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WATER RESOURCES AND SEWERAGE

WATER RESOURCES AND THEIR CONTROL

Ministry of Water Resources and Water Supply

The Ministry of Water Resources and Water Supply was established under the *Water Resources Act* 1975 for the purpose of ensuring that the water resources of Victoria are utilised in the most efficient manner.

The *Water Resources Act* 1975 vested in the Minister of Water Supply the administration of the Water Act, the Melbourne and Metropolitan Board of Works Act (in respect of water, sewerage, and drainage functions), the Geelong Waterworks and Sewerage Act, the Latrobe Valley Act, the Mildura Irrigation and Water Trusts Act, the West Moorabool Water Board Act, the Dandenong Valley Authority Act, the Sewerage Districts Act, the Groundwater Act Part V, the River Improvement Act, and the Drainage of Land Act.

As part of the Ministry, there is a Water Resources Council, consisting of eleven members appointed by the Governor in Council and comprising the Director of Water Resources who is chairman; the three commissioners of the State Rivers and Water Supply Commission; the chairman, secretary, and engineer-in-chief of the Melbourne and Metropolitan Board of Works; a representative or nominee from each of the Waterworks Trust Association of Victoria, the Victorian Irrigators Central Council, the Ministry for Conservation, and the Co-ordinator of Works from the Victorian Treasury. The functions of the Council are to investigate and advise the Minister generally on matters pertaining to the water resources of Victoria or to water supply, drainage, or sewerage throughout Victoria, referred to it by the Minister.

During 1982, the Ministry was involved in a number of new and on-going studies, including:

(1) *Study into institutional arrangements.* This study was aimed at investigating the responsibilities and activities of the various authorities involved in water management in Victoria with a view to identifying areas of overlapping and conflicting interest.

(2) *Urban Water Services Financing Study.* This study, which was concerned with examining financing of non-metropolitan water and sewerage services, was completed and its recommendations adopted in principle by the Victorian Government. A start has been made in implementing some of the recommendations.

(3) *Nutrient removal trials.* A pilot study of alternative nutrient reduction processes for sewage effluent, being carried out at the Lilydale Sewerage Authority's plant, was completed in May 1982. A report has been prepared and circulated to interested groups for their information.

(4) *Reclaimed Water Committee.* Timber growth trials, aimed at determining the feasibility of growing native trees on land irrigated with sewage effluent, continued at various locations including Mildura, Horsham, and Robinvale. Vegetable growth trials to determine the feasibility of growing vegetables on land irrigated with sewage effluent also continued.

(5) *Fringe Area Committee.* A report on the water supplies in the Upper Yarra Catchment area was considered by the Water Resources Council and the technical advantages of integration of all water supplies in the region were noted. A background paper is being

prepared on the advantages and disadvantages of transferring the responsibilities of the Waterworks Trusts and Sewerage Authorities in this area to the Melbourne and Metropolitan Board of Works.

(6) *Sewerage strategy for the Lower Yarra Valley.* Following the preparation by the Environment Protection Authority of a Draft Statement on Environmental Protection Policy for the waters of the Dandenong Valley, work commenced on a report to examine the implications on the management of wastewater and sewerage authorities in the lower part of the Policy area and on Victoria's resources generally.

Further references: Water resources and their control, *Victorian Year Book* 1977, pp. 373–4; 1979, pp. 291–2; Water in the Victorian environment, 1982, pp. 1–19

MELBOURNE AND METROPOLITAN BOARD OF WORKS

Introduction

The Melbourne and Metropolitan Board of Works is the authority for providing water supply, sewerage, and main drainage services to the Melbourne metropolitan area. It is also Melbourne's metropolitan planning authority. The formation of a body such as the Board was urged by an 1889 Royal Commission into Melbourne's sanitary conditions after continuous agitation by local municipalities for a sewerage system in the city. The Board was constituted by an Act of the Victorian Parliament in 1890 and began operations in July 1891. Its initial functions were to provide a sewerage system for Melbourne and the metropolitan area, and to assume responsibility for the city's water supply, previously administered by the Public Works Department.

In the years since its inception, the Board, in addition to assuming responsibility for main drainage, has also been made responsible for maintenance and improvement of metropolitan rivers and watercourses, town planning, and metropolitan parks. With the exception of town planning, the Board's responsibilities are laid down in the *Melbourne and Metropolitan Board of Works Act* 1958 (as amended). Until 1 August 1978, the Board comprised 54 unpaid commissioners, a full-time elected chairman, and from 1975, a deputy chairman. Commissioners who were required to be members of a municipal council, could not hold their seats for more than three years without reappointment, while the maximum term for the chairman was four years before his appointment was reviewed. The deputy chairman's term was also for four years. Following recommendations by a Board of Inquiry, the composition of the Board was changed on 1 August 1978. It comprised a full-time appointed chairman and six part-time members, four elected by area commissions comprising groupings of municipalities and two appointed by the Victorian Government. Their appointments were for four-year terms. In 1982, as the result of a further review, the Board now consists of a part-time chairman, six part-time members (as above), and a full-time general manager who is not a member of the Board.

Acts of the Victorian Parliament empower the Board to levy four rates annually: the water rate, metropolitan general rate (for sewerage services), metropolitan drainage and river improvement rate, and the metropolitan improvement or planning rate, all of which are based on net annual valuations of rateable properties but subject to specified minimum charges. The incoming revenue is used to operate and maintain the water, sewerage, and main drainage systems, to pay interest and redemption charges on loans raised for capital works, and to meet administrative expenses.

The proceeds of the metropolitan improvement rate meet annual expenditure for town planning, the Board's statutory contribution towards financing the Melbourne underground rail loop, payments of compensation for lands reserved under the Metropolitan Planning Scheme, and for metropolitan parks. The capital works of the Board are financed mainly from money which the Board is given approval to borrow after the annual meeting of the Australian Loan Council has considered the projected loan programmes of semi-governmental authorities throughout Australia.

