Submission
No 135

INQUIRY INTO A SUSTAINABLE WATER SUPPLY FOR SYDNEY

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Date Received: 10/03/2006

Subject:

Summary

Rcd GPSC 10/3/06

General Purpose Standing Committee No. 5: Inquiry into a Sustainable Water Supply for Sydney

Submission

Robert Thorne

This submission is made under part (g) of the Terms of Reference of the Inquiry *'Any other relevant matter'*. Specifically, the submission relates to the past and future impact on the Shoalhaven river and estuary, of diversion of river flow at Tallowa Dam, to the Sydney water supply system.

Contents

Summary

A detailed historical record of Shoalhaven estuary salinities extends back to 1995. This record can be used to understand the significant detrimental impacts on the estuary that have occurred since almost total diversion of river flow by the Sydney Catchment Authority at Tallowa dam, commenced in mid-2003. A limited "Environmental Flow" of a maximum of 90 megalitres a day that has been released from Tallowa dam during this period has been totally inadequate for maintenance of estuarine health.

This historical record can also be used as a basis for defining the significantly increased and variable environmental flows that must be permitted to regularly enter the estuary, to reflect the natural

conditions on which the biological health of the estuary depends. From this, the flows past Tallowa dam that must be permitted for this to occur, can be determined.

It is imperative that the health of the river and estuary be accounted for first, before any consideration is given to possible transfers of water to Sydney. Mismanagement .

It is my belief that both the resources and technologies for meeting Sydney's future water supply needs exist in the form of recycling wastewater, storm water harvesting, demand management, and increased use of domestic rainwater harvesting. I believe that this is the direction that the Inquiry should be leading, and that transfers from outside the Sydney Basin should be proscribed, particularly from the Shoalhaven River.

Impact of river diversions at Tallowa Dam on the health of the Shoalhaven Estuary

The Shoalhaven estuary extends for 50 kilometres, from the end of the river tract at Burrier to the ocean at Crookhaven Heads. The estuary is dominated by tidal fluctuations which play an important role in the interaction of salt and fresh water within the estuary.

The attached graph shows the variation in salinity of the lower Shoalhaven estuary at Greenwell Point, between 1995 and 2005. It is based on more than 4000 daily measurements. Near the top of the graph, salinities approaching 35 parts per thousand (ppt) occurred when low flow occurred in the river. The droughts of 1997-98 and 2002-3 are prominent as prolonged periods of high salinity in the estuary. In response to increased river flow following rainfall, estuary salinity falls, and where the graph hits zero, the estuary has been completely flushed of all marine water. It can be seen that from 1995 to mid-2003 this occurred on 12 occasions, or on average, every 8 to 9 months. Between these flushes, regular freshes of varying magnitude occurred in the lower Shoalhaven estuary, in which estuary salinity falls

to intermediate levels.

After the flush of May 2003, the character of the graph changes dramatically. While this was in part due to drought, it was primarily caused by the diversion of massive volumes of water to the Sydney water supply system. Until the flush at the start of July 2005, when the flow in the river exceeded the capacity of the Sydney Catchment Authority (SCA) to pump, no water was permitted to flow over Tallowa dam wall by the SCA. Only a spuriously-named Environmental Flow of up to 90 megalitres a day was discharged by the SCA through the dam outlet. All natural intermediate flows which would have freshened up the lower river and estuary was diverted from the river at Tallowa dam. The few very brief reductions in estuary salinity that occurred in estuary salinity during this period, resulted from inflows to the river from tributories below Tallowa dam, principally from Yalwal Creek.

As a consequence, for more than two years, the entire Shoalhaven estuary was subjected to unnatural prolonged high salinities which were approaching the worst drought levels. It is pointed out that during this period, good coastal rainfalls caused river flows into Tallowa dam which would have produced reduction in estuary salinity that would have been beneficial to estuary health, had they not been diverted.

The detrimental impacts of the prolonged high estuary salinity, which will not be discussed in detail here, include widespread deaths of the reed Phragmites, which fringes the estuary and provides habitat for juvenile fish and other species; decimation of prawn stocks, impacts on the oyster industry; invasion of marine species into the estuary, including undesirable species such as jellyfish and blue ringed octopusses. And without doubt, many other impacts that we are not yet aware of.

The damage done to the estuary by the heavy extractions at Tallowa dam is not restricted to the increase in estuary salinity resulting from low river inflows. Reduction in the supply of both organic and inorganic nutrients to the estuary impacts from the bottom to the top of the food chain. The decline in fish numbers in the estuary is doubtless attributable to a degree to this. The lack of higher

flows is also resulting in significant siltation of the estuary in some areas.

The data on which the attached estuary salinity graph is based can be presented in other ways. An examination of the proportion of time for each year that various salinity ranges have occurred in the estuary, shows that in the two years following commencement of pumping by the SCA in 2003, the period of high salinity (30-35 ppt) approximately doubled relative to the preceding years.

Studies if Estuary Processes

Further studies have shown how the salinity increases downstream from the freshwater zone under differing inflow regimes. An understanding of the processes controlling salt and freshwater distribution in the estuary has been gained. Peak river inflows to the estuary required to achieve varying degrees of flushing of the estuary have been determined, but require confirmation. This current knowledge emphasizes how manifestly inadequate the existing "Environmental Flow" of 90 megalitres a day is for maintaining the physical health of the estuary. The inflow must be considerably higher, and variable, to reflect the natural system.

Correlation of river flows at the Grassy Gully gauging station, immediately upstream of the estuarine tract, with estuary salinity, should enable the river inflows required to achieve various salinity levels within the estuary to be determined in greater detail. From the historical estuarine salinity record, an acceptable minimum salinity regime could be determined, and from that, the flows and frequencies that must be permitted to pass Tallowa dam.

Based on the above, determination of any surplus river water that might be available to be diverted to the Sydney water supply system, could be defined. The Department of Natural Resources, who are studying environmental flows for the Shoalhaven, have expressed an interest for my data to be used in the modeling program.

Proposed Increased Extraction from the Shoalhaven River

It has been announced that raising of the Tallowa dam wall will now not proceed, but that increased

extraction of 300 billion litres a year will occur. This is of considerable concern for two reasons. Firstly, I believe that both the resources and technologies for meeting Sydney's future water supply needs exist in the form of recycling wastewater, storm water harvesting, demand management, and increased use of domestic rainwater harvesting. I believe that this is the direction that the Inquiry should be leading, and that transfers from outside the Sydney Basin should be proscribed, particularly from the Shoalhaven River.

Secondly, the Shoalhaven river has been seriously degraded under the existing extraction and mismanagement regimes over the past two and a half years. Any further extraction can only damage the river to a far greater extent.

Whether increased extraction from the river proceeds or not, the importance of the installation of a multi-level offtake at Tallowa dam is imperative to protect downstream water quality. A multi-level offtake was part of the proposed solution to poor downstream water quality, proposed for the raised Tallowa dam. Until the July 2005 flush, with no spillway flows being permitted, the only flow passing the dam was very poor quality water from the bottom of the dam. This water was cold, acid, hypoxic, and sulphurous, resulting from reaction with organic matter such as dead trees, in the bottom of the reservoir. This discharged water was very hostile to fish and other aquatic organisms. A multi-level offtake will permit access to better quality surface waters in the reservoir, even when water level is below the spillway crest.

Conclusion

In conclusion, it must be emphasized again that an environmental flow regime must be provided for the lower river and estuary that provides a variable flow regime that reflects the natural conditions in the estuary. The importance of intermediate flows, which have been denied to the estuary for more than two and a half years, cannot be stressed too strongly.