State of the Environment
Report 2005

December 2005

City of
Norwood
Payneham
& St Peters

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CONTENTS

1. Introduction

Conservation and enhancement of the environment is a challenging but rewarding vision for any society. The vision is essentially about sustainable development; meeting the environmental, social and economic needs of the present generations, without compromising the ability of future generations to meet their own needs.

State of the Environment (SoE) reporting is a means of providing information on the condition and trends of the environment at a local, national or global scale. This SoE Report will allow the City of Norwood Payneham & St Peters to understand its current position in relation to key environmental issues. The indicators described to measure the pressures, condition of resources or burdens, and responses, will allow the Council to assess its performance in relation to these environmental issues.

The new SoE report has incorporated key elements from the following policies and plans:

- City of Norwood Payneham & St Peters Development Plan 2003;
- City of Norwood Payneham & St Peters Strategic Plan 2006; and
- City of Norwood Payneham & St Peters Environmental Sustainability Policy within the Environmental Management Plan.

This report does not replace or replicate these plans, however it does aim to provide a measure of the success of these plans in achieving the environmental objectives and visions of the City of Norwood Payneham & St Peters. The themes and issues described provide a summary of the environment in this area. As the second SoE Report for the City of Norwood Payneham & St Peters, the measurements provided by each indicator can be compared to baseline information from 2002, against which performance can be assessed. In future years, changes in the measures for each indicator will allow the City of Norwood Payneham & St Peters to assess the improvement or decline in the environment. This information will then guide future actions taken by the Council and its community with respect to environmental management.

This report has been prepared following the Pressure-State-Response model first proposed by the Organisation for Economic Cooperation and Development (OECD) in 1991. The themes described follow the same format as South Australian SoE Reports (2003, 1998, 1993 and 1988). The indicators developed have taken into consideration those used at both State and Local Government level in South Australia, and particularly those used by neighbouring Councils.

The report provides a brief history of SoE reporting, a profile of the City of Norwood Payneham & St Peters and then each environmental theme is described with respect to pertinent issues.

2. State of Environment Reporting

Since the establishment of the World Commission on Environment and Development by the United Nations General Assembly 20 years ago, environmental management has evolved from a focus of protection to one of sustainability. The Commission's 1987 Bruntland Report, "Our Common Future," suggested that to enable the world's population to meet its growing needs without destroying the environment it depends on, sustainable development would be required. The report defined sustainable development as:

> *'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'*.

Since 1987, governments around the world have recognised the need to adopt the principle of sustainable development in their decision making, enabling the integration of environmental policy and economic development. Australia's National Strategy for Ecologically Sustainable Development (NSESD) was adopted in December 1992, following three years of research, development and consultation. The NSESD defines ecologically sustainable development (ESD) as:

> *'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased*'.

ESD and sustainable development tend to be used interchangeably, and the principles of each concept have now been enshrined in a growing number of documents concerning national and state legislation. This includes the *South Australian Environment Protection Act 1993*, the *Local Government Act 1999* and the *Commonwealth Environment Protection* and *Biodiversity Conservation Act 1999*.

The United Nations Conference on the Environment and Development was first held in Rio de Janeiro in 1992. The aim of the conference was to ensure that practical considerations for sustainable development were put into place. One of the major outcomes of the Rio summit was the Agenda 21 Document.

2.1. Local Agenda 21

Agenda 21 describes the actions that governments, international organisations, industries and the community can take to achieve sustainability. The important role local authorities could play in promoting sustainability was highlighted in Agenda 21, and the term Local Agenda 21 was conceived.

Local Agenda 21 programs encourage a long-term commitment to achieve local environmental sustainable development. Local Agenda 21 is effectively a process that involves local Councils and the community working together to create strategies that incorporate plans to meet the environmental, social and economic needs of the present generations, without compromising the ability of future generations to meet their own needs.

The need for ecologically sustainable development of the world's finite resources, and its dependence on the co-operation of communities at the local level, is recognised by this Agenda. Therefore, local government is perceived as having an important role in developing the planning, educational, economic and environmental strategies to achieve sustainable development outcomes, because it is this level of governance that is closest to the community.

2.2. What is State of the Environment Reporting?

SoE reporting is a means of providing information on the condition and trends of the environment at a local, national or global scale. SoE reports are a key tool for environmental management as they:

- Provide accurate, timely and accessible information about environmental condition to decision makers and the community;
- Increase public understanding and awareness of environmental issues;
- Provide early warning of potential environmental problems;
- Use indicators that are accessible and agreed upon to review and report on changes and trends in the environment;
- Evaluate the effectiveness of existing environmental policies and plans in achieving environmental standards and targets; and
- Identify gaps in the existing knowledge of environmental conditions and trends.

(Adapted from DEST, 1994)

2.2.1. The Pressure State Response Model

The Pressure-State-Response model was developed by the OECD as a framework to guide the preparation of SoE reports. This model is based on the rationale that human activities exert *pressure* on the environment, which change its *state* or *condition*. Society then *responds* to these changes, by developing and implementing policies and plans, which alter those human activities exerting pressure on the environment. (OECD, 1991).

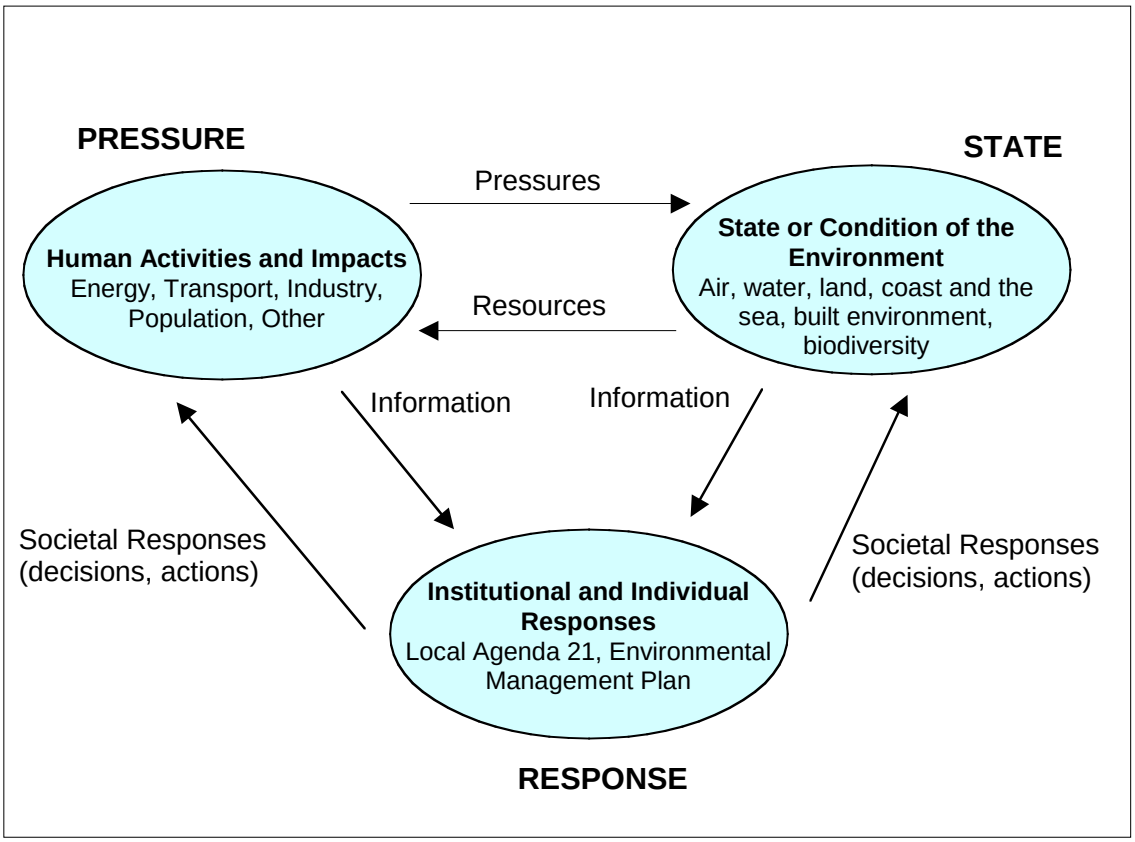


Figure 2.1 Pressure-State-Response Model (Adapted from OECD, 1993)

2.3. Indicators

Indicators are a means of reporting changes in environmental issues and pressures. Indicators also measure the state of the environment and respond to mitigative measures. Indicators can be physical, chemical, biological or socio-economic measures. Their objective is to provide enough information for stakeholders to make informed decisions on the nature and trajectory of environmental impacts. They must provide enough information to enable the monitoring of trends, but do not need to include every piece of information that would be required in a rigorous scientific monitoring program.

The indicators need to be relevant, reliable, timely, sensitive, reproducible, linked to policy and useful. The following list elaborates on this principle:

Relevance	Usefulness for users.
Reliability	Level of completeness, consistency, and accuracy of data.
Timeliness	Availability of data at a time suitable for reporting purposes.
Sensitivity	Ability to show trends over time.
Reproducible	Well founded technically and able to take into account availability of resources.
Policy Linkage	Linked to strategic goals (Local Agenda 21).
Utility	Ability to be reproduced nationally and regionally over time.

The indicators developed for this State of the Environment report have been chosen to achieve the goals stated above. Many are Key Performance Indicators used in the 2002 SoE report, or form part of existing programs such as the Cities for Climate Protection Program.

A summary of indicators used by the City of Norwood Payneham & St Peters, and during the preparation of this report, is located in Section 9. Titled "Recommended Strategies for Council and Community," Section 9 clearly defines the City's goals and strategies that aim to improve environmental conditions as depicted by the indicators, in addition to comments on each indicator's ability to sufficiently reflect these changes.

2.4. Community Consultation Surveys

A community survey was designed to give residents of the City Norwood Payneham & St Peters the opportunity to comment on local environmental issues. The pie graphs entitled "Community Comment" appearing throughout the report are based on the statistics collected from these surveys. A copy of the survey is provided in Appendix A.

The survey prompted respondents to indicate their level of concern about a range of environmental issues (eg greenhouse effect, loss of biodiversity etc) and to comment on the extent to which they value a range of environmental values/assets (eg clean beaches, heritage conservation etc). The survey also gave people the opportunity to make general comments and collected data about the most widely consulted sources of environmental information to assist the City Norwood Payneham & St Peters with its communication strategy. The survey was mailed out to residents, available to be completed online at the City's website, and was used for verbal shopping centre surveys undertaken by Council staff on three occasions.

In addition to survey questions, a detailed summary of the responses to each question is given in Appendix A. 158 survey responses were received.

2.5. Response: Council's Commitment to the Environment

The SoE is part of the City of Norwood Payneham & St Peters commitment to the principles of Local Agenda 21, and the ideology of sustainable development as instilled by this agenda. In conjunction with the Council's Strategic Plan and Environmental Policy, the SoE aims to address factors that will drive the need for quality environmental management into the future, including:

- participation in Local Agenda 21, previously endorsed by the Council;
- obligations for Ecologically Sustainable Development (ESD) as required by the *Local*
- *Government Act 1999*;
- a duty of care to comply with relevant government legislation and policies;
- risk management responsibilities;
- community expectations as demonstrated through the strategic planning process and the Section 30 Development Plan review; and
- potential at the local level to contribute to improvements in global performance.

The City of Norwood Payneham & St Peters have committed resources to actively address these areas, with a strong focus on balancing environmental initiatives with community development, thereby improving the long-term sustainability of the region.

> *'The City of Norwood Payneham & St Peters is committed to protecting the urban character and cultural identity of the area and working towards a more sustainable natural environment through recognising and respecting biodiversity and seeking to provide intergenerational equity, reducing the consumption of natural resources, minimising air, soil, noise and water pollution and reducing waste'.*

(NPSP Environment Sustainability Policy Manual 2004)

The Council's commitment to the environment is further demonstrated through its environmental management system (EMS), which has been operating since mid 2004. EMS has enabled Council to consider the environmental impact of a wide variety of operations, which are systematically being addressed through the development or refinement of standard operating procedures.

Several recommendations have been outlined in this SoE to further assist the City in achieving sustainable development goals in water management, biodiversity, climate change and air quality, cultural and urban forms, and waste management.

3. Profile of the City of Norwood Payneham & St Peters

The City of Norwood Payneham & St Peters is rich in historic and cultural diversity, a legacy of its close association with the original development of Adelaide. The area has undergone many transformations since settlement, from an area dominated by agriculture in the 1800s to a lively, bustling City of the 21st century. The latest major transformation occurred in November 1997, when the former Cities of Kensington and Norwood, Payneham, and the Town of St Peters amalgamated to form the City of Norwood Payneham & St Peters. The City provides a dynamic living environment, high in aesthetic appeal and visual amenity, set against the picturesque backdrop of the Adelaide Hills.

3.1. Location

The City of Norwood Payneham & St Peters borders Adelaide City Council to the west, the City of Burnside to the south, Campbelltown City Council to the east, and Port Adelaide Enfield and the Town of Walkerville to the north.

The location of the City of Norwood Payneham & St Peters is shown by Map 3.1.

The City's administrative area covers 15.1 km^2, including seven Council wards and 21 suburbs as listed by Table 3.1:

Table 3.1 Council wards and Suburbs of the City of Norwood Payneham & St Peters

WARD	SUBURBS	WARD	SUBURB
Torrens	Felixstow	**Stepney / Maylands**	Evandale
	Marden		Maylands
	Royston Park		Stepney
	Joslin	**East Adelaide / Kent Town**	St Peters
Payneham	Glynde		College Park
	Payneham		Hackney
Trinity	Firle		Kent Town
	Payneham South	**West Norwood**	Norwood
	St Morris	**Kensington**	Kensington
	Trinity Gardens		Marryatville
			Heathpool

3.2. Climate

The City of Norwood Payneham & St Peters has a Mediterranean climate, with hot dry summers and cool wet winters. The closest Bureau of Meteorology weather station is located within the City's suburb of Kent Town. Figure 3.1 shows the average monthly rainfall and daily maximum and minimum temperatures at Kent Town (Bureau of Meteorology, 2005).

The City receives an average annual rainfall of 558 mm, with rainfall increasing generally to the south east where the City boundary nears the hills face zone. Map 3.2 shows the distribution of annual rainfall for the City of Norwood Payneham & St Peters.

The average hours of sunshine per day range from 10.5 in January to 4.4 in June. February is the driest month with an average of 13.7 mm of rain falling over 3.4 rain days. June is the wettest month with an average of 83 mm of rain falling over 15.4 rain days.

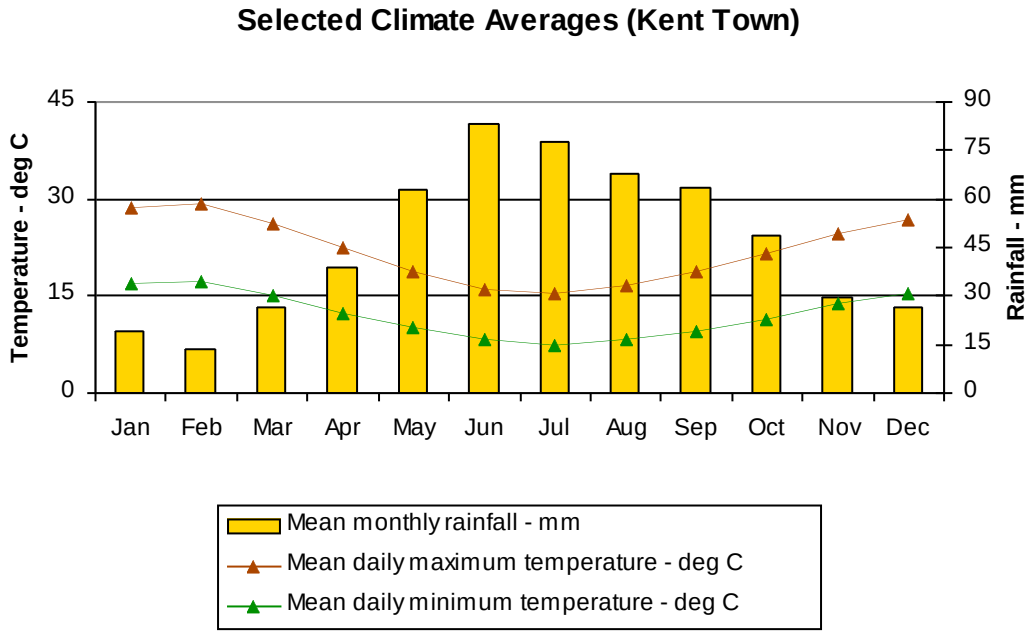


Figure 3.1 Selected Climate Averages (Kent Town)

3.3. Population

The population of the City of Norwood Payneham & St Peters at the 2001 census was 32,272, living in 15,008 rateable properties (ABS 2001a; ABS 2001b). A preliminary calculation of the estimated resident population in 2004 (includes people who usually reside in other areas of Australia or overseas) shows a strong upward trend to 34,054 people.

Further details on the population and demography of the City of Norwood Payneham & St Peters may be found in section 7.2 of this report, and in the *Community Profile for the City of Norwood Payneham & St Peters* available online from the City's website (www.npsp.sa.gov.au).

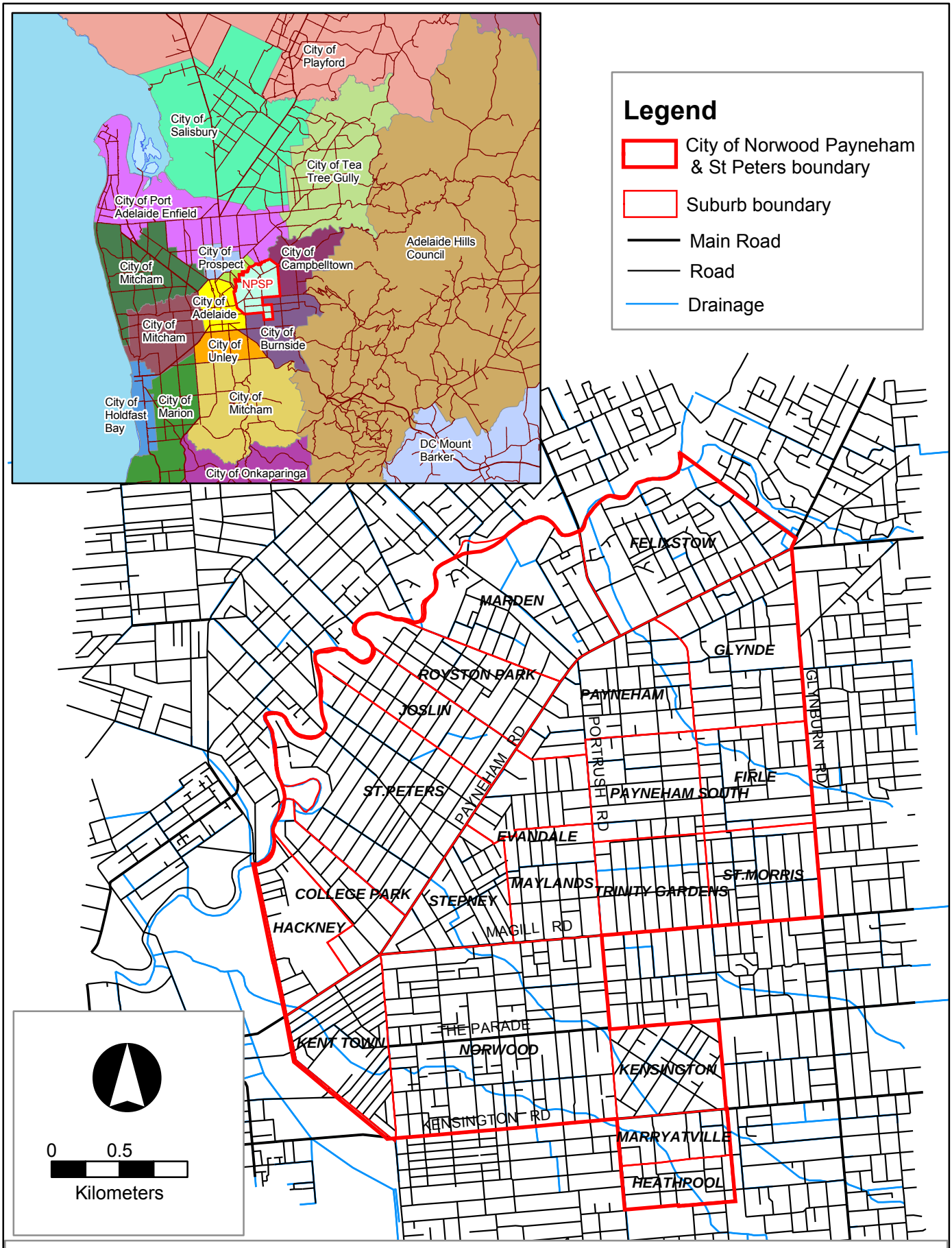
3.4. Urban Character

The City is diverse in urban character, combining desirable leafy suburbs and open areas with cosmopolitan shopping precincts, productive commercial and light industries, and attractive, vibrant dining and entertainment precincts. An array of cultural influences are symbolised by the varied architectural designs throughout the City, from stately Victorian villas and bungalows to maisonettes, townhouses and contemporary style apartments. The area retains a strong sense of community that is highly prized and actively maintained by the policies and guidelines developed at the local government level.

> *'Our City aims to maintain and develop this unique richness and sense of community to see that it continues to prosper and have a strong sense of place and vibrancy.'*

(City of NPSP "Council" web page)

Further details on the urban character of the City of Norwood Payneham & St Peters may be found in section 7 of this report.



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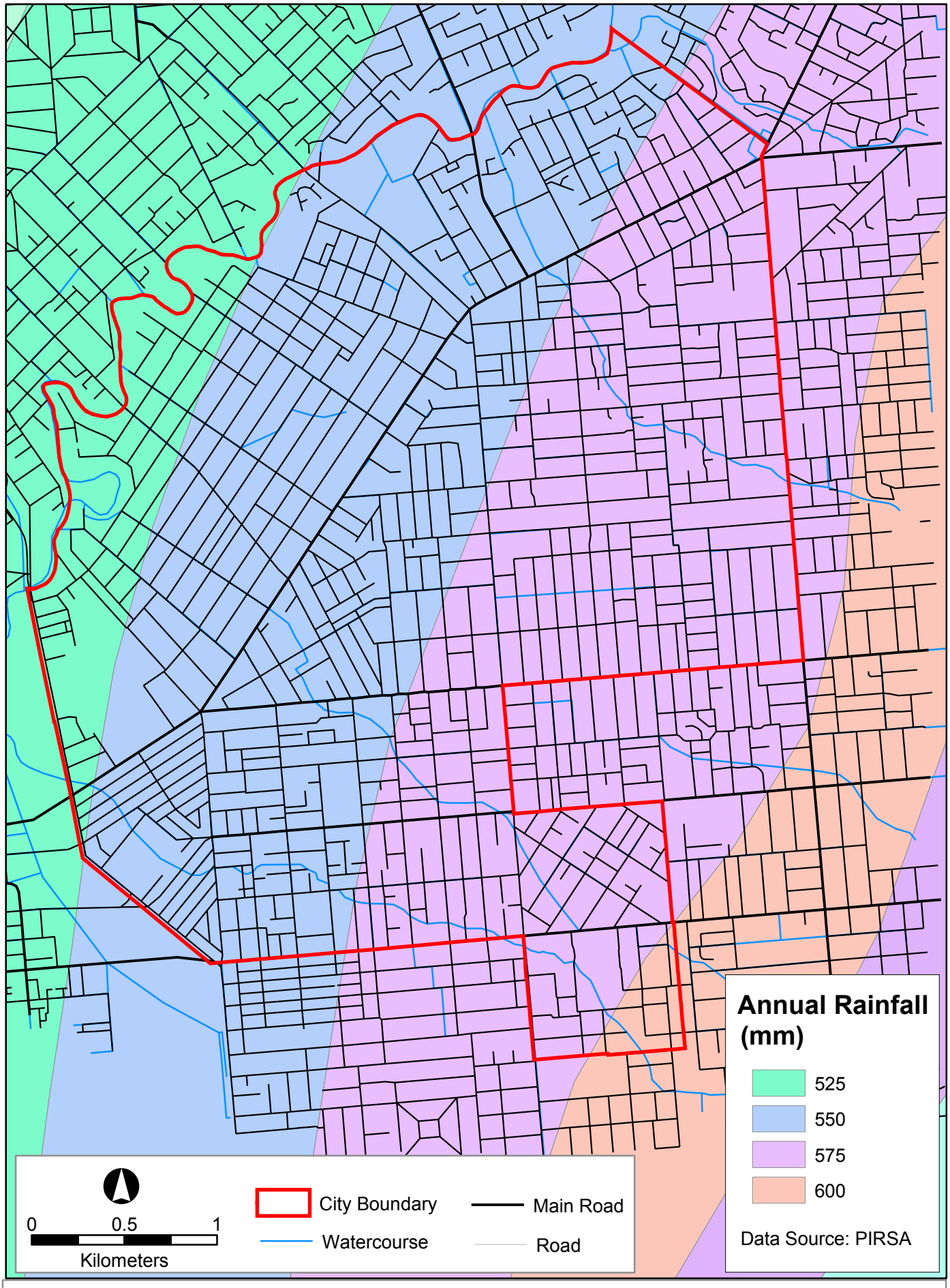
Map 3.1 Location Map

STATE OF THE ENVIRONMENT REPORT
CITY OF NORWOOD PAYNEHAM & ST PETERS

City of Norwood Payneham & St Peters



Map 3.2 - Annual Rainfall Distribution

STATE OF THE ENVIRONMENT REPORT 2005

CITY OF NORWOOD PAYNEHAM & ST PETERS

3.5. The Economy

The City of Norwood Payneham & St Peters is home to a thriving economic sector, attractive to an assortment of commercial and industrial activities, but largely focused on cultural, sporting and leisure based services that attract visitors from neighbouring suburbs and towns. The City actively supports the business sector, developing policies and procedures that aim to:

> '*…foster[ing] an environment that promotes business development appropriate for the City and that broadens the economic base of the City.*'

(City of NPSP "Business" web page)

The City of Norwood Payneham & St Peters Community Profile contains information on the employment status of the community, based on figures from the 2001 census (ABS 2001a; ABS 2001b). Of 16,285 people (58.7 %) in the labour force (i.e. aged over 15 years), 6.6 % of people were unemployed, while 91.3 % were employed in full time or part-time work. These figures compare favourably to Adelaide averages of 7.9 % unemployment and 89.7 % full or part-time employment, and can in part be attributed to a large proportion of residents with higher educational qualifications.

A significant portion of residents are also aged 18-49 (48.5 %) and are considered in the prime of their working life. However, a trend towards an ageing population has prompted the City to consider the range and quality of services it will need to provide into the future. A key outcome of the City of Norwood Payneham & St Peters Annual Report 2003/04 (2004) reflects these needs by encouraging the development of a healthy business sector:

> '*The City will continue to encourage and support the development of a commercial sector that improves local employment opportunities and benefits business and residents by improving access to services and facilities.*'

3.6. Administration

Since the amalgamation in 1997, the City of Norwood Payneham & St Peters undertakes most of its business from the head office at the Norwood Town Hall, with smaller customer services centres operating at Payneham and St Peters.

The seven wards of the City are managed by two Councillors each, with the Torrens Ward having three Councillors.

The Council is administered through four key areas:

- urban services;
- strategic and urban planning;
- community development and library services; and
- corporate services.

3.6.1. City Vision

The City of Norwood Payneham & St Peters is strengthened by its Council vision, of a population that:

> *'…is unique and diverse; committed to promoting acceptance, innovation, creativity and community spirit.'*

The Council's mission aims to promote and enhance these qualities, while acknowledging the value that a healthy environment has on its community:

> *'We will retain and build on our strength and vitality, continue to provide quality of life for residents, opportunities for business, and retain and enhance our natural environment.'*

The first City of Norwood Payneham & St Peters SoE report (2002) provides a benchmark study against which to measure the City's progress towards these goals. This SoE report will revisit the original goals, provide an objective assessment, and reshape future targets to ensure they reflect the current aims and visions of the City.

4. Water Management

4.1. Introduction

Fresh water is vital for the maintenance of life on Earth. It is required for agriculture, manufacturing, transport and recreation, moderates the climate, and dilutes pollutants (Miller, 1996). In South Australia, and more particularly in Adelaide, the influence of European settlement on water resources has been severe. On the Adelaide plains, rivers flowed into pools and lagoons behind dune systems that separated them from the sea. As land was required for agriculture and later residential areas, drains were formed to channelise these areas, culminating in the construction of the South West Suburbs Drainage Scheme in the early 1970s (BC Tonkin & Associates, 1996). The lower Torrens Catchment, in which the City of Norwood Payneham & St Peters is located, encloses the First to Fifth Creeks, and the River Torrens, draining a significant proportion of stormwater from highly impervious, developed areas into the receiving waters below (TCWMB 2002).

Fresh water resources in the City of Norwood Payneham & St Peters comprise surface, ground and storm waters. The surface waters are largely from the First, Second and Third Creeks and the River Torrens that runs along the north and north-western boundary, comprising approximately 20 km in length. Ground waters are accessed via bores from a number of Quaternary, Tertiary and fractured rock aquifers, and while total bores within the City is low, no restrictions are placed on those utilising this resource at this stage. Stormwater is generated as rain falls onto impervious surfaces, draining into the three creeks and the River Torrens that traverse the City. Surface water and stormwater ultimately flows into the sea via surface water networks, where the often highly turbid, nutrient enriched and polluted water can have deleterious effects on marine ecosystems (Gabric and Bell, 1993).

The Torrens Catchment Water Management Board (TCWMB) is responsible for the management of the watercourses that flow through the City. However the TCWMB will be replaced with the newly formed Adelaide & Mt Lofty Ranges Natural Resources Management (AMLR NRM) Board in January 2006, which has established with the aim of achieving a more integrated and coordinated approach to the management of soil, water, coastal and biodiversity assets. The previous symbiotic relationship between the Council and TCWMB has resulted in many improvements, including the installation of trash racks, and the on-going rehabilitation of St Peters Billabong.

The introduction of minor water restrictions in October 2003, reflected the growing concern on the state of our water supplies in South Australia, with the program embracing “common sense” measures for a community living in the driest state on the driest inhabited continent. Below average rainfall in the last few years combined with reduced flows in the River Murray has seen the permanent enforcement of these water saving measures.

4.2. Water Supply, Consumption and Treatment

Water consumption in the City of Norwood Payneham & St Peters is linked to population and land use. Domestic households require water for indoor (washing, bathing and cooking) and outdoor (irrigation and car-washing) uses. Industrial activities may require water for production, heating and cooling.

In 2002-03, the average residential water consumption per household was 284 KL/year or around 380 L/person/day (assuming 2.07 persons per household - ABS 2001a & b) with 60% used indoors and the remaining 40 % used outdoors, primarily on the garden (Water Proofing Adelaide 2004). The City water use rate is below the state average of

445 L/person/day (EPA 2003a), and may reflect reduced watering requirements in a dense urban environment (i.e. smaller gardens), or the increasing awareness of water conservation issues gaining strong support at this time. Average consumption may vary dramatically each year depending on the weather, although permanent water restrictions have attempted to diminish this fluctuation. Figure 4.1 provides a breakdown of how the average household uses their water (Water Proofing Adelaide 2004).

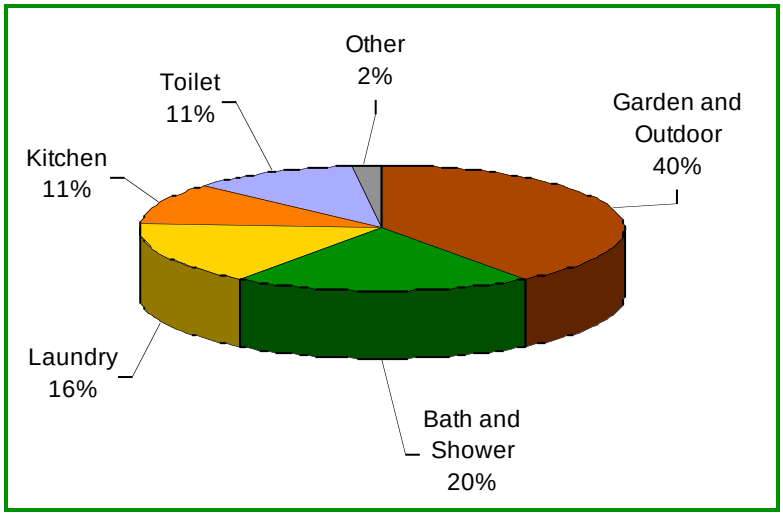


Figure 4.1 Average Household Water Use

The City of Norwood Payneham & St Peters' water supply is sourced primarily from Anstey Hill Reservoir, but is supplemented with water from Happy Valley Reservoir and Hope Valley Reservoir at various times during the year (Peter Quinlivan, UWI, pers. comm.). Anstey Hill water treatment plant is supplied with water from either the River Murray via the Mannum-Adelaide pipeline or from the Millbrook Reservoir. Happy Valley water treatment plant receives water from the Happy Valley Reservoir. Hope Valley water treatment plant is supplied with water from the River Murray into the Torrens River system via the Millbrook and Kangaroo Creek Reservoirs. After treatment, water is delivered to consumers from all plants via the existing potable water reticulation system.

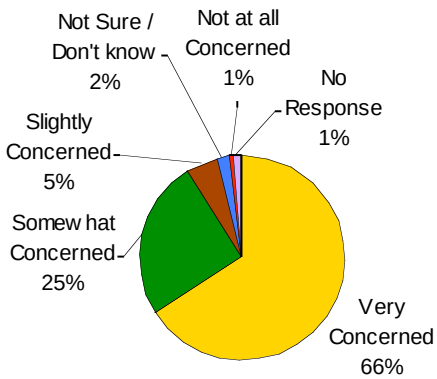
Metropolitan Adelaide currently demands around 300,000 ML of mains water per annum. The introduction of compulsory water saving measures affecting all SA Water customers is expected to reduce this demand by 5 % (Water Proofing Adelaide 2004), through restrictions relating to:

- Watering gardens, grounds and nurseries
- Cleaning of motor vehicles and boats
- Hosing down external paved areas
- Construction Sites

SA Water implemented a highly publicised campaign, with television and newspaper advertisements. The vast majority (86 %) of survey respondents indicated that they were either very concerned or somewhat concerned with water consumption in the City of Norwood Payneham & St Peters.

Community Comment…

How concerned are you about water consumption?



Treatment of wastewater or sewage from the City of Norwood Payneham & St Peters occurs at the Bolivar Wastewater Treatment Plant. The Bolivar Plant has been undergoing a $100 million staged environmental improvement program over the last decade, and once the upgrade is complete, it will be responsible for treating approximately 70% of Adelaide's wastewater. The following environmental benefits have already been experienced:

- Reduced nitrogen concentrations in the treated wastewater;
- Reduced outflows of treated wastewater to the sea;
- Reduced odours; and
- Reduced demand on the northern Adelaide Plains groundwater basin by providing an alternative source of water for irrigation.

(SA Water "Bolivar EIP" web page)

4.2.1. Pressures

Increases in population in the City of Norwood Payneham & St Peters will have an associated increase in demand for water supply and wastewater treatment. Residential water consumption, assuming the state average rate of 284 KL per person per year (Water Proofing Adelaide 2004), will equate to approximately 9.67 GL per year based on current population estimates.

The City of Norwood Payneham & St Peters consumed approximately 0.5 GL through standard council operations in 2003 (Sarah Wigley, NPSP, pers comm.). The majority was used in reserve maintenance (85 %), with smaller volumes consumed through traffic control devices (8 %), council buildings (3 %), reserve buildings (2 %), and swimming pools (2 %).

Figures on the volume of water disposed of to sewer are not available for the Council area. As the Bolivar Wastewater Treatment Plant (WWTP) treats this water, the volume of water treated can be used as an indicator of the volume of water requiring treatment in the City of Norwood Payneham & St Peters. On average, the Bolivar WWTP processes 135 ML/day of wastewater, from an estimated 1.3 million people. The City of Norwood Payneham & St Peters population constitutes approximately 2.5 % of 1.3 million, meaning that Bolivar treats approximately 1.23 GL of wastewater from the City per annum.

INDICATORS OF PRESSURE	
Mains water consumption by the City of Norwood Payneham & St Peters (Corporate).	0.5 GL / year
Mains water consumption by the Community of the City of Norwood Payneham & St Peters.	9.67 GL / year
Change in population in the City of Norwood Payneham & St Peters.	Fairly Constant (+0.23% 2003/4)
Estimated volume of wastewater produced by the City of Norwood Payneham & St Peters based on population.	1.23 GL

4.2.2. State of Resource

The state of water consumption in the City of Norwood Payneham & St Peters is not covered in this State of the Environment Report. The South Australian SoE Report addresses the state of water supply with the same information that would be available for this City. Issues discussed in the South Australian SoE Report include the quality of mains water assessed against water quality guidelines and freshwater algal blooms in water sources.

