

SOUTH EAST WATER

SEWAGE TREATMENT PLANTS  
SUMMARY ENVIRONMENTAL  
PERFORMANCE REPORT

2007/08



ABN 89 066 902 547



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## EXECUTIVE SUMMARY

The Sewage Treatment Plants Annual Summary Report for 2007/08 has been prepared and submitted to the EPA in accordance with the EPA Waste Discharge Licences for the Sewage Treatment Plants (STPs) operated by South East Water Limited.

This summary report is intended to provide an overview of SE Water's STP plant and environmental performance for the twelve months commencing 1 July 2007 and is a supplement to South East Water's *2007/08 Annual Report Incorporating Our Sustainability Report* which is available at [www.southeastwater.com.au/Reports2008](http://www.southeastwater.com.au/Reports2008)

SE Water achieved compliance with the waste discharge requirements of the EPA Licences for the eleventh year in succession.

Continued excellent performance has been assisted by SE Water's capital works program including; the continuation of the Backlog Sewerage Program with increased load to the STPs; approval of the Rosebud STP Class A upgrade; as well as an ongoing focus on improved operations. In particular, significant effort has been spent on process investigations and following up issues identified in environmental and internal quality audit programs. This has resulted in process changes to ensure compliance and continual improvement.

Other significant achievements include; receiving zero odour or noise complaints from our STPs; continuation of the Biodiversity Program at the Mornington STP; working with the Australian Dental Association to reduce mercury loads on the sewerage system; and having five staff become the first in Australia to be trained in Liquid Waste Management Certificate IV course.

SE Water continues to invest in research and development to underpin innovation, the capacity of our people and address knowledge gaps.

**GLOSSARY**

BOD	Biochemical Oxygen Demand
CEIP	Corporate Environment Improvement Plan
DHS	Department of Human Services
DSE	Department of Sustainability and Environment
EC	Electrical Conductivity
EIP	Environment Improvement Plan
EMS	Environmental Management System
EPA	Environment Protection Authority (Victoria)
ETP	Eastern Treatment Plant (Bangholme)
GHG	Greenhouse Gas
N	Nitrogen
NS	Not Specified
SAR	Sodium Absorption Ratio
SEO	South Eastern Outfall
SS	Suspended Solids
STP	Sewage Treatment Plant
TDS	Total Dissolved Salts
TCN	Total Combined Nitrogen
TP	Total Phosphorus
TRC	Total Residual Chlorine
WTP	Western Treatment Plant (Werribee)

## 1. INTRODUCTION

The Sewage Treatment Plants Annual Summary Report for 2007/08 has been prepared and submitted to the EPA in accordance with the EPA Waste Discharge Licences for the Sewage Treatment Plants (STPs) operated by South East Water Limited.

SE Water has operated eight STPs over the past year. The STPs are distributed throughout mainly rural locations in the Mornington Peninsula and the Western Port catchment. A summary of the sites and their Licence is provided in Table 1 below.

Table 1 SE Water STPs and Licences

Name <sup>1</sup>	Location	Licence No.	Discharges to:
<b>Blind Bight</b>	Anchorage Drive	EX 158	Reuse
<b>Hastings</b>	South Beach Road	ES 26	Water (SEO) & Reuse
<b>Koo Wee Rup</b>	Sybella Avenue	EX 49	Reuse & Waterway <sup>2</sup>
<b>Lang Lang</b>	Westernport Road	EX 36	Reuse
<b>Longwarry</b>	Cathcart Road	ES 27651	Reuse
<b>Mornington</b>	Craigie Road	EX 25939	Water (SEO) & Reuse
<b>Pakenham</b>	Koo Wee Rup Road	EX 45	Waterway (Deep Creek) & Reuse
<b>Rosebud</b>	Limestone Road	EX 25940	Water (SEO) & Reuse

<sup>1</sup> Note, for operational purposes, the names of some STPs have changed: Hastings STP is now known as Somers STP, Mornington STP as Mt Martha STP, and Rosebud STP as Boneo STP. However, this report uses the previous names to be consistent with EPA licence names.

<sup>2</sup> Discharge to waterway only follows coppicing of trees as per licence agreement.

This report is intended to provide an overview of SE Water's STP plant and environmental performance for the twelve months commencing 1 July 2007 and is a supplement to South East Water's 2007/08 Annual Report Incorporating Our Sustainability Report. These reports can be found on the web at [www.southeastwater.com.au/Reports2008](http://www.southeastwater.com.au/Reports2008)

## 2. ENVIRONMENTAL MANAGEMENT

### 2.1 QUALITY SYSTEM DOCUMENTATION

Quality procedures, work instructions, standard forms and checklists have been developed for all areas of the business, including STPs. The Quality System documentation for the STPs is assessed internally and externally through regular reviews and audits.

