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LAKE TINAROO (AUSTRALIA) — TOWARDS A MANAGEMENT PLAN

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ABSTRACT

Tinaroo Falls Dam provides a water supply for irrigated agricultural production, primarily tobacco, rice, tree and horticultural crops, near Mareeba in Far Northern Queensland.

The increasing popularity of Lake Tinaroo as a recreation and tourist venue is providing impetus for a management plan to be prepared for the lake. Urban and agricultural use of the catchment has caused a change in the trophic state of the lake.

The competing uses and emerging issues in relation to a sustainable, healthy lake are discussed.

The QWRC is desirous of establishing a management plan for the catchment. Progress in implementing such a plan is discussed.

KEYWORDS

Water, catchment management, trophic state, lake management.

INTRODUCTION

The Queensland Water Resources Commission has an ongoing responsibility to protect the quality of water and the environment of storages under its control.

The approach taken to date has been to declare a Catchment Area within which the Commissioner may exercise powers over subdivision and changes of land use.

With the pressures now being placed on storages from recreational and commercial use as well as catchment development, wider issues affecting water quality and the storage environment must be addressed.

The Commission has, therefore, initiated appropriate action to develop a Management Plan for each of its dams, in conjunction with the Local Authority, interested Government Departments and client and user groups.

Planning for Lake Tinaroo will encompass strategies for:

- Storage Operation
- Catchment Management
- Development Control
- Recreation Management

Tinaroo Falls Dam is located at 146° E and 17° S at elevation 670 m and was constructed to supply water to the Mareeba-Dimbulah Irrigation Area (M.D.I.A.) and to the Barron Gorge Hydro Electric station, Fig. 1.

It has a storage capacity of 407,000 ML, a reservoir area of 34 km^2 and a catchment area of 54,500 ha. It first filled in 1965.

The storage area enjoys a magnificent tropical climate and provides an area for year round watersport for North Queensland. This is especially important in the summer marine stinger season. It is attractive to developers, tourist operators and the real estate industry.

The Lake straddles the Eacham/Atherton Shire boundary.

LAKE TINAROO - EMERGING ISSUES

The water supply project has been successful in stabilising agricultural and power production, however, evidence of declining water quality has meant that the Commission must address some emerging issues.

Growth of Tourism

Tourism has become a major income earner for the Region. Passenger movements through the Cairns International Airport have more than doubled to 800 000 p.a. since its opening in 1984.

The growth in visitor numbers at Tinaroo has been exceptional:

1982/83, 369 000; 86/87, 917 000; 87/88, 1 300 000 (anticipated).

Private sector response has seen new accommodation facilities, increased lakeside development, and commercial operations on the storage.

Government initiative has opened the Danbulla State Forest Park including five new camping areas, enhanced sport fishing by stocking the lake with barramundi.

Lakeside Development

Much of the lake frontage is freehold land with prime development potential.

In the past 10 years, subdivision has created 344 urban/rural residential lots and increased the lakeside population by 1 200. A permanent lakeside population of 3 000 (900 dwellings) excluding urban and tourist accommodation might be expected by the year 2000.

As such, there is an urgent need to examine the consequences to water quality, public access and particularly the visual environment and to put in place a co-ordinated approach to development control within the Catchment Area.

Catchment Development

The present levels of urban and agricultural development within the catchment are being reflected in declining water quality.

Increased macrophyte growth in the water body and along the Barron R. downstream, suspect water analyses and an estimation of nutrient loading using export co-efficients for comparison with Vollenweider and Dillon's Trophic Status Model, all suggest that the storage is already eutrophic.

Work is required now to confirm the trophic state of the lake and the processes occurring for interpretation against the nutrients expected from the urban development and agricultural practices in the catchment.