Further reference: Board of Inquiry into the Melbourne and Metropolitan Board of Works, 1977, *Victorian Year Book*, 1980, pp. 304–6

Melbourne's water storages

Water to Melbourne and the metropolitan area is supplied from eight storage reservoirs drawing on the water resources of mountain catchment areas. Pipelines carry the water

from on-stream storages distant from the city to off-stream storages located around the perimeter of the metropolitan area. Water is then conveyed to service reservoirs and elevated tanks throughout the suburbs for distribution to consumers.

When the Upper Yarra Dam was completed in 1957, the usable capacity of the storage reservoirs serving the supply system was increased to 296,000 megalitres, comprising Yan Yean Reservoir (30,000 megalitres), Maroondah (22,000), O'Shannassy (4,000), Silvan (40,000), and Upper Yarra (200,000).

In the 23 years since Upper Yarra was commissioned, this storage capacity has more than doubled to 705,000 megalitres by construction of Greenvale (27,000 megalitres), Cardinia (287,000 megalitres), and Winneke (95,000 megalitres). Work is progressing on a new major reservoir on the Thomson River, in Gippsland. The Thomson Reservoir will have a capacity of 1.1 million megalitres, 950,000 megalitres of which will be available for supply to Melbourne. This additional storage, which will be available by the late 1980s will bring the total storage capacity of Melbourne's system up to 1,655,000 megalitres or approximately three times the expected annual demand at that time.

Other major works undertaken since 1957—and particularly following the severe drought of 1967-68—include duplication of the transfer main between the Upper Yarra and Silvan Reservoirs; diversion of several Yarra tributaries into the supply system; construction of the Yarra Valley Conduit to further increase transfer capacity between Upper Yarra and Silvan; construction of a transfer main between Silvan and Cardinia Reservoirs; and the Thomson-Yarra Tunnel and Easton and Swingler Diversion Works to transfer water from the Thomson River to the Upper Yarra Reservoir.

Greenvale Reservoir is on Yuroke Creek, a branch of the Moonee Ponds Creek in the north of the city, and serves Melbourne's north-western and western suburbs to Werribee. Greenvale is supplied by pipeline from the Silvan Reservoir near Monbulk in the Dandenong Ranges, east of Melbourne. Silvan stores water from the O'Shannassy, Upper Yarra, and Thomson systems.

Cardinia is the biggest of the Board's storages with a capacity of 287,000 megalitres. It supplies Melbourne's south-eastern suburbs as far south as the boundary of Frankston and the State Rivers and Water Supply Commission Mornington Peninsula system and is fed from the Upper Yarra system via a pipeline from the southern end of the Silvan Reservoir. Supply to Silvan is supplemented by the new Yarra Valley Conduit from the Upper Yarra Reservoir which enables water diverted into the Upper Yarra from the Thomson River to be transferred to Cardinia Reservoir. This system also provides a marked degree of regulation of water from the Thomson River pending construction of the Thomson Dam.

In mid 1973, the Victorian Government announced a dam building programme aimed at further increasing the storage capacity of Melbourne's water supply system. Included in this programme is the Thomson Reservoir as the main component of the third stage of the Board of Works' largest water supply project to date—the diversion of water from the Thomson River, about 170 kilometres east of Melbourne, into the Upper Yarra system. Construction work on the Thomson project started in 1969 and the first stage—allowing diversion of water from the Thomson through a 19.6 kilometre tunnel to Fehrings Creek, a tributary of the Yarra—was commissioned in September 1974. Water from the Thomson was diverted into the tunnel, then into the Yarra River via Fehrings Creek. From the Yarra, the flow entered the Upper Yarra Reservoir. Stage two of the project involved extending this tunnel at both its western and eastern ends. The western extension carried the tunnel to the Yarra River near the Reservoir, thereby superseding the outlet into Fehrings Creek. The eastern tunnel extension allows diversion of flow from the Thomson at a point known as Swingler, just below the confluence of the Thomson and Jordan Rivers, thus making use of a larger catchment area. Incorporating a concrete diversion dam at Swingler, stage two was completed early in the second half of 1977. The major component of the third stage of the Thomson Diversion Scheme is a large storage on the Thomson River, north of Erica, to be formed by the Thomson Dam. When completed, this dam will be about 165 metres high and the earth and rockfill structure will form a reservoir inundating about 2,200 hectares. The dam will impound about 1.1 million megalitres and the proposed reservoir will extend for some 23 kilometres north of the wall.

A final decision to proceed with the Thomson Dam and its associated works was made by the Victorian Government early in 1976 after a study of the environmental implications

during both the construction and operation of the dam. During the study, members of the public were able to make written submissions, either as individuals or collectively, on any aspect of the investigation, and these submissions were taken into account during preparation of the final report and recommendations. Apart from the Thomson Dam, the works involved in the third and final stage of the Thomson scheme entail an extension of the Thomson–Yarra diversion tunnel in a south-easterly direction for about 5.5 kilometres from Swingler to emerge within the proposed Thomson Reservoir, and allowing water to be transferred to the Upper Yarra system as required, as well as outlet works in the Thomson Dam for the release of water for other uses downstream. Excavation of the tunnel is complete and construction of the dam embankment and associated works is proceeding. The Thomson Reservoir will store water during wetter years when inflows are high and thus provide an adequate water supply for Melbourne during drier years. This will enable the Board to operate its available storages much more efficiently than would be possible without a large back-up storage such as the Thomson. In addition, the dam will provide regulation of the stored water to supplement the variable flows in the Thomson River for the irrigators and water users in the Thomson Valley.

The augmentation programme announced in 1973 also included the Winneke Reservoir Project (95,000 megalitres usable capacity) to develop the resources of the Yarra River at Yering Gorge and the nearby Maroondah aqueduct. Commissioned in November 1980, the Winneke scheme comprises an intake and pumping station on the Yarra in Yering Gorge; a "pressure tunnel" from the pumping station to the reservoir; a draw-off structure and tunnel from the reservoir to carry water to a pumping station below the main dam wall; a pipeline rising from this pumping station to a water treatment plant; a "clearwater" storage basin adjacent to the treatment plant; and a pipeline from the storage basin through which treated water is transferred to the supply system.

