THOMSONS LAKE URBAN STRUCTURE STUDY AND SOUTH JANDAKOT DEVELOPMENT WATER RESOURCES MANAGEMENT PLAN

Report and Recommendations of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
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1. INTRODUCTION

In response to a referral from the State Planning Commission, the Environmental Protection Authority (EPA) has recently considered the following reports:

. Thomsons Lake Urban Structure Study (TLUSS); and

. South Jandakot Development Water Resources Management Plan (SJDWRMP).

The EPA has assessed the propositions contained in these reports pursuant to Part IV of the Environmental Protection Act (1986).

2. DISCUSSION

Through its predecessor, the Department of Conservation and Environment (DCE), the EPA has had previous involvement with the TLUSS. In early 1985 the DCE provided detailed comments to the then Metropolitan Region Planning Authority on a draft of the TLUSS report. The Department canvassed a number of issues in its comments, the principal ones being:

. the inconsistency of the preferred land use strategy identified in the draft report with the boundary of the System 6 recommendation M93 to the north and west of Thomsons Lake;

. air pollution impacts; and

. the implications of the preferred land use strategy for Thomsons Lake and adjacent wetlands, and the groundwater resource.

The land use strategy now recommended fully accommodates the System 6 boundary adjacent to Thomsons Lake and, accordingly, this issue can be regarded as resolved.

Those sections of the TLUSS report dealing with air pollution issues contain some inaccuracies, and these have been taken up directly with the State Planning Commission. Nevertheless, in an overall sense, air pollution issues have been satisfactorily addressed, with acceptable conclusions having been drawn and incorporated into the recommended land use strategy. Air pollution issues can also, therefore, be regarded as having been resolved.

The recommended land use strategy envisages a major urban cell to the east of Thomsons Lake. This cell would be within the Jandakot Public Water Supply Area. The EPA believes that residential development as envisaged could contribute contaminants to the groundwater and in an environmental resource management context should, therefore, be viewed with caution. Particularly as the Jandakot groundwater mound is an important public water supply source, major changes to land use with the potential to affect groundwater quality should, ideally, be rigorously assessed.

In this instance, the EPA recognises that the Water Authority has accepted the concept of residential development on the Jankakot mound. This is

apparently because urban development is considered potentially more controllable in terms of impacts on groundwater quality, and private demand for groundwater that could conflict with the public water supply scheme, than likely alternative land uses. Like the Water Authority, the EPA is, therefore, prepared to regard residential development on the Jandakot mound as an acceptable (but not necessarily desirable) compromise. Nevertheless, the EPA stresses that the position it has adopted in this instance should not be regarded as acceptance in general of urban development over groundwater mounds. For any such proposals in the future, it is likely that the EPA would press for comprehensive environmental impact assessment.

For residential development within the proposed urban cell to the east of Thomsons Lake to proceed in an acceptable manner, a number of controls would be necessary. Sewerage reticulation would be required as a matter of course, initiatives to educate the incoming population regarding domestic gardening activities (both in terms of fertiliser and water use) would be needed, and careful management of the surface and groundwater systems (including provisions for monitoring and review) would be essential. This latter requirement is especially important as residential development of the proposed urban cell would necessitate the implementation of a comprehensive land drainage scheme that could both conflict with the availability of groundwater for public supply purposes and adversely affect the wetlands throughout the general area.

The TLUSS report indicates that a reticulated sewerage service would be installed. It also reflects recognition of the need to address issues relating to management of the ground and surface waters of the area, one of the specific recommendations in the report being the preparation of a "water resources management plan" for the area east of Thomsons Lake. The SJDWRMP represents the response to this recommendation.

The EPA welcomes recognition that ground and surface water management is central to proper land use planning in this area, given the importance of the Jandakot mound as a water resource. In broad terms, the EPA supports the concepts put forward in the SJDWRMP. For instance, the water quality analysis contained in the SJDWRMP provides a reasonable basis for the establishment of preliminary water quality criteria for Thomsons Lake. However, the EPA is concerned that the consequences for Thomsons Lake of the drainage scheme as envisaged, and the options for ameliorating these consequences, have not been addressed in sufficient detail.