The SE Water Quality Management System document control utilises a management system software package 'Livelihood'. The Livelihood system uses web browser applications to manage the process documentation. Functions of this system include:

- Automated email notification to interested parties when documents are added or changed in the Quality Management System Livelihood system;
- Reporting capability on archiving processes;
- Cataloguing and indexing content; and
- Version and audit trail.

### 2.2 SE WATER'S CORPORATE ENVIRONMENT MANAGEMENT SYSTEM

SE Water has implemented an Environment Management System (EMS) throughout all areas of its business, including its STPs. The purpose of the EMS is to improve environmental co-ordination and performance, and meet the requirements of Section 7 (Environmental Management System) of the EPA / SE Water Memorandum of Understanding about Environmental Performance.

The EMS was certified to the International Standard ISO 14001 in November 1996 and is subject to one external compliance audit annually. As part of SE Water's continual improvement system, internal audits are also undertaken throughout the entire organisation including the management of the STPs. Zero non-conformances were detected during audits conducted in 2007/08.

A key feature of the EMS is its integration with the Company's Quality System (ISO 9001). Some of the main aspects of the EMS relating to the STPs are discussed in the following sections.

SE Water has formed an alliance with Thiess and Siemens known as '**us**' - Utility Services. Operational aspects of the STPs are managed by '**us**' - Utility Services.

'**us**' - Utility Services has developed an Environmental Management System that is now certified to the ISO 14001 standard. Operational activities are captured under the Utility Services EMS while SE Water maintains the planning, management, and auditing role. Reporting and monitoring processes are also integrated between the two systems.

### 2.3 SE WATER'S CORPORATE ENVIRONMENT IMPROVEMENT PLAN

A key component of SE Water's EMS is the annual Corporate Environment Improvement Plan (CEIP). The CEIP provides a mechanism for ensuring continuous improvement within the framework of the Environmental Policy by outlining a number of programs to enhance environmental performance.

The CEIP is updated annually. The objectives of the CEIP are to:

- Maintain a benchmark for SE Water's environment management practices and customer expectations regarding these practices;
- Improve SE Water's overall environmental performance and maintain compliance with statutory policies and EPA licences and regulations;
- Instil confidence in customers, contractors, regulators and the general public that SE Water is committed to achieving high standards of environmental performance, in an open, consultative manner; and
- Ensure continual improvement in environmental management.

In addition, the various control and checking measures in SE Water's EMS ensure that any improved performance is maintained. Progress with the CEIP programs is tracked and performance against the CEIP targets is reported biannually to the SE Water Board.

The CEIP is integrated with business planning processes through the Corporate Plan. This ensures that environmental improvement programs under the CEIP remain closely linked with SE Water's business planning and review processes.

## 2.4 AUDIT PROGRAM

SE Water's Environmental Management System (EMS) includes an environmental audit program for the Company's STPs and reuse customers, and surveillance / re-certification audits of the Quality System and EMS. These audits are carried out to ensure SE Water is compliant with all regulatory requirements, EPA guidelines and reuse guidelines and the ISO14001 EMS Standard. The outcomes of these audits are used as a measure of continual improvement of the Company's operations.

### 3. PERFORMANCE MONITORING AND REPORTING

SE Water undertakes monitoring programs at all STPs as required by the Licences in order to identify any impacts from the Company's operations and to ensure environmentally sustainable practices are followed. The following sections summarise the monitoring carried out during 2007/08.

#### 3.1 DATA MANAGEMENT

SE Water's Steeple database manages the data associated with STP monitoring. The system provides functions to manage sample programs, sample test data and sample registration. The system currently stores data associated with final effluent monitoring, internal process monitoring, sludge and environmental (soil, groundwater and surface water) monitoring.

#### 3.2 FLOW AND QUALITY MONITORING

SE Water achieved compliance with the waste discharge performance requirements of the EPA Licences for the eleventh successive year. Continued excellent performance has been assisted by our capital works program and an ongoing focus on improved operation. In particular, significant effort has been invested in establishing quantitative process measures, process investigations and pursuing issues identified in our environmental audit and internal quality audit programs. This has resulted in process changes to ensure compliance and continual improvement.

The following tables summarise the requirements and results for STP flow and quality monitoring in accordance with the EPA Discharge Licences for each STP. Effluent quality limits are determined according to:

Destination of Effluent	Source of Effluent Quality Limits
Effluent treated for supply as recycled water	Limits set out in EPA publication 464.2 <i>Guidelines for Environmental Management – Use of Reclaimed Water</i> and as required by the STP Licences.
Discharge to marine waters	Specific limits and monitoring requirements are set in the Licences.
Discharge to inland water	Specific limits and monitoring requirements are set in the Licences.