The main dam is 85 metres high and 1,000 metres long, impounds 95,000 megalitres of water, and is flanked by two smaller saddle dams. Comprehensive treatment of Winneke water is necessary because it is drawn from a habitated catchment. The treatment plant is located close to the southern end of the main dam. It uses conventional water treatment methods in which chemicals are added to clarify water which is then filtered and chlorinated. As with the rest of Melbourne's water supply, water from Winneke is fluoridated in line with the requirements of the *Health (Fluoridation) Act* 1973.

A final decision to proceed with this project followed a comprehensive environmental study of the implications of the proposal, as a result of which significant changes were made to the original proposals to overcome environmental objections. Winneke commenced operating in February 1981.

Water is conveyed to homes and industry in the Melbourne metropolitan area from various service reservoirs situated in convenient places so that an adequate pressure can be maintained in the mains. There are 77 service reservoirs and tanks with a combined capacity of 2,308 megalitres. Underground distribution and reticulation mains convey the water from the service reservoirs to its point of use.

As part of its water supply catchment management programme, the Board is carrying out extensive forest hydrology research at Coranderrk and North Maroondah, two eucalypt forest areas north and south of Healesville. The experiments are designed to determine a scientifically based, efficient catchment management policy related to water yield and quality. At Coranderrk, the effects of two different timber harvesting operations applied to mature eucalypt forests are being monitored, while at North Maroondah studies are being made to assess the effects of a regenerated eucalypt forest on water yield.

Following consideration of the results of this research up to 1979, the Victorian Government announced in 1981 that commercial logging of timber from the Board's catchments would not be permitted.

In the interest of preserving water quality, public access to the Board of Works' forested catchment areas is not allowed, but there are picnic and passive recreational facilities at all the Board's storages except the O'Shannassy Reservoir. Public access is also available to four smaller reserves—Donelly's Weir, Coranderrk Weir, Fernshaw, and the top of Black Spur. All the reserves are easily reached by car.

Total water consumption for 1981–82 was 451,416 megalitres. Rainfall over the catchment area averaged 1,044 mm, compared with the long-term average of 1,117.2 mm.

At 30 June 1982, there were 930,573 properties or an estimated 2,545,000 persons in Melbourne supplied with reticulated water.

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: WATER SUPPLY SYSTEMS: STREAMFLOW YIELDS
(megalitres)

Year	Yan Yean	Maroondah	O'Shannassy	Upper Yarra	Thomson Diversion	Total water yield
1977–78	20,800	79,400	109,200	r213,100	67,100	r489,600
1978–79	25,400	r89,700	r123,600	227,900	75,900	r542,500
1979–80	14,300	r60,400	r92,500	122,400	76,800	r366,400
1980–81	10,900	r82,800	r114,400	183,800	112,400	r504,300
1981–82	16,800	90,400	116,200	189,200	105,000	517,600

NOTE. The yield shown for O'Shannassy includes the yield from Coranderrk, for the years 1978–79 to 1980–81 inclusive. In 1977–78, the Coranderrk yield was included with Maroondah.

Further references: Thomson-Yarra Development Scheme, *Victorian Year Book* 1974, p. 253; Cardinia Reservoir, 1975, pp. 188–9; Lower Yarra Development Scheme, 1979, pp. 295–6

Cost of water supply system

The cost of capital works in respect of the water supply system under the control of the Board is shown in the following table for each of the years 1976–77 to 1980–81:

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: CAPITAL OUTLAY ON WATERWORKS
($'000)

Particulars	1976–77	1977–78	1978–79	1979–80	1980–81
Yan Yean system (including Greenvale)	45	42	30	27	17
Maroondah system (including Watson's Creek and Sugarloaf)	21,286	42,355	55,435	49,177	31,104
O'Shannassy, Upper Yarra, and Thomson system (including Silvan and Cardinia)	28,473	22,657	19,297	22,672	36,555
Service reservoirs	3,686	4,704	4,904	3,935	5,916
Large mains and pumping stations	18,488	19,330	9,470	5,097	3,992
Reticulation	9,590	17,712	12,566	14,108	17,418
Afforestation	21	20	—	—	23
Investigations, future works	1	Cr.154	Cr.209	Cr.308	Cr.589
Total outlay	r81,590	106,666	101,493	94,708	94,436

Consumption of water

During the year ended 30 June 1982, the maximum consumption of water in Melbourne and suburbs on any one day was 2,838 megalitres on 12 January 1982, and the minimum consumption was 786 megalitres on 27 July 1981.

The following table shows, for each of the years 1977–78 to 1981–82, the number of properties supplied with water and sewers, the quantity of water consumed, the daily average consumption, the daily average consumption per head of population served, etc.:

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: WATER CONSUMPTION AND SEWERAGE CONNECTIONS

Year	Improved properties supplied with water at 30 June	Total annual consumption of water	Consumption of water on any one day		Daily average of annual consumption of water	Daily consumption of water per head of population served	Improved properties for which sewers were provided at 30 June
			Maximum	Minimum			
	number	megalitres	megalitres	megalitres	megalitres	litres	number
1977–78	868,640	402,632	2,399	705	1,103	444.08	716,670
1978–79	875,485	393,626	2,297	694	1,078	434.85	748,787
1979–80	899,341	446,801	2,657	714	1,221	488.90	768,647
1980–81	913,652	453,306	2,933	771	1,242	491.49	793,118
1981–82	930,573	451,416	2,838	786	1,237	486.05	820,075

Sewerage system

The cost of sewerage works during each of the years 1976–77 to 1980–81, is shown in the following table:

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: CAPITAL OUTLAY ON SEWERAGE SYSTEM
($'000)

Particulars	1976–77	1977–78	1978–79	1979–80	1980–81
Farm purchase and preparation	742	574	1,235	1,793	2,032
Treatment works	7,458	4,942	4,164	2,675	4,611
Outfall sewer and rising mains	354	89	Cr.214	104	825
Pumping stations, buildings, and plant	921	1,207	1,491	865	855
Main and branch sewers	33,575	14,368	9,669	17,463	18,426
Reticulation sewers	30,667	50,378	46,621	45,128	54,586
Sanitary depots	3	61	Cr.15	1	Cr.34
Investigations	11	56	Cr.48	Cr.377	Cr.349
Total outlay	73,731	71,675	62,903	67,652	80,952

Disposal of nightsoil from unsewered premises

The responsibility for the collection, removal, and disposal of nightsoil from unsewered premises within the Melbourne metropolitan area was transferred from the individual municipal councils to the Melbourne and Metropolitan Board of Works by legislation in 1922. By agreement, each council pays to the Board a prescribed amount per annum to offset the cost of the service, etc. For the year 1980–81, working expenses were $324,131, costs of conveying and treatment $135,453, and investment $40,506, making a total of $500,090. Revenue was $438,434, giving a deficit of $61,656.

