Appendix 5

Site visits, inspections and informal briefings

This Appendix provides an outline of the informal activities undertaken by the Committee in seeking to gain a comprehensive understanding of urban water management, involving a program of site visits, inspections and informal briefings. The site visits in particular were important for the Committee to gain an appreciation of urban water management in practice, and also provided an opportunity for it to be briefed at first hand by the managers and staff working directly on the projects inspected.

The Committee wishes to express its gratitude to everyone – whether publicly elected representatives, public sector officers from Federal, State/Territory or local government agencies, and private sector representatives working in the water management industry - who willingly gave of their time and expertise to ensure that the Committee's visits were of such great value.

39th Parliament

8 August 2001 - Canberra

Officers of CSIRO's Melbourne-based Urban Water unit made themselves available to give the Committee a comprehensive private presentation on the unit's research activities, the current state of technical knowledge, and an overview of urban water management issues. The briefing gave Committee members a thorough grounding for the demands of the inquiry that lay ahead. The officers provided the Committee with a hard copy set of their slides presentation, which proved an invaluable resource in support of the Committee's subsequent inquiries.

10 August 2001 - Canberra

Officers of ACTEW Corporation provided the Committee with a briefing on the role and functions of the Corporation and of ActewAGL and an overview of their operational and regulatory arrangements, before escorting the Committee on a series of inspections of several of Canberra's water treatment facilities. ACTEW Corporation was established in 1995 and in 2000 it formed a joint venture partnership with AGL Limited, which is called ActewAGL. ACTEW Corporation remains the holding company and asset manager of the major water and sewerage assets. ActewAGL provides electricity and gas services to the ACT community and is the contractor to ACTEW Corporation to provide water and sewerage services to the ACT.

The inspections commenced at the Lower Molonglo Water Quality Control Centre, Canberra's major wastewater treatment plant and the only one that discharges into a water course for subsequent use by downstream users. The treated wastewater

discharged into the Molonglo River flows into the Murrumbidgee and then to the Burrinjuck Reservoir. The impact of its effluent is particularly significant in dry periods and it is crucial that the treatment processes are effective. The Centre, which was constructed in the mid- to late-70s incorporated the best technology available at the time. It is an advanced sewage treatment plant using physical, chemical and biological treatment prior to discharge into the Molonglo River.

The Committee then inspected the Southwell Park Water Mining Facility. This is a demonstration project of re-use of wastewater for the watering of the adjacent sportsgrounds. It supplies water to some 10 hectares of grounds.

Finally, the Committee inspected the Stromlo Water Treatment Plant, Canberra's main plant for the treatment of potable water. It has a maximum capacity of 320 ML per day although, water sourced from the relatively undisturbed Cotter catchment, requires only low-level treatment including chlorination, fluoridation and pH correction.

The Committee records its appreciation of the efforts of Mr Asoka Wijeratne, Manager, Water Contract & Regulatory Matters, ACTEW Corporation and his colleagues for their assistance with the day's activities.

40th Parliament

3 April 2002 - Townsville

The Committee was accompanied on its site visits in Townsville by Mr Hugh Yorkston, Manager, Strategic Policy and Liaison, for the Great Barrier Reef Marine Park Authority and Mr Greg Bruce, Manager, Environmental Management for the Townsville City Council.

Ross Island Barracks

The Committee commenced by inspecting the Ross Island Barracks, which houses elements of the Maritime Wing of the Army Logistics Training Centre, Northern Logistics Group Townsville and 10 Field Support Battalion. The Committee was met by Major Caroline Hall, the Barracks' 2IC, and environmental officers Ms Jutta Jaunzenis and Ms Penny Clowery, who are part of the team responsible for the environmental management of some 80 Defence sites across northern Queensland. Ross Island was described as the demonstration best practice site.

Ross Island is on a reclaimed land site that was created in 1982 using dredge spoil and is situated in a sensitive environment within the mangrove and saltpan communities adjacent to two creeks that flow into the Ross River. Given the light industrial nature of much of the Barracks' activities, it is important that runoff and the quality of stormwater exiting the site be carefully controlled. The Committee was shown the specifically designed controls that ensure that stormwater is appropriately treated under EPA requirements before flowing to the adjacent creeks, and that intercept oils, fuels, other chemicals and general refuse on-site for disposal to landfill. The Committee was also told of the ongoing stormwater monitoring program which

enables Defence to detect any break downs in the built system or changes in workshop practices.

Problems of siltation of the boat harbour are overcome by annual dredging. The dredged material is placed in a settlement pond and checked under EPA permit conditions before being used as spoil. Mr Yorkston pointed out that small-scale dredging tends to be land-based, but some major dumping is permitted to take place at sea under ANZECC guidelines.

Mr Bruce noted that several of the facilities used at the Barracks for water quality and environmental protection would be of great value for use by local government, but that they were considered too costly to maintain. The Committee commends the Department of Defence for demonstrating its awareness of the need for careful water management in such a sensitive area, especially where tropical rains can lead to significant environmental problems.

Townsville City Council water management projects

The Committee then examined several water quality projects of the Townsville City Council (TCC). It was joined by Councillor Ann Bunnell, Deputy Mayor and Chair of the Council's Environmental Services Committee, for part of the inspection tour. It was also accompanied by Mr Adam Sadler, an environmental engineer with Citiworks, the TCC's engineering business unit responsible for roads and drainage infrastructure.

It was stressed that while stormwater is a major environmental issue for all urban areas, North Queensland in particular faces the challenge of managing tropical catchments, with heavy intensive rainfall over short, and a long dry season. Townsville's urban drainage systems incorporate both natural and engineered elements in a series of low-lying essentially flat catchments and the TCC stressed that it is conscious that the stormwater discharge from its urban waterways and creeks ultimately ends up in the Great Barrier Reef World Heritage Area, a highly valued and sensitive ecosystem.

The Commonwealth Government's role in providing assistance to certain projects under the Natural Heritage Trust's *Clean Seas program* or *Living Cities Urban Stormwater Initiative (USI)* was stressed.

The Committee was first shown a drain lining project under the railway yards. At a cost of some $90,000, it involved a trial use of sewerage technology to retrofit an existing pipeline with a polypropylene liner to seek to separate stormwater from the contaminated groundwater of the railway yards. The stormwater drain carried the message "No waste – flows to creek and Reef".

The party then visited Reid Park, a joint TCC/USI initiative. The project was described as the first trial in constructing a wetland in an estuarine area. It was seen as an intuitive attempt at a solution, with an expectation that lessons could be learnt for the future. The Committee inspected the excavation site – with work still in progress – of a gross pollutant trap designed to capture the sediments and first flush of run-off

from surrounding suburbs and an old landfill site, but which permitted the higher water levels of a 'big event' to pass through unimpeded. Careful native plant selection was seen as a key element in the success of the wetland and the mangroves were cut regularly as a component of the pollution management system.

At Ingham Road, in the middle of a residential area, the Committee inspected the Lakes 2 site which it was told had in 1998 been so polluted that there had been a total fish kill and ducks had died from contacting and eating the toxic algae. Part of the problem was that the site had limited water interchange and, given its shallowness, the water would heat in summer to the point of being oxygen deficient. It also varied between highly saline and fresh. The TCC is trialling a range of water quality initiatives, with apparent success. Being a tropical area, one challenge was to deal with the first flush of a major event, especially after low rainfall periods, while also maintaining water quality at other times. Initiatives included use of floating buoys carrying activated carbon to absorb organic material, use of a swimming pool filter for aeration and cleansing, a floating litter boom, a baffle system to restrain sediments while allowing water to pass through, and maximal use of biomass as biofilters of excess nutrients. Inflowing water runs over rocks as a means to improve aeration. The TCC is also experimenting in conjunction with the Department of Primary Industries with the use of mullet to aid water quality.

One interesting feature was the attitude of local residents, who naturally wished not to have a stagnant pond at their doorsteps, or to be flooded in major events, but who also argued for a neatly manicured grassed area rather than a biomass of reeds, even though they would be a better practical option for both nutrient removal and flood mitigation.

Finally, the Committee was shown the Louisa Creek project, towards which the TCC received some $500,000 of NHT Clean Seas funding. The Creek is a semi-natural waterway which flows through both industrial and residential areas. The Creek also flows directly under the major airport flight path, which means that increased risk of birdstrike has had to be avoided in any attempt to remediate wetlands. TCC sees the Louisa Creek project as a practical chance to study the practice of mitigating urban run-off in a tropical low-lying catchment and to investigate innovative solutions to stormwater pollutant treatment under various scientific, political and social paradigms for managing waterways. A key issue was that site conditions and land availability ruled out use of conventional wetlands and gross pollutant traps (GPTs).

To seek to ensure maximum efficiency and cost reduction, TCC adopted a treatment train approach for the entire length of the creek under its jurisdiction, with a combination of off-stream and in-stream pollutant treatment systems. Two sites in particular, in light industrial sub-catchments at Camuglia and Greg Jabs Court, were selected for the construction of innovative pollution control systems. While intended as experimental, they were first passed by both the Commonwealth's Technical Advisory Panel and the Council's own engineering/environmental consultants.

The Committee was shown the project at several locations, the detail of which would be too voluminous to include in this report. It included elements of formal

engineering works, vegetative repair of the riparian corridor, and in-stream improvements such as rock ripples to aid aeration. It was an interesting response to the perceived need to manage water quality when it was considered most at risk, in the middle to late dry season, and immediately prior to the 'first flush' when accumulated pollutants were mobilised and transported downstream. While some attention is being paid to treating the large volumes of run-off generated in the wet season, TCC formulated the view that it is the low flows that most need to be addressed for overall environment protection. While not stated in these terms, it is assumed that the thinking is that the Great Barrier Reef was unaffected by high flows before urbanisation, but that it is the effects of urbanisation which need to be mitigated.

One clear lesson from the project is the benefit of protection of a whole system - including land and water use policies for contiguous and surrounding sites - rather than simply addressing components of it, such as the construction of 'end of pipe' wetlands prior to discharge. Also, it is clear that only the more wealthy councils will attempt such projects without financial assistance. Apart from the project's direct cost, TCC has foregone revenue from land sales and rate revenue to ensure the project's viability.

