WATER RESOURCES AND SEWERAGE

WATER RESOURCES AND THEIR CONTROL

Ministry of Water Resources and Water Supply

During the summer of 1973 the Melbourne metropolitan area was faced with a serious water shortage because of a prolonged dry spell of weather. To advise the Victorian Government on steps to overcome the emergency at that time and to plan future water conservation works, a Standing Committee consisting of representatives of Victoria's two major water authorities—the State Rivers and Water Supply Commission and the Melbourne and Metropolitan Board of Works—and a representative of the Victorian Treasury, was appointed. The work of the Committee emphasised the desirability of having a co-ordinating body for Victoria's water resources.

The Water Resources Act 1975 established the Ministry of Water Resources and Water Supply for the purpose of ensuring the most efficient utilisation of the water resources of Victoria. This Act vested in the Minister of Water Supply the administration of the Water Act, the Melbourne and Metropolitan Board of Works Act (in respect of the water, sewerage, and drainage functions), Geelong Waterworks and Sewerage Act, Latrobe Valley Act, Mildura Irrigation and Water Trusts Act, River Improvement Act, West Moorabool Water Board Act, Groundwater Act Part V, and 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 comprising the three commissioners of the State Rivers and Water Supply Commission, the chairman, deputy chairman, 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, and the Ministry for Conservation, the co-ordinator of works from the Victorian Treasury, with the Director of Water Resources as chairman. 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.

The Ministry performs a co-ordinating function in assessing and developing Victoria's water resources, including the extension and development of sewerage and drainage services, and has responsibilities for long range planning of future requirements, for achieving a balance between rural, urban, and industrial development, and for advice on priorities for construction.

The legislation does not change in any way the functions of either the State Rivers and Water Supply Commission or the Melbourne and Metropolitan Board of Works, but implements the Victorian Government's policy of bringing both bodies under a single Ministry to enable the co-ordination of their activities to occur.

Further reference, 1976

Groundwater Act

The Groundwater Act, which was proclaimed in September 1970, enabled the Mines Department* and State Rivers and Water Supply Commission to establish the administrative procedures necessary for the investigation, conservation, and utilisation of the groundwater resources of Victoria. The Act gives the Mines Department authority to investigate Victoria's groundwater resources so that total water resources and their proper use can be considered by the Victorian Government in the future.

At August 1977, 4,161 licences to extract groundwater for purposes other than domestic and stock use had been issued by the Commission, and more than 11,200 bores had been registered for domestic and stock use.

A Groundwater Conservation Area has been declared in the Koo-Wee-Rup-Dalmore District. More than 200 bores are operated in the district for the irrigation of a total area of about 4,000 hectares of pastures and miscellaneous cash crops. Investigations are in progress to determine the safe volume which may be extracted annually.

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). The Board comprises 54 unpaid commissioners, a full-time, elected chairman and, from 1975, a deputy chairman. A commissioner, who must be a member of a municipal council, cannot hold his seat for more than three years without appointment, while the maximum term for the chairman is four years before his appointment is reviewed. The deputy chairman also serves four years before there is a review of his appointment.

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 with certain minimum amounts payable for the three former rates. The incoming revenue is used to operate and maintain the water, sewerage, and main drainage systems, to pay interest and redemption charged on loans raised for capital works, and to meet administrative expenses.

The proceeds of the metropolitan improvement rate meet annual expenditure for town planning, 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 moneys 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.

^{*} Now part of the Department of Minerals and Energy. (See also Chapter 12.)

Melbourne's water storages

Water to Melbourne and the metropolis is supplied from seven 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 metropolis. 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 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 20 years since Upper Yarra was commissioned, this storage capacity has more than doubled to 610,000 megalitres and work is under way on two new major reservoirs to add about another 1.2 million megalitres of water storage and give Melbourne, by the early 1980s, a supply system with a storage capacity equivalent to three times the expected annual demand.

The years since the completion of the Upper Yarra Dam have been the most significant in the history of Melbourne's water supply system. 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 Greenvale and Cardinia Reservoirs; 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, as well as transfer mains from Cardinia to Dandenong, and from Dandenong to Notting Hill; and the Thomson Diversion Tunnel and Easton Diversion Works to transfer water from the Thomson River to Upper Yarra Reservoir. Major works currently in progress include the Sugarloaf Dam, with associated pumping station and water treatment works, and construction of the Thomson Dam.

The completion of the Greenvale (1971) and Cardinia Reservoirs (1973) added another 314,000 megalitres to the storage capacity of the metropolitan water supply system, bringing this capacity to its current level. Greenvale and Cardinia are off-stream storages in the sense that they are located on watercourses with little catchment of their own and hence are filled from external sources, i.e., the on-stream storages.

Greenvale Reservoir is on Yuroke Creek, a branch of the Moonee Ponds Creek to the north of the city, and serves Melbourne's north-western and western suburbs to Werribee. With a capacity of 27,000 megalitres, Greenvale is supplied by pipeline from 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 by far 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 is fed from the Upper Yarra System via a pipeline from the southern end of Silvan Reservoir. Supply to Silvan is supplemented by the new Yarra Valley Conduit from Upper Yarra Reservoir, which enables surplus water from the O'Shannassy and Upper Yarra catchments to be stored, and provides a marked degree of regulation of water from the diversion of the Thomson River, pending construction of the Thomson Dam.

Cardinia, with its large storage, provides a substantial reserve supply for use during extremely dry or drought periods and supplies water to both the Dandenong and Notting Hill service reservoirs. The main dam embankment, with a base width of 303 metres, is generally rockfill with an impervious earth core. It has a maximum height of 86 metres, a crest length of 1,542 metres and contains about 3.7 million cubic metres of earth and rock. Cardinia started filling in 1973 and filled for the first time late in October 1977. The reservoir, which was designed by the Snowy Mountains Engineering Corporation, has a shoreline of about 56 kilometres and a surface area of more than 1,295 hectares.