Drainage

The Board has been responsible for main stormwater drainage in the Melbourne metropolitan area since 1923. The current drainage area under the Board's control covers some 1,878 square kilometres. Besides being responsible for underground drains and the smaller creeks and watercourses, the Board also has responsibility over the metropolitan rivers within the drainage area. However, considerable portions of the catchments of these rivers are outside the Board's area of jurisdiction, a situation which has caused many problems. Local drainage responsibilities, namely, those areas draining less than about 60 hectares, rest with the respective municipal councils.

The drainage functions of the Melbourne and Metropolitan Board of Works are aimed at the control of flooding, erosion, and pollution and include construction of works, maintenance of works and natural channels, and policing of regulations. Total prevention of flooding is not financially feasible, so efforts are directed towards control and minimisation of the effects. Structural measures such as pipes and channels considerably improve the hydraulic efficiency of a waterway. (Lined channels are often used to overcome the susceptibility of many of Melbourne's soils to erosion.) However, such solutions are not always viable. Alternative solutions such as retarding basins have been successfully provided and 27 such basins are operated by the Board. A retarding basin is a reservoir, normally empty, having an outlet, always open, which is smaller than the inlet. During high flows the constriction holds back some of the flow and this only gradually escapes to the downstream system as the inflow subsides.

Other measures to minimise flooding take the form of regulations. The prevention of building in flood prone areas, the setting of designated flood levels which control floor levels in new buildings, and the restriction of filling in of flood plains which use up valuable natural flood storage, are examples of such regulations.

During 1980–81, the Board published an Interim Drainage Basin Management Criteria Manual which is aimed at achieving a co-ordinated approach to the drainage, flood control, and flood plain management based mainly on the total catchment management principle.

The Board carries out continual maintenance to ensure the required waterway area is always available. Such maintenance includes the removal of sedimentation, erosion

prevention measures, clearing debris and rubbish, and de-snagging. In so doing the appearance of the creeks and watercourses is preserved and dangerous areas eliminated.

The Board is also the delegated agency of the Environmental Protection Authority in regard to pollution of the rivers, creeks and drains in the Melbourne metropolitan area. These responsibilities include conditional licensing of trade and industrial waste discharges, monitoring and analysing samples, and reporting any infringement or illegal discharge to the Authority.

At 30 June 1982, the total length of constructed drains under the Board's control was 534 kilometres.

Finance

Assessed value of property

The net annual value of property in 1977–78 to 1980–81 for the purpose of the Board's rating is shown in the following table:

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: ASSESSED VALUE OF PROPERTY RATED
($m)

Rate	Net annual value of property			
	1977–78	1978–79	1979–80	1980–81
Water rate	1,641.5	1,677.9	1,719.5	1,752.3
Metropolitan general rate (for sewerage services)	1,321.6	1,374.5	1,435.7	1,478.3
Metropolitan drainage and river improvement rate	1,360.6	1,382.6	1,402.1	1,421.7
Metropolitan improvement rate	1,668.9	1,706.5	1,743.9	1,777.3

Finance for capital works

Capital works are financed mainly from money which the Board is given approval to borrow after the annual meeting of the Australian Loan Council has considered the projected loan programmes of semi-governmental authorities throughout Australia.

Board's borrowing powers and loan liability

The Board is empowered under section 187 of its Act to borrow up to $2,000m, exclusive of loans of $4.8m originally raised by the Victorian Government for the construction of waterworks for the supply of Melbourne and suburbs. In addition, the Board may, under section 200 of its Act, receive advances by way of loan from the Treasurer of Victoria, and the value of these loans is not included in the limit of $2,000m quoted in section 187. At 30 June 1981, the Board's total loan liability amounted to $1,626.8m, of which $1,369.0m had been incurred under section 187. All money borrowed is charged and secured upon the Board's revenues.

Revenue, expenditure, etc.

The following table shows the revenue, expenditure, surplus or deficit, and capital outlay of the Board in respect of its water supply, sewerage, and drainage functions during each of the years 1976–77 to 1980–81. The Board keeps a separate account of its financial activities as the Metropolitan Planning Authority.

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: REVENUE, EXPENDITURE, ETC.
($'000)

Particulars	1976–77	1977–78	1978–79	1979–80	1980–81
	REVENUE				
Water supply—					
Water rates and charges (including revenue from water supplied by measure)	67,189	73,951	82,037	111,452	132,291

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: REVENUE, EXPENDITURE, ETC.—*continued*
($'000)