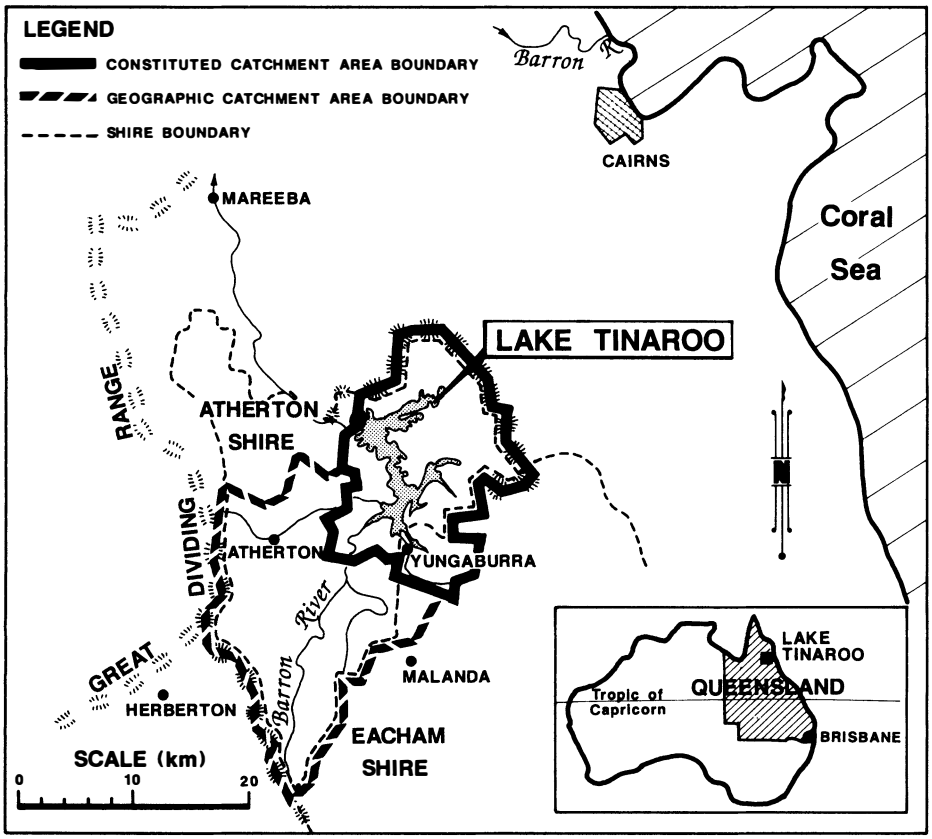

Fig. 1. Lake Tinaroo Locality Plan

Recreation Management

Recreational use of the storage has occurred depending on access ability, suitability of conditions and available land.

Private boating, fishing and other passive recreation occur throughout the storage, with concentrations at the points of access. Sailing, powerboat and canoe clubs, plus five community youth camps have established organised centres of activity.

A number of commercial operators ply the tourist trade with various hire craft, house boats and tourist ferries. Active recreation is restricted by standing timber in the dam, particularly at peak periods and low water levels.

A co-ordinated management plan is required to be administered by one authority, clearly defining strategies, zonings and permitted uses. At present, two Federal and five State Departments, plus the two Local Authorities are involved in the management of the storage.

Storage Operation

Water from Tinaroo Falls Dam has been used exclusively for irrigation and power generation, with provision to reduce the annual allocation for power generation to 72 000 ML over a number of years. At this figure 225 000 ML annually should be available to irrigators. However, while the power authority have used their quota, the irrigation demand has grown more slowly than expected and a substantial unallocated volume exists.

The tourist/recreation/lakeside-living scenario has developed during a period of under-commitment of water supplies, and community interest in sustaining a high lake water level has emerged as an issue.

Concern over the future viability of the M.D.I.A., brought about by agricultural uncertainty, together with the underutilized water supply has created the need to review the traditional storage operating rules and management practices, and to examine future water requirements and the economic options for the uncommitted water.

LAKE AND CATCHMENT MANAGEMENT STRATEGIES

Technology Based

Scientific Advisory Committee. Chemical water quality has been monitored from 30 sites in the lake and irrigation area since 1956. Interest has been in conductivity and chloride ion because of the emphasis on tobacco growing under irrigation.

The expansion of unsewered urban and rural/residential development in the catchment area adjacent to the lake has highlighted the need to expand the water sampling program to take in nutrients and pollutants.