'Health of rivers, streams and wetlands: VARIABLE but generally in decline due to increasing extraction and drainage…''

(EPA 2003a)

4.2.3. Response

The State Government undertook a study into future options for Adelaide's water supply. Titled "Water Proofing Adelaide" it considers economically viable ways to secure Adelaide's water supply whilst ensuring the protection of the natural environment. A variety of options are proposed at a wide variety of costs to the consumer, and include some of the following:

- Education and promotion;
- Management options at the household/community level (e.g. use of water efficient devices);
- Price changes;
- Incentives (e.g. rebates for water efficient devices);
- Reducing loss from the existing system;
- Encouraging use of recycled water (e.g. greywater, sewer mining);
- Encouraging the harnessing of local water (e.g. water sensitive urban design); and
- Desalinisation of sea water.

The key to providing an on-going drinkable water supply probably lies within a combination of these options. Many of these suggestions can and have be successfully employed within the City of Norwood Payneham & St Peters. "Micromet" automated watering control devices have been installed at 18 of the Councils largest reserves, a system which limits the amount of water required by grassed areas as determined by local rainfall data. Early indications predict up to a 30 % reduction in water use at these reserves (City of Norwood Payneham & St Peters 2004). In addition, 125 irrigation systems were upgraded to comply with statewide water conservation measures.

Water sensitive urban design requires the integration of water cycle management, including use minimisation, reuse, waterway health and wastewater, into urban planning and design. Its key principles are:

- Protect natural systems;
- Integrate stormwater treatment into the landscape;
- Protect water quality;
- Reduce runoff and peak flows; and
- Add value while minimising development costs.

(Melbourne Water, undated)

Statewide water restrictions introduced in July 2003 were successful in reducing water consumption across South Australia, and in October 2003 permanent water conservation measures were introduced.

4.3. Groundwater

The groundwater resource of the City of Norwood Payneham & St Peters is obtained from up to 12 individual aquifers, classified by their geological formation. These aquifers are replenished or recharged by rainfall that percolates through the soil profile. The land through which water passes into an aquifer is called the recharge area. Land use activities can influence the quality and yield of the underlying groundwater resource. Pollutants within the soil profile can enter the recharge area and seep into groundwater. Significant recharge of aquifers in the City is only likely to occur through the system of creeks and the River

Torrens, with the rest of the City incorporating a high percentage of impervious surfaces and/or clay dominated soils (Bainbridge, 2002).

Map 4.1 has been adapted from the TCWMB Plan (2002) and shows the main groundwater zones over which the City is located.

There are two main zones of groundwater, both subject to minor rates of withdrawal:

- Zone 5 (major) includes up to three Quaternary and two Tertiary aged aquifers, and one fractured rock aquifer that is high yielding and of low salinity near the River Torrens. In comparison, Tertiary and Quaternary aquifers become thin, shallow and interconnected closer to the River Torrens. The upper Tertiary aquifer is used for irrigation of open space.
- Zone 6 (minor) comprises up to five Quaternary, one Tertiary, and one fractured rock aquifer.

The Quaternary units are this aquifers formed by sands and gravels. They are generally low yielding and have high salinities. Pollution potential of these aquifers is high. The Tertiary aquifers are formed with sand, sandstone and limestone, and provide higher yields of better quality.

The Department for Water, Land and Biodiversity Conservation (DWLBC a) is responsible for groundwater monitoring at a number of observation bores across South Australia. These bores are used to monitor water and/or salinity levels, the results of which are publicly available at http://www.dwlbc.sa.gov.au/water/groundwater/obswell.html.

4.3.1. Pressures

The major pressures on groundwater resources relate to the quantity and quality of the resource. Recharge of aquifers is very slow and the extraction of the groundwater for domestic, industrial and irrigation uses places pressure on the system. Pollution or contamination resulting from inappropriate or poor land management can reduce the quality of the groundwater resource.

The Torrens Catchment Water Management Plan (TCWMB, 2002) describes:

> '*No charge is levied for the use of groundwater. Accordingly, once the well and pumping plant are established, groundwater is a cheap water source with little economic incentive to use it efficiently or replenish it where possible.'*

With no controls on extraction volumes, assessing the pressure on the groundwater resource from extraction is almost impossible. However when new bores are drilled, the DWLBC requires an application to be submitted. This application requires an explanation of the purpose of the bore, for example extraction (i.e. removal for above ground use) or observation (i.e. monitoring of individual aquifer levels). Therefore the number of new bores drilled and tracked by DWLBC can be used as indication of increasing demand on the groundwater resource.

Since 2002 when the last SoE was produced, 41 bores have been drilled in the City of Norwood Payneham & St Peters (DWLBC b). This is nearly half the number of bores drilled during an equivalent period from 1998 to 2001. A substantial decrease in the number of bores approved and drilled may indicate a change in the way groundwater resources are managed by the TCWMB and DWLBC, which may have been instigated by the introduction of the *Environment Protection (Water Quality) Policy* in 2003 (EPA 2003a). The 41 bores

drilled since 2002 are utilised for a variety of purposes including domestic (68 %), monitoring (15 %), irrigation (5 %) and investigative (7 %) purposes (DWLBC b).

As with soils, historical and current land use activities can indicate the potential for groundwater to be affected by contamination. See Section 7.4 highlighting land uses with potentially contaminating activities.

INDICATORS OF PRESSURE	
Number of bore applications/bores drilled 2002-2005	41
Number of potential contaminant sites (i.e. EPA licensed premises producing listed waste)	7

4.3.2. State of Resource

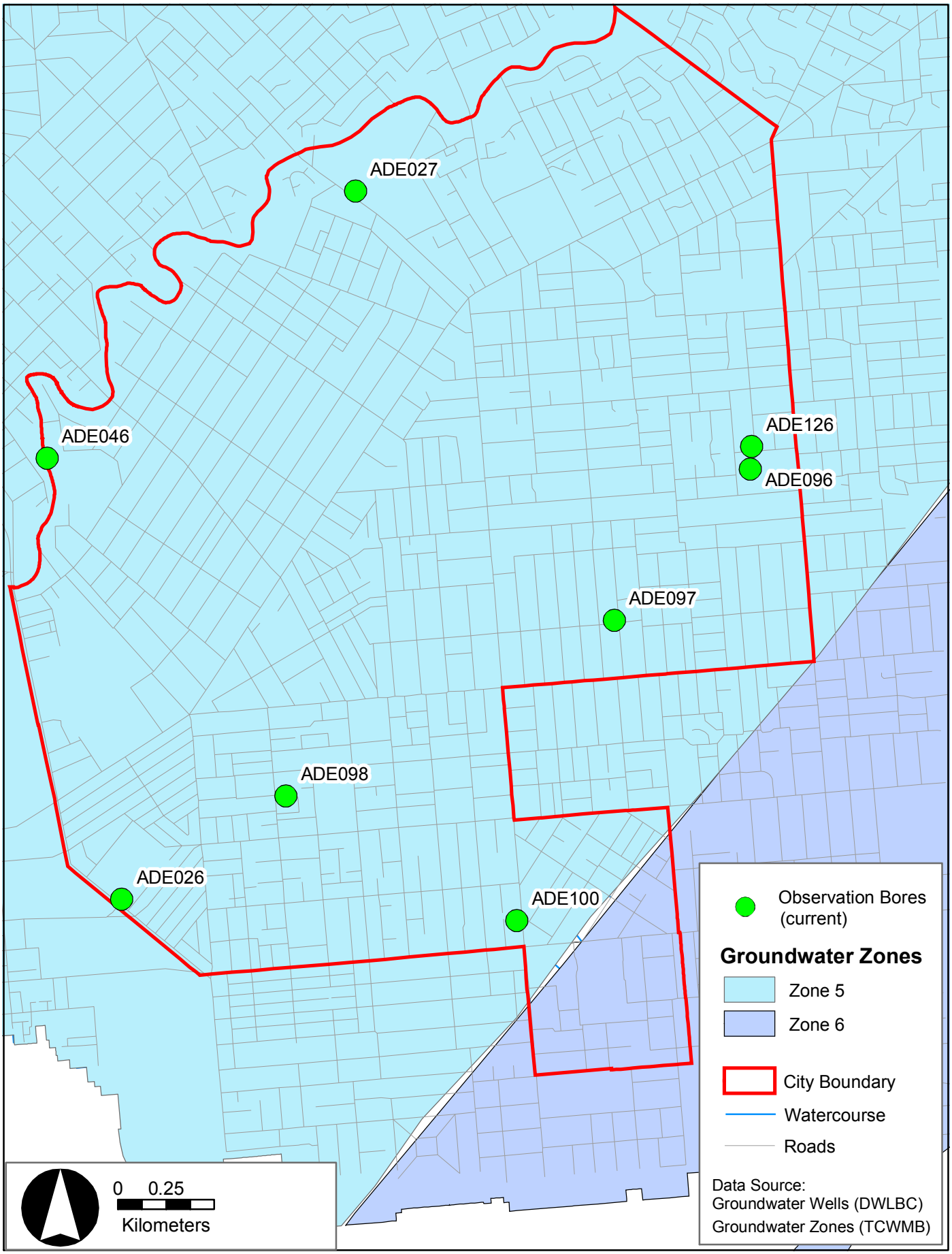
Results of groundwater gauging and sampling for water levels and salinity from observation bores are available from DWLBC. The location of bores in the City of Norwood Payneham & St Peters is shown on Map 4.1, and the monitoring regime of each bore described by Table 4.1. This information is available on the Obswell site (DWLBC a). Water level is measured as Standing Water Level, the distance from the ground surface to the water surface.

Table 4.1 Groundwater Observation Bores and Monitoring Regimes

BORE (OBS NUMBER)	STANDING WATER LEVEL MONITORING	SALINITY MONITORING
ADE026	Y	N (historic)
ADE027	Y	Y
ADE046	N (historic)	Y
ADE096	Y	N (historic)
ADE097	Y	Y
ADE098	Y	Y
ADE100	Y	N
ADE126	Y	N

Most of the bores show a relatively constant standing water level, indicating that the rate of use is relatively balanced by the rate of recharge. Decreasing standing water levels may indicate the use of an aquifer in an unsustainable manner. Salinities of the Tertiary and Quaternary aquifers range from 1000 to 5000 mg/L, but are mostly in the order of 1000-2000 mg/L..

INDICATORS OF STATE	
Groundwater Standing Water Level at observation bores	See table 4.1
Goundwater Salinity at observation bores	See table 4.1



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Map 4.1 - Groundwater Zones & Monitoring Bores

STATE OF THE ENVIRONMENT REPORT 2005

CITY OF NORWOOD PAYNEHAM & ST PETERS

City of Norwood Payneham & St Peters

4.3.3. Response

DWLBC is responsible for the control of groundwater resources across South Australia. The *Natural Resources Management Act 2004* allows the prescription of groundwater resources where use is either concentrated or strategic. DWLBC licences the use of prescribed groundwater, allocating quantities of groundwater and stipulating conditions of use, in way that balances economic, social and environmental demands.

Continued monitoring of standing water levels, quality and extraction rates, provides a useful check on the sustainability of current use of groundwater, and the effectiveness of associated management policies.

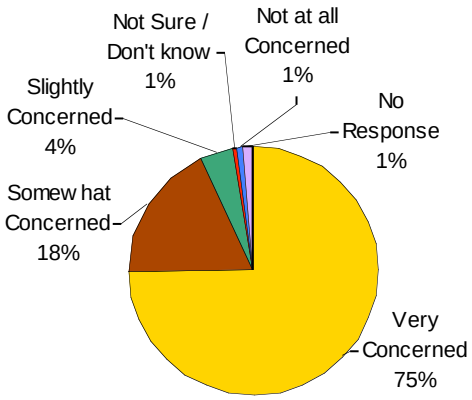
INDICATOR OF RESPONSE	
Number of active groundwater monitoring bores in the City of Norwood Payneham & St Peters	8

4.4. Surface Water

The City of Norwood Payneham & St Peters has approximately 20 km of watercourses traversing the City including the First, Second and Third creeks, and the River Torrens. The First, Second and Third tributary Creeks drain into the River Torrens, which exits the City to the west. A significant proportion of the creeks are highly modified and have been diverted through concrete channels, with approximately 40 % of First Creek, 85 % of Second Creek, and 20 % of Third Creek flowing through enclosed drains. The surface waters of this City also include St Peters Billabong, an old section of the River Torrens isolated by bank erosion in the 1970s. For this SoE Report, surface water has been taken to include only open waters.

Community Comment…

How concerned are you about water pollution in the River Torrens?



Section 4.5 on Stormwater has predominantly addressed the underground channels of this City. Map 4.2 shows the major watercourses of the City.

The City's watercourses lie within the greater Torrens Catchment. The Torrens catchment is around 620 km^2, with approximately 56 % of this area located below the Mount Lofty Ranges watershed in the Adelaide Plains (TCWMB 2002). Water supplies upstream are highly committed for agricultural purposes (see *Map 4.3 Upper Catchment Land Use*) and to supply potable water to Adelaide, leaving only winter flows that enter River Torrens Linear Park below the George Weir. While there is some utilisation of surface water to irrigate a Council oval at St Peters and several ovals within the ground of St Peters College, use across the urban Torrens Catchment is relatively low (TWCMB 2002).

Despite reduced flows through the creeks and rivers of the Torrens Catchment, the consequences of the rainfall patterns that contribute to surface water (and stormwater) resources must be carefully considered. With most heavy rains generated in winter over multiple, short periods, there are limited opportunities to capture, store and utilise, or even control this resource. Consequently, most of this water becomes storm water that needs to be drained away, but that also leaves urban city areas with an elevated flood risk. The predominant flood risk in Norwood Payneham & St Peters is most likely associated with the First to Third Creeks. Floodplain mapping across First to Fifth Creeks has been undertaken

in a partnership between the TCWMB, Cities of Adelaide, Burnside, Campbelltown and Norwood Payneham & St Peters, and State and Federal Governments. The study considered water volumes after rain events, and the direction of water flows during major storms, and will enable the City to develop appropriate flood mitigation strategies for high risk areas. The report is currently in draft form, and will provide statistics on 20, 50, 100 and 500-year maximum probable floods.

4.4.1. Pressures

Land activities can have significant implications for water quality and quantity. Pollutants from industrial and agricultural activities, including nutrients, hydrocarbons and chemicals can contaminate soil and stormwater, and runoff into watercourses. Maintaining native vegetation throughout the water catchment and in particular along watercourses assists in filtering incoming pollutants. Clearance of native vegetation means this natural filtering does not occur.

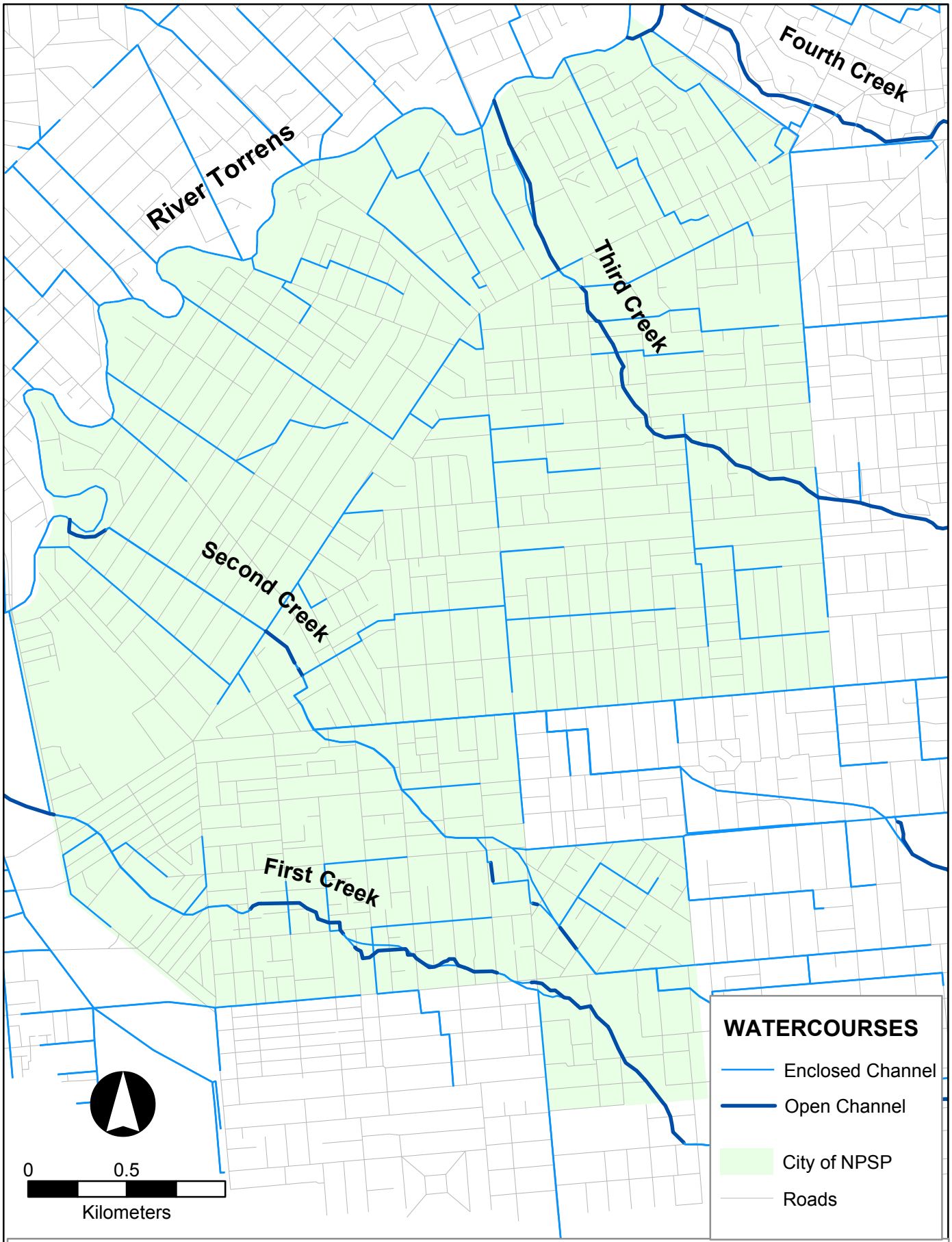
Map 4.3 shows land use in the lower Torrens Catchment, highlighting areas of industry, agriculture, livestock and horticulture, and native vegetation. Table 4.2 lists the areas of industry, agriculture, livestock and horticulture in the upper Torrens Catchment and their proportions.

Table 4.2 Torrens Catchment Land Use (Planning SA 2003)

LAND USE	AREA (ha)	PERCENT (%) OF UPPER CATCHMENT AREA
Agriculture	1574	2
Industry[1]	2129	3
State Parks (Native Vegetation)	2828	4
Horticulture	4916	7
Livestock	17960	27
Residential[2]	24058	36

1 'Industry' includes 'utility industry' and 'food industry' land use categories
2 'Residential' includes 'residential' and 'rural residential' land use categories

INDICATORS OF PRESSURE	
Upstream catchment area of industry, agriculture, horticulture, livestock	See table 4.2
Change in industry, agriculture, horticulture, livestock in upstream catchment	To be determined for future SoEs
Change in native vegetation cover	To be determined for future SoEs



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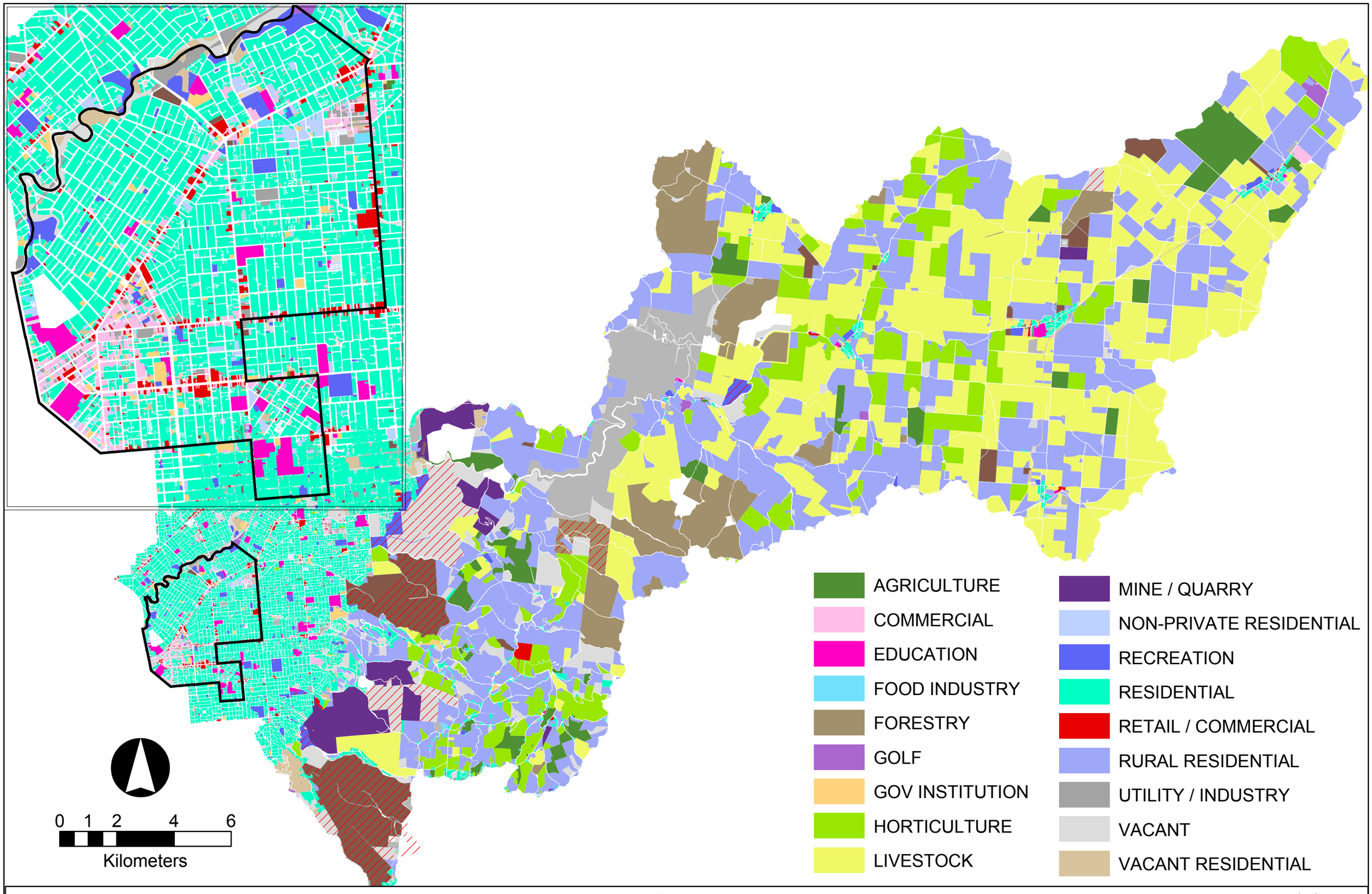
Map 4.2 Watercourses

STATE OF THE ENVIRONMENT REPORT
CITY OF NORWOOD PAYNEHAM & ST PETERS

City of Norwood Payneham & St Peters



EARTH TECH

Map 4.3 Upper Torrens Catchment Landuse

STATE OF THE ENVIRONMENT REPORT 2005

CITY OF NORWOOD PAYNEHAM & ST PETERS

City of Norwood Payneham & St Peters

4.4.2. State of Resource

The quality and quantity of water flowing in watercourses provides an indication of the condition of the water resource. Across South Australia monitoring is undertaken by a variety of government organisations and community groups, including the Environmental Protection Authority (EPA), KESAB, Waterwatch and Catchment Boards. While the EPA does not monitor any watercourses within the City's boundaries, a community monitoring program called *Snapshots* (jointly run by KESAB, Waterwatch and the previous Torrens and Patawalonga Catchment Water Management Boards) collects data during six 'snapshot' days of the year from 11 sites around the City. The program provides training and support along with a water quality testing kit, allowing each community group to test for nitrates, pH, phosphates, salinity and turbidity.

WaterCare at Work sign, St Peters Billabong, St Peters.

Figures 4.2 - 4.4 show results for select parameters of water quality sampling undertaken by community groups for the Snapshots Program, 2004 at four established Waterwatch sites:

STP050 – St Peters Billabong, St Peters	**FIR065** – First Creek, Marryatville High School
SEC090 – Second Creek outfall adjacent St Peters Billabong, St Peters	**TOR475** – River Torrens upstream of St Peters Billabong, St Peters

The EPA guideline amounts shown on these figures are for freshwater aquatic ecosystems, as quoted in the Environment Protection (Water Quality) Policy and Explanatory Report (EPA 2003b). Exceedances of EPA guidelines are common during Winter due to more frequent stormwater flows. By capturing and utilising maximum stormwater, the volume of polluted runoff reaching the City's watercourses will be reduced, and nutrient spikes may also fall. Addressing the pollutants themselves is more difficult due to diffuse sources throughout the City and Catchment. Map 4.4 shows all of the City's WaterWatch sites.

A Frog Census coordinated by the EPA is undertaken each year in September. Frogs provide an excellent indicator of the condition of waterways; frogs are sensitive to pollution and habitat degradation and so polluted or degraded habitats are generally found to have few or no frogs present. Four main species have been recorded in the watercourses within the City of Norwood Payneham & St Peters since the inception of the Frog Census Program (Peter Christy, EPA, pers. comm.). These include the Common Froglet (*Crinia signifera*), two races of the Spotted Grass Frog (*Limnodynastes tasmaniensis*), Brown Tree Frog (*Litoria ewingi*) and Eastern Banjo (*Limnodynastes dumerili*). Frog Census statistics from the City have been summarised for two consecutive four year periods, representing conditions before the City's first SoE Report and conditions after the report, to present (Table 4.3).

Table 4.3 Frog Census Statistics for the City of Norwood Payneham & St Peters (Peter Christy, EPA, pers. comm.)

		One (1)	Few (2-9)	Lots (10-50)	Many (>50)
Common Froglet	1997-2000	-	22 %	22 %	56 %
	2001-2004	-	20 %	10 %	70 %
Spotted Grass Frog	1997-2000	-	100 %	-	-
	2001-2004	-	100 %	-	-
Brown Tree Frog	1997-2000	-	50 %	-	50 %
	2001-2004	-	50 %	-	50 %
Eastern Banjo	1997-2000	40 %	60 %	-	-
	2001-2004	20 %	20 %	20 %	40 %

* Percentages are calculated on records for each year period

Census populations appear relatively stable if not potentially growing in the size, which may indicate constant or improving water quality conditions in the City's watercourses. Observations of the Common Froglet and Eastern Banjo Frog at densities greater than 50 or "Many" category have increased in 2001-2004 compared to the 1997-2000 period, but it is important to note that this response could be due many factors or even a combination of factors affecting breeding cycles. These factors could include, amongst others, a change in water quality, habitat density, average temperature and average rainfall (EPA 2002).

INDICATORS OF STATE	
Phosphorus and nitrogen concentrations in the River Torrens and Tributary Creeks	Table 4.6
Exceedances of EPA guidelines for water quality (Nitrate, Phosphorus, Turbidity)	4 (2004)
Abundance and diversity of frogs	Table 4.3

4.4.3. Response

The influence of land activities in the Torrens Catchment on water quality means that water quality improvement and pollution prevention measures upstream will influence water quality in City of Norwood Payneham & St Peters. The TCWMB and KESAB manage a number of programs to improve the health of the catchment:

- **Trash racks** have been installed at strategic locations (e.g. junctions of watercourses or inlets of drains) to trap gross pollutants such as litter and organic debris.

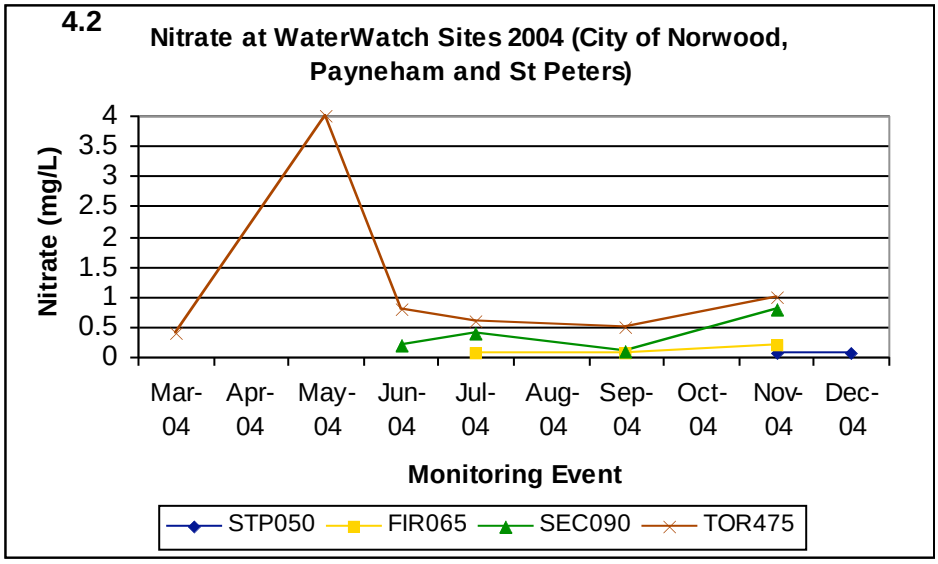
- The **Our Patch Program** supports community groups and schools to improve a "patch" of land that may require revegetation or rehabilitation. There are currently five active Our Patch sites in the City of Norwood Payneham & St Peters.

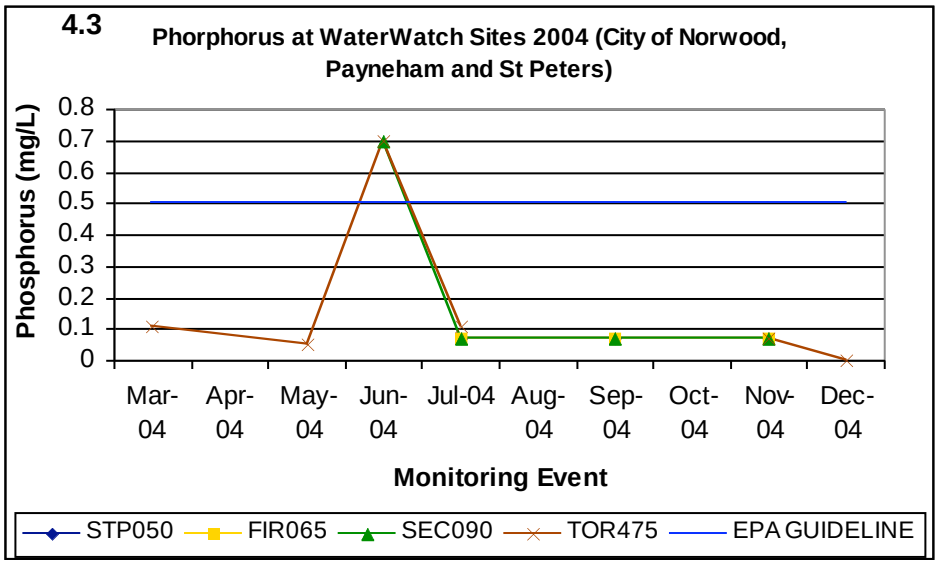
- **Stormwater Pollution Prevention Programs** (including 'Gutter Guardians', drain stencilling and various education sessions for schools and community groups).

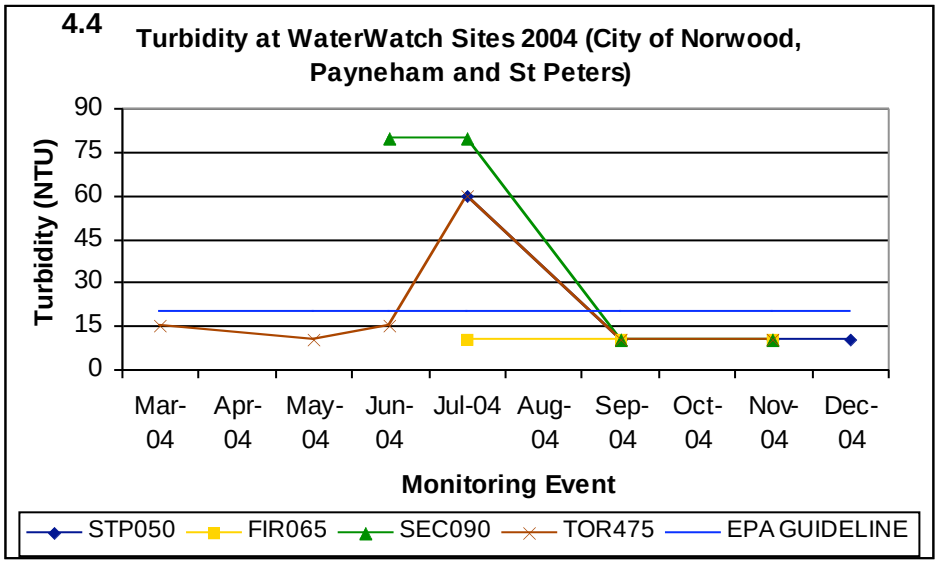
- The **Landholder Assistance Program** assists rural landholders to rehabilitate their watercourses, providing assistance to remove stock access around watercourses, and for exotic plant control and revegetation. The rehabilitation or restoration of watercourses to natural condition means recreating the natural vegetative buffers that filter water before it enters the watercourses. Watercourse rehabilitation has additional benefits of improving biodiversity and habitat. The TCWMB's Landholder Assistance Program has been running since 1996.

Map 4.4 shows the location of the trash racks and activities in the City of Norwood Payneham & St Peters.

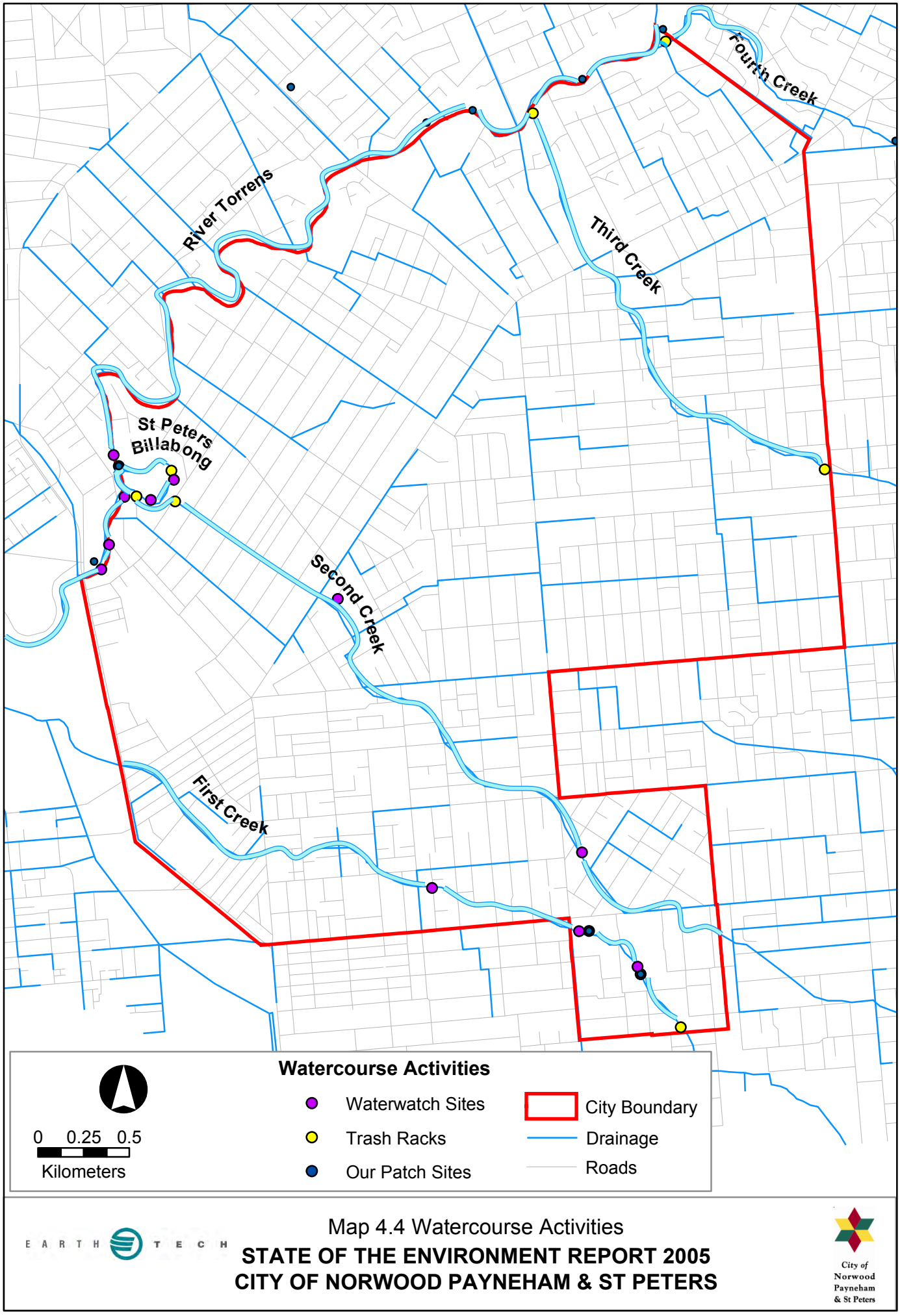
INDICATORS OF RESPONSE	
Number of watercourse rehabilitation projects	2
Number of water quality protection projects	4







Figures 4.2 – 4.4 Nitrate, Phosphorus and Turbidity Water Quality Results for WaterWatch Sites, City of Norwood Payneham & St Peters, 2004.