In summation, the Committee was informed by the TCC that little research had been conducted on stormwater quality issues in tropical urban catchments and that it was leading the way in this respect. The information it is gathering will be of value to all councils, and to community and environmental/engineering groups. Much of its research is through trial and error, with a view to identifying which approaches are successful, and which are not. Its work is intended to provide the scientific evidence to support the development of management solutions to tropical urban and industrial run-off. It is seeking to develop modular systems, where different proven approaches can be applied at different sites - rather than a one-size-fits-all approach.

The Committee was impressed with the commitment of TCC's elected representatives and officers. Perhaps even more significantly, TCC's willingness to experiment and to confront the consequences of failure is, in public life, both brave and refreshing.

4 April 2002 - Brisbane

A planned visit to the Luggage Point sewage treatment plant had to be cancelled at short notice when an incident in the immediately preceding days led to the plant's closure to visitors. Instead, the Committee's host, Mr Ralph Woolley, Senior Program Officer, Technology for the Brisbane City Council (BCC) made alternate arrangements for the Committee to inspect the Chandler Recycling and Waste Transfer Station and the Gibson Island Wastewater Treatment Plant.

Chandler Recycling and Waste Transfer Station

At Chandler, the Committee was met by Mr David Solley, a Senior Engineer with Brisbane Water, and Mr Evangelos Callipolitis, Supervisor of the Landfill Remediation section, and several of their colleagues, where the Committee was shown

efforts to remediate a former landfill for use as a public park, including a criterion bike track, the roads for which would be used to help to trap stormwater.

As part of the remediation, the site had had installed a complex of drains and gas wells before being capped, the former to capture both stormwater and leachate and the latter the methane gas arising from the fill's decomposition. The Committee inspected the on-site leachate treatment plant, which extracts nitrogen and other elements, before discharging the effluent.

The Committee was told that BCC had hopes to contract with the nearby Chandler swimming pool complex to use the methane for providing fuel for its heating requirements and for surplus power to be loaded into the main power grid. The surplus methane gas is currently flared, which is considered to have less harmful greenhouse effects than its release in gaseous form.

Gibson Island Wastewater Treatment Plant

The Committee arrived at Gibson Island after normal closing time and is grateful to Messrs Graham Chapman and Duncan Taylor for their willingness to await the Committee's arrival despite the relatively short notice of the planned visit. The $40 million plant is fully automated and only four staff are required to monitor its computers, although officers of Council's Scientific Services Branch regularly take samples of the wastewater at various treatment stages to keep track of plant performance and the chemical make-up of the effluent. It treats mainly domestic sewage from Brisbane's southern suburbs, received by gravity feed in a specifically constructed $19 million 25 kilometre sewer pipeline.

In 1960 only 38 per cent of Brisbane properties were sewered. That figure is now 97 per cent. Gibson Island is one of several wastewater plants built by the Brisbane City Council in the past 20 years, and its current Stage One is designed to treat waste from a population of around 150,000 residents.

Treatment involves both a primary fine screening to remove all the silt and solids from the sewage and a secondary biological removal of the lighter suspended solids, fats and dissolved organic matter. Gibson Island differs from other major BCC sewage treatment plants by its use of screens to remove heavy or solid matter, rather than primary settling tanks. The treatment includes an extended period of aeration of the sewage and 'activated sludge' mixture in a race-track shaped series of channels (called oxidation ditches), before the treated effluent is discharged into the river through an underwater outfall. Sludge not recycled within the process has the excess water removed and the solids waste are transported to landfill.

The Royal Brisbane Golf Club takes a small amount of treated effluent for use on its grounds - which it takes responsibility for chlorinating. Mr Chapman indicated that the effluent discharged into the river is not chlorinated because the river is not considered to have a recreational use, although he expressed a personal preference for ultra violent disinfection rather than chlorination.

5 April 2002 - Brisbane

The Committee spent the whole day on site visits in the Brisbane area. It commenced the day travelling down the Brisbane River from the South Bank Jetty and then across Moreton Bay on *The Moreton*, use of which had been donated by the Queensland Department of Transport. The Committee records its appreciation to the boat's captain, Mr John Bensley, and his crew for their cooperation.

The Committee was accompanied by Dr Eva Abal, Scientific Coordinator of the Moreton Bay Waterways and Catchments Partnership, Ms Diane Tarte, the Partnership's Community, Industry and Government Liaison officer, and Ms Ursula Kerr, Principal Waterways Program Officer in the BCC's Urban Management Division, which developed the Brisbane River Corridor Management Plan. The Committee observed the several industrial and residential developments and stormwater drain outfalls along the route.

Dr Abal maintained a commentary on water quality issues and, in particular, demonstrated turbidity at several points. One of her principal concerns was the effects of urbanisation and turbidity on the health of seagrass beds on which the Bay's dugong population relied. She clearly demonstrated by reference to the Sechi turbidity measure that water quality in the river, and even close to its mouth at Moreton Bay, falls below accepted standards for seagrass growth.

Ms Kerr outlined the key elements of the Brisbane River Corridor Management Plan, a comprehensive BCC program to develop a holistic approach to balancing the economic, transport and residential needs of the community with the protection and restoration of the river. The Plan is too comprehensive to detail here, given that it includes recreational, transport and cultural elements, as well as water quality measures. Some of the elements intended to improve river health include: $17 million to upgrade nitrogen removal at the Luggage Point Treatment Plant, the installation of over 30 Stormwater Quality Improvement Devices (SQIDs) around the city to stop rubbish and sediment from entering the waterways, actions taken to reduce sediment and run-off from building sites, and the launch of a community education program based on the theme *Improving our waterways from Backyard to Bay.*

Brisbane City Council water management projects

Upon arrival at Manly Boat Harbour, the Committee was met by Mr Stuart Hoverman, Principal Waterways Program Officer in the BCC's Urban Management Division. Mr Hoverman escorted the Committee to a number of the stormwater projects of which Ms Kerr had spoken. He indicated that BCC had imposed a 0.5 per cent environmental levy on ratepayers which had provided much of the necessary funding for the projects which the Committee would inspect, although some support had been received from the NHT's Coasts and Clean Seas program.

The first site was the newly completed Bowie's Flat wetland in the suburb of Bridgewater. It was a constructed wetland on a site which had previously consisted of two traditional concrete culverts. Mr Hoverman stressed that, while the concrete

culverts were designed with a view to getting rid of stormwater as quickly as possible, the principle behind constructed wetlands is to slow the flow of water to enable vegetation to filter the system. The Bowie's Flat wetland train commences with a gross pollutant trap to collect litter, vegetation and sediment from neighbourhood run-off, followed by a series of shallow ponds to, firstly, capture coarse particles of sand and soil, before the water passes through wetland plants where fine particles and microscopic nutrients are trapped. The wetland is kept to a maximum depth of one metre to ensure plant growth. Cleaner water, and in heavy rain excess water, flows into Norman Creek, the Brisbane River and Moreton Bay.

Despite its functionality, the site is an attractive amenity for local residents, who were heavily consulted during the planning stages. Even the potential threat of mosquitos had been overcome with the presence of fish - despite none having been introduced. A problem common to such developments – not only SQIDS – is that the contents of the GPT and the course sediments need to be regularly removed to retain the site's effectiveness. Mr Hoverman noted that all such works are budgeted for.

The next project was in the new housing development of Windamere, in the suburb of Jindalee. The construction of a wetland along the creek in the centre of the housing development had been a BCC requirement in its DA approval, although BCC has accepted ongoing maintenance responsibility. The wetland was based on a natural design concept with water flowing over gravel and rocks and through reed beds. Mr Hoverman noted – and it was a point that was to be often heard by the Committee during later inspections – that real estate agents had suggested that the presence of the wetland had added 20 percent to the value of the houses. The only residual concern was the possibility of snakes taking refuge in the reed beds.

The Committee then briefly inspected the Keith Boden Wetlands in Cressy Street. This was similar in design concept to the Bowie Flat wetland, although some three and a half years old. It receives stormwater from two major channels, parts of which had been buried to improve the amenity of the immediate area. Situated in the middle of a parkland and readily accessible by cycleways, Mr Hoverman noted that the site was a popular spot for families, which it is hard to imagine would have been the case if the stormwater had been a trickle in the bottom of a concrete culvert. The considerable number of ducks present in the area was also a vote of confidence in the health of the system.

In summary the Committee records its high regard for the efforts of the Brisbane City Council. As with most local government authorities, it clearly has a long history of water quality neglect to address, but it has certainly made an impressive start.

19 April 2002 - Sydney

The Committee spent the whole day on site visits in the Sydney area.

Sydney's Sustainable House

It commenced by visiting 58 Myrtle Street, Chippendale, the home of Mr Michael Mobbs, his partner Ms Heather Armstrong, and their two children. What is special about the house is that Mr Mobbs has adapted an otherwise ordinary terrace house built in a suburb of inner Sydney in the 1890s into what has come to be known as Sydney's Sustainable House - a house almost entirely self-sufficient in electricity, water and waste disposal. A comprehensive description of the house is given in the book *Sustainable House: Living for our future*, first published in 1998 as A Choice Book by the Australian Consumers' Association.

Mr Mobbs showed the Committee over the main features of the house. Of most significance to the Committee's inquiry, all stormwater and sewage is retained on site, the former for potable and personal bathing purposes and the latter recycled for non-potable uses such as garden watering and toilet flushing. A first flush water diverter was installed at a cost of only $40. One of Mr Mobbs' regrets is that he has to pump all water, having failed to get a neighbour's agreement to install a water tank in the roof, which also means that water supply is a problem when there is an energy failure. The back garden includes a small wastewater treatment system and a miniature wetland, which Mr Mobbs estimates prevents 100,000 litres of sewage going into the Harbour each year.

The house is in a heritage conservation area and from the outside looks much like the others in the terrace. And it includes the standard appliances of modern life. The Committee congratulates Mr Mobbs on his efforts and, while noting that his vision may not be to everyone's tastes, he has proven what can be achieved with a bit of ingenuity and a lot of determination.

Sydney Coastal Councils Group/Mosman Municipal Council

The Committee then visited Mosman and Balmoral Beach as guests of the Sydney Coastal Councils Group and Mosman Municipal Council. The Committee was met by Councillor Jim Reid, Mayor of Mosman Municipal Council, Councillor Patricia Harvey, Chair of the Sydney Coastal Councils Group, and several Council officers. The Committee inspected developments below the Mosman Wharf road, which are the culmination of an extensive drainage re-alignment of the 70 hectare (largely heavily treed) catchment from an original seven drains – five of which were capped – into the current two which were natural watercourses. SQIDS have been installed on both outlets to minimise the flow of litter and sediments into the Harbour.