The drainage system outlined in the SJDWRMP is intended to maximise the on-site retention of drainage waters within the development area, but does provide for discharge to Thomsons Lake under peak flow conditions. Under such conditions a rise in water levels in Thomsons Lake in excess of one metre (superimposed on normal fluctuations) is anticipated. The drainage system is also intended to reduce nutrient inputs to Thomsons Lake and it is predicted in the SJDWRMP that, when compared with water quality data presented in the 1976 report of the Cockburn Wetlands Study, improvement would be achieved. Nevertheless, the nutrient levels predicted in the SJDWRMP would still be sufficient to cause algal blooms in Thomsons Lake.

The Department of Conservation and Land Management ascribes a high conservation value to Thomsons Lake, both as an example of a Swan Coastal Plain wetland that is in a relatively natural condition, and because of the waterbird populations it supports. As many of the waterbird species using

Thomsons Lake are waders, water depths in the lake are especially important. Clearly, water quality is also an important issue in terms of sustaining the lake's value as a waterbird habitat.

The EPA's recently released draft Guidelines on Wetland Conservation in the Perth Metropolitan Area also identify Thomsons Lake as a valuable wetland because of its relatively intact natural systems. The management priority for Thomsons Lake identified in the Guidelines is maintenance and enhancement of its natural attributes and functions.

For these reasons, the EPA considers that any drainage scheme established in this area that involves discharge to Thomsons Lake must include as a primary objective the maintenance of water levels in the lake within a predetermined range. In essence, the underlying priority should be to maintain the current water level regime in Thomsons Lake to the satisfaction of the National Parks and Nature Conservation Authority.

In general, the overall strategy outlined in the SJDWRMP is based on reasonable environmental principles. However, particularly in relation to water levels in Thomsons Lake, the EPA is concerned that these principles would not be adequately realised. It has been indicated at officer level that an increase in water levels as predicted in the SJDWRMP would not be acceptable to the Department of Conservation and Land Management. An alternative drainage management strategy will, therefore, need to be devised. A number of options in this regard are identified in the SJDWRMP but have not been examined in detail in that report. There is an obvious requirement for this to be done. Clearly, in devising the drainage strategy to be implemented, the question of lake water levels must be considered in conjunction with:

. the input of nutrients and toxic contaminants to Thomsons Lake; and

. beneficial use of drainage waters.

In view of the extent of the proposed urban cell to the east of Thomsons Lake, the opportunity would apparently exist to implement a comprehensive drainage scheme progressively, closely monitor its effects, and adjust the system if necessary. There may be practical difficulties in achieving an effective drainage monitoring and review programme because of differing land ownership throughout the proposed urban cell. Nevertheless, there should be a tangible contribution from all developers involved, such contributions occurring in consort with the phasing of development. The Local Government Authority involved might also have a role to play in this regard.

3. CONCLUSIONS

3.1

The EPA is prepared to regard the proposed urban cell to the east of Thomsons Lake as acceptable provided residential development therein would be under appropriate control. Management of the ground and surface water resources of the south Jandakot area constitutes an essential requirement in terms of achieving appropriate control over the proposed development. Accordingly, the EPA endorses the initiative of producing a water resources management plan which takes into account the effects of the development both on the groundwater resource and the quantity and quality of water to be discharged from the area.

3.2

The EPA believes that the theoretical principles on which the analyses are based are acceptable, but that the practical application of these principles requires further study. Verification of the predictions of water levels and water quality from a better data base and improved understanding of the response of the lake ecosystem are required.

3.3

The opportunity to stage development of a drainage scheme for the South Jandakot area would enable the scheme to be managed on an adaptive basis (ie operational management of the drainage scheme could be modified in response to experience gained). Necessarily, the notion of adaptive management is premised on careful monitoring of all the systems involved, cooperation between the various parties with an interest in these systems, and appropriate commitments from the relevant parties to respond as required to monitoring results.

3.4

Based on its consideration of the SJDWRMP, the EPA believes that the following would be appropriate objectives for water management in the general area:

. Development of a package of mechanisms to control water levels in the urban cell which is acceptable to the Water Authority of Western Australia, as the water supply and drainage agency, and in Thomsons Lake which is acceptable to the National Parks and Nature Conservation Authority in which the Thomsons Lake reserve is vested. In the event of the implementation of the proposed Beeliar Regional Park it will also be necessary for water levels in other wetlands in the Park to be acceptable to the appropriate vesting agency within the Beeliar Regional Park administration.

