other water losses. Between 2007 and 2008 and 2014 and 2015 this ranged between 33% and 45% for channel users and up to 35% on average. These percentages were reported as part of the SunWater efficiency assessment as noted in 2.2.1 of this response.

The lack available consultation and visit by the hydrologist from Water Solutions also caused additional concerns. This includes issues such as water taken outside of the GBGA, upstream, temporary transfers, system losses and water harvesting. In addition this report failed to acknowledge that water harvesting occurs in the Majors Creek area. Conducting a desktop review off site in Brisbane has limited the credibility and accuracy of the Water Solutions report based on the capacity to assess these and other local issues.

In the Water Solutions report it was concluded "GBA irrigators are receiving little contribution from natural Haughton River flow in dry periods". No clarification was provided how that conclusion was reached which appeared to contradict the reported data in the years 1998/99 (Use 18,618 V Diversion 4,406ML), 2000/01 (Use 27,315 V Diversion 14,160), 2007/08 (Use 30,742 V Diversion 22,018) and 2008/09 (Use 27,061 V Diversion 19,101). SunWater is still yet to provide release data for the period 1/4/19-30/9/19 which we fully expect will prove this conclusion wrong.

In the Water Solutions report it was concluded "The ODH Model also indicates that the contribution of natural flows is "very small"". No clarification was provided how that conclusion was reached which appears to contradict the statement in the OD Hydrology Report (on page ii) which states that "scenario assessment of an un-supplemented aquifer under varying levels of demand indicates a sustainable, reliable supply of approximately 30-50% of current demands (10,000-17,000ML/a)"

Further clarification from BDCG was sought from the Water Solution's Consultants in relation to:

- Reasons why the report did not note the fact that up until October 2015 the release data was only estimated by SunWater

- Reasons why the report did not recognize the fact that the estimation of water releases was affected in some years by excessive aquatic weed growth being caught up in the release gate and therefore giving the impression that more water had been released than was actually released, as noted in page 14 of the Kavanagh Report

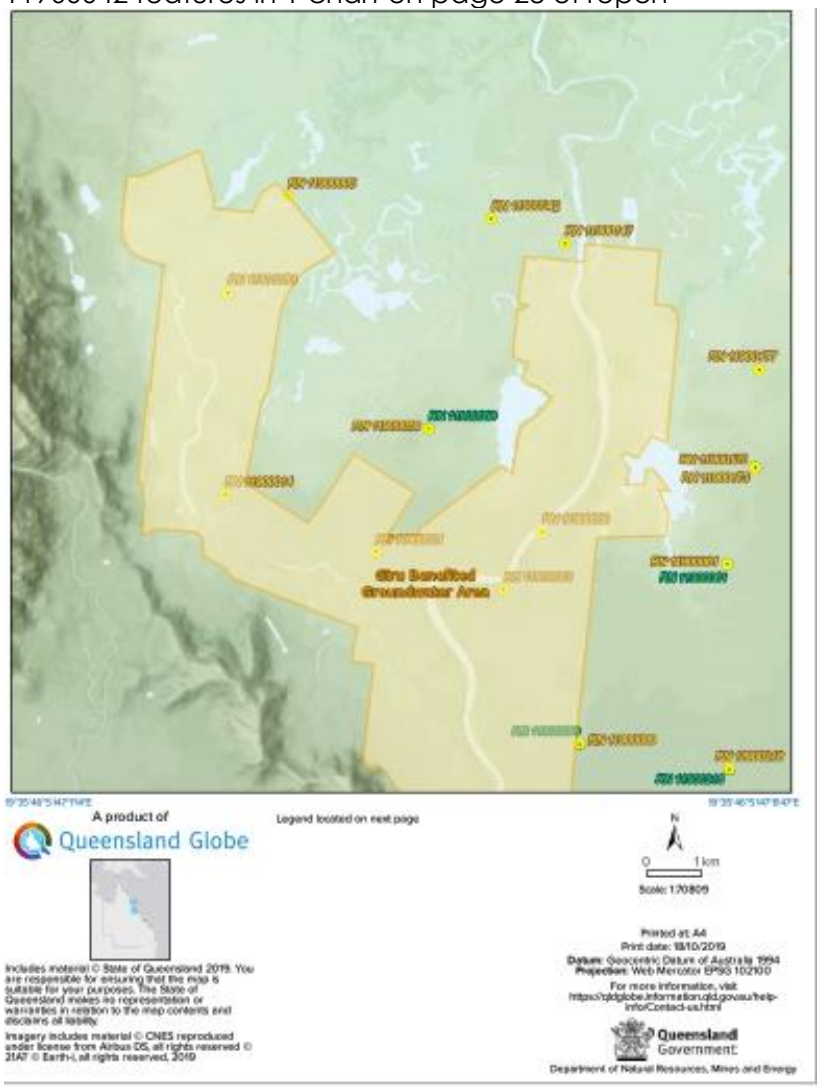
3.2.3 ODH Report

The report commissioned by SunWater and completed by ODH is also subject to the same inconsistencies as outlined above with the Kavanagh Report. The continued reliance on this dataset outside its intended purpose provides significant and justifiable cause for the integrity of any report to be questioned.

The dataset produced by ODH also utilised two bores outside of the GBGA. The use of the inaccurate mapping initially introduced within the Kavanagh Report has resulted in a number of inaccuracies in the collection of data from areas that are not included within the GBGA.

The two bores used for data and that are not in the GBGA are shown below:

11900058 features in 6 charts on pages 20,21,23,29 of report
11900042 features in 1 chart on page 28 of report



The ODH does make a number of concessions that support the ongoing maintenance of existing pricing arrangements for the GBGA. The acknowledgements within this report include:

- An acknowledgement was made by ODH of an aquifer and groundwater system contribution as shown through the following statement: "scenario assessment of an un-supplemented aquifer under varying levels of demand indicates a sustainable, reliable supply of approximately 30 to 50% of current demands (10,000 – 17,000 ML/a)"
- Acknowledgement of water distribution system inefficiencies estimated at 140 ML needed to supply 100 ML equating to approximately 28.57% inefficiency or a 71.3% efficiency

The ODH report while drawing from the same compromised set of data makes a significant indication and contribution to the establishment of an aquifer and groundwater supplemented system to the GBGA.

3.2.4 Queensland Competition Authority Consultation

The Queensland Competition Authority (QCA) initially conducted a consultation on 16 October in recognition of the sensitive and contentious nature of issues surrounding the GBGA irrigators. This specifically related to concerns on the Kavanagh and ODH reports on the reliability of data now considered the foundation for future decision-making. The GBGA irrigators in the consultation process highlighted that there were concerns on release and usage data and bore locations which were never subjected to scrutiny while containing obvious limitations.

The consultant, put forward as part of this consultation, did not appear to be qualified to make an assessment of the GBGA system. The Water Act in dealing with the requirements for an appropriately qualified person to undertake groundwater impact assessment roles provides an example of the eligibility requirements to be holding a geology degree.

The BDCG also highlighted concerns in relation to the final Water Solutions report issued on 4 September 2019 which was dated after the QCA report, 31 August 2019. The report indicated only minor revisions were made between the report described as final and issued on 26 July 2019 and the final report provided by Water Solutions after the date of the QCA report. This leads to concerns that the QCA had predetermined conclusions prior to receiving the final amended report from Water Solutions. The QCA did not clarify this inconsistency at stakeholder workshops.

Participants within the consultation highlighted potentially disastrous impacts based on recommended pricing arrangements using the Water Solutions report. Concerns were raised in relation to the openness and transparency of the QCA review process which included the availability of the consultant from Water Solutions at a follow up workshop held only three weeks prior to the 4 November 2019 deadline for submissions.

The QCA produced a summary of the scheduled and follow-up workshops, which was in our view incomplete and inaccurate. No participants in the consultation process were offered the opportunity to provide comments or suggested edits to the scheduled workshop summary of which has been made public. However, after a concern was raised an opportunity was offered in respect to the follow-up workshop to provide comment and suggested edits and a large number of amendments were made.

3.2.5 Conclusion

Burdekin District Cane Growers Ltd (BDCG) have significant concerns in relation to the transparency, accuracy and integrity of the draft report produced by the QCA based on the information presented above.

In summary the BDCG questions the integrity of this report based on the following:

- Use of inaccurate, incomplete and inconsistent data based on assumptions and estimates produced within the Kavanagh Report not intended for irrigation pricing
- Failure to incorporate system inefficiencies which range from 35% to 50% depending on each dataset when preparing conclusions
- Use of a hydrologist instead of a hydrogeologist to prepare a report
- Selection of a bore outside of the GBGA to conducted data analysis undermining conclusions made
- Insufficient availability of the consultant hydrologist to verify data with limited timeframes for response
- Failure of the hydrologist to visit the site to undertake assessments

3.3 Differential Pricing

Burdekin District Cane Growers Ltd (BDCG) seeks to highlight significant differences in the supply of services and as a result pricing between channel irrigators and the Giru Benefitted Groundwater Area (GBGA). As demonstrated in section 2.1 there is a clear case for the existence of an aquifer and the importance of an equal combination of groundwater and surface water use by irrigators in the GBGA.

BDCG's primary concern relates to the conclusion put forward by the Queensland Competition Authority (QCA) which states the following:

> *"As the costs of supplying the GBA tariff group customers are not materially different to the costs of supplying Burdekin Channel tariff group customers, we consider that the cost-reflective prices should be the same for both tariff group customers"*

BDCG seeks to confirm that the supply of water to customers in the Burdekin Channel tariff group and GBGA requires different service levels and infrastructure. All customers in the GBGA are required to pump surface water from bulk water assets such as weirs to required locations. The supply of water to these assets by SunWater requires minimal infrastructure. This is significantly different to supplying water to the Burdekin Channel tariff group which includes a large amount of infrastructure with associated maintenance and costs. BDCG argues that the costs associated with maintaining each of these systems is significantly different with customers in the GBGA receiving a lesser product and infrastructure than the Burdekin Channel tariff group. BDCG has sort advice and confirm this arrangement with Peter Gilbey, former Regional Manager for the Department of Primary Industries.

BDCG also has significant evidence to indicate that the original purpose in establishing current pricing and supply arrangements for the GBGA was to lock in a system with a real incentive to continue the use of groundwater in this area. The purpose of this approach was to ensure the water table did not come to the surface on farms as experienced elsewhere in the BRIA. The importance of continuing to incentivise this approach is essential to the long-term viability and sustainability of farming on lands within the GBGA.

The BDCG is confident that the evidence provided does not support the conclusion put forward by the QCA in that the costs of supplying both customer groups is not materially different. There is no doubt that the water systems are individual and different. The systems can be differentiated in terms of infrastructure requirements, operating maintenance requirements and determination of peak flow entitlement (PFE) which cannot be guaranteed as the Haughton River and both weirs do not constitute a distribution system. It however appears both weirs are being operated as a distribution system as noted in the Water Solutions report.

As part of the supply of a product especially which seeks significant remuneration the delivery of reliable and efficient system is essential. This includes the maintenance of quality infrastructure along with the capacity to guarantee supply such as a peak flow entitlement arrangement. A significant issue with the supply of water through the GBGA is the loss of water at the end of Healeys Lagoon.

It should be noted that the Burdekin Channel tariff group efficiencies have improved in recent years to 82%. However, we believe that similar improvements to the GBGA distribution system have not been implemented. This is significantly higher than the efficiency levels for the GBGA. Evidence has been provided to consistently demonstrate that poor management of the GBGA system as noted in the Olzard report and there

should be a further incentive for GBGA irrigators to use more groundwater than surface water. The current arrangement is for 51% surface water and 49% groundwater. This arrangement as stated above has been in place to arrest the rising groundwater problem in the GBGA.

BDCG has consistently provided evidence that the GBGA irrigators have used above and beyond the water delivered through the bulk assets or weirs demonstrating the existence of natural yield and the importance of this in maintaining sustainable farming operations. GBGA irrigators have consistently demonstrated the use of natural yield and achieved significant benefit from this process.

Recommendation

BDCG recommends an incentive be introduced to increase the proportion of useful groundwater across all areas in the Burdekin were rising groundwater problem exists.

3.4 Capacity to Pay

Burdekin District Cane Growers Ltd (BDCG) seeks to address a number of inconsistencies and issues surrounding the capacity for growers to pay for a significant increase in irrigation pricing. All cane growers function within a fixed price market subject to the fluctuations of the world sugar price. At no stage in the pricing process is there a capacity to increase this price to absorb additional cost. With no subsidies from Government or tariffs associated imported sugar, growers are vulnerable to regulated pricing increases that have a direct impact on the cost of doing business. All BDCG irrigators experience the same difficulties associated with the capacity to pay.

Previously the Invicta Cane Growers Organisation engaged Tom Mullins Consulting to undertake a comprehensive data analysis in relation to the sensitivity of cane growers in the Giru Benefitted Groundwater Area (GBGA) to absorb additional cost. With more than 20 years employment in the Burdekin region and particularly the agricultural sector Tom was able to provide valuable insight into the potential scenarios associated with pricing increases.

As a result of the release of this draft report the BDCG has again engaged Tom Mullins Consulting to conduct a more comprehensive analysis based on the pricing suggested by SunWater and recommended by Queensland Competition Authority (QCA) report. In summary the findings of this report (See attached) include:

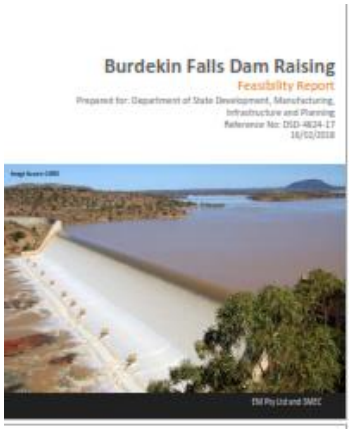
- BDCG irrigators would not be capable of sustaining the proposed increases in irrigation water charges
- Cash losses would escalate to unsustainable levels for GBGA irrigators
- The introduction of dam safety charges in 2025/26 would require a break even estimated sugar price of $485 per tonne which is approximately $45.50 per ton cane for GBGA irrigators
- Average QSL four year (2019 – 2022) indicates a price of $422 per tonne sugar or $38.66 per ton cane for the average GBGA irrigator resulting in a loss of $5.85 per tonne cane produced or $620 per hectare

As evidenced in the attached report there is significant evidence to indicate that GBGA irrigators will experience direct and significant cash losses as a result of the capacity to pay both irrigation price increases and dam safety charges.

