E N V I R O N M E N T C O M M I T T E E R E P O R T **Agenda Item 5.2**

6 February 2007

WATER CONSERVATION INITIATIVES

Division Urban Environment

Presenter Ian Harris, Group Manager Parks & Recreation

Purpose

1. To update Committee on various matters relating to water conservation initiatives, the impact of Stage 3 water restrictions on the City's parks and gardens and a proposal to develop a long term sustainable water use plan, in accordance with the Committee resolution of 14 November 2006.

Recommendation from Management

2. That the Environment Committee note:

   2.1. actions taken to mitigate against the loss of the City's tree stock including financial implications, whilst ensuring responsible management of water to comply with Stage 3 water restrictions;

   2.2. that a long term sustainable water use plan is to be developed; and

   2.3. the intention to establish a Reference Group to guide development of the sustainable water use plan.

Key Issues

Water Conservation Information

3. It was resolved at the Environment Committee meeting of 14 November 2006:

   "that a report be presented to the 6 February 2007 Environment Committee meeting outlining and costing the:
   - *Princes Park sewer mining project;*
   - *completion of the upgrade of the irrigation systems for all parks, gardens and reserves; and*
   - *installation of rainwater tanks and grey water recycling systems on all Council buildings, including town halls, child care centres, sports pavilions, etc."*

Princes Park Water (Sewer) Mining Project

4. This project was considered in detail at the special meeting of Council on 25 January 2007.

5. In summary the Princes Park Water Mining project proposes the treatment of sewage for re-use as recycled water on Council's parks and gardens. The plant would be constructed and operated by City West Water and the treated water purchased by the City of Melbourne.

6. The project has been costed at $30 million, with Council's contribution to be $1.25 million. Council's contribution would be confined to establishing the reticulation network required to deliver the treated water to the City's parks and gardens.

7. The proposed facility would be located beneath Princes Park and would provide treated water to Princes Park, Royal Park and Carlton Gardens. Other potential sites include Melbourne Zoo, University of Melbourne, Fitzroy and Treasury Gardens and Yarra Park. Water would be sourced from the large sewer located under Cemetery Drive.

8. The proposed plant would have the capacity to produce 700,000 kilolitres per year (peak output). The feasibility study was modelled on Council purchasing the treated water at approximately the same price as potable water. It was estimated that the reduction in potable water for Melbourne's parks and gardens would be in the range of 350,000 to 450,000 kilolitres per year, a saving in the order of 25 - 30 % of Council's annual irrigation volume (about 1.2 million kilolitres in an average year).

9. Application for funding lodged by City West Water as the proponent in 2005 was made to the 'Australian Government Water Fund - Water Smart Australia'. This application was not successful.

10. It is understood that recent discussions involving the Lord Mayor and the State Minister for Water have been held to explore funding options for this project.

Irrigation Upgrades

11. Most of the City's parks and gardens, and the trees contained within them, have been irrigated for many years. These trees have become dependent on irrigation water for survival through dry periods. Melbourne's key boulevards, including St Kilda Road, Victoria Parade, Royal Parade and Flemington Road, and a number of other streets have irrigated medians and nature strips. The trees in these boulevards and streets are also dependent on irrigation water. Most of the City's other street trees, including all CBD trees have not been watered (since initial planting) and are not dependent on supplementary water.

12. It is estimated that out of the City's total tree population of 55,000 trees, about 15,000 trees are to a varying extent dependent on irrigation water.

13. The City's irrigation system comprises more than 300 site controllers with 3,500 stations and 40,000 spray heads. In normal years the vast majority of the system operates with above ground watering which cannot be used (without exemption) under Stage 3 restrictions. Total replacement value of the irrigation system is approximately $ 26 millon.

14. A detailed study commenced in association with Burnley Horticultural College to investigate the most efficient irrigation system for use in Melbourne's parks and gardens has been temporarily put on hold pending developing proposals for a long term strategy (see below).

Alternative Water Sources for Council Buildings

15. Measures to minimise the use of potable water have been investigated as part of the on going program to upgrade Council buildings. Recent examples of upgrades, or proposed upgrades include:

    15.1. the Ryder and Brens Pavilions in Royal Park which have been upgraded to include the installation of water tanks and plumbing to supplement toilet flushing and installation of water efficient devices including shower flow restrictors;

15.2. the recently completed East Melbourne Library includes features such as large tanks to collect rainwater for use in the toilet flushing and garden irrigation systems;

15.3. the proposed additions to the Kensington Community Children's Centre and Queen Victoria Market projects will include rainwater collection from the roof to provide a substitute for potable water use in both toilet flushing and landscape irrigation;

15.4. water saving initiatives at the Melbourne City Baths to include, installation of shower flow restrictors, water balancing between pools and drainage to capture backwash;

15.5. development and implementation of environmental management plans at Child Care Centres has included installation of water tanks for garden watering;

15.6. routine maintenance on other Council buildings includes installation of water saving devices such as restricted flow devices, dual flush toilets;

15.7. water recycled from CH2 has been plumbed into the car wash bay in CH1; and

15.8. investigations are underway to explore opportunities for surplus CH2 recycled water to be used in CH1, the Administration Building, on trees, gardens, fountains and for street cleansing.

16. The costs of these works have typically been:

16.1. installation of water tanks in child care centres for providing water for gardens is approximately $5,000 per site; and

16.2. installation of water tanks at pavilions and associated plumbing for grey water toilet flushing is approximately $40,000 per site.