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 chanelled into the diversion 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 diversion 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 160 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 20 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. The Thomson Reservoir will store water during the wetter years when inflows are high and thus ensure an adequate water supply for Melbourne during the 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 Sugarloaf Reservoir (95,000 megalitres live capacity), which will store water pumped from the Yarra River at Yering Gorge, and from the nearby Maroondah aqueduct. Basically, the Sugarloaf 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 covered "clearwater" storage basin adjacent to the treatment plant; and a pipeline from the storage basin through

which treated water will be introduced to the supply system. Comprehensive treatment of Sugarloaf water will be necessary because it will contain agricultural and urban run-off. The treatment plant will be located close to the southern end of the main dam and will use conventional water treatment methods. Chemicals will be added to the water to encourage the settling of particles which cause turbidity and then the water will be filtered and chlorinated to kill any bacteria. The plant will produce a high quality potable water. Water from the Sugarloaf Reservoir will be introduced to the supply system via the Sugarloaf-Preston Pipeline which will run from the clearwater basin to a tunnel of the Maroondah aqueduct. Downstream of this point, the aqueduct is being converted to a 2.1 metre diameter pressure pipeline. As with the rest of Melbourne's water supply, water from Sugarloaf will be fluoridated in line with the requirements of the *Health* (*Fluoridation*) Act 1973. The reservoir, being an off-stream storage, is formed by a dam across the Sugarloaf Creek near Christmas Hills. The main dam will be 85 metres above stream bed level and will have a crest length of 1,000 metres. There will be two small saddle dams on the southern side of the reservoir. Sugarloaf will supply the northern and western suburbs, as well as Greenvale and Yan Yean storages, and thus reduce this component of demand on Silvan Reservoir.

Water reaches houses and industry in the Melbourne metropolitan area from the various service reservoirs situated in the highest convenient places so that a maximum pressure can be maintained, and peak demands can be met. There are 67 service reservoirs and tanks with a combined capacity of 1,853 megalitres. Underground mains and pipes convey the water from the service reservoirs to its point of use. As part of its water supply catchment management program, the Board is carrying out extensive forest hydrology research at Coranderrk and North Maroondah, two eucalypt forest areas south and north 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 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.

While public access to the Board of Works' forested catchment areas is not allowed, 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—Donnellys Weir, Coranderrk Weir, Fernshaw, and the top of Black Spur. All the reserves are easily reached by car.

Total water consumption for the year 1975–76 was 384,000 megalitres, an 8 per cent increase over the previous year's consumption of 356,000 megalitres. Both years experienced very dry summer-autumn periods and substantially reduced inflows into the storage reservoirs. This was coupled with high consumption. Notwithstanding the present decline in the rate of population growth, the planning of future water requirements for Melbourne has allowed for a continuous increase in water consumption due mainly to the continuing growth in households.

At 30 June 1976, there were 829,941 properties or an estimated 2,507,000 people in Melbourne supplied with reticulated water. Average consumption for the 1975–76 year was 463,000 litres per property.

MELBOURNE AND METROPOLITAN BOARD OF WORKS

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

Year	Yan Yean	Maroondah	O'Shannassy	Upper Yarra	Thomson	Total water yield
1971-72	25,500	98,300	138,100	255,200	3,700	520,800
1972-73	15,000	63,200	102,800	128,800	17,200	327,000
1973-74	27,400	93,800	136,200	206,500	26,500	490,400
1974-75	31,900	108,500	170,300	351,000	25,300	687,000
1975-76	23,000	91,400	152,400	230,900	47,200	544,900

Thomson-Yarra development scheme 1972, 1974; Cardinia Reservoir, 1975

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 1971-72 to 1975-76:

VICTORIA-MELBOURNE AND METROPOLITAN BOARD OF WORKS: CAPITAL OUTLAY ON WATERWORKS

(\$'000)

Particulars	1971-72	1972–73	1973–74	1974-75	1975-76
Yan Yean System (including Greenvale) Maroondah System O'Shannassy Unper Yarra and Thomson	1,293 44	813 47	246 136	320 802	82 8,574
System (including Silvan and Cardinia) Service reservoirs Large mains and pumping stations Reticulation Afforestation Investigations, future works	14,202 895 7,027 4,412 8 209	19,923 441 9,827 4,667 5 796	26,350 1,286 6,134 4,533 2 1 994	36,678 1,627 3,690 5,963 22 1,917	23,041 4,523 14,086 8,766 6 Cr. 91
Total outlay	28,089	36,519	40,681	51,019	58,987

Consumption of water

During the year ended 30 June 1976 the maximum consumption of water in Melbourne and suburbs on any one day was 2,290 megalitres on 18 February 1976, and the minimum consumption was 658 megalitres on 31 August 1975.

The following table shows, for each of the years 1971–72 to 1975–76, 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	Total annual consumption	Consum wate any or	ption of r on ne day	Daily average of annual	Daily consumption of water per head of	Improved properties for which sewers were
	at 30 June	of water	Maximum	Minimum	of water	population served	provided at 30 June
	number	megalitres	megalitres	megalitres	megalitres	litres	number
1971–72 1972–73 1973–74	722,016 748,990 787,052	331,465 315,208 361,858	1,943 1,637 2,202	568 534 590	906 864 991	384.33 357.60 405.48	575,221 591,673 621,161
1974–75 19 7 5–76	809,372 829,941	355,625 384,058	2,274 2,290	620 658	974 1,049	393.66 418.56	640,165 662,912

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Sewerage system

Cost of the sewerage system

The cost of sewerage works during each of the years 1971-72 to 1975-76, is shown in the following table :

VICTORIA—MELBOURNE AND METROPOLITAN BOARD OF WORKS: CAPITAL OUTLAY ON SEWERAGE SYSTEM

(\$'000)

Particulars	1971–72	1972–73	1973–74	1974–75	197 5-76
Farm purchase and preparation	519	707	496	560	898
Treatment works	10,760	21,091	21,265	11,425	10,409
Outfall sewer and rising mains	15,012	16,675	2,975	1,430	393
Pumping stations, buildings, and plant	2,750	4,770	4,935	2,772	1,969
Main and branch sewers	11,853	12,879	24,201	43,301	45,249
Reticulation sewers	5,979	7,001	12,096	20,067	26,554
Sanitary depots	2		Cr. 48	(a)	
Investigations	220	149	1,057	1,437	Cr. 121
Total outlay	47,095	63,273	66,978	80,992	85,351

(a) Less than \$500.

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 1975–76 working expenses were \$248,965, and interest \$43,724 making a total of \$292,689. Revenue was \$536,915, giving a surplus of \$244,226.

Drainage

Retarding basins

The Board of Works, acting as the drainage authority in the metropolitan area, is responsible for providing flood protection works to serve in the most effective and economical manner. This has often been done by the construction of retarding basins. A retarding basin is a reservoir, normally empty, having an outlet always open, which is smaller than the inlet, so that during heavy storms part of the flow is held back and released gradually as the storm abates.