Mr Paul Davis, Council's Senior Design Engineer, pointed out that the two GPTs, one using netting and the other a screen, had proven extremely effective in capturing, in particular, the large amounts of leaf litter which were once washed downstream, especially in high rainfall events. He noted that the traps required regular cleaning and that there had been problems when blockages had occurred.

The Committee was then shown two of the three CDS units at Balmoral Beach. The Committee was joined by Council General Manager, Mr Vic May. The first unit, set into the gutter in the road above the beach, had effectively eliminated surface rubbish from reaching the Harbour. Councillor Reid noted that the unit cost some $200,000 but that its cost was offset against reduced street sweeping and associated waste removal costs. Some concerns were expressed about its operation, including anaerobic breakdown and the need, every couple of years, to pump out all the sediments which are not caught by the emptying grab mechanism.

The second CDS unit at Balmoral South was the first installed in NSW in 1995 at the bargain price of $40,000. It was installed at the end of a reconstructed creek bed which fed stormwater from hinterland bushland and which carried considerable sediment and leaf litter into the Harbour.

It was stressed that the community had been fully consulted in these processes, which gave it a sense of ownership in its success. Councillor Reid told the Committee that the waters off Balmoral were observably cleaner for swimming in than surrounding areas - but that, of course, his Council could do nothing about pollution from nearby areas.

Over lunch in the Council Chamber, apart from receiving a warm welcoming speech by Councillor Reid, the Committee was shown a powerpoint display of the Council's stormwater management program by Mr Davis. The Committee was informed that Council had, with almost unanimous community support, and the requisite approval of the State Government, imposed a 5 per cent environmental levy onto residents' rates to fund a program called the Community Environmental Contract (CEC). The levy is projected to generate $6.8 million and is complemented by an additional $2.2 million in grant monies. One project, the Taylors Bay Stormwater Project, had received funding under the NHT's Coast and Clean Seas Program, and from the National Parks and Wildlife Service, as well as the CEC.

The Council had shown its commitment to the program by establishing inter-departmental and inter-organisational project teams to ensure a cooperative approach. The Council had adopted a flexible approach, using both structural and non-structural solutions. The construction of 13 SQIDS, creek restoration and stormwater diversion were examples of the former approach, with some 50 per cent of Mosman's catchments now draining through SQIDS, while a comprehensive education campaign, development controls and legislative enforcement were components of the latter. The community now closely identifies with the 'Mosman CEC' name and concept.

The success of the program was summarised as being based on: strategic planning; use of multi-disciplinary project teams; use of an integrated approach to stormwater management using structural and non-structural controls; the support of politicians, staff and the community; an innovative approach to funding; and cooperation between all levels of Government.

Councillor Reid noted that he had originally taken some persuading about the merits of the program, but that he is now one of its staunchest advocates. This echoed a message that the Committee was to hear with regularity - that a successful program is dependent on a high level of commitment from its political leaders and staff. Mosman Municipal Council obviously has this in abundance.

Sydney Olympic Park

The Committee then visited the Sydney Olympic Park complex at Homebush Bay. It was met by Mr Warwick Proctor, Director, Asset Management of the Sydney Olympic Park Authority (SOPA - formerly known as the Olympic Co-ordinating Authority) and Nicole Campbell, the Authority's Environmental Policy Manager. The visit commenced with a boardroom and powerpoint presentation in the Homebush Bay Visitor's Centre in Herb Elliott Avenue, before the Committee undertook a quick tour of the Park's water recycling facilities.

The Committee was informed that, while the original tender document for the construction of the site included prescribed environmental objectives, of which water quality was but one element, tenderers had put forward numerous imaginative suggestions. The philosophical underpinnings had been: a commitment to environmentally sustainable development; the minimisation of sewage and stormwater; the optimisation of recycled water; and minimal use of water of drinking quality standard. While Mr Proctor gave the Committee a considerable insight into the historical context, the outcome was the Water Reclamation and Management Scheme (WRAMS), which was the first integrated water management scheme of its type in Australia. It provides recycled water to residential, commercial and sporting facilities in the neighbouring suburb of Newington (connected in April 2001) and Sydney Olympic Park and is both a showpiece and model for managing water resources in an urban environment.

The main elements of WRAMS are: a water reclamation plant to harvest water from sewage; a water storage reservoir in the former brickpit to provide extra water for treatment when demand is high; a water treatment plant to filter and disinfect effluent from the reclamation plant and stormwater from storage; and a separate, dedicated supply system, to pipe water from the treatment plant to the sporting venues, parks and to Newington. WRAMS is complemented by other water saving initiatives, such as rainwater collection systems at Stadium Australia and the main arena of Sydney Showground, and the use in all new developments of such water saving devices as low volume toilet flushing systems to reduce demand on water. The grounds are planted with Australian native plants that require very little extra water.

The Water Treatment Plant, which can treat up to seven million litres of water per day from the Water Reclamation Plant and the brickpit reservoir uses two processes: continuous micro-filtration to remove all particles larger than 0.2 microns, and reverse osmosis to reduce salinity. It is then disinfected by chlorine. The Committee was shown a sample of the membrane filtration technology which has the advantage that it can act as a disinfectant by mechanically removing all colloids, bacteria, large viruses and protozoa cysts.

The recycled water is pumped from the treatment plant back to Newington and the Park's major venues and facilities and used where potable water is not required, such as for toilet flushing, irrigation, firefighting, washing cars and construction and industry. It is not intended for drinking, cooking, personal bathing, swimming or for washing clothes.

The price at which recycled water is sold to customers is currently set at about 15 per cent below the standard drinking water price by the Independent Pricing and Regulatory Tribunal, which will be reviewed in conjunction with its periodic review of drinking water prices. This price of 78 cents per kilolitre is well below SOPA's operating cost of $1.40 per kilolitre, which also compares unfavourably with average traditional operating costs of about $1.00 per kilolitre.

During their presentation, Mr Proctor and Ms Campbell noted that there had been some issues between SOPA and State authorities, many of a jurisdictional nature. For example, Sydney Water still charges rates to properties included in the WRAMS scheme on the basis that it still needs to maintain back-up systems in case of a system failure by WRAMS. It is also clear, however, that being the agency responsible for hosting the Olympics had given them some considerable clout to get regulations passed in a timely manner which might otherwise still be being debated.

The Committee congratulates the NSW Government and SOPA for their achievements. The granting of several awards to OCA/SOPA, such as RiverCare 2000 (State Government Category) and the 2001 Banksia Environmental Award (Infrastructure and Services), are testimony to the high regard in which the WRAMS scheme is held by industry experts. SOPA was, incidentally, also awarded the 2000 Gold Banksia Environmental Award for its work in protecting the Green and Golden Bell Frog at Homebush Bay.

While it is clear that the reuse aspect of the project is not justifiable on a straight economic basis, its cost disadvantage over conventional infrastructure may disappear if the true cost of environmental externalities and other surcharges is taken into account. The overall environmental performance of the scheme includes a reduction of demand for potable water by over 50 per cent, a reduction in sewage discharge by 850ML per year, and a reduction in stormwater pollution by 70 – 90 per cent when compared to traditional urban stormwater runoff. The resulting improvements in water quality in Sydney's rivers and the Pacific Ocean is an obvious environmental benefit which should be taken into account.

Sydney airport/Botany Bay area

The Committee had planned to undertake a tour of the Botany Bay area as a guest of the Southern Sydney Regional Organisation of Councils. Because of the late hour, arrangements were made for a briefing to be given instead.

The briefing was conducted in the boardroom of Sydney Airports Corporation Limited, at Level 10 of the Airport Central Building in O'Reardon Street, Mascot. The Committee was met by Ms Lisa Smith, the Corporation's Manager, Environment

and Community, who gave a brief overview of water management at the airport. The boardroom looked south over the runways and Botany Bay, which considerably assisted the Committee's understanding of the briefings. Ms Smith provided the Committee with two documents: *Sydney Airport 1998-2000 Report on Environmental, Social and Economic Sustainability* and *Towards Sustainability,*a summary report of the first report. Those reports suggest that the Corporation is paying due regard to the triple bottom line concept, and not simply focussing on economic outcomes.

Ms Smith noted that water management was undertaken under Commonwealth statute, in particular the Airports (Environment Protection) Regulations. Sydney airport has two unique water management issues: runway stormwater runoff and aircraft sewage disposal.

The runways have no formal stormwater system. The majority of rainwater simply runs into the adjacent lawned areas where it is absorbed. Water otherwise drains into Botany Bay through the Mill Stream, Cooks River or Alexandra Canal. Ms Smith assured the Committee that tests had shown that local creeks carrying urban runoff were more contaminated than runoff from the airport. There is more risk of contamination around the terminals, but an automated hydrocarbon filter system monitors discharges and in the event of a spill, cuts off stormwater egress from the site. Most routine spills are cleaned up by the Spill Response Team, while the Airport Emergency Plan is triggered by a major hydrocarbon spill situation. The runways are also swept twice daily and scrubbed periodically to collect rubber traces.

Sewage off the aircraft raises a quarantine issue and it is delivered off-site to a special trade waste plant for treatment. Non-quarantine waste is disposed of to landfill.

The Committee was then briefed by Mr Jim Colman, consultant to Southern Sydney Regional Organisation of Councils (SSROC) SSROC on the Botany Bay Program (BBP). Mr Colman's curriculum vitae demonstrated his longstanding expertise in major projects of this nature. He gave the Committee a copy of *The Tide is Turning,* the December 2001 report by SSROC on the BBP, an 18-month project funded under the NHT's Coasts and Clean Seas Program. Botany Bay is Sydney's 'second harbour' with a waterway area of 80 sq km, and catchment of 1100 sq km - which covers a third of the area of metropolitan Sydney. Apart from its role as Sydney's primary maritime facility, it also provides a setting for aquatic recreation, tourism, industry, housing, commercial and recreational fishing, flora and fauna habitats and public open space.

The report updated the information contained in the July 2001 discussion paper entitled *Turning the Tide,* which SSCROC had already provided as part of its submission to the Committee's inquiry. That Discussion Paper presented for public comment, documents the results of the first 12 months of work on the BBP.