Particulars	1976-77	1977-78	1978-79	1979-80	1980-81
REVENUE—*continued*					
Sewerage—					
Sewerage rates	84,228	92,390	103,792	121,972	132,451
Trade waste charges	6,681	7,411	7,989	9,717	11,221
Sanitary and miscellaneous charges	2,423	2,712	3,042	4,127	4,760
Metropolitan farm—					
Grazing fees, rents, pastures, etc.	3	2	4	3	3
Balance, livestock account	229	421	1,279	2,374	1,343
Metropolitan drainage and rivers—					
Drainage and river improvement rate	11,870	13,697	15,541	18,499	20,040
River water charges	12	16	18	122	165
Total	172,635	190,600	213,702	268,266	302,274
EXPENDITURE					
Water supply—					
Management	8,694	10,445	12,087	15,199	18,212
Maintenance	16,488	18,847	20,819	23,784	30,448
Water supply works	1,652	1,652	1,932	*(a)*	*(a)*
Sewerage—					
Management	10,755	13,144	13,754	15,507	18,387
Maintenance	19,599	22,102	24,747	27,382	31,359
Sewerage works	3,068	3,068	3,588	*(a)*	*(a)*
Metropolitan farm—					
Management	813	884	941	1,027	1,087
Maintenance	2,992	3,383	3,751	4,308	5,729
Metropolitan drainage and rivers—					
Management	1,735	2,165	3,164	3,510	3,906
Maintenance	4,162	4,691	4,705	5,306	6,596
Drainage works	1,180	1,180	1,380	*(a)*	*(a)*
Pensions and allowances	844	—	—	—	—
Loan flotation expenses	1,128	672	1,593	2,430	2,693
Interest (including exchange)	74,246	89,052	106,304	118,818	118,747
Contributions to—					
Sinking fund	2,727	3,172	3,693	4,074	4,555
Loans redeemed reserve	6,436	7,159	7,850	8,378	8,698
Renewals fund	1,796	2,449	3,168	5,632	6,520
Depreciation	1,019	372	299	309	322
Superannuation account	4,965	5,317	5,653	5,450	6,289
Provident Fund	—	—	—	—	2,000
Municipalities for valuations, etc.	265	444	442	441	448
Rates equalisation reserve	4,371	202	Cr.6,468	2,952	Cr.2,408
Appropriations for contingencies, accrued interest, etc.	3,200	200	300	—	5,000
Insurance fund	..	..	..	4,500	4,292
Capital works	..	..	..	18,400	28,200
Other	500	—	—	859	1,194
Total	172,635	190,600	213,702	268,266	302,274
Capital outlay at 30 June—					
Water supply	515,931	622,597	724,091	818,798	913,234
Sewerage	700,769	772,445	835,348	903,001	983,953
Drainage and river improvement works	74,098	83,343	91,981	101,339	114,153

(a) Not now apportioned between services. See contributions to capital works.

Town planning, metropolitan freeways, etc.

As a result of the passing of the *Metropolitan Bridges, Highways, and Foreshores Act* 1974 by the Victorian Parliament, the Board's road making powers, road assets, etc., and certain officers and other employees were transferred to the Country Roads Board, on 1 July 1974.

Also, under the same Act, the Board's responsibility for foreshores reverted to the Public Works Department.

In respect of its town planning functions, the Board now operates under the authority of the Minister for Planning.

The following table summarises the revenue, expenditure, and capital outlay of the Board in connection with its functions as the Metropolitan Planning Authority during the period 1976–77 to 1980–81:

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: METROPOLITAN IMPROVEMENT FUND: REVENUE ACCOUNT AND CAPITAL OUTLAY
($'000)

Particulars	1976–77	1977–78	1978–79	1979–80	1980–81
REVENUE					
Metropolitan improvement rate and sundry income	16,344	17,447	17,995	19,447	20,866
Sales of land	1,644	4,781	2,766	2,565	4,734
Other	19	—	—	—	—
Total revenue	18,007	22,228	20,761	22,012	25,600
EXPENDITURE					
Management	4,576	4,864	5,650	6,453	7,532
Maintenance	305	453	757	1,027	1,580
Interest	120	210	51	51	51
Reserved land and acquisitions	5,557	2,409	7,084	2,415	4,535
Metropolitan parks land acquisitions	6,080	6,629	2,775	6,677	2,663
Construction works	894	1,451	1,284	1,847	1,869
Contribution to Melbourne Underground Rail Loop Authority	1,372	2,250	3,036	3,900	5,225
Transfer to rates equalisation fund	Cr.1,289	3,540	Cr.337	Cr.828	1,513
Other	392	422	461	470	632
Total expenditure	18,007	22,228	20,761	22,012	25,600
Capital outlay at 30 June	55,591	61,238	69,498	75,715	80,786

STATE RIVERS AND WATER SUPPLY COMMISSION

Operations

Following a Royal Commission on water supply, the Victorian Parliament passed the Irrigation Act of 1886 which vested the right to the use and control of all surface waters of Victoria in the Crown. This Act also provided for the establishment of irrigation trusts. Within a few years, large areas of Victoria were included in their districts. Inadequate water conservation, divided control of water resources, insufficient charges, and irregular revenue because water was used on a large scale only in dry years, caused most of the trusts to fail. Their failure made clear the need for a single authority to manage Victoria's water resources and resulted in the formation of the State Rivers and Water Supply Commission.

The State Rivers and Water Supply Commission was constituted under the Water Act passed by the Victorian Parliament in 1905. Under the provisions of the Act, the Commission was made responsible in general terms for the conservation, distribution, and management of Victoria's water resources outside the Melbourne metropolitan area.

In recent years the Commission's role has broadened. The *Groundwater Act* 1969 gave the Commission additional responsibilities in regard to control of underground water. Amendments to the Local Government Act in 1973 extended the Commission's powers over sub-division of land. Prior to the amendment, the Commission's approval was only required for sub-divisions within irrigation districts; its approval is now required for all sub-divisions outside the Melbourne metropolitan area. The *Drainage of Land Act* 1975 conferred on the Commission additional powers relating to the drainage of land and management of flood plains, outside the Melbourne and Metropolitan Board of Works and Dandenong Valley Authority areas.

The Commission comprises three commissioners appointed by the Governor in Council. At 31 August 1982, it employed a permanent workforce of 1,839 persons throughout Victoria. Maximum numbers of permanent staff engaged on programmes were: 260 on water resources; 81 on the management of waterways and related lands; 850 on management of irrigation, drainage, and salinity control works; 396 on operation and

management of urban water and waste-water systems; and 252 on management support. A casual labour force of 1,100 persons was also employed on construction, operation, and maintenance activities.

In addition to the administration of flood protection, drainage, and river improvement works throughout Victoria, more than 60 large storages, 320 subsidiary reservoirs, and 30,000 kilometres of channels and pipelines are operated by the Commission to supply water for irrigation, stock and domestic purposes, and reticulated town supplies. All these works were designed and constructed, and are operated and maintained by the Commission. Delivery of irrigation water totalled 3,060,955 megalitres for 1981–82.