The first retarding basin constructed by the Board of Works is still in operation in Hawthorn, after 50 years' service. Twenty-one others have been constructed since, and there are plans to construct new basins and extend two existing basins in Moorabbin. It is probable that more basins will accompany the continuing growth of Melbourne.

The Board's network of retarding basins can be divided into five systems, each system feeding one of the following watercourses : Moonee Ponds Creek, Merlynston Creek, Hawthorn East Drain, Gardiners Creek, and Mordialloc Creek. Although each basin had unique legal and economic problems associated with its development, all have similar hydrological reasons for their inception.

As the older catchments developed, no effective legislation was available to exclude development from the flood-prone areas adjacent to the creeks. This type of growth in some cases constricted the passage of larger flows and, during heavy storms, showed the retarding basin as the most effective and economical method of reducing peak flows to a flow which can be transmitted safely along the downstream drainage system. The alternative would have been the duplication or enlargement of the existing drainage systems. In other areas, retarding basins are included in the original design of the drainage system. In these cases the basin not only retains peak flows but also reduces the size, and therefore the cost, of drainage works further downstream.

Some regions of Melbourne were originally swamp land and unfit for development. In such areas it is desirable to reduce flows and confine them to a narrower, controlled drainage system. This, in turn, drains the marshy areas and effectively opens up new lands for development. All this can and has been achieved most economically by the careful location of retarding basins.

A retarding basin may be formed in one of two ways. It can be excavated from a relatively flat area, or it can be formed by an embankment traversing a natural valley. The embankment may be specially constructed for the retarding basin or it can be used for a dual purpose by carrying a road across the valley.

The nature of a retarding basin lends itself easily to other uses. As many of the basins are empty and dry for the greater part of the time, some, with the co-operation of local councils, have been used for reserves and playing fields. Others have been designed to blend naturally with the surrounding flora to form parks, which to the untrained eye would not be recognised as flood protection structures.

The Lake Road Retarding Basin in the City of Nunawading is an example where a permanent lake has been incorporated in the design. The area surrounding the lake is preserved as a wildlife sanctuary by the Council. In addition, Cherry's Swamp and Truganina Swamp in Altona have been developed to act as retarding basins, but the original character of the swamps has been maintained so that these areas still provide a habitat for bird life, including several migratory species from the northern hemisphere.

Further references, 1977

Finance

Assessed value of property

The net annual value of property in 1974–75 and 1975–76 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

Rate	Net annua pro	al value of perty
	1974–75	1975-76
Water rate Metropolitan general rate (for sewerage services) Metropolitan drainage and river improvement rate Metropolitan improvement rate	769.9 623.3 662.5 794.3	791.3 644.7 680.6 822.1

(\$m)

Finance for capital works

Capital works are financed mainly from moneys 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 \$1,000m, 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 \$1,000m quoted in Section 187. At 30 June

1976, the Board's total loan liability amounted to \$866.7m, of which \$736.1m had been incurred under Section 187. All moneys borrowed are 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 1971–72 to 1975–76. 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.

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12,000)

Particulars	1971-72	1972-73	1973-74	1974-75	1975-76
REVENUE					
Water supply-					
Water rates and charges (including					
revenue from water supplied by	26 024	20.060	24 026	11 060	57 140
measure)	20,934	30,900	34,920	44,900	57,140
Sewerage—	20 648	22.082	41 204	57 688	73 737
Trade waste charges	3 126	3 168	3,490	3,471	5,033
Sanitary charges	609	1,225	1,329	1,280	1,456
Metropolitan farm—					-
Grazing fees, rents, pastures, etc.	4	4	3	3	4
Balance, livestock account	279	589	756	Dr. 263	Dr. 4
Metropolitan drainage and rivers-					
Drainage and river improvement rate	6,139	6,299	8,068	8,366	10,353
River water charges	18	13	12	16	11
Total	67,757	74,340	89,878	115,521	147,231
EXPENDITURE					
Water supply—					
Management	3,529	4,655	6,068	6,394	7,690
Maintenance	5,899	6,916	8,226	11,531	14,158
Water supply works	1,400	1,400	1,400	1,400	1,652
Sewerage-	2 401	1 265	E 011	0 222	0 (17
Management	3,401	4,303	5,811	9,232	9,017
Sewerage works	2,600	2,600	2.600	2.600	3.068
Metropolitan farm	_,	_,	_,	_,	-,
Management	256	329	399	465	658
Maintenance	1,296	1,441	1,645	2,118	2,548
Metropolitan drainage and rivers-	-	,		,	
Management	709	979	1,298	1,053	1,588
Maintenance	1,539	1,626	2,097	2,734	3,421
Drainage works	1,000	1,000	1,000	1,000	1,180
Pensions and allowances	544	283	376	404	513
Loan flotation expenses	369	273	384	628	720
Interest (including exchange)	30,699	30,978	42,027	51,708	04,101
Contributions to—	1 677	1 883	2 023	2 210	2 408
Loops redeemed reserve	2 840	3 616	4 125	4,955	5,610
Renewals fund	1,148	988	1,109	1,151	1,466
Depreciation	329	341	264	320	1.015
Superannuation account	2,733	871	1,640	3,123	4,505
Municipalities for valuations, etc.	192	199	265	273	279
Rates equalisation reserve	1,493	Cr. 1,513	505	858	3,674
Appropriations for contingencies, etc.	• •			••	1,880
Other	3	13			100
Total	67,757	74,340	89,878	115,521	147,231

	(\$'000)	210. 00			
Particulars	1971–72	1972–73	1973–74	1974–75	1975–76
Capital outlay at 30 June— Water supply Sewerage Drainage and river improvement	247,138 330,443	283,657 393,716	324,338 4 60 ,694	375,356 541,686	434,343 627,037
works	41,657	45,215	49,285	57,104	6 6,1 3 9

VICTORIA-MELBOURNE AND METROPOLITAN BOARD OF WORKS : REVENUE EXPENDITURE ETC.-continued

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, as from 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 Local Government and 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 1971-72 to 1975-76:

VICTORIA-MELBOURNE AND METROPOLITAN BOARD OF WORKS: METROPOLITAN IMPROVEMENT FUND: REVENUE ACCOUNT AND CAPITAL OUTLAY

(\$'000)