All effluent monitoring results in this report are undertaken in accordance with EPA Publication 441 *A Guide to the Sampling and Analysis of Water and Wastewater* and samples analysed by a NATA endorsed laboratory.

Where monitoring is required, but no limit has been specified, these have been highlighted in orange text as **NS**.

#### BLIND BIGHT

Blind Bight supplies all Class C recycled water to an off-site reuse customer on a year round basis.

During 2007/08 the Blind Bight STP met all performance requirements in the Licence, as shown in Table 2 and Table 3.

Table 2 Blind Bight Flow Monitoring Results

Location	Unit	Monitoring Frequency	Licence Limit		Result	
			Median	Max.	Median	Max.
<b>STP Inflow</b>	kL/day	Daily	1050	NS	427	610
<b>Discharge to storage off-site</b>	kL/day	Daily	NS	NS	427	923

Table 3 Blind Bight Recycled Water Quality Monitoring Results

Performance Indicator	Unit	Guideline Limit (Class C)	Result (median)
BOD	mg/L	20	2
SS	mg/L	30	4
<i>E.Coli</i>	orgs/100 mL	1,000	0
pH (10 <sup>th</sup> %ile)	pH units	>6	7
pH (90 <sup>th</sup> %ile)	pH units	<9	8
Ammonia as N	mg/L	NS	2.5
TCN	mg/L	NS	8.7
TP	mg/L	NS	11
EC	µS per cm	NS	750
SAR			3.7

## HASTINGS

Hastings discharges effluent to Bass Strait at Boags Rocks via the South Eastern Outfall, and delivers Class C recycled water to offsite reuse customers throughout the year.

During 2007/08 the Hastings STP met all performance requirements in the Licence, as shown in Table 4 to Table 6.

Table 4 Hastings Flow Monitoring Results

Location	Unit	Monitoring Frequency	Licence Limit		Result	
			Median	Max.	Median	Max.
STP Inflow	ML/day	Daily	NS	NS	3.5	7.6
Discharge to Water	ML/day	Daily	5	10	2.3	6.3

Table 5 Hastings Effluent Quality Monitoring Results - Discharge to Water

Performance Indicator	Unit	Monitoring Frequency	Licence Limit			Result	
			Median	90 <sup>th</sup> %ile	Max.	Median	90 <sup>th</sup> %ile
BOD	mg/L	Weekly	20	30	NS	3	4
SS	mg/L	Weekly	30	40	NS	6	11
TRC	mg/L	Weekly <sup>1</sup>	NS	NS	1.0	N/A	N/A
Ammonia N	mg/L	Weekly	5	10	NS	0.6	2.9
TCN	mg/L	Monthly	20	30	NS	5.1	7.8
TP	mg/L	Monthly	NS	NS	NS	9.5	11
<i>E.Coli</i>	orgs/100 mL	Weekly	200	1,000	NS	16	50
Toxicity		Annually	NS	NS	NS	Refer to Section 3.7	

<sup>1</sup> Chlorine not used throughout 2007/08 year.

Table 6 Hastings Recycled Water Quality Monitoring Results

Performance Indicator	Unit	Guideline Limit (Class C)	Result (median)
<b>BOD</b>	mg/L	20	3
<b>SS</b>	mg/L	30	6
<b>E.Coli</b>	orgs/100 mL	1,000	16
<b>pH (10<sup>th</sup> %ile)</b>	pH units	>6	9
<b>pH (90<sup>th</sup> %ile)</b>	pH units	<9	9
<b>Ammonia as N</b>	mg/L	NS	0.6
<b>TCN</b>	mg/L	NS	5.1
<b>TP</b>	mg/L	NS	9.5
<b>EC</b>	µS per cm	NS	800
<b>SAR</b>			6.1

## KOO WEE RUP

Koo Wee Rup supplies Class C recycled water to an on-site reuse customer.

During 2007/08 the Koo Wee Rup STP met all performance requirements in the Licence for reuse, as shown in Table 7 and Table 8.