17. To enable a prioritised program of works on Council buildings to be developed, all buildings will be investigated over the next few months to determine ways to further reduce potable water usage. This investigation will include:

17.1. water usage audit of each building;

17.2. assessing existing water use (toilets, showers, sinks etc);

17.3. examining measures to reduce water demand at each building;

17.4. investigating alternative water sources to provide alternatives to the use of potable water such as rainwater harvesting systems, grey water and recycled water treatment systems;

17.5. identifying potential potable water saving measures in existing facilities and possible upgrades that could include water saving devices, renewal piping and other works;

17.6. recommendations for the most effective short, medium and long term actions; and

17.7. setting out the staging of implementation of respective actions with a preliminary costing and projected potable water savings.

18. The results of this study will be used to develop a long term program to reduce potable water usage in Council buildings. The aim will be to meet, and where possible, exceed Council's water saving targets. The subsequent proposals would then be considered as part of Council's annual Capital Works and maintenance budgets.

Stage 3 Water Restrictions

19. The Government introduced Stage 3 water restrictions in metropolitan Melbourne from 1 January 2007. The major requirements of these restrictions (which can be varied by a Water Conservation Plan approved by the water authorities) are:

    19.1. no watering of public lawns;

    19.2. no watering of sportsfields except turf wickets, bowling greens, golfing greens and tees;

    19.3. fountains must not be filled or topped up;

    19.4. below ground dripper systems must be used in place of above ground spray systems for irrigation; and

    19.5. restricted hours of watering.

20. In planning for the introduction of Stage 3 restrictions a program of installing sub surface dripper systems commenced in late November 2006 in avenues, boulevards and parks and gardens containing significant trees that are dependent on artificial irrigation for survival.

21. Over 100 kilometres of underground dripper systems have now been installed and will be used in public parks and gardens to try and sustain Melbourne's tree population during Stage 3 restrictions.

22. A revised Water Conservation Plan (WCP) to address Stage 3 restrictions, at Attachment 1, has now been prepared to achieve at least a 50% water reduction. As under the Stage 2 Water Conservation Plan, the priority is to provide water to trees in parks and gardens and boulevards.

23. The Stage 3 WCP has been submitted to City West Water and South East Water (the suppliers of water to the City of Melbourne). This Plan provides for partial exemption from Stage 3 restrictions to allow limited on going use of sprinklers in addition to the dripper system for the City's suite of heritage gardens. These gardens are those already on or are expected to be listed on the World Heritage Register, State Heritage Register and/or National Trust Register, and are:

    23.1. Carlton Gardens, Fitzroy Gardens, Flagstaff Gardens, Treasury Gardens, Domain, Shrine; and

    23.2. Queen Victoria Gardens, Alexandra Gardens and Speakers Corner (Birrarung Marr).

24. The exemptions proposed under the WCP, together with use of the below ground dripper system program will enable Council to ensure the survival of the most significant trees within the City. As previously reported, it is likely that there will be tree losses especially where trees are already stressed. These trees are in parks, gardens and City streets.

Sustainable Water Use Plan for Parks and Gardens

25. The City of Melbourne's Watermark policy sets out a target to reduce its organisational water consumption by 40% by the year 2020. Approximately 80% or 1.2 million kilolitres of this water is consumed in watering the City's parks, gardens and trees.

26. The onset of climate change has the potential for the long term reduction of rainfall by up to 25% together with the increased variability of this reduced rainfall. The last ten years have been the driest in Melbourne on record and the 2006/07 drought has resulted in the implementation of Stage 3 restrictions with the possibility of future implementation of Stage 4 restrictions. Stage 4 is likely to mean water cannot be used for any irrigation.

27. The current restrictions have required the City of Melbourne to immediately reduce its potable water consumption for parks and gardens watering under a Water Conservation Plan by at least 50%. This Plan has been developed to meet the current drought and water restrictions and not to address long term changes in water use. This reduction will have a significant impact on the park landscapes that have been designed and maintained in the past on the premise of plentiful supplies of potable water for irrigation purposes.

28. To address water use in the long term it is proposed to develop a long term sustainable water use plan. The primary goal being to eliminate the need for mains water to maintain the City's parks and gardens. This could possibly be achieved by a combination of measures, such as reducing water use and substituting mains water with recycled water. The implementation of the Plan would result in the parks and gardens being able to be maintained without the on-going risk from reduced and variable rainfall and consequential water restrictions.

29. Implementation of the plan would provide the opportunity to partner with other agencies responsible for managing park areas close to or within the City of Melbourne, viz the Royal Botanic Gardens, Parks Victoria (in its role of managing Albert Park), Government House and the Melbourne Zoo.

30. Reference Group comprising key stakeholders in the water industry is proposed to assist in the development of the Plan furthering City of Melbourne's water conservation strategies.

31. The Sustainable Water Use Plan for Melbourne's Parks and Gardens would likely contain:

    31.1. an audit of past and current water use in parks and gardens;

    31.2. identification of potential potable water savings through use of new state of the art irrigation systems as well as more efficient operation of current irrigation infrastructure;

    31.3. a review of world's best practice of non-potable water sources including but not limited to: sewer mining, stormwater harvesting and ground water use;

    31.4. an analysis of the suitability of the application of these non-potable water sources to Melbourne's parks and gardens;

    31.5. preliminary cost estimates and staging of measures recommended; and

    31.6. possible partnerships/arrangements with other garden management agencies.