Particulars	1971-72	1972-73	1973-74	1974-75	197576
Revenue—					
Metropolitan improvement rate and sundry	,				
income	8,682	9,022	11,760	12,438	14,972
Recoup from Country Roads Board	••	••		1,026	: :
Sales of land	••	• •	••	2,042	5,225
Other		••	••	993	665
Total revenue	8,682	9,022	11,760	16,499	20,863
Expenditure-					
Management	1.720	1.644	2,144	2,936	4,249
Maintenance	900	1,216	1,110	42	38
Interest	59	65	70	73	77
Contributions to sinking fund	24	24	24	24	Cr 24
Reserved land and acquisitions	4,938	4,441	6,056	8,615	4,759
Metropolitan parks land acquisitions				3,170	3,812
Special Road Projects acquisitions, etc.				553	553
Construction works	• •	::	. : :	81	308
Road and foreshore works	4,252	1,452	114	••	
Contribution to Melbourne Underground			206	701	1 2/1
Rail Loop Authority	·:-	174	306	721	1,261
Transfer to rates equalisation fund	Cr.3,417	Cr. 163	1,778	10	5,469
Other	207	170	158	222	361
Total expenditure	8,682	9,022	11,760	16,499	20,863
Capital outlay at 30 June (a)	103,370	121,580	145,472(6)41,213	44,825

(a) Includes expenditure of the following amounts paid from the Roads (Special Projects) Fund: 1971-72, \$7,813,000; 1972-73, \$5,712,000; and 1973-74, \$8,864,000. Also includes expenditure of the following amounts paid from the Commonwealth Aid Roads Fund: 1971-72, \$4,106,000; 1972-73, \$9,301,000; and 1973-74, \$10,458,000.
(b) Henceforth excludes highways and bridge works, and foreshore works, responsibility for which has been transferred to other authorities.

Further references, 1977

STATE RIVERS AND WATER SUPPLY COMMISSION

Operations

The State Rivers and Water Supply Commission was constituted under the Water Act passed by the Victorian Parliament in 1905 and was made responsible for the conservation and distribution of rural water resources and the control of the use of water from rivers and streams and other natural sources with the exception of the area controlled by the water supply authority for the Melbourne metropolitan area.

The establishment of the Commission followed earlier attempts to set up a body to manage Victoria's water resources. The Irrigation Act of 1886 provided a solid foundation for the development of water supply and irrigation that followed its effective nationalisation of all surface waters of Victoria, whereby the right to the use and control of waters in every river, creek, stream, billabong, lake, lagoon, swamp, and marsh was vested in the Crown. The Act also provided for the establishment of irrigation trusts with financial advances from the Victorian Government to meet the cost of irrigation works and for certain headworks to be constructed by the Victorian Government. The earliest of these headworks were the Goulburn Weir near Murchison and the Laanecoorie Weir on the Loddon River. The irrigation trusts proliferated and within a few years spread throughout Victoria, but they failed to provide a reserve water supply in dry seasons because of the lack of large storages and the unreadiness of landholders to make appropriate use of water when it was available.

Since the establishment of the State Rivers and Water Supply Commission in 1905, three commissioners, appointed by the Governor of Victoria, have managed its activities. The Commission employs a permanent work force of some 1,700 persons throughout Victoria and up to 2,000 temporary personnel according to the demand for labour on Commission works. Of the total permanent staff employed (1,700) about 500 are engaged on engineering, surveying, drafting, and other professional occupations, about 550 on water distribution, district operations, and maintenance, and about 550 on accounting and administrative duties. In addition, a day labour force of 1,700 persons is employed, of whom 600 are engaged on construction projects and 1,100 on district maintenance.

More than 60 large storages, 264 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 for reticulated town supplies. In addition, the Commission provides water supply for domestic, stock, and industrial purposes in an area of rural and urban lands totalling about 5,000,000 hectares. It also administers flood protection, drainage, and river improvement works throughout Victoria. Delivery of irrigation water totalled 2,551,986 megalitres for 1975–76.

The Commission's engineering functions are divided into the following three main branches, each under the control of a chief engineer: major works—investigation, survey, design, and construction of major projects; rural water supplies—operation and maintenance of irrigation, drainage, and flood protection districts; and town water supplies—construction, operation, and maintenance of urban water supplies, as well as engineering and financial supervision of local authorities for water supply, sewerage, and river improvement. All of these works were designed and constructed, and are operated and maintained, by the Commission. Specialised services to these branches are provided by the mechanical, finance, accounts, stores, staff, estates, valuations, and secretarial branches of the Commission.

Outside the Melbourne metropolitan area there are now 446 reticulated town water supplies of which 148 come under the direct control and management of the Commission and the remaining 298 town supplies are administered by local

water authorities. There are 124 sewerage authorities, 29 river improvement trusts, and 4 drainage trusts in Victoria outside the Melbourne metropolitan area.

The Commission has also developed, patented, and arranged for the manufacture under licence of small control structures, of both manual and automatic operation, for use on farm (terminal) channels.

Major water supply projects completed between 1967 and 1976 included :

Project	Features
Lake William Hovell	Earth and rockfill dam, storage 12,330 megalitres
Lake Nillahcootie	Earth and rockfill dam, storage 39,790 megalitres
Lake Merrimu	Earth and rockfill dam, storage 19,140 megalitres
Merrimu Tunnel	Tunnel 2 kilometres long, 2.3 metres diameter
Campaspe Irrigation and Drainage District	9,000 hectares
Barr Creek Salinity Lake Hawthorn Salinity	Salinity control on Murray River
Pyramid Creek and Broken Creek	Improvement by dredging of 130 kilo- metres of natural watercourse used as major supply and drainage carriers
Lake Mokoan	Earth and rockfill off-river storage, cap- acity 364,800 megalitres
Lake Rosslynne	Earth and rockfill dam, storage 24,700 megalitres
South Otway	55 kilometres concrete-lined mild-steel pipeline of 500 mm diameter
Tarago-Western Port	65 kilometres concrete-lined steel pipe- line of 1,100 mm diameter
Merrimu Second Stage Tunnel	Tunnel 4 kilometres long, 2.7 metres diameter

Still under construction in 1977, due for completion in 1978, was the Dartmouth Dam, an earth and rockfill dam of 4 million megalitres capacity.