Table 7 Koo Wee Rup Flow Monitoring Results

Location	Unit	Monitoring Frequency	Licence Limit		Result	
			Median	Max.	Median	Max.
<b>STP Inflow</b>	kL/day	Daily	400	1500	301	1496
<b>Discharge to Land</b>	kL/day	Daily <sup>1</sup>	NS	NS	259	481

<sup>1</sup> of days in which discharge occurred

Table 8 Koo Wee Rup Recycled Water Quality Monitoring Results

Performance Indicator	Unit	Guideline Limit (Class C)	Result	
			Median	90 <sup>th</sup> %ile
<b>BOD</b>	mg/L	20 (median)	3	20
<b>SS</b>	mg/L	30 (median)	9	91
<b>E.Coli</b>	orgs/100 mL	1,000 (median)	16	222
<b>pH (10<sup>th</sup>%ile)</b>	pH units	>6	8	
<b>pH (90<sup>th</sup>%ile)</b>	pH units	<9	9	
<b>Ammonia as N</b>	mg/L	NS	0.3	3.7
<b>TCN</b>	mg/L	NS	5	12
<b>TP</b>	mg/L	NS	10	11
<b>EC</b>	µS/cm	NS	630	690
<b>SAR</b>			6.2	

The Koo Wee Rup STP effluent is reused on a tree plantation. This plantation was harvested in 2006 resulting in reduced water demand. In accordance with the licence, a discharge to waterway was made, refer to Table 9.

The volume and effluent quality discharged was reported separately to EPA.

Table 9 Koo Wee Rup Effluent Quality Monitoring Results – Discharge to Water

Performance Indicator	Unit	Monitoring Frequency	Licence Limits		Result	
			Median	90 <sup>th</sup> %ile	Median	90 <sup>th</sup> %ile
<b>BOD5</b>	mg/L	Weekly	15	30	2	3
<b>SS</b>	mg/L	Weekly	30	40	11	21
<b>E.Coli</b>	orgs/100 ml	Weekly	200	1000	20	30
<b>pH</b>	pH units	Weekly	6.0 (min)	9.0 (max)	7.8	8.2
<b>Ammonia</b>		Weekly	NS	8	0.1	0.2
<b>TCN</b>	mg/L	Weekly	NS	20	3.7	4.2
<b>TP</b>	mg/L	Weekly	NS	12	10	11
<b>EC</b>	µS/cm	Weekly	NS	NS	660	661

## LANG LANG

The Lang Lang STP supplies Class C recycled water to an on-site tree plantation.

During 2007/08 all effluent from the Lang Lang STP was reused, with no discharge to waterways. All the performance requirements in the Licence for reuse were met, as shown in Tables 10 and 11

Table 10 Lang Lang Flow Monitoring Results

Location	Unit	Monitoring Frequency	Licence Limit		Result	
			Median	Max.	Median	Max.
<b>STP Inflow</b>	kL/day	NS	NS	NS	133	912
<b>Discharge to Land</b>	kL/day	Daily <sup>1</sup>	NS	NS	74 <sup>1</sup>	1202

<sup>1</sup> of days in which discharge occurred

Table 11 Lang Lang Recycled Water Quality Monitoring Results

Performance Indicator	Unit	Guideline Limit (Class C)	Result (median)
<b>BOD</b>	mg/L	20	8
<b>SS</b>	mg/L	NS	68 <sup>1</sup>
<b>E.Coli</b>	orgs/100 mL	1,000	73
<b>pH – 10th%ile</b>	pH units	>6	8
<b>pH – 90th%ile</b>	pH units	<9	9
<b>Ammonia as N</b>	mg/L	NS	0.3
<b>TCN</b>	mg/L	NS	5.8
<b>TP</b>	mg/L	NS	11
<b>EC</b>	µS/cm	NS	750
<b>SAR</b>			5.6

<sup>1</sup> Suspended solids is exempt in license, high suspended solids value is due to the re-suspension on inorganic particles.

## LONGWARRY

Longwarry supplies Class C recycled water to an on-site user. During 2007/08 the Longwarry STP met all EPA Licence and reuse guideline performance requirements, as shown in Tables 12 to 14.

Table 12 Longwarry Flow Monitoring Results

Location	Unit	Monitoring Frequency	Licence Limit		Result	
			Median	Max.	Median	Max.
<b>STP Inflow</b>	kL/day	Daily	600	NS	291	764
<b>Discharge to Land</b>	kL/day	Daily <sup>1</sup>	NS	NS	934	2950

<sup>1</sup> of days in which discharge occurred

Table 13 Longwarry Recycled Water Quality Monitoring Results (November – April)

Performance Indicator	Unit	Guideline Limit (Class C)	Result (median)
<b>BOD</b>	mg/L	20	6
<b>SS</b>	mg/L	30	19
<b>E.Coli</b>	orgs/100 mL	1,000	250
<b>pH (10<sup>th</sup>%ile)</b>	pH units	>6	9
<b>pH (90<sup>th</sup>%ile)</b>	pH units	<9 <sup>1</sup>	9 <sup>1</sup>
<b>TCN</b>	mg/L	NS	2.5
<b>TP</b>	mg/L	NS	1.9
<b>EC</b>	µS/cm	NS	1400
<b>SAR</b>			7.5

<sup>1</sup> Algae Present: EPA Licence allows for pH limit to be exceeded when algae or water weed is present. Refer to the full version the 2007/08 STP Annual Report for further information.