Additionally the attached report also demonstrates that all BDCG irrigators experience a cash loss went facing increases in irrigation pricing and dam safety upgrades. While each area may vary in relation to breakeven point and return a financial analysis of all participant growers indicates a cash loss.

The analysis conducted by Tom Mullins Consulting along with the restrictive pricing experienced in relation to world sugar price creates an unstable environment for sugarcane production. Without the ongoing support and cooperation of Government agencies including SunWater and QCA any fluctuations in fixed prices has significant impacts to the cost of doing business and the sustainability of cane growing operations throughout the region.

There is a misconception held by many Government departments that cane growers have a greater capacity to pay increased costs than is realistically possible. An example of how Government departments hold this view can be seen in the following table which appeared in the Feasibility Study into the raising of the Burdekin Falls Dam, less than two years ago. This report published the following information:



BURDEKIN FALLS DAM RAISING - WATER DEMAND STUDY

Table 5.1: Crop Production and Gross Margin Summary

	Broad Acre			Horticulture			
Crop	Sugarcane[1]	Sorghum	Lucerne[2]	Capsicums[3]	Rockmelons[3]	Tomatoes[3]	Sweet Corn[3]
Price ($/t)	$40.9	$200	$300	$2,000	$675	$1,600	$727
Yield (t/ha)	150	6	15.4	24	32	50	35.4
Irrigation (ML/ha)	10 with 1/5 years fallow	5	6	4	4	4	4
Gross Margin ($/ha)	$2,976	$356	$3,162	$16,263	$4,727	$24,013	$10,455
Maximum Capacity to Pay for Water ($/ML)	$372	$71	$162	$4,566	$1,182	$6,003	$2,614
Market Depth	High	Medium	Medium-Low	Low	Low	Low	Low
Export Intensity	High	Med	Low	Low	Low	Low	Low

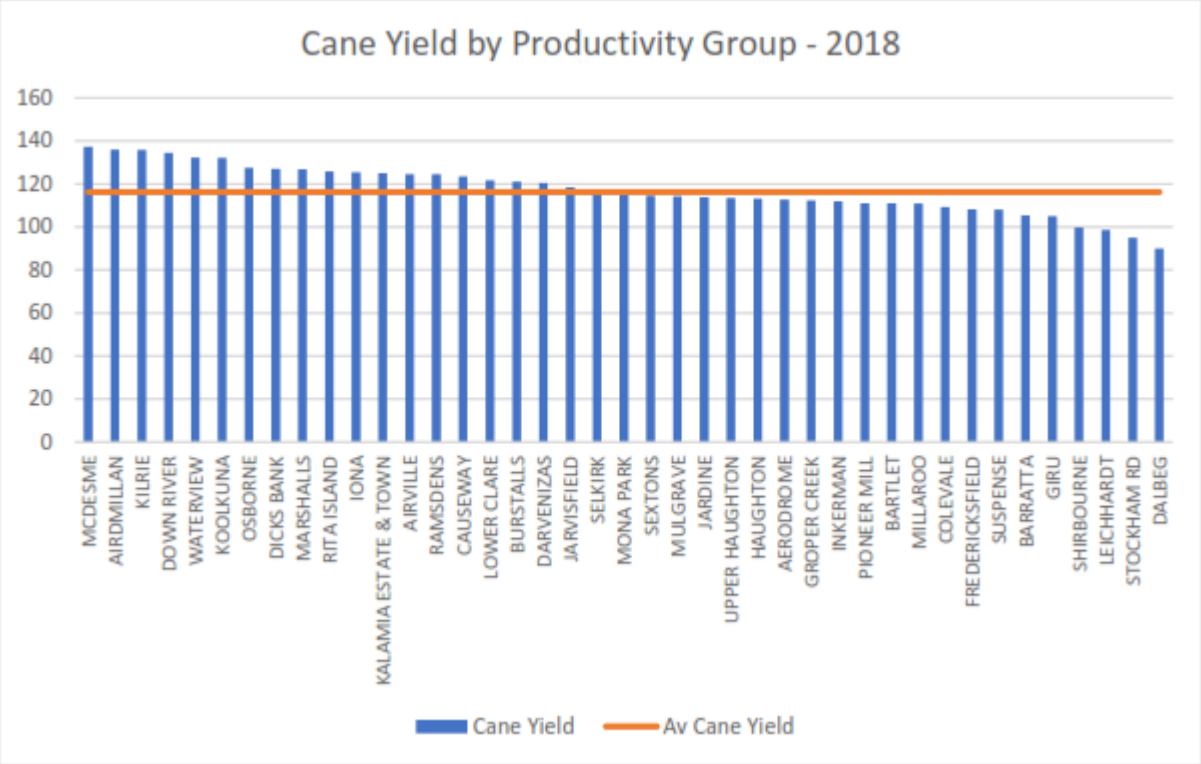
Note: [1] Based around whole of crop average and SRA Adviser kit long term average yields. [2] Based on four cuts per annum. [3] Indicators based on a single annual crop cycle.
Source: McKellar Et. Al (2013), DAF (2016), NSW DPI (2017), ABARES (2017b), LRAM (Unpublished), AEC

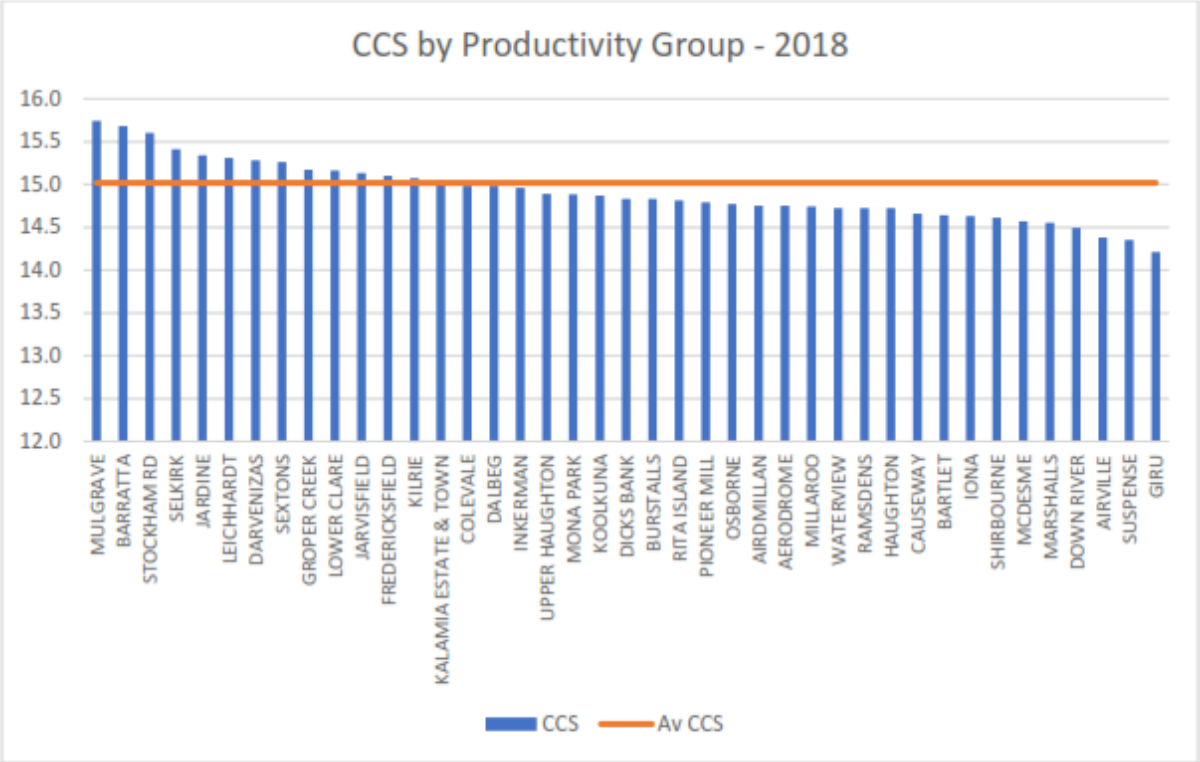
While the indicative capacity to pay considers the viability of new opportunities over the short term, the long term nature of the dam raising project means that new technologies and changing market factors will potentially make new opportunities viable. Potential capacity to pay will be assessed against the whole of life costs of the dam raising project as part of Phase 3 of this feasibility study.

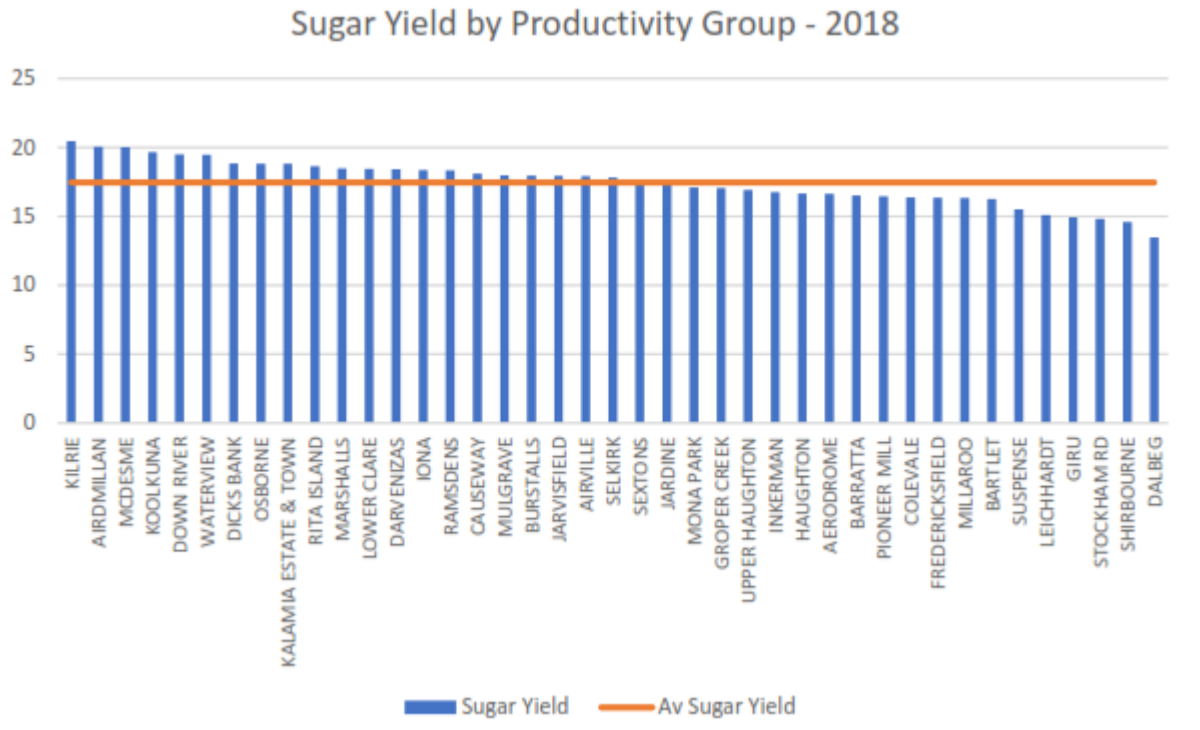
The data suggests that the Yield on a Tonnes per Hectare basis is 150. Data from Burdekin Productivity Services suggests that District Yields average around 120 and yields for the Giru / Shirbourne area average around 102. See below aggregated data:

	Giru					Shirbourne			
	Year	**TCH**	**High**	**Low**		**Year**	**TCH**	**High**	**Low**
	2018	103.31	152	56		2018	95.80	136	62
	2017	107.26	171	61		2017	101.17	133	76
	2016	109.37	150	89		2016	112.53	148	70
	2015	104.05	124	61		2015	107.18	141	62
	2014	92.96	119	74		2014	92.62	130	60
	2013	93.38	154	61		2013	86.63	114	62
	2012	94.37	116	80		2012	94.08	130	73
	2011	109.08	139	82		2011	113.92	144	78
	2010	117.96	134	84		2010	119.17	186	89
	2009	99.87	111	88		2009	92.36	123	48
10 year average		103.16	137	74			101.55	139	68

In the recent 2018/19 Burdekin Productivity Services Annual report the following 3 productivity graphs depict the Giru and Shirbourne areas as having some of the worst productivity in the Burdekin Region on pages vii and viii as follows:





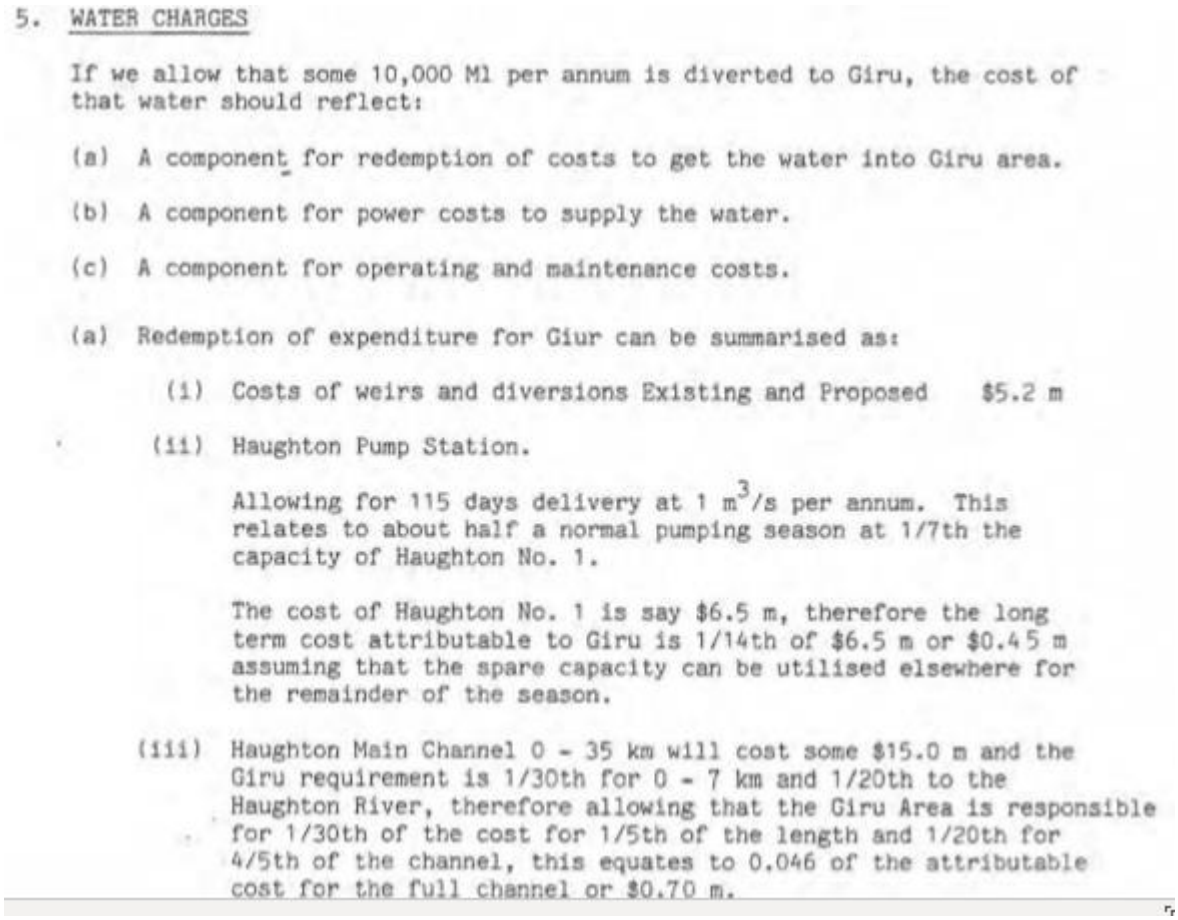


It is clear that the proposed increase in price for GBGA irrigators does not take into account the differences currently being experienced by GBGA irrigators in terms of low crop yields and the additional electricity costs borne in order to extract water from underground water supplies through pumps. These pumps not only incur significant capital

and maintenance cost but also operating costs. Many of these costs are not incurred by others especially those in the channel system.

It was confirmed that GBGA irrigators have already had built into their water costs a contribution for capital costs incurred for water diversion to the GBGA as set out in the attached letter which states in April 1987 that a charge would be levied.

> "A component for redemption of costs of water diverted to Giru (costs of weirs and diversions existing and proposed, Haughton Pump station and the Haughton Main channel), power costs to supply water into the Giru area, operating and maintenance costs."



5. WATER CHARGES

If we allow that some 10,000 Ml per annum is diverted to Giru, the cost of that water should reflect:

(a) A component for redemption of costs to get the water into Giru area.

(b) A component for power costs to supply the water.

(c) A component for operating and maintenance costs.

(a) Redemption of expenditure for Giur can be summarised as:

(i) Costs of weirs and diversions Existing and Proposed $5.2 m

(ii) Haughton Pump Station.

Allowing for 115 days delivery at 1 m^3/s per annum. This relates to about half a normal pumping season at 1/7th the capacity of Haughton No. 1.

The cost of Haughton No. 1 is say $6.5 m, therefore the long term cost attributable to Giru is 1/14th of $6.5 m or $0.45 m assuming that the spare capacity can be utilised elsewhere for the remainder of the season.

(iii) Haughton Main Channel 0 - 35 km will cost some $15.0 m and the Giru requirement is 1/30th for 0 - 7 km and 1/20th to the Haughton River, therefore allowing that the Giru Area is responsible for 1/30th of the cost for 1/5th of the length and 1/20th for 4/5th of the channel, this equates to 0.046 of the attributable cost for the full channel or $0.70 m.

The following analysis demonstrates use of available information from Sunwater in terms of diversions versus usage for the BRIA Channel system and Haughton Zone A from 2006/07 to 2015/16. Combined with SunWater fees and charges for 2015/16 and allowing for Non GBGA usage the return to SunWater for its diverted water to the channel area and the GBGA is very similar under the current pricing arrangement.

Channel Haughton Efficiency Tables

	Dalbeg	Total	Efficiency			Millaroo	Total	Efficiency
Year	Diversion	Water	of total		Year	Diversion	Water	of total
		usage	usage				usage	usage
	(ML)	(ML)				(ML)	(ML)	
2006/07	18,121	10,978	61%		2006/07	32,617	19,119	59%
2007/08	14,723	8,391	57%		2007/08	27,477	15,217	55%
2008/09	13,245	6,924	52%		2008/09	28,334	15,594	55%
2009/10	17,773	9,428	53%		2009/10	30,842	18,233	59%
2010/11	7,677	3,518	46%		2010/11	11,592	5,011	43%
2011/12	10,002	4,674	47%		2011/12	25,042	14,639	58%
2012/13	17,584	8,957	51%		2012/13	32,443	18,205	56%
2013/14	19,213	12,069	63%		2013/14	36,989	24,486	66%
2014/15	16,503	10,527	64%		2014/15	34,996	22,441	64%
2015/16	13,236	7,849	59%		2015/16	23,731	17,356	73%
Average	**14,808**	**8,332**	**56%**		**Average**	**28,406**	**17,030**	**60%**
	CLARE	**Total**	**Efficiency**			**NEW**	**Total**	**Efficiency**
Year	**Diversion**	**Water**	**of total**		**Year**	**BRIA**	**Water**	**of total**
		usage	**usage**			**Diversion**	**usage**	**usage**
	(ML)	**(ML)**				**(ML)**	**(ML)**	
2006/07	34,503	25,326	73%		2006/07	300,975	219,915	73%
2007/08	27,023	18,973	70%		2007/08	259,647	174,109	67%
2008/09	24,067	17,209	72%		2008/09	235,827	142,304	60%
2009/10	33,445	26,287	79%		2009/10	309,810	204,109	66%
2010/11	9,279	5,941	64%		2010/11	90,760	51,151	56%
2011/12	26,499	17,527	66%		2011/12	221,144	140,973	64%
2012/13	27,938	20,600	74%		2012/13	246,305	151,235	61%
2013/14	34,900	25,252	72%		2013/14	368,452	208,230	57%
2014/15	30,940	27,615	89%		2014/15	398,624	280,965	70%
2015/16	29,412	23,484	80%		2015/16	335,754	243,425	73%
Average	**27,801**	**20,821**	**75%**		**Average**	**276,730**	**181,642**	**66%**

BRIA Combined								
	Burdekin	Total	Efficiency			Haughton	Total	Efficiency
Year	Channel	Water	of total		Year	Zone A	Water	of total
	Diversion	usage	usage			Diversion	usage	usage
	(ML)	(ML)				(ML)	(ML)	
2006/07	386216	275338	71%		2006/07	31,556	37,984	120%
2007/08	328870	216690	66%		2007/08	22,018	30,742	140%
2008/09	301473	182031	60%		2008/09	19,101	27,061	142%
2009/10	391870	258057	66%		2009/10	38,465	35,571	92%
2010/11	119308	65621	55%		2010/11	5,872	6,677	114%
2011/12	282687	177813	63%		2011/12	29,603	20,387	69%
2012/13	324270	198997	61%		2012/13	26,873	20,610	77%
2013/14	459554	270037	59%		2013/14	44,671	29,668	66%
2014/15	481063	341548	71%		2014/15	47,405	46,422	98%
2015/16	402133	292114	73%		2015/16	47,019	47,031	100%
Average	**347744**	**227825**	**66%**		**Average**	**31,258**	**30,215**	**97%**

Return to SunWater $ Per ML Diversion Update

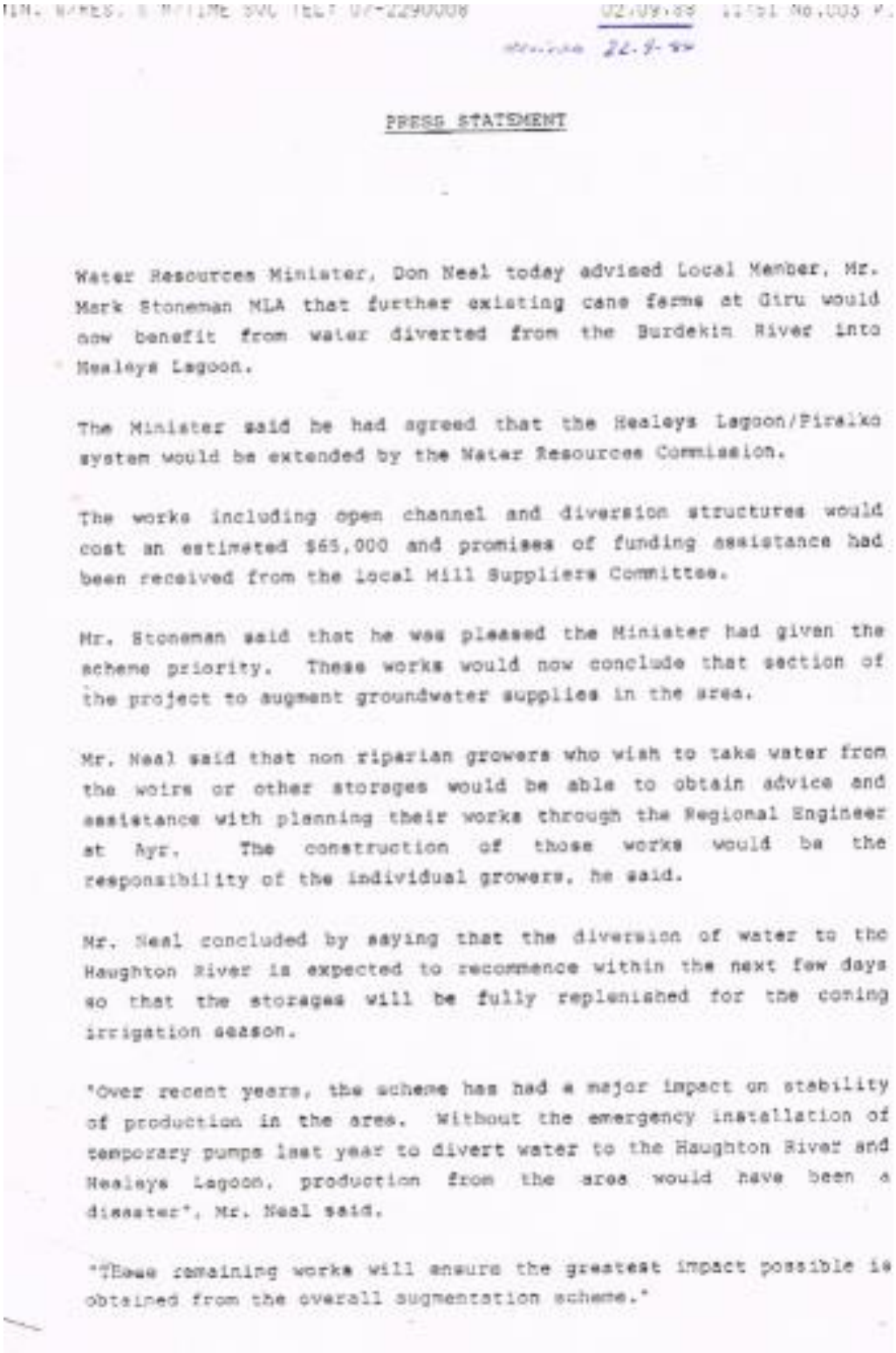
10 year Average 2006/07 to 2015/16 Sunwater Data		Price	2015-2016				Return to Sunwater per ML Diverted
Burdekin Channel	**ML**	**Part A**	**Part B**	**Part C**	**Part D**	**TOTAL**	**Burdekin Channel**
Average Usage	227825		$0.52		$26.82	$6,228,725	
Allocation	278957	$12.22		$20.74		$9,194,423	
Average Diversion	**347744**					**$15,423,147**	**$44.35**
Giru Groundwater Area (GBA)	**ML**	**Part A**	**Part B**	**Part C**	**Part D**	**TOTAL**	**GBA**
Average Usage	24507		$0.52		$13.42	$341,628	
Allocation	40249	$12.22		$7.82		$806,590	
Average Diversion to supply GBA	**25640**					**$1,148,218**	**$44.78**
Average Temporary water allocation transfers into Haughton Zone A	5268						
Council Average Usage, Haughton Zone A(non GBA allocation usage)	350						
TOTAL Non GBA Allocation usage	**5618**						
Haughton Zone A Average usage	30125						
less Total Average Non GBA Allocation Usage	-5618						
Average GBA Usage	**24507**						
Haughton Zone A Average Diversion	31258						
less Total Non GBA Allocation Usage	-5618						
Average Diversion to supply GBA	**25640**						

Chart showing QCA draft price increase impact							
QCA Cost reflective Draft Price. Part A+C Table 88, Part B+D Table 90							**Return to Sunwater**
		Price					**per ML Diverted**
Burdekin Channel	**ML**	**Part A +C**	**Part B+D**			**TOTAL**	**Burdekin Channel**
Average Usage	227825		$22.34			$5,089,602	
Allocation	278957	$45.08				$12,575,382	
Average Diversion	**347744**					**$17,664,983**	**$50.80**
Giru Groundwater Area (GBA)	**ML**	**Part A +C**	**Part B+D**			**TOTAL**	**GBA**
Average Usage	24507		$22.34			$547,486	
Allocation	40249	$45.08				$1,814,425	
Average Diversion to supply GBA	**25640**					**$2,361,911**	**$92.12**

Not only does this support the findings of BDCG in relation to the capacity to pay for all irrigators this provides additional evidence on the difference in pricing and product supplied by SunWater to customers in the GBGA and channel system. The return to SunWater in relation to these two areas is similar and indicates the lack of infrastructure and service requirements to the GBGA irrigators.

3.5 Reclassification of Val Bird Weir and Giru Weir from Bulk Water Assets to Distribution Assets

The following is a press release from September 1988 which confirms that the water diversions, weirs and water storages were designed to "augment groundwater supplies in the area"



PRESS STATEMENT

Water Resources Minister, Don Neal today advised Local Member, Mr. Mark Stoneman MLA that further existing cane farms at Giru would now benefit from water diverted from the Burdekin River into Nealeys Lagoon.