The Commission's engineering functions are divided among the following five Branches, each under the control of a director:

(1) Engineering and Technical Services Branch is responsible for survey, design, and construction of major projects, maintenance and operation of major storages, and laboratory services;

(2) Rural Water Supplies Branch is responsible for design of works and operation and maintenance of irrigation, drainage, flood protection, river improvement districts, and flood plain management;

(3) Urban Water Services Branch is responsible for the construction, operation, and maintenance of urban water supply systems, as well as engineering and financial supervision of local water supply and sewerage authorities;

(4) Mechanical Branch is responsible for the design, construction, and maintenance of the Commission's mechanical and electrical engineering works as well as supervising the Commission's plant and vehicle fleets; and

(5) Planning and Development Branch is responsible for investigations of major proposals and salinity control works, and for developing corporate works programmes.

Support services to these Branches are supplied by the Finance, Stores, Personnel, Property and Legal Services, Valuations, and Secretarial Divisions of the Commission.

Outside the Melbourne metropolitan area there are now 461 towns served by a reticulated water supply scheme, of which 126 are managed by the Commission and the remaining 335 are managed by 202 local water authorities. There are also 139 sewerage authorities, 28 river improvement trusts, and 4 drainage trusts serving Victoria outside the Melbourne metropolitan area.

Other services offered by the Commission include: irrigation and agricultural extension services, such as surveying, irrigation land layout, and surface and underground drainage layout; salinity control; licensing and control of private diversions from rivers and streams and from underground sources; and assessment, licensing, and policing of discharges to water outside the Melbourne metropolitan and La Trobe Valley and Dandenong Valley areas. The Commission has also developed, patented, and arranged for the manufacture under licence of small control structures, both manual and automatic, for use in farm channels.

VICTORIA—MAJOR WATER SUPPLY PROJECTS COMPLETED, 1974 to 1982

Project	Features
Rosslynne Reservoir (1974)	Earth and rockfill dam, storage 24,500 megalitres.
Millewa Domestic and Stock Scheme (1975)	Replacement of channels with pipelines, serving 227,000 hectares.
South Otway Pipeline (1975)	80 kilometre concrete-lined, mild steel pipes of 450 mm diameter.
Tarago–Western Port Pipeline (1977)	90 kilometre concrete-lined, mild steel pipes of 1,050 mm diameter.
Merrimu Stage 2 (Lerderderg River to Goodmans Creek) (1979)	Tunnel 4 kilometres long and Diversion Weir on Lerderderg River.
Dartmouth Dam (River Murray Commission) (1979)	Earth and rockfill dam, storage capacity 4,000,000 megalitres.
Cardinia–Frankston Pipeline (Stage 1) (1981)	11.73 kilometres concrete-lined, mild steel pipes 1,420 mm diameter.

VICTORIA—MAJOR WATER SUPPLY PROJECTS COMPLETED, 1974-1982—*continued*

Project	Features
Mildura-Merbein Groundwater Interception Scheme (1981)	Construction of bores adjacent to Murray River, and pipeline to inland evaporation basin, to intercept saline groundwater entering Murray River.
Nyah Pipeline Project (1982)	Replacement of channels with 44.74 kilometres of concrete pipeline serving an area of 1,566 hectares.

Future programmes

Proposed expenditure on major works, urban water supply, provision of sewerage facilities, environmental protection, and water quality improvement under the Commission's six-year programmes of capital works for the period 1982-83 to 1987-88 requires an allocation of $297m (at December 1981 prices) over the programme period, subject to the availability of funds. This involves an average annual expenditure of $49.5m.

Major provisions in the programme include:

(1) Completion of three major water conservation dams already under construction, augmentation of three further dams for urban, industrial, and irrigation supplies, and water resource assessment. Total estimated cost of this programme is $43m.

(2) Management of waterways and related lands, flood plain management, and control of flood protection districts. Total estimated cost of this programme is $21m.

(3) Provision of rural water supplies, including private diversions and drainage and salinity control measures. This programme aims to enhance the viability of existing irrigation schemes, having regard to the need to protect Murray River water quality. Total expenditure is estimated to be $41m. This includes amounts for ongoing investigations and monitoring.

(4) Provision of urban water supply and wastewater services. Expenditure includes works to augment water supply systems, improve their operating capabilities, and for water quality improvement works. Total expenditure for main urban districts is estimated to be $77m.

Irrigation

Most irrigation is carried out in districts directly controlled by the Commission, although there is an increasingly large proportion of "private diverters", that is, irrigators who are authorised to take water from watercourses but whose holdings are not located inside an irrigation district. In the irrigation districts, water assigned to a given district is allocated to lands commanded by the channel system and suitable for irrigation on the basis of a water right. Irrigators pay a fixed sum for the volume of water allocated under water rights whether or not the water is actually used. Water rights are available in all but the driest years, and volumes in excess of water rights are usually available. The water right system ensures the irrigators of a minimum volume of water each year (except in severe drought years). Similarly, the Commission can rely on fairly constant revenue to meet the costs of district operations.

A feature of Victorian irrigation policy has been the development of closer settlement by intensive irrigation, that is, by allocating relatively large quantities of water per holding instead of limiting the allocation of water to a portion of each holding. This has meant that Victorian irrigation is predominantly devoted to dairying and horticulture, rather than to sheep raising. Delivery of irrigation water totalled 3,060,955 megalitres for 1981-82.

In 1981-82, the area watered by private diversion from lakes, rivers, etc., was 76,375 hectares and the number of private diversions authorised for irrigation was 7,775. The water delivered was used mainly to produce annual and perennial pastures and fodder, as well as potatoes, tobacco, hops, vegetables, vines, fruits, and cereals. About half the area privately watered is supplied from streams regulated by storages, the other half being from streams wholly dependent on rainfall. Many private storage dams are being built, frequently at substantial cost, to insure against low flows in the natural source.