Table 14 Longwarry Licence Performance Limits (Annual results)

Performance Indicator	Unit	Monitoring Frequency	Licence Limit		Result	
			Median	90 <sup>th</sup> %ile	Median	90 <sup>th</sup> %ile
<b>E.Coli</b>	orgs/100 mL	Every two weeks	NS	1,000	80	654
<b>BOD</b>	mg/L	Every two weeks	NS	40	3	10
<b>EC</b>	µS/cm	Every two weeks	NS	NS	1300	1400
<b>SS</b>	mg/L	Every two weeks	50	NS	12	23
<b>TCN</b>	mg/L	Monthly	NS	NS	2.6	6.1
<b>TP</b>	mg/L	Monthly	NS	NS	2.8	3.5
<b>pH</b>	pH units	Every two weeks	>6.0 <sup>1</sup>	<9.0 <sup>2</sup>	8.8 <sup>1</sup>	9.2 <sup>2</sup>

<sup>1</sup> 10<sup>th</sup> percentile

<sup>2</sup> Algae Present: EPA Licence allows for pH limit to be exceeded when algae or water weed is present. Refer to the full version the 2007/08 STP Annual Report for further information.

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## MORNINGTON

Mornington discharges effluent to Bass Strait at Boags Rocks via the South Eastern Outfall and supplies Class C recycled water off-site reuse customers and for on-site use.

During 2007/08 the Mornington STP met all EPA Licence and reuse guideline performance requirements under the license dated the 4<sup>th</sup> August 1995, as shown in Table 15 to Table 17.

Table 15 Mornington Flow Monitoring Results

Location	Unit	Monitoring Frequency	Licence Limit		Result	
			Median	Max.	Median	Max.
<b>STP Inflow</b>	ML/day	NS	NS	NS	12.2	22.9
<b>Discharge to Water</b>	ML/day	Daily	14	25	12.1	22.9

Table 16 Mornington Effluent Quality Monitoring Results – Discharge to Water

Performance Indicator	Unit	Monitoring Frequency	Licence Limit		Result	
			Median	90 <sup>th</sup> ile	Median	90 <sup>th</sup> ile
<b>BOD</b>	mg/L	Weekly	20	30	3	4
<b>SS</b>	mg/L	Weekly	30	40	6	8
<b>TRC</b>	mg/L	Weekly	NS	NS	0.9	1.3
<b>E.Coli</b>	orgs/ 100 mL	Weekly	200	1,000	0	5
<b>Ammonia as N</b>	mg/L	Monthly	NS	NS	0.5	2.8
<b>TCN</b>	mg/L	Every 4 months	NS	NS	16	22
<b>TP</b>	mg/L	Every 4 months	NS	NS	13	15
<b>Broad Spectrum Toxicant</b>		Annually	NS	NS	Refer to Section 3.7	

Table 17 Mornington Recycled Water Quality Monitoring Results

Performance Indicator	Unit	Guideline Limit (Class C)	Result (median)
<b>BOD (median)</b>	mg/L	20	3
<b>SS (median)</b>	mg/L	30	6
<b>E.Coli (median)</b>	orgs/100 mL	1,000	0
<b>pH (10<sup>th</sup>ile)</b>	pH units	>6	7
<b>pH (90<sup>th</sup>ile)</b>	pH units	<9	8
<b>Ammonia as N</b>	mg/L	NS	0.4
<b>TCN</b>	mg/L	NS	15
<b>TP</b>	mg/L	NS	14
<b>EC</b>	µS/cm	NS	770
<b>SAR</b>			3.8

## PAKENHAM

Pakenham discharges effluent to water (Deep Creek) and supplies Class C recycled water to off-site reuse customers.

During 2007/08 the Pakenham STP met the performance requirements in the Licence, as shown in Tables 18 to 20.

Table 18 Pakenham Flow Monitoring Results

Location	Unit	Monitoring Frequency	Licence Limit		Result	
			Median	Max.	Median	Max.
<b>STP Inflow</b>	ML/day	NS	NS	NS	4.7	13.6
<b>Discharge to Water</b>	ML/day	Daily	5.0	NS	2.0	7.8

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Table 19 Pakenham Effluent Quality Monitoring Results - Discharge to Water