The final report represents an integrated and whole-of-government environmental strategy for the Bay, with a view to ensuring that future development and facility expansion is consistent with the principles of ecologically sustainable development. The project had grown out of community and governmental concerns about what was

seen as a continuing decline in the environmental health of Botany Bay and its catchment, with the Botany Bay Basin having been described by the NSW Ministry for Environment Control as an 'environmentally overstressed region' as early as 1973.

The main trigger to action was the July 1998 *State of the Bay* report, a report compiled by a working party of Bay councils, which had highlighted the lack of a Bay-focussed management regime and included historical evidence of the Bay's steady environmental deterioration. That report had concluded that better planning and management of the Bay was vital if its environment was to be improved, and that it was the responsibility of all three tiers of government and the community at large to take action. In November 2001 the NSW Independent Commission of Inquiry into the Georges River - Botany Bay System (the Healthy Rivers Commission) had also recommended that the Bay be subject to an integrated decision-making framework, while at the same time the Southern Sydney Catchment Management Board was working on a draft catchment management strategy.

Mr Colman briefed the Committee on the project and its major findings. He drew particular attention to the implementation of a recommendation which called for the establishment of a Botany Bay Studies Unit at the University of New South Wales, which would provide a focus for relevant research in the physical and social sciences.

He also stressed the finding that, while the State Government had in 1998 established the Office of Sydney Harbour Manager within the Department of Urban Affairs and Planning, Botany Bay and its catchment had no such 'champion' – a designated organisation whose sole concern is the Bay's environmental welfare. Some 15 State agencies, 21 local councils and three federal bodies are involved in activities which have direct or indirect implications for management of the catchment. Who is responsible for what is not necessarily a question that is easily answered, and a Botany Bay 'supremo' may be able to cut though the bureaucratic maze.

Mr Colman concluded by commenting favourably on the long-term nature of the NHT funding, although he had clearly been perplexed by some of the bureaucratic accountability processes.

22 April 2002 - Bendigo

The Committee spent the whole day visiting water management projects in Bendigo.

Coliban Region Water Authority

Coliban Water was established in 1992 as the Victorian Government's State-owned water and wastewater business for North Central Victoria and is based in Bendigo. Its service area is some 16,500 sq kms, with a population of 130,000, and includes 55 towns or service areas. The services provided include water treatment, water harvesting and storage, urban and rural water supply, and wastewater collection, treatment and disposal. It also provides trade waste disposal services to a large number of businesses, including milk processors, abattoirs, food processors, major laundries, saleyards and a tannery.

Sandhurst Water Treatment Plant

The Committee commenced its visit at the newly constructed $50 million Sandhurst Water Treatment Plant in Kangaroo Flat and was met by Coliban Water's Chief Executive, Mr Geoff Mitchell, and Vivendi Water operational personnel. The plant was due to become fully operational at the end of the month – so the Committee's visit could not have been more timely in terms of seeing the very latest technology.

Sandhurst is the largest component of Coliban Water's $80 million AQUA construction project to bring a high quality water supply to the 110,000 residents of Bendigo, Castlemaine and Kyneton. The former Kennett Government had provided $61 million as part of a program to improve water quality in provincial areas. Adjacent to the Plant is the Sandhurst Reservoir, a new 40 megalitre covered clear water storage reservoir, also constructed as part of the AQUA project. All Bendigo's water is supplied via the Coliban Main Channel from the Upper Coliban, Lauriston and Malmsbury Reservoirs near Kyneton, although some water is also pumped from Lake Eppalock.

The project is being undertaken through a Public-Private Partnership arrangement (also referred to as a BOOT contract: Build-Own-Operate-Transfer) between Coliban Water and international water company, Vivendi Water, using leading edge, Australian developed microfiltration technology. Under the BOOT contract, Vivendi develop and operate the infrastructure before handing it back to Coliban Water after 25 years.

The Plant had proven a popular destination for international water supply practitioners attending the IWA World Water Congress in Melbourne only two weeks earlier, although it was stressed that such technology was only suitable for use in a large scale plant.

The visit commenced with a powerpoint description of the Plant's operations before the Committee was shown over its main features. The microfiltration technology was similar to the type shown to the Committee by the Sydney Olympic Park Authority, although its use here in a fully submerged environment is claimed to be a world first.

The Committee will not attempt to give a comprehensive description of the Plant's technical operations. It is a fully automated process using a SCADA computer system. The raw water is subject to a higher than standard level of screening, based on perceived need over a 25 year period, before passing through the microfiltration cells. It then is subjected to another barrier against viruses and cysts such as giardia and cryptosporidium, and treated with ozone and biologically activated carbon filtration to remove any unpleasant taste and odour. It is dosed at various stages with chemicals such as lime, ammonia and chlorine, and fluoridation was to commence in the near future. Not unexpectedly, the final product exceeds the standards set by the World Health Organisation and the National Health and Medical Research Council.

Coliban Water Head Office

Over lunch at Coliban Water's offices, the Committee held informal discussions with Mr Mitchell and Executive Manger, Planning, Mr Greg Sheehan, and a couple of their colleagues. Coliban Water had been subject to a price reduction of 21 per cent in 1998 and a subsequent three years price freeze. During 2000-01 there was a price determination process across the whole Victorian water sector, with approved increases of 4.9 per cent for 2001-02, CPI plus 1 per cent for 2002-03, and CPI only for 2003-04.

Among other matters discussed were the impact of the National Competition Policy agenda, the risk transfer element of BOOT contracts, the perverse incentive to privatised water companies to seek to sell more water in preference to conservation, and Coliban Water's demand management measures. The point was made that water supply is sufficiently reliable that water conservation is not yet seen as a dramatic issue. It was also noted that the improved water supply will assist the area's commercial and industrial development and, for example, it was noted that the Bendigo Hospital was already making savings on the cost of replacing filters.

Bendigo Wastewater Treatment Plant

The Committee then conducted a brief inspection of the Bendigo Wastewater Treatment Plant, operated by Coliban Water. It was told that when built 12 years ago its biological nutrient removal plant had been the first of the type in use in Australia. Consideration is now being given to its upgrade to meet new EPA Licence requirements. Construction of an additional tertiary treatment plant to remove more phosphorous by subjecting existing effluent to further filtration and ultraviolet disinfection was just being commenced. The project was expected to cost about $4.8 million.

City of Greater Bendigo

The Committee then visited the offices of the City of Greater Bendigo, where it was met by the Mayor, Councillor Willi Carney, Mr David Beard, Director of Infrastructure Services, and Mr Anthony Sheean, Community Environment Officer.

The visit commenced with a brief introduction to water issues in Bendigo. The City of Greater Bendigo has a population of about 87,000 people and an area of 3020 sq kms. It services a diverse mix of urban and rural communities. The Committee was told that Bendigo is not confronted with any great water supply problem, and that there is even scope for increased irrigation use. It has an issue, however, with the re-use of water for non-potable purposes – especially in relation to the need for compliance with EPA and health regulations. The community had expressed strong opposition to re-use of treated sewage. In principle, the City does not disapprove of the use of water tanks, or of on-site greywater use, subject to meeting the mandated requirements.

Harcourt Park

The Committee then visited Harcourt Park in the suburb of Strathdale, where it was met by Chief Executive Officer of Peter Harcourt Services Association Inc, Mr Paul Kirkpatrick. The Committee was accompanied by Councillor Carney and Messrs Beard and Sheean.

Peter Harcourt Services is a community-based, not-for-profit organisation providing day programs and supported employment services to over 150 people with disabilities in Bendigo and surrounding areas.

Harcourt Park, which opened its Stage 1 in October 2001, is a community environmental park focusing on the achievements of people with a disability. It has the joint aims of providing a venue for people with a disability to gain agricultural and horticultural skills, and as a site that can demonstrate to the community – such as school groups – the merits of sustainable agricultural, environmental and energy techniques practiced in an urban environment. Harcourt Park has received support and financial assistance from many community and charitable groups, as well as grants from State programs and Centenary of Federation funding. The City of Greater Bendigo is heavily involved in a community partnership with Peter Harcourt Services and has, for example, undertaken major infrastructure design and construction works.

The Committee was given an outline of future plans and then shown over the site by Mr Kirkpatrick. Of particular relevance for the Committee, a creek catching the stormwater for a relatively large area flows through the site and, like all creeks in Bendigo at some stage, it had been mined for alluvial gold. Prior to the Harcourt Park development the stormwater had been largely unmanaged. Considerable attention had been paid to the creek's reconstruction, with the inclusion of a chain of wetland ponds to help purify stormwater entering the creek, and an extensive reed bed around a stone filled trench to capture nutrients. Given its flood prone nature, all buildings and intensive work areas are sited above the flood zone. Greywater from the Amenities building, and nutrient rich runoff from the worm farm and animal stalls, were also directed through the reed beds for primary treatment.

The Committee applauds the vision of both Peter Harcourt Services and the City of Greater Bendigo for initiating this project. While still in its early stages at the time of its visit, the Committee could see that it will prove to be of great benefit not only to those who are employed in the complex but also to the residents of the city of Bendigo as a valuable educational resource.

White Hills Botanic Gardens

The Committee then inspected the White Hills Botanic Gardens, where it was told of the City's plans to construct a wetland on Bendigo Creek. The Gardens are an attractive and well-maintained facility and which, based on the Committee's observations of wetlands elsewhere, will be significantly enhanced by the proposal. Councillor Carney conceded that the site was somewhat restricted, but that they hoped to achieve up to a 70 per cent solution.

The proposed wetland development is a joint project between the City of Greater Bendigo and the North Central Catchment Management Authority (NCCMA). This is because the council has various responsibilities as a drainage authority under the Local Government Act and other State legislation, while the NCCMA is responsible for the care and wellbeing of the rivers and streams and their respective catchments.

NCCMA had submitted an application for a grant under the Victorian Government's Stormwater Action Program (VSAP). It seemed that a decision on funding was the final step before the project could proceed.