Map 4.4 Watercourse Activities

STATE OF THE ENVIRONMENT REPORT 2005

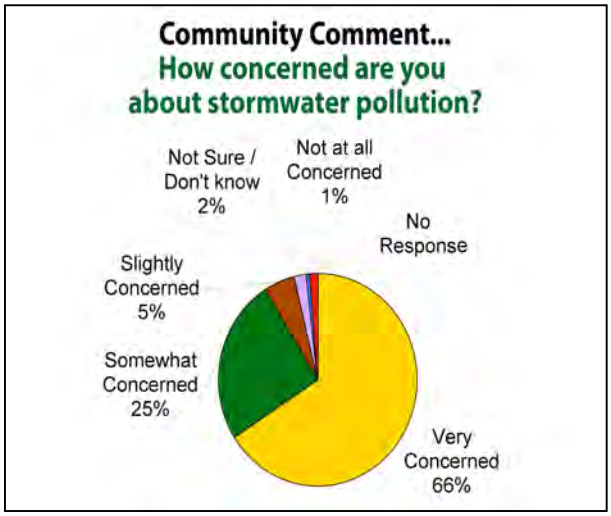
CITY OF NORWOOD PAYNEHAM & ST PETERS

EARTH TECH

City of Norwood Payneham & St Peters

4.5. Stormwater

Stormwater consists of rain and other water runoff from paved or coated surfaces, outdoor drains, gutters and roads. As rain falls on and runs off mostly non-porous surfaces, it can accumulate pollutants, rubbish or fine matter on the surface, including oil, grease, heavy metals, nutrients, sediment, organic matter and litter.



Stormwater drains carry stormwater into waterways and the sea. Map 4.2 shows the stormwater network of the City of Norwood Payneham & St Peters (enclosed drainage). Most drains flow to one of the three major creeklines, with only a handful bypassing the tributaries through drains that discharge straight into the River Torrens. All flow ultimately drains through the River Torrens. As a result of the stormwater network, untreated stormwater has the potential to pollute receiving watercourses.

Concreted stormwater drain adjacent Patterson Oval, Payneham

The Council's Development Plan (2003) describes the need to minimise concentrated stormwater discharge from all developments through the implementation of appropriate measures. In the Kensington and Norwood areas, these measures include a requirement to equip each new dwelling with a rainwater tank, collecting excess water from roof outlets. This policy generally extends to all suburbs in the Norwood Payneham & St Peters area, with developers encouraged to retain and utilise as much stormwater as possible through measures such as:

- utilising run-off in rain saver gutters and rainwater tanks for irrigation and internal purposes;
- re-direction of rainfall run-off into landscaped areas;
- installation of appropriate soakage devices (soakage trenches or wells); and
- installing permeable forms of paving for public and private areas (e.g. car parks, walkways).

It is difficult to gauge the use of stormwater in residential and commercial settings, but with specific provisions in the Development Plan for the former Cities of Kensington and Norwood, the use via rainwater tanks is expected to be higher in these areas than in the remainder of the City. Furthermore, mandatory provisions under the recently proclaimed Water Quality Policy (2003) have legislated for local stormwater pollution prevention strategies that were considered best practice but were previously voluntary.

From 1 July 2006 it will be mandatory for all new dwellings and extensions with a roof size of greater than 50m^2 to have a 1kL rainwater tank plumbed internally (Water Proofing Adelaide 2004).

66 % of survey respondents indicated that they were very concerned about the level of stormwater pollution in the City of Norwood Payneham & St Peters.

4.5.1. Pressures

Land use and human activities are influential in determining the quality of stormwater. Where domestic or recreational activities occur, there is the potential to create greater amounts of litter, which following rain can be swept into the stormwater system.

Trash racks (or gross pollutant traps - GPT) are physical barriers designed to capture large gross litter and debris. They are commonly placed at stormwater drain outlets to prevent this litter from reaching the receiving environment. The City of Norwood Payneham & St Peters has installed seven GPTs at the following locations, which are regularly serviced by the City thanks to partial funding from the TCWMB:

- Second Creek at Borthwick Park, Kensington;
- Second Creek at the end of Goss Court (outfall to the River Torrens), St Peters;
- end of St Peters Street, St Peters (outfall to River Torrens);
- Third Creek adjacent Firle Shopping Centre, Firle;
- Third Creek adjacent OG Road (upstream of outfall to River Torrens), Payneham;
- Fourth Creek outfall, Felixstow Reserve, Felixstow (Fourth Creek borders the City of Norwood Payneham & St Peters and Campbelltown Council areas); and
- end of Battams Road, Royston Park (outfall to River Torrens).

The volume of litter removed from trash racks gives an indication of the pressure human activities are placing on stormwater systems. Table 4.4 shows the volume of litter removed from trash racks in the City of Norwood Payneham & St Peters during 2004. All materials collected from trash racks are disposed through the Campbelltown City Council Depot (Sarah Wigley, NPSP, pers comm.).

Table 4.4 Total Litter Accumulated in Gross Pollutant Traps during 2004

GROSS POLLUTANT TRAP LOCATION	ACCUMULATED LITTER (TONNES)
Second Creek, Borthwick Park, Kensington	45.13
Second Creek, Goss Court, St Peters	50.15
End of St Peters St, St Peters	No data available
Third Creek, Firle Shopping Centre, Firle	30.10
Third Creek, OG Road, Payneham	101.75
Fourth Creek, Felixstow Reserve, Felixstow	92.35
End of Battams Road, Royston Park	No data available
TOTAL	**319.48 t**

The EPA have recognised that particular businesses and industries pose a greater threat to stormwater, and have prepared a series of fact sheets on stormwater management for the following businesses (2003c):

Auto Dismantlers	Auto Servicing / Mechanical Repair Workshops
Car Yards	Concrete Cutters
Crash Repairers	Garden Shops
Home and D-I-Y Handyperson	Landscape Gardening & Garden Maintenance
Laundries and Dry Cleaning Premises	Metal Fabricators
Painters	Printers
Radiator Repair Premises	Retail Food Businesses
Service Stations and Sites with Underground Storage Tanks	Shopping Centres
Small Business and Industry	Transport Companies

INDICATORS OF PRESSURE	
Volume of litter removed from trash racks	319.48 tonne

4.5.2. State of Resource

The amount of developed land and length of road network provide an indication of the quantity and quality of stormwater. As land is developed and natural surfaces sealed, the volume of stormwater increases as the runoff rates increase. Norwood Payneham & St Peters is an established City with no new road networks expected. Development of new areas is confined to the odd undeveloped block of land, or the redevelopment of existing sites. In a highly developed city dominated by impermeable surfaces, water quality is expected to be poor and equivalent to that for most developed cities.

From rainfall, land cover information and gauging stations on the major watercourses, the TCWMB (2002) has estimated the volume of stormwater flow in each sub-catchment, shown by Table 4.5. Note that the City of Norwood Payneham & St Peters is located within the Torrens Urban Catchment.

Table 4.5 Discharge Volumes, Torrens Catchment

CATCHMENT	DISCHARGE TO GULF ST VINCENT/ PORT ESTUARY SYSTEM (ML)
River Torrens (flow over Gorge Weir)	11,700 per annum (mainly 6th creek)
First to Fifth Creeks (rural contribution)	9,700
Torrens Urban	**18,900**
Barker Inlet	8,100
West Lakes/Port Adelaide River	6,900
TOTAL	**54,800 per anum, on average**

Typical urban water quality figures and common sources of contamination are shown in Table 4.6 for the Torrens Catchment (TCWMB 2002).

Table 4.6 Typical Urban Water Quality

PARAMETER	INDICATIVE RANGE OR AVERAGE LOAD	TYPICAL SOURCES
Gross Pollutants	10 – 20 kg/ha/month	Leaf litter, debris, man-made rubbish
Faecal Coliforms	10 – 10^6cells/100 mL	Faeces from birds, ducks, dogs, cats, some septics, sewer overflows
Nitrogen	0.05 – 3.0 mg/L	Animal waste, vegetative matter, fertiliser, atmospheric fallout (N), erosion material, riverine sediments
Phosphorus	0.1 – 1.5 mg/L	
Copper	0.04 mg/L	Industrial areas, road surfaces, motor vehicle wear and fuel exhausts, industry spills, accidental spills and discharges
Lead	0.20 mg/L	
Zinc	0.20 mg/L	
Chromium	0.17 mg/L	
Suspended Solids (SS)	150 – 650	Construction, land disturbance erosion, road maintenance
Oils and Grease	1 – 10	Oil leaks, car exhaust emissions, spillages
Biochemical Oxygen Demand (BOD)	10 – 60	Organic matter (e.g. waste, leaf litter)

A further indication of stormwater quality may be gauged from the number of complaints made to the Environmental Protection Authority (EPA) and the Eastern Health Authority (EHA, which provides health services to the Cities of Burnside, Campbelltown, Prospect, Town of Walkerville and the City of Norwood Payneham & St Peters) in regards to discharge of stormwater. A total of 41 stormwater complaints were received in 2004/2005 (47 % of all complaints 2004/05), concerning a range of issues often related to poor building site waste containment (Peter Snell, EHA, pers. comm.). However, the number of stormwater complaints received during the previous 2003/2004 period was significantly higher at 56 complaints (64 % of total complaints for 2003/04) (EHA 2004), possibly indicating an increase in awareness through education at Council and State Government levels, and or the use of more effective regulatory methods provided under the EPA *Water Quality Policy* effective May 2003.

INDICATORS OF STATE	
Number of stormwater complaints made to the EHA (2004/05)	41
Quantity of stormwater discharged from the Torrens Urban Catchment	18,900 ML
Quality of stormwater	See table 4.6

4.5.3. Response

The City of Norwood Payneham & St Peters is committed to ensuring that water conservation and environmental principles underpin the management of stormwater. The City's Strategic Plan (NPSP 2006) proposes the following strategies and actions to improve the capture, quality and disposal of stormwater in this area:

- work with the Torrens Catchment Water Management Board;
- ensure that planning policies address water management;
- improve and build an integrated stormwater management;
- rehabilitate creeks and watercourses where possible;
- build links with community groups involved in water management initiatives;
- promote the re-use of stormwater; and
- build water management strategies into environmental and strategic planning activities.

The *Gutter Guardians* Program was initiated by KESAB in 1997 to raise community awareness of the environmental impacts of organic street waste on stormwater systems (Rachel Coates, KESAB, pers. comm.). Each year, school and community groups sweep sections of street gutters and collect the sweepings (generally a mixture of litter and leaves). Once sorted, students calculate the type and amount of pollutants entering our stormwater systems by analysing the collected materials. The sweepings are then used for mulch, composted, or collected by the Council.

The City of Norwood Payneham & St Peters has participated in the *Gutter Guardians* Program since 2002, and also supplements the program with their own Autumn Leaf collection initiative. In this case, the footpath and road surface within streets of predominately deciduous street trees are swept on a weekly to fortnightly basis during Autumn. The initiative minimises the amount of leaf litter entering local and regional waterways.

In addition to *Gutter Guardians*, KESAB also run the Drain Stencilling Initiative in conjunction with various education sessions aimed at local schools in the area (Rachel Coates, KESAB, pers. comm.). Drain Stencilling is a hands-on community action program designed to raise awareness and reduce the impacts of stormwater pollution on rivers, creeks and coastal waters in the Patawalonga and Torrens Catchments.

Community and School groups can stencil environmental slogans or images on stormwater drain lids, or coordinate a letterbox drop of an informative brochure outlining the Drain Stencilling Initiative and providing hints on how to minimise the impacts of stormwater pollution. Education sessions run by KESAB with particular relevance to stormwater pollution prevention include:

- "Catchment to Coast" - Torrens focus;
- Catchment Tours;
- Why Wetlands; and
- Something Fishy and/or Fish Crime Investigation Unit.

INDICATORS OF RESPONSE	
Number of trash racks	7
Number of stormwater pollution prevention projects (Gutter Guardian, Drain Stencilling, Autumn Leaf Collection Initiative)	3

5. Biodiversity

5.1. Introduction

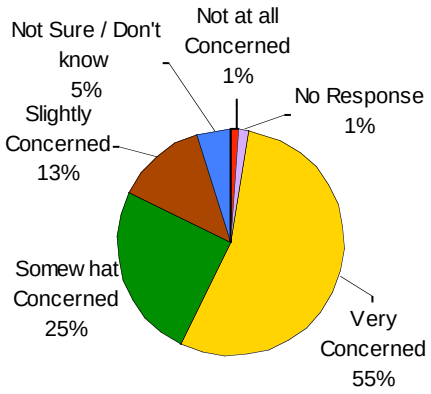
Biodiversity is the variety of life and encompasses the genetic, species and ecosystem levels.

The maintenance and enhancement of biodiversity is important for a number of reasons. These include:

- Life support: biodiversity is important because our very survival depends on it. Healthy, functioning ecosystems maintain the atmosphere, including the air we breathe, regulate the climate, produce fresh water, form soils, cycle nutrients, and dispose of wastes.
- Economic: biodiversity provides food, fibre, medicine, building materials, crop pollinations and pest control. Biodiversity is also an increasingly important part of tourism.
- Cultural: biodiversity contributes to our cultural identity, physical health and spiritual enrichment through the provision of landscape amenity and opportunities for recreation and education.
- Ethical: no generation has the right to use resources solely for their own benefit. This recognition of inter-generational equity is expressed in the desire we have to leave things in a better condition for our children.

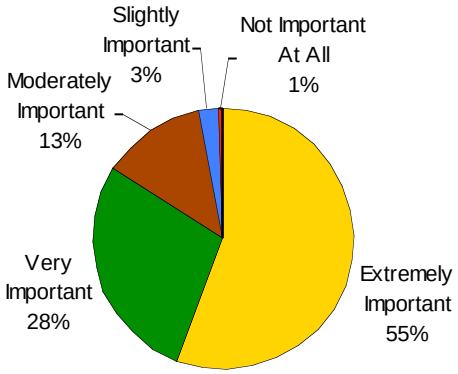
Community Comment…

How concerned are you about the loss of native flora and fauna?



Community Comment…

How important is biodiversity to you?



Urban environments play a role in conserving biodiversity through the parks, reserves and open areas that allow the persistence of some native species. The City of Norwood Payneham & St Peters is a human-dominated landscape containing many small reserves, but due to extensive landscape fragmentation, indigenous biological diversity is greatly reduced in comparison to pre-urbanised times. Despite dramatic losses of native flora and fauna, biological diversity was found to be of great importance to the community, with over 80 % indicating that biodiversity was very important or extremely important.

5.1.1. Pre-European

The historic ecosystems of the area can be surmised from existing remnant vegetation and a consideration of soil types, aspect and hydrology. The following account of the possible original ecosystems of the City of Norwood Payneham & St Peters is derived from Kraehenbuehl (1996).

Originally the eastern plains between Adelaide and Burnside were described as supporting:

> *"…a magnificent gum forest with and undergrowth of Kangaroo Grass so high that people travelling between Adelaide and Kensington lost their way."*

The area was thought to have been dominated by River Red Gums (*Eucalyptus camaldulensis*) along the creeklines, extending to mixed South Australian Blue Gum (*Eucalyptus leucoxylon*), River Red Gum open woodland with patches of Drooping Sheoak (*Allocasuarina verticillata*) and Native Pine (*Callitris preissii*) on the plains. The diverse understorey incorporated a variety of shrub, grasses and herbs, including amongst others, Golden Wattle (*Acacia pycnantha*), Sweet Bursaria (*Bursaria spinosa*), Yacca (*Xanthorrhoea semilpana* ssp. *semiplana*), and Kangaroo Grass (*Themeda triandra*). Dense shrubby patches were commonly interspersed with grass-dominated understoreys. Historic sources note the multitude of wild flowers beneath and birds above, and along the creeklines, innumerable small crayfish darting amongst white and brown pebbles of the stream floor.

The River Torrens and tributary creeks feature prominently in these early accounts, which were described as growing various forms of vegetation. Despite the clearance and fragmentation of adjoining woodlands, a surprising range of sedges and rushes have been retained along the stream banks. Associations include significant stands of the Common Reed (*Phragmites australis*) and Narrow-leaf Bulrush (*Typha domingensis*) with a diverse range of *Juncus* and *Carex*. Furthermore, it is likely that this ecosystem supported many other less conspicuous species before the channels were highly modified and the water quality deteriorated.

5.2. Native Flora

5.2.1. Pressures

The pressures on native vegetation in urban areas, which arise from landscape fragmentation and subsequent degradation, are diverse but can include:

- Weed invasion;
- Modified water and fire regimes;
- Impacts arising from recreational usage; and
- Loss of genetic diversity.

Weed invasion

Exotic species impact upon native vegetation by out-competing and replacing native plants and in some cases forming conditions that prevent native plants from establishing around them, such as shading and changing the soil chemistry. Exotic plant species have the capacity to establish exclusive populations because of the absence of the physical and biological controls that keep them in check in their place of origin. Exotic plants can be introduced to remnant native vegetation by birds dispersing seeds, seed and vegetative plant parts being transported via waterways, dumping of garden waste and escapees of garden plants from adjacent private properties. Exotic plant species recorded at Our Patch sites within the Council are indicated in Appendix B.

Rice Millet weeds at St Peters Billabong

Modified water and fire regimes

When compared with the hydrological regime prior to development, remnant native vegetation

in urban areas may receive more or less runoff water depending on the configuration of the stormwater system. Over time this has the capacity to the affect species composition within a remnant.

The Australian flora has been largely shaped by fire and many native plant species rely upon fire to facilitate seed germination. Consequently the management of remnant native vegetation in urban areas to reduce fire hazard will have major implications for these species.

Recreational impacts
Patches of native vegetation within urban areas are often subject to high levels of use by people for recreational use, such as walking or bike riding. This leads to soil compaction and erosion in some areas, impacting upon the native plants present. Deliberate vandalism and the associated destruction of native vegetation sometimes also occurs in these remnants.

Loss of genetic diversity
Isolated patches of native vegetation are subject to the insidious loss of biodiversity through inbreeding within species, reducing the genetic diversity and as a result the capacity of the population to cope with environmental change. Furthermore an isolated plant population can be destroyed by a single catastrophic event and if there is no nearby population to recolonise, that species will become extinct from that patch.

In addition, there is a host of other degrading influences upon remnant vegetation in urban areas, including the dumping of rubbish and contamination from fertilisers and chemicals.

INDICATORS OF PRESSURE	
Distribution and abundance of pest plants, particularly in priority biodiversity areas (e.g. River Torrens corridor)	Survey to be undertaken

5.2.2. State of Resource

Remnant Vegetation
Given that the City of Norwood Payneham & St Peters incorporates some of the older suburbs in metropolitan Adelaide, it is not surprising that only small pockets of native remnant vegetation persist.

There are 40 council-managed parks and reserves within the City of Norwood Payneham & St Peters. Although managed primarily for recreational purposes, small pockets of remnant vegetation remain within these reserves. Basic plans that consider the management of native flora and fauna do not exist for any of these reserves.

There are five *Our Patch* sites located within the City of Norwood Payneham & St Peters (Map 4.4), and a summary of these is provided in Table 5.1.

The most significant reserve in terms of area, connectivity and conservation of species is the River Torrens Linear Park, 37 ha of which is in the City of Norwood Payneham & St Peters. This area, which includes St Peters Billabong, has retained larger, emotive trees like the River Red Gum, and a variety of rushes and sedges in the watercourse, but has lost most of the understorey shrubbery (eg. *Leptospermum* sp.). The urban portion of the River Torrens Linear Park is rated as having 'high to moderate' aquatic vegetation for over 65% of its length, although lacking high quality terrestrial habitat due to requirements for flood mitigation (TCWMB 2002).

St Peters Billabong is the flagship of the biodiversity assets of the City of Norwood Payneham & St Peters. Located near the junction of Second Creek and the River Torrens, this wetland has been the subject of an extensive rehabilitation initiative designed to improve water quality and enhance biodiversity.

A list of plant species recorded at Our Patch sites is included Appendix C. Indigenous and replanted species are also indicated. Our Patch sites and objectives for each site in the City are summarised by Table 5.1, the locations of which are indicated by Map 4.4.

St Peters Billabong

Table 5.1. Our Patch sites and objectives in the City of Norwood Payneham & St Peters

Patch Name	Group	Vegetation Association	Objectives
Torrens Linear Park – Felixtow Reserve	Eastern Suburbs Permaculture Group	River Red Gum (*E. camaldulensis)* woodland	Revegetation of this section of the River Torrens using permaculture principles. Involves a staged approach of controlling kikuyu and planting of local provenance tube stock. Regenerating species will be identified and used to further stabilise the site.
Torrens Linear Park – Felixtow Reserve	Steve Donnellan Our Patch	River Red Gum (*E. camaldulensis)* woodland	Aims to revegetate the Fourth Creek between the outflow and the footbridge. Willows, bamboo and kikuyu require ongoing control. Plantings of understorey species will supplement natural regeneration.
Torrens Linear Park – Marden	Marden Senior College	River Red Gum (*E. camaldulensis)* woodland	Designed to revegetate several disjointed areas of the Torrens Linear Park. Initially will involve planting of sedges and rushes in damp areas, followed by small trees and shrubs at a second site, coupled with weed control.
Marryatville High School First Creek	Marryatville High School	River Red Gum (*E. camaldulensis)* woodland	Aims to rehabilitate the section of the First Creek that flows through the school's grounds. Olives, ash and ivy have been replaced by indigenous understorey species.
St Peters Billabong	St Peters College	River Red Gum (*E. camaldulensis)* woodland	Builds on the work undertaken by the TCWMB, Council and Friends of the Billabong to revegetate using local indigenous plant species. This will help improve water quality and increase habitat diversity.

Source: Kate Hallahan, Our Patch Officer (East), Torrens CWMB

Threatened plant species and communities

No plant communities listed as threatened under State and Commonwealth legislation currently occur within the Council area. Although no threatened plant species occur within

the Council area, three indigenous species are regarded as uncommon in the Southern Mt Lofty Ranges Botanical Region. These are the River Bottlebrush, Greater Bindweed and Creeping Brookweed, which have persisted in the vicinity of St Peters Billabong.

Significant Trees
Large native trees provide important habitat and resources for a range of fauna species, particularly birds and invertebrates. The Council's Register of Significant Trees includes species that are indigenous to the area and therefore provides useful biodiversity information. Appropriate application of the relevant legislation will encourage the retention of these important landscape elements.

Significant Trees are covered in detail in section 7.3 *Open Space and Streetscape* of this report.

Street Trees
Street trees are planted for a range of reasons including amenity value, to provide shade, enhance property values and as habitat for wildlife. While there is always community discussion as to the relative merits of individual species and 'exotic' versus 'native' trees, it is apparent that street trees form an important component of metropolitan Adelaide's 'urban forest' (Young & Johnson in press).

Street trees that meet the relevant criteria are recorded on Council's Register of Significant Trees.

Suburban Gardens
Given the level of urbanisation that has taken place within the City of Norwood Payneham & St Peters, the gardens associated with individual homes have the capacity to make an important contribution to the conservation of biodiversity. Although the Council area contains many examples of ornamental and cottage gardens, the move to bush gardens in recent decades is also evident. Many gardens contain some Australian native plants, but few of these would incorporate locally indigenous species of most value to associated native flora and fauna.

INDICATORS OF STATE	
Area of reserves managed for remnant indigenous vegetation	Survey to be undertaken
Condition of indigenous remnant vegetation within these reserves	Survey to be undertaken

5.2.3. Response

The importance of biodiversity is recognised by the City of Norwood Payneham & St Peters in section 3.2 of its Strategic Plan. One of the key principles stated in the City of Norwood Payneham & St Peters' Environment Policy is to *"value and protect biodiversity".* The Council's Open Space Strategy recognises the important role that open space provides for conservation and biodiversity, through the protection of natural features and the development of natural habitats.

To date, basic management plans have been prepared for all of the parks and reserves managed by the Council. However, these plans do not consider the management of biodiversity values but rather the management of infrastructure for recreational purposes. More detailed plans should be prepared for all Council-managed parks and reserves, with an emphasis upon the protection of remnant vegetation and the enhancement of biodiversity values.

On-ground activities to enhance biodiversity have been underway at the five Our Patch sites within the Council area. This has involved rehabilitation of degraded areas through weed removal and reestablishment of local native plant species. Opportunities exist for extension of the activities at all of these sites (Kate Hallahan, Our Patch Officer, pers. comm.). Presently three schools are involved in working at Our Patch sites (Marryatville High School, Marden Senior College, St Peters College) and Loreto College have expressed an interest in rehabilitating a section of First Creek that flows through the school grounds. The Our Patch program has delivered various education sessions to number of other schools within the Council area.

Council can play an important role in the enhancement of biodiversity through the promotion of Our Patch activities via its website and through information in *Look East* and *The Messenger*.

Further to this, Council can provide information about indigenous plants, not only to enhance the community's understanding of the local vegetation, but to promote the planting of appropriate species in suburban gardens. In addition, information about garden plants that have the potential to establish as weeds (eg. see Taylor *et. al.* in press) and thereby threaten remnant native vegetation can also be made available through the Council's website and articles in *Look East* and *The Messenger*.

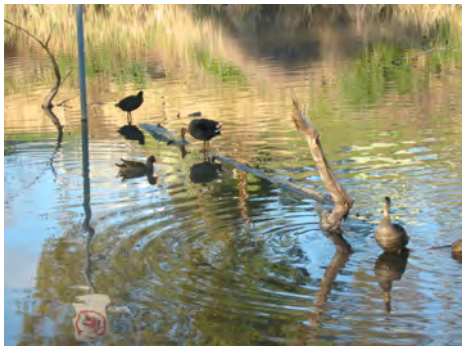
INDICATORS OF RESPONSE	
Number of reserve management plans considering remnant vegetation management	0

5.3. Native Fauna

Historically the Adelaide Plains supported a diverse fauna. The development of metropolitan Adelaide following European settlement resulted in the extensive removal and fragmentation of habitat, leading to the extinction of many species, with ground-dwelling mammals the hardest hit (Tait and Daniels in press).

5.3.1. Pressures

The pressures on fauna in urban environments revolve largely around the impacts on existing habitat that is closely linked to stresses on plant communities. Particular pressures exerted on fauna result from habitat fragmentation and the associated degradation and loss of connectivity.



Water birds at St Peters Billabong

Habitat fragmentation and degradation

The fragmentation of formerly continuous habitat into disjunct patches brings with it a host of challenges for fauna. Not only are there fewer resources available in the form of food, shelter and breeding sites, but the habitat that does remain is altered through the degrading influences from surrounding landscape. This modification of habitat tends to favour more generalist species at the expense of those with more specialist requirements. The threat of predation is also increased.

Loss of connectivity

The capacity of organisms to move is an important determinant of their ability to survive within a fragmented urban landscape. Individuals may need to disperse from their place of birth to find sufficient habitat capable of sustaining them. The movement of animals between patches is also important as it facilitates the maintenance of genetic diversity. It is for this reason that connections or "corridors" are important within any urban landscape.

Introduced species
Urban environments are characterised by opportunistic, adaptable species. It is these generalists that can compete with or prey upon native species.

The introduced fauna species occurring within the City of Norwood Payneham & St Peters are typical of metropolitan Adelaide. Introduced mammals include foxes, cats, rats and mice; introduced bird species include starlings, blackbirds and pigeons. Carp and mosquito fish are common in the vicinity of the St Peters Billabong.

Little information is available on introduced invertebrates although honeybees, European wasps and Portuguese millipedes are well established.

Introduced fauna species known to occur within the Council area are highlighted in Appendix D.

5.3.2. State of Resource

Fauna habitat
The River Torrens Linear Park is the largest remnant area within the Council area. Not only does it provide habitat for a range of fauna, being a natural landscape connection it serves corridor function for a number of species.

The Our Patch sites described earlier are remnants in which the habitat value is being enhanced through the rehabilitation activities of volunteers.

Given the extent to which native vegetation has been removed from the landscape, suburban gardens provide important habitat for fauna. In many instances it is the structural and floristic diversity of gardens in close proximity to remnant patches which best function to support faunal species (Taylor *et al*. in press).

Street trees also offer resources for fauna, most obviously birds, but also possums, geckos and a host of invertebrates (Young & Johnson in press).

Vertebrates
A list of fauna species recorded within the City of Norwood Payneham & St Peters, and particularly in the vicinity of St Peters Billabong, is provided in Appendix D. This list, which is skewed towards vertebrates, indicates that 75 birds, 8 mammals, 11 reptiles, 5 frogs and 6 fish species are known to occur in the Council area. It should be noted that no bats have been included on this list although nine bat species are known to occur in the suburban Adelaide (Reardon & Tait in press).

The Frog Census program run annually by the EPA provides valuable information on the distribution and abundance of amphibians in urban environments. Results from the past four years for Frog Census sites within the City of Norwood Payneham & St Peters are presented in Appendix E.

Invertebrates
Information on invertebrates within the Council area is limited.

Although details on the distribution and abundance of butterflies in the Council area is not available, it is known that 36 species occur on the Adelaide Plains, of which 14 species are threatened (Grund in press).

Water quality monitoring indicates the presence of a range of macroinvertebrates in the vicinity of St Peters Billabong (Appendix F)

Threatened fauna species
A number of the bird species recorded in the Council area are listed as 'migratory species' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. This indicative of the capacity of these species for large scale movements (eg. ducks, birds of prey) between habitats rather than any imminent threat of local decline on their part. Nevertheless, Council should follow due process in the consideration of any developments that have the potential to impact upon these species.

INDICATORS OF STATE	
Diversity and abundance of frogs	See Appendix E

5.3.3. Response

The response of the City of Norwood Payneham & St Peters to the pressures facing native vegetation will have direct benefits for native fauna. Enhancing native vegetation will improve the amount of habitat and quality of that habitat for fauna species.

Further rehabilitation along the Torrens Linear Park will enhance the value of this landscape connection.

As indicated in relation to the response to the pressures facing native vegetation, Council can play an important role in promoting biodiversity-related activities. With respect to fauna this could include information on the Council website and articles in *Look East* and *The Messenger* in relation to the:

- frog census program – involvement of the local community and the monitoring of new sites; and
- designing backyards for wildlife – including information on appropriate plants to provide resources for fauna.

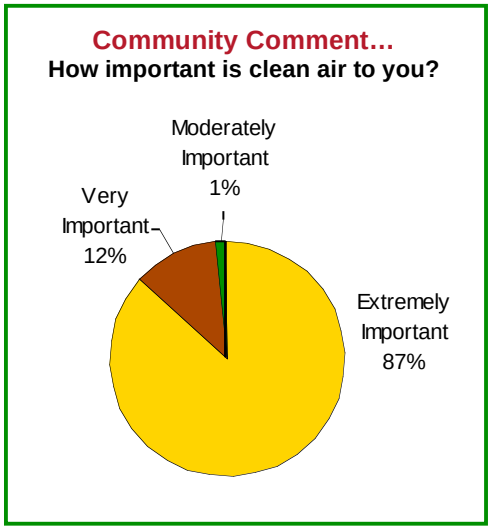
In addition to maintaining existing partnership with the Urban Forest Biodiversity program, significant opportunities exist for the City of Norwood Payneham & St Peters to become involved with BioCity (the Centre for Urban Habitats) at Adelaide University and the newly formed Adelaide & Mt Lofty Ranges Natural Resources Management (AMLR NRM) Board.

INDICATORS OF RESPONSE	
Change in the diversity and abundance of indicator species (e.g. frogs)	To be determined for future SoEs

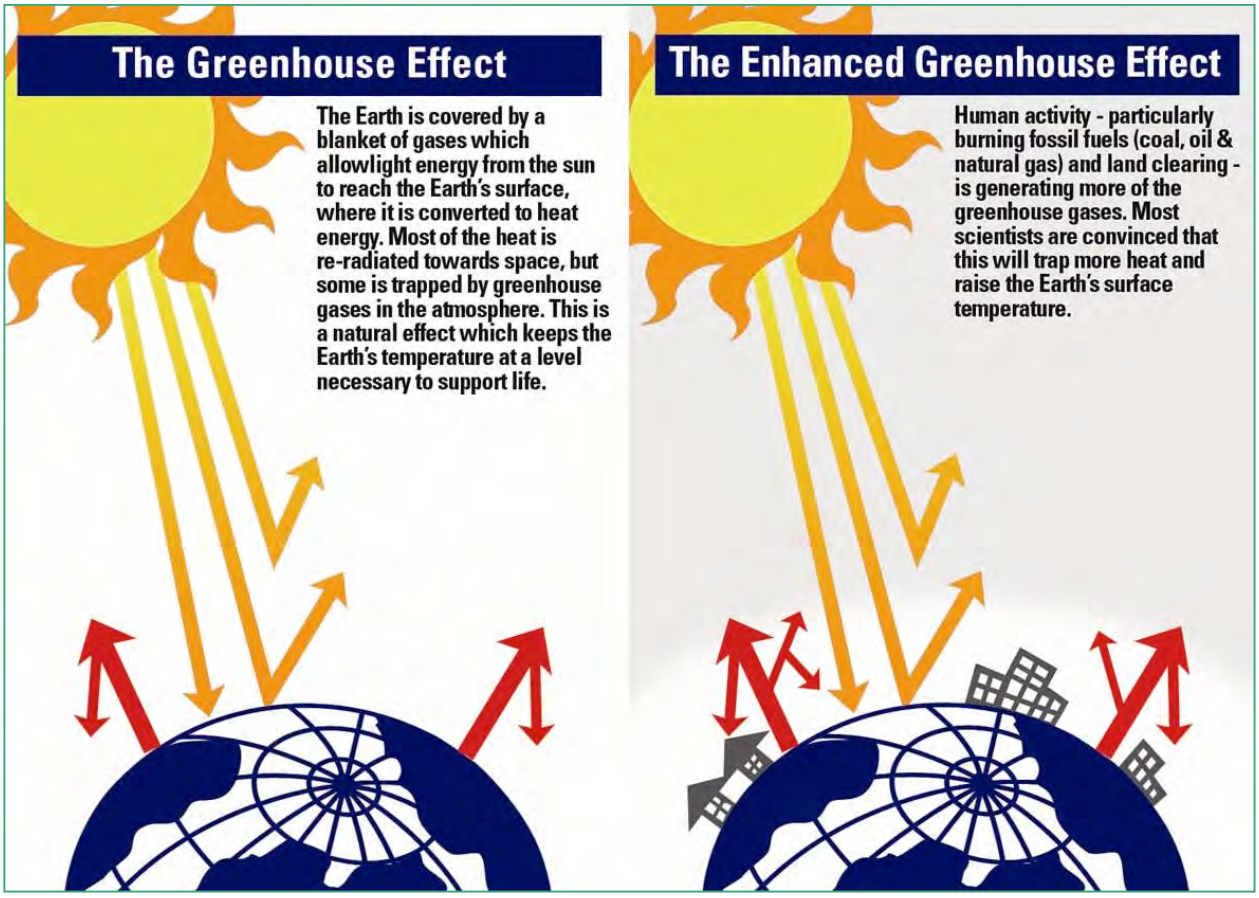
6. Air Quality and Climate Change

6.1. Introduction

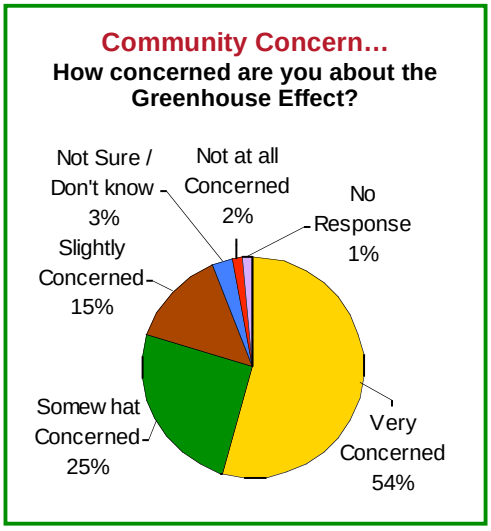
Poor air quality is closely related to the burning of fossil fuels, a universal pathway used to generate the energy that powers our homes, offices, and cars. An accumulation of gasses emitted during the combustion process not only affects human health, but also the naturally occurring greenhouse effect that warms the Earth and enables the persistence of life. Together with vegetation clearance and poor land management, the burning of fossil fuels has led to an imbalance of greenhouse gases in the atmosphere.



Water vapour (H_2O), carbon dioxide (CO_2) and methane (CH_4) are the chief greenhouse gasses, which regulate the temperature experience on Earth. After solar energy reaches the Earth and warms the lands and oceans, it is released as infrared radiation (radiant heat) into the lower atmosphere. The greenhouse gasses in the lower atmosphere trap a certain quantity of this radiation before re-emitting it into the heating cycle. Today's elevated concentration of greenhouse gases is expected to trap even more radiant heat, resulting in global warming. Relatively minor climatic changes at a global level are predicted to cause major ecosystem shifts, the side effects of which may include habitat loss, fragmentation, invasion, and species extinction.



6.2. Greenhouse Gas Emissions



While climate change is occurring on a global scale, it is the collective influence of actions at a local scale that will lead to substantial reductions in greenhouse gas emissions (CCP 2005). Local governments play a crucial role in creating, implementing and sustaining greenhouse solutions, a role recognised through a global initiative called the Cities for Climate Protection (CCP®) Program. CCP® is focussed on attaining realistic emission reductions through local government, and is currently on the agenda for over 200 of Australia's Local Councils. The City of Norwood Payneham & St Peters has been participating in the program since May 2001, along with 18 other local Councils in South Australia. The CCP® program utilises a strategic framework to achieve reductions through the following milestones:

Milestone 1: Analyse the key sources of greenhouse emissions in your Council and community, and forecast future emissions growth.
Milestone 2: Set an emissions reduction goal.
Milestone 3: Develop and adopt a local greenhouse action plan to achieve those reductions.
Milestone 4: Implement your local greenhouse action plan.
Milestone 5: Monitor and report on greenhouse gas emissions and implementation of actions and measures.