Performance Indicator	Unit	Monitoring Frequency	Licence Limit			Result	
			Median	90 <sup>th</sup> %ile	Max.	Median	90 <sup>th</sup> %ile
<b>BOD</b>	mg/L	Weekly	15	25	NS	2	4
<b>SS</b>	mg/L	Weekly	15	25	NS	4	8
<b>Ammonia N</b>	mg/L	Weekly	5.0	NS	10	0.3	3.7 (max)
<b>TCN</b>	mg/L	Monthly	15	NS	NS	4	8.4
<b>TP</b>	mg/L	Weekly	2.0	NS	NS	1.5	7.0
<b>E.Coli</b>	orgs/100mL	Weekly	200	1,000	NS	35	652
<b>pH</b>	pH units		6.0	-	9.0	7.4 (min)	8.8 (max)

Table 20 Pakenham Recycled Water Quality Monitoring Results Bald Hill Farm Reservoir

Performance Indicator <sup>1</sup>	Unit	Guideline Limit (Class C)	Result (median)
<b>BOD</b>	mg/L	20	4
<b>SS</b>	mg/L	30	3
<b>E.Coli</b>	orgs/100 mL	1,000	54
<b>pH (10<sup>th</sup>%ile)</b>	pH units	>6	7
<b>pH (90<sup>th</sup>%ile)</b>	pH units	<9	9
<b>Ammonia as N</b>	mg/L	NS	0.9
<b>TCN</b>	mg/L	NS	16
<b>TP</b>	mg/L	NS	11
<b>EC</b>	µS/cm	NS	750
<b>SAR</b>			6

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## ROSEBUD

Rosebud discharges effluent to Bass Strait at Boags Rocks via the South Eastern Outfall and to an on-site reuse scheme.

During 2007/08 the Rosebud STP met all performance requirements in the Licence, as shown in Table 21 to Table 23.

Table 21 Rosebud Flow Monitoring Results

Location	Unit	Monitoring Frequency	Licence Limit		Result	
			Median	Max.	Median	Max
<b>STP Inflow</b>	ML/day	NS	NS	NS	7.9	19.5
<b>Discharge to Water</b>	ML/day	Daily	9.0	27	7.9	19.5

Table 22 Rosebud Effluent Quality Monitoring Results - Discharge to Water

Performance Indicator	Unit	Monitoring Frequency	Licence Limit			Result	
			Median	90 <sup>th</sup> %ile	Max.	Median	90 <sup>th</sup> %ile
<b>BOD</b>	mg/L	Weekly	20	30	NS	3	9
<b>SS</b>	mg/L	Weekly	30	40	NS	5	8
<b>Ammonia N</b>	mg/L	Monthly	NS	NS	NS	11	34
<b>TCN</b>	mg/L	Every 4 Months	NS	NS	NS	19	48
<b>TP</b>	mg/L	Every 4 Months	NS	NS	NS	4.8	9
<b>TRC</b>	mg/L	Weekly	NS	NS	1	0.4	1(max)
<b>E. Coli</b>	orgs/100mL	Weekly	200	1,000	NS	26	330
<b>Toxicity</b>		Annually	NS	NS	NS	Refer to Section 3.7	

Table 23 Rosebud Recycled Water Quality Monitoring Results

Performance Indicator	Unit	Guideline Limit (Class C)	Result
<b>BOD (median)</b>	mg/L	20	3
<b>SS (median)</b>	mg/L	30	5
<b>E. Coli (median)</b>	orgs/100 mL	1,000	26
<b>pH – 10<sup>th</sup> %ile</b>	pH units	>6	7
<b>pH – 90<sup>th</sup> %ile</b>	pH units	<9	8
<b>Ammonia as N</b>	mg/L	NS	11
<b>TCN</b>	mg/L	NS	19
<b>TP</b>	mg/L	NS	4.8
<b>EC</b>	µS/cm	NS	1000
<b>SAR</b>			5.2

### 3.3 SOIL MONITORING

SE Water carries out soil monitoring at all its STPs where recycled water is used on-site and at Bald Hill Farm. The aim of the program is to identify any potential soil impacts associated with wastewater reuse and to monitor the sustainability of the irrigation programs. Sustainability Monitoring is conducted biannually by monitoring irrigated soils for salts (type and concentration) and nutrients before and after each irrigation period. A list of the biannual soil test parameters is listed in Table 24.

Table 24 Soil Monitoring Parameters for biannual analysis.

Parameters	
<b>pH</b>	<b>Emersion Dispersion</b>
<b>EC</b>	<b>Total Phosphorous</b>
<b>SAR</b>	<b>Total Nitrogen (reported as TKN, NO<sub>x</sub> and Total Nitrogen)</b>

To assess other impacts to soil at the STPs and reuse areas, additional soil monitoring is also undertaken biennially (2-Yearly Contaminant Monitoring). This biennial program includes additional parameters which include: exchangeable sodium; exchangeable cations; total Kjeldahl nitrogen; soluble cations; and metals (arsenic, cadmium, chromium, copper, iron, lead, mercury, nickel, selenium and zinc).