The Minister said he had agreed that the Nealeys Lagoon/Pirelko system would be extended by the Water Resources Commission.

The works including open channel and diversion structures would cost an estimated $65,000 and promises of funding assistance had been received from the Local Mill Suppliers Committee.

Mr. Stoneman said that he was pleased the Minister had given the scheme priority. These works would now conclude that section of the project to augment groundwater supplies in the area.

Mr. Neal said that non riparian growers who wish to take water from the weirs or other storages would be able to obtain advice and assistance with planning their works through the Regional Engineer at Ayr. The construction of those works would be the responsibility of the individual growers, he said.

Mr. Neal concluded by saying that the diversion of water to the Haughton River is expected to recommence within the next few days so that the storages will be fully replenished for the coming irrigation season.

"Over recent years, the scheme has had a major impact on stability of production in the area. Without the emergency installation of temporary pumps last year to divert water to the Haughton River and Nealeys Lagoon, production from the area would have been a disaster", Mr. Neal said.

"These remaining works will ensure the greatest impact possible is obtained from the overall augmentation scheme."

The Queensland Water Resources Commission Preliminary Design Report dated April 1987 from Peter Gilbey confirms the purpose of the weirs and explains how the total works were seen to improve the annual yield of the aquifers by some 6,000 ML to 20,000ML and its connection to an irrigation rate of 6ML/Ha to the total gross assigned area.

The Water Solutions report provided by the QCA also indicates that SunWater has been utilising these bulk water assets as distribution facilities. The original construction of these facilities was based on a focus to provide 51% surface water to GBGA irrigators supplementing the 49% natural yield or ground water. At this stage there is inconsistent reports on how these assets were reclassified and what decision-making process was implemented.

Further evidence of the intended purpose for the weirs and the shared arrangement between groundwater and surface water for GBGA and other irrigators in the region is shown through correspondence provided by Tim Smith, former Regional Engineer North Queensland for the Department of Water Resources (See attached). In this correspondence Tim states the following:

> *"At no time did the Government envisage that use of the underground resource would be abandoned in favour of some system of operation that just flooded the weirs with water from the BRIA pumping and channel system. Consultation with the sugar industry and miller, had agreed for good reasons that the future should be based on conjunctive use of groundwater and Burdekin water."*

The initial intention and use of these weirs in this region was to supplement the groundwater system used for irrigation in the GBGA. There was never an intention that the weirs be used as a distribution system. This shift in operational procedure ignores the initial intention and investment by Government, irrigators and the miller.

Current evidence suggests that SunWater is seeking to change the purpose of these assets from their original design intention.

Recommendation

BDCG suggests that SunWater provides further detail and clarification on why these assets were reclassified.

3.6 Consequences of Proposed Price Increases to GBGA irrigators

A shift to the use of more surface water over groundwater is causing significant problems to cane growers through a rising water table. In the report provided by Olzard there is continued and significant risk associated with the water table rising and affecting crops throughout the region. Other areas within the BRIA have experienced similar issues and problems in this process. An incentive-based approach towards encouraging Giru Benefitted Groundwater Area (GBGA) irrigators to maintain the use of groundwater will continue to address this issue.

Burdekin District Cane Growers Ltd (BDCG) holds significant concerns over SunWater's capacity to guarantee peak flow entitlement in the event that all irrigation water is sourced through current bulk assets and weirs. Included in this submission is significant evidence of the existence of a natural yield and aquifer important to supplementing irrigation in this region and particularly the GBGA. In the event that all water is sourced from these assets the capacity for SunWater to meet their obligation in terms of a peak flow entitlement will be severely compromised. The increased usage of surface water aligned with the potential for SunWater to not guarantee a peak flow entitlement reinforces the importance for no commercial basis to the change in pricing.

A significant increase in price for GBGA irrigators will continue to drive up the cost of cane production. With limited incentives for continued production cane growers will make a transition to other crops with a higher yield and less production costs. This cost increase must also be taken in the context of constant pressures from Government agencies as shown through changes in electricity charges and rates.

BDCG holds significant concerns over the capability of SunWater to maintain service delivery if full reliance on surface water is required. Evidence has been provided that demonstrates the existence of natural yield and the aquifer that currently provides additional and significant amounts of water to the BDCG and GBGA irrigators.

3.7 Dam Safety Upgrade

Burdekin District Cane Growers Ltd (BDCG) submits to the Queensland Competition Authority (QCA) that costs associated with the Burdekin Falls Dam safety upgrade should not be passed on to irrigators in the Burdekin Haughton region. In relation to the safety upgrade insufficient information and evidence is provided on the exact nature of this upgrade, detailed cost analysis and scope of works to be completed. The safety assessment conducted by SunWater in relation to this upgrade has not been made public.

In Part B, section 3.6.1 of QCA's draft report it is identified that the dam safety upgrade is in response to an improved understanding of extreme rainfall events and resultant floods and increased understanding of potential failure of dams. BDCG concern is that the Burdekin Falls Dam safety upgrade is driven by the regulatory requirement for SunWater to maintain this asset and protect communities with little relevance or economic correlation to irrigators and the use of water throughout the Burdekin Haughton Water Supply Scheme. BDCG recognises the importance of protecting communities and ensuring dam safety however the burden of cost associated with this lies more with government regulators and associated entities than consumers.

BDCG is also an agreement with the submission put forward by the Lower Burdekin Water Board which highlights the significant issues associated with the dam safety upgrade and passing cost through to consumers. In this report the capacity for this board to comply with additional cost requirements and the need to pass these on to irrigators was clearly outlined and demonstrated to be detrimental towards long-term industry performance. In addition to the conclusions put forward in this report BDCG also have demonstrated above the capacity for irrigators in the GBGA to absorb additional costs above any pricing changes. Increases would result in significant and demonstrated hardship as shown through the documentation and evidence presented in item 2.4 Capacity to Pay.

A recent example of similar construction projects is shown through the Tinaroo Dam Upgrade. This was a $40 million project relating to the insertion of steel cable anchors into the main dam wall and strengthening the dam by further securing the wall to the foundation bedrock. The height of the saddle dam was increased with a specific focus on minimising damage caused by seepage during a flood event. Federal funding was a part of this project.

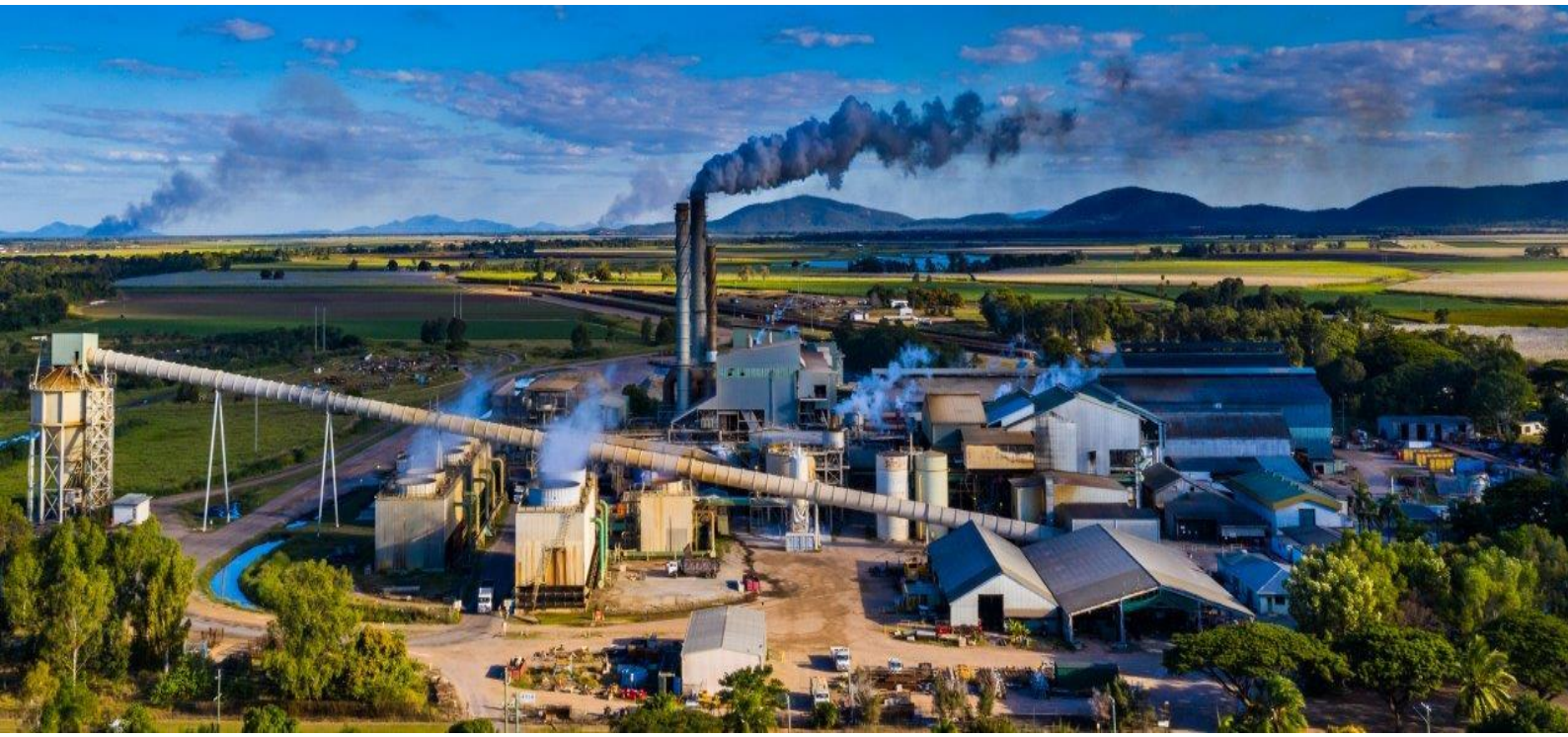
BDCG also submits that given the lack of information available in relation to the safety upgrade and exact scope of works to be completed with an associated detailed costing the potential for major capital works being undertaken in the current price path is unrealistic.

4 Attachments

Irrigation Pricing Review Part 2 – Tom Mullins Consulting

Correspondence Tim Smith

Groundwater Australia Report



4.1 Irrigation Pricing Review Part 2 – Tom Mullins Consulting

Irrigation Pricing Review

Issues submission paper (Part 2) – Queensland Competition Authority

Invicta Cane Growers Organisation Ltd.

Capacity to Pay report (Part1)

The original submission lodged in March 2019, investigated the capacity of Invicta Growers to absorb any irrigation water price increase based on current prices and returns using financial analysis techniques.

Table 1. Summarises the findings of that report

TABLE1. Financial analysis of participant growers in the Invicta mill area based on current costs and returns

Aggregate of all participant growers

Breakeven point $/Tonne cane		$40.51
Income	$/Tonne	$37.78
Return $/Tonne		($2.72)

Giru Benefit Area Growers

Breakeven point $/Tonne cane		$39.88
Income	$/Tonne	$35.74
Return $/Tonne		($4.14)

"Other" Invicta Growers

Breakeven point $/Tonne cane		$41.17
Income	$/Tonne	$39.84
Return $/Tonne		($1.33)

The report summarised that at present costs and returns, growers did not have the capacity to absorb increases in irrigation costs.

Financial Impact on growers as a result of "proposed" changes in irrigation water charges.

Analysis of the proposed changes and resultant increases in water charges on $/ML basis are represented in tables (2) and (3).

TABLE 2. Proposed $/ML increase in Giru ground water costs without and with Dam Safety (DS) charges												
Year	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Proposed $/ML - with Dam Safety (DS)	36.71	$39.96	$43.35	$46.87	$50.53	$55.16	$72.37	$78.21	$80.68	$82.40	$84.16	$85.96
Proposed $/ML increase- no DS		$3.25	$6.64	$10.16	$13.82	$18.45	$23.64	$29.48	$31.95	$33.67	$35.43	$37.23
Proposed $/ML increase-with DS		$3.25	$6.64	$10.16	$13.82	$18.45	$35.66	$41.50	$43.97	$45.69	$47.45	$49.25

TABLE 3. Proposed $/ML increase in Burdekin Chanel water costs without and with Dam Safety (DS) charges												
Year	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Proposed $/ML - with Dam Safety (DS)	$72.73	$67.40	$69.02	$70.65	$72.32	$74.03	$87.80	$89.58	$91.41	$93.28	$95.20	$97.16
Proposed $/ML increase- no DS		-$5.33	$1.62	$1.63	$1.67	$1.71	$1.74	$1.79	$1.83	$1.87	$1.92	$1.94
Proposed $/ML increase-with DS		-$5.33	$1.62	$1.63	$1.67	$1.71	$13.76	$13.81	$13.85	$13.89	$13.94	$13.96

The $/ML increases in water charges have been converted back to $/Tonne Cane using the production data (2015-2018) supplied by Wilmar International. The data has been aggregated and DE identified by BPS.

Table 4. Summary of Giru Benefit Area (GBA) production data, 2015- 2018.					
Total Tonnes harvested 2015-2018		1,814,185			
Total Ha		17,176			
Average CCS		14			
Average Tonnes per Ha		106			
Sourced from Wilmar international. The data has been aggregated and DE identified by BPS.					

The Queensland Sugar Limited site was used to source indicative pricing $/tonne sugar for 2019- 2022.

Table 5. Queensland Sugar Limited, Indicative Pricing ($/Tonne sugar).						
Year	2019	2020	2021	2022	4 yr average	
Indicative price	$397	$417	$436	$436	$422	
Sourced from QSL web site, 03/11/2019.						

Financial Analysis

All the above information was used to identify the financial impact on Giru Benefit Growers using the original financial analysis and then including the proposed irrigation water price changes.