City of Greater Bendigo offices

The Committee then returned to the offices of the City of Greater Bendigo, where it was formally welcomed by the Mayor before being shown a slides presentation by Mr Beard. He outlined the urban water management issues facing the City Council and its plans to address them. The Council has developed a Stormwater Management Plan, which is a prerequisite to gaining VSAP funding. In any case, it complies with council's corporate goal of achieving efficient and sustainable management of stormwater. Once again, the Committee sensed the great enthusiasm of both elected representatives and Council officers as seen in visits to other councils, but there was also an element of frustration at the constraints. Funding was, not surprisingly, one of the issues, with a State Government dollar-for-dollar program concluding after three years, with Councils expected to find all future funding, and the grant monies having to be shared with the local Catchment Management Authority. Lack of clarity over Council's and the EPA's respective responsibilities was also noted.

Ms Suzanne Milne, an officer of the City's Health Department, then attended to answer some questions from the Committee on policies on domestic greywater re-use and rainwater tanks. Interestingly given the comment above, Ms Milne stated that industrial re-use is an EPA responsibility, while councils are responsible for projects at the domestic level. She then referred to an EPA Information Bulletin issued in November 2001 entitled *Domestic Wastewater Management Series – Reuse options for household wastewater*. The Bulletin had been issued by the EPA in recognition that the State is experiencing increasing pressure on its finite water resources and because the community is showing increasing interest in water conservation. The Bulletin states that while there are no specific local or State government controls on household diversion systems, the wastewater reuse must not create a public health hazard, an environmental hazard or a nuisance. Thus householders can divert greywater for reuse, provide they obtain consents from the relevant authorities and use a licensed/registered plumber to carry out the works.

Ms Milne noted that, under the *State Environment Protection Policy* wastewater disposal in sewered areas must be via the sewer. The Bulletin sets out standards for approval of effluent reuse schemes that meet the objective of 'sustainably protects human health and the environment, with a risk level equal to (or less) than that associated with discharging to sewer' – and then notes that water balance calculations have indicated that it is not possible to reuse the entire wastewater flow from a

household on typical urban allotments in Victoria. Hence the policy largely applies only to unsewered housing.

Ms Milne noted that several of the newer housing developments are unsewered and Council examines about 200 septic tank installations each year. She noted that there are a number of packaged greywater treatment plants – costing around $6000-8000 – which have EPA certification. Approvals take account of considerations such as soil type, topography, size of dwelling and size of block, but must meet minimum water output standards. Ms Milne made particular mention of the potentially adverse effects on neighbours of using untreated greywater. Anyone allowing their greywater to enter adjoining properties may be exposed to civil liabilities associated with private nuisance, trespass and negligence.

In relation to rainwater tanks, Ms Milne advised that the health department has no restrictions on their use – but that the planning department may have concerns about larger ones. She also added that saltwater swimming pools are discouraged because of salinity concerns, while backwash is required to go to sewer.

In summary, once again the Committee has met representatives of a local government authority which is concerned about urban water management and committed to addressing it from a sustainability perspective. The Committee congratulates Councillor Carney for her leadership and vision, and her officials for their enthusiasm in seeking solutions.

24 April 2002 - Melbourne

The Committee spent the whole day on site visits in the Melbourne area. It was accompanied by Mr Peter Scott, Melbourne Water's Group Manager, Science and Technology.

Collex Pty Ltd

The Committee visited the Collex facility in the suburb of Brooklyn. It was met by Dr Ray Spokas, Engineering & Environmental Services Manager, and Mr Grahame Sturzaker, Manager Liquid Division. The Committee was briefed about the facility's role and functions before being given a brief tour.

Collex, which is part of the global Vivendi Environment Group, is Victoria's largest front lift and roll-on waste transporter. The Brooklyn facility is one of the company's six Australian liquid treatment plants, which specialise in industrial wastes including grease trap waste and food sludges, organic sludges, hydrocarbon based waste, phenol contaminated water, acids, alkalines, paint, resins, inks and dyes, adhesives, wash waters, and hazardous liquid spills.

Dr Spokas noted that they take in 1.2 to 1.5 million litres of effluent each week. Simple liquid waste is generally dealt with in on-site facilities, and it is only the more problematic materials which get delivered to Brooklyn. Once treated, the material is either sent to sewer or to landfill in cake form. He highlighted the fact that their

Victorian facilities are too old to burn flammable solvents, which are sent to Collex facilities in NSW and Gladstone.

He noted that the discharge water is put through several processes, including the addition of lime to extract heavy metals. He noted that salt – such as sodium chloride – is an unwanted by-product of these processes. The salt can be extracted, but then there arises a problem of its disposal, with the landfill option ruled out because of the leaching concern. At present it ends up at the Werribee Water Treatment Plant where, at least, it gets diluted before disposal in the ocean. Dr Spokas described it as a huge problem with no obvious solution. He also noted that ammonia and photographic waste is another problem area, creating excess nitrogen. Extracting the ammonia is feasible but, in the absence of a market for ammonia is uneconomic, and Werribee receives additional nitrogen as a result.

Victoria only has two landfills for industrial waste, both of which will be full in only another three years, which is an issue for the Victorian Government to address. Dr Spokas told the Committee about the success of a recent Collex project at the Qenos plant in Altona. Qenos is a global plastics and rubber business, which requires the sludge in its sedimentation pond to be cleaned periodically. When last cleaned in 1990, the sludge was treated with bulking stabilisation material before being disposed of to landfill. The process had emitted high levels of odour from the ammonia waste. In 2000 Collex developed a pumping system attached to a submerged hydrozer, the removed waste being transferred to a sludge treatment decanting unit, which reduced the sludge volume, mainly water, by 70 per cent. The remaining 30 per cent dry-cake, containing an estimated 18 tonnes of copper, was sent for recycling to Pasminco Smelter at Port Pirie. Not only was the copper recovered, but a major reduction in landfill was achieved.

Dr Spokas indicated that Collex had spent millions of dollars researching the calorific energy that can be gained from trade waste, and despite it being found to have some three times the value of brown coal, little industrial interest has been shown while landfill disposal remains relatively cheap. He indicated that it would be ideal for use in a lime kiln, where the high temperatures would negate any air pollution problems.

Collex had also mooted a green waste composting system with Coles and Woolworths. The latter company simply opted for landfill, again on economic grounds.

The Committee is grateful to Dr Spokas and Mr Sturzaker for their frank assessment of some of the problems involved in industrial waste disposal. Price is clearly the biggest impediment to best practice, while companies can legally dump wastes cheaply at landfill rather than pay the cost of proper remediation. It appears that companies like Collex have the capacity to, at least, try to deal with the worst of contemporary industrial excesses, but there is a lack of incentive to ensure that high-tech recycling operations are viable. There are clearly some major challenges ahead for both industry and government to address.

Cairnlea

The Committee then visited the Cairnlea Land Sales Centre, a residential estate being developed by the Urban and Regional Land Corporation (URLC) on the 460 hectare site of the Department of Defence's former Albion explosives factory in Deer Park. The project is significant for the extent to which it incorporates elements of Water Sensitive Urban Design (WSUD). The Committee was met by Mr Doug Vallance, the Cairnlea Project Manager, Ms Barbara Mitrevski, Project Manager, and Ms Lynn Betts, a Land Sales Consultant. The Committee was also met by Mr Bernie Porter, Project Manager of the Corporation's Lynbrook Estate development.

The Committee was shown a model of the estate and Mr Vallance and Ms Mitrevski described its main features. The former explosives site had left significant and extensive soil contamination, which had had to be remediated before development of the residential estate could commence. While the Commonwealth undertook some initial remediation, at the time URLC entered into a Remediation and Development Agreement with the Commonwealth some 40 per cent of the site, containing some of the most heavily contaminated areas, remained.

As part of the remediation, URLC constructed an on-site repository for the contaminated soils, which was formed into a 10 metre high mound before being landscaped for passive recreational purposes. URLC describes the repository as the most advanced yet seen in Australia and the equal of world best practice.

Mr Vallance noted that the success of the project was shown by the fact that, while the project was originally expected to have a life of 10-12 years, some 1500 of the 3000 lots had sold within the first three years. He argued that the several water features and associated parkland that had been incorporated into the estate was a significant contributing factor in this respect.

The most prominent feature of Cairnlea is its comprehensive water quality and stormwater re-use strategy, involving the use of four major man-made lakes together with numerous wetlands and sediment ponds. A GPT at the head of the lake catches surface rubbish while the macrophyte plants in the ponds filter sediment and nutrients. The ponds act as storage for stormwater, which is subsequently used for on-site irrigation, representing a 50 per cent cost saving. Existing creeks have been rejuvenated from polluted drains into living creeks. Three conservation reserves, totalling 35 hectares, have been set aside to protect the habitat of endangered flora and fauna, including the striped legless lizard and plains rice flower.

The development masterplan includes boardwalks, pavilions, parklands and picnic area, as well as sportsgrounds and walking and cycling tracks. Victoria University of Technology and primary and secondary schools are nearby, with plans for the estate's own primary and secondary school in the future.

Mr Porter described the main features of the Lynbrook Estate development at Lyndhurst, before showed the Committee a video. Lynbrook was the first large scale residential estate in Australia to incorporate WSUD and the CRC for Catchment

Hydrology and Melbourne Water were heavily involved in its development as a major demonstration of WSUD principles. In 2000 the project was presented with an Urban Development Institute of Australia Excellence Award for its innovation in land development.

The first two stages of a three-stage $15 million development are complete. The most significant feature is the design of the local streets, where concrete gutters and pipes are replaced by grass swales (as well as a gravel swale in the middle of the median strips of two of the main boulevards). The swales slow down the runoff and allow some of the water to be absorbed back into the ground, which filters out pollutants. The runoff from the streets and houses eventually drains into wetlands and a lake, which is an aesthetic and recreational amenity for residents.

The URLC representatives stressed that WSUD is still a developing concept and that accordingly neither project contained all features. They pointed to their Corporation's 8000 lot development in Epping where all these ideas are being built into one of the units. That project will, no doubt, create a great deal of interest in the potential for WSUD.

The CRC for Catchment Hydrology has stated that WSUD systems can remove up to 80 % of phosphorous, 60 % of nitrogen and 90 % of suspended solids from stormwater. The Committee was told that, while the WSUD philosophy is catching on, there are still builders who remain to be persuaded of its merits. Some individual Cairnlea houses, for example, still had full guttering and down pipes to traditional stormwater drains. It is known that several major city councils have adopted WSUD as planning policy for new developments – given the difficulties associated with retrofitting, it seems to the Committee that others should follow their example.