Other services for which the Commission is responsible cover irrigation and agricultural extension work, including surveying, irrigation land layout, surface and underground drainage layout, salinity control; licensing and control of diversions from rivers and streams and from underground resources throughout Victoria; and the assessment, licensing, and policing of discharges to water throughout most of Victoria.

Water pollution control

The Commission's Pollution Control Section was established in 1973 to implement powers delegated to the Commission by the Environment Protection Authority. These powers entailed the control of water pollution in country areas, excluding the Latrobe valley and the Yarra valley.

Pollution inspectors are located at Wodonga, Wangaratta, Shepparton, Bendigo, Ballarat, Frankston, Geelong, Horsham, and Warrnambool. The inspectors at Shepparton, Bendigo, and Horsham work under the direct supervision of the local district engineer in close liaison with the Pollution Control Section. The inspectors have a wide range of experience in work such as health inspection, waste treatment, laboratory work, inspection or pollution control duties in other departments, and technical teaching. On appointment, inspectors undertake an intensive two to three months training programme at the Commission's Head Office before working in the field. Monthly training programmes then follow, so that the activities of inspectors throughout Victoria can be co-ordinated. Policy on many discharges, such as farming operations and discharges from garages and car washes, are still under consideration. However, it is clear that waste resulting from the operation of dairies and piggeries will no longer be acceptable in streams and drains and that farmers will be required to distribute their effluent onto pastures. To cope with the additional laboratory work involved, extensions are being completed to the Commission's laboratories at Head Office.

Future programmes

The Commission's second ten year plan, a full programme of works for the period 1973–1983, received Victorian Government approval (subject to funding) during 1973. The new programme reflected a changing emphasis in the Commission's work towards increased involvement with urban water supply, sewerage, environmental protection, and water quality.

Two basic principles were adopted by the Commission in formulating the programme :

(1) The environmental impact of new projects would be taken into account with the emphasis on multi-objective planning. The Commission would take into consideration both the effects its works would have on the environment and the contribution they would make to the environment and to the quality of life of those people whom they serve; and

(2) each project should be economically sound and feasible. There are a number of intangible benefits which accompany water conservation projects and one of the Commission's tasks will be to evaluate these in money terms.

Major provisions of the 1973–1983 programmes include :

(1) Construction of new water supply trunk mains, reticulated services, and water treatment plants at an estimated cost of \$112m (including \$46m for locally administered waterworks trusts);

(2) sewering of all towns with populations of more than 200 persons by the end of 1982 at an estimated cost of 37m;

(3) expenditure of \$15m on river improvement, flood protection, and drainage trusts to preserve flood waterways, protect valuable marginal land, and safeguard the natural environment of streams in their catchment area;

(4) expenditure of \$7.5m on rural waterworks districts, including the Millewa pipeline scheme (completed in 1975) and commencement of the pipelining of the extensive Mallee domestic and stock channel system;

(5) construction or enlargement of ten major storages at a total cost of \$47m (including Victoria's share of the cost of the Dartmouth Dam project);

(6) expenditure of \$58m on irrigation and drainage works within existing irrigation districts;

(7) expenditure of \$30m to reduce water losses and control seepage in irrigation distribution systems;

(8) provision of adequate drainage systems, including groundwater control in irrigation districts, at an estimated cost of \$15m;

(9) expenditure of \$13m on salinity control works to arrest the deterioration of highly productive irrigated lands and protect the Murray River from saline inflows from Victorian irrigation areas;

(10) expenditure of 5.5m as Victoria's share of capital works undertaken by the River Murray Commission (additional to the Dartmouth Dam project); and (11) expansion of the Commission's facilities and resources at an estimated cost of 12m.

The ten year programme as proposed is consistent with the Victorian Government's aim of encouraging decentralisation. The programme provides for safeguarding and improving the service to rural based enterprises reliant on Victoria's irrigation systems and for adequate and high quality urban water services and proper sewerage systems in country areas throughout Victoria. Additional recreational facilities for the people of Victoria will be provided as a by-product of further storage construction and provision has been made in the programme for the development of these assets.

Further reference, 1976

Storages

Dartmouth

The Dartmouth Dam, an earth and rockfill embankment 180 metres high, is being constructed on the Mitta Mitta River in north-eastern Victoria. It will be Australia's highest dam, and will impound a storage of 4,000,000 megalitres, 20 per cent more than Lake Hume, the River Murray Commission's largest storage to date. A 150 megawatt State Electricity Commission power station will also be built at the foot of the dam to provide an annual output of 330,000,000 kilowatt-hours of electric power for Victoria, and a re-regulating pondage will be built downstream of the main dam to contain irregular discharges from the power station so that more constant flows of water can be passed downstream. (See also Victorian Year Book 1977, pages 379–81.)

Eildon

Located on the Goulburn River, immediately below its confluence with the Delatite River, Eildon is Victoria's largest dam. The lake extends over an area of some 13,000 hectares and is the main storage for the Goulburn Irrigation System, the oldest and most developed irrigation system in Australia. The original dam was constructed between 1915 and 1927 and modified during the period from 1929 to 1935. Maximum height of this structure was then 47.5 metres and its reservoir capacity was 377,000 megalitres. Between 1952 and 1955 a new embankment 79.25 metres high was constructed immediately downstream of the original dam to impound 3,390,000 megalitres.

Hume

Hume Dam is situated 8 kilometres upstream from the City of Albury, immediately below the confluence of the Mitta Mitta River with the Murray River. The reservoir, known as Lake Hume, covers an area of some 22,500 hectares, and is the main regulating storage for the Murray River system. Constructed for the River Murray Commission by the Department of Public Works, New South Wales, and the Victorian State Rivers and Water Supply Commission, the dam is a popular tourist attraction for travellers between Melbourne and Sydney. It is close to the site where the explorers Hamilton Hume and William Hovell crossed the river in 1824. Water from the dam is used for town and irrigation supplies along the Murray River.

Waranga

Waranga Reservoir was first built in 1905 as an off-river storage filled with water diverted from the Goulburn River at Goulburn Weir. It is filled via the Stuart, Murray, and Cattanach Canals and is one of the largest storages in the system. Waranga Dam has a small catchment area of its own and supplies water to irrigation areas west of the Goulburn including Tatura, Rochester, and Tongala.