Therefore,in 1987, the Commission moved to establish an Interdepartmental Technical Advisory Committee to steer a study to:

- assess the trophic state of the lake
- identify the nutrient load and the limiting nutrient on the lake and in the receiving waters
- project the nutrient loading trend
- project the trophic status trend
- outline alternative intervention strategies and recommend action.

The water sampling program has been expanded to include 7 sites to examine local influences, with a further 6 sites at hydrographic stations on tributary streams.

At lake stations, "on-site" profiles of temperature, dissolved oxygen, pH and light are taken. All stations forward samples for laboratory analysis of total phosphorus and nitrogen, nitrate, chlorophyll, pH and bacteriological and standard chemical analysis. Duration of the sampling program is expected to be two years.

Initial analyses confirm that phosphorus and nitrogen levels are already very high, and that development of considerable further biomass can be expected.

There is already a large algae biomass in the lake, indicated by the supersaturated oxygen at the surface and de-oxygenated lower waters. The consistent drop of pH with depth further confirms the eutrophic state of the storage.

Catchment Land Use Options. Since the storage was completed the population living in the catchment has almost trebled, from 3,050 to 8,650.

Atherton, the largest town in the catchment, is sewered and discharges into Mazlin Creek, 10 km upstream of the storage.

Collection of information for development of the lake and catchment management plans is being undertaken jointly with:

- Department of Geography, James Cook University, Townsville.
- Department of Forestry, New England University, Armidale.
- CSIRO, Division of Forest Research, Atherton.

The current geographical distribution of land use has been reasonably constant since the lake filled. The approximate areas of the various land uses are, Dairying and grazing 14 000 ha; Cropping 5 500 ha; State Forest and National Park 18 700 ha; Lake Area 3 400 ha; Other 13 900. Total 54 500 ha.

Australian Bureau of Statistics Reports show that fertiliser use increased dramatically in the 1970's to 0.5 Tonnes/hectare fertilised (total 4000 Tonnes used).

Use is chiefly on dairying pastures and maize. The principal fertilisers used are nitrogen and phosphorus.

Storage Operation Options. While surplus water is available and options exist to provide additional power generation, retain it in the lake for tourism, or introduce changes and incentives to increase irrigation use.

Future water levels will therefore depend on the operating strategy adopted.

The recreational benefit diminishes rapidly once the storage drops below 70%. However, the temptation is to retain it at this level. At $1.00/visitor the recreational value would equal 60% of the running cost of the Irrigation Area.

Legislatively Based.

The Commission, in conjunction with the two local Authorities, is developing a statement of responsibilities and objectives for the storage and its environment. This will include conditions which developers must meet before undertaking works or changes of land use within the Gazetted Catchment Area.

It is intended that a Development Control Plan covering the Gazetted Catchment be prepared, incorporating the required performance standards of the Commission and the policies of the Local Authorities. Responsibility for approval of development proposals would be delegated to the Local Authorities through a "deemed to comply" provision.

Socially Based.

The Commission's policy is to involve the local community in establishing the management plans for the lake and the catchment.

This will be accomplished through the formation of Management Plan Steering Committees.

The planning process will involve a community awareness and education phase to foster understanding of the issues and options.

Financially Based.

Existing charges already are levied on tourist operators using the lake for commercial purposes.

A revenue collection system is being investigated to recover the cost of investigating change of land use applications in the catchment area. Options for funding the ongoing costs of lake and catchment management are being examined.

Further avenues for raising sufficient funds to meet a proportion of the ongoing management costs are being investigated. These include entry charges to day picnic areas and a precept associated with a change in land use of the catchment from a rurally based to urban/residential use.

CONCLUSION

Increasing use of the lake for recreation and tourism and increasing use of the catchment for rural/residential development has given rise to the initiative to investigate the sustainability of the system under present management strategies.

The Commission sees its role, as lead agency, to bring about a new management plan for the lake and it's catchment.

Steps are being taken to move in this direction through co-ordinating expert advice and involving the local community generally.

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