32. The Reference Group would guide the work of an internal working group comprising Council officers and relevant technical experts. It is proposed that a draft report of the Plan would be presented to Council's Environment Committee in late 2007 including items to be considered in future budget cycles.

Relation to Council Policy

33. The City's contribution to the conservation of water is in line with its Total Watermark Strategy, which was released in 2004, bringing Council's water conservation strategy together with its stormwater, wastewater and ground water policies. Water Sensitive Urban Design Guidelines have also been developed by the City of Melbourne for staff and developers. The Guidelines provide on-ground assistance for a range of water saving and water quality initiatives including rainwater tanks and water recycling.

34. Council's goal is to reduce water consumption by 40% compared to the base year of 1999/2000.

Consultation

35. Discussions are ongoing with relevant water authorities, State Government Departments, Council's open space contractors, park users, sporting groups and the community. A Communications Plan has been developed to ensure that these groups are kept informed of the Council's response to the water situation.

36. Preliminary discussions have been held with the key proposed participants in the Reference Group for developing the Sustainable Water Use Plan. Preliminary feedback has been positive.

Finance

37. The initiatives needed in this financial year to respond to Stage 2 and 3 restrictions and the Water Conservation Plan were not identified in the 2006/07 budget as these were not anticipated when the budget was developed. The drought conditions in Melbourne and the imposition of water restrictions has developed within a few months. The urgency of the situation left no other alternative than to implement emergency measures in order to preserve Melbourne's significant tree assets and to conserve water.

38. A total of $1.1million has been committed through the City's Parks and Open Space contractors to install emergency dripper systems for many water-sensitive trees along boulevards and along avenues within parks and gardens. These costs are being offset by an approved $500,000 increase in the December forecast to the Parks Open Space Contractors Budget, an anticipated reduction in water expenditure of $500,000 and $100,000 of identified savings in Parks and Gardens Depreciation – Infrastructure.

39. In addition, further unbudgeted expenditure estimated at $500,000 will be required this financial year for tree preservation activities. The final figure will depend on the length of the drought and time period of emergency measures. If the drought continues until April 2007, further funds could be required. Major components of this expenditure include;

    39.1. hire of 1,300 water-filled plastic road barriers and 8 tankers to fill the barriers to provide emergency water to stressed trees;

    39.2. additional labour costs for tanker drivers and other watering and

    39.3. purchase and placement of mulch and soil bunding around tree bases.

40. Considerable funds will be required when the water restrictions are lifted and/or it rains in 2007/2008 or later years to reinstate parks, gardens and sports fields. The amount will only be able to be determined when the drought conditions end.

41. The cost of water savings initiatives planned for Council buildings will be incorporated into future facilities capital and maintenance budgets.

42. The major cost of developing the Water Sustainability Plan will occur in 2007/08 and the funding required will be incorporated into the 2007/08 budget bids.

Legal

43. This report is for noting only and no direct legal issues arise.

Sustainability

44. There are significant issues related to sustainability which have been covered as part of the various sections of this report and the attached WCP. The overall amenity of the City has been adversely impacted upon by the current water restrictions. The long term water use plan will be designed to greatly improve the sustainability of the City's parks, gardens and trees.

Background

45. In response to the driest winter and spring on record the State Government introduced Stage 1 and 2 restrictions commencing 1 September 2006 and 1 November 2006 respectively. It subsequently introduced Stage 3 water restrictions in metropolitan Melbourne from 1 January 2007.

46. The majority of the City of Melbourne's green open spaces and park boulevard trees, particularly the European styled gardens, are dependent on potable water for irrigation during summer periods for survival.

47. It is unlikely that plentiful unrestricted water will be available again in the foreseeable future and alternative approaches will be required to ensure the long term sustainability of the City's parks, gardens and tree stock.

48. Key initiatives already implemented by Council to provide recycled water for its operations include the Royal Park Wetlands which treats and captures water from the Royal Park Creek for use on the Royal Park Golf Course, and CH2 which recycles sewage water (plant yet to be commissioned).

Attachment:

1. Water Conservation Plan – Stage 3 Restrictions

Attachment 1
Agenda Item 5.2
Environment Committee
6 February 2007

CITY OF MELBOURNE

WATER CONSERVATION PLAN
STAGE 3 RESTRICTIONS

JANUARY 2007 to DECEMBER 2007

CONTENTS

EXECUTIVE SUMMARY

Stage 2 water restrictions presently operate to control water consumption. Stage 3 restrictions commenced on 1 January 2007. Stage 3 restrictions are designed to further reduce the rate of water consumption by eliminating the use of water for specific activities and identifying specific times for irrigation system operation.

The City aims to supply irrigation water to assets identified to be of high priority and/or of greater sensitivity. In order to ensure the maximum possible reduction of water use consistent with protecting key assets, all sports fields and lawns that do not support trees have not been watered since 1 November 2006. All available water has been directed towards the City's trees particularly in Melbourne's heritage listed parks and gardens and boulevards. These mature trees are irreplaceable in the short to medium term, have taken considerable time to develop, are noted as key elements of a horticultural and landscape environment, and are a symbol of Melbourne's character.

During October and November 2006, significant works were carried out to the City's irrigation infrastructure, particularly the selective capping of irrigation spray heads to redirect water to tree avenues and groups so that over spray onto lawns areas has minimised and water only applied to turf adjacent to trees.