During 2007/08, Sustainability Monitoring was carried out in October 2007 and April 2008. The location and the test type are shown in Table 25. The '2-Yearly Contaminant Monitoring' was not undertaken this year and is next scheduled for April 2009.

Table 25 Soil sampling details.

Location	October 2007 sites sampled	April 2008 sites sampled	Test Type
<b>Bald Hill Farm</b>	4	4	Subsoil
<b>Blind Bight</b>	1	0	Subsoil
		2	Subsoil
<b>Hastings</b>	1	1	Subsoil
<b>Koo Wee Rup</b>	4	4	Subsoil
<b>Lang Lang</b>	4	4	Subsoil
<b>Longwarry</b>	5	5	Subsoil
<b>Mornington</b>	5	0	Topsoil
	1	1	Topsoil
	1 (topsoil only)	2 <sup>1</sup>	Subsoil
<b>Pakenham</b>	4	4	Subsoil
<b>Rosebud</b>	6	5	Topsoil
	1	1	Topsoil
	0	1	Topsoil
	1	1	Subsoil

<sup>1</sup> Additional monitoring was undertaken at this site to assess suitability for application of biosolids and of trees – this was originally scheduled for October 08.

Samples analysed are composite samples collected in accordance with the EPA Publication 441, *A Guide to the Sampling and Analysis of Waters, Wastewaters, Soils and Wastes*. A topsoil test is a single sample of the soil taken just below the surface, whilst a subsoil test is generally three samples taken from various depths including the topsoil test.

In 2005/06 a review of soil monitoring data collected since 1997 on the eight permanent licensed STPs and the Bald Hill Farm property, was completed by Coffey Geosciences. A report on the outcome of this review was presented to EPA in late 2005 and follow up actions were reported in the 2006/07 STP Annual Report. The next full review of soil monitoring data is due to be undertaken in 2010.

The preliminary results from 2007/08 do not indicate any additional actions need to be taken in 2008/09.

### 3.4 GROUNDWATER MONITORING

Groundwater monitoring is undertaken biannually before and after the irrigation season at all eight STPs and Bald Hill Farm. The aim of the monitoring program is to assess any potential impacts to groundwater from the use of recycled water at STPs, and Bald Hill Farm as well as from the operation of the STPs. Groundwater analysis parameters are presented in Table 26.

Table 26 Groundwater Analysis Parameters

Analysis	
<i>E.coli</i>	Zinc (Zn)
Sodium (Na)	Iron (Fe)
Potassium (K)	Nitrate (NO <sub>3</sub> )
Calcium (Ca)	Ammonia (NH <sub>3</sub> -N)
Magnesium (Mg)	Total Phosphorous (P)
SO <sub>4</sub> (Sulphate)	Total Organic Carbon (TOC)
Chloride (Cl)	Total Dissolved Solids (TDS)
Bicarbonate (HCO <sub>3</sub> )	Total Nitrogen (TN)
Cadmium (Cd)	pH
Chromium (Cr)	EC
Copper (Cu)	Dissolved Oxygen (DO)
Lead (Pb)	Oxidation Reduction Potential
Nickel (Ni)	

Table 27 Groundwater sampling locations and details.

Location	October 2007 sites sampled	April 2008 sites sampled
Bald Hill Farm	5	4
Blind Bight	9	9
Hastings	10	10
Kooweerup	5	5
Lang Lang	6	7
Longwarry	8	10
Mornington	15	16
Pakenham	5	7
Rosebud	17	15

### 3.5 GROUNDWATER MONITORING REVIEW AND OUTCOMES

In 2005/06 a review of all groundwater monitoring data collected since 1997 on the eight permanent licensed STPs and the Bald Hill Farm property used for irrigation was completed by consultants GHD, with a senior review of the findings by Golder and Associates. A report on the outcome of this review was presented to EPA in late 2005.

The next full review of the groundwater results is due in 2010. The following provides a brief summary of the outcomes from sampling during 2007/08.

### 3.6 BLUE-GREEN ALGAE MONITORING

Blue-Green Algae monitoring is undertaken at all STPs with lagoons. Throughout 2007/08, staff conducted regular monitoring of the lagoons for visual signs of Blue-Green Algae. All Blue-Green Algae occurrences are managed in accordance with SE Water's Quality System Work Instruction 'Blue-Green Algae Management'. This work instruction reflects the guidelines given in the publication *Blue-Green Algae* published by the Department of Natural Resources and Environment 1998.