(Cities for Climate Protection "About CCP" Web Page)

At a federal level, the Australian Government has implemented a mandatory renewable energy target, aiming at increasing the contribution of renewable energy sources in Australia's electricity supply to 9,500 GWh per year by 2010. Financial penalties are issued to companies failing to obtain the minimum number of Renewable Energy Certificates (REC's), thus providing an incentive to develop cleaner energy resources that reduce greenhouse gas emissions.

79 % of the community survey respondents reported being either very concerned or somewhat concerned about the greenhouse effect.

6.2.1. Pressures

Greenhouse gas emissions are measured as tonnes of carbon dioxide equivalent (CO_2-e). Australia's per capita rate of greenhouse gas emissions is one of the highest in the industrialised world at around 27.9 tonnes per person per year (EPA 2003). In South Australia during 2000-01, greenhouse gas emissions totalled 34.07 million tonnes, or 22.43 tonnes per person (EPA 2003).

In 2004, the City of Norwood Payneham & St Peters corporate (Council) greenhouse gas emissions totalled 4,842 tonnes of CO_2-e, which is a 10% decrease of the Council's total 200/01 CO_2-e levels. This also represents a 5% achievement of the 20% CO_2-e reduction target, by 2012/13 for corporate emissions. This is a significant achievement since 2002 when the Council committed to the CCP® Program and invested in greenhouse gas abatement measures.

Table 6.1 shows the main sources of greenhouse gas emissions in South Australia during 2001 as tonnes of CO_2-e (EPA 2003).

Table 6.1 Major sources of greenhouse gas emissions (South Australia)

SOURCE	ANNUAL EMISSIONS (TONNES CO_{2-e})	PERCENT CONTRIBUTION TO SA TOTAL (%)
Stationary energy (generation of electricity by power stations, and industrial or domestic use of fossil fuels)	9,540,000	28
Transport	7,836,000	23
Agriculture	6,133,000	18
Industry	4,770,000	14
'Fugitive emissions from natural gas processing	3,407,000	10

Table 6.2 summarises the major sources of greenhouse gas generated by the Council's corporate sector in 2000 and 2004, as calculated by the CCP® greenhouse software.

Table 6.2 Corporate Greenhouse Gas Emissions 2000, 2004.

	Energy Consumption (GJ)	Equivalent Tonnes CO_2 (Tonnes)
	2000	
Buildings	8,817	1,407
Vehicle Fleet	9,145	635
Streetlights	8,040	2,649
Waste		707
TOTAL	**26,002**	**5,397**
	2004	
Buildings	8,954	986
Vehicle Fleet	10,115	702
Streetlights	9,332	2,489
Waste		666
TOTAL	**28,401**	**4,842**

Sources: Council Staff, AGL, Origin, Council contractors.

Energy consumption is greatest for buildings, which increased marginally from 2000 – 2004. However, the corresponding CO_2-e production shows an 11% drop from 2000 to 2004, possibly indicating an improvement in energy efficiency despite corporate expansion (the Council has been progressively upgrading to more energy efficient appliances and equipment including lighting and air-conditioning).

Emissions for the vehicle fleet have increased marginally in size, corresponding to a slight rise in energy consumption and production of CO_2-e. Energy consumption through council streetlights has also risen marginally from 2000 - 2004 but corresponding CO_2-e has fallen slightly. Similar to buildings, a progressive upgrade of streetlights may have reduced CO_2-e output, but this discrepancy is more likely due to small errors in data collection. With an overall decrease in total CO_2-e emissions between 2000 and 2004 for these main sectors, the future looks promising.

Table 6.3 summaries the amount of energy consumed and the CO_2-e emissions by the various sectors in the community of the City of Norwood Payneham & St Peters. This data was based on ABS data for 2001 and calculated using ICLEI-A/NZ default data.

Table 6.3 Community Greenhouse Gas Emissions 1998, 2001

	Energy Consumption (GJ)	Equivalent Tonnes CO_2 (Tonnes)
	1998 (NPSP population 34,248 -*ABS)	
Residential	510,120	104,837
Commercial	617,245	133,923
Industrial	2,292,908	267,196
Transportation	1,184,441	80,623
Waste		109,312
TOTAL	**4,604,714**	**695,891**
	2001 (NPSP population 33,745 - *ABS)	
Residential	534,625	120,732
Commercial	608,779	141,132
Industrial	2,021,734	241,894
Transportation	1,292,906	88,006
Waste		145,460
TOTAL	**4,458,044**	**737,224**

Sources: ABS Census data, ICLEI-A/NZ data

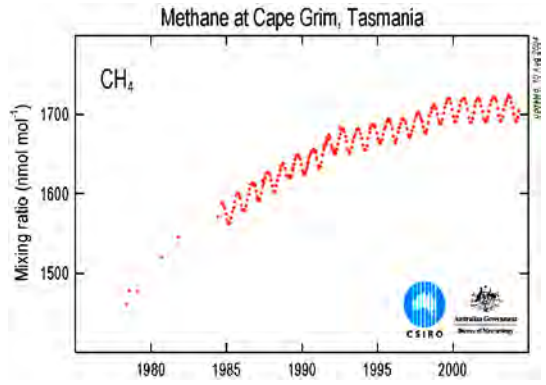
The Industrial sector is the most significant contributor of greenhouse gas emissions in the community. There are no significant energy-using industries in the Council area, rather, the sources of emissions are generated by a number of small to medium industrial businesses.

INDICATORS OF PRESSURE	
2004 corporate CO_2-e emissions (using CCP data)	4,842 tonnes
2001 community CO_2-e emissions (using ABS and CCP data)	737,224 tonnes

6.2.2. State of Resource

Concentrations of greenhouse gases in the atmosphere are measured at Cape Grim, Tasmania, by the CSIRO. This information is used to indicate greenhouse gas concentrations across Australia and subsequently is included in the Australian and South Australian State of the Environment Reports. This section is a brief summary of the information contained by those reports, followed by forecast greenhouse gas emissions for the City of Norwood Payneham & St Peters.

The CSIRO has been monitoring greenhouse gases including carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4) since 1976. The concentrations of greenhouse gases have been steadily increasing since monitoring began, as depicted by figure 6.1 (CSIRO 2004).



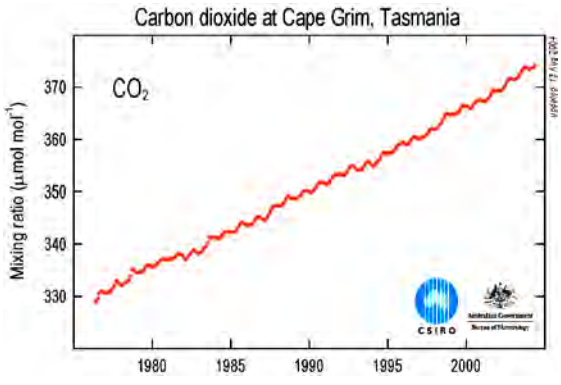


Figure 6.1 Atmospheric Concentrations of Carbon Dioxide and Methane

In 2001, community greenhouse gas emissions for the City of Norwood Payneham & St Peters were estimated to total around 737,224 tonnes CO_2-e, comprising energy use from residential, commercial, industrial, transportation and waste sectors. This figure represents a 5.6% increase in CO_2-e output since the previous inventory of 1998, which is predicted to continue rising as the population expands and as improved energy efficient technologies lag in their replacement of older existing technologies.

The highest corporate greenhouse gas emissions in 2004 were courtesy of the streetlight and buildings sectors, totalling 3,475 tonnes CO_2-e or around 72% of the estimated total output for that year. For the community, the greatest greenhouse gas emissions in 2001 were due to the industrial and waste sectors, comprising 387,354 tonnes CO_2-e or approximately 53% of the estimated total output for that year.

6.2.3. Response

The Council has set targets through Milestone 2 of the CCP® Program, which include a 20 % reduction below 2000/01 corporate emission levels by 2012/13, and a 20 % reduction below 1998 community emission levels by 2012.

The Council's Greenhouse Strategy Plan (NPSP 2002) developed as part of Milestone 3 provides ideas on how to achieve emission reduction targets, through conducting energy efficiency audits and targeted upgrades, increasing the use of renewable energy, and through education, incentive, and promoting best possible practices. Some of the key strategies proposed for corporate (council) operations and community sectors are summarised by Table 6.4.

Table 6.4 Greenhouse Emission Reduction Strategies (NPSP 2002)

SECTOR	TARGET	STRATEGY
All	All Areas/Groups	1) Promote renewable energy options, energy efficient design & initiatives through council publications
Corporate (Council)	Public Lighting	1) Upgrade energy efficiency of public lighting 2) Purchase Green Power for public lighting 3) Investigate illumination of key sites & buildings from renewable energy sources
	Buildings	1) Conduct energy audits of council buildings and facilities 2) Retrofit energy efficient lighting, timers and dimmers 3) Investigate progressively replacing electric and gas systems with solar 4) Activate energy efficient devices on all possible office equipment
	Swim Centres	1) Conduct energy audits of all council swim centres 2) Investigate most effective strategies to reduce energy use (e.g. solar blankets, variable speed pumping plant)
	Vehicle Fleet	1) Review fleet leasing & purchasing policies with a view of supporting renewable or energy efficient fuels 2) Develop staff travelling policy to promote use of sustainable transport where possible
	Staff Training and Education	1) Educate staff to turn off computers & lights when not in use, to recycle, & to adopt efficient workplace practices
Community	Urban Design	1) Develop planning design guidelines that support energy efficiency 2) Introduce building efficiency requirements for new developments 3) Promote best practice (e.g. awards for urban design)
	Industrial and Commercial Groups	1) Investigate showcasing business practices that are energy efficient 2) Support development of new more sustainable businesses to the area 3) Promote participation in National Greenhouse Challenge Program (national incentive program)
	Residential Group	1) Promote energy efficient practices (e.g. home audits) 2) Promote rebate schemes for solar powered electricity 3) Provide community assistance to low income families wanting to improve their energy efficiency 4) Promote SA Government initiative requiring a minimum 4 star energy rating for dwellings
	Community Awareness	1) Disseminate Energy SA efficiency initiatives 3) Sponsor community educational events 4) Support schools and community groups to develop energy efficiency initiatives (e.g. council grants)

The Council has firmly indicated its intentions to reduce greenhouse gas emissions by developing and participating in various programs and initiatives, and through the development of supportive policies and guidelines. The Development Plan for Norwood Payneham & St Peters acknowledges the high rate of greenhouse gas emissions attributed to energy consumption, and the need to actively reduce this level of consumption through renewable pathways (Planning SA 2003). Two key objectives include:

- the development of renewable energy facilities, such as wind and biomass energy facilities, in appropriate locations; and
- renewable energy facilities located, sited, designed and operated to avoid or minimise adverse impacts and maximise positive impacts on the environment, local community and the State.

During the 2003/04 financial year, the Council successfully sought funding from the Australian Greenhouse Office to install a 6kW solar photovoltaic system on the roof of the new Payneham Library and Community Facility (NPSP 2004). The solar panels produce 23 kW per day on average, and in combination with other environmentally friendly design aspects, represent a substantial reduction in greenhouse gas emitted from this building.

In a further attempt to reduce emissions through energy use, the Council has implemented substantial energy conservation improvements by retrofitting efficient lighting and air conditioning systems and digital timers in Council buildings (NPSP 2004). The installation of thermal blanket covers at the Payneham Swimming Centre (October 2004) has reduced nightly heat loss, thereby reducing the overall amount of gas heating required to maintain a constant temperature. This initiative saves approximately 80 tonnes of greenhouse gas emissions and around $9 000 in heating costs per year. A thermal blanket cover was also installed on the Norwood Swimming Pool during 2005/06.

Motor vehicles are responsible for 23% of air pollutant emissions in the City (NPI, 2004), and represent a substantial contribution to greenhouse gas emission levels through the burning of fossil fuels. The Council participates in the TravelSmart SA program that aims to reduce greenhouse gas contributions from the travel sector, encouraging residents to use more sustainable methods of transport including cycling, walking and public transport. In support of this program, bicycle lanes and rails have been provided on most arterial roads to encourage cycling, while approximately 6,000 km of footpath have recently been upgraded to encourage walking. In addition, the City has five Adelaide Metro 'Go-Zones' and a number of 'Smart Stops' (provides auditory and visual information on bus arrivals) to encourage residents and visitors to utilise public transport.

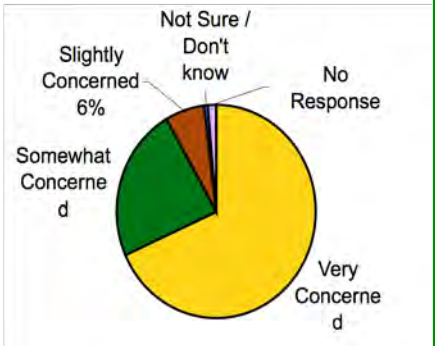
The Council completed Milestone 5 of the CCP® Program in November of 2005, which involved an analysis of energy used for 2004 in order to track the Council's progress towards the corporate emission reduction target set by Milestone 2.

INDICATORS OF RESPONSE	
Milestones reached in CCP® Program	5

6.3. Air Quality

The quality of the air we breathe is essential to our health, and is often in the limelight as countries experience higher rates of pollution often associated with development and industrialisation. While air pollution may be caused by natural events (e.g. dust storms and volcanoes), human activities tend to be the most damaging in terms of variety, frequency, and duration of events. 91 % of survey respondents indicated that they were either very concerned or somewhat concerned about air pollution in the City of Norwood Payneham & St Peters.

Community Comment…
How concerned are you about air pollution?



Poor air quality may have a range of impacts on human health depending on exposure time and concentration. The human body has a number of natural defences against air pollution, including mucous to trap small particles, coughing and sneezing to expel contaminated air and mucous, and nose hairs to trap larger particles (Miller 1996). However, exposure to air pollution can overload or break down these defences to the detriment of our health and well being.

The environment is also impacted by poor air quality, in particular soil, water and vegetation as a result of the deposition of pollutants to land via rainfall, runoff, or gravity settling of particles. The following table (6.5) summarises the most widespread pollutants in South Australia, listing possible sources within the City of Norwood Payneham & St Peters, and potential health effects.

Table 6.5 Pollutants, sources, and potential health effects, City of Norwood Payneham & St Peters (adapted from AIUS and City of Melbourne 2002 and WHO 2000)

NAME	POTENTIAL SOURCES	POTENTIAL HEALTH EFFECTS
Particulates– fine solid particles suspended in the atmosphere, size (measured in microns ie PM10, PM2.5) determines their environmental characteristics and potential health effects	Paved roads, solid fuel burning (domestic), (also potential source from bushfires and dust storms)	Large particulates (greater than PM10) are caught by mucous in the nose, mouth and bronchus and either coughed out or pass through intestinal tract with low absorption. Smaller particulates (particularly smaller than 5 microns) can remain in lungs and cause bronchitis, asthma and lung irritation.
Carbon Monoxide (CO)	Motor vehicles, Solid fuel burning, lawn mowing	Exposure at low levels can lead to increased occurrence of cardiovascular disease symptoms due to decreased ability of blood to carry oxygen (CO combines with haemoglobin). Chronic exposure linked to impaired physical coordination, vision and judgement.
Ozone (O_3)	Motor vehicles,	Exposure can have effects ranging from coughing, wheezing and burning in chest to aggravation of existing respiratory and cardiovascular disease. Asthmatics particularly sensitive.
Lead (Pb)	Motor vehicles, paved roads	Strong effects on central nervous system, with children and unborn babies especially at risk.
Oxides of Nitrogen (NO_x)	Motor vehicles, fuel consumption (produced by all burning processes)	Health effects include decreases in lung function, increased susceptibility to respiratory infection and aggravation of existing respiratory and cardiovascular disease
Sulfur Dioxide (SO_2)	Motor vehicles	Exposure can cause irritation and damage of moist mucous membranes, associated with respiratory disease and asthma. Breathing concentrations above 400-500ppm can cause death.
Volatile Organic Compounds (VOC) – organic chemicals (containing carbon and hydrogen) that evaporate easily including octane, butane, benzene, toluene, carbon tetrachloride	Motor vehicles, industry,	Many VOCs have been classified as toxic and carcinogenic (cancer causing). Health effects from overexposure to VOCs include dizzines, headaches, and nausea. Long-term exposure to certain VOCs, such as benzene, has also been shown to cause cancer, and eventually death.

6.3.1. Pressures

In South Australia, the most common sources of pollution are emissions from motor vehicles followed by industrial activities and a range of commercial and domestic activities (EPA 2003). The City of Norwood Payneham & St Peters is home to a popular shopping and entertainment precinct, and therefore experiences frequent pollution events due to heavier traffic around these areas. Other major sources of air pollution in the City include the burning of solid fuel (i.e. wood fires) and emissions from paved roads and painted architectural surfaces common to the City.

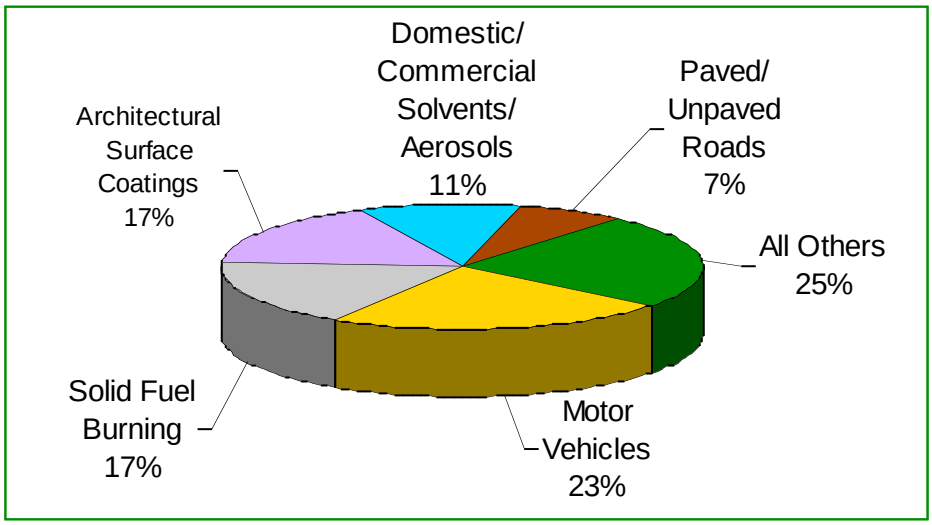
The National Pollutant Inventory (NPI) is a database that stores information on the types and amounts of pollutants being emitted to the environment. Industrial facilities are required to report emissions to the NPI if they use more than a certain amount of one or more substances on the NPI reporting list, consume more than a certain amount of fuel or electric power, or emit more than a certain amount of Nitrogen or Phosphorus to water. There are no NPI facilities in the City of Norwood Payneham & St Peters (NPI 2004).

INDICATORS OF PRESSURE	
Number of cars registered in the City of Norwood Payneham & St Peters (May 2005)	33,830
Industrial Land Use as a percentage of total Council area	3 %

6.3.2. State of Resource

In South Australia, air quality is generally good by national and international standards (EPA 2003). The NPI produces annual reports of the indicative top sources of pollutants for each local government area in Australia. Figure 6.2 summarises the results of a NPI report for the City of Norwood Payneham & St Peters in 2003-04:

Figure 6.2 Indicative Top Sources of Air Pollution (NPI 2004)



Land use in the City of Norwood Payneham & St Peters is dominated by residential areas (67 %). Only 3 % of land is classified as industrial (Planning SA 2003). These areas are situated predominantly in the suburbs of Glynde and Marden.

The number of vehicles (motorbikes, car and trucks) registered to addresses in the City was obtained from Transport SA. These were provided by postcode area, resulting in the inclusion of some suburbs not within the City (Rose Park, Leabrook, Kensington Gardens,

Kensington Park and Beulah Park). Table 6.6 shows the number of vehicles registered in each postcode area at the end of May 2005.

Table 6.6 Vehicle Registrations by Postcode (Peter Bravey, TSA, pers. comm.)

POSTCODE	SUBURBS	NO. REGISTRATIONS
5067	*Beulah Park, Kent Town, Norwood, *Rose Park	8,816
5068	Heathpool, Kensington, *Kensington Gardens, *Kensington Park, *Leabrook, Marryatville, St Morris, Trinity Gardens	8.963
5069	College Park, Evandale, Hackney, Maylands. St Peters, Stepney	6,487
5070	Felixstow, Firle, Glynde, Joslin, Marden, Payneham, Payneham South, Royston Park	9,564
TOTAL		**33,830**

* Indicates suburb not in the City of Norwood Payneham & St Peters

The EPA has monitoring stations across metropolitan Adelaide, the nearest being located within the City at Kensington. Particulates, ozone and nitrogen monoxide are monitored at this station. From the information collected at this station and others across South Australia, the Air Quality Index (AQI) is calculated. The AQI is a scale that indicates the quality of air, relating monitoring data to Australian air quality standards. If the AQI is poor, then one or more air pollutants have exceeded the standard (EPA 2005).

$$AQI = \frac{\text{Pollution Concentration}}{\text{Pollution Standard}} \times 100$$

The standard used is the National Environment Protection Measure for Air Quality (NEPM). Table 6.7 shows the NEPM standards (EPA, 2003).

Table 6.7 NEPM Air Quality Standard (EPA, 2003)

POLLUTANT	AVERAGE PERIOD	MAX. CONCENTRATION
Ozone	Maximum 1-hour value in last 24 hours	0.10 ppm
Nitrogen dioxide		0.12 ppm
Sulfur dioxide		0.20 ppm
Carbon monoxide	Maximum 8-hour value in last 24 hours	9.0 ppm
Particles as PM10	1-hour values averaged over 24 hours	50 µg/m3

The City of Norwood Payneham & St Peters falls within the Eastern Adelaide air quality region, which also includes the Corporation of the Town of Walkerville, City of Unley, Adelaide City Council, City of Burnside, City of Mitcham, City of Prospect, and Campbelltown City Council. Air quality is measured at Kensington, where ozone, nitrogen dioxide and particulates are monitored.

Table 6.8 states the number of times the NEPM standards were exceeded in 2003 (EPA 2004). This information is reported by the EPA as part of their annual reporting. Two particle exceedances can be attributed to dust storm events.

Table 6.8 NEPM Exceedances at Kensington, 2003 (EPA 2004)

POLLUTANT	NUMBER OF EXCEEDANCES OF NEPM STANDARDS AT KENSINGTON 2003
Sulfur dioxide	0
Ozone	0
Nitrogen dioxide	0
Particles as PM10	2

Air quality complaints are made to either the EHA or through the EPA. Table 6.9 summarises the complaints received by the City of Norwood Payneham & St Peters in the 2004-05 financial year (Peter Snell, EHA, pers. comm.).

Table 6.9 Air Quality Complaints for the 2004-2005 Financial Year

COMPLAINT FOCUS	2004-2005
Wood smoke	5 (14 %)
Dust -building industry	3 (8 %)
Food / cooking odour	8 (22 %)
Spray drift – paint or chemical	2 (6 %)
Odour animal keeping	18 (50 %)
TOTAL	**36**

The total number of air quality complaints rose substantially from 25 (29 %) in the previous reporting period of 2003/2004 to 36 (43 %) in the last financial year (EHA 2004). Approximately 72 % (21) of complaints concerned food/cooking or animal odours, probably representing a clash between the residential and retail commercial zones of the City. Smoke complaints from slow combustion heaters and open fireplaces in the residential sector are also common, constituting 14 % of air quality complaints received by the EHA in the 2004-05 reporting period.

INDICATORS OF STATE	
Complaints regarding air quality received by EHA	36
Number of times NEPM standards exceeded in 2002-2003	2

6.3.3. Response

Motor vehicles are responsible for 23% of total air pollutant emissions in the City (NPI, 2004). Reducing the number of cars on the roads will therefore result in a reduction in air pollutants. The Council thus participates in the TravelSmart SA program to encourage residents to use more sustainable methods of transport including cycling, walking and public transport. Throughout the Council area, bicycle lanes and rails have been installed to encourage cycling, while approximately 6,000 km of footpath have recently been upgraded to promote walking. In addition, the City has five Adelaide Metro 'Go-Zones' and a number of 'Smart Stops' (provides auditory and visual information on bus arrivals) to encourage residents and visitors to utilise public transport.

The City supports 'Smogbusters Way to School,' a national program aimed at improving air quality through educating students on how they contribute to the greenhouse problem, and encouraging students and teachers to reduce this contribution by changing the way they commute to school. The Conservation Council of South Australia manages the Smogbusters project in this State, in conjunction with other relevant stakeholders.

The City also supports and administers the following EPA guidelines and policies in addition to its own pollution reduction programs:

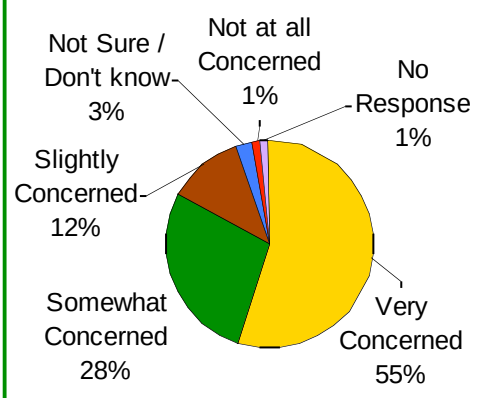
- Environment Protection (Burning) Policy 1994;
- Burning in the open on domestic and non-domestic premises (2003);
- Spray-painting booths – control of air and noise emissions (2003);
- Exhaust ventilation in commercial and institutional kitchens (2003);
- Wood-burning heaters – and how to use them effectively (2004);

Introduced in 1994, the Environment Protection (Burning) Policy has been effective in reducing air emission from backyard incinerations by prohibiting such activities unless a permit is obtained from the Council. The EHA also provides advice on how to minimise smoke of residential wood-fired heaters.

INDICATORS OF RESPONSE	
Number of air quality programs supported / administered by the City	2

6.4. Energy Use

Community Comment…
How concerned are you about energy consumption?



Energy is fundamental to the operation of modern urban environments, required to produce goods and services, industrial production and transport (Newton *et al*, 1998). Approximately 98% of energy in South Australia is sourced from non-renewable resources – oil (47%), natural gas (29%) and coal (22%) (EPA, 2003). Only 0.1 % of energy was generated via renewable pathways in 1998, but this value is expected to be around 5 % today with the development of windfarms at various sites across the state (EPA 2003). The production of non-renewable electricity by burning fossil fuels and using fuels to power motor vehicles releases air pollutants and greenhouse gases, which contribute to global warming.

6.4.1. Pressures

Increasing population, business and industry will escalate the pressure on primary energy resources. 55 % of survey respondents indicated that they were very concerned about energy consumption in the City, reflecting community views on the use of non-renewable energy sources to support growing community and business sectors.

At the residential level, significant up-front costs associated with the installation of renewable technologies (e.g. photovoltaic cells) make public grid-connected households economically difficult to justify, even with current rebates (Watt 2004).

INDICATORS OF PRESSURE	
Population increases in the City of Norwood Payneham & St Peters	Fairly Constant (+0.23% 2003/4)
Non-renewable energy use (EPA audit)	? ~95 %

6.4.2. State of Resource

Electricity and gas are the most common energy resources utilised in the City of Norwood Payneham & St Peters.

Electricity distribution is operated by ETSA Utilities. Since January 2003, the introduction of electricity retail competition has meant that numerous companies including AGL, Origin Energy, TRU Energy and NRG Flinders have entered the electricity market.

The majority of residential energy consumption is used for water heating, electrical appliances and equipment, and general space heating. Figure 6.3 shows the proportion of energy used by residential activities (Source: Energy SA, undated).

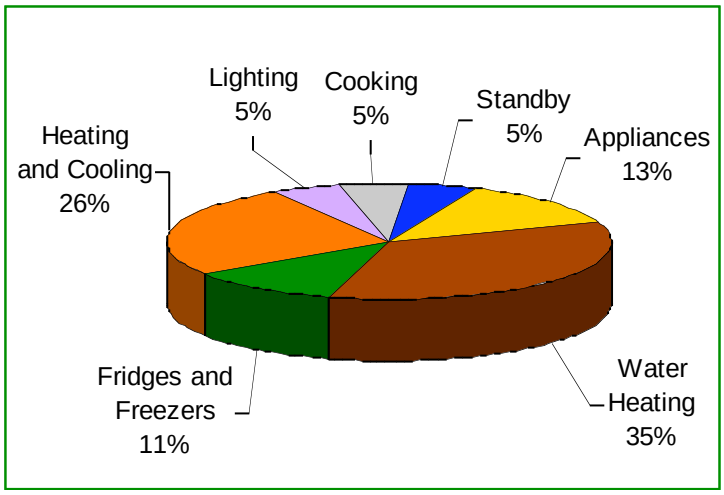


Figure 6.3 Residential Energy Consumption

As part of the Cities for Climate Protection® Program Milestone 5 requirements, a corporate energy inventory was prepared for the City of Norwood Payneham & St Peters in 2004, including Council operated buildings, fleet cars, streetlights, energy consumed in water and sewage operations and waste produced under Council activities. An energy audit of Council assets (Table 6.10) indicated the following rates of consumption during the 2004 calendar year:

Table 6.10 Energy Consumption for 2004 for the City of Norwood Payneham & St Peters

ENERGY TYPE	CONSUMPTION PER ANNUM	
	VOLUME	POWER
Electricity	n/a	11759 GJ
Gas	181941 m^3 (181,941,000 Lt)	6527 GJ
Petrol	48921 Lt	2069 GJ
Diesel	33759 Lt	8045 GJ
TOTALS	181,723,680 Lt	28400 GJ

INDICATORS OF STATE	
Annual energy use by the City of Norwood Payneham & St Peters (Corporate)	Table 6.10
Annual energy and gas use by the Community in the City of Norwood Payneham & St Peters (using CCP data) for 2001	4,458,044 GJ

6.4.3. Response

The City of Norwood Payneham & St Peters acknowledges the need to reduce energy use through its participation since 2001 in the Cities for Climate Protection (CPP®) Program. In response to reductions targets set by the CCP® Program, a number of Council initiatives have been implemented to address corporate and community emissions resulting from energy use. These initiatives have been summarised in Table 6.4 in section 6.2.3, describing the City's response to escalating greenhouse gas emissions. As part of this response, the City has employed a facilitator to investigate significant energy saving opportunities as part of a long term Council Corporate Energy Management Project (CEMP) (NPSP 2004).

CEMP is a hybrid version of the Energy Performance Contract, which identifies energy saving initiatives with an ability to generate a 20% return on investment. CEMP has implemented a number of actions across Council owned facilities including the installation of swimming pool thermal blanket covers at the Payneham and Norwood Swimming Centres, economy cycle air conditioning, and lighting upgrades to reduce energy use. A lighting upgrade of St Peter Library was one such opportunity that has already been completed.

A Photovoltaic Rebate Program has been run through the State Government of South Australia since January 2000, with the primary aim of encouraging the generation of electricity through photovoltaic technology.

Since its inception, the program has provided rebates to over 1700 households across the State worth in excess of $9.6 million. Rebates to the value of $242,630 have been approved within the City of Norwood Payneham & St Peters to date, with a combined installed capacity of 76 kW. The systems alone can generate approximately 125,322 kWh of electricity per annum thus reducing CO_2 emissions by 139 tonnes per year.

Photovoltaic cells positioned on roof top of Payneham Library building

Table 6.11 provides a breakdown on the distribution of rebates offered to residents in each suburb of the City (John Standen, DTEI, pers. comm.) since the program began.

Table 6.11 Photovoltaic Rebates by Suburb (John Standen, DTEI, pers. comm.)

SUBURB	RESIDENTIAL	COMMUNITY
Felixstow	3	
Marden	2	1
Royston Park	4	
Joslin	1	
Glynde	0	
Payneham	2	
Firle	1	
Payneham South	1	
St Morris	3	
Trinity Gardens	1	1
Evandale	0	
Maylands	4	
Stepney	2	
St Peters	2	
College Park	2	
Hackney	1	
Kent Town	0	
Norwood	10	1
Kensington	0	
Marryatville	0	
Heathpool	2	
TOTALS	**41**	**3**

The Solar Hot Water Heater Rebate Scheme is an initiative of the Government of South Australia that commenced on 1 July 2001. Rebates of up to $700 are issued for residential solar hot water systems that meet set eligibility criteria, in a statewide push to enhance energy efficiency and reduce greenhouse gas emissions.

Table 6.12 provides a breakdown of the Solar Hot Water Heater Rebates offered to residents in the City since the scheme's inception (Jinny Pavanello, DTEI, pers. comm.):

Table 6.12 Solar Hot Water Heater Rebates (Jinny Pavanello, DTEI, pers. comm.)

FINANCIAL YEAR	No. OF REBATES ISSUED
2001/02	8
2002/03	17
2003/04	24
2004/05	19
TOTAL	**68**

In 2004, the Council introduced energy self-audit kits available to residents from the three local libraries. The kit enabled users to conduct an in-home energy audit, and identify areas where energy consumption could be reduced or utilised more efficiently. The kit was initially borrowed from St Peters Library (11 loans), Payneham Library (13 loans) and Norwood Library (9 loans), but little interest has been shown in 2005.

Energy Friends, an initiative of the Government of South Australia, can provide a "Free Home Energy Check" for eligible households (Energy SA undated). A trained Home Energy Adviser can assist residents to do a complete energy audit by examining past electricity bills and electrical appliances. Advice is given on ways to reduce electricity use in general, and how to heat and cool your house more efficiently. If appropriate, the Energy Adviser can install a free energy-saving retrofit kit (AAA-rated showerhead, low-energy light globes & draft stopper) to further increase energy efficiency in the home.

INDICATORS OF RESPONSE	
Number of households receiving Photo-Voltaic rebates	41
Number of households receiving Solar Hot Water Service rebates	68
Number of households who have conducted home energy audits*	33

* based upon loans of energy self-audit kits from Council libraries

7. People and Places

7.1. Introduction

At the time of preparation of the 2002 State of the Environment Report, the development controls and strategic plans of the former Cities of Norwood and Kensington, Payneham and St Peters had not yet been fully merged for the amalgamated City of Norwood Payneham & St Peters. Consultation and planning for this alignment of vision had been initiated through the Future Directions Position Paper (2000) and other forums, and a suite of consolidated planning and strategy documents for the City have subsequently been produced.

Front aspect of Payneham Library

As an inner city local government area, urban character forms an essential component of the environment. Access to facilities, appropriate development and visual amenity contribute to both liveability and economic viability of a local government area. This was recognised in the 2002 State of the Environment Report and the theme is continued here with a discussion of urban character and community identity through the sub-themes of Residential Density and Urban Form, Open Space and Streetscape, Recreational and Community Facilitates, Transport Network, Built Heritage, Indigenous Heritage and Historical Identity.

7.2. Residential Density and Urban Form

Local Government Development Plans provide controls over the density and type of development that is allowed to occur in a council area. The planning controls set out in a Development Plan take into consideration the infrastructure and services available to support new development and the unique and valuable characters of the local area.

7.2.1. Pressure

Many aspects of the City of Norwood Payneham & St Peters contribute to the high demand for housing in the area. These qualities include proximity to central Adelaide, historic character and access to many services and facilities within the local area. The median price of houses in the City of Norwood Payneham & St Peters rose by 8.11% over the 2004 – 2005 period, compared with a state-wide average rise of 7.59% (REISA 2005).

Figures from the Real Estate Institute of SA (2005) (Table 7.1) show that several suburbs within the City of Norwood Payneham & St Peters continue to see substantial rises in median house prices, indicating demand for housing in the area.

Table 7.1 Change in Median House Price by Suburb (Real Estate Institute of SA 2005)

Suburb	No of Sales	% Change in Median Price 2004 – 2005
College Park	1	+42.86%
Evandale	3	+23.42%
Felixstow	5	+15.03%
Firle	5	+48.13%
Glynde	7	-25.15%
Hackney	1	+44.51%
Heathpool	2	+6.40%
Joslin	3	-47.38%
Kensington	4	+14.38%
Marden	4	-11.71%
Maylands	5	-0.27%
Payneham	8	-4.39%
Payneham Sth	6	-13.15%
Royston Pk	1	+25.68%
St Morris	4	+28.09%
St Peters	8	+38.19%
Stepney	3	+16.22%
Trinity Gdns	3	+5.94%

Increasing sub-division results from the combination of high demand for housing and the availability of existing large residential titles in older suburbs. The pressure to sub-divide is driven both by the demand for new housing and the economic incentives presented to developers and current owners of large residential blocks (particularly if the owners are older people retired from the workforce and/or less able to physically maintain a large residence).