. Regulation of the input of nutrients and toxic contaminants to the ground water to the satisfaction of the Water Authority of Western Australia and to the wetlands to the satisfaction of the EPA. As an initial guide, the following water quality criteria for Thomsons Lake would be considered appropriate:

  - a maximum loading of 0.75 tonnes per annum of phosphorus;

  - a maximum loading of 7.5 tonnes per annum of nitrogen; and

  - other parameters as per Schedule 7(2) (Maintenance and Preservation of Aquatic Ecosystems) of Department of Conservation and Environment Bulletin No 103, with the exception of nutrients which are defined above, and recognising that criteria for temperature, salinity and pH require more precise definition. In accordance with the concept of adaptive management, these criteria may need to be refined in response to monitoring results.

  Maintenance of a wide range of options for use and disposal of drainage waters (ie maximisation of the beneficial uses of drainage waters) to the satisfaction of the Water Authority of Western Australia and, as the

options might affect Thomsons Lake and other wetlands in the proposed Beeliar Regional Park, to the satisfaction of the National Parks and Nature Conservation Authority.

4. RECOMMENDATIONS

Having considered the SJDWRMP and consulted the Department of Conservation and Land Management, and the Water Authority of Western Australia, the Environmental Protection Authority makes the following recommendations in relation to water management requirements associated with urban development of the South Jandakot area.

4.1

The Environmental Protection Authority recommends that, prior to the initiation of any rezoning proposals to allow for urban development, a drainage scheme which would satisfy the following objectives should be formulated for the South Jandakot area:

- *establish a package of mechanisms to control water levels in the urban cell which is acceptable to the Water Authority of Western Australia, as the water supply and drainage agency, and in Thomsons Lake which is acceptable to the National Parks and Nature Conservation Authority in which the Thomsons Lake reserve is vested.*

  In the event of the implementation of the proposed Beeliar Regional Park it will also be necessary for water levels in other wetlands in the Park to be acceptable to the appropriate vesting agency within the Beeliar Regional Park administration.

- *regulate the input of nutrients and toxic contaminants to the groundwater to the satisfaction of the Water Authority of Western Australia and to the wetlands to the satisfaction of the Environmental Protection Authority.*

- *maintain a wide range of options for use and disposal of drainage waters.*

4.2

The Environmental Protection Authority recommends that once this drainage scheme has been devised, it should be progressively and adaptively implemented through:

- *staged urban rezoning and development;*

- *monitoring of the effects of the drainage scheme; and*

- *tangible contributions and commitments from the developers involved (and from the Local Government Authority if it is to assume responsibility for the drainage system) towards monitoring, review and adjustment of the drainage scheme.*

4.3

The Environmental Protection Authority recommends that a structure for reviewing the acceptability of the drainage scheme should be established.

This should provide for the periodic reporting on the progress of the development, the functioning of the drainage system and retention basins and the behaviour of the wetland ecosytems. The reporting requirements should be:

- *annual reports;*
- *detailed review of progress after three years; and*
- *exhaustive review after five years with decisions to be taken at that time on whether and under what conditions the development should proceed.*

These reports should be prepared by the developers involved, with the Local Government Authority if it assumes responsibility for the drainage scheme, and submitted for review to the following agencies:

- *the Department of Conservation and Land Management:*
- *the Water Authority of Western Australia: and*
- *the Environmental Protection Authority.*

Advice from these agencies will then form the basis for adjustment or continuation of the drainage scheme.

4.4

The Environmental Protection Authority recommends that there should be liaison between:

- *the Department of Conservation and Land Management:*
- *the Water Authority of Western Australia:*
- *the State Planning Commission;*
- *the Local Government Authority: and*
- *the Environmental Protetion Authority.*

to establish procedures for the implementation of the preceding recommendations.

Appendix: Interim Water Quality Criteria to be applied to Thomsons Lake and Drainage Discharges to the Lake.

SCHEDULE 7 (2)[1].