The key impact of stage 3 restrictions particularly relevant in terms of management and maintenance of an open space system, is the prohibition (without specific exemptions) of the use of above ground spray irrigation systems for watering densely treed gardens and parks. Only dripper irrigation systems will be allowed.

Melbourne's open space horticultural assets, tree assets in particular, have been and are supported by extensive irrigation systems. These systems are largely above ground sprays that operate automatically at night to minimise evaporation loss and serve to minimise damage that results from inadequate water supply. These systems support and are the principal resource input that enables tree stock to develop and survive.

Conversion of the City's irrigation infrastructure from above ground spray systems to dripper systems would require significant resources and installation times. Complete conversion is not logistically or financially feasible in the short term. However in order to meet significant water saving targets and comply as far as possible with Stage 3 restrictions, the City has undertaken an emergency installation response plan for dripper systems to provide water to the key avenue and boulevard trees. However the minimum water requirements of these trees will require longer operating time periods than specified under the Stage 3 restrictions requirements.

Planning commenced in November 2006 to install these dripper irrigation systems. More than 100 kilometres of dripper pipes and associated valve arrangements will be required, even for a basic system, given the extent of the Council's tree population. The rollout of this first stage dripper irrigation system has been progressing and is expected to be completed by February 2007. There is some uncertainty with this completion time, given the holiday period and construction contingencies.

The installation of the dripper irrigation networks is less complicated when the trees are in avenues or boulevards. It becomes more difficult when the design needs to account for trees that are randomly scattered in parks and gardens.

The Water Management Authorities' Drought Response Plan indicates that continued use of potable water for irrigating certain public park and garden assets can continue in accordance with an approved Water Conservation Plan ("WCP") that demonstrates an achievable and identifiable water saving. Savings are calculated against a base year defined to be the period March 2005 - February 2006.

Provision of adequate water to sensitive assets is therefore critical in terms of minimising risk. The City of Melbourne has been implementing water conservation measures over a number of years and has reduced its water usage. The total volume utilised within the City of Melbourne's open space system identified for the period March 2005 to February 2006 was 1,200,000 kilolitres.

The proposed maximum volume to be consumed in the 12 month period 1 January 2007 to 31 December 2007 is 600,000 kilolitres, a 50% reduction compared to the base year. Achieving this level of saving is in itself is a major challenge given the lack of spring rains and soils already depleted of water. Even at this level of watering, and depending on weather conditions, it is anticipated that in both the short and long term, there will be loss of trees.

This WCP seeks the flexibility to adjust the quantities of water that will be used on the City's trees through the irrigation systems with an overall City of Melbourne (Parks and Gardens) water saving of at least 50%. A summary of the key proposals are:

- Achieve an overall reduction of at least 50% compared to the water consumption during the period March 2005 to February 2006 as the base year. The City aims to provide the minimum water required to ensure the survival of the majority of its key tree stock both through the current drought period, and in the longer term.

- Sports fields and lawns that do not support trees will not be watered.

- With a few exceptions, the City's annual floral beds will not be watered.

- Irrigation water to most of the City's trees will be progressively transferred to the dripper system during December 2006 to February 2007 as the dripper systems are commissioned.

- In the interim, in scheduled areas where dripper systems are not yet operating, above ground sprays, will need to continue to be used to water trees, generally between midnight and 5 am on alternate days.

- The dripper systems will need to be operated within a 7 day framework to supply enough water for tree survival. Given that it is a basic dripper system, the hours of operation will need to be adjusted from site to site to ensure adequate water is provided to the trees, however, the goal of a 50% water use reduction will be maintained.

- Separate applications have been made for exemptions for heritage Gardens of Significance in the City (Section 5.2 of this WCP). However, even with such exemptions the total water savings for the City will be at least 50% of the base year consumption.

- Exempt playing surfaces will continue to be watered in accordance with Stage 3 restrictions. However, reclaimed water from the Royal Park Wetlands is now being used to water Royal Park Golf Course greens and tees and wicket turf tables in Royal Park North.

- Mulching and aeration will be applied to the bases of trees that require this treatment.

- Water barriers will continue to be required to provide water to trees that cannot be provided with dripper systems and those trees that display signs of water stress. These water barriers will continue to be filled using tankers filled from water hydrants and, when available, from Council building CH2. The water trucks which are driven to each tree to top up the water barriers, (a time consuming process) will need to operate within a 7 day framework from 8am to 8pm.

- Consumption and volume usage milestones will be identified to ensure that planned savings are achieved, and usage volumes are in accord with the planned 50% overall saving.

Council is conscious of the public interest in relation to water management and water conservation, and of the quality and presentation of city horticultural assets. Information will continue to be provided to the public regarding the City's plans and actions. Organisations that utilise open space areas for sporting, recreational and tourism programs have been consulted and will be kept informed.

The City of Melbourne has provided significant financial allocations at short notice to undertake emergency response infrastructure alterations and installations and will continue to provide adequate resources to distribute water to trees that depend on it for their survival.

1 INTRODUCTION

Melbourne's public open space assets are a defining element to the character of Melbourne. Whilst the Yarra River, heritage buildings, street layout and special sporting stadiums are dominant landscape elements, the linkages that combine these elements to provide a framework for the city as a 'landscape' are the horticulturally embellished open spaces and boulevards.

Trees and other plants are the primary horticultural resources that provide suitable and attractive landscape environments and spaces for active and amenity recreation. In addition to their contribution to the physical well being and daily lives of Melburnians these resources also provide a strong visual and practical contribution to the character and presentation of the city. Melbourne parks and gardens are recognised in terms of the tourism industry and their value as an asset associated with encouraging increased visits.