Table 6. Financial analysis - capacity based on $/Tonne cane and sugar of Giru Benefit										
	Area (GBA) growers to absorb proposed increased water charges.									
(Fixed and variable costs other than water have been indexed by 2% per annum)										
Year	*2020/21*	*2021/22*	*2022/23*	*2023/24*	*2024/25*	*2025/26*	*2026/27*	*2027/28*	*2028/29*	*2029/30*
Breakeven point $/Tonne Cane	$40.60	$41.35	$42.12	$42.90	$43.70	$44.51	$45.35	$46.19	$47.06	$47.94
Income $/Tonne Cane	$38.12	$39.83	$39.83							
Income $/Tonne Cane based on 4 yr average indicative price (2019-2022)				$38.66	$38.66	$38.66	$38.66	$38.66	$38.66	$38.66
Return $/ Tonne Cane	**-$2.48**	**$1.52**	**-$2.29**	**-$4.24**	**-$5.04**	**-$5.48**	**-$6.69**	**-$7.53**	**-$8.40**	**-$9.28**
Breakeven $/Tonne sugar	$445	$450	$460	$470	$475	$485	$495	$505	$515	$525
Indicative Price $/Tonne sugar	$417	$436	$436							

4 Yr average (2019-2022) indicative price				$422	$422	$422	$422	$422	$422	$422
Surplus or Deficit $/Tonne sugar	**-$28**	**-$14**	**-$24**	**-$48**	**-$53**	**-$63**	**-$73**	**-$83**	**-$93**	**-$103**

Summary

On the available knowledge of likely income and expenditure a GBA cane grower would not be capable of sustaining the proposed increases in irrigation water charges.

Analysis indicates that cash losses would escalate to unsustainable levels. In 2025/26 when Dam safety charges are applied the growers would require to break even an estimated sugar price of $485/tonne which is approximately $45.50 per tonne cane.

The QSL 4 yr (2019-2022) average indicative price is $422/ tonne sugar or $38.66 per tonne cane for the average GBA grower which equates to a loss of $5.85 per tonne of cane produced or $620 per ha.

4.2 Correspondence Tim Smith

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Consulting Engineers
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MALANDA, Q 4885

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timsmithco@bigpond.com
Contact: Tim Smith

28 October, 2019

Comments on the Water Resources of the Giru Benefitted Area

Comments provided by Tim Smith, former Regional Engineer North Queensland based in Ayr with responsibility for the Department of Water Resources programs in the area from Ingham down to Bowen from 1983 to 1991. Those programs included the planning, design, construction and operation of the Burdekin River irrigation Area (BRIA) and the extension of that scheme to supplement existing water allocations from the Haughton River and in the Giru Benefitted Area (GBA).

Before the Burdekin Water

The Giru area and in particular the what was later gazetted as the GBA had ground water resources before the decision was made by the Commonwealth and State Governments to construct the Burdekin Dam, build the Burdekin Dam to provide water to Townsville and establish the BRIA adjacent to the existing North and South Burdekin Water Board Areas at Ayr and Home Hill.

At that time, the Giru area had an established cane growing area, an area assigned to the CSR owned and operated Invicta Mill. Cane growing was based on irrigation from groundwater resources drawn from the aquifers that depended on annual recharge from the Haughton River. While flows in the Haughton River were obviously variable, that source of water was sufficient to support an industry at Giru including the investment by CSR in the Invicta Mill.

The State Government decisions to construct first the Giru Weir in 1977, then Val Bird Weir in 1983 and then the pipeline from that weir to Ironbark Creek and Healeys Lagoon in 1984 were made to increase the available ground water resource and improve it's reliability for the Giru area.

At the same time (1982/83), the construction of the Burdekin Dam was commenced, funded by the Commonwealth. In 1984, the State was able to accelerate the design, and construction of works for the BRIA. At that stage, given that the weirs and the Ironbark Creek pipeline had been completed what benefit the BRIA water might eventually be able to add to the sugar industry in Giru area was not a planning or design priority What planning had been completed was to add the bag to Val Bird Weir to further increase its capacity to store wet season flows in the Haughton and cause additional recharge of the underground system.

The Burdekin Water

The 5 years of well below average rainfall in the Dry Tropics Region from 1983 to 1987 stressed the availability of water on the whole Townsville and Giru area. The Haughton River didn't flow and the ground water system all but failed. So did Townsville's water supply from Ross River Dam. In 1987, both the people of Townsville and the Giru sugar industry and Invicta Mill were in extreme need of water.

Temporary works were put in place to get water to Townsville and partially replenish groundwater resources for the GBA. Operational charges were set for both Townsville and the GBA to supply water from the just completed Burdekin Stage 1 Pumpstation.

Later, after the emergency was over, the consultation with the Giru sugar industry – growers and miller and planning took a new direction – the recent experience of the drought signalled the priority then giver to the introduction of Burdekin water through the BRIA pumping and channel system was completed after the temporary works were dismantled, water as a backup on an assured basis.

Final Decisions

So the State Government decided to formalise the option of having Burdekin water available to supplement the groundwater system used for irrigation in the GBA when the system was under stress. Water could be diverted to Val Bird Weir and released to Giru Weir to recharge the underground.

At no time did the Government envisage that use of the underground resource would be abandoned in favour of some system of operation that just flooded the weirs with water from the BRIA pumping and channel system. Consultation with the sugar industry and miller, had agreed for good reasons that the future should be based on conjunctive use of groundwater and Burdekin water.

That view had not changed when I left the Burdekin in 1991.

Those reasons mentioned included

- the GBA had a resource that had supported and industry and sugar mill before the Burdekin scheme and that resource was still available
- on average, the weir infrastructure had enhanced the whole ground water system the State and industry had invested in and was operable for the benefit of the whole area
- conjunctive use was going to be an important factor in managing ground water levels for the long term sustainable use of the land for growing cane
- cost, the area had lower cost water if irrigation continued to be based on the ground water resource of the GBA with Burdekin water available as an option to supplement ground water supplies when necessary

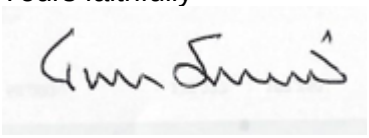
Irrigation today

I understand that today, the weir system may not be being operated as was envisaged when it was constructed and operated in the 1980's. If it is not, what is going on ignores the reasons mentioned above. Conjunctive use, and a cost structure for water based

on that, was what the State Government, cane growers and the miller intended. Any other system ignores the earlier investment made for the longterm by those stakeholders and I believe would look in their eyes unreasonable..

I believe that the canegrowers and miller are focussed on sustainable longterm cane and sugar production in the Giru area, and surely the options and cost of water supply for irrigation need align with that focus.

Yours faithfully



Tim Smith
RPEQ No 2668

4.3 Groundwater Australia Report

Groundwater AUSTRALIA

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REVIEW OF AQUIFER STORAGE AND NATURAL RIVER FLOWS IN THE GIRU BENEFITED GROUNDWATER AREA (GBGA)

INVICTA CANE GROWERS ORGANISATION LTD

4 NOVEMBER 2019

1 INTRODUCTION

There is a substantial groundwater aquifer in the Giru Benefited Groundwater Area (GBGA), and it's ludicrous for anyone to suggest otherwise. The GBGA is often referred to as the Giru Benefited Area (GBA) by Sunwater, the QCA and other parties, which removes acknowledgement that it is in fact a groundwater system with significant storage. There are historic reports from Government departments from the late 1960's and 1970's that acknowledge and define the limits and storage capacity of the aquifer/s in the area and refer to it as the GBGA.

A sugar mill was constructed in 1920 (68 years before the GBGA scheme) to process sugar cane only from this area. Logically, a mill would not have been built if there was a risk of having insufficient groundwater.

The GBGA has been flooded with Burdekin surface water since it's inception, which has led to masking of the natural river flows and groundwater storage. The GBGA has been subject to rising water levels in some places, which will continue to be a problem if there is not a significant reduction of surface water supplied to the GBGA, better management of the supply, and an increased use of groundwater.

This investigation is based on a review of limited data available at the time. The investigation relies on establishing the facts about the substantial aquifer that exists within the GBGA. The facts are based on earlier studies in the 1960's and 1970's, and current bore hole data provided on Queensland Globe by the Department of Natural Resources, Mines and Energy (DNRME).

Give more time (six to twelve months) a robust and comprehensive numerical groundwater model of the aquifer system could be constructed, which would enable reliable simulation and prediction of:

- the impacts of over supplying the system with freshwater,
- the impacts of supplying too little,
- the best locations to monitor groundwater levels which would inform decisions to release water,
- how much groundwater should be used by irrigators,
- which areas should take more or less groundwater,
- the impacts of seawater intrusion or upwelling of saline groundwater.
- the impacts of salinity caused by rising water tables,
- the volume of water exiting the system in aquifers,
- the volume of groundwater entering the system from all sources.

Instead, Sunwater has failed to acknowledge the existence of a groundwater system.

2 QUALIFICATIONS AND EXPERIENCE - KELVIN OLZARD

I have worked in the Burdekin area since 2006, for the following clients:
South Burdekin Water Board
North Burdekin Water Board
Lower Burdekin Water
Sunwater

The projects I was involved with include:

- seawater intrusion and saline upwelling investigations - both Boards
- rising salinity, rising water table - BRIA, Homestead Road (SBWB), Woods Road (SBWB), Ardmillan Road (NBWB),
- improving groundwater recharge – both Boards
- injection bores for seawater intrusion prevention - Woods Road (NBWB).
- Rising water tables/salinity – Upper Burdekin – various sites – Mona Park, Haughton Main Channel, Upper Haughton, Mulgrave.
- Design and installation of groundwater monitoring bores – SBWB.
- Groundwater monitoring and analysis of SBWB and DNRME bore data.
- Organised and supervised geophysical surveys to define the seawater interface – NBWB and SBWB.

During the current 2019 pricing review by the Queensland Competition Authority (QCA), for Sunwater, a qualified hydrogeologist was not used to assess the existence, capacity and sustainability of the GBGA aquifer/s or the natural flows in the Haughton River, both within the bed sands and neighbouring sediments. Instead hydrologists, who are not generally qualified to give advice on groundwater, were used.

3 THE GBGA AQUIFER

3.1 Hydrogeology

The aquifers in the GBGA are comprised of narrow Recent sandy alluvial deposits that occur within and adjacent to old channels and the current channel of the Haughton River, which has incised older Tertiary clay-rich marine sediments. Fresh to brackish groundwater is contained within sandy alluvium to deeps of approximately 10 metres. The aquifers overly saline clay rich sediments so are at risk of saltwater contamination due to upwelling caused by pumping. The area is also at risk of seawater intrusion caused by over pumping.

3.2 Storage Capacity

The Queensland Irrigation and Water Supply Commission (QIWSC) estimated the boundaries of the aquifer as shown in Figure 1. In 1967, the QIWSC estimated the "available storage" at 10,000 acre feet (12,300 ML) which was "sufficient to meet full irrigation requirements for 9,200 acres for some 160 days". In 1971, the QIWSC re-estimated the available storage (without the weirs) to be 13,568 ML. With the weirs, the combined storage in the aquifer and weirs was estimated to be

19,700 ML. This was the volume used as the natural yield of the aquifer since 1983. This was what the irrigators relied on solely for irrigation, despite periods of drought.

The available storage volume of the aquifer could be higher than 13,568 ML.

Using the grey shaded areas in Figure 1, which represent the groundwater areas, I produced similar outlines in Google Earth (Figure 2), although my areas were much more trimmed to the edge of the Haughton River, are thinner in the Healey's Lagoon area and did not include additional areas previously drawn in Figure 1. I used a value of 30% for available storage in the sands, which is reasonable given the coarse nature of the sediments in many of the bore logs in the area. Average aquifer thicknesses of 8 metres and 6 metres for the Haughton Aquifer and the Healy's Lagoon Aquifer respectively were used. I arrived at a total aquifer storage volume of about 15,600 ML, which is higher than the 13,568 ML estimated in 1971. This is without the weirs.

The point is that qualified hydrogeologists can replicate the estimation process that was used in 1967 and 1971 and reach similar aquifer storage volumes. The aquifer does exist and, with the weirs, holds around 20,000 ML of water.

The weirs themselves only hold about 1,640 ML. If the aquifer is insignificant, as Water Solutions are suggesting, and the only storage is in the weirs (1,640 ML), then it would be very difficult indeed to balance and distribute the full annual usage (20,000 ML to 40,000 ML) from such a small pond. There is certainly an aquifer there, it holds at least 20,000 ML and it serves as a significant balancing storage. Before 1988 this aquifer was topped up by natural flow in the Haughton River.

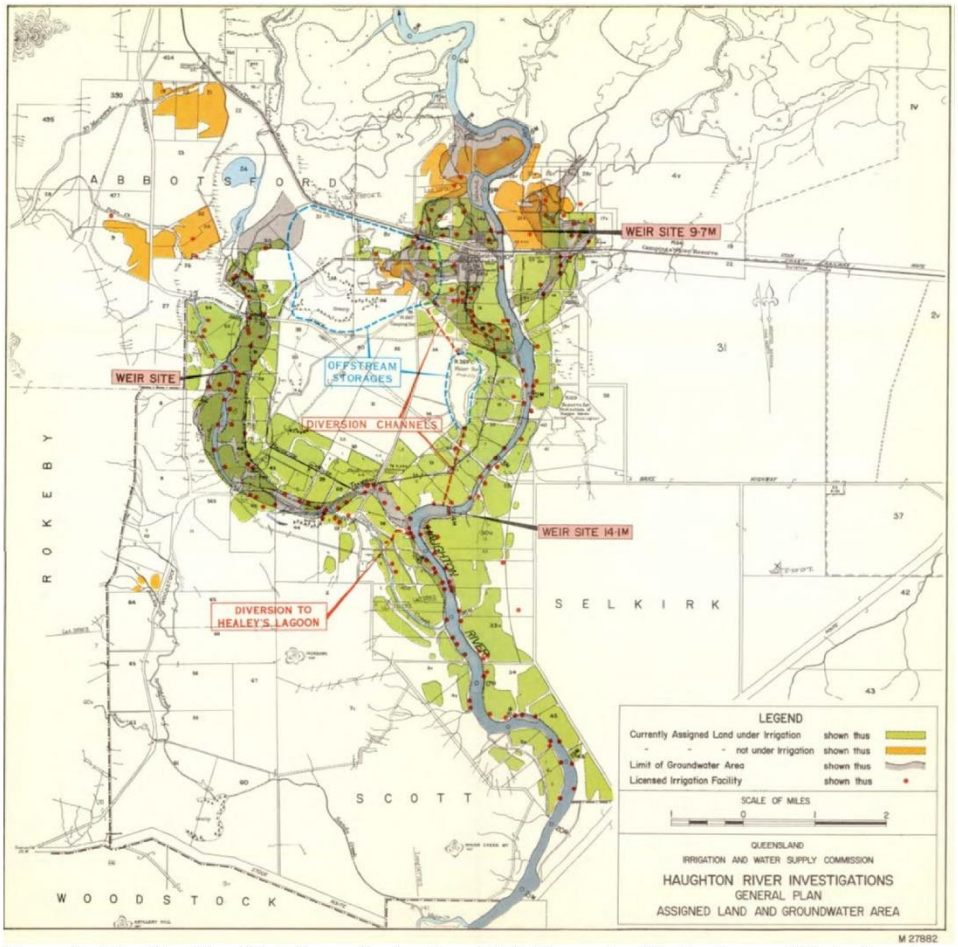


Figure 1 - The Giru Benefited Groundwater Area 1971 (Queensland Irrigation and Water Supply Commission). The aquifer includes the darker grey area defining the river and the paler grey areas which cross the green irrigated areas.