MARINE AND ESTUARINE WATER QUALITY CRITERIA FOR MAINTENANCE AND PRESERVATION OF AQUATIC ECOSYSTEMS

Class 2

Parameter	Criterion	Source
Aesthetic Considerations	As on page 8.	USA EPA (Comp)
Floating and Submerged Litter	No materials should be present which directly or indirectly have an adverse effect upon aquatic organisms.	WG
Barriers	No barrier should be constructed, substances added nor alterations made to the marine or estuarine environment which will prevent the normal movement and migratory patterns of marine and estuarine organisms to the detriment of their populations or cause changes in the normal water movement pattern which will lead to adverse effects upon them.	WG
Light Attenuation	The combined effects of turbidity and colour should not reduce the depth of the compensation point for photosynthetic activity by more than 10% from the seasonal background value.	USA EPA
Settleable Matter	Unnatural inputs of settleable material should not cause the formation of deposits which are harmful to aquatic organisms.	VIC EPA (M)
Suspended Solids	Upper limit of 80 mg/ L and depth of compensation point for photosynthetic activity should not be reduced by more than 10% from the natural seasonal norm.	Hart/ USA EPA
Temperature	The maximum acceptable variation in the weekly average temperature due to artificial sources is 1°C for waters north and 2°C for waters south of latitude 27°S during all seasons of the year, provided that no single value exceeds the highest summer maximum recorded over the previous five years inclusive.	USA EPA
Salinity	Unnatural influences should not change the seasonal mean salinity, measured preferably over not less than five years, by more than 0.25 of the standard deviation, nor change the salinity beyond the range recorded over that period.	WG/ VIC EPA (G)
Ionic Ratio	The ratios of major ions should not be altered such that this beneficial use is affected.	WG
pH	6.5-8.5 and no change in excess of 0.2 units from normal. For waters of salinity below 5 000 mg/ L (5°/oo) the pH range should be 6.0 to 9.0 and no change in excess of 0.5 units.	USA EPA/ WG/ Hart
Dissolved Oxygen	Not to fall below 4.0 mL/ L (5.7 mg/ L) for more than 6 consecutive hours, and never to fall below 3.5 mL/ L (5.0 mg/ L).	WG
Arsenic	6 month median not to exceed 8 μg/ L No more than 20 per cent of readings to exceed 80 μg/ L. No single reading to exceed 500 μg/ L.	Calif (K&S)
Cadmium	6 month median not to exceed 3 μg/ L. No single reading to exceed 8 μg/ L.	Calif (K&S)
Chromium (total)	6 month median not to exceed 2 μg/ L. No single reading to exceed 7 μg/ L.	Calif (K&S)

Copper	6 month median not to exceed 5 μg/L. No single reading to exceed 40 μg/L.	Calif (K&S)
Lead	6 month median not to exceed 8 μg/L. No more than 20 per cent of readings to exceed 80 μg/L. No single reading to exceed 200 μg/L.	Calif (K&S)
Mercury	6 month median not to exceed 0.14 μg/L. No more than 20 per cent of readings to exceed 1.4 μg/L. No single reading to exceed 3 μg/L.	Calif (K&S)
Nickel	6 month median not to exceed 20 μg/L. No more than 20 per cent of readings to exceed 200 μg/L. No single reading to exceed 450 μg/L.	Calif (K&S)
Silver	6 month median not to exceed 0.45 μg/L. No more than 20 per cent of readings to exceed 4.5 μg/L. No single reading to exceed 10 μg/L.	Calif (K&S)
Zinc	6 month median not to exceed 20 μg/L. No single reading to exceed 200 μg/L.	Calif (K&S)
Aldrin	Not to exceed 0.003 μg/L	USA EPA
Azinphosmethyl	Not to exceed 0.01 μg/L	USA EPA
Camphechlor	Not to exceed 0.005 μg/L	USA EPA
Chlordane	Not to exceed 0.004 μg/L	USA EPA
2,4-D	Not to exceed 4 μg/L	NAS/NAE
DDT	Not to exceed 0.001 μg/L	USA EPA
Dieldrin	Not to exceed 0.003 μg/L	USA EPA
Endosulfan	Not to exceed 0.001 μg/L	USA EPA
Endrin	Not to exceed 0.004 μg/L	USA EPA
Heptachlor	Not to exceed 0.001 μg/L	USA EPA
Lindane	Not to exceed 0.004 μg/L	USA EPA
Maldison	Not to exceed 0.1 μg/L	USA EPA
Methoxychlor	Not to exceed 0.03 μg/L	USA EPA
Parathion	Not to exceed 0.04 μg/L	USA EPA
Other Pesticides	Not to exceed 0.01 of the 96-hour LC_{50} value for the selected test species.	WG
Ammonia (expressed as Nitrogen)	6 month median not to exceed 600 μg/L. No single reading to exceed 2000 μg/L.	Calif (K&S)
Chlorine (total residual)	6 month median not to exceed 2 μg/L. No single reading to exceed 10 μg/L.	Calif (K&S)
Cyanide	6 month median not to exceed 5 μg/L No single reading to exceed 10 μg/L.	Calif (K&S)
Fluoride	6 month median not to exceed 2 mg/L. No single reading to exceed 10 mg/L.	WG
Hydrogen Sulphide	Not to exceed 2 μg/L	USA EPA
Total Hydrocarbons	Not to exceed 10 μg/L	WG
Aromatic Hydrocarbons	Not to exceed 1 μg/L	WG
Phenolic Compounds	6 month median not to exceed 300 μg/L.	Calif (K&S)
Polychlorinated Biphenyls (PCBs)	Not to exceed 0.001 μg/L	USA EPA
Surfactants	Not to exceed 0.01 of the 96-hour LC_{50} value for the test organisms.	WG