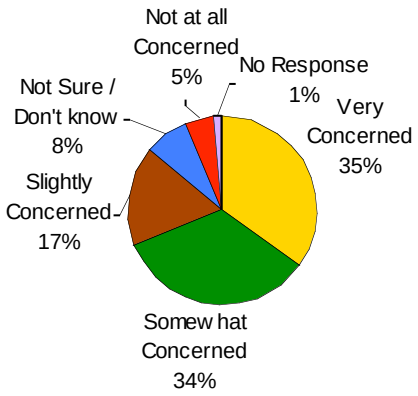
The 2002 SoE Report described demographic characteristics that contribute to the trend toward sub-division, including a higher proportion of older people and a high proportion of single person households. A comparison of the 1996 and 2001 Census data for the City (former separate Cities in 1996) and the 2001 State data show a slight increase in both of these trends and confirm that they are higher in the City of Norwood Payneham & St Peters than in the State as a whole.

Table 7.2 Select Census Results

	1996 Census (NPSP)	2001 Census (NPSP)	2001 Census (SA)
Persons aged 75 and over	10.8%	11.1%	7.0%
Single person households	38.4%	39.7%	11.1%

Community Comment…

How concerned are you about urban housing development (infill)?



The 2002 SoE Report reported that between 1994 and 2002, there were 1,202 new titles created in the Local Government area. For the financial year 2004 – 2005 Planning SA issued 84 Land Division Certificates, for the creation of 138 allotments (Steve Barnes, Planning SA, pers comm.).

The State Government of South Australia has identified a planning priority of urban containment, which is outlined in the Planning Strategy for Metropolitan Adelaide (draft 2005).

The Strategy seeks to encourage appropriate urban development and re-development to halt urban sprawl with the benefits and desired goals including:

- improvements in transport efficiency, with follow-on energy savings;
- protection of ecological assets and production landscapes located beyond the boundary of current urban development;
- maximising the value of strategic replacement and refurbishment of infrastructure; and
- minimising the development of disadvantage in communities located on the outer urban fringe.

Each Local Government Development Plan provides part of the process for implementing this statewide strategy by identifying opportunities for development whilst setting out measures to protect the character, ecological assets and utility of the area from inappropriate development.

The potential impacts of higher density development are increased stormwater run-off, increased pressure on existing infrastructure, higher consumption of resources (a side effect of lower occupancy rates per dwelling) and decreased connective habitat for native fauna (due to clearance of mature trees and provision of limited garden areas). In addition to the impacts on these resources, the historic character and visual integrity of the urban environment can be impacted if appropriate controls are not placed on the design and spatial placement of new developments.

Kensington, Marryatville, Kent Town and Norwood were settled as distinct villages by the early 1840s and their organic development as early satellite settlements means that many services and industries were interspersed with residential development. This availability of a diverse range of services and industries in the City is now one of the key attractions of living in the area. It also means that a balance between the interests of industry, retail and residential development must be maintained through the City's planning policies and development controls. In comparison with outer suburban local government areas, it is less likely that the City will be faced with new large industries seeking to establish within the area. A more likely situation is that existing light industries may seek to modify or expand the range of processes undertaken on an established site. A business premises must be licensed by the Environment Protection Agency if it produces certain hazardous wastes that are listed under Schedule 1 Part B of the *Environment Protection Act 1993*. There are also prescribed activities (Schedule 1 Part A) that require a license, including, for example, storage of chemicals, powder surface coating and abrasive blasting.

As an indicator of the rate of change in land use, the total number of licenses issued in the City and the number of applications for new licenses are given below:

Table 7.3 Total licenses at June 2005 for the City of Norwood Payneham & St Peters

Licensed for:	Number of Licenses
Activities Producing Listed Waste	7
Produce Processing Works-Deep Fat Frying, Roasting	1
Recycling Depot	1
Surface Coating - Powder Coating	1
Surface Coating - Spray Painting	2
Transfer Station	1
Waste transport business (category A): listed waste	1

Source: M Abbot, EPA, pers comm.

Between 2002-05 one new license and one exemption was issued by the EPA. Both were for previously unlicensed sites (Meredith Abbot, EPA, pers comm.).

The density of population, existing range of commerce, and socio-economic profile of the area means that the City continues to be an attractive location for new retail, commercial and entertainment outlets.

INDICATOR OF PRESSURE	
Land Division Certificates / New Allotments (2004/2005)	84 / 138

7.2.2. State of Resource

The 2002 State of the Environment Report detailed net residential density in the City, showing the number of dwellings per hectare. These statistics were compiled for a particular report (Future Directions Paper 2000) and are not updated on a regular basis. Planning SA have provided updated figures for the current State of the Environment Report. A comparison with the latest available figures is given below:

Table 7.4 Net Residential Density for the City of Norwood Payneham & St Peters

	Suburb	2002	2005
Lowest	College Park	12	12.4
Highest	Kent Town	39.9*	
	Stepney		33.9
Average net residential density across City of Norwood Payneham & St Peters		18.5	20.0

Source: C Rudd, Planning SA
Net Residential Density = dwelling count/area of all land parcels with a dwelling
*2002 State of the Environment Report figures were derived from the *Future Directions Position Paper, June 2000*. The 2002 figure for Kent Town has been re-examined by Planning SA and Earth Tech staff and is assumed to be in error.

Land use across the City has been presented in Figure 4.4. It shows the mix of light industry, commerce, retail and residential land uses as described by the graph below.

Commerce is concentrated in Kent Town and along The Parade and Payneham Road. Retail is also most highly represented along The Parade, Kensington Road, Glynburn Road, Magill Road and Payneham Road. Industry is represented in Stepney, Marden, Glynde and Kent Town. Educational land use is scattered throughout the City. Non-private residential land use is also scattered throughout, but with several large facilities represented in Glynde and Felixstow.

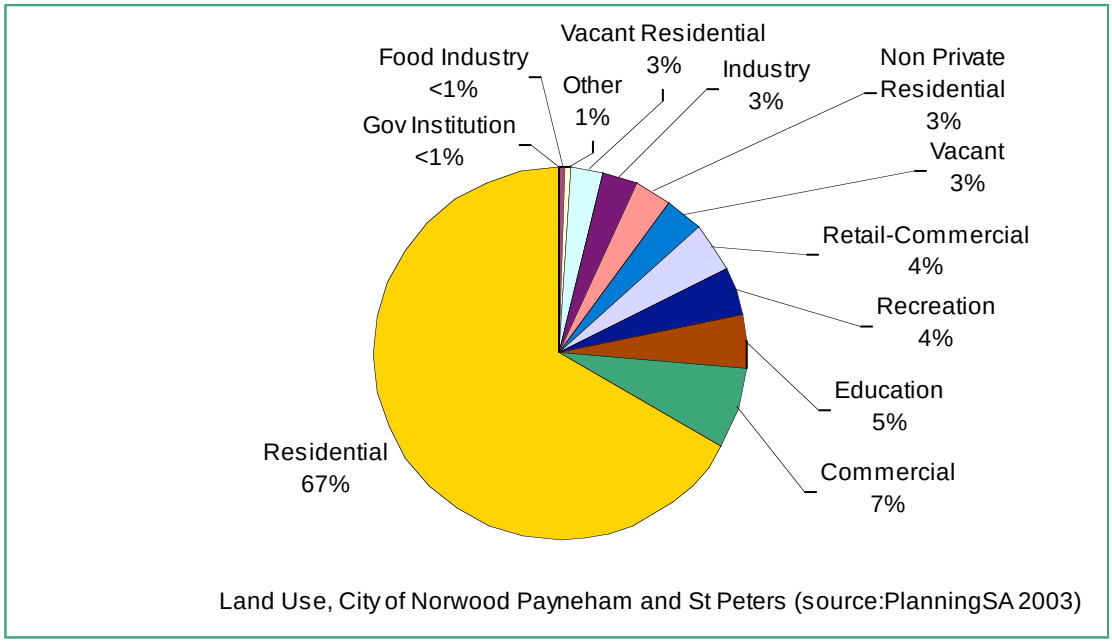


Figure 7.1 Land Use, City of Norwood Payneham & St Peters

Noise complaints were cited as a common land use interface issue in the 2002 State of the Environment Report, and data from the EPA was provided as an indicator of the significance of the issue. In 2002, the data showed that relatively few complaints were received by the EPA for City areas and that there was no clear trend of either increasing or decreasing numbers of complaints. Noise complaint data from the EPA was not available for the current State of the Environment Report.

7.2.3. Response

The City of Norwood Payneham & St Peters Development Plan is the primary document governing the way that land can be divided and developed.

The Development Plan recognises the planning pressures facing greater Adelaide and the desire to "contain the spread of the urban area" through infill development (Planning SA 2003:10). However, it also sets out objectives and principles of development control that are designed to protect the City's unique local character and lifestyle.

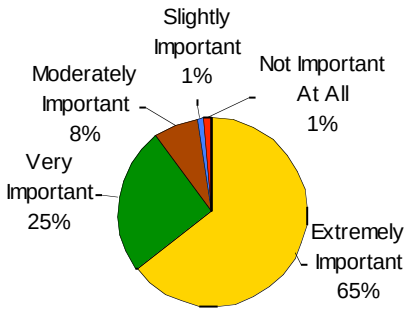
The Development Plan addresses "Form of Development" through 12 distinct objectives and 17 specific principles of development control, that include the requirement to consider economy in the provision of public services, appropriate segregation of land uses and limitation of various adverse effects on neighbours.

The Development Plan also addresses "Land Division" providing the guiding objective of "Land in appropriate localities divided into allotments in an orderly and economic manner" (Planning SA 2003:10). It sets out principles of development control that prevent certain types of division and place conditions on division that is permitted.

Zoning for the City of Norwood Payneham & St Peters is complex owing to the history of the three former councils. Further information on planning zones can be found in the Development Plan (2003).

7.3. Open Space and Streetscape

Community Comment…
How important is open space to you?



Open Space has traditionally been valued as providing opportunities for active and passive recreation for the community. The 2003 City of Norwood Payneham & St Peters Open Space Strategy recognises additional benefits provided by the open space assets of the area, including:

- conservation and biodiversity;
- aesthetic amenity;
- service in stormwater management;
- enhancement of transport and access linkages; and
- tourism opportunities.

The streetscape is recognised as an important aspect of the urban character and heritage of the City of Norwood Payneham & St Peters. The streetscape forms a valuable adjunct to the open space network particularly in local government areas where previous development and current land value make the purchase of further formal open space difficult. Protection of the visual amenity of streetscapes also encourages the use of pedestrian networks between local parks, facilities and retail areas.

7.3.1. Pressure

The 2002 State of the Environment Report identified the likelihood that urban infill pressure would continue to see access to private open space gradually diminish, placing more and more importance on the protection of public open space. Sub-division and creation of high density styles of housing means not only a loss of private recreational space but also a loss of potential corridor habitat for fauna (birds in particular). This is because these styles of development are dominated by hard surfaces rather than gardens, and often also involve removal of old trees in their construction.

Avenues Shopping Centre, Payneham Road, St Peters

In comparison with outer suburban, lower density local government areas, the established and highly developed nature of the City of Norwood Payneham & St Peters means that there is unlikely to be further significant disposal of public open space for private development, though this is not to say that small parcels are safe from development. Rather than being subject to pressures that erode the open space resource, the challenge for management of the open space resource is to be adaptive to the changing demographic trends noted above, and the changing community expectations that open space can deliver biodiversity and water management gains as well as recreational facilities.

Potential pressures on the preservation of streetscape amenity are road widening, development that is not adequately set back from the street and destruction of street trees.

A summary of the number of applications for tree damaging activities that were received by the Council's Strategic & Urban Planning division are given below:

	2001/2002	2002/2003	2003/2004
Number of Applications	164	144	78

The figures appear to indicate a downward trend. They can be influenced by fluctuations in the amount of development occurring in the local government area and may also reflect increasing community value of significant trees leading to an acceptance by developers that new designs need to allow for existing trees.

INDICATOR OF PRESSURE	
Number of applications to undertake tree damaging activity 2003/2004	78

7.3.2. State of Resource

A comparison of the open space assets presented in the 2002 State of the Environment Report and the open space assets in 2005 are presented in Table 7.5.

Table 7.5 Open Space Summary

Type of Open Space	Number of Parks or Reserves 2002	Number of Parks or Reserves 2005	% LGA Area that is Open Space 2002	% LGA Area that is Open Space 2005	Total Area of Open Space 2005
Passive Recreation	41	31			
Include Playgrounds	25	26			
Active Sporting Fields/Facilities	8	19*			
Total	74	76	6.5%	6.6%	100ha

Sources: 2002 SoE Report, Open Space Strategy 2003.
*Categories used in the 2003 Open Space Strategy are not identical to the categories reported in the 2002 SoE

The categories used for the new Open Space strategy are not identical to the categories presented in the 2002 State of the Environment Report. The new categories are not exclusive. That is, the number of parks with playground equipment may overlap with the parks classified as a General Park, for example. Several new environmental attributes have been recorded for open space reserves: Stormwater Management Area; Natural/ Conservation Area; and Linkage Area. The River Torrens Linear Park is the only open space asset considered to be a Natural/Conservation Area. May Street Reserve in Firle and the River Torrens Linear Park were the only two considered to provide corridor linkage benefits. Eight Reserves provided stormwater management services.

All of the 12 parks and sporting complexes listed as 'key' open space assets in the 2002 State of the Environment Report (2002:9) have continued to serve the community.

In 2002 it was reported that a total of 9,925 significant trees were recorded for the City of Norwood Payneham & St Peters. This consisted of 1,725 trees on private property, 8,117 trees in public road reserves and 83 in parks. Planning SA subsequently withdrew the requirement for Local Governments to formally record and maintain a register of significant trees. The significant tree database has therefore not been updated since 2002 and there are no current comparative figures (Andy Wark, NPSP, pers comm.). Despite this,

significant trees in the City are still afforded some protection through State legislation including the *Native Vegetation Act 1991* and the *Development Act 1993*.

7.3.3. Response

Since the last State of the Environment Report the City of Norwood Payneham & St Peters has produced an amalgamated Development Plan that has standardised the development controls protecting open space and streetscape in the City.

The Development Plan sets out the following objectives for open space:

Playground, Koster Park

Objective 73: Adequate public parks and recreation areas conveniently located.

Objective 74: Increased landscaped open space in the City especially along the creek system, and promotion of the creeks as unique and attractive recreational resources.

Objective 75: Upgraded street environments and additional attractively landscaped public spaces throughout the City, which assists in the re-establishment of local indigenous plant species where it is practical to do so.

And, the following objective for protection of significant trees:

> **Objective 89:** The conservation of significant trees in Metropolitan Adelaide which provide important aesthetic and environmental benefit.

An Open Space Strategy was released by the City of Norwood Payneham & St Peters at the end of 2003. The Open Space Strategy (2003) undertook an audit of existing open space assets, including the amount, location and type of open space. The Strategy also undertook an assessment of future needs and set out strategies that will help the Council to work towards achieving its Vision of " a comprehensive and sustainable network of quality open space facilities to serve the needs of the community" .

The Council was working on an urban tree policy at the time that the previous State of the Environment Report was being completed and this is currently in final draft form, to be released shortly (Andy Wark, NPSP, pers comm.).

7.4. Recreational and Community Facilities

Availability of a range of recreational and community facilities contributes to the social well-being of the community (Planning SA 2003:34) and enhances the liveability of a local government area. Local government can contribute to community cohesion by directly providing community services, recreational and meeting facilities; by providing support to community groups; and by creating planning policy that facilitates community development.

7.4.1. Pressure

Preservation of recreational and community facilities is subject to the same development pressures that contribute to urban infill, and loss of open space and urban character.

Additionally, community services and facilities experience difficulties maintaining momentum when they are reliant on volunteer resources.

7.4.2. State of Resource

A summary of recreational and community facilities listed in the SWAP community database (not necessarily a complete inventory of all facilities available in the City of Norwood Payneham & St Peters) is shown in Table 7.6.

Table 7.6 Summary of recreational and community facilities

Community Facility or Association	Number
Churches	17
Service clubs (eg RSL, Kiwanis, Rotary)	8
Schools	15
Special education centres	2
Community centres or halls for hire	21
Sporting facilities and clubs	15

This summary is provided for general information and is not intended to imply that the number of community facilities can be simply equated with social well-being.

Approximately 250 volunteers are registered to help deliver community support in the City of Norwood Payneham & St Peters. Their services are in the areas described in Table 7.7.

Table 7.7 Volunteer Contribution to Community Support Programs

Community Service Area	Number of Registered Volunteers
Home & Community Care Programme – transport services and organisation of social events	53
Community visiting programme – volunteers to visit people in residential care	51
Graffiti removal programme	32
Library volunteers	22
Youth programmes	20
Christmas Pageant	19
Beulah Road Community Centre – including tax help and teaching various skills/crafts	19
Friends of St Peters Billabong	4

7.4.3. Response

The City of Norwood Payneham & St Peters runs two community funding programs. The Community Support Donation Program is available to eligible groups who can demonstrate ongoing service to the community over a number of years or who can demonstrate the need to establish a specific community group (NPSP undated). The Community Project Grant Program allocates funds for projects that actively address identified community needs, are collaborative and inclusive, innovative and within the context of the Council's Strategic Plan (NPSP undated). In 2003 – 2004 $50,000 was distributed to 31 applicants from these funding programs (NPSP 2004).

Approximately 250 volunteers are currently registered to help to deliver community services, as detailed above. The Council provides a Volunteer Coordinator to recruit new volunteers, organise security screening, manage an induction process, allocate and coordinate volunteers to jobs and organise periodic events to recognise the work of volunteers.

The City of Norwood Payneham & St Peters is proposing the introduction of a Community Benefit Matrix Questionnaire for sporting and community groups that wish to utilise a Council owned building.

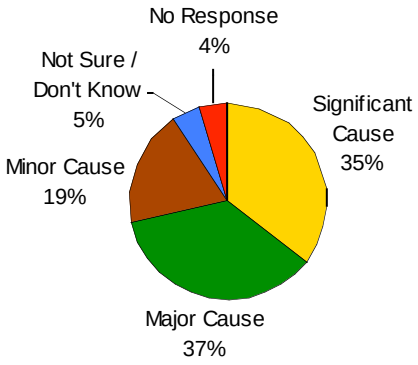
It is envisaged that the questionnaire will include the following question:

"Does you organisation contribute to creating a better environment? Yes/No
If yes, please explain"

Monitoring the number of positive responses to this question will provide a sample to collate an indicator of the contribution of sporting and community groups that are utilising Council owned buildings towards creating a better environment.

7.5. Transport Network

Community Comment…
How would you rate motor vehicles as a cause of environmental decline?



Motor vehicle transport puts pressure on air quality, increases greenhouse gas emissions and energy consumption. Higher traffic flows also reduce road conditions, leading to a requirement for more regular maintenance.

7.5.1. Pressure

The major pressure on the transport network is the on-going increase in use of private motor vehicles.

The direct environmental impacts of reliance on private motor vehicles include emissions of greenhouse gases and other air pollutants, run-off of engine oils and fluids into the stormwater system, and generation of excess noise. The congestion caused by excessive traffic also discourages cycling and walking as alternative greener modes of transport, and reduces the performance of the public transport system.

Table 7.8 represents a summary of method of transport to work places that residents of the City of Norwood Payneham & St Peters indicated in the 2001 census.

Table 7.8 Method of Transport to Work (Census 2001)

Mode of Travel to Work	Number	%
Car - as driver	9,051	59.6
Car - as passenger	860	5.7
Motorbike	35	0.2
Truck	84	0.6
Taxi	61	0.4
Train	6	0.04
Bus	1,175	7.7
Tram	0	0
Bicycle	353	2.3
Walked only	688	4.5
Other	51	0.3
More than one method of transport	308	2.0
Worked at home	615	4.0
Did not go to work	1,713	11.3
Not stated	189	1.2
Total	15,189	100.0

If figures for people who did not respond, did not go to work and who stated more than one method were excluded, the results show an even greater proportion of people using private vehicles as their mode of transport to work (69.7% as the driver and 6.6% as a passenger).

The number of vehicles registered by postcode in the City of Norwood Payneham & St Peters has been supplied by TransportSA (Peter Bravey, TransportSA, pers comm) and is summarised in Table 7.9.

Table 7.9 Summary of Registered Vehicles by postcode (Peter Bravey, TransportSA, pers comm)

Postcode	Number of Vehicles Registered
5067	8,816
5068	8,963
5069	6,487
5070	9,564

Note that the postcodes 5069 and 5070 fall entirely within the council area while postcodes 5067 and 5068 include the suburbs of Rose Park, Kensington Gardens, Kensington Park and Leabrook which are not in the City of Norwood Payneham & St Peters.

INDICATOR OF PRESSURE	
Number of vehicles registered for postcodes 5069 & 5070	16,051

7.5.2. State of Resource

There are approximately 171 kilometres of road in the City of Norwood Payneham & St Peters. The key East-West roads servicing the City of Norwood Payneham & St Peters are Magill and Kensington Roads, and The Parade. Glynburn and Portrush Roads are the key North-South roads and Payneham Road and North Terrace carry high volumes of traffic between the north eastern suburbs and the City of Adelaide.

A selection of annual average daily traffic estimates for 24 hour two-way flows for sections of key roads are given in Table 7.10. (DTEI 2005):

Table 7.10 Selected annual average daily traffic estimates

Section of Road	Traffic Volume Estimate (24 hour two-way flows)
Payneham Road (between Nelson St and Magill Rd)	33,900
North Terrace (between Payneham and Hackney Rds)	34,400
Magill Road (between Portrush Rd and Osmond Tce)	27,500
The Parade (between Portrush Rd and Osmond Tce)	18,800
Kensington Road (between Portrush Rd and Osmond Tce)	22,100
Portrush Road (between Payneham and Magill Rds)	27,400

Over 20 bus services pass through the council area, including Go Zones along Payneham Rd, Coorara Ave, Magill Rd, The Parade, and the Adelaide O-Bahn.

Bicycle lanes are provided along the following roads:

- Stephen Terrace/Nelson Street/Osmond Terrace
- Magill Road
- The Parade and Parade West (from Osmond Terrace, and in Kensington)
- William Street
- Beulah Road (part)
- George Street (Norwood)
- Sydenham Road

Bike Direct maps outlining bike routes in metropolitan Adelaide are made available at Council offices and the Council's three Public Libraries, as well as Transport SA website: www.transport.sa.gov.au.

7.5.3. Response

TravelSmart is an educational campaign initiated by TransportSA aiming to reduce transport-related greenhouse gas emissions through travel behaviour change and a shift in societal values towards sustainable travel patterns (TransportSA 2005). The City of Norwood Payneham & St Peters is one of eight Local Government areas participating in the campaign and had appointed a TravelSmart Project Officer in late 2003 (position currently vacant due to resignation). The appointment of a local TravelSmart Officer, who was shared with the City of Prospect and the Town of Walkerville, meant that the aims of the program were conveyed with local relevance, raising local community awareness of alternative travel options in the council area, promoting the use of local services and lobbying for initiatives and improvements to local bicycle, pedestrian and public transport networks.

Projects run by the TravelSmart Officer for the City of Norwood Payneham & St Peters over 2003 - 2005 included:

- *10,000 Steps Along The Parade* – participants received education about using sustainable forms of transport such as cycling, walking and passenger transport and the associated health and environmental benefits of doing so.
- *Sustainable Transport Access Guide for The Parade* – was distributed to residents and businesses in Norwood through The Messenger newspaper.
- *Passenger Transport tickets for business-related travel* – provision of passenger transport tickets to Council staff for business-related travel.

- *Walk to Work Day* – an annual, national event run by the Pedestrian Council of Australia. In November 2004 staff from the City of Norwood Payneham & St Peters participated in the event. Pedometers were loaned to highlight the incidental exercise associated with using a sustainable form of transport. On the day, participating staff used sustainable transport to travel over 96 kilometres that would normally have been travelled by car.

It is primarily the South Australian Department for Transport Energy and Infrastructure who are responsible for planning initiatives that improve use of public transport. However, input from, and negotiation with, local government is essential in realising physical improvements on the ground. Changes to the road network are limited by the historical layout of the City of Norwood Payneham & St Peters, but changes to the configuration of lanes and right of way at intersections can improve the performance of public transport. Provision of infrastructure such as the "smart stops" and appropriate street furniture improve the community's experience of the public transport network.

Recently "Smart Stops" have been installed along The Parade providing commuters with 'real time' visual and auditory information regarding the arrival of buses.

The City of Norwood Payneham & St Peters has committed to a program of footpath upgrades. Footpath upgrades encourage the use of pedestrian networks and are critical in enhancing accessibility for users of wheelchairs, 'gophers' and pushers. In the 2003 – 2004 financial year 94,652m² of pavement surfaces were resealed, about 4,110 metres of kerbside was replaced and brick paving measuring 9,609m² was replaced at various points across the City. In the 2004 – 2005 financial year, some 107,296m² of road pavements are expected to be resealed, 3,739 metres of kerbside will be replaced and brick paving will be replaced over an area of 13,712m² (NPSP 2004).

7.6. Built Heritage

According to the *Development Act 1993*, a Development Plan may designate a place as a place of local heritage value if--

(a) it displays historical, economic or social themes that are of importance to the local area; or

(b) it represents customs or ways of life that are characteristic of the local

(c) it has played an important part in the lives of local residents; or

(d) it displays aesthetic merit, design characteristics or construction techniques of significance to the local area; or

(e) it is associated with a notable local personality or event; or

(f) it is a notable landmark in the area; or

(g) in the case of a tree …it is of special historical or social significance or importance within the local area.

Kiln from original property, Koster Park

Items on the State Heritage Register:

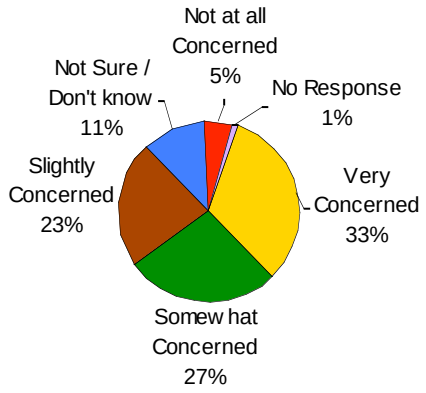
- Demonstrate important aspects of the evolution or pattern of the State's history;
- Have rare, uncommon or endangered qualities that are of cultural significance;
- Yield information that will contribute to an understanding of the State's history, including its natural history;
- Are an outstanding representative of a particular class of places of cultural significance;
- Demonstrate a high degree of creative, aesthetic or technical accomplishment or are an outstanding representative of particular construction techniques or design characteristics;
- Have strong cultural or spiritual associations for the community or a group within it; or/and
- Have a special association with the life or work of a person or organisation or an event of historical importance.

Cultural Heritage Trail Marker

The Register of National Estate echoes similar criteria, on an Australia-wide level of significance. The Register of National Estate is a statutory register established under the *Australian Heritage Commission Act 1975*. The *Australian Heritage Commission Act 1975* has recently been repealed, but the Register has been retained under the new *Australian Heritage Council Act 2003*. A new Commonwealth Heritage List and National Heritage List have been created under the *Environment Protection and Biodiversity Conservation Act 1999*.

Community Comment…

How concerned are you about the loss of built heritage?



7.6.1. Pressure

Pressure to develop heritage listed sites arises from owners being able to realise economic gain through demolishing and dividing land, enabling higher density occupation. The value of built heritage is also eroded through general deterioration in the condition of properties, in the case where owners are unable to afford maintenance.

7.6.2. State of Resource

The properties listed on the State Heritage Register and the Register of the National Estate are listed in Appendix G. A summary of Local Heritage Places can be found in the City's Development Plan. A comparison of the summary figures from the 2002 SoE Report and current listings on the Australian Heritage Places Inventory and Council Development Plan (2003) is shown in Table 7.11.

Table 7.11 Summary figures comparison

Heritage Listing	No of Properties 2002	No of Properties 2005 (or most recent collated data)
Register of the National Estate	15	39
State Heritage Register	68	73
Local Heritage Register	1,137	456 listed properties for the Norwood and Kensington area with properties in other areas to be listed as a result of the two forthcoming Heritage PARs.

The bulk of heritage listed properties are residences of the Victorian and Edwardian period, representing the time of rapid housing development after early settlement. There are also a number of early symmetrical and attached row cottages, as well as churches and civil buildings, hotels and shops and factories.

7.6.3. Response

A listing on the Register of National Estate does not place any direct constraints on private property owners with respect to management of the property (AHC 2004). A listing on the State Heritage Register requires property owners to gain approval for any alterations, development or demolition.

State Heritage Building, Bells Plumbing Shop, Payneham Road, College Park

The Development Plan for the City of Norwood Payneham & St Peters requires the development approval process to take the heritage values of properties into consideration and assess how any modification or development may impact that heritage value.

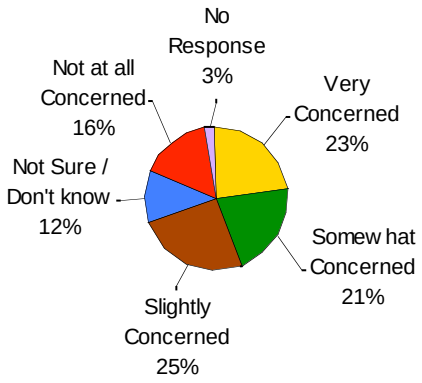
Since late 2005, the Council has offered a free Heritage Advisory Service to owners of a State or Local Heritage Place or a building within a Historic Conservation Zone (whether specifically listed or not). Owners have been able to obtain free expert architectural advice from the Council's Heritage Advisor on building maintenance and renovation proposals as well as information on potential funding sources and assistance with development applications. The Council also developed a Local Heritage Place Grant scheme that will be introduced in 2006. The Scheme will offer assistance to owners of heritage listed properties in the form of restoration advice and funding to undertake works. The Local Heritage Place Grant is being developed in recognition of the high costs incurred by property owners for maintenance and restoration works that deliver great public benefits by preserving the historic character of the local government area.

Federation Arch, near Patterson Oval, Payneham

In late 2005, the Council released two Heritage Plan Amendment Reports (PAR) for public consultation, the Heritage (St Peters, Kensington & Norwood) PAR, and the Heritage (Payneham) PAR. These PARs propose to list additional Local Heritage Places in the Council's Development Plan as well as review the Council's heritage policy

7.7. Cultural Identity and History

Community Comment…
How concerned are you about the loss of Aboriginal heritage?



Items of moveable heritage, such as photographs, documents and artefacts, provide a tangible connection to the past and are effective in communicating heritage to the public.

When brought together in a collection these items form a valuable resource. A repository of primary historical documents and artefacts provide a record of the past that future researchers can query and interpret according to changing community interest and research priorities.

Traditional Aboriginal culture comprises complex relationships with the land that connect spirituality, laws of conduct, kin relations and natural resource management. Oral traditions preserve and are used to teach this knowledge. Many groups are now working to record, and recover from historical sources, information about language structure, ceremony, clan ancestry, and ethno-botanical knowledge.

7.7.1. Pressure

As in the case of built heritage, indigenous archaeological heritage is vulnerable to destruction due to development pressure. This pressure poses even more difficulty in the case of archaeological deposits because their presence is often not discovered until disturbance has occurred. Under Section 20 of the *Aboriginal Heritage Act 1988* landholders must report the discovery of Aboriginal sites, objects and remains to the Minister for Aboriginal Affairs as soon as possible. The *Aboriginal Heritage Act 1988* protects all Aboriginal sites, objects and remains regardless of whether or not they are already listed on the Register of Aboriginal Sites and Objects.

Traditional Aboriginal knowledge has been lost throughout the historical period due to intentional policies of assimilation as well as acculturation. The importance of this knowledge for indigenous people's sense of identity and continuity, and for non-indigenous people who now live in this environment, has begun to be acknowledged by the wider community and at all levels of government

Cultural institutions charged with the responsibility of caring for artefacts, such as the Council History Collection, often need to prioritise items or choose between items offered to their collection because of constraints on physical storage space and constraints on funds available to professionally conserve deteriorating items. The Norwood History Centre utilises the assistance of volunteers. Volunteer attrition is therefore also a pressure on the operation of the centre.

7.7.2. State of Resource

Indigenous heritage is evidenced through physical archaeological deposits such as middens, scatters of stone tools, scar trees and burials. Indigenous heritage is also conserved through cultural practice such as language, ceremony and crafts. The Department for Aboriginal Affairs and Reconciliation's Central Archive does not have any sites of significance recorded for the City of Norwood Payneham & St Peters area.

In the 2001 Census there were 125 indigenous Australians living in the City of Norwood Payneham & St Peters. Nine people were speaking Aboriginal languages in the home, but no people were practising Australian Aboriginal Traditional Religions (ABS 2001a & b).

The History Centre operates three days a week. It holds a large collection of documents, photographs and ephemera relating to the City of Norwood Payneham & St Peters. A number of publications have also been developed by the staff and volunteers of the Centre.

7.7.3. Response

The City of Norwood Payneham & St Peters Cultural Heritage Program provides the following services (NPSP website 2005):

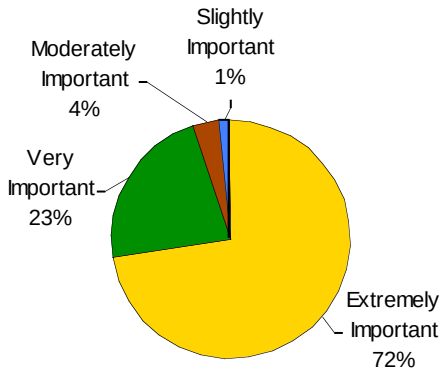
- Management and preservation of the Council's History Collection;
- Provision of information on local family history, houses, streets and public buildings;
- Professional site histories for corporations or businesses;
- Referrals to heritage agencies;
- Outreach education programmes for school and community groups;
- Oral history programme;
- Development of historical exhibitions and displays;
- Coordination of historical plaques programme;
- Provision of guided historical walks and tours; and
- Coordination of heritage events.

8. Waste Management

The issues associated with waste management have become paramount in today's society, particularly when considering the rate of population expansion combined with the high rate of product consumption in developed countries. The impacts of waste on the environment fall into two broad categories, namely impacts arising from physical disposal and inefficient resource use. Waste recycling is an important strategy to help preserve and utilise these finite resources that may become 'waste', by redistributing used products from one industrial, commercial or residential sector to another where it may be reused as a resource.

Community Comment…

How important is best practice waste management to you?



'The disposal of waste to landfill removes the potential to derive a higher resource value from the waste materials through re-use, recycling and resource recovery. Producing unnecessary waste means we are not using resources sustainably.'

(Zero Waste 2004b "What is Zero Waste" web page)

South Australia has been identified as one of the best recycling regions in the world, diverting some 62 % of recyclables from landfill (Nolan ITU, 2004). South Australian Local Governments (or contractors) are responsible for most aspects of domestic waste management in terms of recycling, collection, storage and disposal, and they therefore have the ability to dramatically improve and encourage efficient, sustainable waste management practices. In particular, Councils often prioritise waste minimisation initiatives due to the many benefits this approach provides, including:

- Reduced demand for landfill space;
- Conservation of resources and energy;
- Reduced pollution of the environment; and
- Cost savings (cleaner production, efficiency of production, reduced disposal).

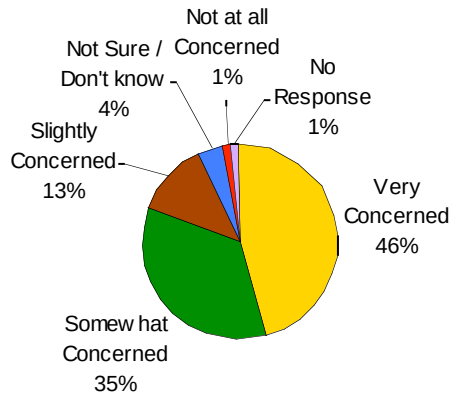
The City of Norwood Payneham & St Peters produces waste from three major sources; domestic (household and public place waste), commercial and industrial (business, government and schools), and construction and demolition waste. The majority of non-recyclable refuse from the City ends up in landfill at Inkerman, 85km North of Adelaide. Prior to January 2005, all waste was disposed of at Wingfield Dump.

8.1. Domestic Waste

Norwood Payneham & St Peters sub-contracts the City's waste collection services to East Waste, who coordinate periodic collection of common domestic waste, and yearly hard rubbish collection of items not collected in usual circumstances (e.g. carpet, white goods). Every residential property has three bins to accommodate their refuse; a 140 L mobile garbage bin with a red lid for the collection of household waste (non-recyclable), a 240 L mobile garbage bin with a yellow lid for recyclable waste, and a 240 L green mobile garbage bin used for green organics. 46 % of survey respondents indicated that they were very concerned about domestic waste management in the City of Norwood Payneham & St Peters.

Community Comment…

How concerned are you about domestic waste management?



The three-bin system was introduced in January 2004 as part of the integrated waste management program, reaffirming Councils commitment to streamline the volume of materials recycled and thereby reduce the amount of waste going to landfill.

In 2004-2005, the City of Norwood Payneham & St Peters residential roadside refuse collection service removed:

- 7750.90 tonnes of waste in non-recyclable bins
- 3694.04 tonnes of waste in greens bins
- 3681.84 tonnes of waste in recyclable bins
- 600.68 tonnes of hard refuse from 4,053 residences (522.37 tonnes to landfill)

(Ann Blinman, East Waste, pers comm.;
Sarah Wigley, NPSP, pers comm.)

The total weight of waste collected during 2004-2005 through the roadside refuse collection service was 15 727 tonnes from around 15 000 rateable properties.