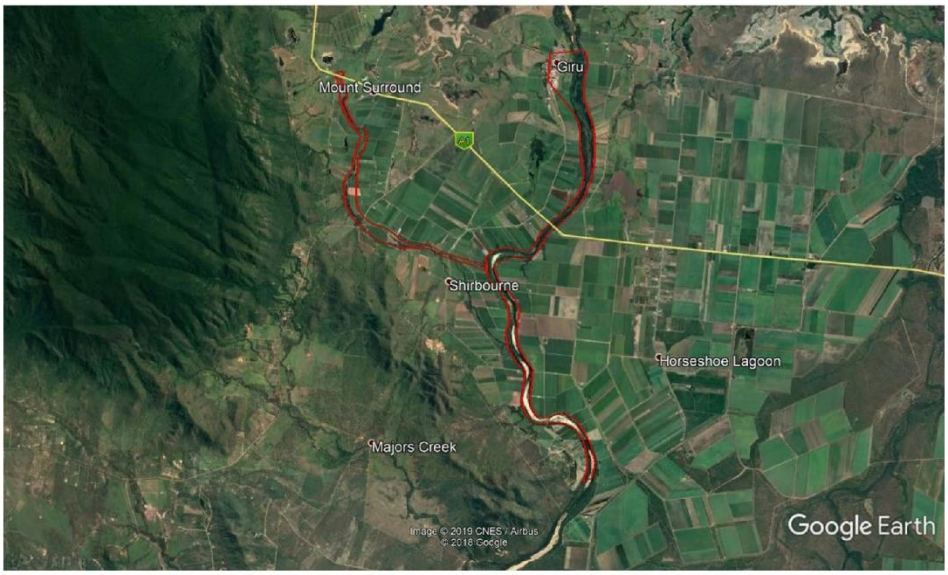


Figure 2 - A possible outline of the GBGA aquifers, which are similar to outlines shown in Figure 1.

3.3 Giru Sugarcane Expansion 1975

In 1975, The Haughton Sugar Company Limited engaged McIntyre and Associates Pty Ltd to conduct the "Caneland Expansion Study". Figure 3, shows the aquifers identified at the time and the directions of groundwater flow (thick grey arrows). The location of the aquifers is similar to the locations provided in the 1971 QIWSC report (Figure 1). The sugar company would not have considered expansion unless there was a reliable water supply. Farmers in the Giru area had been using predominantly groundwater for decades by then. Sugar cane was on consignment so there had to be security of a successful crop each year, which was enabled by groundwater.

Figure 4 shows a plot of soils types in the region. Within the Giru area the soils are classified as 'delta soils', which are "light sandy soils ideally suited sugar cane". It is no coincidence that the Giru Benefited Groundwater Area has the same shape as the soil map. This was an enclave of sugar producers that had the correct soils and a fresh groundwater supply through the middle, independent of the Barattas and the Burdekin. They operated successful productive farms independently of the rest of the Burdekin Delta long before the weirs and the Haughton Main Channel. There were periods of drought where water supplies became depleted and water security was threatened, and there was a risk of seawater intrusion as water demand increased. When a supplementary freshwater supply was made available by Sunwater, from the Burdekin River, it was welcomed because it essentially eliminated those risks. But what has developed in practice is a system that is so oversupplied with freshwater that the natural flows are no longer recognised, but they are still there. Sunwater has supplied so much water for so long that water levels are continuously elevated resulting in an increasing threat of rising groundwater levels, which is as detrimental to sugar cane production as seawater intrusion.

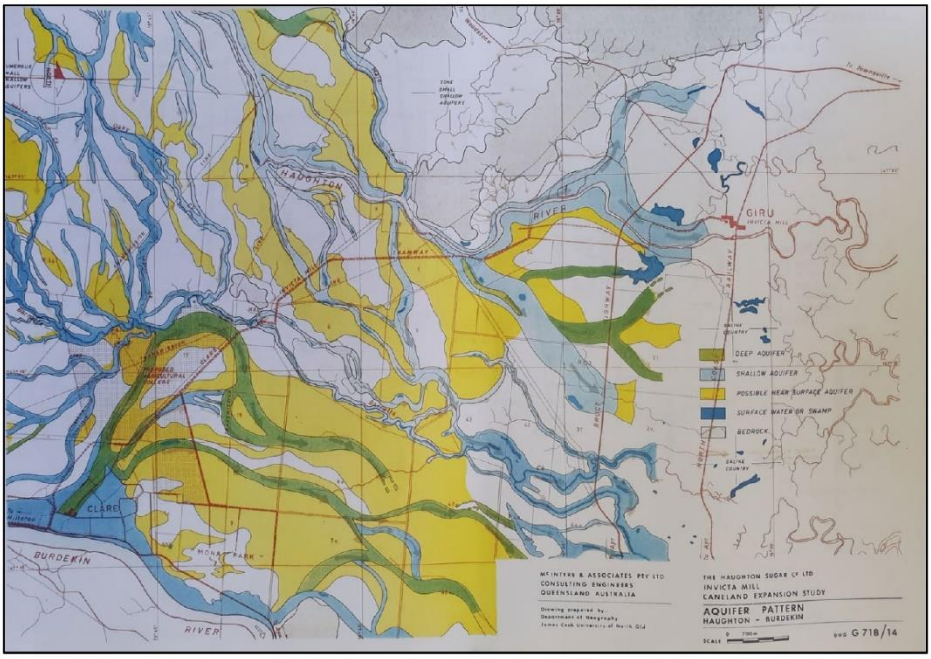


Figure 3 - Groundwater aquifers in the region and in the GBGA. McIntyre and Associates (1975).

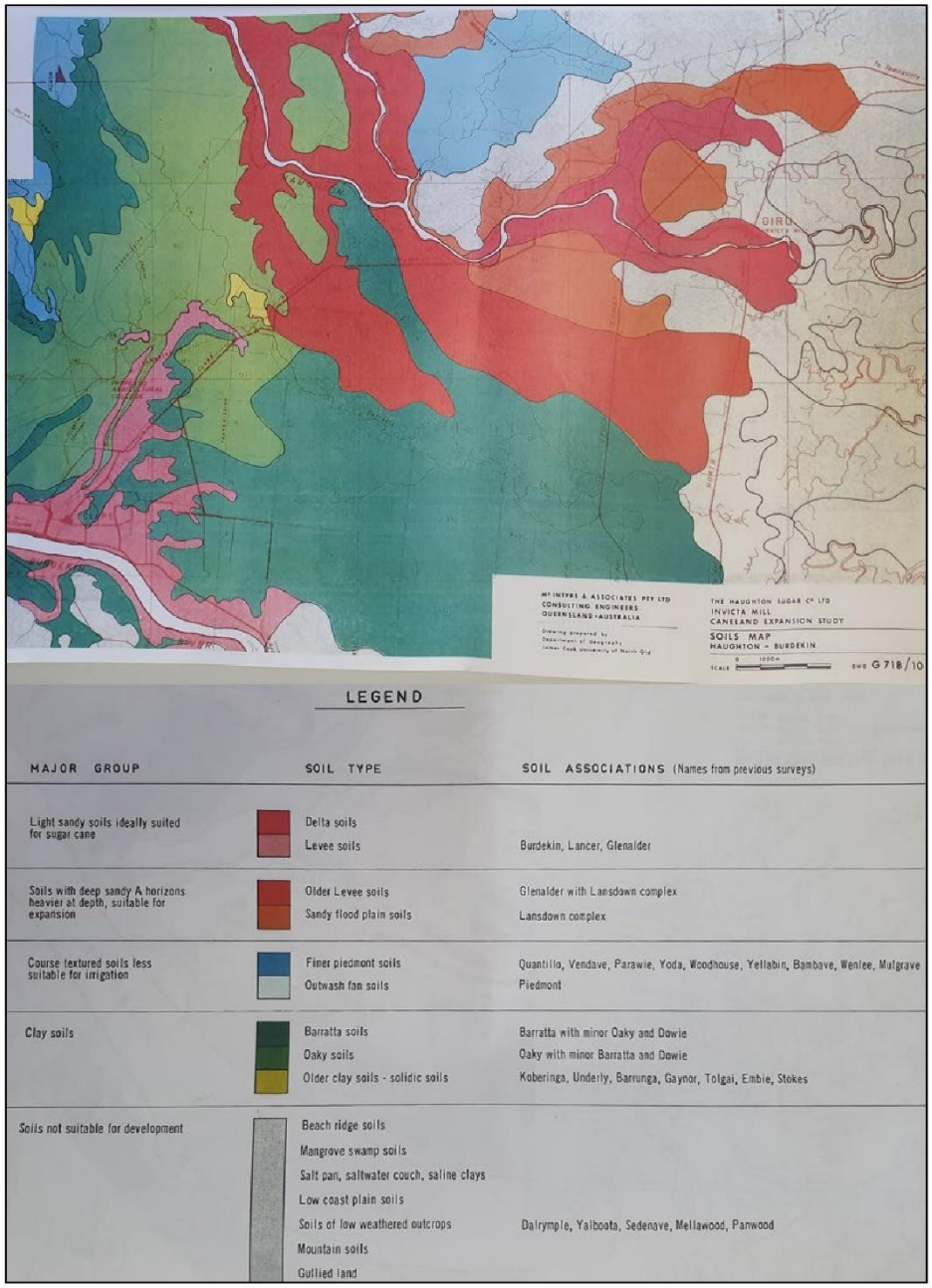


Figure 4 - Soil types in the Giru Benefited Groundwater Area

3.4 Groundwater Modelling

Detailed groundwater numerical modelling has not been conducted for the GBGA aquifer. But modelling is the only way that a true balance of incoming and outgoing groundwater (and surface water) can be simulated or demonstrated. The available storage is not only the groundwater held in the aquifer itself but should include an assessment of the groundwater in transit towards the aquifer from other sources, such as riverbed sands and neighbouring sediments.

In Sunwater's current assessment of the GBGA aquifer/s, there is no accounting for the volume of groundwater entering the GBGA groundwater system:

- via the Haughton River upstream of the junction of Majors Creek.
- from Majors Creek, which receives extended run-off and seepage from Mt Elliot after the wet season. Mt Elliot is a wet tropical mountain region which would receive more rainfall than Giru itself.
- via bed sands in the Haughton River (not visible to observers), a substantial system of groundwater storage, which transports groundwater to the GBGA.
- run-off and seepage from Mt Elliot to Healey's Lagoon.
- via groundwater flow from other sediments surrounding the GBGA.

Also, there is no accounting for the volume of groundwater leaving the GBGA groundwater system:

- via the Haughton River downstream of the Giru Weir.
- via the downstream side (ocean side) of Healey's Lagoon.
- via other groundwater flow paths from the GBGA towards the North.
- flood harvesting by farmers along Majors Creek, where water is taken before it reaches the GBGA. This water is part of the natural flow of the Haughton River. Is this water accounted for and the usage adequately charged to the users?

4 WATER BALANCE OF THE GBGA AQUIFER

The bathtub concept in Figure 5 shows the inflows and outflows of the GBGA system. The only part of the system that is measured with any degree of accuracy and confidence is the amount used by irrigators. Sunwater have not supplied all the relevant information relating to the losses in the Haughton River, the natural flows from the whole Haughton Catchment, the flood harvesting that is done from Major Creek, or the Temporary Transfers to farmers in Haughton Zone A (upstream of the GBGA). At the last meeting with the QCA in October 2019, the GCA hydrology consultant (Water Solutions) did not know:

- that there is historic evidence for the GBGA aquifer, which holds in excess of 20,000 ML.
- the shape and location of the aquifer/s.
- where Major Creek is.
- that a bore (RN11900058), which was chosen by Water Solutions to represent the aquifer, was not located in the aquifer or the GBGA.
- that water is being flood harvested from Major Creek
- that surface water and groundwater enter Healey's Lagoon from Mt Elliot for many months after the wet season ends.

Water Solutions and OD hydrologists seem to be pushing the line that there is insignificant natural flow in the Haughton River system, despite the overwhelming historic evidence to the contrary.