Mokoan

This large artificial lake with an area of 79 square kilometres was formed by an earthen dam 10 metres high and 7.5 kilometres long. It was built in 1970 across the end of the Winton Swamp near Benalla in north-eastern Victoria. In conjunction with the Nillahcootie Reservoir, this off-river storage harnesses the flows of the Broken River and its tributaries. Special facilities were provided to maintain breeding areas for bird life. Storage capacity is 364,800 megalitres.

Rocklands

Located on the Glenelg River, 14.5 kilometres upstream from Balmoral, this is the major storage of the unique Wimmera-Mallee domestic and stock supply system in north-western Victoria. It marks the first example in Victoria where a south flowing stream was diverted northwards via a tunnel. Storage capacity is 335,500 megalitres.

Eppalock

Situated on the Campaspe River, upstream from Axedale near Bendigo in north-western Victoria, Eppalock Dam was built between 1960 and 1962. Waters of the reservoir are released downstream to irrigate farms along the river and within the Campaspe Irrigation District south of Rochester. At periods of peak demand in the Goulburn Irrigation System, supplementary supplies are pumped from the river to the Waranga Western Channel. Eppalock water is also conveyed by pumping to Bendigo in a 26 kilometre pipeline. The lake is a popular recreation location, especially for speedboat enthusiasts.

Glenmaggie

The keystone of the Gippsland irrigation areas, Glenmaggie Dam is situated on the Macalister River in Gippsland, eastern Victoria. The reservoir supplies irrigated properties in the vicinity of the towns of Maffra, Heyfield, Stratford, and the City of Sale. Soldier settlement after the Second World War necessitated an increase in irrigation areas, and the storage was enlarged from 61,700 megalitres to 190,300 megalitres.

Bellfield

Built as a reserve storage for the Wimmera-Mallee domestic and stock supply system in north-western Victoria, Bellfield Dam was constructed between 1963 and 1967 on Fyans Creek upstream of Halls Gap in the Grampians region. The dam is normally kept full and is depleted only at the end of a dry period in the Wimmera-Mallee region. Water from the dam is used primarily for stock and domestic purposes in the system.

Devilbend

Constructed to supply the rapidly growing urban and industrial demands of the Mornington Peninsula, this earth and rockfill dam, 27.4 metres high, was completed in 1964. The project includes a pumping station below the dam and catch drains around the reservoir periphery to prevent pollution. Storage capacity is 14,560 megalitres.

Tarago

The Tarago earth and rockfill dam, 34.1 metres high, on the Tarago River was constructed in 1968 to provide a new storage for the Mornington Peninsula system to supplement the previously adequate aqueduct diversions. The design provided for a 50 per cent enlargement of the storage capacity, which was completed in 1972.

Rosslynne

The Commission's most recent large dam is Rosslynne Reservoir on Jacksons Creek, near Gisborne. It was built to provide additional water supplies to the rapidly expanding townships of Sunbury and Gisborne, and to support irrigation development by diverters along the Maribyrnong River. The dam will have a storage capacity of 24,700 megalitres.

Buffalo-Stage 1

Set at the foot of the western flank of Mt Buffalo and its national park, this dam was constructed in 1965. The storage impounded by this earth and rockfill dam, 30.5 metres high, forms the first stage of the Buffalo River project and safeguards pumped supplies to growers of high value crops and the City of Wangaratta in north-eastern Victoria.

Pykes Creek

Situated 72 kilometres west of Melbourne, Pykes Creek dam impounds a storage for irrigation and domestic requirements in the Bacchus Marsh and Werribee areas. The Western Highway crosses the site by an embankment constructed below the dam. An earthern dam, 39 metres high, it was first built in 1911 and raised in 1930.

Merrimu

Merrimu Dam was constructed on the Coimadai Creek north-east of Bacchus Marsh as the first stage of an irrigation and town supply project. The existing first stage storage impounds water diverted by means of a tunnel from Goodmans Creek, provides a reserve for the Bacchus Marsh and Werribee irrigation districts, and will supplement urban water supply for the Melbourne metropolitan satellite development at Melton. The second stage of the project provides for the diversion of the Lerderderg River by another tunnel to connect the river to Goodmans Creek. In the third stage, it is proposed to raise the dam embankment. Storage capacity is now 19,120 megalitres.

William Hovell

Lake William Hovell is located on the King River, 24 kilometres upstream from Whitfield in northern Victoria. It takes its name from the explorer William Hovell who passed through the region in 1824 with Hamilton Hume. The dam consists of an earth and rockfill embankment and a concrete lined chute and ski-jump spillway. Water from the dam is used for irrigating tobacco, hops, and grazing areas lower down the King River and in the Ovens River valley. Storage capacity is 12,330 megalitres.

Irrigation

Most irrigation is carried out in districts directly controlled by the Commission, although there is an increasingly large proportion of "private diverters", irrigators who are authorised to take water from streams, lakes, etc., but who do not come within the boundaries of an irrigation district. A feature of the districts is the system of "water rights" under which a certain quantity of water is assigned to each district and allotted to the lands commanded and suitable for irrigation. The irrigators pay a fixed sum for this water each year, whether they use it or not, and also pay a general rate. Water rights are available in all except the very driest years and water in excess of the water right can be bought in most seasons. The water right system assures irrigators of a definite quantity of water each year, and the Commission can rely on fairly constant revenue to meet the cost of district operations. Water usage varies according to seasonal conditions and the water right system provides a constant minimum income to the Commission.

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. The advantage of intensive irrigation is that much higher returns are available from a given quantity of water and, consequently, a much larger rural population is supported. In 1975–76 the total area irrigated including lands adjoining an irrigation district was 578,200 hectares and the total water right delivered to these lands was 2,551,986 megalitres.

