

## **6.0 SOURCES OF SUPPLY AND ISSUES OF RELIABILITY**

This Section of the report describes the current supply position of the existing Waterpark Creek water supply system and examines broadly, the issues and risks associated with this system continuing to provide the Capricorn Coast conurbation with an assured water supply. This Section also examines some of the risks associated with the following supplementary sources of supply meeting the ongoing needs of the conurbation.

- € Sandy Creek;
- € Desalination; and the
- € Fitzroy River.

It is necessary that Appendix A, dealing with the reliability of the existing system, be read in order to fully comprehend the following Sections of this report.

### **6.1 Capricorn Coast Water Consumption**

In recent years Livingstone Shire Council has successfully adopted and introduced a demand management policy which has reduced individual allotment usage and minimised overall consumption. For example, the year 1993 consumption was not greatly less than the year 2003 consumption although the overall population supplied with a reticulated supply increased by some 25 percent during this period.

Livingstone Shire uses treated effluent from its sewage treatment facilities to irrigate sporting ovals, golf courses, landscaped areas and parks. In addition, the community is well aware of the need to conserve water. While further reduction in water consumption per ET on the Capricorn Coast is possible, it is believed that the scope for more than a marginal overall reduction, which does not impact adversely on the area's tourist industry, is limited.

### **6.2 Source Reliability Requirements**

For towns which have a populations in excess of 10,000 persons it is necessary that the water supply not fail. Failure of a water supply to a town of 10,000 or more persons would require at least a megalitre (ie. emergency supply) of water a day in order to ensure commerce and basic normal household activities were able to continue.

The hydrologic/runoff analysis undertaken and described in Appendix A has been undertaken to identify the 'safe yield' of the existing Waterpark Creek and Sandy Creek sources.

For the purposes of this report 'safe yield' has been defined as the assured water volume that can be provided every year based on a theoretically assessment of the runoff that can be derived from the known rainfall record and a correlation between rainfall and measured runoff.

For the catchment of Waterpark and Sandy Creeks the magnitude of the 'safe yield' is determined by the drought which occurred in the year 1902. The year 1902 drought was particularly severe and no event of similar magnitude has occurred in the last 100 years. Examination of the rainfall/runoff model indicates that the minimum annual yield able to be obtained from the catchment of Waterpark and Sandy Creeks would be some 60 percent greater that the 'safe yield' were the year 1902 drought event not included in the overall rainfall record.

It could be argued that a yield based on the rainfall record commencing after the year 1902 drought (ie. since the year 2003), has a level of reliability which is acceptable and is an adequate basis on which the water supply to a town, such as the Capricorn Coast, can be planned. This is especially the case if restrictions can be applied which will ensure supplies can be maintained during a drought such as the event of the year 1902. The difficulty with this proposition is that before adopting such a stance a number of factors need to be considered. These factors are as follows.

- € The catchment of Waterpark and Sandy Creeks is relatively small and, while it has demonstrated an ability to meet the requirements of the Capricorn Coast over a period of thirty-five years, the actual rainfall/runoff processes are not well understood;
- € The accuracy of flow measurements, modelling and the resultant yields can not be attested to with a high level of confidence;
- € There is no basis for excluding the possibility of a future drought more severe than the event of the year 1902;
- € There is a need to ensure that the yield adopted is sufficient to meet the restricted needs of the Capricorn Coast should a wet season totally fail;
- € Should failure of the system occur the costs to maintain a basic water supply to the Capricorn Coast would be high and the consequences for local businesses severe;
- € The source is a considerable distance from the centres of demand;
- € It can be expected that the direct relationship between annual water demands and population will be restored now that the benefits of demand management practices have been implemented;
- € Development at the Capricorn Coast could be easily underestimated over any five year period; and
- € Eventually the supply from Waterpark and Sandy Creeks will need to be supplemented irrespective of the extent to which this source is developed.