Other Toxic Substances	No material should be present in an amount exceeding 0.01 of the 96-hour LC_{50} value for the test organism.	WG
Radioactive Substances	Radioactive substances should not be present in concentrations that are deleterious to human, plant, animal, or aquatic life or that result in the accumulation of radioactive substances in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life.	Calif.
Nutrients and Other Biostimulants [2]	The loads of nutrients and other biostimulants to receiving waters should not cause excessive or nuisance growths of algae or other aquatic plants or deleterious reductions in dissolved oxygen concentrations in those waters.	VIC EPA (M)
General Provision	Should any individual species or component of the ecosystem be known to have lower tolerances than those specified in the above criteria, then these levels should be those used in setting water quality objectives.	VIC EPA (M)

II. MARINE AND ESTUARINE WATER QUALITY CRITERIA FOR RECOGNISED BENEFICIAL USES

For ease of reference and for the sake of completeness, a certain amount of deliberate repetition has occurred in several Schedules corresponding to different beneficial uses. This repetition also permits independent future modification to any given Schedule without perturbation of the others.

GENERAL AESTHETIC CRITERIA

The following general aesthetic criteria should apply to all water bodies regardless of the declaration of beneficial uses unless otherwise specified.

Waters should be:

1. Free from substances which will settle to form putrescent or otherwise objectionable sludge deposits.
2. Free from floating debris, oil, grease, scum, foam and other floating materials, in amounts sufficient to be unsightly or otherwise objectionable.
3. Free from materials which will produce colour, odour, turbidity, or other conditions to such a degree as to be unsightly or otherwise objectionable.

CRITERIA FOR RADIOACTIVE SUBSTANCES

Although the Working Group consulted as widely as it was able in order to obtain specific criteria for radioactive substances, the information provided in most cases was not relevant and lacked specificity.

For example, the World Health Organization figures which are available apply only to drinking water and are not considered applicable to any envisaged beneficial uses of marine and estuarine waters.

Given the nature of the information available the following narrative criteria from the Water Quality Control Plan for Ocean Waters of California is currently adopted and should apply to all water bodies:

> Radioactive substances should not be present in concentrations that are deleterious to human, plant, animal or aquatic life or that result in the accumulation of radioactive substances in the food web to an extent that presents a hazard to human, plant, animal or aquatic life.

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1. Schedule 7(2) from Environmental Protection Authority (1981)

   Water Quality Criteria for Marine and Estuarine Waters of Western Australia. Report of the Working Group established by the Environmental Protection Authority. Department of Conservation and Environment, Perth, Western Australia. Bulletin No 103, April 1981.

2. See criteria for Phosphorous and Nitrogen loadings in Conclusion 3.3 of the report.