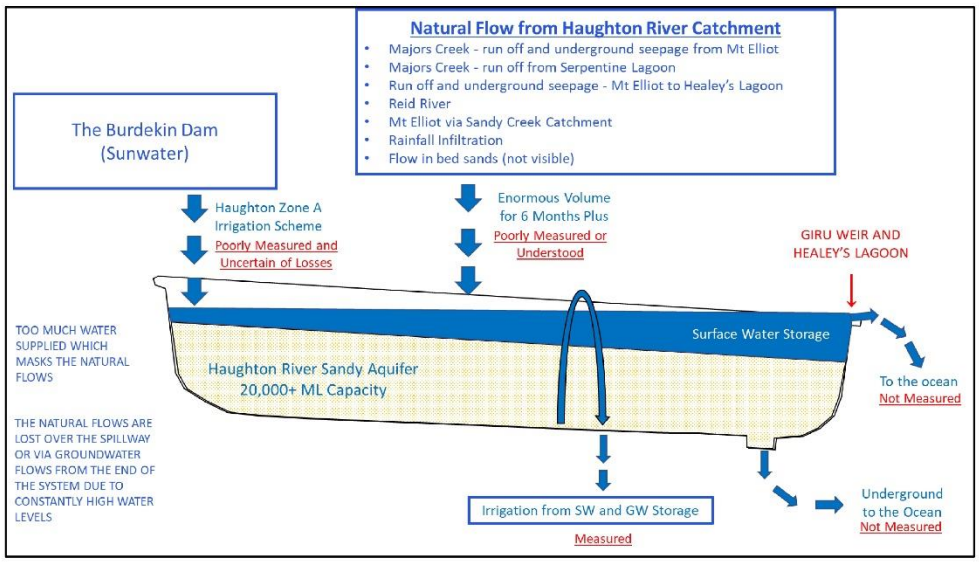


Figure 5 - An overfilled bathtub analogy to explain the problem with the GBGA. Too much water supplied by Sunwater, and very poor measurement of losses and other allocations or extractions upstream of the GBGA.

Figure 6 shows the sources of natural flow in the Haughton River Catchment, and its distance of separation from the Burdekin River and Barrattas. The sources of water in the Haughton River Catchment are:

- The Haughton River catchment upstream of Reid River
- The Reid River
- Serpentine Lagoon which drains into Major Creek.
- Major Creek.
- Mt Elliot into Major Creek. Mt Elliot is a tropical rainforest area which receives much more rainfall than the surrounding area. Rainwater drains from the southern side of Mt Elliot as run off in Major Creek and through groundwater infiltration in soils, fractures and bed sands which feed Major Creek.
- Sandy Creek which drains the south eastern side of Mt Elliot.
- Run off and seepage from the north eastern side of Mt Elliot.
- Direct rainfall run off , overland flow and infiltration through soils and sediment.

The Haughton River catchment provides surface water and groundwater to the Giru Benefited Groundwater Area. It is a separate system to the Barrattas and the Burdekin River.

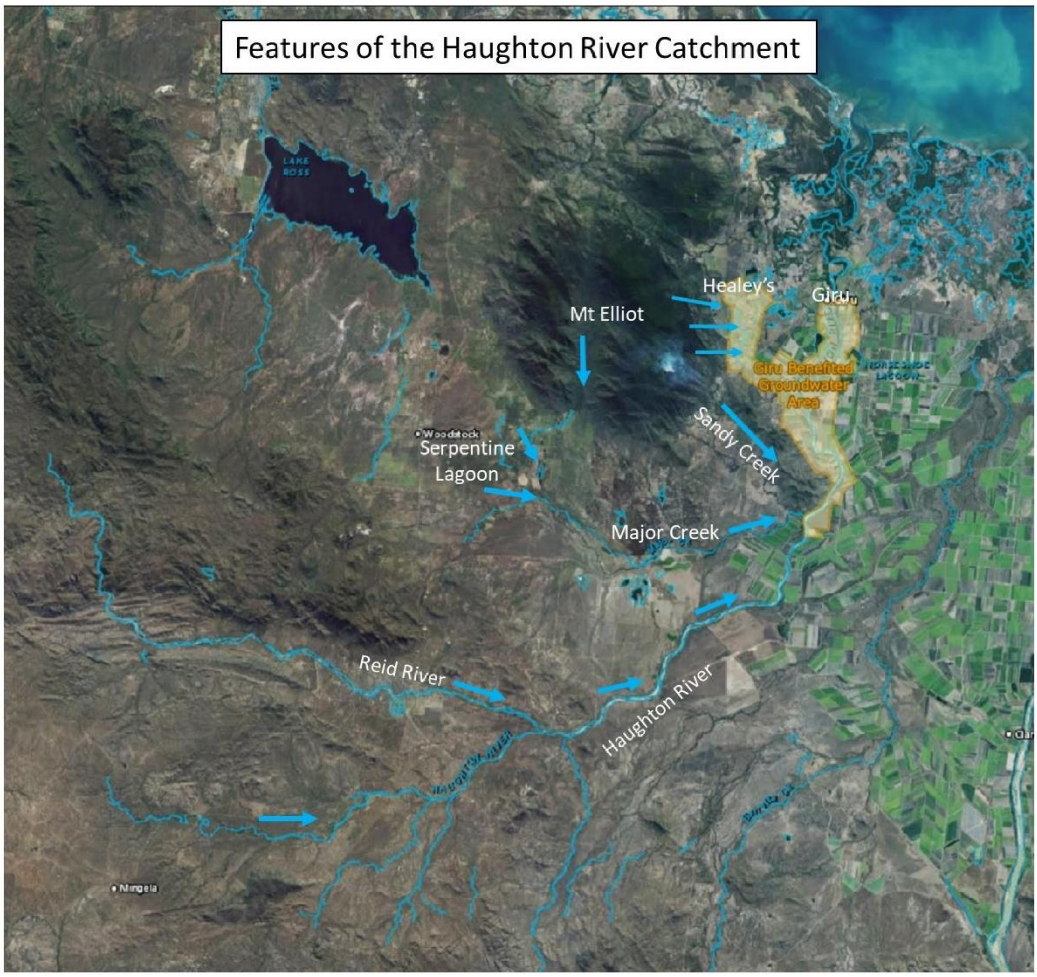


Figure 6 - Features of the Haughton River Catchment, including surface water flow and groundwater infiltration.

5 NATURAL YIELD AND AQUIFER STORAGE

Tim Smith (former engineer with the Haughton Irrigation Scheme, 1980's and 1990's) stated recently that it took 3 months for water to reach bores at the downstream end of the GBGA aquifer (near Giru township) when they first released water from the Haughton Main Channel into the Haughton River, in the late 1980's. The water levels in the aquifer were very low (about 6 metres below ground level in bore 11900147) after a prolonged drought, and bores were being monitored in the Giru township area (probably bore 11900147) for the signs of rising groundwater levels which would have been a result of aquifer recharge from the water released into the Haughton River. Water was released from the scheme at a rate of 60ML per day for three months before a

change in groundwater levels was noticed. This is a total volume of 5400 ML over the three-month period. Surface water continued to be pumped into the system until the full thickness of the aquifer and the weirs were full. This is evidence of the significant volume of groundwater stored in bed sands, in palaeochannels (buried river channels) running off the Haughton River, and in the sediments beside and under the Haughton River.

In 1988 it took 5,500 ML of water to fill that space (storage capacity) within the sediments. In other words, this represents the volume of water making its way along the 19+ km section of river towards the Giru Weir, and being soaked up by the porous sediments and bed sands. After a normal wet season all that storage capacity is full, and there is an enormous load of surface water (not measured) and groundwater (not measured) which is still making its way to the GBGA. Flood water, and water in-transit after the flood, is considered the natural yield. The flow in Major Creek and the Haughton River can last up to 6 months or more after a big wet season. This volume easily exceeds 5,500 ML but is not properly measured and recorded by Sunwater.

The aquifer storage capacity is the volume of groundwater the aquifer can hold. It is estimated to be in excess of 20,000 ML (including surface water). The natural yield of the aquifer should not only be thought of as the volume held in the aquifer (20,000 ML) but should also include the residual natural flows in the whole catchment for months after a wet season. During most wet seasons, between January and April (4 months inclusive), the aquifer will remain full. The farmers will be using less water than normal over that period because there will be occasional rainfall to assist with irrigation. The creeks and rivers in the catchment will continue to flow for another two months or more (potentially up to six months as is the case after the February 2019 Monsoon Event), which may maintain the aquifer at full capacity, and meet irrigation requirements. According to the 1971 QIWSC study, a full aquifer will last approximately 8 months.

Therefore, in most years the natural flows and the storage capacity of the aquifers during and after a wet season is enough to sustain irrigation for 10 to 12 months. An attempt to quantify that volume is provided in Table 1. Irrigators in the GBGA should be permitted to extract at least 20,000 ML per year, as planned at the inception of the scheme, and not have to pay for that portion, since it is widely viewed as the natural yield or storage capacity of the aquifer. In most years the aquifer and natural flow is sufficient to supply all the water for irrigation.

Table 1 - Estimate of natural flows and storage in the GBGA

Water Sources for Irrigation	Volume (ML)	Description
Natural Flows. Bed sands and sediments upstream of the GBGA	20,000	Estimated but will be greater than this. Includes surface water and groundwater in transit (not measured) towards GBGA after a wet season. Not measured by Sunwater.
Full aquifer	20,000	full at the end of the wet season and available for irrigation for 6 to 8 months. Partially supplemented by natural flows for several months after a wet season
Usage during the set season	10,000	water taken in between rainfall events. The aquifer is topped up through out the 4 month period.
TOTAL	**50,000**	**Exceeds the GBGA total allocation**

5.1 Pricing – Fixed Charges

GBGA water users currently pay a fixed price (half the price paid in the BRIA) for the full 40,249 ML annual allocation. The current pricing review proposes GBGA users to pay the full rate (same as BRIA) for the 40,249 ML allocation. Given that the aquifer and natural flows can provide full irrigation in most years, being charged the full rate for the allocation seems unreasonable. There should be a move by GBGA irrigators to appeal for charges to be applied only to 20,000 ML (the storage capacity of the aquifer).

According to the Kavanagh (2017) table shown in Table 2, the average annual water consumption from 1997 to 2016, in Haughton Zone A (of which the GBGA is a subset), was 32,774 ML. Therefore, the annual allocation should be set lower than 40,249 ML. It seems inappropriate to charge for amount that is rarely used.

The data in Table 2 for "diversions from balancing storage" prior to 2015 are only estimates.

Table 2 - 1998 to 2016 releases and usage in ML (Kavanagh, 2017)

Year	Diversion from Balancing Storage (ML)	Total Water Use Haughton Zone A SW & GW (ML)	Percentage of water required to be delivered from the Balancing Storage
1997/98	22,873	28,297	81%
1998/99	4,406	18,618	24%
1999/00	25,138	22,832	110%
2000/01	14,160	27,315	52%
2001/02	43,685	48,059	91%
2002/03	60,037	51,253	117%
2003/04	42,453	42,485	100%
2004/05	45,257	48,609	93%
2005/06	32,136	33,125	97%
2006/07	31,556	37,937	83%
2007/08	22,018	30,742	72%
2008/09	19,101	27,061	71%
2009/10	38,465	35,571	108%
2010/11	5,872	6,677	88%
2011/12	29,603	20,387	145%
2012/13	26,873	20,610	130%
2013/14	44,671	29,668	151%
2014/15	47,405	46,422	102%
2015/16	47,019	47,031	100%
Averages	**31,723**	**32,774**	**97%**

5.2 Pricing – Usage Charges

GBGA water users are charged per ML for the water they use, but they pay half the rate of the BRIA users. This was set in place in recognition of the natural yield of 19,700 ML that the system provides. The question is, how much of the water used is natural yield.? As already mentioned, in most years the natural yield and aquifer storage is enough to provide full irrigation.

Sunwater releases water into the Haughton River approximately 5.5 kilometres upstream of the GBGA. That section of the river is part of Haughton Zone A, not the GBGA. Water users in Haughton Zone A have annual allocations of 2,400 ML, but they probably need about 10,000 ML per year, based on water consumption for the same area in other places. Temporary transfers of those additional allocations are provided to those irrigators. Sunwater have only provided temporary transfer volumes from 2009 to 2018 (Table 3). The temporary transfers should be subtracted from the values in Table 2 to show usage and release volumes for the GBGA only, as shown in Table 3. The release values should also be reduced by the losses in the river. Losses of 35% are experienced in the Haughton Main Channel, so has also been applied to data in Table 3. In the grey columns, for the period shown (2009 to 2017) the average annual releases were 20,333 ML (less temporary transfers and losses) instead of 33,840 ML and the average annual usage was 25,131 ML (less temporary transfers) instead of 31,520 ML.

In summary, the data provided by Sunwater for releases and usage within the GBGA are erroneous, unreliable and incomplete. Therefore, it is unreasonable and irresponsible of Sunwater to base pricing calculations on these numbers. Much more accurate and reliable data should be provided before the pricing review can continue.

Based on the revised average release volume (20,333 ML) shown in Table 3, it is most likely that natural storage and flows could have met that demand over that period. Why should Sunwater start charging users the full price (BRIA rates) when the natural yield supplies in excess of 19,700 ML/year, which was the entitlement of the GBGA water users at commencement of the Haughton irrigation scheme? Sunwater no longer recognises the contribution that natural yield provides, but the 19,700+ ML of natural yield still exists, and is being used.

Table 3 - Modified water releases and usage for the GBGA

Year	Temporary Transfers (ML)	Released to Haughton R (ML)	Released to Haughton R. (less temporary transfers) (ML)	Released to Haughton R. (less temporary transfers and 35% losses) (ML)	Used in Zone A (ML)	Used in Zone A less temporary transfers (ML)	Volume released as a % of volume used
2009/10	6,283	38,465	32,182	23,839	35,571	29,288	81
2010/11	485	5,872	5,387	3,990	6,677	6,192	64
2011/12	1,484	29,603	28,119	20,829	20,387	18,903	110
2012/13	1,032	26,873	25,841	19,141	20,610	19,578	98
2013/14	2,883	44,671	41,788	30,954	29,668	26,785	116
2014/15	11,814	47,405	35,591	26,364	46,422	34,608	76
2015/16	13,364	47,019	33,655	24,930	47,031	33,667	74
2016/17	7,841	29,357	21,516	15,938	33,502	25,661	62
2017/18	12,318	35,291	22,973	17,017	43,814	31,496	54
Average	**6389**	**33840**	**27450**	**20333**	**31520**	**25131**	**82**

6 WATER LEVELS

There is no dispute that water levels in the aquifer have been very low in the past, and that there is a risk to seawater intrusion if water levels are too low for too long. What is not clear is how low groundwater levels can drop and remain there before seawater starts to migrate into the aquifer. This could be done if there was a detailed calibrated numerical groundwater model, but there isn't one. The whole system (surface and underground) is flooded constantly, masking any of the natural flows and keeping groundwater levels constantly high. This is likely to cause other issues including waterlogging of sugar cane and rising salinity if groundwater extraction is not managed correctly.