The City's key gardens are also of significant heritage and culture importance with the Carlton Gardens listed in the world Heritage Register and the Carlton, Fitzroy, Treasury and Flagstaff Gardens, and the Shrine Reserve listed on the State Heritage Register

The two key open space categories are amenity spaces (e.g. Fitzroy Gardens) and active recreation spaces (e.g. Princes Park). Amenity spaces are dominated by trees, shrubbery, special features and lawns which when combined create the landscape character. Active recreation spaces are dominated by turf surfaces, which are utilised for physical activity.

Amenity space horticultural elements are divided into three key elements. 'Trees' which are the key structural landscape framework, 'shrubbery' that creates interest and defines spaces, and 'grass lawns' that link, emphasis and highlight the other elements.

The creation of a landscape environment that is defined by its horticultural elements is by definition only possible if there is an adequate supply of water either from natural rainfall, or by supplementary supplies. Their survival and successful contribution is dependent on water.

Melbourne has a range and density of tree stock that is distinctly different to other Capital city open space systems. The density and size of trees has resulted from historic landscape design principles, which determined that trees were to be a primary element. Their development and survival could be achieved if the seasonal variations relating to rainfall and temperature were managed. Those variations were and have been overcome by two key supply systems – the development of storage dams which fed potable water to Melbourne by pipe and/or aqueduct, and the delivery of 2nd class water directly from the Yarra River above Dights Falls. Both sources became essential to the development of the open space system.

Key open space areas and boulevards are now serviced by extensive automatic irrigation systems. The level of application efficiency that is presently achieved is considered to be at the highest level. Options for water saving in terms of direct application from existing systems are therefore limited to mechanical operation of sprinklers and associated fittings. Preparation of a plan is required to be

consistent with horticultural asset demands and requires careful analysis of sites and associated horticultural assets.

The Water Conservation Plan is based on establishing asset priorities, volumes to be applied and adopting practical procedures to administer the plan to ensure sensitive biological assets are protected. The plan is based on an evaluation of high risk assets and the need to rationalise application rates to ensure those assets are maintained in a condition that ensures their survival this year and their preparation for next year. The plan accepts that adequate water for healthy growth cannot be applied during restrictions and stress minimisation must be a high priority. Achieving a 50% saving of total water applied requires consideration of ceasing to water low risk assets and reducing water to medium risk assets.

Where achievable, a volume increase to high risk assets may occur to overcome the impact of an abnormally dry season.

The water conservation plan is required to identify achievable overall volume savings. Those savings are to be achieved within the context of ensuring sensitive tree assets, or those considered to be at greater risk from drought, or reduced water availability, are not put at risk, and their longevity is protected.

Reduction to, or complete cessation of watering to selected sites considers the sites to be of lower priority, or they contain trees species considered capable of withstanding a season of limited or no moisture.

Ongoing management of supply and distribution will be undertaken to ensure agreed volumes and savings are achieved. Internal auditing and monitoring will ensure effective utilisation. Detection of loss or waste will be prompt. To further ensure that efficient site delivery occurs and that the water delivered has the greatest beneficial outcome in terms of penetration into the ground, watering times are proposed to be at night within a 7 day cycle.

Shorter but more regular watering cycles allow complete penetration rather than extended application that can result in surface runoff. Utilising automatic systems to deliver irrigation water is efficient, however, factors such as mains pressure, availability of adequate volumes, size of delivery pipes and restricted operational times means that watering has to be managed to suit infrastructure that was established without those restrictions. Operational issues such as stations only able to supply a certain number of spray heads, and the need to operate stations individually due to inadequate mains pressure will require station sequencing and alterations to accepted operational practices.

Council is conscious of community interest in terms of Melbourne's open space assets and the requirement to conserve water. Therefore there will be extensive community information provided to ensure the public is informed of actions and reasons why those actions are necessary.

It is essential that Council is able to confidently move forward with the support of water management authorities and the public, with a combined aim of ensuring those key tree assets and key open space sites are not placed at risk.

2 BACKGROUND

2.1 OWNERSHIP AND RESPONSIBILITY

Most of Melbourne's open spaces are Crown Lands and ultimately the responsibility of the Victorian State Government. Individual open spaces are one of the following:

- Crown Lands Vested jointly in the Minister of Lands and Melbourne City Council and under the control of the Melbourne City Council as the Committee of Management. (e.g. Fitzroy Gardens, Flagstaff Gardens, Fawkner Park and others);
- Crown Lands vested in the Melbourne City Council (e.g. Queen Victoria Gardens);
- Crown Lands under the control of the Melbourne City Council as a committee of Management. (e.g. Treasury Gardens, Kings Domain, Shrine, Royal Park and others); or
- Tree reserves and other street reserves maintained by the Melbourne City Council (e.g. Victoria Parade, St Kilda Rd, Royal Parade and Flemington Rd).

These spaces, and their horticultural resources, are public assets that define the character of Melbourne. Responsibility for asset survival has no boundaries and at times of water scarcity, all authorities become jointly responsible for survival of assets of state significance.

2.2 SEASONAL DEMAND

Adverse seasonal conditions and drought events cause surface and subsurface soil profiles to be depleted of water, particularly during winter and spring. As spring summer temperatures rise and Melbourne is subjected to hot dry north winds, the consequence of a depleted profile is a significant reduction to health and vitality. Stress symptoms such as leaf loss that occur in the spring period when demand for water for growth is intensive, can result in the death of a tree.