The question as to whether the safe yield based on the inclusion of the year 1902 drought event or a higher yield, which does not include the year 1902 event, should be adopted as the basis for planning the Capricorn Coast's water supply requirements is a decision which needs to be carefully considered by Council and the community. Adoption of the safe yield will require that infrastructure be constructed earlier than would otherwise be required if a higher yield was adopted. This essentially means that adoption of the safe yield (ie. in this instance a yield which takes into account the year 1902 rainfall record) results in higher cost. However, the benefit is a corresponding reduction in the likelihood of failure at any given time.

Should the higher yield be adopted the overall costs to the community will be lower provided the source does not fail. Failure of the source will inevitably result in a significant cost to the community.

Overall it is considered that the safe yield should be adopted as the basis for source planning. However, given the increased cost involved this is a matter for careful consideration by Council. Any decision also requires community support.

## **6.3 Existing Waterpark Creek Supply – Current Situation**

In early October, 2004 flows in Waterpark Creek had fallen to 120L/s and, without further rainfall within the catchment could be expected to continue to fall at a progressively decreasing rate from that which has occurred over the preceding two months (ie. the reduction over the last two months has averaged 40L/s per month). Without additional rainfall in the next couple of months flows in Waterpark Creek could be expected to be less than 50L/s by early in the year 2005. Should this be the case the Capricorn Coast would be reliant solely on the water stored in Kellys Offstream Storage.

In early October, 2004 Kellys Offstream Storage contained 880ML. Under stringent restrictions and careful management this volume could be expected to meet the Capricorn Coast's minimal water requirements until the end of March or early April, 2005 assuming that no further significant rainfall occurs on the Waterpark Creek catchment and flow from Waterpark Creek ceases.

It is believed that a restricted supply could be maintained until August, 2005 should the Sandy Creek source be connected to the existing system. The problem here is that much hinges on reasonable rainfall occurring in the coming wet season. Should the wet season fail there is the possibility that stored supplies will not be sufficient to maintain a restricted supply through to the following wet season.

Of course it is probable that reasonable rainfall will occur during the year 2005 wet season. However, it is questionable as to whether even reasonable rainfall over the catchment of Waterpark Creek during the next few months will immediately restore the catchment's performance, in terms of base flows, to what might be considered typical or normal flows. Adding to the difficulty of predicting a significant improvement in flows, should rainfall occur, is the lack of understanding as to how rainfall is actually translated into base flows following prolonged periods of low rainfall such has occurred in the last few years.

In October, 2004 Waterpark Creek was clearly showing signs of stress related to prolonged low flows which have not been seen in the last thirty years. Indeed, it could be argued that the level of stress existing in October 2004 has reached an extent, which has not occurred since the year 1902. Certainly the existing situation has not occurred in the period since rainfall measurements in the vicinity of Waterpark Creek have been recorded.

It should also be noted that the Defence Forces and Irrigators periodically drawing water supplies from the catchment of Waterpark Creek. The extent to which the Defence Forces are currently impacting on flows in Waterpark Creek is unknown. Historically the Defence Forces are thought to have had a relatively minor impact on flows. However, given the current low flow regime, the significance of any withdrawal by the Defence Forces is clearly of increasing significance.

### **6.3.1 Supply Risks**

Queensland's climate is renowned for producing long periods of drought followed by flooding. Hence, it is extremely difficult to predict weather conditions in the short term and almost impossible to predict the long term weather situation particularly as there appears to be some evidence of a fundamental climatic change leading to increased periods of drought followed by periods of more intense rainfall.

Since the year 1975, the 3, 5 and 10 year moving average rainfall totals for the Yeppoon – Byfield area show a distinct downward trend, albeit from a reasonable high 1975 total.

The actual significance of this is difficult to determine but it may indicate a change which could lead to lowering of the yield that can be ascribed to Waterpark Creek source. A possibility which must be taken into account is that reliability derived from the historical rainfall and flow records may not be a good indicator of the future safe yield.

Another risk applying to the Waterpark Creek source is the possibility of increased water harvesting by the Defence Forces in the northern portion of the catchment. While it is thought that extractions by the Defence Forces will have only a slight impact on the overall flows reaching Livingstone Shire Council's intake (in those periods when the flow at the Council's intake exceeds 150L/s) the Defence Forces have indicated a requirement to take 'significant' quantities of water in the future. Further investigation and understanding of the catchment's response to rainfall is required if the Defence Forces are to withdraw 'significant' supplies during periods of low flow in Waterpark Creek and Council does not have access to alternative sources.