The following table shows the areas irrigated in Victoria for the years 1977-78 to 1981-82:

VICTORIA—AREA IRRIGATED
(hectares)

Source of supply	1977-78	1978-79	1979-80	1980-81	1981-82
Goulburn-Loddon system	272,339	259,836	256,350	264,786	269,977
Murray River system	181,643	179,329	193,553	192,216	185,136
Other northern systems	7,035	6,541	6,975	7,549	7,593
Southern systems	36,341	34,800	37,725	36,815	37,090
Private diversions	77,988	71,101	74,045	75,753	76,375
Total	575,346	551,607	568,648	577,119	576,171

Further references: Irrigation, *Victorian Year Book* 1962, pp. 479–83; Wimmera-Mallee region water supply, 1963, pp. 499–501; Flood protection, river improvement, and drainage, 1963, pp. 501–2; Underground water, 1964, pp. 544–5; Water supply in Victoria, 1964, pp. 535–44; Goulburn-Murray Irrigation District, 1965, pp. 477–9; Spray irrigation in agriculture and dairying, 1965, p. 502; Private irrigation development, 1966, pp. 477–9; Water Research Foundation, 1966, pp. 479–80; River improvement, 1967, p. 298; Rivers and streams fund, 1967, p. 298; Dandenong Valley Authority, 1968, pp. 300–1; Water conservation, 1969, pp. 309–10; Water supply to Western Port, 1971, pp. 288–90; Lake William Hovell dam, 1972, pp. 294–5; River Murray Agreement and the River Murray Commission, 1972, pp. 296–301; Ten year plan, 1974, pp. 298–304; Millewa pipeline project, 1974, pp. 296–7; Snowy Mountains Hydro-Electric Scheme, 1974, pp. 298–304; Millewa Scheme, 1975, pp. 403–6; Tarago-Western Port pipeline, 1975, pp. 406–7; Storages, 1979, pp. 303–5; Water pollution control, 1981, p. 312

COUNTRY TOWN SUPPLIES

Introduction

During the gold rushes of the 1850s, large numbers of persons migrated to areas without adequate water supply either for domestic or mining purposes. The mining population was too unsettled to accept responsibility and no suitable supply authority existed. The Victorian Government, therefore, established the Victorian Water Supply Department which constructed reservoirs where needs were most pressing. The earliest reticulated supplies were to Bendigo in 1859, Ballarat in 1862, and Geelong in 1865. From 1872, government loans enabled municipal corporations to construct many waterworks of enduring value.

The first comprehensive legislation for the supply of water to country districts was the Water Conservation Act of 1881. This Act provided for the constitution of waterworks trusts to construct and manage supply works throughout Victoria. More detailed legislation to control supplies in urban areas was added in 1884.

By 1945, there were 258 cities and towns in Victoria with water supply systems, providing reticulated supplies to 51 per cent of Victoria's population outside the Melbourne metropolitan area. There are now 461 cities and towns with reticulated water supplies. Supplies to 126 of these are managed by the State Rivers and Water Supply Commission—either as part of its major urban supply systems or as isolated towns in areas supplied for irrigation or domestic and stock purposes. The remaining 335 towns are supplied by local water authorities.

Eighty-two towns are supplied by the Commission's major urban supply systems on the Mornington Peninsula, Bellarine Peninsula, Otways, and Coliban areas which were constructed primarily to supply towns (although a substantial volume of water for irrigation is supplied to the Bendigo-Castlemaine areas). A further sixty towns are supplied from irrigation or waterworks districts in isolated areas of the State.

Local authorities

The administration of water and sewerage systems by separate authorities in country towns is unique to Victoria. Each authority enjoys autonomy in most of its functions but, as the Victorian Government usually provides a high degree of financial assistance, it requires that each trust submits proposals for new works to the Commission's scrutiny before approval and funds are forthcoming. At June 1982, there were 202 local water authorities supplying 335 Victorian country towns. A further seven town supply systems are under construction.

VICTORIA—LANDS UNDER IRRIGATED CULTURE: EXTENT OF IRRIGATION AND AREAS WATERED, 1981-82

Name of district, area, etc.	Total area of holdings in irrigation districts	Area classified as suitable for irrigation	Water rights apportioned (including extra water right)	Area irrigated, (including lands adjoining a district)										
				Total	Cereals including millet	Lucerne grown for pasture and hay	Sorghum and other annual fodder crops	Pastures			Vine-yards	Orchards	Market gardens	Fallow and mis-cellaneous
								Native	Annual	Perennial				
	hectares	hectares	megalitres	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares
GOULBURN-CAMPASPE-LODDON SYSTEM														
Shepparton	82,321	75,876	181,481	37,577	1,042	277	88	267	12,164	18,835	101	3,602	463	738
Rodney	109,136	100,791	254,350	62,435	—	738	3,279	518	21,566	30,999	55	3,169	1,655	456
Tongala-Stanhope	31,164	28,610	105,071	25,278	795	67	—	10	6,684	17,419	—	143	50	110
Deakin	62,850	41,431	43,573	10,791	299	159	—	13	5,346	4,294	—	—	337	343
Rochester	75,682	69,170	148,814	48,656	1,380	173	557	—	24,007	20,555	—	9	899	1,076
Dingee	4,379	3,822	10,051	2,336	50	—	6	—	684	1,596	—	—	—	—
Calivil	26,734	24,721	39,991	11,569	327	108	22	44	5,730	4,797	—	—	—	541
Tragowel Plains	88,805	76,216	121,956	45,145	3,637	58	544	1,997	30,770	5,112	—	—	32	2,995
Boort	47,288	40,606	54,077	21,216	2,742	735	97	80	11,351	1,982	—	—	380	3,849
Campaspe	8,535	8,119	19,381	3,896	192	377	—	—	528	2,544	—	—	200	55
East Loddon	—	—	—	165	8	—	—	—	99	58	—	—	—	—
West Loddon	—	—	—	913	24	48	—	—	327	40	—	—	—	474
Total	536,894	469,362	978,745	269,977	10,496	2,740	4,593	2,929	119,256	108,231	156	6,923	4,016	10,637
MURRAY RIVER SYSTEM (Torrumbarry Weir)														
Cohuna	52,326	49,110	135,834	41,108	203	287	1,299	521	19,972	18,682	—	—	23	121
Koondrook	38,139	32,464	73,168	25,210	2,171	87	186	186	16,423	5,262	—	91	5	799
Swan Hill	15,479	14,700	56,056	8,138	68	262	27	4	1,418	3,281	1,359	467	846	406
Third Lake	9,279	8,386	13,207	3,407	365	174	133	28	2,391	183	—	1	—	132
Mystic Park	8,673	7,735	11,508	4,775	790	42	—	57	3,372	320	26	16	28	124
Tresco	1,842	983	5,315	1,045	—	—	—	1	14	2	775	145	108	—
Fish Point	7,431	7,044	9,981	2,202	101	—	47	1,216	680	97	—	—	—	61
Kerang	34,246	29,668	62,150	22,726	1,456	193	227	1,461	14,033	3,996	—	—	8	1,352
Kerang North-West Lakes	—	—	—	558	71	38	15	—	195	—	79	41	7	112
Total	167,415	150,090	367,219	109,169	5,225	1,083	1,934	3,474	58,498	31,823	2,239	761	1,025	3,107