The present season has delivered less rainfall in terms of volumes than are sufficient to recharge subsurface water tables, and less surface water for plant growth. Irrigation systems have therefore been in operation earlier and with greater intensity than previous years. The outcome is that seasonal consumption has commenced in advance of the norm, and irrigation water generally used and normally associated with the warmer and drier periods after November, is being applied earlier than normal.

2.3 SUPPLEMENTARY SUPPLY

Drought events and consequent water shortages do not always go hand in hand. Adequate rainfall in a catchment can overcome a dry period at the point of distribution, but when the catchment and distribution points both experience inadequate rainfall the result is a drought. In broader terms, prediction has some certainty in terms of scientific identification of El Nino and La Nina events, accurate weather pattern forecasts, demographic consumption records, industry and agricultural demand for water and discrepancies between catchment and distribution point precipitation all are factors that when analysed provide indications of future demand, supply and distribution requirements.

At the time when Melbourne's water storage reservoirs were constructed this range of information and data was not available. Foresight and long term vision created extensive storage capacity for the purpose of collecting and retaining water during times of above average flow, which would otherwise pass unchecked to oceans and bays, so that water was available during times of below average flow. Those actions have provided a water resource structure and framework that has enabled Melbourne to develop an extensive system of parks, gardens and reserves protected from seasonal variations and adverse weather patterns. Trees and other horticultural features that require supplementary water during the drier and hotter months of the year are now the principal landscape element. It is for this reason that restricted application becomes a critical factor, and one that threatens the lifestyle of Melbourne's population and Melbourne's garden state image.

2.4 STRESS FACTORS

- **Lack of water**

A lack of soil moisture at a time when plants are responding to daily temperature increases and lengthening daylight hours is a critical inhibitor to growth and development. A normal season provides adequate rainfall, which can be supplemented by irrigation, however rainfall has not eventuated this season and plants are completely reliant on supplementary water. This is the worst possible series of events and circumstances, and is considered to be a major threat to trees and other horticultural assets.

- **Adverse conditions**

At a time when trees are stressed due to lack of water, they are vulnerable to the impact of higher daily temperature and drying winds whether they are hot northerly or mild easterly. Both are devoid of moisture and draw further moisture from the ground.

- **Overuse and compaction**

Surfaces that become impervious to water further exacerbate the problem of dry soils. Vehicular traffic, pedestrian traffic and infrastructure that covers the ground all result in repelling any rain that does fall, or ponding and being evaporated. The outcome is a soil profile less able to provide and release moisture.

2.5 STRESS IMPACT

Stress is generally exhibited by partial or complete defoliation of deciduous species, or a gradual drying and death of leaves or both. Complete branches of evergreen exotic and native trees will die as a natural response. However, if the loss is substantial, it can result in complete branch death which weakens the tree so that it is unable to survive the loss and complete death results either in the short or longer term, or the tree is severely disfigured and no longer serves a purpose. The consequence is removal.

2.6 GLOBAL CONSIDERATIONS

Trees are considered to be the lungs of the cities, and it is trees and other plants that are primary sources of carbon dioxide conversion to oxygen. Continued health of plants is therefore essential to the continuance of that function and it is leaf surface area that is the critical element to the continued

photosynthetic process that converts carbon dioxide. Tree stress results in immediate leaf loss and consequent reduction to the conversion process.

The provision of water via irrigation systems is the most environmentally sound delivery method. The environmental footprint of irrigation infrastructure is inconsequential compared to watering by tankers and other mechanical delivery systems which are dependent on fossil fuels. Delivery of water by road transport requires thousands of litres of diesel and petrol fuel resulting in increased emissions of greenhouse gases to the atmosphere. Council is conscious of the negative environmental impact associated with truck delivery, as opposed to the environmentally clean method of irrigation piping and spray equipment operated by water pressure. However, the use of tankers will be needed to water trees that cannot be provided with dripper irrigation, isolated trees and to supplement existing systems that are inadequate.

2.8 LIVEABLE CITY IMAGE

It is considered that the loss of key tree assets is unacceptable. Heritage links, community lifestyle, landscape contribution, biological contribution, city character and tourism contribution are key elements of Melbourne's most liveable city image, and the loss of tree stock will diminish those sought after qualities.

3 SITE ANALYSIS

The water conservation plan achieves savings by reduction in some areas and cessation of watering in others. Sites assessed to be capable of withstanding seasonal extremes for a season will have their volumes reduced or ceased. Those that are recognised to be sensitive to abnormally dry and hot seasonal conditions, particularly if supplementary water is denied, are assessed in terms of adequacy or otherwise of present allocations.

3.1 OPEN SPACE SITES

- **Site categories**

For the purpose of the conservation plan, open spaces are considered in terms of a hierarchy of significance according to their location, character, tree content, general asset content, sensitivity to environmental fluctuations and the uncertainty of the impact of a reduced supplementary watering program.

While turf is very sensitive to water denial, it is an asset that can be replaced within a shorter timeframe compared to trees. The financial implication of asset loss associated with development, repair, maintenance, removal, replacement costs and replacement timeframe are factors to be considered.

- **Location**

Location or precincts that are highly significant areas in terms of character, ambience, social qualities, and have heritage values are important sites. Recreational participants, passers by and

traffic movement are indicators in terms of levels of exposure. Sites of high exposure will receive greater attention compared to sites of low level exposure.