Private irrigation by the diversion of water from rivers, lakes, etc., has increased in recent years. In 1975–76 the area watered privately was 84,556 hectares. The number of private diversions authorised in 1975–76 was 11,937 and the water delivered was used mainly to produce annual and perennial pastures and

			Water				Aı	rea irrigate	d, includin	g lands adjo	vining a dis	strict		
f district. h	Total urea of oldines	Area	rights apport- ioned				Sorehum		Pasture	s				Fallow
, etc. d	in rigation listricts	as suitable for irrigation	including extra water right	Total	Cereals	Lucerne grown for pasture and hay	and other annual fodder crops	Native	Annual	Perennial	Vine- yards	Orchards	Market gardens	and mis- cellaneous
h JRN-CAMPA	lectares SPE-LO	hectares DDON SY	megalitres	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares
anhope 10 9	0,367.5 0,257.9 0,942.3 3,790.5 5,839.8	83,503.3 101,033.1 28,354.1 41,727.2 69,032.8	191,062.0 253,483.0 104,858.0 43,320.0 147,876.0	39,491.8 60,397.0 24,716.0 12,057.0 39,302.0	39.3 101.0 57.0 98.0 153.0	445.2 925.0 113.0 335.0 334.0	436.0 194.0 51.0 135.0 266.0	175.3 1,905.0 28.0 159.0	14,509.2 23,511.0 6,610.0 6,324.0 17,280.0	$\begin{array}{c} 17,947.4\\ 28,753.0\\ 17,413.0\\ 4,910.0\\ 20,536.0\end{array}$	107.6 72.0 	4,471.1 3,466.0 407.0 14.0 25.0	366.3 1,189.0 29.0 172.0 251.0	994.4 281.0 15.0 41.0 238.0
Jains 24	6,611.8 8,634.4	24,618.7 24,618.7 76.081.6	9,964.0 39,742.0 121.077.0	2,445.0 10,817.0 46,906.0	11.0	435.0	7.0 128.0 611.0	224.0 224.0 4 339.0	5,877.0 37,101.0	1,521.0 3,893.0 7,109.0	::	::	.0 9 9	6.0 243.0 219.0
H no	5,387.4 8,693.7	38,633.1 8,179.4	51,106.0 14,953.0	20,582.0 3,525.0 421.0 1,646.0	787.0 11.0 148.0	878.0 387.0 8.0 167.0	861.0 19.0 7.0	43.0 280.0	111,832.0 686.0 101.0 801.0	2,548.0 2,227.0 47.0	:::::	::::	95.0 173.0 .:	3,538.0 22.0 476.0
1 54	3,718.6	474,813.2	977,441.0	262,305.8	1,570.3	4,459.2	2,747.0	7,192.3	120,513.2	106,904.4	179.6	8,383.1	2,283.3	8,073.4
RIVER SYST	IEM (To	orrumbarry	Weir)											
46	6,130.8	43,088.7	121,370.0	39,165.0	194.0	588.0	487.0	1,506.0	18,195.0	18,055.0	:	: 00	30.0	110.0
,	5,583.7 8,191.8 8,409.3	7,494.1 7,494.1	55,775.0 55,775.0 12,145.0 11,046.0	2,107.0 10,370.8 3,737.0 2,928.4	35.0 35.0 63.2	361.8 361.8 84.9	132.0 3.2	23.4 23.4 252.0 194.4	10,00/.0 1,446.4 2,844.0 1,983.0	4,8/3.0 6,585.7 244.0 288.5	1,169.0 17.9	198.0 459.1 13.5	287.3 3.2	420.0 14.0 12.0 276.6
	1,857.3 7,431.2 7,600.6	987.6 7,046.1 32,934.5	5,057.2 9,857.0 69,811.0	926.0 2,447.5 24,351.0	184.9 519.0	54.1 21.8 152.0	89.0 942.0	704.5 1,403.0	40.6 1,018.3 15,832.0	306.0 4,997.0	670.4 	101.9 	59.0 9.6 	113.4 506.0
orth-West	:	:	:	549.0	:	4.0	12.0	40.0	470.0	23.0	:	:	:	:
1 16	3,294.2	146,682.8	357,518.2	109,643.7	2,121.2	1,543.6	3,063.2	4,568.3	58,496.3	35,372.2	1,857.3	772.5	397.1	1,452.0
lley Neir) 12	1,859.1	106,817.2	245,862.0	58,898.0	1,755.6	1,014.0	468.2	1,243.8	24,666.8	22,429.5	115.0	1,909.2	384.7	4,911.2
arth-West 3: 11 16 116 112 121 121 121 121 121 121 12	1,857.3 7,431.2 7,600.6 3,294.2 1,859.1	7,046.1 32,934.5 146,682.8 106,817.2	5,057.2 9,857.0 69,811.0 	226.0 2447.5 24,351.0 549.0 58,898.0 58,898.0	184.9 519.0 1,755.6	54.1 21.8 152.0 4.0 1,543.6 1,014.0	3	89.0 942.0 12.0 063.2 468.2	3.2 1.2 1.2 88.0 704.5 88.0 1,403.0 12.0 40.0 063.2 4,568.3 063.2 4,568.3 468.2 1,243.8	3.2 1.74.5 1.74.5 1.40.6 89.0 704.5 1,018.3 40.6 942.0 1,403.0 15,832.0 40.6 12.0 40.0 470.0 663.2 4,966.3 063.2 4,568.3 58,496.3 54,496.3 468.2 1,243.8 24,666.8	3.2 1.94.5 1.96.6 2.06.1 89.0 704.5 1.018.3 306.0 942.0 1,403.6 15,832.0 4,997.0 12.0 40.0 470.0 23.0 063.2 4,568.3 58,496.3 35,372.2 468.2 1,243.8 24,666.8 22,429.5	3.2 1.74.5 1.90.6 670.4 89.0 704.5 1.018.3 306.0 670.4 942.0 1,403.0 15,832.0 4,997.0 12.0 40.0 470.0 23.0 063.2 4,568.3 58,496.3 35,372.2 1,857.3 068.2 1,243.8 24,666.8 22,429.5 115.0	3.2 1,2,3,5 1,2,3,5 1,4,6,6 2,6,5,5 1,01,3	3.1 1.2 1.2 1.2 2.0 2.0 2.0 2.0 3.0

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WATER RESOURCES AND SEWERAGE