6.1 Rising Water Levels and Salinity

The GBGA is at risk of rising groundwater levels and rising salinity if not managed correctly. The volume of freshwater supplied by Sunwater should be managed closely, and the volume of groundwater taken by bores should be maintained (or increased) to prevent these problems.

Figure 7 shows water levels and salinity rises in a bore located above the Val Bird Weir (CSIRO, 2004). The same pattern is observed in other bores throughout the GBGA which are located slightly off the Haughton River, in clay rich saline sediments. The problem of rising water levels in the GBGA was evident in 2004. The problem will spread an get worse if not managed correctly. The root zone of cane extends to about 2 metres below ground level. There are times that groundwater levels are recorded within that zone. If it hasn't already been noticed, this will cause depletion or loss of can production.

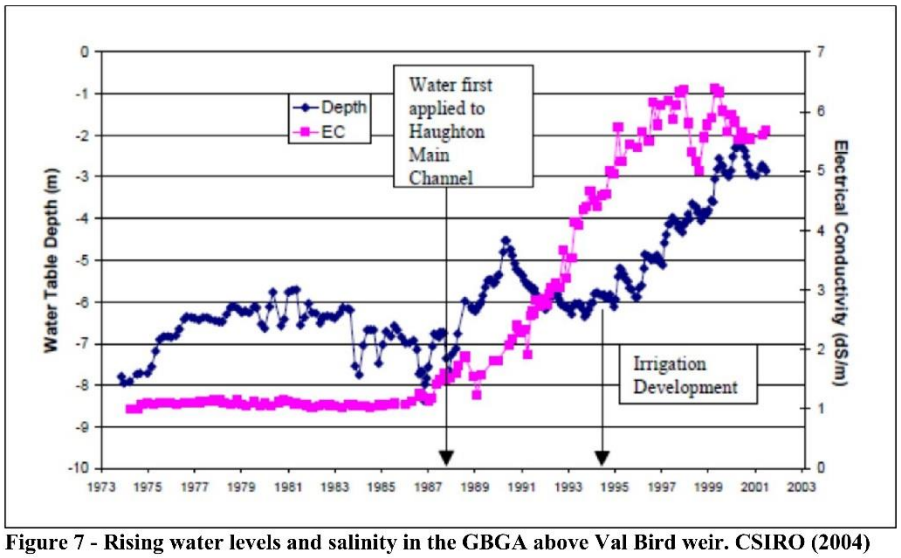


Figure 7 - Rising water levels and salinity in the GBGA above Val Bird weir. CSIRO (2004)

6.2 Groundwater Monitoring

A basic review of all the Queensland Government bores registered in the GBGA confirmed the existence of sandy tightly constrained aquifers which fringe the Haughton River and old channels, and which are recharged by the Haughton River. OD Hydrology (2018) chose two bores (11900054 and 11900058) which they believed represented the hydrogeology of the GBGA (shown in Figure 8). They are not within the GBGA aquifer system. They are located within older saline clay rich sediments with very high salinity (Figure 9). It is important to have a clear understanding of the shape, extent and nature of the aquifer in this hydrogeological setting. The aquifer overlies and is surrounded by unfavourable sediments.

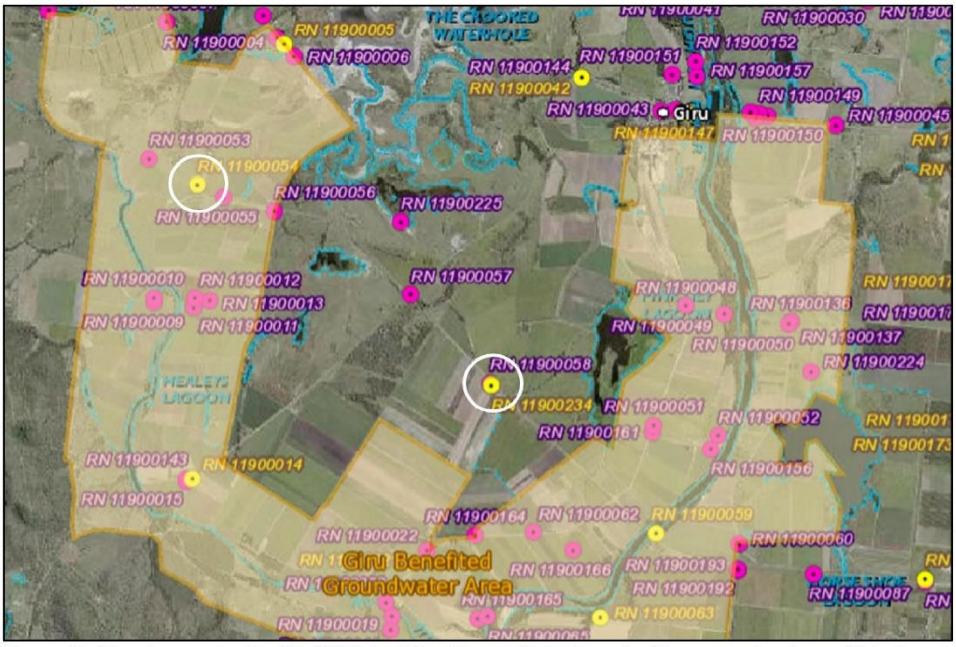
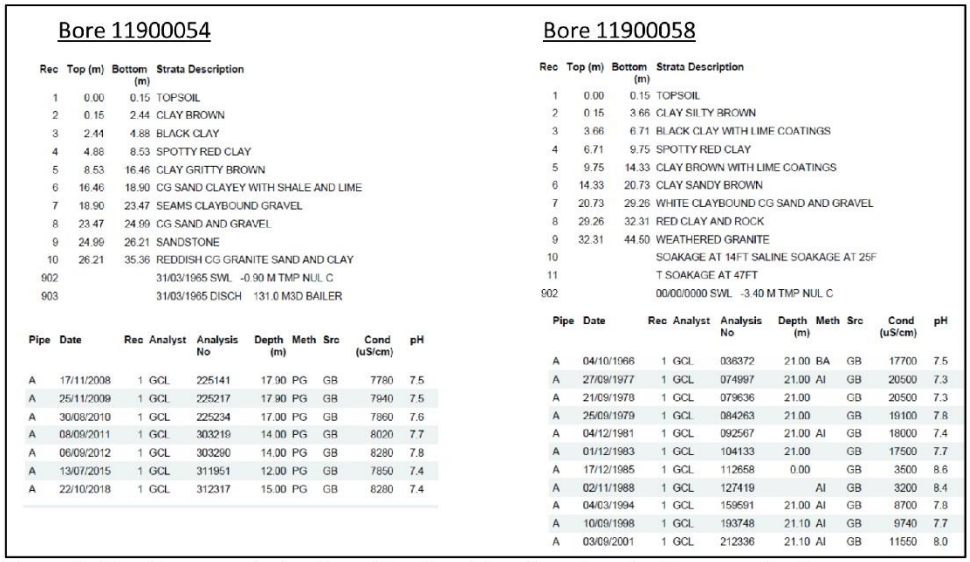


Figure 8 - Two bores otuside the GBGA with saline sediments and saline groundwater, which do not represent the GBGA aquifer.



Bore 11900054

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	0.15	TOPSOIL
2	0.15	2.44	CLAY BROWN
3	2.44	4.88	BLACK CLAY
4	4.88	8.53	SPOTTY RED CLAY
5	8.53	16.46	CLAY GRITTY BROWN
6	16.46	18.90	CG SAND CLAYEY WITH SHALE AND LIME
7	18.90	23.47	SEAMS CLAYBOUND GRAVEL
8	23.47	24.99	CG SAND AND GRAVEL
9	24.99	26.21	SANDSTONE
10	26.21	35.36	REDDISH CG GRANITE SAND AND CLAY
902			31/03/1965 SWL -0.90 M TMP NUL C
903			31/03/1965 DISCH 131.0 M3D BAILER

Pipe	Date	Rec	Analyst	Analysis No	Depth (m)	Meth	Src	Cond (uS/cm)	pH
A	17/11/2008	1	GCL	225141	17.90	PG	GB	7780	7.5
A	25/11/2009	1	GCL	225217	17.90	PG	GB	7940	7.5
A	30/08/2010	1	GCL	225234	17.00	PG	GB	7860	7.6
A	08/09/2011	1	GCL	303219	14.00	PG	GB	8020	7.7
A	06/09/2012	1	GCL	303290	14.00	PG	GB	8280	7.8
A	13/07/2015	1	GCL	311951	12.00	PG	GB	7850	7.4
A	22/10/2018	1	GCL	312317	15.00	PG	GB	8280	7.4

Bore 11900058

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	0.15	TOPSOIL
2	0.15	3.66	CLAY SILTY BROWN
3	3.66	6.71	BLACK CLAY WITH LIME COATINGS
4	6.71	9.75	SPOTTY RED CLAY
5	9.75	14.33	CLAY BROWN WITH LIME COATINGS
6	14.33	20.73	CLAY SANDY BROWN
7	20.73	29.26	WHITE CLAYBOUND CG SAND AND GRAVEL
8	29.26	32.31	RED CLAY AND ROCK
9	32.31	44.50	WEATHERED GRANITE
10			SOAKAGE AT 14FT SALINE SOAKAGE AT 25F
11			T SOAKAGE AT 47FT
902			00/00/0000 SWL -3.40 M TMP NUL C

Pipe	Date	Rec	Analyst	Analysis No	Depth (m)	Meth	Src	Cond (uS/cm)	pH
A	04/10/1966	1	GCL	038372	21.00	BA	GB	17700	7.5
A	27/09/1977	1	GCL	074997	21.00	AI	GB	20500	7.3
A	21/09/1978	1	GCL	079636	21.00		GB	20500	7.3
A	25/09/1979	1	GCL	084263	21.00		GB	19100	7.8
A	04/12/1981	1	GCL	092567	21.00	AI	GB	18000	7.4
A	01/12/1983	1	GCL	104133	21.00		GB	17500	7.7
A	17/12/1985	1	GCL	112658	0.00		GB	3500	8.6
A	02/11/1988	1	GCL	127419		AI	GB	3200	8.4
A	04/03/1994	1	GCL	159591	21.00	AI	GB	8700	7.8
A	10/09/1998	1	GCL	193748	21.10	AI	GB	9740	7.7
A	03/09/2001	1	GCL	212336	21.10	AI	GB	11550	8.0

Figure 9 - Bore log excerpts showing saline clay rich sediments and saline groundwater.

The Department of Natural Resources Mining and Energy (DNRME) have recorded water levels, electrical conductivity and other features in registered monitoring bores since the 1960's. There are dozens of registered bores that are currently being monitored in real time, or that have been monitored in the past. This department should have a very good understanding of the behaviour of groundwater levels in the aquifers since before the establishment of the Giru and Val Bird weirs in 1977 and 1983, and the introduction of the GBGA scheme in the late 1980's.

Groundwater monitoring bores could be used by Sunwater to better manage the releases into the river, not only by using weir levels. One such bore (RN11900147) that could be used is shown in Figure 10. It lies just outside the GBGA but it is screened in deep sands (9.5 metres thick) and is in a prime area of the aquifer, where there is elevated water levels resulting from the weirs being almost full most of the time, and a constant head of water which is allowing groundwater to leave the system towards the North through buried channels (palaeochannels).

Figure 11 shows the historic water levels recorded in Bore 11900147 and the rainfall (Majors Creek Station) for the same period. (the Giru North Station does not record water levels past 2016). Notice the rise in water levels at the introduction of Burdekin water in 1988, and the relatively stable and small fluctuations in water levels ever since. Burdekin water was introduced to the system after a five-year drought which broke in about 1988. Prior to 1988, the water levels, which represent the natural storage of groundwater in the aquifer, dropped below sea level two times for short periods, not enough to cause seawater intrusion. Pre 1988 water levels fluctuated between about 1.5 metres below ground level (mbgl) and 4 mbgl, which means that more of the groundwater stored in the aquifer was being used than we see after 1988. After 1988 the system is always top up, with water levels not dropping below 3.5 mbgl, but instead rising to 0.5 mbgl. The

system is over supplied with Burdekin water which will lead to problems of rising water levels and rising salinity seen elsewhere in the BRIA.

Figure 10 - Location of DNRME Bore 11900147. The royal blue arrows indicate the flow direction of groundwater, in old river channels (part of the aquifer), which leaves the area towards the North. Pale blue arrows indicate the continuous flow of surface water into the aquifer from the weir.

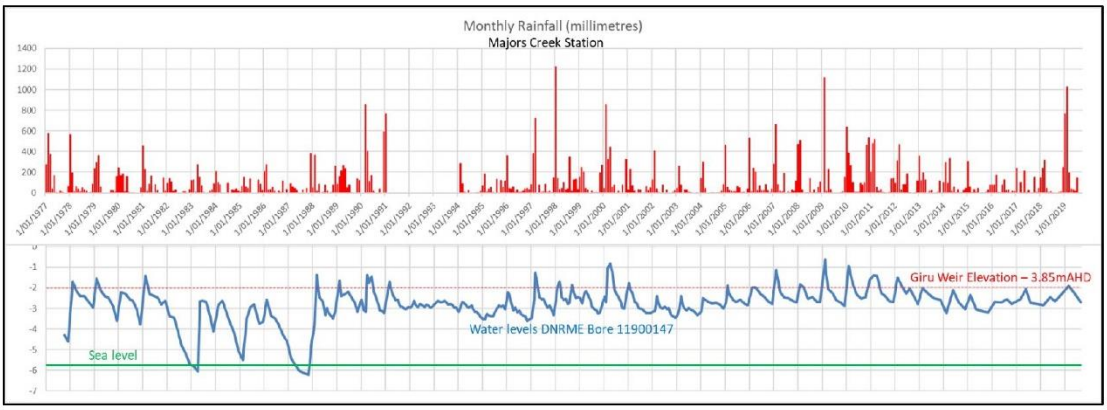


Figure 11 - Water levels from Bore 11900147 and rainfall from the majors Creek Station.

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Dated: **November 2019** **Groundwater Australia**

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