VICTORIA—LANDS UNDER IRRIGATED CULTURE: EXTENT OF IRRIGATION AND AREAS WATERED, 1981–82—*continued*

Name of district, area, etc.	Total area of holdings in irrigation districts	Area classified as suitable for irrigation	Water rights apportioned (including extra water right)	Area irrigated, (including lands adjoining a district)											
				Total	Cereals including millet	Lucerne grown for pasture and hay	Sorghum and other annual fodder crops	Pastures			Vineyards	Orchards	Market gardens	Fallow and miscellaneous
								Native	Annual	Perennial				
	hectares	hectares	megalitres	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares
MURRAY RIVER SYSTEM—*continued* (Yarrawonga Weir)														
Murray Valley (direct from river by pumping)	128,944	113,531	254,505	56,254	2,826	538	264	2	25,004	23,101	34	1,811	302	2,372
Nyah	1,566	1,327	9,359	994	—	—	8	44	36	77	592	65	144	28
Red Cliffs	5,503	5,169	43,798	4,831	—	8	—	30	1	7	4,518	177	18	72
Merbein	3,732	3,501	30,318	3,351	—	3	—	9	7	13	2,972	301	1	45
Robinvale	3,608	3,079	17,551	2,226	—	—	—	—	—	—	2,118	101	2	5
Carwarp-Yelta	—	—	—	238	166	13	—	10	49	—	—	—	—	—
Total	143,353	126,607	355,531	67,894	2,992	562	272	95	25,097	23,198	10,234	2,455	467	2,522
First Mildura Trust	15,863	8,073	73,820	8,073	—	—	—	—	—	214	6,223	284	—	1,352
Murray River system Total	326,631	284,770	796,570	185,136	8,217	1,645	2,206	3,569	83,595	55,235	18,696	3,500	1,492	6,981
OTHER NORTHERN SYSTEMS														
Coliban	—	—	—	4,624	5	69	—	288	750	2,900	44	394	100	74
Wimmera	—	2,988	—	2,969	10	4	—	—	22	2,879	—	34	20	—
Total	—	2,988	—	7,593	15	73	—	288	772	5,779	44	428	120	74
SOUTHERN SYSTEMS														
Bacchus Marsh	2,060	1,297	3,760	1,234	—	55	—	26	—	604	—	236	266	47
Werribee	3,760	3,511	9,673	3,120	5	53	—	—	2	1,041	—	33	1,959	27
Maffra-Sale	34,680	28,602	66,358	19,632	29	99	98	627	—	18,768	—	—	11	—
Central Gippsland	17,896	15,417	40,126	12,875	40	18	110	434	—	12,273	—	—	—	—
Mornington Peninsula	—	—	—	104	—	—	—	—	—	—	—	—	58	46
Bellarine Peninsula	—	—	—	125	—	—	—	—	—	—	—	—	105	20
Total	58,396	48,827	119,917	37,090	74	225	208	1,087	2	32,686	—	269	2,399	140
PRIVATE DIVERSIONS THROUGHOUT THE STATE														
Total	—	—	—	76,375	1,683	3,135	1,210	366	14,151	30,800	4,100	4,885	11,305	4,740
GRAND TOTAL 1981–82	921,921	805,947	1,895,232	576,171	20,485	7,818	8,217	8,239	217,776	232,731	22,996	16,005	19,332	22,572
GRAND TOTAL 1980–81	922,403	805,840	1,891,678	577,119	31,581	8,276	3,627	8,901	213,714	229,689	22,707	15,975	18,622	24,027

Organisation

There are two broad classes of local water authority:

(1) "Local governing bodies", which are municipal councils constituted as local governing bodies under the Water Act; and

(2) "waterworks trusts", the commissioners of which might comprise:

(i) councillors for the time being of the municipality concerned plus one Victorian Government nominee;

(ii) councillors of one or more municipal ridings plus up to three nominees; or

(iii) commissioners elected directly by the water ratepayers.

Local governing bodies (16) are usually limited to cities or boroughs as their water supply districts must be essentially urban in character. Although a local governing body may be composed entirely of councillors and use the council's name, it is a separate legal entity and its business and accounts must be kept apart from the administration of municipal affairs. Waterworks trusts usually comprise about six commissioners and have jurisdiction over a waterworks district, within which there may be one or more urban districts, and in some cases, rural districts.

Five local water authorities operate under special Acts which are usually supplementary to the Water Act. These special authorities include the Mildura Urban Water Trust, the First Mildura Irrigation Trust, the Geelong Waterworks and Sewerage Trust, the Latrobe Valley Water and Sewerage Board supplying water in bulk to towns and industries in the La Trobe Valley, and the West Moorabool Water Board which supplies water in bulk to the local authorities at Ballarat and Geelong. A number of small townships in Victoria are still supplied by local municipal councils under powers conferred by the Local Government Act. However, the provisions of that Act in relation to water supply are not sufficiently specific for the management of any substantial town water supply system. Although such supplies can receive consideration for a capital grant under the town water supplies assistance formula, the remainder of the costs must be found by the municipality concerned from its normal sources of loan funds.

The structure and organisation of country town water and sewerage supplies have been subject to the scrutiny of the Public Bodies Review Committee. Recommendations published in the Committee's Sixth Report entitled *Future Structures for Water Management: Regional and Local Structures for Urban Services* are now being used as the basis to begin re-structuring these local authorities.