8.1.1. Pressures

The environmental burdens relating to the physical disposal of domestic waste include:

- Loss of landscape amenity;
- Loss of productivity of the land, including ecosystem value;
- Generation of environmental odours;
- Generation of greenhouse gases through the breakdown of wastes, and through transportation of waste from collection to disposal points;
- Creation of habitat for weedy plants and pest animals; and
- Potential pollution of groundwater resources.

In addition, there are the economic burdens associated with the operational costs of collection, and loss of monetary value of the land that has been given up to waste disposal.

From a sustainability perspective, as landfills near capacity, there will be a need to travel further to dispose of waste, increasing transport costs and the subsequent release of greenhouse gases and air pollutants. Furthermore, the process of site restoration once the filling phase has ended can be costly. The land must be restored in accordance with the requirements of local planning and environmental authorities in a way that controls environmental emissions until they no longer pose a risk. The recognition of substantial and prolonged expenses associated with this stage has escalated the cost of waste disposal in recent years, and is reflected by appropriate council rate increases for all consumers.

Our consumer driven society has grown accustomed to producing and using materials in linear life spans consisting of production, use and disposal. For society to exist in a sustainable balance with the finite resources of the environment, we must look at opportunities to reduce waste, reuse and recycle materials. Wastage of resources and energy is a broad impact on the environment represented by our high disposal of waste to landfill. All of the energy and materials locked up in the waste discarded to landfill represents the inefficient use of these resources.

INDICATORS OF PRESSURE	
Solid domestic waste sent to landfill	8273 tonnes

8.1.2. State of Resource

The Wingfield Dump, which used to accept some 70 % of Adelaide's metropolitan waste (EPA 2003), closed its landfill services in December 2004. Wingfield has subsequently become a transfer depot where waste is processed (i.e. sorted and recyclables removed) and compacted before being transported to new landfill sites. WasteCare SA, a local government regional subsidiary (Adelaide City Council, City of Campbelltown, City of Prospect, City of Charles Sturt, City of Norwood Payneham & St Peters, Town of Walkerville), has been formed to manage and coordinate the transfer of waste from the Waste Management Centre at Wingfield to the new Inkerman landfill site approximately 85km north of Adelaide (NPSP 2004).

In addition to the Wingfield Waste Management Centre and Inkerman Landfill site, Adelaide metropolitan waste is received another four licensed landfill sites.

- Maslin Beach (Southern Waste Depot);
- Pedler Creek (Southern Region Disposal Depot);
- Dublin (Integrated Waste Services Balefill);
- Nuriootpa (Waste Management New Zealand); and
- Uleybury (Northern Adelaide Waste Management Authority Balefill).

(Zero Waste SA 2004b)

It is estimated that at current waste disposal rates the available void space in these licensed landfills will meet the waste disposal needs of Adelaide for at least the next 20 years (EPA 2003).

8.1.3. Response

The City proposed a number of strategies and activities in their 2006 Strategic Plan (NPSP 2006) to encourage a "reduce, re-use, recycle" waste management philosophy. These included:

- working with the community to prepare a waste management strategy;
- maintaining a waste management programme that encourages minimisation, re-use and recycling;
- promoting waste management issues through "Look East" and the [council] web site;
- providing waste management information for residents;
- encouraging domestic composting and mulching of green waste;
- promoting a waste minimisation philosophy, for Council operations, the community and industry; and
- working with the Eastern Health Authority to monitor the disposal of industrial and commercial waste.

The Council's kerbside refuse collection service is supported by the promotion and production of printed educational materials describing the benefits of recycling and information on how to correctly sort and present materials for collection. In addition, electronic versions of similar information are available on the City's website, and on the website for East Waste (contractor). The three bin kerbside collection system introduced as part of the Integrated Waste Management Program has been successful in reducing the City's waste to landfill.

Over a period between January and June 2004, the new system produced, in comparison to the equivalent period in 2003:

- 38 % drop in household waste going to landfill;
- 75 % increase in the collection of recyclable products; and
- 1638 % increase in the collection of green organics. (NPSP 2004)

East Waste collected 7375.92 tonnes of waste through the recycling and green organics bins from the City during the 2004 - 2005 financial year, representing an additional 47 % of total 2004-05 domestic waste that would otherwise have gone to landfill.

The Council also offers a domestic battery disposal and car oil collection service at the Council depot. The Council has also recognised the need to assist residents in cleaning up the large volumes of leaves dropped in streets dominated by deciduous exotic species. The annual Autumn Leaf Pick-up Program is coordinated in areas that experience heavy leaf fall, in an effort to improve the quality of water entering the creek and river systems.

The City of Norwood Payneham & St Peters has an active role in Wastecare SA, an alliance of six Local Governments formed to manage and coordinate the transfer of waste from the Waste Management Centre at Wingfield to Inkerman Landfill (NPSP 2004). This association allows the City to be involved in developing regional strategies for waste minimisation and to plan for future waste disposal facility requirements.

In January 2004, the Council became a signatory to the National Packaging Covenant in a step that reaffirmed its commitment to minimising the impacts of consumer packaging waste on the environment. The City successfully obtained funding to support a Plastic Bag Reduction Campaign, which aimed to discourage the use of plastic bags by providing residents with re-usable 'Sustainable Shopper' bags and reminder fridge magnets for every 10 plastic bags traded in (NPSP 2004). Plastic bag recycling bins are also provided at the Councils three libraries and the Norwood Town Hall (NPSP 2005).

The State Government launched Zero Waste SA in 2003, which is intended to set up a framework for government to work with Local Government and industry to drive a new State-wide integrated strategy for waste reduction, waste minimisation, recycling and waste disposal (Zero Waste SA 2004).

INDICATORS OF RESPONSE	
Percentage diversion of domestic waste materials going to landfill (via recycling and greens bins)	47 %

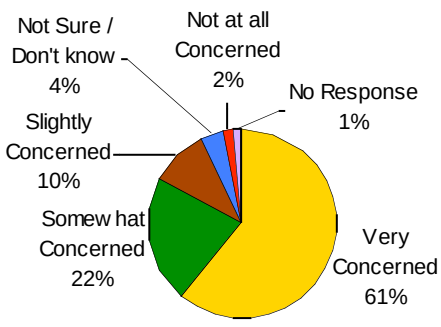
8.2. Commercial and Industrial Waste

Commercial and industrial waste is generated by commercial, industrial or trade activities, including construction and demolition, and is considered to pose a low hazard to the environment (EPA 2005a). The impacts on the environment from disposal of commercial and industrial waste are similar to those caused by disposal of domestic waste, though at a higher volume.

In 2000, the Environment Protection Agency published the results of an audit of landfill sites that involved collecting data on weights of materials deposited at six landfill sites in metropolitan

Community Comment…

How concerned are you about commercial and industrial waste?



Adelaide and recording the sources of the material from the delivery vehicles. The audit showed that, by weight, 53.1% of waste deposited to the landfill sites was from building and demolition activities, 15.7% from the Commercial and Industrial sector, 27.5% from domestic sources and 3.7% from other sources (EPA 2000). Table 8.1 describes the industry sector breakdown for commercial and industrial waste.

Table 8.1 Metropolitan Adelaide weight of commercial and industrial waste deposited to landfill sites by industry.

INDUSTRY DESCRIPTION	% BY WEIGHT
Manufacturing	44.7
Retail Trade	17.5
Mixed small to medium enterprise	10.6
Hospitality	7.7
Government/admin/defence	3.6
Services supply	3.3
Wholesale trade	2.1
Education	2.1
Health and community services	1.9
Agriculture/forestry/fishing	1.8
Transport and storage	1.6
Property and business services	1.6
Unknown	0.8
Cultural and entertainment	0.3
Communication services	0.2
Construction	0.1
Mining	0.1
TOTAL	**100%**

* Adapted from EPA South Australia Landfill Audit Report 2000

Table 8.2 describes the industry sector breakdown for Building and Demolition waste.

Table 8.2 Metropolitan Adelaide weight of building and demolition waste deposited to landfill sites by industry in 2000

INDUSTRY SECTOR	% BY WEIGHT
Institutional/Govt building & devt	35.9
Residential building & devt	28.4
Residential demolition	16.3
Commercial building & devt	10.7
Unknown	2.2
Institutional/Govt building demolition	2.1
Landscaping building & demolition	1.9
Commercial demolition	1.7
Other building & demolition	0.9
TOTAL	**100%**

* Adapted from EPA South Australia Landfill Audit Report 2000

Although the effects on the environment of domestic and commercial/industrial waste are similar, there are differences in the composition of that waste and in the behavioural context that results in waste disposal.

Whilst domestic waste is characterised by small volumes of mixed materials waste, commercial and industrial activity sometimes results in larger volumes of particular types of materials. This potentially means that much less processing is involved in separating recyclable materials and may mean that it is viable to source economically attractive

arrangements for removal of clean recyclables by contractors who can sell and or reuse these materials.

Unfortunately one of the main disincentives to the commercial and industrial sectors participating in waste recycling is the perception that this will impose an economic burden through extra time and labour expended. In comparison to domestic contexts, workplaces find it challenging to alter routine and documented procedures in order to accommodate waste reduction strategies. 61 % of survey respondents indicated that they were very concerned about commercial and industrial waste in the City.

8.2.1. Pressures

The City is home to an array of commercial and light industrial activities, including cafes, shops and businesses along The Parade and Magill Road districts, interspersed with a variety of businesses, light industry, and food manufacturers particularly around the Glynde area. Currently land use data, as presented in Section 7.3, indicates that Industry accounts for 4% (industry – 3 %, food industry – 1 %) and Commerce for 11% of land in the City of Norwood Payneham & St Peters (Planning SA 2003). The attractiveness of the City has seen a steady growth in the redevelopment and or subdivision of pre-existing residences, but little new development given the already highly urbanised nature of the City.

An increasing number of commercial and industrial premises in the City will see a comparative increase in the production of commercial and industrial waste. Construction and demolition activities associated with development inside the council area will result in a greater need for waste disposal on a project by project basis. During the 2004-05 financial year, a total of 84 land division certificates were issued resulting in the creation of 138 allotments (Steve Barnes, Planning SA, pers comm.)

INDICATORS OF PRESSURE	
Change in commercial and industrial land use	To be determined for future SoEs

8.2.2. State of Resource

Commercial and industrial waste that is not recycled goes to the same landfills as domestic waste as described above in Section 8.1.2.

The amount of materials being recycled within industry is not known (EPA 2003). As businesses and industry have adopted their own solutions to recycling and waste disposal through private contracts, consolidated statistics are not available. Some indication may be gauged from the number of EPA licensed sites in the City, currently at 10 (Meredith Abbot, EPA, pers comm.). These businesses are listed for a variety of reasons including the production of listed waste, or activities that involve produce processing works, waste transfer, recycling or surface coating.

A waste audit was conducted in August 2005 to approximate the annual production of Council corporate waste. Waste was collected from recycling and general rubbish bins at council owned facilities and then sorted into categories as seen in Table 8.3.

Team members conducting a waste audit, 2005

Table 8.3 Waste Categories of Council waste audit, August 2005

Waste Stream	Tonnes (collected in 1 week)	Approximated Annual Tonnage
Paper products (paper/cardboard)	0.09821 (23%)	5.107
Food waste	0.05808 (13%)	3.020
Wood/textiles	0.00338 (1%)	0.176
Other waste (plastic, metal, glass, medical)	0.2025 (45 %)	10.530
Depot waste (greens, construction & demolition)	72.35 (16 %)	3762.200
TOTAL	**72.71 tonnes per week**	**3781.003 tonnes per year**

Paper products, the majority of other waste, and depot waste are all recyclable waste streams. Of this total volume, approximately 19.7 tonnes per year of administrative waste is predicted to go to landfill (based on weights recovered from non-recyclable bins). A level of concern was expressed about the volume of recyclable paper products found in non-recyclable bins. In addition to the 'Other' and 'Depot' waste generated, and additional 274 tonnes of waste from litter collection and footpath sweeping services ends up in landfill per year.

INDICATORS OF STATE	
Tonnes of commercial and industrial waste to landfill	Unknown
Tonnes of council administrative waste to landfill (approximate per year)	19.7 tonnes

8.2.3. Response

Residential green waste is collected via the three bin system which is then commercially processed to produce mulch and compost for retail (David Waters, NPSP, pers comm.). While waste from depot operations is currently disposed of as 'mixed waste,' the recovery company sorts the waste off-site into recyclable streams. A new waste stream enabling on-site sorting into recyclable waste streams is being introduced in 2006 (David Waters, NPSP, pers comm.).

A recent Council policy change is encouraging the use of electronic communication rather than hard copy media, while recycled paper is now used in all photocopy machines. In addition, officer toner and ink cartridges are recycled. The City has recently begun a review to expand the 'green' element of their procurement policy.

Businesses utilise the same bin system as that in the residential sector of the City, disposing of standard refuse through the kerbside collection program. Organisations can pay for additional bins to be collected through the same program, but those producing more waste than is feasible for kerbside collection would generally require the services of a private waste management contractor. Commercial and industrial waste that poses either a high risk or is unsuitable for regular kerbside collection programs must be disposed of appropriately through a private, licensed contractor.

At a State level, the EPA, in conjunction with Business SA, WorkCover and other agencies, have developed a number of tools and training packages to assist business and industry to analyse and improve their environmental performance, including:

- the Small Business Eco-efficiency Training Program - assists businesses to understand what eco-efficiency means and how they can benefit. Tools and techniques are provided to help identify efficiencies that in many cases result in financial benefit and reduced environmental impacts (EPA 2005b);

- Greening the Supply Chain – improving the efficiency of supply chains through environmental performance agreements between medium to large business, their suppliers and the EPA (EPA 2005c);
- Greener Business Alliance Program – assists medium to large sized businesses to improve their environmental performance along a supply chain through partnership with the EPA, allowing the business to act as a mentor and effect environmental change down through to its suppliers (EPA 2005c); and
- publications such as the Business and the Environment Handbook (Business SA publication) and Small Business Environmental Management Solutions (joint EPA, Business SA, WorkCover and City of Onkaparinga publication).

In 2000, the Federal Department of the Environment and Heritage produced best practice Waste Reduction Guidelines (DEH 2000) for the construction and demolition industry.

8.3. Hazardous Waste

Hazardous wastes are wastes that have the potential to harm humans or the environment, in either the short or long term. A person or business must be licensed by the Environment Protection Agency if it produces certain hazardous wastes (including medical waste) that are listed under Schedule 1 Part B of the *Environment Protection Act 1993*. There are also prescribed activities (Schedule 1 Part A) that require a license including, for example, the storage of chemicals, sewage treatment and abrasive blasting.

8.3.1. Pressures

The pressures leading to increased disposal of hazardous waste derive from an increased population requiring more services that generate such wastes. An example would be an increase in medical facilities to service an aging population.

Substantial changes in the demand for disposal of hazardous waste can occur temporarily in response to major development projects. Demolition and site remediation can result in large volumes of contaminated soil or asbestos, for example, that require disposal. The production of hazardous waste in association with demolition and site remediation/redevelopment is particularly pertinent in this City, which may be described as a popular, older established area with new housing construction usually being redevelopment or urban infill.

INDICATORS OF PRESSURE	
Increase in EPA licensed premises producing hazardous waste	To be determined for future SoEs

8.3.2. State of Resource

There are 10 licenses issued by the EPA for activities occurring in the City of Norwood Payneham & St Peters (Meredith Abbot, EPA, pers comm.). Of the 10 licensed premises, 7 were approved for producing listed waste while the remaining 3 relate to prescribed activities. Two applications for licenses were received and approved by the EPA during 2002-2005 inclusive, concerning established sites in the City that were previously unlisted.

The EHA receives complaints in relation to hazardous waste, but often refers these matters onto appropriate organisations including the Department of Health (e.g. regarding infectious diseases) and the EPA (e.g. asbestos complaints). Six sharps complaints were received by the EHA during each of the two past financial years, constituting 7 % of total complaints relating to environmental management and sustainability for both 2002/2003 and 2003/2004 (Peter Snell, EHA, pers. comm.).

INDICATORS OF STATE	
Number of EPA premises licensed for activities producing listed waste	7
Number of complaints regarding hazardous waste made to EHA (2004/2005)	6

8.3.3. Response

Disposal of hazardous waste is controlled by the State through legislation administered by the Environment Protection Agency (EPA). The legislation administered by the EPA includes:

- *Aquaculture Act 2001;*
- *Environment Protection Act 1993* ;
- *Radiation Protection and Control Act 1982;* and
- *Wingfield Waste Depot Closure Act 1999.*

These Acts set out regulations regarding transport and storage of hazardous substances, licensing of prescribed activities, fines and levies, and define the powers of the Agency to inspect and issue direction.

The EPA operates a collection depot for household waste. This depot does not accept hazardous waste from commercial sources. The EPA can provide advice to commercial operators, but they are required to organise disposal or re-processing of hazardous wastes by licensed facilities.

Zero Waste SA has set up a mobile household hazardous waste collection service. This unit is currently able to operate at one location at a time due to requirements for qualified staffing, provision of secure storage and licensed and equipped vehicles for transport of the collected waste.

Zero Waste SA held their first mobile collection service in Norwood Payneham & St Peters on 18 June 2005, at the Council's Depot. Hazardous household waste was accepted from residents within the City and from the neighbouring Town of Walkerville, Campbelltown City Council and the City of Burnside. A total of 405 people delivered 15.3 tonnes of hazardous material, a categorical breakdown of which is provided by Table 8.4 (Colleen Dobson, Zero Waste SA, pers. comm.):

Table 8.4 Hazardous Waste Categories as Collected by Zero Waste, 18 June 2005

WASTE CATEGORY	AMOUNT COLLECTED (kg)
Paint (solvent, water, lead based and flammable)	8416
Waste Oil	2332
Batteries (Lead Acid, NiCad, Zinc Carbon, Mercury, Lithium)	1537
Flammable Compounds NOS (liquids/solids)	731
Pesticides (mercury based, general liquids/solids, organophosphorus liquids/solids, organochlorine liquids/solids)	472
Coolant	318
Fertiliser (inorganic, solid)	310
Alkalis	306
Detergents	220
Aerosols (paint, cleaning products, insect sprays)	197
Acids	167
Pharmaceuticals (liquids/solids)	84
Oxidising Compounds NOS (liquids/solids)	80
Arsenic Compounds (liquids/solids)	59
Chlorinated Solvents	44
Mercury/Liquid Metallic	16
Organic Compounds (liquids/solids/NOS)	15
Smoke Detectors	4
Formaldehyde (> 35 % concentration)	4
BCF (Halon) Extinguishers	4
Cyanide inorganic liquid NOS	3
Strychnine or salts	2
PCB (polychlorinated biphenyls) Capacitors	2
Ink Cartridges	2
Creosote	2
TOTAL	**15327 (15.3 ton)**

* NOS – not otherwise specified

INDICATORS OF RESPONSE	
Amount of hazardous waste deposited during household collection days	15.3 tonnes

8.4. Litter

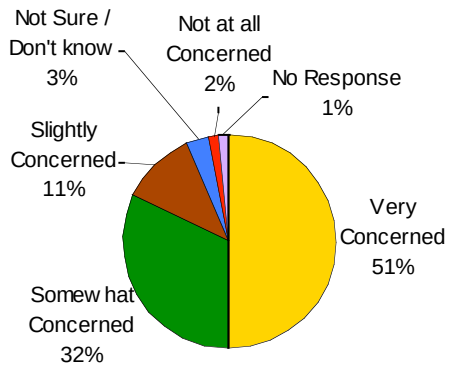
Litter is rubbish or waste inappropriately disposed of, particularly in public places. Litter can end up in stormwater and drains. It can cause localised flooding where it obstructs the flow of water, distress to birds and animals through entanglement or ingestion, harbour pests, and can detract from the visual amenity of the landscape.

8.4.1. Pressures

An increase in local population as predicted by current growth rates may contribute to an increase in littering (ABS 2001a, ABS 2001b). Visitors to the City are also responsible for littering and may have a lesser understanding of the environmental impacts of littering, especially if they are not familiar with the local ecosystem.

Major public events also unfortunately see a high rate of littering. In highly crowded situations people's access to rubbish bins can be obstructed and many assume that their littering will have less impact because they expect that a major clean up will most probably follow the event.

Community Comment…
How concerned are you about litter?



The City of Norwood Payneham & St Peters enjoys a rich cultural diversity, and hosts many public events to celebrate this richness with residents and visitors alike. Two large outdoor events, including The Parade Food, Wine and Music Festival (attracting c. 60 000 people), and the Norwood Christmas Pageant (attracting c. 10 000 people), would contribute significantly to litter found in the City during these times. Many more public events are held indoors in seated spaces throughout the year, including concerts and other arts based programs particularly in the Norwood Town Hall. A total of 13 major public events are planned for 2005/06 financial year (Sharon Cleary, NPSP, pers comm.).

Two major cosmopolitan shopping and entertainment precincts are located at Magill Road and The Parade, attracting a constant stream of visitors that may further contribute to the litter found in these areas.

INDICATORS OF PRESSURE	
Number of public events held in one year (planned for 2005/2006)	13

8.4.2. State of Resource

Litter has a pronounced effect on the City of Norwood Payneham & St Peters due to being a popular destination for shopping and entertainment, and also the site of major public events including the Norwood Christmas Pageant and The Parade Food, Wine and Music Festival. Atkins Waste Services, a private contractor responsible for waste collection and removal, estimate that 190 tonnes of litter is collected and removed from the City each year (Barry Atkins, Atkins Waste Services, pers comm.). Of the 190 tonnes, Atkins have indicated approximate contributions from the following waste streams in Table 8.5.

Table 8.5 Major waste streams contributing to litter

WASTE STREAM	VOLUME (tonnes)
General Litter (wrappers, picnic waste, cans, bottles)	76 (40 %)
Household and commercial waste	57 (30 %)
Dog dropping bags	57 (30 %)
TOTAL	**190**

KESAB undertake a quarterly audit of litter at selected monitoring sites across rural and metropolitan South Australia. There are five monitoring sites in the City of Norwood Payneham & St Peters, including two residential sites, (Kensington and Norwood), an industrial site (Magill), a car park at Firle, and a shopping centre at Firle. Counts of litter from the City have not been able to be separated from the total counts and KESAB have advised that the small number of sites would not allow any valid statistical comparisons with the total South Australian counts (John Phillips, KESAB, pers comm.).

The February 2005, the South Australian KESAB Litter Strategy Monitoring Survey collected 25,167 items at 151 sites. The composition of this litter is shown in Figure 8.1.

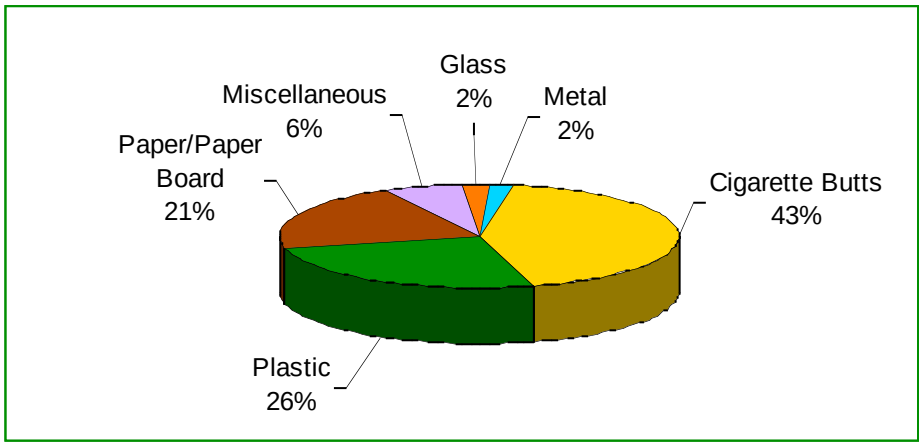


Figure 8.1 Composition of Litter, KESAB Litter Strategy Monitoring Survey Feb 2005

Notably, 43% of all the litter collected is cigarette related (KESAB 2005). The monitoring sites are categorised by land use type. Table 8.5 shows the percentage of sites of each type surveyed across South Australia, and the percentage of litter that each site type contributed to the total count of litter.

Table 8.6 Contribution of Litter to Total Count by Site Type, KESAB Litter Survey Feb 2005

SITE TYPE	% OF EACH SITE TYPE SURVEYED	% LITTER OF TOTAL COUNT
Residential	17	5
Beach	11	3
Industrial	11	12
Carpark	15	16
Shopping Centre	8	5
Retail	11	11
Recreation Park	9	3
Highway	18	44

If the results of Table 8.6 are extrapolated, the City of Norwood Payneham & St Peters would expect to find the highest amounts of litter along roadsides, in car parks and around business premises on retail commercial strips like Magill Road and The Parade (KESAB 2005). The contribution of industrial litter is also significant at 12 %, but would likely be a minor problem in the City due to the presence of mostly light industrial activities in areas such a Glynde.

8.4.3. Response

Education of the public on the detrimental effects of littering is one of the activities that the City of Norwood Payneham & St Peters can undertake to reduce people's tendency to litter. The City uses various media formats (council publications, banners etc.) to promote public clean-up days, and the effect litter has on rivers, streams and the stormwater system.
There were eight sites registered in the City for the annual Clean-up Australia Day in March 2005, including locations around schools, reserves, sports grounds and the River Torrens.

Provision of bins in public places and installation of gross pollutant traps are the two main physical remedial actions that the council can undertake to reduce the impacts of litter. The City of Norwood Payneham & St Peters provides general rubbish bins in public places, and recycling bins at major community events such as The Parade Food, Wine and Music Festival (Sharon Cleary, NPSP, pers comm.). The City has undertaken the installation of seven pollutant traps (with partial assistance from the TCWMB) at major watercourse junctions and outflows.

The City has recently installed 45 purpose built ashtray bins along the busy commercial section of The Parade, to cope with the increase in cigarette butts from visitors and workers who now must smoke outside of most public premises. The ashtray bins have been attached to existing bins to encourage pedestrians to dispose of their cigarette butts appropriately. Installing ashtray bins pairs well with a current education program run by KESAB.

The 'Please Butt It, Then Bin It' is a national campaign advertised through various forms of media across Australia, aimed at increasing smokers' awareness of the effect of littered cigarette butts on their environment.

INDICATORS OF RESPONSE	
Number of trash racks in watercourses	7

9. Progress to Date and Recommended Strategies

The aim of this section is to provide a brief overview of the key issues associated with the five major sections:

- Water Management;
- Biodiversity;
- Air Quality and Climate Change;
- People and Places; and
- Waste Management.

Each section is summarised by its key environmental issues, current indicators and current management strategies, in addition to recommended directions for monitoring and management into the future. An assessment on the status towards achieving key targets from the previous State of the Environment Report is also made and guides the recommendations in this review.

9.1. Water Management

9.1.1 Issues

The key water management issues identified centre around the quality and quantity of groundwater, surface water and stormwater resources. More specifically these include:

- increasing use of water resources as a function of population, commercial and or light industry growth;
- quality of groundwater, stormwater and surface water resources as determined by adjacent and upstream land use; and
- quantity of stormwater entering drainage system due to high development (impermeability) and low capture rate.

9.1.2 Strategies

The key Council strategies relating to water management to date include:

- expansion of gross pollutant traps (GPTs);
- further development and management of the St Peters Billabong;
- installation of water timers at all parks and “Micromet” water sensor system in major Council parks; and
- retrofitting of dual flush toilets in some Council public toilets.

Further information on the progress in implementing the strategies identified in the 2002 SoE Report is included in Appendix H.

9.1.3 Scorecard 2001 - 2005

Table 9.1 provides a scorecard of the water management targets set to address similar issues in the 2002 SoE Report, including the response of indicators used to measure progress or the progress of relevant individual projects. A discussion of the suitability of current indicators and additional future management suggestions immediately follows Table 9.1.

Table 9.1 Water Management Scorecard 2001 - 2005

Issue	Indicator / Measure	Target (2001 -2010)	Baseline (taken from the 2001 SoE Report)	Progress (taken from the 2005 SoE Report)	Comments
Surface water quality	Phosphorus and nitrogen concentration in the River Torrens and tributary creeks	Moderate to good rating given by the Torrens Catchment Water Management Board (TCWMB) on water nutrient levels	2001 rating = moderate to poor for nutrient levels	2005 rating = moderate to poor for nutrient levels. No change in rating	Retain as target. Future target ratings will have to be obtained from Adelaide and Mt Lofty Ranges Natural Resources Management Board, as the TCWMB was dissolved in Jan 2006.
Stormwater Quality	Volume of litter removed from trash racks	10% reduction in litter volume	760 tonnes collected in 2000. 775 tonnes collected in 2001	320 tonnes collected in 2004. This equates to 58% decrease in litter volume between 2001 and 2004	Retain measure. In 2005/06 two additional gross pollutant traps (GPTs) will be installed. Up to two GPTs are planned for installation in 2006/07.
Water Consumption	Volume of water used by the Council and the community per sector per year (based on SA Water use)	10% reduction in overall water use (as supplied by SA Water)	2000 community use = 4,510 ML. 1999/00 Council use = 208 ML	No data for community water use. No comparable data is available for 2004.	Retain as indicator but target reduced to 5% by 2016. Current water use data sets are not accurate and are not a true reflection of water consumption - to be addressed through The Water Campaign™, in 2006/07 when

Issue	Indicator / Measure	Target (2001 -2010)	Baseline (taken from the 2001 SoE Report)	Progress (taken from the 2005 SoE Report)	Comments
					an inventory of water consumption is undertaken. Permanent water restrictions were introduced in SA in Oct 2003, with total water usage decreasing across the State by 14% during 2003/04 compared to 2002/03.
Area of natural waterways	Kilometres of concrete channel returned to natural vegetated waterway	2% increase in natural waterway	No data on this indicator collected	No data on kilometres of concrete channel has been collated. However, none is known to have been returned to natural setting.	Retain target, as still appropriate.

9.1.4 Opportunities

In addition to actions suggested by the 2002 SoE, the following opportunities are recommended to enhance the City's water resources:

- Prioritise the completion and implementation of draft water policies. **INDICATORS:** n/a

- In addition to upgrading the remaining irrigation systems in City parks to allow for more efficient watering, the development of individual irrigation management plans will assist to tailor and reduce water consumption in this area. **INDICATORS:** percentage of parks with irrigation management plans, annual water consumption.

- The incorporation of indigenous native vegetation with lower water requirements is recommended for reserve gardens and streetscapes. **INDICATORS:** indigenous native vegetation policy development, annual water consumption.

- Upgrading to more water efficient fixtures in high use corporate locations (e.g. Council offices) or council owned facilities (e.g. community centres, halls). INDICATORS: number of buildings upgraded, annual water consumption of upgraded buildings.

- A rainwater tank rebate may help to decrease potable water use, while increasing the ability to capture rainfall and reduce potential stormwater volumes. **INDICATORS:** number of rebates offered yearly, annual water consumption relevant sectors.

- Employ a water project officer working with commercial and light industrial sectors to improve water use practices, minimise water disposal through maximising recycling opportunities, providing appropriate resources and contacts, alerting businesses to financial gains through reducing water use and or trade waste licences. The officer could investigate new businesses and industries with water minimisation and reuse strategies, and encourage their establishment within the City through the planning sectors. **INDICATOR:** number of businesses participating in program.

- Provide active support to the TCWMB to encourage joint education, awareness and restoration programs in community, corporate (council), commercial and industrial sectors. **INDICATORS:** number of joint annual programs for each sector, feedback assessments to gauge program success.

9.2. Biodiversity

9.2.1 Issues

The key biodiversity issues identified by this report include:

- habitat loss due to suburban infill;
- habitat fragmentation, with the only major linkage (i.e. Linear Park) providing inadequate resources to native fauna and flora; and
- competing recreational and environmental pressures in council reserves.

9.2.2 Strategies

The key Council strategies relating to biodiversity to date include:

- preparation of Biodiversity Strategy;
- increase in community revegetation projects, eg. Our Patch, Green Australia; and
- revegetation with indigenous species along section of watercourse, eg.Third Creek adjacent Patterson Reserve.

9.2.3 Scorecard 2001 - 2005

Table 9.2 provides a scorecard of the biodiversity targets set to address similar issues in the 2002 SoE Report, including the response of indicators used to measure progress or the progress of relevant individual projects. A discussion of the suitability of current indicators and additional future management suggestions immediately follows Table 9.2.

Table 9.2 Biodiversity Scorecard 2001 - 2005

Issue	Indicator / Measure	Target (2001 -2010)	Baseline (taken from the 2001 SoE Report)	Progress (taken from the 2005 SoE Report)	Comments
Presence of indicator species	Abundance and diversity of frogs recorded in the annual Environment Protection Agency (EPA) community frog census	15% increase in number of recordings of ''lots'' (greater than 50 frogs) of frogs recorded	2000 = two recordings of "lots" of frogs. For all 4 species recorded, an average of 32% of the observations were of "lots" or "many" (10 -50).	2004 = no recordings of "lots" of frogs. For all 4 species of frogs recorded in 2004, an average of 48% of the observations were of "lots" or "many" - an increase of 16% from 2000.	Small numbers of observations were made, therefore care needs to be taken if using the data. Limited alternatives are available. Could use revised target of 15% increase in recordings of "lots" of frogs
Presence of weeds in priority biodiversity areas	Number of indicator weed** outbreaks per year along the River Torrens or tributary creeks	10% reduction in number of weed outbreaks per year	Data on this indicator not collected	No data collected.	May be recorded after Biodiversity Strategy completed in June 2006, therefore can only be used a future indicator
Area of Native Vegetation	Area of indigenous species	5% increase in native vegetation	Data on this indicator is yet to be collected through a biodiversity survey	No data collected.	Data will be available after the Council's *Biodiversity Strategy* completed in June 2006, therefore can only be a future indicator.

*** Note: an appropriate indicator weed species needs to be determined through a weed survey prior to the use of this indicator.*

Many of the proposed biodiversity management actions were not assigned an indicator due to their planning or policy development nature. While frog census data has been used to provide an indicator of habitat quality, caution should be exercised when basing conclusions on a small number of recordings. If frog census data is to be continually used as an indicator, further encouragement of the community to participate in the program is required. This may be facilitated through the provision of frog monitoring kits through the local library.

The implementation and effectiveness of education programs is not currently monitored and should be, through tracking the number of events annually and assessing feedback from each event. The assessment of feedback will allow events to be tailored to the City's needs, thus increasing their potential effectiveness.

No data has yet been collected on the number of indicator weed outbreaks, percent area of indigenous native vegetation, or percent area of open space. Appropriate weeds are yet to be identified through the development of the *Biodiversity Strategy*, thereby delaying the collection of data for this indicator. Common weeds from aquatic, riparian and terrestrial environments should be selected to ensure an appropriate indication of weed infestations across the varied habitat types of the city.

The measure of percent area of indigenous vegetation is time consuming to calculate and requires GIS support and or substantial ground truthing to be effective. A more appropriate indicator may be the number of indigenous native plants planted annually, but ground truthing of existing remnants will still be required.

Difficulties associated with the collection of percent open space data are similar to those for percent indigenous vegetation. With the formal requirements of open space defined by the Council's Development Act, a more easily collected statistic may be the number of non-complying developments approved annually. However, this statistic is currently not collated and documented for any other purpose making the information more difficult to obtain.

9.2.4 Opportunities

In addition to actions suggested by the 2002 SoE, the following opportunities are recommended to enhance the City's biodiversity resources:

- Detailed management plans should be prepared for all Council-managed parks and reserves, with an emphasis upon the protection of remnant vegetation and the enhancement of biodiversity values. **INDICATORS:** percent of Council-managed parks with detailed management plans.

- Provide information about indigenous plants, enhancing the community's understanding of local species (including threatened communities), promoting appropriate indigenous species in suburban gardens, and educating the community on garden plants that have the potential to establish as weeds. **INDICATORS:** relevant articles in *Look East* and *The Messenger*, hits on select pages of the Council's website (if posted on the web).

- Promote the design and establishment of native fauna friendly gardens and nest boxes to increase the amount of available resources. In addition, the promotion of further rehabilitation along the Torrens Linear Park will enhance the value of this landscape corridor for local fauna. **INDICATORS:** relevant articles in community newspapers or hits on the Council website, number of habitat restoration programs (e.g. Our Patch) operating in the City.

- Consider the implementation of a pet curfew to minimise the loss of native fauna at night. **INDICATORS:** n/a

- Once identified, an assessment of the condition of indigenous vegetation remnants should be done to enable the identification of management issues and prioritisation of works. The assessment can be tailored to include a measure of indicator weeds. **INDICATORS:** percent of remnants assessed.

9.3. Air Quality and Climate Change

9.3.1 Issues

The key environmental issues identified by this report for air quality and climate change include:

- increasing use of non-renewable energy (petrol, electricity, gas) by corporate and community sectors;
- high dependence on personal transport, despite campaigns to boost environmentally friendly alternatives (e.g. public transport, walking, bike riding);
- high dependence on non-renewable energy sources.

9.3.2 Strategies

The key Council strategies to address air quality and climate change issue to date include:

- completion of all Cities for Climate Protection (CCP®) Program Milestone and membership of CCP® Plus;
- committing more than $300,000 (since 2003/04) to improving the Council's energy efficiency mainly through the Corporate Energy Management Project (CEMP);
- participation in the TravelSmart SA Program to reduce greenhouse emissions relating to transport;
- trialling 20% Biodiesel in Council's Depot vehicles; and
- converting some Council passenger vehicles from 6 cylinder to 4 cylinder.