The Committee declares that that each member of the group that visited Cairnlea received a 'show bag' consisting of a T-shirt, baseball cap, video, key ring and a small presentation box of chocolates.

Melbourne Water's Western Treatment Plant, Werribee

The Committee then visited Melbourne Water's Western Treatment Plant at Werribee, where it was met by Mr George Judkins, Section Leader, Process Support, of Melbourne Water's North West Operations. Melbourne Water is the Victorian Government agency charged with managing the city's water supply catchments, removing and treating most of Melbourne's sewage, and managing waterways and major drainage systems.

Mr Judkins detailed the plant's history and current operations, before the Committee was shown around the site.

Werribee originated out of a Royal Commission report in 1888 into a typhoid outbreak and it accepted its first sewage in 1897. It was chosen because of its favourable soils and gradients, and low rainfall. It is now a site of 10,000 hectares, discharging 165,000 megalitres (ML) of Melbourne's total 300,000 ML of treated effluent each year, from four EPA-approved outlets into Port Phillip Bay. 75% of its

inflow is domestic waste, while the 25% of industrial waste accounts for 50% of the organic load.

Werribee uses three methods of wastewater treatment: lagooning in some 289 hectares of ponds for year-round peak daily and wet weather flow; land filtration (by irrigation) during summer periods of high evaporation, and grass filtration (by overland flow) during winter periods of low evaporation. The site is listed under the Ramsar Convention, being a sanctuary to about 270 species of bird, and with an estimated count of some 65,000 birds. Werribee also has the largest cattle herd in Australia which, with sheep, are integral parts of the land filtration process by grazing after the land has had time to dry out from flooding. The Committee was able to observe that trees on the site were generally not thriving and Mr Judkins advised that livestock had proven more profitable than timber.

Melbourne Water has embarked on a $125 million upgrade at Werribee aimed at odour reduction, nutrient removal and increased recycling. The emphasis on nitrogen removal follows the recommendations of a four-year study by CSIRO completed in 1996. Werribee currently recycles only one per cent of effluent, and it is proposed to achieve 20 per cent of effluent recycling by 2010, which will significantly reduce both discharges to marine environments and demand for potable water.

Mr Judkins noted that its current recycled water is classified as Class C, while the plans are to aim for the generation of Class A water, which has EPA consent for use in horticulture, urban residential and industrial.

Melbourne Water estimates that its recycling program has a market potential to replace 2500 ML per annum of potable water. Under the Land Use Strategy, the Werribee Tourist Precinct, consisting of the Werribee Zoo, Golf Course, Parks Vic and Equestrian Centre, may use up to 700 ML of recycled water each year. Also the Werribee Irrigation District adjacent to the Plant might replace some of its current annual consumption of 13,500 ML taken from the Werribee River and bores, thereby freeing up potable water for Barwon and Western Water.

City of Port Phillip

The Committee then visited four water management projects of the City of Port Phillip, which has adopted a comprehensive approach to water management at the municipal level.

Catani Gardens

The Committee travelled to Catani Gardens, St Kilda, where it was met by Councillor Liz Johnstone and Mr Jim Holdsworth from the City of Port Philip, Mr Peter Diprose from CDS Pty Ltd, and Dr Peter Fisher and Mr Victor Lewis-Hansom from Bell Environmental, who were present because they are engaged in a study of contaminant levels in litter and sump water from GPTs.

The Committee had seen two CDS units when visiting Balmoral Beach in Sydney. The visit to Catani Gardens was an opportunity to witness a demonstration of the

clearing of a CDS unit. Like at Balmoral, it is also adjacent to the ocean and collects stormwater from a commercial and medium density housing area.

The Catani Gardens CDS has a removable basket design, and the Committee observed a demonstration of the basket's extraction by crane. Vegetative material and street litter were most prominent, with a strong composting odour. It is certainly reassuring that such material is not polluting the Bay.

While in the Gardens, the Committee accepted an invitation from Mr Barry Battiscombe of Micromet Victoria Pty Ltd to examine his company's irrigation control system. From an unassuming controller – looking much like a small electricity substation – watering of the gardens by its existing irrigation system is fully regulated by a computer, which receives data from sensors about whether the soil is dry or moist. Importantly, the device shuts off watering when it is raining. The Committee was told that some 25 per cent of water used in irrigating the park has been saved and that Council had saved about $10,000 in its monthly summer water bills from watering the 20 parks and gardens in which the system has been installed.

Ormond Road

The Committee then visited a townhouse development at 48 Ormond Road, Elwood. The Committee was joined by Mr Gary Spivac, Council's Housing Development Officer.

In 1999 the Council commissioned a study by Irrigation Design Consultants to establish the feasibility of incorporating stormwater retention measures into new development proposals. Among its findings, the study concluded that the increase in hard surfaces and roof area associated with higher density developments means that there is less area available for landscaping and therefore less water for irrigation. The installation of tanks in new developments is a means to collect stormwater and thus reduce peak flows to the drainage system, and harvesting of water from the roof area only is preferable, as this water is the easiest to collect and minimises the danger of polluted or contaminated water.

Further to the study's final report, the Council successfully applied for funds from the NHT's Coasts and Clean Seas Program. The grant of $27,000, which was required to be matched by the Council, was used in the Ormond Road project to demonstrate that sustainable design solutions can help address the problems facing the city's stormwater drainage system. The site at Ormond Road had been a detached family home with only 29 per cent hard surface site coverage which was being redeveloped to a medium density development of seven residential apartments with over 95 per cent site coverage (of which the roof area is about 43 per cent).

The Committee was shown the 15,000 litre water tank which had been installed in the basement car park to capture stormwater from the 270 square metres of roof area and from which water will be pumped after filtering into 'plumbed in' toilet cisterns in the seven apartments. It had been decided that the water quality could not be guaranteed

to be safe enough for human consumption or even for use in garden taps, where people may inadvertently seek to drink from it.

The rainwater retention system is complemented by traditional mains supply and stormwater drainage. If levels in the tank fall too low, top-up by mains supply occurs automatically. An overflow pipe discharges excess water to the street drain. First flush is also diverted straight to drains.

The scheme's simplicity is its great attraction. The Committee was told that comprehensive monitoring and in-line flow metering will provide accurate data, thereby providing a basis for a more informed Council policy development process.

At an additional cost of $7000 per unit, the scheme is not cheap, however, the Committee was told that this cost could be reduced with the benefit of experience. Further, and echoing a comment heard by the Committee whenever the interaction between real estate prices and water saving initiatives was raised, it was also seen as a positive and well-received benefit by the market.

EcoHouse

The EcoHouse is run by Port Phillip EcoCentre Inc at 55A Blessington Street, St Kilda, set on the corner of the St Kilda Botanical Gardens. The project was initiated by Earthcare, a local environmental group, and sponsored by the City of Port Phillip. Mr Michael Mobbs is acting as an adviser to the project, which has a construction budget of $180,000.

The Committee was met by Mr Peter Barker, the Eco House project coordinator, and Mr Neil Blake, the City of Port Phillip's EcoCentre Coordinator, who described its main features and its role as a model sustainable site to both educate and inspire the general community. Mr Barker described the project as containing a 'smorgasboard' of initiatives, including use of recycled, sustainably harvested and non-toxic materials, to use of solar energy, collecting all its own water, and transforming its waste water into a resource. They have installed a water tank to collect rain water, water conservation appliances such as smaller toilet cisterns and water saving shower heads, composting toilets and are irrigating the garden using grey and black water filtered through reed beds. Consideration is being given to collecting that water and recycling it into the toilet cisterns.

Inkerman Oasis

The Committee then visited the Inkerman Oasis housing project in Inkerman Street, St Kilda, a joint venture between the City of Port Phillip and Inkerman Developments Pty Ltd. It is a 236 unit, 3 to 5 level residential project in six buildings and designed to incorporate best practice sustainable development principles. At the time of the Committee's visit, development of the site had been underway for some 16 months, with construction scheduled to be completed in two stages by about July 2003.

The Committee was met by Mr Michael King, Inkerman Developments' Project Manager, who used a model of the project to describe its main features. The 1.2

hectare site was a former St Kilda municipal depot which became surplus to requirements as a result of the local government amalgamation process in 1994. In 1996 the City of Port Phillip resolved to use the site for a mixed private and social housing development project and, among its project objectives, was the establishment of a demonstration project of best practice environmentally sustainable design features, both passive and active.

The sustainable design features are too numerous to list here, but included: optimal solar access to living areas in most units; solar communal lighting across the project; low energy/resource efficient appliances and fixtures; and landscaping largely with native plants.

It also incorporates features of water sensitive urban design (WSUD), combining domestic grey and stormwater recycling in a manner unprecedented both in Australia and in a medium density housing project. Grey water from 50 per cent of the units' bathroom basins, baths and showers will receive primary treatment in a 60,000 litre activated sludge (aeration) tank, before passing through a 400 square metre wetland and sand filter using sub-ground filtration and absorption. First flush roof and ground flow stormwater is also captured and cleaned through the wetlands and sand filter.

The combined recycled water is used for both sub-ground garden irrigation of 2,000 square metres of soft landscaped areas and toilet flushing in dual flush toilets across the development. The irrigation is controlled to release water from a 45,000 litre storage tank to dry areas through close to 6000 lineal metres of 'Geoflow' slow release dripper piping by 12 solenoids triggered by a computer and moisture sensors. The recycled water for toilet flushing received tertiary treatment through a microfiltration and ultraviolet disinfection unit.

It is noteworthy that the recycling project was assisted by a grant of $267,000 by the Commonwealth under the Living Cities Urban Stormwater Initiative.

In summary, the several projects of the City of Port Phillip have given the Committee a clear demonstration of what can be achieved at the municipal tier of government level in even the most urbanised of environments. The Committee congratulates the Council for its efforts.

King's Domain On-site Water Recycling

The Committee then visited Melbourne Water's sewer mining trial in the King's Domain gardens in Melbourne. The aim of the trial is to demonstrate that water from sewers can be successfully recycled and used to irrigate parks and gardens. The demonstration plant was particularly configured to reduce nutrients in the recycled water to prevent pollution of Melbourne's waterways and the Bay, and to control salt and major ion levels to protect valuable botanical assets.

The Committee was met by Mr Michael Arbon, Melbourne Water's Manager, Reuse Projects, and colleagues. Mr Arbon indicated that the Victorian Government had set Melbourne Water a target for the recycling of water of 20 per cent, and the King's

Domain trial would inform decisions on how that level of improved recycling performance might be achieved.