- **Site character**

Residential, business and tourism destination objectives are contributed to and enhanced by the character and image of city landscapes. Melbourne is recognised as a city of parks, green spaces and tree lined streets, and a character that is defined by 'traditional' horticultural sites being intensively horticultural and generally planted with exotic species. They are water dependent landscapes and define the character of Melbourne as a treed city and a city that displays the traditional seasonal changes. 'Modern' sites are those that have less intense horticultural content and often utilise native species.

Traditional landscapes are more sensitive to drought and the consequence of water restrictions and therefore require protection.

- **Replacement**

Some assets are irreplaceable, some can be replaced but require 30-50 years to reach replacement value, and others can be replaced during a season.

3.2 TREE TYPE

Asset sensitivity

The Water Conservation Plan identifies trees as the primary asset and rates their sensitivity according to species, age, integration with adjacent trees and location. Exotic deciduous species are more sensitive to water denial then evergreen exotic, with evergreen native being the least sensitive. Sites that are dominated by exotic deciduous species are therefore rated more highly in terms of selection to receive continued or additional irrigation.

4 TREE PRIORITY

An irrigated site consisting primarily of dominant trees such as the Fitzroy Gardens is an integrated and complex environment. Irrigation of tree stock provides water to lawn surfaces and cessation of water to a lawn surface has the direct consequence of denying water to trees.

4.1 TREE CATEGORIES

Decisions in terms of actions to continue, reduce or cease irrigation are based upon tree significance and sensitivity.

Trees are categorised as follows:

- Heritage listed;

- National trust listed;
- High priority 1; and
- High priority 2.

Significance and sensitivity rating is based upon the following criteria:

- Trees that are of Heritage or National Trust significance and display special features, aesthetic appeal or site contribution.

- Trees that take decades to develop, and have incurred considerable resource allocation and financial input (e.g. Platanus, Quercus, Ulmus, Populus, Fagus, Cedrus, Agathis, Cupressus, and a wide range of other genus and species).

- Dominant and prominent trees and their presence, which if diminished or lost cannot be replicated without many years of development and resource allocation (e. g. Avenues in Fitzroy Gardens).

- Exotic species that have been developed in an environment very different to their natural environment. Development has been achieved by application of supplementary irrigation to sapling trees, and cannot be replicated unless application volumes for replacement saplings are consistent with the volumes applied in the past (e.g. Quercus)

- Trees and shrubs that are not recognised as being drought tolerant and will suffer if supplementary water is not available (e.g. Calodendron).

- Trees that have been the recipients of supplementary irrigation during the majority of their life and have developed a dependency. Denial of water will cause canopy decline, which accelerates the process towards death (majority of trees in traditional open space area).

- Trees that are exposed to other influences or pathogens that will in addition to the reduced availability of water result in additional stress and potential decline and death (e.g. Ulmus Sp).

- Trees in combination with other trees to provide a distinct landscape feature, and a character that only serves a purpose if it remains in tact (e.g. Boulevards).

- Trees that have been documented in previous years to be sensitive and display stress.

5 SITE PRIORITY

5.1 STABLE ENVIRONMENTS

The majority of open space sites have developed into ecological sites that are relatively stable or as stable as can be expected of an urban site. Large trees create a horticultural space which is protected from winds, consist of small microclimatic zones that support a wide range of vegetation that would not otherwise survive, provides a range of shade condition from dense to dappled and supports fauna

including birds and possums. Tree loss will change site conditions to the extent that the balance that has been achieved over the past 50 years will be eliminated, resulting in a degradation of understorey species, and difficulty re-establishing a similar landscape.

Sites such as the Carlton Gardens which is a world heritage listed site, are complex in terms of their content. Design layout, size, special features, infrastructure, buildings, play features, sculptures, ponds and other features are all directly affected by the presence of trees.

5.2 GARDENS OF SIGNIFICANCE

The City of Melbourne contains gardens and boulevard sites where its horticultural assets have World Heritage, National Heritage, State Heritage and/or National Trust significance. These include:

- Carlton Gardens
- Fitzroy Gardens
- Treasury Gardens
- Flagstaff Gardens
- Queen Victoria Gardens
- Alexandra Gardens
- Kings Domain
- Shrine Reserve
- Speakers Corner (at Birrarung Marr)

Separate applications have been made to seek partial exemptions under the Stage 3 restrictions to achieve flexibility to ensure the survival of the trees at these important sites. However, the total water savings for the City of Melbourne (including for these sites) will be at least 50% of the base year consumption.

6 IRRIGATION SYSTEMS

Based on site and tree significance criteria the open spaces and boulevards have been assessed and allocations determined. The total overall irrigation reduction to Melbourne's parks, gardens and trees will be 600,000 kilolitres which is 50% of the March 2005 to February 2006 base.

During October and November 2006, significant works, particularly capping of spray heads were carried out to the City's irrigation infrastructure to redirect water to tree lines and groups so that over spray onto lawns areas was minimised and water is only applied to turf adjacent to trees. The effectiveness of these modifications is being monitored.

Conversion of the City's irrigation infrastructure from above ground spray systems to dripper systems would require significant resources and installation times. Complete conversion is not logistically or financially feasible in the short term. However in order to meet significant water saving targets and comply as far as possible with Stage 3 restrictions, the City has undertaken an emergency installation response plan for dripper systems to provide water to the key avenue and

boulevard trees. However the minimum water requirements of these trees will require longer operating time periods than specified under the Stage 3 restrictions requirements.