			Water				Are	a irrigated	, including	lands adjoi	ning a dist	rict		
Name of district.	Total area of holdings	Area	rights apport- ioncd				Sorehum		Pastures					Fallow
area, etc.	in irrigation districts	as suitable for irrigation	including extra water right	Total	Cereals	Lucerne grown for pasture and hay	and other annual fodder crops	Native	Annual	Perennial	Vine- yards	Orchards	Market gardens	and mis- cellaneous
	hectares	hectares	megalitres	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares	hectares
Direct from river by Nyah Red Cliffs Merbein Robinvale	pumping	1,317.6 5,211.2 3,507.4 3,076.9	9,124.7 43,779.5 30,257.2 17,532.7	1,158.0 4,847.0 3,558.8 2,198.0		9.0 4.7 5.4	 27.8 	27.0 18.0 17.0	12.0 8.6 	209.0 40.4 80.8	755.0 4,554.9 2,976.6 2,029.0	56.0 199.1 323.8 169.0	75.0 1.3 2.0	15.0 28.6 48.3
Total	14,414.2	13,113.1	100,694.1	11,761.8	24.5	63.1	27.8	62.0	20.6	330.2	10,315.5	747.9	78.3	91.9
First Mildura Trust	15,863.7	7,994.3	73,099.6	7,994.3	:	:	:	:	:	269.1	6,221.9	310.8	:	1,192.5
Murray River System total	315,431.2	274,607.4	777,173.9	188,297.8	3,901.3	2,620.7	3,559.2	5,874.1	83,183.7	58,401.0	18,509.7	3,740.4	860.1	7,647.6
OTHER NORTHER! Coliban Winmera	N SYSTEM	3,048.0	::	4,246.0 3,228.5	3.0 	129.0 69.8	65.2	322.0 	871.0 16.7	2,281.0 3,001.4	3.0 0.2	467.0 68.1	136.0 7.1	34.0
Total	:	3,048.0	:	7,474.5	. 3.0	198.8	65.2	322.0	887.7	5,282.4	3.2	535.1	143.1	34.0
SOUTHERN SYSTE Bacchus Marsh Werribee Warra-Sale Mafra-Sale Central Gippsland Mornington Peninsula Bellarine Peninsula	MS	1,346.6 3,605.4 28,437.4 15,342.2	3,880.9 9,757.0 64,961.0 38,807.0	1,233.0 3,205.0 19,214.0 11,671.0 125.0		75.0 81.0 31.0 6.0	3.0 35.0 16.0	240.0 240.0	:::::	739.0 1,405.0 18,870.0 111,649.0	:::::	185.0 37.0 	1,671.0 34.0 68.0 105.0	45.0 7.0 50.0 20.0
Total	58,849.0	48,731.6	117,405.9	35,566.0	8.0	193.0	54.0	240.0	:	32,663.0	:	222.0	2,064.0	122.0
PRIVATE DIVERSI(THROUGHOUT TH STATE	: E E	:	:	84,556.0	949.0	6,106.0	4,145.0	1,999.0	11,641.0	40,170.0	3,957.0	3,831.0	7,549.0	4,209.0
GRAND TOTAL 1975–76	917,998.8	801,200.2	1,872,020.8	578,200.1	6,431.6	13,577.7	10,570.4	15,627.4	216,225.6	243,420.8	22,649.5	16,711.6	12,899.5	20,086.0
GRAND TOTAL 1974-75	917,580.1	801,140.2	1,869,893.0	586,199.4	3,643.2	14,546.3	12,653.2	13,894.9	217,240.2	252,350.4	23,891.9	17,213.9	13,118.0	17,647.4

VICTORIA-LANDS UNDER IRRIGATED CULTURE: EXTENT OF IRRIGATION AND AREAS WATERED, 1975-76-continued

STATE RIVERS AND WATER SUPPLY COMMISSION

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fodder, as well as potatoes, tobacco, hops, vegetables, vines, fruit, 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 streams normally used.

The following table shows the area irrigated in Victoria for the years 1971-72 to 1975-76:

VICTORIA-AREA IRRIGATED (hectares)

Source of supply	1971-72	1972-73	1973–74	1974–75	1975-76
Goulburn-Loddon system	275,525	276,172	234,074	264,673	262,306
River Murray system	193,063	193,963	183,488	188,045	188,298
Other northern systems	7,346	7,360	7,316	7,341	7,475
Southern systems	34,137	33,789	34,988	35,345	35,566
Private diversions	85,872	87,710	85,176	90,439	84,556
Grand total	595,943	598,994	545,042	585,843	578,201

COUNTRY TOWN SUPPLIES

Introduction

During the gold rushes of the 1850s large numbers of people migrated to areas without adequate water supply either for domestic or for mining purposes. The mining population was too unsettled to accept responsibility, and no suitable supply authority existed. The Victorian Government, therefore, constructed reservoirs where needs were most pressing. The earliest reticulated supplies were to Bendigo in 1859, Ballarat in 1862, and Geelong in 1865. As early as 1872 a number of municipal corporations received government loans with which many waterworks of permanent value were constructed.

The first comprehensive legislation for the supply of water to country districts was the Water Conservation Act of 1881. This 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. At the end of the Second World War there were 258 country towns in Victoria with water supply systems, providing reticulated supplies to 51 per cent of Victoria's population outside the Melbourne metropolitan area. Country urban communities with reticulated water supplies now number 446. Supplies to 148 of these towns are managed directly 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 for rural domestic and stock purposes. The remaining 298 town supplies are managed by local water authorities especially constituted for the purpose under the Water Act.

The 148 town supplies managed directly by the Commission fall into two categories—those forming part of the large main urban supply systems, and those located within irrigation or waterworks districts and operated as part of those systems. The main urban supplies comprise towns in the Mornington Peninsula, the Bellarine Peninsula, the Otway System, and the Coliban System. All these systems were constructed principally for the supply of towns only, although the Coliban System also provides substantial irrigation supplies to the Bendigo–Castlemaine area. The general responsibilities of the Commission in the supply of water to country towns are essentially similar to those noted in the following section on local authorities.

Local authorities

The establishment of separate authorities to provide water and sewerage services to country towns is unique to Victoria. These authorities are independent responsible statutory bodies which make their own decisions, engage their own staff, and construct and manage their own works. However, as the Victorian Government usually provides a substantial degree of financial assistance, all their operations and proposals are subject to general review by the Commission. At June 1975 there were 208 local water authorities throughout Victoria at present supplying 303 country towns. Four of these authorities operate under special Acts. The remainder have been constituted under the Water Act, which provides several different ways in which such a local authority could be constituted so as to meet a variety of local conditions.

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 (25) 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 quite 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.

Several local water authorities operate under special Acts which are usually supplementary to the Water Act. These special authorities include the Mildura Urban Waterworks Trust, the Geelong Waterworks and Sewerage Trust, the Latrobe Valley Water and Sewerage Board supplying water in bulk to towns and industries in the Latrobe 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 insufficiently specific for the management of any substantial town water supply system. Although such supplies assistance formula, the remainder of the costs must be found by the municipality concerned from its normal sources of loan funds.