The on-site recycling plant is housed in a portable shipping container and Mr Arbon explained its main features. Raw sewage is pumped from the sewer, screened and fine screened. Particulates larger than 3 mm are returned to the sewer. A membrane bioreactor reduces organics and removes particles in the product water down to 0.04 micron using an aerobic biological treatment process coupled with an ultrafiltration separation membrane. The product water is then preconditioned for a reverse osmosis treatment by filtering, UV disinfection and descaling. Reverse osmosis then reduces nutrients, pathogens and salts to acceptable levels.

The plant can produce 30,000 litres of high quality recycled water per day, at a cost of 1.4 cents per litre. The recycled water, which is used to irrigate nearby lawned areas, exceeds Victoria's Class A requirements, which makes it suitable for high contact end uses, such as residential garden watering.

A rigorous testing program will be carried out during the trial to ensure that recycled water meets EPA and Department of Health requirements.

The Committee notes that there is a clear potential to substitute potable water with recycled water on a large scale, but there are obvious legislative and cost constraints that first have to be overcome.

29 April 2002 - Perth

The Water and Rivers Commission hosted the Committee's brief inspection program. The Committee was accompanied by the Commission's Mr Bill Till, Program Manager, Stream and Stormwater Management.

Bannister Creek

The Committee was met by Ms Julie Roberts, Coordinator of the Bannister Creek Catchment Group. The Committee was shown the Group's 'living stream project' at several points along its length. The creek was originally a series of wetlands, but had been used as a main drain since 1979, conveying stormwater from the urban and industrial catchment into the Canning River.

The aim of the project was to transform a straight section of the drain into a living stream. As the creek is within a recreational reserve, aesthetic enhancement was also an objective. Support for the project has been given by a range of groups, including the NHT.

Large volumes of soil have been removed from the site to reshape the steep banks to a gentler slope and to 'meander' the creek itself. Riffles have been built to aerate flows and create habitat, and erosion control matting was used to stabilise sections of the stream banks and the area revegetated.

Ms Roberts told the Committee that the channel realignment and bank stabilisation works have been very successful. She noted that a storm event in the winter of 2001 had caused severe damage to a main drain structure upstream, while the newly streamlined channel carried the increased flow without any problems.

The Committee commends the work of the Catchment Group. Once fully established, the area around the stream will be an attractive addition to the amenity of the local community, as well as achieving a positive water management outcome.

Ascot Waters

The Committee then visited the Ascot Waters development in Belmont, close to both the Swan River and the Belmont Racecourse. It was met by two representatives of the development company, PPK Environment & Infrastructure Pty Ltd: Mr Marino Evangelisto and Mr Brian Farrell. They used a series of mounted displays to point out the site's main features, before the Committee was briefly shown around a part of the development.

The development is based on WSUD principles, for which it has received numerous awards, including the Urban Development Institute of Australia's (UDIA) 2001 National Award for Excellence in Residential Development. Planning for the site was commenced with a grant from the Commonwealth's Building Better Cities program.

Mr Evangelisto told the Committee that his company had set out to construct a stormwater management system to control stormwater volume and peak discharge rates in a treatment train of best management practices (BMPs). Pollution in runoff is reduced through physical containment or flow restrictions designed to allow settling, filtration, percolation, chemical treatment or biological uptake and assimilation of nutrients. The point was made that the more BMPs that are included in the treatment train, the more effective it becomes, and the less reliant the overall performance is on any one element.

Runoff is dealt with in three zones. Zone A, which includes the commercial/marina area and extensive hard surface parking areas, directs runoff into a series of gross pollutant traps and then into landscaped 'nutrient stripping' wetlands basins prior to entering the Swan River. A horse faecal runoff problem had been solved by creating a retention pond in the middle of the track. Zone B runoff is directed into a shallow basin/swale, from where it seeps away to the saltmarsh area. Zone C runoff is directed down the central open space corridor/linear park through a 'leaky' pipe into swales and micropools/detention basins and finally into a freshwater wetland. An overflow into the main water body will operate during extreme events.

The Committee walked through the central open space corridor, with housing built along either side. It was a pleasant parkland area, planted with large jacarandas. One of the detention basins had been designed for use as an amphitheatre, while another doubles as a children's playground, making clever use of the space. The Committee was told that the WSUD nature of the development had been a positive marketing feature.

1 May 2002 - Adelaide

The Committee spent the whole day on site visits in the Adelaide area. The program of inspections in Adelaide was arranged by Mr Martin Allen, Senior Policy Adviser, Water Conservation for the Department of Water, Land and Biodiversity Conservation.

Australian Water Quality Centre

The Committee visited the Australian Water Quality Centre (AWQC) at SA Water's Bolivar Wastewater Treatment Plant, where it was met by Mr Robert Thomas, General Manager, Contract Operations for the South Australian Water Corporation (SA Water) and Dr Mary Drikas, AWQC Principal Research Chemist, Water Treatment.

A series of presentations were then given; firstly by Mr Thomas and Dr Drikas, followed by Dr David Cunliffe, Principal Water Quality Adviser in the Environmental Health Branch of the Department of Human Services, and then Mr Russell Martin, Manager, Groundwater Assessment for the Department of Water, Land and Biodiversity Conservation.

Mr Thomas described the general role and functions of the AWQC while Dr Drikas gave a comprehensive account of the Centre's analytical and research activities. The AWQC is a wholly-owned subsidiary of SA Water with some 110 staff, 55 of whom are professional scientists. It has a turnover of around $10 million and an Australia-wide client base. Its mission is to provide high quality analytical services, which it has often commercialised after development through its water quality research programs. It offers a comprehensive analytical service for the inorganic constituents of waters, wastewaters, sludges and sediments and analytical services for routine complex organic compounds. The methods employed include high performance liquid chromatography, gas chromatography and mass spectrometry. It also offers a broad range of biological services including laboratory algal counts, field analysis such as macroinvertebrate biomonitoring, and consultancy and research on algal management issues.

The AWQC is a key partner in the Cooperative Research Centre (CRC) for Water Quality and Treatment, which has its head office based at the AWQC. Reference was made with approval to the Commonwealth Government's decision to extend the CRC's funding to 2008.

Dr Drikas addressed in detail the Magnetic Ion Exchange Process (MIEX) water treatment technology. She noted that cost effective management of dissolved organic carbon (DOC) in potable water is one of the key challenges facing today's water treatment industry. DOC has many detrimental effects on the treatment of drinking water, not least that it can react with disinfectants used in water treatment to produce undesirable colour, taste and odour. The AWQC, in conjunction with CSIRO's Division of Molecular Science and Orica, a publicly owned Australian chemical company (formerly ICI), has developed a revolutionary, yet simple, process that

incorporates MIEX DOC Resin for the removal of dissolved organic carbon from potable water sources.

The Committee was shown samples of the resin. It is in the form of tiny acrylic beads which have a positive charge and negative chloride ions bound onto them. When mixed with water, the DOC ions, which are negative, displace the chloride ions on the resin, which then rapidly settles out the water. The DOC coating the beads is easily removed, allowing them to be recycled.

SA Water and Orica have invested $7.5 million in a pilot plant at Mount Pleasant which treats 2.5 megalitres of water per day. It has demonstrated that the process has operability, economics and scalability in both greenfields and retro-fitting situations. Trials have shown that MIEX has removed up to 80 per cent of colour and, by the addition of a small amount of alum in the treatment process, 70-80 per cent of DOC. The Committee particularly note that, compared to traditional water treatment technologies, MIEX is relatively chemical-free.

Mr Thomas described the Bolivar/Virginia Pipeline Scheme, a major re-use initiative of SA Water. The Virginia Pipeline Scheme delivers high class irrigation water to the Northern Adelaide Plains, a horticultural area with a high demand for water. Motivation for the scheme grew out of several factors, not least calls from the local growers in the 1980s for a re-use scheme to be developed. This vision was not realised until the days of the Multi Function Polis proposal of the early 1990s.

It coincided with several other factors, however, including:

- a 1995 State Government policy to seek to phase out sewage discharges to the marine environment where economically and environmentally sustainable;
- EPA licence requirements for wastewater treatment plant discharge to the marine environment;
- unsustainable exploitation of groundwater; and
- access to $10.8 million of Building Better Cities funding.

The use of reclaimed water from the Bolivar plants achieves two significant goals. Pressure on groundwater resources in the Northern Adelaide Plains and discharges into Gulf St Vincent during the summer months are both reduced, with accompanying reductions in seagrass degradation, and turbidity and algal growth from the high nutrient levels of the discharged effluent.

Dr Cunliffe emphasised the health aspects of the Virginia Scheme, and in particular the risk management considerations in relation to the use of reclaimed water. Significant upgrades to Bolivar have enabled treated water to meet ‘Class A’ standards, meaning it is permitted to be used for spray irrigation onto crops, including those that may be eaten raw. The Class A parameters relate to maximum levels of turbidity, *e. coli* organisms and pathogens.

Boliver does this through a combination of secondary treatment, lagooning and the use of a new $30 million Dissolved Air Flotation/Filtration (DAF/F) plant. Secondary

treatment removes organic and inorganic substances and reduces bacteria/pathogens. Lagoon treatment provides extra disinfection by reducing residual organic matter and bacteria/pathogens, as well as providing extra protection against short term contamination spikes through flow equalisation. The DAF/F plant removes algae (one disadvantage of lagooning,) and bacteria/pathogens.

Monitoring of the pipeline scheme has shown it to be achieving generally very good results. Very high levels of removal of Cryptosporidium and Giardia have been achieved, with 60 – 90 per cent removal of viruses, adenoviruses being the most common. No hepatitis A has been detected.

Dr Cunliffe noted that as part of the approval process, xenoestrogens and pharmaceuticals – the 'endocrine disrupters' – were assessed but were not considered to be a significant issue based on current knowledge. In response to a question from a Committee member based on the somewhat contrary evidence it had received from Dr Peter Fisher in Melbourne about the potentially serious adverse effects of endocrine disrupters, Dr Cunliffe noted that fish bathed in estros had been found to be adversely affected but that what we are talking about in water re-use schemes is much lower levels of exposure in terms of human consumption. He noted that plastic food wrappers are high in chemicals implicated as potential xenoestrogens.