Planning commenced in November 2006 to install these dripper irrigation systems. More than 100 kilometres of dripper pipes and associated valve arrangements will be required, even for a basic system, given the extent of the Council's tree population. The rollout of this first stage drip per irrigation system has been progressing and is expected to be completed by February 2007. There is however some uncertainty with this completion time, given the holiday period and construction contingencies.

The installation of the dripper irrigation networks is less complicated when the trees are in avenues or boulevards. It becomes more difficult when the design needs to account for trees that are randomly scattered in parks and gardens.

Within the overall 50% reduction commitment, dispensation is therefore sought from the Water Authorities for continued use of the above ground irrigation system in those areas where the dripper system has yet to be commissioned. As soon as the dripper systems are commissioned, the above ground sprays will be turned off.

The dripper system that is being installed is only a basic system and cannot deliver the quantity of water needed by the trees under the Stage 3 time restrictions. Given that it is a basic dripper system, it will have to be operated within a 7 day framework and the hours of operation will need to be adjusted from site to site to supply enough water for tree survival. However, the goal of a 50% water use reduction will be maintained.

Also under exemptions submitted for the heritage gardens listed, ongoing use of surface sprays (within the 50% reduction commitment) to water key trees where it is not efficient to install dripper systems is proposed.

7 CONSUMPTION MANAGEMENT

7.1 CONSUMPTION AUDITS

Auditing of water usage will be undertaken to ensure consumption milestones are achieved. Monthly reading of meters servicing the major spaces by Council, and separate to those undertaken by water authorities, will provide consumption data. Data will be analysed and where deviations to expected and planned usage patterns are identified, alterations to the irrigation program will be initiated.

7.2 ASSET AUDITS

Tree assets will be inspected weekly to determine the effectiveness or otherwise of the application programs. Stressed trees will be identified and assessment made to determine if the extent of stress will result in long term damage and therefore additional and immediate additional irrigation is required, or the tree can accept the reduced flow and no long term impact is anticipated.

7.3 IRRIGATION INFRASTRUCTURE AUDITS

Effective operation of irrigation infrastructure is essential and therefore all systems will be monitored to ensure accuracy of spray direction, prompt repairs to bursts, and repair of broken or vandalised heads and pipes.

It should be noted that the dry weather and cessation of lawn watering has resulted in ground movements which lead to pipe breakages and consequent unavoidable loss of water that is in the affected irrigation network.

8 SITE MANAGEMENT

8.1 INFRASTRUCTURE MODIFICATION

The allocation of water will be directed to tree stock. Sites that have dominant lawn areas and limited tree numbers will not be irrigated. (e.g. Gordon Reserve). Wherever possible water will be provided to trees through dripper systems included under Council's emergency response program. In the exempted heritage parks some limited use of sprays identified to water key trees will need to be operated to allow their survival.

8.2 SITE USAGE

Alterations to supplementary irrigation programs in addition to dry and hot weather patterns will alter the immediate condition of an open space surface. Loss of grass, compaction of soils, and undue vehicular and pedestrian traffic can result in a degradation of surface and subsoil conditions. Utilisation of open space surfaces during a normal season has little if any detrimental impact if soil moisture conditions are adequate. During drought or periods of restriction, the surfaces are less able to rejuvenate from public use. The use of surfaces for car parking, major events that require heavy equipment, and events that generate intense pedestrian activity will need to be reviewed during the season and those uses prevented if it is deemed the impact will be detrimental.

9 CONCLUSION

Stage 3 water restrictions have been introduced on 1 January 2007. The City is committed to achieving the maximum possible reduction of water use consistent with protecting key assets, and this Water Conservation Plan commits the City to an overall reduction of at least 50% compared to the consumption during the period March 2005 to February 2006 as the base year. However the requirement that only dripper systems can be used requires a longer time frame for operation to enable enough water to be delivered to trees than the hours specified under the Stage 3 restrictions.

Also as further time is required to complete the installation of dripper systems, extra time is therefore required for continued use of above ground sprays until the dripper systems are completed in February 2007. As the dripper systems are commissioned at various sites, the above ground sprays will be turned off.

Separate application have been made for partial exemptions to allow ongoing use of above ground spray systems in the heritage Gardens of Significance. This use will also be within the overall level of water savings commitment of at least 50%.

The City looks forward to working closely with the Water Authorities to monitor the on-going use of water under these restrictions and into the future in order to lock in all opportunities for water savings.

FINANCE ATTACHMENT

WATER CONSERVATION INITIATIVES

Funding of $1.100M has been provided in the 2006/07 forecast for expenditure on water.

An additional $0.500M has been provided in the 2006/07 forecast for the initiatives needed in this financial year to respond to Stage 2 and 3 restrictions and the Water Conservation Plan.

Joe Groher
Manager Financial Services

LEGAL ATTACHMENT

WATER CONSERVATION INITIATIVES

The subject matter of the report and the recommendation made are within the role and power of the Council.

Section 3C(2) of the *Local Government Act* 1989 ("the Act") provides that Council must have regard to the following facilitating objective in endeavouring to achieve the best outcomes for the local community having regard to the long term and cumulative effects of decisions:

> *"(a) to promote the social, economic and environmental viability and sustainability of the municipal district;"*

Also, section 3D(2) of the Act sets out that the role of a Council includes:

> *"(c) maintaining the viability of the Council by ensuring that resources are managed in a responsible and accountable manner;"*

Kim Wood
Manager Legal Services