The Waterpark Creek system and associated infrastructure is located within a few kilometres of the coast and to that extent is vulnerable to cyclonic depression. This is of some concern in terms of access and power supplies given that the water supply treatment plant is some 15 kilometres north of Yeppoon, Kellys Offstream Storage is a further kilometre and the Waterpark Creek intake and pump station a further 18 kilometres away.

Table 6.1 summarises the risks to the Waterpark Creek water supply system in terms of a long term reliable water supply source.

**Table 6.1**  
**Overall Risks – Waterpark Creek System**

<b>Risk</b>	<b>Description</b>
Yield Assessment	Further monitoring of flows and investigation of the catchment is required to increase the level of confidence that can be assigned to yield assessments, particularly in relation to periods of low rainfall.
Climatic Change	Given the allocation limitation of 4,400ML/a the system is highly susceptible to the impact of any increase in the periods of low rainfall.
Defence Force Extraction	Thought likely to have only a marginal effect on yield but dependent on what is meant by 'significant' water supply requirements as indicated in correspondence from the Defence Forces to Livingstone Shire Council.
Cyclonic Influences	Short term influence on the supply immediately following a major event.

## 6.4 Sandy Creek Supply

Many of the risks to the Waterpark Creek water supply system apply equally to the Sandy Creek source of supply with the exceptions that access to the Sandy Creek intake is slightly more remote and the Defence Forces are unlikely to harvest water supplies from this catchment.

## 6.5 Supplies Obtained from Desalination

The desalination of sea water on the Capricorn Coast will be associated with a number of risks that are likely to affect the reliability of supply. These are as follows.

- € Power Supply;
- € Operational and Maintenance Expertise;
- € Cyclonic Influences; and
- € Fitzroy River Flooding.

Desalination processes are dependent on significant reliable quantities of electrical power. Any interruption to the supply can have implications for the desalination process which seriously disrupts the production of potable water.

Desalination processes also require a high level of management competence and technical expertise, which not only needs to be available in terms of the ongoing management and operation of the plant but also needs to be readily available in the event of system failures.

A desalination plant for the Capricorn Coast would be required to produce at least 5 to 6ML/d. This is a significant sized plant in the Australian context and would need to be supported by appropriate staffing in order to ensure system reliability. Failure to provide the necessary level of expertise would expose the desalinated supplies to risks to which other more conventional sources of supply and systems are not exposed.

A desalination plant would need to be located on the coast and draw sea water supplies from a reasonable distance off shore. Major cyclonic activity and the impacts of Fitzroy River flooding, which can adversely affect the quality of coastal sea water for extended period, have a potential to interrupt the operation of a desalination plant on the Capricorn Coast. As increased reliance is placed on desalination as a source of supply any interruption to the production of potable would have a corresponding increasing detrimental impact on the supply of water to the community.

## 6.6 Supplies Obtained from the Fitzroy River

The Fitzroy River barrage is some 30 kilometres from the Capricorn Coast.

The risks associated with obtaining supplies from this source chiefly relate to the availability of high priority water and the possible implications of climatic change. Other risks include disruption to power supplies and pumping failure.

Overall, and in comparison to the existing Waterpark Creek source of supply, the risks associated with obtaining supplies from the Fitzroy River would appear less. However, it is not clear what the actual safe yield of the Barrage is and given that the yield is directly related to the management of upper reaches of the river there is a need to clarify the availability and reliability of 'high priority' water especially in relation to longer term demands.

Climate change could have an impact on the overall yield of the Fitzroy River. However, given the size of the Fitzroy River's catchment the impact is likely to be significantly less than the impact on the catchments of Waterpark Creek and Sandy Creek.

In addition, it must be recognised that if a pipeline is to be built from the Fitzroy River it will be necessary to consistently draw, at least a base supply from this source in order to ensure the quality of the supply. The quality will suffer if water is left within the pipeline for even relatively short periods.