Dr Cunliffe stressed that, while the Virginia Pipeline water was Class A quality and continuously monitored, numerous pipeline and on-site controls also apply. The pipeline itself is colour coded or marked to indicate that it is carrying reclaimed water. Irrigation areas are signposted to advise that the water is not safe to drink. Reclaimed water is not used for final washing, packaging or processing of product.

In summary, crop testing has not detected any problems, physically and microbiologically the pipeline water is superior to any surface water in Australia (which is, of course, able to be used by growers, despite its quality not being subject to 24 hour monitoring) and the scheme has met with general public acceptance.

Dr Cunliffe was asked whether consideration had been given to commercial fish farming in the lagoons using carp. He said that he had heard that the practice had potential, but that there were reservations about the fish causing damage to the liners.

It is noteworthy that a NHT grant was made to a team from Adelaide University and CSIRO Land and Water to develop a booklet entitled *Sustainable Use of Reclaimed Water on the Northern Adelaide Plains: Grower Manual,* published in 2001 by Department of Primary Industries and Resources South Australia Rural Solutions.

Mr Martin gave the Committee a presentation on the Department of Water, Land and Biodiversity Conservation's Aquifer Storage and Recovery (ASR) program. There are a number of extensive aquifers which lie beneath the Northern Adelaide Plains from which groundwater has been extracted for the past 50 years for irrigation purposes. ASR is a method of enhancing water recharge to underground aquifers by gravity feeding or pumping excess water into the aquifers for later use in times of peak demand. It has considerable potential to use excess surface water – includeing

urban stormwater runoff and treated wastewater – and where the aquifers are suitable it offers a comparatively low cost method of storing water as an alternative to surface storage.

A significant number of ASR schemes are now established in Adelaide metropolitan, regional and country areas. Mr Martin outlined the recent ASR focus on the treated water from the Virginia Pipeline which is surplus to grower's requirements, especially in winter. The project has been described as being at the international leading edge. A consortium comprising the Department of Water, Land and Biodiversity Conservation, United Water, SA Water, CSIRO, and the Department of Administration and Information Services' Major Projects Group – with financial assistance from the NHT – is undertaking a four-year, $3 million study of the technical feasibility, environmental sustainability and economic viability.

The first year of the project was extensive laboratory studies, with many of the studies being focussed on the fate of pathogens to ensure that none reach drinking water supplies. It has been shown that, if any pathogens survive the disinfection process they quickly die-off once introduced into the ground water system.

Injection began in earnest during October 2000 and by the end of March 2001 the target volume of 280 ML had been stored in the aquifer. Extensive sampling to monitor water quality changes is being undertaken. If the trial proves that the practice is safe, can be well managed and is both technically and economically viable and will have no adverse environmental impacts, ASR of the reclaimed water will represent a long-term solution to the sustainable management of all of the water resources on the Northern Adelaide Plains.

Bolivar Wastewater Treatment Plant

The Committee then undertook a brief tour of the Bolivar Wastewater Treatment Plant, accompanied by Mr Robert Thomas. The Committee inspected the $30 million DAF/F plant, a fully automated plant operated by United Water under contract with SA Water. Detail of its operations was given above. Mr Thomas made the point that the DAF/F plant had a capacity to treat all of Bolivar's wastewater, but that at this stage the Virginia growers were drawing only about 50 per cent of the total flow and that they only needed to have a minimum of one day's storage. The ASR trial is obviously a key component of planning for the future re-use of the other 50 per cent.

The Committee was then met by Mr Tony White of Tyco Water at the opening point of the pipeline where it was fed by the final of a series of lagoons. The pipeline had cost $22 million, $7.15 million of which Tyco provided under a BOOT contract with SA Water which expires in January 2018. Building Better Cities had contributed $8.15 million and SA Water 6.7 million.

Mr White displayed a plan of the 150 km irrigated area, serviced by 105 km of ABS pipe of varying sizes. The project has more than 240 customers, who pay 9.5 c/kL in summer, 7.5 c/kL in shoulder and 5.0 c/kL in winter under their initial contracts.

Future contracts will be at market rates. Tyco is not charged for its source water by SA Water.

City of Salisbury

The Committee visited the offices of the City of Salisbury where it was met by its Mayor, Mr Tony Zappia, and several senior Council officers. Over lunch, Mr Zappia noted that the Council had been engaged in water management projects over a period of some 25 years, but in October 1995 the City had adopted the challenge of Local Agenda 21 (LA 21), a call by the United Nations to local government in partnership with their local community to address the implications of global issues in a local context. A 1996 State of the Environment Report identified eight significant environmental issues affecting the City, including Water Management.

Mr Zappia gave a general outline of his Council's comprehensive program of achievements in the field of water management, which includes the creation of 36 wetlands around the city totalling about 250 hectares in area and costing in excess of $16 million, and the recent establishment of two major stormwater projects in Parafield Airport and at Kaurna Park. He provided a document which claimed that the City of Salisbury is recognised as a world leader in the field of wetlands technology. Stormwater – traditionally regarded as a problem, and in some cases a threat – is now harnessed and used to enhance the landscape and create habitat diversity.

Mr Zappia noted that the findings of the Committee's June 2000 report *Inquiry into Gulf St Vincent*, to which he had given evidence and BIPEC had made a submission, had been well received and had given strength to his arguments for State and Commonwealth Government financial assistance.

A video of the Barker Inlet Port Estuary Committee (BIPEC) project was then shown. Mr Zappia introduced the video by emphasising that the Barker Inlet is a delicate marine environment which had suffered years of neglect, and polluted inflows had left the Inlet in a delicate state. The Inlet is the largest tidal estuary in Gulf St Vincent and is significant as:

- an important nursery and feeding area for commercial and recreational fish species;
- provides habitat for a diverse bird community;
- is a feeding and nursery area for Port River dolphins; and
- has the most Southern population of grey mangroves.

The area had suffered from being managed in discrete components and from the absence of any integrative processes.

The City took the initiative in the mid-90s to convene a summit on Barker Inlet, which led to the formation of BIPEC with the primary objective of developing a cooperative management framework. BIPEC includes representatives of local governments, catchment boards, environment groups, research experts and private industry, while several State agencies and the National Parks and Wildlife Service act as advisors.

The project is continuing and, once an action plan for on-ground initiatives for the protection and conservation of the area is finalised, BIPEC's long-term role will be to oversight the plan's implementation. Mr Zappia indicated that, at this stage, there had been no Commonwealth financial assistance for the project, but that discussions with the NHT secretariat are continuing.

Mr Zappia then described some of the Council's other initiatives. He made particular mention of the Mawson Lakes residential development on the site of the former Multi Function Polis. While residents have access to mains water, the complex includes a dual-pipe treated greywater system, from which residents can opt to draw water at a substantially discounted price. The Mawson Lakes development includes a major wetland as well as a lake. The Council's plan is to achieve 80 per cent use of recycled water through a combination of financial incentive and education, and Mr Zappia noted that his Council was the leading South Australian local government authority in the field of water re-use.

Parafield Airport

The Committee then visited Parafield Airport where it was met by Mr Peter Mitchell of G.H. Mitchell and Sons, Australia's largest wool processing company, which has entered into an agreement with the City of Salisbury for the supply of cleansed stormwater water for use in its nearby plant. The Committee was also briefed by Mr Stuart Lane, Council's Senior Environmental Engineer.

The *Parafield Partnerships Urban Storm Water Initiative* arose from Council's recognition that the area to the north and east of the Airport was the last remaining catchment without treatment to filter and cleanse stormwater prior to its discharge to the marine environment. The concept of treating stormwater on airport land was put by Council to the Parafield Airport management in September 1999, with G.H. Mitchell and Sons brought in as a concept partner. Mr Mitchell noted that his company traditionally used some 1 billion litres of Adelaide mains water, much of it pumped via pipeline from the Murray River, for its wool scouring processes.

The Council adopted an innovative, large scale partnership approach to the proposal, initially with Mitchell and then with the airport management, industry stakeholders and community groups. The proponents were successful in gaining a grant of $1.3 million in June 2000 from the Commonwealth's Urban Stormwater Initiative, with the remainder jointly funded by the Council and Mitchell.

Stage 1 of the project has just been completed, at a cost of $3.7 million. It consists of a linked network of ponds: an inflow capture pond, a treatment pond, and a holding storage pond. The scheme involves the diversion of stormwater via a weir in the Parafield drain to a 50 M/L capture basin, and its pumping to a similarly sized holding basin, before gravitating to a two hectare cleansing reed bed. Water will flow continuously through the densely planted reed bed to be biologically cleansed. Nutrient and pollutant loads will be reduced by up to 90 per cent with the treated water having a salinity of less than 220 mg/l, markedly lower than mains water.

One of the striking features of the development is that the collection and treatment ponds are covered by netting, which aims to discourage birds from nesting in the region, increasing the risk of bird strike by planes using the Airfield. Fish will be released to overcome any mosquito problem.

It is estimated that some 1100 M/L of water will initially be produced, at around half the price of mains water. About one half will be used by Mitchell, the other half being stored by the development of an aquifer storage and recovery (ASR) borefield. Depending on inflow water quality, the residency period of the water in the treatment ponds prior to being pumped to users, or stored in the aquifer, is expected to be between seven and 10 days.

Stage 2 of the project is a similar scheme for treating stormwater on the southern boundary of the airport, with a capacity to supply an estimated 1500 M/L of cleansed stormwater to Mawson Lakes, nearby schools and a golf course. Another proposed stage, which will depend on the outcomes of field testing, is intended to treat Mitchell's saline wastewater in specially developed reedbeds. Mitchell contributes some 25 per cent of Bolivar's solids waste. Once the greases are removed, the waste is nutrient rich, especially potassium which sheep excrete in their sweat, but is otherwise chemical free. Mr Mitchell told the Committee that his company is keen to explore ways to make use of the nutrients, rather than their being either composted or mixed with toxic materials in the main wastewater system.

This visit concluded the Committee's program of site visits, inspections and informal briefings. While the Committee's visit to the City of Salisbury was relatively brief, it could not help but be impressed by Mr Zappia's high level of personal commitment and the extent of the Council's achievements. The Committee will long carry with it memories of the enthusiasm and dedication to the cause of sustainable urban water management displayed by everyone it met during these site visits. It expresses its sincere gratitude for their cooperation.