9.3.3 Scorecard 2001 - 2005

Table 9.3 provides a scorecard of the air quality and climate change targets set to address similar issues in the 2002 SoE Report, including the response of indicators used to measure progress or the progress of relevant individual projects.

Table 9.3 Air Quality & Climate Change Scorecard 2001 - 2005

Issue	Indicator / Measure	Target (2001 -2010)	Baseline (taken from the 2001 SoE Report)	Progress (taken from the 2005 SoE Report)	Comments
Mode of transport to work	% of population riding bikes, walking or catching public transport to work	5% decrease in population driving cars to work between 2001 and 2005	1996 = 8.5% of employed persons used public transport and 66% travelled to work in cars or by motorbike. 1996 = 6.4% of employed persons walked/rode bike to work.	2001 = 9.7% employed persons used public transport (2001 Census) – an increase of 1.2% from 1996. 2001= 73% travelled to work in cars or motorbikes (2001 ABS) – an increase of 7% from 1996. 2001 = 6.9% of employed persons walked/rode bike to work – an increase of 0.5% from 1996.	Revise target to 10% increase in population riding bike, walking or catching public transport to work from 2001 levels by 2011.
Air Quality	Number of complaints received by the Eastern Health Authority (EHA) and the Environment Protection Agency (EPA) on air pollution matters within the Council.	10% decrease in complaints relating to air quality	• 41 complaints received by EHA in 2000/01. • 20 complaints received by EPA in 2000/2001	• 36 complaints from EHA in 2004, a 13% reduction from 2000/01. • No EPA figures available for 2004.	Retain (EHA) measure but increase target to 20% reduction by 2012. Remove EPA measure as lack of information available.
Energy consumption and greenhouse gas contributions within the Council area	Energy consumption in Gigajoules (Gj) per annum and equivalent tonnes carbon dioxide (CO_2e) produced (Council operations and community sectors as determined through the Cities for	20% reduction in forecasted greenhouse gas emissions by 2012	• 2000/01 Corporate emissions of CO_2e = 5,397 tonnes or 26,002 Gj of energy used. • 1998 Community emissions	• 2004 Corporate emissions of CO_2e = 4,842 tonnes, or 28,402 Gj of energy used, a 10% since 2000/01, but a 9% increase in energy	Target to be retained as it's a policy commitment through the Council's Greenhouse Strategy (a component of the CCP® Program). CO_2e emissions have

Issue	Indicator / Measure	Target (2001 -2010)	Baseline (taken from the 2001 SoE Report)	Progress (taken from the 2005 SoE Report)	Comments
	Climate Protection® Program Model).		of CO_2e = 407, 497 tonnes or 3,844,917 Gj	use. • 2001 community greenhouse gas emissions = 737,224 CO_2e	decreased while energy use has increased, as a result of the CCP® Program emission factor (figure used to determine the amount of CO_2e emitted from energy used) decreased.
Completion of Cities for Climate Protection (CCP®) Program Action Plan	% of CCP Actions completed	Achievement of Action Plan. Completion of all five Milestones of the CCP® Program.	**Data on actions completed to be monitored by Council	All of the 5 Milestones of the CCP® Program completed in November 2005. 8 main actions from Action Plan completed by November 2005.	Retain target, but refer to Milestone 5 report. Details on actions completed in the Action Plan are listed in the Milestone 5 Report Now undertaking CCP® Plus Program, this assists to address actions in the Action Plan.

9.3.4 Opportunities

In addition to actions suggested by the 2002 SoE, the following opportunities are recommended to enhance the City's air quality and to manage climate change goals:

- Progressively replace leased fleet cars dependent on non-renewable fuels with hybrid electric cars (note that this strategy is not appropriate for the depot utility fleet with no suitable alternative yet available). **INDICATORS:** percent of hybrid fleet cars.

- Prioritise the purchase of green power for corporate operations through the Council's electricity provider, publicising this purchase through appropriate mediums (i.e. community newspapers) to encourage residents, businesses and industry to do likewise: **INDICATORS:** percent green power utilised (as listed on energy bills).

- Employ an energy project officer working with residential, commercial, and light industrial sectors to develop energy minimisation strategies, provide appropriate

resources and contacts, and alert clientele to potential savings available through government rebates. The officer could investigate new businesses and industries with low energy requirements, and encourage their establishment within the City through the planning sectors. **INDICATORS:** number of residents/businesses participating in program, number of hits on relevant Council websites (if posted on the web).

- Renew sustainable transport and energy efficiency publicity campaigns in community accessible mediums (i.e. newspaper, radio, website). **INDICATORS:** number of articles, participation in events.

9.4. Urban Character

9.4.1 Issues

The key environmental issues identified by this report for urban character include:

- inconsistency in the Council's Development Plan provisions across the City;
- loss of open space, urban character, and built heritage due to suburban infill;
- insufficient focus on sustainable development in Development Plan priorities to guide appropriate development;
- need for greater integration of sustainable transport options to cater more for walking, cycling etc; and
- increasing demand on infrastructure such as stormwater, open space, waste management etc.

9.4.2 Strategies

The Council's key strategies regarding "people and places" to date include:

- commencing the development of the Residential Plan Amendment Report and Heritage Plan Amendment Reports;
- completion of the Open Space Strategy;
- implementation of the Heritage Incentive Scheme; and
- completion of the Cultural Development Strategy.

9.4.3 Scorecard 2001 - 2005

Table 9.4 provides a scorecard of the urban character (people and places) targets set to address similar issues in the 2002 SoE Report, including the response of indicators used to measure progress or the progress of relevant individual projects. A discussion of the suitability of current indicators and additional future management suggestions immediately follows table 9.4.

Table 9.4 Urban Character Scorecard 2001 - 2005

Issue	Indicator / Measure	Target (2001 -2010)	Baseline (taken from the 2001 SoE Report)	Progress (taken from the 2005 SoE Report)	Comments
Residential Development	Number and type of new dwellings across Council area	Average density of 20 dwellings per hectare across the Council.	Average density =18.5 dwellings per hectare across the Council in June 2000.	Comparable data is not available	Revise measure for future
Heritage	Number of properties/significant trees on local and state heritage registers	Increase of 1%	1,220 properties listed. Total number of significant trees to be reviewed by Council.	Data is not comparable	Revise measure for future
Heritage Conservation	Number of heritage incentive scheme projects funded	Increase of 5%	Numbers of projects funded yet to be recorded by Council.	Data not yet available	Revise measure. The Council's Heritage Incentive Scheme (for Local Heritage Places) commenced in Oct 2005 and will be an on-going initiative.
Private open space	Percentage of private open space in new dwellings	Private open space: >250m^2 allotment – 20%. <250m^2 allotment – 35m^2	To be recorded by the Council through future development approvals.	No data collected.	Revise measure.
Streetscape	Number and type of street improvements undertaken, eg. tree planting, street-lights, artwork.	10% increase in public artwork	A survey to measure the current level of public art work is required	2003/04 = 150 Sculpture Public Art Project completed. "You'll Go Down in History" wall murals completed 350 new street trees planted in 2003/04.	A revised measure for street trees and other improvements is needed. The public art survey recommended by 2002 SoE was not undertaken. "Sparkle Up The Parade" program initiated.

					Signposted cultural heritage walks have been established.

** In some cases, percentage indicators have been used to take into account population changes within the City of Norwood, Payneham & St Peters*

The statistic of the number and type of new dwellings per hectare is not generated on a regular basis and needs to be specifically requested. Variations in the methodology used by Planning SA to calculate this statistic have made it inappropriate to compare results between 2000 and 2005. The number of land divisions rather than number of dwellings per hectare may be an appropriate alternative indicator, which is readily available from Planning SA.

The 2002 SoE selected the number of heritage incentive scheme projects funded as an indicator of heritage conservation. As the scheme has only recently been implemented, statistics have not yet been collated. An alternative or additional indicator might also be the number of volunteer hours spent working on places of local heritage. A change in Planning SA requirements, dissolved the formal requirement to record and maintain a register of significant trees. Consequently, the indicator of number of significant trees on local and state registers is not complete. The number of applications for tree damaging activities rather than trees listed on significant tree register is an alternative possible indicator.

9.4.4 Opportunities

In addition to actions suggested by the 2002 SoE, the following opportunities are recommended to improve conditions for the City's people and places:

- Prioritise the completion and implementation of key streetscape and open space strategies. **INDICATORS:** n/a.

- Prioritise the development of an integrated strategic plan for the whole City to provide overall direction on key council aspirations and strategic management of valued assets. **INDICATORS:** n/a.

- Review land zoning across the City, with the express aim to standardise and minimise some 33 classifications currently used. The review would need to address competing land uses in the context of residential, Council, recreational, commercial and industrial needs. Once incorporated into the Council's Development Plan, simplified land use classifications assist to minimise common conflicts through the clarification of permissible development. **INDICATORS:** number of unresolved development complaints.

- The volume of traffic on roads in the City is of great concern to many residents. While road improvements are under the guise of Transport SA, the City could make valuable inputs to assist this agency with prioritising of works. Key issues the City should be working on with Transport SA include improving traffic flows on major roads (i.e. minimising pollution associated with prolonged traffic congestion), and slowing drivers down on side streets. **INDICATORS:** number of joint projects with Transport SA.

- An industry study as recommended by the 2002 SoE should be conducted to identify suitable management strategies for industrial areas. As part of this assessment, industries supporting best environmental practice (i.e. low energy requirements,

minimal production of hazardous waste and air pollutants) could be identified and targeted for establishment through the planning sector. **INDICATORS:** Percent of industry types with management plans.

9.5. Waste Management

9.5.1 Issues

The key waste management issues identified by this report include:

- increasing population (residential, commercial, light industrial) contributing to waste production in all sectors;
- potential recyclable waste streams ending up in non-recyclable bins; and
- litter production at public events and in public places (i.e. commercial and entertainment precincts).

9.5.2 Strategies

The Council's key strategies relating to waste management to date include:

- implementation of three-bin kerbside collection system in January 2004;
- membership of the National Packaging Covenant;
- development of a Waste Management Action Plan; and
- preparation of a "Green" Purchasing Guide.

9.5.3 Scorecard 2001 – 2005

Table 9.5 provides a scorecard of the waste management targets set to address similar issues in the 2002 SoE Report, including the response of indicators used to measure progress or the progress of relevant individual projects. A discussion of the suitability of current indicators and additional future management suggestions immediately follows Table 9.5.

Table 9.5 Waste Management Scorecard 2001 - 2005

Issue	Indicator / Measure	Target (2001 -2010)	Baseline (taken from the 2001 SoE Report)	Progress (taken from the 2005 SoE Report)	Comments
Household waste disposed to landfill	The % diversion of domestic waste materials from going to landfill	18% diversion of waste materials going to landfill by 2003	2001 = 10.24% average diversion rate over the last three years	2004/05 = 47% diversion rate – an increase of 36.76% from 2001.	Use revised indicator and target to reflect SA Government Strategy. The 3-bin kerbside system introduced in Jan '04 with an increase of 1683% in green organic recycling in first year.
Commercial and industrial (C & I) waste disposed to landfill	Tonnes of commercial and industrial waste disposed of to landfill as determined in EPA Landfill Audits	20% reduction in tonnes to landfill between 2001 and 2005	8,152 tonnes of C & I waste was disposed in 1998	Comparable data is not available	Remove - not feasible for future target, as data is not readily available
Council operations waste disposed to landfill	Tonnes of Council administration and operations waste disposed of to landfill annually	20% reduction in tonnes to landfill between 2001 and 2005	From an audit in September 2001 it was estimated that Council disposed of 86.7 tonnes of administration waste per year to landfill	From a 1 week audit undertaken in July 2005 = 19.7 tonnes of Council administrative waste per year is disposed to landfill - a decrease of 67 tonnes, or 77% from 2001.	Retain as indicator and target. Data is not reliable as the audits were completed using two different methods. Next audit should be for a 2 week period to ensure fewer anomalies.

As an indicator, the tonnages of commercial and industrial waste to landfill are now difficult to attain due to the privatisation of landfill services and varied collection arrangements with private waste collection companies. However, there exists no simple alternative indicator in this case.

9.5.4 Opportunities

In addition to actions suggested by the 2002 SoE, the following opportunities are recommended to improve conditions for the City's waste management:

- Make the green event approach (e.g. provision of recycling facilities) compulsory for all public events through the development of appropriate policy. Publicise the green status of events to encourage private companies and community to do likewise. **INDICATORS:** n/a (policy development)

- Provide more recycling facilities at all Council owned buildings, including community centres and public libraries. This may include, if appropriate, the provision of composting facilities for food waste at community centres (composted waste could be used in adjacent community gardens). **INDICATORS:** percent council owned facilities with full recycling facilities.

- Provide additional recycling education programs to be implemented at Council facilities. In addition, publicise common recyclable and non-recyclable items to minimise recyclable waste ending up in non-recyclable bins and vice versa. **INDICATORS:** number of education programs held, feedback assessment, percent recyclable product ending up in non-recyclable bins (information from future waste audits)

- Employ a waste project officer working with commercial and industrial sectors to minimise waste production, encourage the exchange of waste products that may be utilised in other sectors, and provide appropriate resources and contacts. A financial incentive could be offered to encourage businesses to join (e.g. reduction in council rates scaled by a companies reduction in waste generation). The officer could investigate new businesses and industries with low waste production and or high waste recycling opportunities, and encourage their establishment within the City through the planning sectors. **INDICATORS:** number of businesses participating in program.

- Investigate the ability to compost or chip green maintenance waste in house for use on Council garden beds. This strategy will also assist in reducing water requirements. **INDICATORS:** volume of green waste collected by private contractor.

9.6 Community Education

The implementation and effectiveness of education programs has not been closely monitored and should be, through tracking the number of events annually and assessing feedback from each event.

The assessment of community feedback will allow events to be tailored to the City's needs, thus increasing their potential effectiveness. Appropriate indicators might include the number of events or participation in events as initiated through these programs.

10. New Indicators and Targets

From consultation with relevant Council staff, revised indicators and targets for the five (5) key themes were developed using the Scorecard for 2001 -2005 and the indicators outlined in Section 9 of this report.

The timeframe for the indicators varies, as some measures are better suited to be either short or long term, as data/information is not always relevant to the same timeframes.

10.1 Water Management

Table 10.1 Water management new indicators and targets

Issue	Indicator /measure	Baseline	Target	Comments	Responsibility
Water Supply	Mains water consumption by the City of Norwood Payneham & St Peters	2004 = 0.5 GL	10% reduction in water use by 2010 from 2004 levels	Analysis needs to take weather patterns into account.	Sustainability Planner
	Mains water consumption by the residential Community of the City of Norwood Payneham & St Peters	2004 = 9.67 GL	5% reduction in water use by 2016 from 2004 levels		Sustainability Planner
Surface Water Quality	Phosphorus and nitrogen concentrations in the River Torrens and tributary creeks	2005 rating = "moderate to poor" for nutrient levels	"Moderate to good" AMLR NRM Board rating on water nutrient levels	Care needs to be taken with data as quality is influenced by upstream pollution, beyond our control.	Sustainability Planner
Stormwater Quality	Volume of litter removed from trash racks	2004 = 320 tonnes	10% reduction in volume.	This appears to be a modest target but will be challenging due to the proposed increase in the number of trash racks. Regular monitoring of data supplied by AMLR NRM Board will be important to taken into account influences such as storm events.	Manager, Field Operations
Area of Natural Waterways	Kilometres of constructed channel returned to natural vegetated	Nil	Increase natural waterway by 200m by 2016		Manager, Assets & Special Projects

Issue	Indicator /measure	Baseline	Target	Comments	Responsibility
	waterway				
Growth in indicator species	Diversity and abundance of frogs (EPA annual frog census)	2004 = 2 recordings of 'many'* frogs (same species)	15% increase of the recordings of 'lots'** of frogs by 2016.	The EPA coordinates an annual frog census with community participation.	Sustainability Planner

** 'many' = 10-50 frogs ,** 'lots' = >50 frogs*

10.2 Biodiversity

Table 10.2 Biodiversity new indicators and targets

Issue	Indicator /measure	Baseline	Target	Comments	Responsibility
Threat to native flora	Distribution and abundance of pest plants, particularly in priority biodiversity areas (e.g. River Torrens corridor)	Survey being undertaken (2006)	100% eradication of identified pest plant in priority sites by 2010*.	Annual survey will be required to monitor progress.	• Sustainability Planner • Technical Officer, Horticulture, • Coordinator, Trees & Horticulture
Area of native flora / growth	Area revegetated with indigenous vegetation	Survey being undertaken (2006)	50% increase in area revegetated with indigenous vegetation by 2010*	Annual survey will be required to monitor progress.	• Sustainability Planner • Technical Officer, Horticulture, • Coordinator, Trees & Horticulture
Quality	Condition (rating) of indigenous remnant vegetation within these reserves	Survey being undertaken (2006)	To be determined when ratings known *	Annual survey will be required to monitor progress.	• Sustainability Planner • Technical Officer, Horticulture, • Coordinator, Trees & Horticulture

***** To be finalised when Biodiversity Strategy has been endorsed July 2006.

10.3 Air Quality and Climate Change

Table 10.3 Air quality and climate change new indicators and targets

Issue	Indicator /measure	Baseline	Target	Comments	Responsibility
Greenhouse gas emissions	Corporate greenhouse gas emissions measured in carbon dioxide equivalent (CO_2e) emissions	2004 = 4,177 tonnes	20% reduction of 2000/01 emission levels by 2012/13	Commitment to this target through the CCP® program.	Sustainability Planner
	Community greenhouse gas emissions measured in CO_2e	2001 = 737,224 tonnes	20% reduction of 1998 emission levels by 2012	Commitment to this target through the CCP® program.	Sustainability Planner
Air Quality	Complaints regarding air quality received by EHA	36 (2004)	20% reduction by 2012		Sustainability Planner
Energy Use	Annual energy use by the City of Norwood Payneham & St Peters (using CCP data)	2004 = 28,402 GJ	Reduction in energy use to ensure greenhouse gas emissions are reduced by 20% by 2012/13 from 2000/01 levels	Commitment to this target through the CCP® program.	Sustainability Planner
	Annual energy use by the Community in the City of Norwood Payneham & St Peters (using CCP data)	2001 = 4,458,044 GJ	Reduction in energy use to ensure greenhouse gas emissions are reduced by 20% by 2012 from 1998 levels	Commitment to this target through the CCP® program.	Sustainability Planner
Mode of transport to work	% of population riding bikes, walking or catching public transport to work	ABS 2001 = • 9.7% used public transport • 73% used car/motorbike • 6.9% walked/rode bike	10% increase from 2001 levels by 2011	ABS Census data	Sustainability Planner

10. 4 Waste Management

Table 10.4 Waste management new indicators and targets

Issue	Indicator /measure	Baseline	Target	Comments	Responsibility
Domestic Waste	Solid domestic waste sent to landfill	2004/05 = 7,751 tonnes (a 75% reduction in waste to landfill compared to 2003/04)	Reduce waste to landfill by 25% by 2014, *based on South Australia's Waste Strategy 2005-2010.*	Council participating in a kitchen organic waste trial (2006/07) with East Waste, Jefferies and Zero Waste SA – trial could improve potential to reduce kitchen waste to landfill if successful.	Manager, Field Operations
	Percentage diversion of domestic waste materials going to landfill (via recycling and greens organic bins)	2004/05 = 47%	75% of all material presented at the kerbside is recycled (if food waste is included), by 2010 - *based on South Australia's Waste Strategy 2005-2010.*		Manager, Field Operations
Council Waste	Tonnes of council administrative waste to landfill (approximate per year)	19.7 tonnes p.a (based on 2005 audit)	20% reduction in tonnes to landfill from 2005 levels to 2015	Audit of council administrative waste to be completed over a two -week period annually.	Sustainability Planner
	Amount of street litter and Depot waste sent to landfill	2005 = 170 tonnes of street litter and depot waste sent to landfill	20% reduction in waste sent to landfill from 2005 levels by 2014.		Manager, Field Operations

10.5 People and Places

Table 10.5 People and places new indicators and targets

Issue	Indicator /measure	Baseline	Target	Comments	Responsibility
Residential Character, Amenity & Urban Form	Number of strategic/policy documents endorsed to improve residential amenity	One (1) - (Residential Strategic Directions)	Completion and implementation of draft Residential Plan Amendment Report (PAR) by 2007/08.	More appropriate targets will be identified as part of the PAR.	Manager, Urban Planning & Sustainability
Open Space and Streetscape	% of private open space in new dwellings is in accordance with the Development Plan	No baseline at present – to be developed after 06/07 financial year data.	The area of private open space for each new dwelling achieves 85% of the Development Plan requirement.	Needs to be recorded through future development approvals.	Manager, Development Assessment
Open Space and Streetscape	Number of initiatives to enhance open space	6 (as at 2005/06)	Implementation as per *Open Space Strategy Implementation Plan.*	Implementation of the *Open Space Strategy Implementation Plan* and associated plans and policies. The achievement of the targets will be subject to annual budget allocations for the proposed projects.	Recreation Development Coordinator
Open Space and Streetscape	Street improvements undertaken eg, public art and street furniture.	Two (2) mosaic and jarrah benches commissioned in 2005/06.	Two (2) mosaic and jarrah benches to be commissioned each year til 2010.	Targets to be revised following the development of a Public Art Policy.	Community Arts Officer
Open Space and Streetscape	Street Tree planting	Estimated to be 22,000 (2005)	No net losses per annum.	Exact numbers to be confirmed through the tree data collection program (last data was 1999).	Coordinator, Trees & Horticulture
Built Heritage	No. of incentive projects funded	N/A (commenced in 2005)	100% take up rate per annum.		Manager, Development Assessment
Cultural Identity and	Number of historical	50 (2005/06)	Install 5 historical		Cultural Heritage

Issue	Indicator /measure	Baseline	Target	Comments	Responsibility
History	plaques and signs		plaques per year until 2010.		Advisor
Recreational and community facilities	Number of environmental initiatives undertaken by community groups as measured by community matrix survey	First survey due in 2007	10% increase by 2010	It is envisaged that the first Community Benefit Matrix Survey will be undertaken in 2007. Annual surveys are planned there after. Note, that the Council currently has no means of control or influence over the number of initiatives that community groups decide to undertake.	Recreation Development Coordinator

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CITY PROFILE

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12. Appendices

Appendix A Community survey results

Appendix B Exotic flora recorded in reserves within the City of Norwood Payneham & St Peters

Appendix C Native plant species recorded in reserves within the City of Norwood Payneham & St Peters

Appendix D Vertebrate fauna species recorded in the City of Norwood Payneham & St Peters

Appendix E Frog records from the City of Norwood Payneham & St Peters, 2002–2004

Appendix F Macroinvertebrate species recorded in the vicinity of St Peters Billabong

Appendix G State and National heritage listed properties

Appendix H 2002 State of the Environment Report Progress on Strategies

Appendix A: Community survey results

City of Norwood Payneham & St Peters
State of the Environment Short Community Survey

Number of Survey Participants: 158

Questions	Question Choices	No. of Responses	% of Reponses
Question 1- Age			
	Under 12	0	0.00%
	12 to 20	1	0.63%
	21 to 35	14	8.86%
	36 to 50	46	29.11%
	51 to 65	40	25.32%
	65+	53	33.54%
	No response	4	2.53%
Question 2 - Gender			
	Male	80	50.63%
	Female	74	46.84%
	No response	4	2.53%
Question 3 - Visitor, Resident, Worker			
	City resident	127	80.38%
	City visitor	4	2.53%
	City worker	7	4.43%
	No response	20	12.66%
Question 4 - In which suburb do you live or work in the City of Norwood Payneham & St Peters?			
	College Park	11	6.96%
	Evandale	1	0.63%
	Felixstow	1	0.63%
	Firle	1	0.63%
	Glynde	1	0.63%
	Hackney	7	4.43%
	Kensington	3	1.90%
	Marden	1	0.63%
	Marryatville	1	0.63%
	Maylands	2	1.27%
	Norwood	8	5.06%
	Payneham	9	5.70%
	Payneham South	4	2.53%
	St Morris	2	1.27%
	St Peters	45	28.48%
	Live and work in more than one City suburb	2	1.27%
	Work in all City suburbs	1	0.63%
	Live or work outside City	6	3.80%

No reponse	24	15.19%

Question 5a to 5f - How important are the folowing environmental values to you?

5a - Clean Air

Extremely Important	137	86.71%
Very Important	19	12.03%
Moderately Important	2	1.27%
Slightly Important	0	0.00%
Not Important At All	0	0.00%
No Response	0	0.00%

5b - Open Space

Extremely Important	102	64.56%
Very Important	40	25.32%
Moderately Important	12	7.59%
Slightly Important	2	1.27%
Not Important At All	2	1.27%
No Response	0	0.00%

5c - Heritage Conservation

Extremely Important	61	38.61%
Very Important	51	32.28%
Moderately Important	26	16.46%
Slightly Important	16	10.13%
Not Important At All	4	2.53%
No Response	0	0.00%

5d - Biodiversity

Extremely Important	88	55.70%
Very Important	45	28.48%
Moderately Important	20	12.66%
Slightly Important	4	2.53%
Not Important At All	1	0.63%
No Response	0	0.00%

5e - Best Practice Waste Management

Extremely Important	114	72.15%
Very Important	36	22.78%
Moderately Important	6	3.80%
Slightly Important	2	1.27%
Not Important At All	0	0.00%
No Response	0	0.00%

5f - Clean Water

Extremely Important	135	85.44%
Very Important	18	11.39%
Moderately Important	5	3.16%

Slightly Important	0	0.00%
Not Important At All	0	0.00%
No Response	0	0.00%

Question 6a to 6p - Please rate the following environment issues according to your level of concern

6a - Greenhouse Effect

Very Concerned	86	54.43%
Somewhat Concerned	40	25.32%
Slightly Concerned	23	14.56%
Not Sure / Don't know	4	2.53%
Not at all Concerned	3	1.90%
No Response	2	1.27%

6b - Air Pollution

Very Concerned	108	68.35%
Somewhat Concerned	37	23.42%
Slightly Concerned	10	6.33%
Not Sure / Don't know	1	0.63%
Not at all Concerned	0	0.00%
No Response	2	1.27%

6c - Water Pollution (River Torrens)

Very Concerned	118	74.68%
Somewhat Concerned	29	18.35%
Slightly Concerned	7	4.43%
Not Sure / Don't know	1	0.63%
Not at all Concerned	1	0.63%
No Response	2	1.27%

6d - Stormwater Pollution

Very Concerned	104	65.82%
Somewhat Concerned	40	25.32%
Slightly Concerned	8	5.06%
Not Sure / Don't know	3	1.90%
Not at all Concerned	1	0.63%
No Response	2	1.27%

6e - Commercial Development

Very Concerned	47	29.75%
Somewhat Concerned	48	30.38%
Slightly Concerned	41	25.95%
Not Sure / Don't know	12	7.59%
Not at all Concerned	7	4.43%
No Response	3	1.90%

6f - Urban Housing Development (Infill)

Very Concerned	55	34.81%
Somewhat Concerned	54	34.18%
Slightly Concerned	27	17.09%
Not Sure / Don't know	12	7.59%
Not at all Concerned	8	5.06%
No Response	2	1.27%

6g - Domestic Waste Management

Very Concerned	72	45.57%
Somewhat Concerned	55	34.81%
Slightly Concerned	20	12.66%
Not Sure / Don't know	7	4.43%
Not at all Concerned	2	1.27%
No Response	2	1.27%

6h - Commercial and Industrial Waste

Very Concerned	96	60.76%
Somewhat Concerned	35	22.15%
Slightly Concerned	16	10.13%
Not Sure / Don't know	6	3.80%
Not at all Concerned	3	1.90%
No Response	2	1.27%

6i - Litter

Very Concerned	79	50.00%
Somewhat Concerned	51	32.28%
Slightly Concerned	18	11.39%
Not Sure / Don't know	5	3.16%
Not at all Concerned	3	1.90%
No Response	2	1.27%

6j - Energy Consumption

Very Concerned	86	54.43%
Somewhat Concerned	45	28.48%
Slightly Concerned	19	12.03%
Not Sure / Don't know	4	2.53%
Not at all Concerned	2	1.27%
No Response	2	1.27%

6k - Water Consumption

Very Concerned	87	55.06%
Somewhat Concerned	48	30.38%
Slightly Concerned	17	10.76%
Not Sure / Don't know	2	1.27%
Not at all Concerned	2	1.27%
No Response	2	1.27%

6l - Loss of Aboriginal Heritage

Very Concerned	37	23.42%
Somewhat Concerned	33	20.89%
Slightly Concerned	39	24.68%
Not Sure / Don't know	19	12.03%
Not at all Concerned	26	16.46%
No Response	4	2.53%

6m - Loss of Built Heritage

Very Concerned	51	32.28%
Somewhat Concerned	43	27.22%
Slightly Concerned	36	22.78%
Not Sure / Don't know	18	11.39%
Not at all Concerned	8	5.06%
No Response	2	1.27%

6n - Loss of Native Flora and Fauna

Very Concerned	85	53.80%
Somewhat Concerned	40	25.32%
Slightly Concerned	21	13.29%
Not Sure / Don't know	8	5.06%
Not at all Concerned	2	1.27%
No Response	2	1.27%

6o - Introduced Weeds and Pest Animals

Very Concerned	76	48.10%
Somewhat Concerned	48	30.38%
Slightly Concerned	25	15.82%
Not Sure / Don't know	3	1.90%
Not at all Concerned	2	1.27%
No Response	4	2.53%

6p1 - Other

Very Concerned	26	16.46%
Somewhat Concerned	4	2.53%
Slightly Concerned	2	1.27%
Not Sure / Don't know	0	0.00%
Not at all Concerned	1	0.63%
No Response	125	79.11%

6p2 - Other Issues Refered to in 6p1 as Specified

Pest animals (stray / feral cats, foxes)	1	0.63%
Park maintenance (playgrounds, vegetation)	2	1.27%
Undue care of contractors (kerbside bins)	1	0.63%
Loss of established character and amentiy	2	1.27%
Communication failure - Council to residents	1	0.63%
High speeds / vehicle use in sidestreets	5	3.16%
Lack of stormwater reduction policies	1	0.63%
Loss of open space / native vegetation	4	2.53%
Inappropriate revegetation - street tree sp.	2	1.27%

Noise pollution (traffic, construction)	3	1.90%
People - unsustainable behaviours	3	1.90%
Significant tree removal - laws too flexible	1	0.63%
Visual pollution (grafitti)	2	1.27%
Lack of water flow in River Torrens	1	0.63%
Public events (e.g. Womad)	1	0.63%
No Response	126	79.75%

7 - What would you say was the single most improtant environmental issue in the City?

Air pollution / greenhouse gas production	7	4.43%
General pollution (air, water, noise, litter)	5	3.16%
Noise pollution	1	0.63%
Water pollution (River Torrens, stormwater)	6	3.80%
Ineffective waste / recycling management	9	5.70%
High energy consumption	1	0.63%
High water consumption	1	0.63%
Inappropriate development / suburban infill	14	8.86%
Decline in green council services / support	3	1.90%
Loss of building / streetscape heritage	5	3.16%
Water retention / stormwater reuse	2	1.27%
Inappropriate vegetation / revegetation management	3	1.90%
Multiple - no one single important issue	3	1.90%
Personal safety	2	1.27%
People (unsustainable practices, population increase)	2	1.27%
Drugs and homelessness	1	0.63%
Catchment landuse reducing flows in Torrens	1	0.63%
No Response	89	56.33%

Question 7a to 7j - How would you rate the following causes of environmental decline in the City?

7a - Population Increase

Significant Cause	19	12.03%
Major Cause	41	25.95%
Minor Cause	57	36.08%
Not Sure / Don't Know	20	12.66%
Insignificant Cause	12	7.59%
No Response	9	5.70%

7b - Industrial Activities

Significant Cause	23	14.56%
Major Cause	40	25.32%
Minor Cause	49	31.01%
Not Sure / Don't Know	25	15.82%
Insignificant Cause	11	6.96%
No Response	10	6.33%

7c - Motor Vehicles

Significant Cause	56	35.44%

Major Cause	57	36.08%
Minor Cause	30	18.99%
Not Sure / Don't Know	8	5.06%
Insignificant Cause	0	0.00%
No Response	7	4.43%

7d - Development (Housing etc.)

Significant Cause	36	22.78%
Major Cause	50	31.65%
Minor Cause	43	27.22%
Not Sure / Don't Know	13	8.23%
Insignificant Cause	8	5.06%
No Response	8	5.06%

7e - Domestic Waste

Significant Cause	27	17.09%
Major Cause	43	27.22%
Minor Cause	57	36.08%
Not Sure / Don't Know	18	11.39%
Insignificant Cause	7	4.43%
No Response	6	3.80%

7f - Commercial and Industrial Waste

Significant Cause	37	23.42%
Major Cause	35	22.15%
Minor Cause	50	31.65%
Not Sure / Don't Know	21	13.29%
Insignificant Cause	7	4.43%
No Response	8	5.06%

7g - Litter

Significant Cause	34	21.52%
Major Cause	41	25.95%
Minor Cause	52	32.91%
Not Sure / Don't Know	22	13.92%
Insignificant Cause	5	3.16%
No Response	4	2.53%

7h - Introduced Flora and Fauna

Significant Cause	25	15.82%
Major Cause	28	17.72%
Minor Cause	56	35.44%
Not Sure / Don't Know	27	17.09%
Insignificant Cause	16	10.13%
No Response	6	3.80%

7i1 - Other

Significant Cause	11	6.96%

Major Cause	1	0.63%
Minor Cause	1	0.63%
Not Sure / Don't Know	0	0.00%
Insignificant Cause	0	0.00%
No Response	145	91.77%

7i2 - Other Issues Referred to in 7i1 as Specified

Bad practice by council management / weak council policies	2	1.27%
Air pollution (heavy vehicles on sidestreets)	1	0.63%
Water pollution (River Torrens, stormwater)	2	1.27%
Inappropriate vegetation / revegetation management	2	1.27%
Stray cats	2	1.27%
Inappropriate urban housing development	2	1.27%
People (unsustainable practices)	1	0.63%
Proliferation of road signage	1	0.63%
No Response	146	92.41%

7j - What would you say was the single most important cause of environmental decline in the City?

Air pollution / quality	4	2.53%
General pollution (air, water, noise)	5	3.16%
Water pollution (stormwater, River Torrens)	4	2.53%
Commercial / industrial activities and waste	3	1.90%
Unsuitable waste management / policies	7	4.43%
Motor vehicles (excessive speeds, reliance)	8	5.06%
Motor vehicles (traffic congestion)	3	1.90%
Lack of appropriate public transport routes	1	0.63%
Housing development / infill	15	9.49%
Inappropriate development	12	7.59%
Loss of built heritage through redevelopment	3	1.90%
Population increase	7	4.43%
People - unsustainable practices / attitudes	6	3.80%
Inappropriate vegetation / revegetation management	6	3.80%
Loss of open space / heritage gardens	3	1.90%
Multiple issues	1	0.63%
Poor council quality control / maintenance / regulation	3	1.90%
Rich over-consuming housewives in 4wd's	1	0.63%
Economic rationalists	1	0.63%
There isn't environmental decline in the city!	2	1.27%
Too hard to say	1	0.63%
No Response	62	39.24%

Question 8a to 8j - Rank the following quality-of-life concerns from highest (1) to lowest (10)

8a - Air Quality

1	34	21.52%
2	18	11.39%
3	24	15.19%

4	14	8.86%
5	16	10.13%
6	10	6.33%
7	11	6.96%
8	5	3.16%
9	2	1.27%
10	2	1.27%
No Response	22	13.92%

8b - Crime

1	32	20.25%
2	22	13.92%
3	21	13.29%
4	11	6.96%
5	16	10.13%
6	7	4.43%
7	6	3.80%
8	7	4.43%
9	7	4.43%
10	7	4.43%
No Response	22	13.92%

8c - Traffic Congestion

1	17	10.76%
2	11	6.96%
3	13	8.23%
4	17	10.76%
5	16	10.13%
6	16	10.13%
7	14	8.86%
8	10	6.33%
9	12	7.59%
10	10	6.33%
No Response	22	13.92%

8d - Water Quality (in watercourses and water bodies)

1	12	7.59%
2	20	12.66%
3	20	12.66%
4	29	18.35%
5	12	7.59%
6	14	8.86%
7	12	7.59%
8	7	4.43%
9	4	2.53%
10	4	2.53%
No Response	24	15.19%

8e - Public Open Space and Recreation Opportunities

1	9	5.70%

2	8	5.06%
3	11	6.96%
4	25	15.82%
5	24	15.19%
6	9	5.70%
7	12	7.59%
8	14	8.86%
9	11	6.96%
10	11	6.96%
No Response	24	15.19%

8f - Affordable Housing

1	10	6.33%
2	11	6.96%
3	12	7.59%
4	5	3.16%
5	12	7.59%
6	18	11.39%
7	14	8.86%
8	17	10.76%
9	22	13.92%
10	15	9.49%
No Response	22	13.92%

8g - Population Growth

1	7	4.43%
2	10	6.33%
3	6	3.80%
4	6	3.80%
5	11	6.96%
6	11	6.96%
7	17	10.76%
8	23	14.56%
9	24	15.19%
10	21	13.29%
No Response	22	13.92%

8h - Urban Noise

1	5	3.16%
2	14	8.86%
3	12	7.59%
4	17	10.76%
5	15	9.49%
6	14	8.86%
7	15	9.49%
8	23	14.56%
9	14	8.86%
10	7	4.43%
No Response	22	13.92%

8i - Loss of Biodiversity

1	6	3.80%
2	6	3.80%
3	10	6.33%
4	10	6.33%
5	12	7.59%
6	19	12.03%
7	19	12.03%
8	18	11.39%
9	21	13.29%
10	15	9.49%
No Response	22	13.92%

8j - Unemployment

1	5	3.16%
2	13	8.23%
3	6	3.80%
4	3	1.90%
5	4	2.53%
6	18	11.39%
7	15	9.49%
8	12	7.59%
9	18	11.39%
10	42	26.58%
No Response	22	13.92%

Question 9 - Where do you obtain your information regarding environmental issues in the City?

9a - The Messenger	129	26.54%
9b - The Advertiser / Sunday Mail	86	17.70%
9c - School	9	1.85%
9d - City of Norwood Payneham & St	22	4.53%
Peters website		0.00%
9e1 - Other	28	5.76%
9e2 - Other Refered to in 9e1 as Specified		
Adelaide Review	1	0.21%
Library	1	0.21%
Personal observation / research	7	1.44%
Radio	1	0.21%
Radio / print / television	4	0.82%
Government / non-government orgs.	2	0.41%
		0.00%
9f - Family / Friends	62	12.76%
9g - Look East Council Newsletter	78	16.05%
9h - Internet	20	4.12%
9i - Community Groups	36	7.41%

Question 10a to 10d - Where do you think the responsibility gor addressing environmental issues lies?

10a - Council

Very Responsible	94	59.49%
Somewhat Responsible	37	23.42%

Slightly Responsible	22	13.92%
Not Sure / Don't know	0	0.00%
Not Very Responsible	1	0.63%
No Response	4	2.53%

10b - Industry and Business

Very Responsible	77	48.73%
Somewhat Responsible	39	24.68%
Slightly Responsible	30	18.99%
Not Sure / Don't know	6	3.80%
Not Very Responsible	1	0.63%
No Response	5	3.16%

10c - Community Groups

Very Responsible	37	23.42%
Somewhat Responsible	51	32.28%
Slightly Responsible	49	31.01%
Not Sure / Don't know	10	6.33%
Not Very Responsible	7	4.43%
No Response	4	2.53%

10d - Householders

Very Responsible	75	47.47%
Somewhat Responsible	44	27.85%
Slightly Responsible	29	18.35%
Not Sure / Don't know	5	3.16%
Not Very Responsible	1	0.63%
No Response	4	2.53%

Appendix B: Exotic plant species recorded in reserves within the City of Norwood Payneham & St Peters

Compiled from information provided by K. Turner (Friends of the Billabong) and Kate Hallahan (Our Patch Officer).

SCIENTIFIC NAME	COMMON NAME
Acacia dealbata	Silver Wattle
Acacia saligna	Golden Wreath Wattle
Allium triquetrum	Three-Cornered Garlic
Amaranthus viridis	Green Amaranth
Anagallis arvensis	Scarlet/Blue Pimpernel
Anagallis minima	Chaffweed
Anredera cordifolia	Madeira Vine
Araujia hortorum	White Bladder-Flower
Arctotheca calendula	Cape Weed
Artemisia sp.	Wormwood
Arundo donax	Giant Reed
Asphodelia fistulosa	Onion Weed
Aster subulatus	Aster-Weed
Atriplex prostrata	Mat Saltbush
Bambusa spp.	Bamboo
Brachychiton populneus	Kurrajong
Capsella bursapastoris	Shepherd's Purse
Casuarina glauca	Swamp Oak
Celtis spp.	Hackberries
Centaurium spp.	Centaury
Centranthus ruber ssp. *ruber*	Red Valerian
Cerastium balearicum	Chickweed
Chamaecytisus palmensis	Tree Lucerne
Chenopodium album	Fat Hen
Conyza bilboana	Fleabane
Conyza bonariensis	Flax-Leaf Fleabane
Coprosma repens	New Zealand Mirror-Bush
Cortaderia selloana	Common Pampas Grass
Critesion murinum	Barley-Grass
Cynara cardunculus	Artichoke Thistle
Cynodon dactylon	Couch
Cyperus rotundus ssp. *rotundus*	Nut-Grass
Echium plantagineum	Salvation Jane
Eremophila maculata	Spotted Emubush
Erodium cicutarium	Cut-Leaf Heron's-Bill
Eucalyptus citriodora	Lemon Scented Gum
Eucalyptus ficifolia	W.A. Red Flowering Gum
Eucalyptus maculata	Spotted Gum
Euphorbia maculata	Eyebane
Euphorbia peplus	Petty Spurge
Euphorbia terracina	False Caper
Ficus carica	Edible Fig
Foeniculum vulgare	Fennel
Fraxinus rotundifolia ssp. *rotundifolia*	Desert Ash
Freesia hybrid	Freesia
Fumaria capreolata ssp. *capreolata*	White-Flower Fumitory
Fumaria muralis	Wall Fumitory
Galenia secunda	Galenia

SCIENTIFIC NAME	COMMON NAME
Galium aparine	Cleavers
Galium divaricatum	Slender Bedstraw
Galium murale	Small Bedstraw
Genista monspessulana	Montpellier Broom
Glycyrrhiza glabra	Liquorice
Grevillea robusta	Silky Oak
Grevillea rosmarinifolia	Rosemary Grevillea
Hardenbergia comptoniana	Western Australian Coral-Pea
Hebe sp.	
Hedera helix ssp. *helix*	Ivy
Heliotropium europaeum	Common Heliotrope
Helminthotheca echioides	Ox-Tongue
Hypochaeris radicata	Rough Cat's Ear
Ipomoeia indica	Morning Glory
Jacaranda mimosifolia	Jacaranda
Kennedia nigricans	Black Coral-Pea
Lathyrus tingitanus	Tangier Pea
Lavatera arborea	Tree Mallow
Ligustrum vulgare	European Privet
Lycium ferocissimum	African Boxthorn
Lycopersicon esculentum	Tomato
Lythrum junceum	Mediterranean Loosestrife
Malva nicaeensis	Mallow Of Nice
Malva parviflora	Small-Flower Marshmallow
Medicago spp.	Medic
Melaleuca nesophylla	
Melaleuca spp	Tea Trees and Paperbark Tea Trees
Melia azedarach var. australasica	White Cedar
Melilotus alba	Bokhara Clover
Melilotus indica	King Island Melilot
Modiola caroliniana	Red-Flowered Mallow
Nerium oleander	Oleander
Nicotiana glauca	Tree Tobacco
Olea europaea ssp. *african*	African Olive
Olea europaea ssp. *europaea*	Olive
Opuntia spp	Prickly Pear
Oxalis pes-caprae	Soursob
Pennisetum clandestinum	Kikuyu
Persicaria sp.	Knotweed
Phoenix canariensis	Canary Island Palm
Picris echioides	
Pinus halepensis	Aleppo Pine
Piptatherum miliaceum	Rice Millet
Pittosporum undulatum	Sweet Pittosporum
Plantago lanceolata var. dubia	Plantain
Plantago major	Greater Plantain
Platanus x *hybrida*	London Plane
Poa annua	Winter Grass
Polygala myrtifolia	Myrtle-Leaf Milkwort
Polygonum aviculare	Wireweed
Polygonum salicifolium	
Populus nigra	Lombardy Poplar
Potamogeton crispus	Curly Pondweed

SCIENTIFIC NAME	COMMON NAME
Prunus spp.	Plums, Almonds, etc
Quercus robur	English Oak
Ranunculus repens	Creeping Buttercup
Ricinus communis	Castor Oil Plant
Rubrus spp	Blackberry
Rumex crispus	Curled Dock
Salix babylonica	Weeping Willow
Scabiosa atropurpurea	Purple Pincushion
Schinus areira	Pepper-Tree
Senecio angulatus	Cape Ivy
Senecio pterophorus	African Daisy
Sisymbrium officinale	Hedge Mustard
Sisymbrium orientale	Indian Hedge Mustard
Solanum mauritianum	Wild Tobacco Tree
Solanum nigrum	Black-Berry Nightshade
Solidago canadensis	Golden Rod
Sonchus arvensis	Corn Sow-Thistle
Stenotaphrum secundatum	Buffalo Grass
Tamarix aphylla	Athel Pine
Tradescantia fluminensis	Wandering Jew
Tragopogon porrifolius	Salsify
Tribulus terrestris	Caltrop
Trifolium arvense	Hares Foot Clover
Trifolium fragiferum	Strawberry Clover
Trifolium spp.	Clover
Tropaeolum majus	Nasturtium
Ulmus procera	Common Elm
Urtica urens	Small Nettle
Valerianella muricata	Valerian
Verbena bonariensis	Purple-Top Verbena
Vicia spp	Vetch
Vinca major	Blue Periwinkle
Watsonia meriana cv. Bulbillifera	Bulbil Watsonia
Xanthium occidentale	Noogoora Burr
Zantedeschia aethiopica	White Arum Lily
Senecio quadridentatus	Cotton Groundsel

Appendix C: Native plant species recorded in reserves within the City of Norwood Payneham & St Peters

Compiled from information provided by K. Turner (Friends of the Billabong) and Kate Hallahan (Our Patch Officer).
# indicates species considered to have persisted since pre-European settlement.

SCIENTIFIC NAME	COMMON NAME
Acacia acinacea #	Gold-Dust Wattle
Acacia iteaphylla	Flinders Ranges Wattle
Acacia ligulata	Umbrella Bush
Acacia longifolia var. *sophorae*	Coastal Wattle
Acacia melanoxylon	Blackwood
Acacia myrtifolia var. *myrtifolia*	Myrtle Wattle
Acacia notabilis	Notable Wattle
Acacia paradoxa	Kangaroo Thorn
Acacia pycnantha	Golden Wattle
Acacia retinodes	Swamp Wattle
Acacia salicina	Willow Wattle
Allocasuarina verticillata	Drooping Sheoak
Amyema miquelii	Box Mistletoe
Arthropodium fimbriatum	Nodding Vanilla-Lily
Atriplex semibaccata #	Berry Saltbush
Atriplex suberecta	Lagoon Saltbush
Banksia marginata	Silver Banksia
Boerhavia dominii #	Tar-Vine
Bolboschoenus caldwellii #	Salt Club-Rush
Bursaria spinosa	Sweet Bursaria
Callistemon sieberi #	River Bottlebrush
Callitris preissii / gracilis	Southern Cypress Pine
Calostemma pupureum	Purple Bells
Calystegia sepium #	Greater Bindweed
Chenopodium pumilio	Clammy Goosefoot
Chloris sp.	Windmill Grass/Chloris
Chloris truncata	Windmill Grass
Convolvulus erubescens	Australian Bindweed
Convolvulus remotus	Grassy Bindweed
Correa alba var. pannosa	White Correa
Correa pulchella	Salmon Correa
Cyperus tereticaulis	Rush Sedge
Cyperus vaginatus #	Stiff Flat-Sedge
Danthonia caespitosa	Common Wallaby-grass
Dianella revoluta var. revoluta	Black-Anther Flax-Lily
Dodonaea viscosa	Sticky Hop-Bush
Einadia nutans	Climbing Saltbush
Enchylaena tomentosa	Ruby Saltbush
Eucalyptus camaldulensis #	River Red Gum
Eucalyptus leucoxylon	South Australian Blue Gum
Eucalyptus viminalis ssp. *viminalis*	Manna Gum
Euchiton involucratus	Star Cudweed
Euphorbia drummondii	Caustic Weed
Eutaxia microphylla var. *microphylla*	Common Eutaxia
Hardenbergia violacea	Native Lilac
Isolepsis nodosa	Knobby Club-rush
Juncus kraussii	Sea Rush
Juncus pallidus	Pale Rush

SCIENTIFIC NAME	COMMON NAME
Koekreuteria panicula	Golden-rain Tree
Lavatera plebeia	Australian Hollyhock
Lemna disperma #	Common Duckweed
Leptospermum continentale	Prickly Tea-Tree
Leptospermum lanigerum	Silky Tea-Tree
Lotus australis	Austral Trefoil
Lysiana exocarpi ssp. *exocarpi* #	Harlequin Mistletoe
Maireana brevifolia #	Small-leaved Blue-bush
Maireana enchylaenoides	Wingless Fissure-Plant
Marsilea drummondii	Common Nardoo
Melaleuca brevifolia	Mallee Honey-myrtle
Melaleuca lanceolata	Dryland Tea-Tree
Myoporum insulare	Common Boobialla
Olearia ramulosa	Twiggy Daisy-Bush
Oxalis perennans	Native Oxalis
Persicaria decipiens	Slender Knotweed
Phragmites australis #	Common Reed
Pittosporum phylliraeoides	Native Apricot
Poa sp.	
Portulaca oleracea	Common Purslane
Pseudognaphalium luteoalbum	Jersey Cudweed
Rhagodia spinescens	Climbing Saltbush
Salsola kali	Buckbush
Samolus repens #	Creeping Brookweed
Schoenoplectus validus	River Club-Rush
Solanum simile	Kangaroo Apple
Stipa scabra #	Rough Spear-Grass
Themeda triandra	Kangaroo Grass
Typha domingensis #	Bulrush
Vittadinia sp.	New Holland Daisy
Westringia dampieri	Shore Westringia
Westringia eremicola	Slender Westringia

Appendix D: Vertebrate fauna recorded in the City of Norwood Payneham & St Peters

Sources: K. Turner (Friends of the Billabong); EPA Frog Census data.
* denotes exotic species
[E] indicates aviary escapee
** indicates introduced from River Murray Drainage Division

SCIENTIFIC NAME	COMMON NAME
Birds	
Tachybaptus novaehollandiae	Australasian Grebe
Poliocephalus poliocephalus	Hoary-headed Grebe
Phalacrocorax carbo	Great Cormorant
Phalacrocorax sulcirostris	Little Black Cormorant
Phalacrocorax melanoleucos	Little Pied Cormorant
Pelecanus conspicillatus	Australian Pelican
Anhinga melanogaster	Darter
Egretta novaehollandiae	White-faced Heron
Ardea pacifica	White-necked Heron
Ardea alba	Great Egret
Nycticorax caledonicus	Nankeen Night Heron
Threskiornis molucca	Australian White Ibis
Cygnus atratus	Black Swan
Aythya australis	Hardhead
Anas superciliosa	Pacific Black Duck
Anas gracilis	Grey Teal
Chenonetta jubata	Australian Wood Duck
Elanus axillaries	Black-shouldered Kite
Accipiter fasciatus	Brown Goshawk
Accipiter cirrhocephalus	Collared Sparrowhawk
Aqulia audax	Wedge-tailed Eagle
Falco longipennis	Australian Hobby
Falco cenchroides	Nankeen Kestrel
Gallinula ventralis	Black-tailed Native-Hen
Gallinula tenebrosa	Dusky Moorhen
Porphyrio porphyrio	Purple Swamphen
Fulica atra	Eurasian Coot
Vanellus miles	Masked Lapwing
Larus novaehollandiae	Silver Gull
Sterna caspia	Caspian Tern
Ocyphaps lophotes	Crested Pigeon
Cacatua galerita	Sulphur-crested Cockatoo
Cacatua sanguinea	Little Corella
Cacatua roseicapilla	Galah
Trichoglossus haematodus	Rainbow Lorikeet
Glossopsitta concinna	Musk Lorikeet
Glossopsitta porphyrocephala	Purple-crowned Lorikeet
Psitteuteles versicolor	Varied Lorikeet [E]
Barnardius zonarius	Australian Ringneck [E]
Platycercus eximius	Eastern Rosella
Platycercus elegans	Crimson Rosella
Psephotus haematonotus	Red-rumped Parrot
Melopsittacus undulates	Budgerigar [E]
Cuculus pallidus	Pallid Cuckoo
Cacomantis flabelliformis	Fan-tailed Cuckoo
Chrysococcyx basalis	Horsfield's Bronze Cuckoo
Tyto alba	Barn Owl

SCIENTIFIC NAME	COMMON NAME
Ninox novaeseelandiae	Southern Boobook
Apus pacificus	Fork-tailed Swift
Dacelo novaeguineae	Laughing Kookaburra
Todiramphus sanctus	Sacred Kingfisher
Hirunda neoxena	Welcome Swallow
Hirunda nigrcans	Tree Martin
Coracina novaehollandiae	Black-faced Cuckoo-shrike
Acrocephalus stetoreus	Clamorous Reed-Warbler
Megalurus gramineus	Little Grassbird
Cincloramphus cruralis	Brown Songlark
Rhipidura leucophrys	Willie Wagtail
Pardalotus striatus	Striated Pardalote
Zosterops lateralis	Silvereye
Lichenostomus penicillatus	White-plumed Honeyeater
Phylidonyris novaehollandiae	New Holland Honeyeater
Acanthorhynchus tenuirostris	Eastern Spinebill
Manorina melanocephala	Noisy Miner
Anthochaera chrysoptera	Little Wattlebird
Anthochaera carunculata	Red Wattlebird
Taeiopygia bichenovii	Double-barred Finch [E]
Grallina cyanoleuca	Magpie Lark
Gymnorhina tibicen	Australian Magpie
Corvus mellori	Little Raven
Streptopelia chinensis	Spotted Turtledove *
Turdus merula	Common Blackbird *
Passer domesticus	House Sparrow *
Sturnus vulgaris	Common Starling *
Columba livia	Rock Dove (Feral Pigeon) *
Mammals	
Trichosurus vulpecula	Brush-tailed Possum
Pseudocheirus peregrinus	Ring-tailed Possum
Hydromys chrysogaster	Water Rat
**Rattus rattus*	Black Rat
**Rattus norvegicis*	Brown Rat
**Mus domestica*	House mouse
**Felis cattus*	Feral Cat
**Vulpes vulpes*	Fox
Reptiles	
Chelodina longicollis	Long-necked Tortoise
**Emydura macquarii*	Short-necked Tortoise
Cryptoblepharus plagiocephalus	Desert Wall Skink
Ctenotus orientalis	Eastern Spotted Ctenotus
Eulamprus quoyii	Water Skink
Hemiergis peronii	Four-toed EarlessSkink
Tiliqua scincoides	Common Bluetongue
Tiliqua rugosus	Sleepy Lizard
Christinus marmoratus	Marbled Gecko
Pseudechis porphyriacus	Red-bellied Black Snake
Pseudonaja textilis	Common Brown Snake
Frogs	
Limnodynastes dumerilii	Southern Banjo Frog
Limnodynastes tasmaniensis	Spotted Marsh Frog

SCIENTIFIC NAME	**COMMON NAME**
Crinia signifera	Brown Froglet
Pseudophryne bibroni	Bibron's Toadlet
Litoria ewingii	Brown Tree Frog
Fish	
Philypnodon grandiceps	Big-headed Gudgeon
Hypseleotris klunzingeri	Western Carp Gudgeon**
Nematocentris fluviatilis	Crimson-spotted Rainbow Fish**
Cyprinus carpio	European Carp*
Carassius auratus	Golden Carp (Goldfish)*
Gambusia holbrooki	Mosquito Fish*

Appendix E: Frog records from the City of Norwood Payneham & St Peters, 2002 – 2004

Source: Environment Protection Agency – Annual Frog Census
*Abundance is rated as few = 2–9, many = 10–50, lots = > 50 frogs.

DATE	SPECIES	COMMON NAME	ABUNDANCE*
Location: Battams Road, Royston Park (stream)			
13 Sep 2001	*C. signifera*	Common Froglet	many
4 Nov 2001	*L. tasmaniensis*	Spotted Grass Frog	few
4 Nov 2001	*C. signifera*	Common Froglet	lots
4 Nov 2001	*L. dumerili*	Eastern Banjo Frog	many
20 Sep 2002	*C. signifera*	Common Froglet	many
30 Sep 2002	*C. signifera*	Common Froglet	few
30 Sep 2002	*L. tasmaniensis*	Spotted Grass Frog	few
30 Sep 2002	*L. dumerili*	Eastern Banjo Frog	lots
Location: Oaklands Avenue, Royston Park (river)			
25 Sep 2001	*C. signifera*	Common Froglet	few
Location: River Torrens, below Severn St footbridge, St Peters (river)			
12 Sep 2004	*C. signifera*	Common Froglet	many
Location: River Torrens, between OG Road and Ascot Avenue (river)			
12 Oct 2004	*C. signifera*	Common Froglet	many
Location: St Peters River Park (river)			
13 Sep 2001	*L. dumerili*	Eastern Banjo Frog	few
13 Sep 2001	*L. tasmaniensis*	Spotted Grass Frog	few
13 Sep 2001	*C. signifera*	Common Froglet	many
13 Sep 2001	*L. ewingi*	Brown Tree Frog	few
12 Sep 2002	*C. signifera*	Common Froglet	many
12 Sep 2002	*L. ewingi*	Brown Tree Frog	many
12 Sep 2002	*L. tasmaniensis*	Spotted Grass Frog	few
12 Sep 2002	*L. dumerili*	Eastern Banjo Frog	one
13 Sep 2002	*L. dumerili*	Eastern Banjo Frog	few

Appendix F: Macroinvertebrates recorded in the vicinity of St Peters Billabong

Source: K. Turner (Friends of the Billabong)

CLASSIFICATION	COMMON NAME
Class Crustacea	
Parataya sp	Shrimp
Cherax sp.	Yabby
Cyclops sp.	Cyclops
Order Cladocera	Water fleas
Order Ostracoda	Seed shrimps
Order Amphipoda	Scuds
Order Isopoda	Slaters and Sow Bugs
Class Arachnida	
Order Acarina	Water mite
Dolomedes sp.	Fishing Spider/ Nursery-web Spider
Class Insecta	
Family Odonata	Damsel-fly larvae
Family Odonata, *Petalurus* sp. and others	Dragon fly larvae (several spp.)
Family Corixidae	Boatmen
Order Trichoptera	Caddis-fly larvae
Order Diptera, Family Culicidae, *Culex* sp.	Mosquito larvae
Family Chironomidae	Non-biting midge larvae
Order Ephemeroptera	Mayfly larvae
Family Gyrinidae	Whirlygig Beetles Adult
Class Gastropoda	
Glyptophysa aliciae	Sculptured snail
Class Bivalvia	Water snails
Corbiculina angasi	Basket Shell
Phylum Annelida	
Tubifex sp.	Tubifex worms
Glossiphonia sp.	Leeches
Phylum Platyhelminthes	Flatworms and planarians
Phylum Nematoda	Nematodes (Roundworms)
Phylum Cnidaria	
Hydra sp.	Hydra

Appendix G: South Australian State Heritage Listed Properties accessed from the Australian Heritage Places Inventory 20/7/05

Type of Property	Address
Benson Memorial Drinking Fountain	Portrush Road Kensington
Bon Marche Building	1 – 13 Payneham Road, College Park
Bridge – Brick arch	53 & 55 Bridge Street Kensington
Britannia Hotel;	1 Kensington Road Norwood
Dwelling	4 Wall St Norwood
Dwelling	2 Wakefield St Kent Town
Dwelling	12 Donegal St Norwood
Dwelling	50 High Street Kensington
Dwelling	11 Northumberland Street Heathpool
Dwelling	1 William street Norwood
Dwelling – Glynde House	54 Avenue road Glynde
Dwelling – Korra Weera	68 Battams Rd Marden
Dwelling – Scarfe Cottage Homes	4 – 12 Gertrude Street Norwood
Dwelling – Sera House	33 Dequetteville Tce Kent Town
Dwelling – former Adelaide & Suburban Tramway Company Horse Tram Depot, including surviving parts of car shed and former office	179 Magill Rd Maylands
Dwelling – former Airlie Hostel	9 Trinity St College Park
Dwelling – former Thomas Caterer's School	116 Beulah Rd Norwood
Dwelling	157 & 161 Kensington Rd Kensington
Dwelling – former Pise Hut	37 Stepney St Stepney
Dwelling and Shop	59 – 61 Rundle St Kent Town
Dwellings – six row houses	39 – 49 Bishops Place Kensington
Former Bell's Plumbers Shop	15 Payneham Rd College Park
Former caretaker's cottage, Kent Town Uniting Church	25 Grenfell Street Kent Town
Former Coach & Horses Inn	105 William St Norwood
Former Kent Town Brewery & Malthouse	Rundle St Kent Town
Former Marryatville Police Station and Dwelling	202 Kensington Rd Marryatville
Former Norwood Baptist Church and Fence	134 The Parade Norwood
Former Norwood Wesleyan Methodist Church	239 The Parade Norwood
Former Romilly House	1 North Tce Hackney
Former Woodroofe Drink Factory	2 Theresa St Norwood
Hackney Bridge – metal arch bridge	Hackney Rd Hackney
Headmaster's residence, Prince Alfred College	19 Flinders St Kent Town

Type of Property	Address
Iron Fence and Gates, former Eden Park Estate	140 Kensington Road Marryatville
Karrawood House	324 Portrush Rd Marryatville
Kent Town Uniting (former Wesleyan Methodist) Church	31A Fullarton Rd Kent Town
Kent Town Uniting Church Hall and Schoolroom	27 Grenfell St Kent Town
Loreto Convent	316 Portrush Rd Marryatville
Lutheran Community Housing Support Unit Offices (former dwelling Fulton Court)	185 Portrush Road Maylands
Maid & Magpie Hotel	1 Magill Rd Stepney
Marryatville High School	170 Kensington Road Marryatville
Marryatville High School Year 12 Centre (former dwelling Eden Park)	1A The Crescent Marryatville
Norwood Courthouse and Police Station – 1938 building only	40 Osmond Tce Norwood
Norwood Hotel	97 The Parade Norwood
Norwood Institute	110 The Parade Norwood
Norwood Primary School main building (former Model School) and boundary walls	Osmond Tce Norwood
Norwood Soldiers Memorial	Osmond Tce Norwood
Norwood Town Hall	175 The Parade Norwood
Office – Forsyth House, former dwelling	160 OG Rd Felixtow
Office – former dwelling of Henry Sewell, nurseryman	296 Payneham Rd Payneham
Office (former dwelling)	12 Dequetteville Tce Kent Town
Office (former dwelling)	94 – 96 Rundle St Kent Town
Office (former Kent Town Uniting Church Manse)	36 Grenfell St Kent Town
Office (former Miethke House or Zurich House)	28 Dequetteville Tce Kent Town
Office (former Parkin College)	64 North Tce Kent Town
Old School House St Peters College	Hackney Rd Hackney
Palm House (former dwelling) St Peters College	North Tce Hackney
Payneham Road Uniting (former Wesleyan Methodist) Church and Hall	343 Payneham Rd M arden
Prince Alfred College	23 Dequetteville Tce Kent Town
Rising Sun Inn	64 Bridge St Kensington
Royal Hotel	2 North Tce Kent Town
Shop & Dwelling (part of Rising Sun Hotel and Shops building)	42 High St Kensington
Shop (former Boot Factory and dwelling)	53 Bridge St Kensington

Type of Property	Address
Shop (former shop and dwelling) (Part of Rising Sun Hotel and Shops Building)	38 High St Kensington
Shops (former Rising Sun Hotel) (Part of Rising Sun Hotel and Shops building)	36 High St Kensington
St Aidans Anglican Church	401 Payneham Rd Marden
St Bartholomew's Anglican Church and front fence	77 Beulah Rd Norwood
St Bartholomew's Anglican Church Rectory and front fence	79 Beulah Rd Norwood
St Joseph's Convent including the 1876 chapel, the 1908 main building and additions to it	286 Portrush Rd Kensington
St Peter's Town Hall and Banquet Hall	101 Payneham Rd St Peters
Two attached houses	1&2/90 – 92 Rundle St Kent Town
Two storey shops and upstairs dwellings	258 – 262 The Parade Norwood

AUSTRALIAN HERITAGE PLACES INVENTORY

1. **Adelaide Meithke House (former)**
   28 Dequetteville Tce, Kent Town, SA
   LGA: Norwood, Payneham & St Peters
   Source: Register of the National Estate

2. **All Souls Anglican Church**
   47A Third Av, St Peters, SA
   LGA: Norwood, Payneham & St Peters
   Source: Register of the National Estate

3. **Bells Plumbers Shop**
   15 Payneham Rd, College Park, SA
   LGA: Norwood, Payneham & St Peters
   Source: Register of the National Estate

4. **Bon Marche Building**
   1-13 Payneham Rd, College Park, SA
   LGA: Norwood, Payneham & St Peters
   Source: Register of the National Estate

5. **Britannia Hotel**
   1 Kensington Rd, Norwood, SA
   LGA: Norwood, Payneham & St Peters
   Source: Register of the National Estate

6. **Chapel Tappeiner Court Nursing Home**
   286 Portrush Rd, Kensington, SA
   LGA: Norwood, Payneham & St Peters
   Source: Register of the National Estate

7. **Drinking Fountain**
   Portrush Rd, Kensington, SA
   LGA: Norwood, Payneham & St Peters
   Source: Register of the National Estate

8. **Dwelling**
   1 William St, Norwood, SA
   LGA: Norwood, Payneham & St Peters
   Source: Register of the National Estate

9. **Dwelling**
   81 The Parade, Norwood, SA
   LGA: Norwood, Payneham & St Peters
   Source: Register of the National Estate

10. **Dwelling and Garden**
    8 Elizabeth St, Norwood, SA
    LGA: Norwood, Payneham & St Peters
    Source: Register of the National Estate

11. **Forsyth House**
    160 O G Rd, Felixstow, SA
    LGA: Norwood, Payneham & St Peters
    Source: Register of the National

Estate

12. **Glynde House**
54 Avenue Rd, Glynde, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

13. **House**
11 Northumberland St, Heathpool, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

14. **House (former)**
296 Payneham Rd, Payneham, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

15. **Kent Town Brewery and Malthouse**
2 Rundle St, Kent Town, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

16. **Korra Weera**
68 Battams Rd, Marden, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

17. **Kosters Premier Pottery Ltd Bottle Kiln**
24 Avonmore Av, Trinity Gardens, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

18. **Maid and Magpie Hotel**
1 Magill Rd, Stepney, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

19. **Methodist Church (former)**
31A Fullarton Rd, Kent Town, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

20. **Norwood Institute Building (former)**
110 The Parade, Norwood, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

21. **Norwood Primary School**
53 Osmond Tce, Norwood, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

22. **Norwood Town Hall**
175 The Parade, Norwood, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

23. **Palm House, Palms and Fountain**
North Tce, Hackney, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

24. **Prince Alfred College (original buildings)**
23 Dequetteville Tce, Kent Town, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

25. **Rising Sun Inn (former)**
60 Bridge St, Kensington, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

26. **Royal Hotel**
2 North Tce, Kent Town, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

27. **St Aidans Anglican Church**
401 Payneham Rd, Marden, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

28. **St Bartholomews Anglican Church**
77 Beulah Rd, Norwood, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

29. **St Bartholomews Anglican Church Hall**
79 Beulah Rd, Norwood, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

30. **St Bartholomews Anglican Church Precinct**
77-79 Beulah Rd, Norwood, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National Estate

31. **St Bartholomews Anglican Church Rectory**
79 Beulah Rd, Norwood, SA
LGA: Norwood, Payneham & St Peters
Source: Register of the National

		Estate
32.	**St Josephs Convent and Chapel** 286 Portrush Rd, Kensington, SA	**LGA:** Norwood, Payneham & St Peters **Source:** Register of the National Estate
33.	**St Matthews Anglican Church** 146 Kensington Rd, Marryatville, SA	**LGA:** Norwood, Payneham & St Peters **Source:** Register of the National Estate
34.	**St Peters College Group** Hackney Rd, Hackney, SA	**LGA:** Norwood, Payneham & St Peters **Source:** Register of the National Estate
35.	**Terraced Shops and Residences** 258-262 The Parade, Norwood, SA	**LGA:** Norwood, Payneham & St Peters **Source:** Register of the National Estate
36.	**The Acacias, Stables and Garden (former)** 316 Portrush Rd, Marryatville, SA	**LGA:** Norwood, Payneham & St Peters **Source:** Register of the National Estate
37.	**Uniting Church Hall, Classrooms, Store, Cottage, former Manse** 25, 27, 36 Grenfell St, Kent Town, SA	**LGA:** Norwood, Payneham & St Peters **Source:** Register of the National Estate
38.	**Wesley Church Complex (former)** 239 The Parade, Norwood, SA	**LGA:** Norwood, Payneham & St Peters **Source:** Register of the National Estate
39.	**Woodroofes Factory Facade** 2 Theresa St, Norwood, SA	**LGA:** Norwood, Payneham & St Peters **Source:** Register of the National Estate

Query matched 39 records.

Appendix H: 2002 State of the Environment Report Progress on Strategies

Previous goals set for 2001-2010	Comments
Environmental Management System: Develop EMS of outdoor operations addressing stormwater pollution, trash rack management, parks / reserves operation and management.	Comprehensive system that minimise adverse impacts of Council operations, including standard operating procedures for staff & contractor activities. Plan identifies opportunities to improve Council's performance, which are being progressively implemented.
Urban Stormwater Master Plan: Develop to provide holistic and integrated water management	An eastern suburbs joint regional USMP is being developed in 2005/06.
Open Space Strategy: Incorporate water sensitive design (automatic watering systems, species requiring less water)	OSS completed in December 2003, but does not consider water management in any detail. Draft Irrigation Policy addresses this in broad terms.
Re-use: Investigate options for re-use of greywater and stormwater	Opportunities within Council operations to be investigated through the Council's Water Management Project and Regional Urban Stormwater Master Plan.
Community Biodiversity Education: Develop education and awareness programs to identify ways in which community can enhance backyard biodiversity.	To be progressed as part of Biodiversity Strategy in 2005/06.
Biodiversity Programs: Participate in and encourage community to participate in biodiversity programs (e.g. Frog Census, Our Patch)	Further priority sites will be identified though the Biodiversity Strategy 2005/06.
Efficient Transport Programs: expand support of programs and planning design to encourage sustainable transport options	*10,000 Steps Along the Parade* project held in 2005. Sustainable Transport Access Guide developed (2004/05). Passenger Transport tickets for council staff for business travel (from 2004). Staff participated in 2004 & 2005 Walk to Work Day
National Greenhouse Challenge Program: Encourage business to participate in the National Greenhouse Challenge Program, advocating cleaner production and energy minimisation.	The Council has promoted improved energy efficiency in the business sector through Biz News and the provision of Business Info Kits. Through Community Abatement Assistance Program from Australian Greenhouse Office, the Council has delivered a Business Energy Efficiency Program with City of Charles Sturt and Campbelltown City Council (2005/06).
Community Education: Expand community education and awareness on strategies to assist in the reduction of greenhouse gas emissions in households.	Actions that Council has undertaken under the CCP® Program have been publicised (eg the photovoltaic system at Payneham Library). Awareness of greenhouse issues has been promoted through the TravelSmart project. Home energy audit kits contain information about greenhouse issues.
Environmental PAR	Not yet progressed due to extensive existing PAR commitments.
Streetscape: Develop streetscape master plan	Council Tree Policy is in draft form, and

(Street Tree Strategy, cost benefit analysis of undergrounding services, verge management)	due for release shortly
Open Space Strategy: (Identify open spaces, linkages, quality and use of facilities, maintenance requirements and implementation plan, prioritise areas for upgrade)	Completed December 2003. Comprehensive, covering all aspects identified. Recommendations currently being implemented.
Industry Study: Identify industrial land use areas and develop management strategies (centralisation, industry type, industry community interface).	The 2003 Development Plan sets out principles for industrial development. PIRSA is responsible for maintaining land use data. A specific study on industry within the city has not been conducted, due to existing PAR commitments.
Waste Management Strategy: Develop waste management strategy integrating provision of waste & recycling services, maximum waste reduction & maximum diversion of recyclables from landfill.	Developed Jan 2004. Comprehensive, covering all aspects. 85 % objectives implemented, many recognised as and ongoing responsibility. Plan currently being reviewed in 2005/06..
Environmental Management System: Develop EMS incorporating waste operations (investigation of administration & depot operations, purchase of "green" office products, paper recycling initiatives, promotion of electronic media, waste disposal practices)	Corporate waste audit conducted 2005. Regular meetings to monitor minimisation initiatives. Recycling facilities provided in most council buildings and at some public events. Policy change encouraging use of electronic communication rather than hard copies. Review of purchasing policies to expand 'green' element of policy. Recycled paper used in photocopiers and printers. Toners and cartridges are recycled. Additional management strategies not yet initiated but planned for 2005/2006.
Green Organics / Recycling Awareness: Promote best practice management of green organics and recycling (e.g. greens collection service, composting of food waste)	Education and publicity undertaken as part of the roll out of the new 3 bin domestic waste collection system. Increase of 1683% of green organic collection in first 12 months. Planned compost and worm farm educational programs for residents in 2005/06.
Council Waste Collection Services: Promote existing and investigate future waste collection services (e.g. batteries, waste oil, chemicals).	Three bin system introduced with significant increases in collection of recyclables and green organics, with 75% decrease in disposal to landfill. First hazardous waste collection day held in council area in 2005, with assistance from Zero Waste SA.
Council Waste Education: Conduct an education and awareness program for council staff on waste minimisation and recycling	Staff awareness training conducted in 2004. The 2005 waste audit identified a significant volume of recyclables ending up in general waste. Room for improvement.

City of
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