Elevated Blue-Green Algae cell counts were observed at 4 STPs in 2007/08. At lagoons where the Blue-Green Algae levels reached the trigger level of 2,000 cells/mL, as set in the Quality System Work Instruction, the relevant procedures were followed for actions and reporting requirements. All affected reuse customers were

notified and provided with information on handling water containing Blue-Green Algae, in accordance with the work instruction.

### 3.7 EFFLUENT TOXICITY MONITORING

Effluent toxicity monitoring is required by the Licences for three of SE Water's STPs. In addition to this requirement, SE Water has been undertaking toxicant monitoring of effluent from the STPs since 1996. This includes monitoring of broad spectrum toxicants (annually) and trace metals (quarterly). This program was developed with and approved by the EPA.

The water industry in Melbourne uses a system for prioritising the risks posed by substances present in sewage and implementing independent plans based on the associated business cases. To date, this system has focussed on cadmium, colour, copper, mercury, salt, and zinc.

#### COPPER AND ZINC

Investigations conducted in 2003 indicated that the proportion of copper in sewage due to domestic waste was in the range 60% to 75% and the proportion of zinc from this source was in the range 70% to 80%. A later study conducted in 2005/06 suggested that the domestic contribution of these metals may be less than indicated by the earlier work.

More recently, the metropolitan water industry has used the Smart Water Fund to support two major studies into the origins of copper and zinc in the sewage system. The studies are;

#### DOMESTIC SEWAGE STUDY

This project is an investigation into the sources of a number of substances, including copper and zinc, in domestic sewage. The study is being conducted by the CSIRO and involves both a desk top and a sampling program.

#### SOURCE OF INDUSTRIAL CONTAMINANTS

The objective of this project is identification of the main trade waste sites responsible for discharge to sewer of a number of substances, including copper and zinc.

This project is being undertaken by an external consultant. It comprises a desk top component to locate the most probable major sites and a field based sampling program to quantify the load from each.

Both projects will be completed in 2009. The results will be used to develop a metropolitan wide management plan to reduce the level of these metals in sewage to the extent practicable.

#### TOXICITY MONITORING AT DEEP CREEK

Toxicity monitoring of effluent entering Deep Creek at the Pakenham STP has been included in the monitoring program since 2001 following liaison with EPA. Microtox<sup>®</sup>, the toxicity test adopted for use at Pakenham, is a rapid and sensitive method of assessing toxicity in effluents. In 2007/08 the Microtox<sup>®</sup> test was applied to the discharge to Deep Creek at the Pakenham STP. One test was conducted during discharge to Deep Creek. The result indicated that the effluent had insufficient toxic effect to calculate a value. Based on this result it was concluded that the effluent has no toxic effect on the receiving water, though SE Water will continue to take samples at this site.

## 4. WASTE MANAGEMENT PROGRAMS

This section covers the Licence requirements for reporting on programs to improve processes and reduce waste discharges.

### 4.1 TRADE WASTE

#### 4.1.1 SE WATER CORPORATE TRADE WASTE PROGRAMS

The following significant initiatives relating to trade waste at local STPs have been undertaken in 2007/08.

##### CLEANER PRODUCTION PARTNERSHIP

SE Water has entered into a jointly funded 'Cleaner Production Partnership' with EPA Victoria. The purpose of this partnership is to part fund investigations into trade waste issues posed by specific substances or specific businesses to identify opportunities to reduce TDS, colour and metal loads being discharged to sewer.

During 2006-08, SE Water entered into partnerships with two trade waste customers to examine opportunities for cleaner production. These partnerships have identified several lines of investigation that can be pursued to reduce both potable water usage and pollutant load to sewer. In the case of the first customer there are opportunities to reduce nitrogen. In the second case, the customer may be able to reduce salt discharge to sewer.

Furthermore, SE Water has engaged the services of an external consultant to conduct detailed assessments of the on-site treatment facilities at a number of other trade waste customers sites to increase the efficiency of their treatment processes to reduce the loads on the Pakenham STP.

##### TRAINING

During 2007/08, three Trade Waste Officers, a Technical Officer and the Operations Manager were part of the first in Australia to complete the Liquid Waste Management Certificate IV course. This course is a joint training program developed by SE Water, the EPA and other water authorities, covering all the issues with the management and operational aspects of trade waste in Victoria.

##### SEWAGE QUALITY MANAGEMENT SYSTEM (SQMS)

SE Water has a *Bulk Sewage Transfer, Treatment & Disposal Agreement (BSA)* with Melbourne Water. The BSA describes the rights and obligations of Melbourne Water and SE Water in regard to transfer, treatment and disposal of bulk sewage. This relates to SE Water's overall management of trade waste. The SQMS is used as the basis for our rights and obligations with our local STPs.

##### ISO22000 PROGRAM IN TRADE WASTE

To assist effective management of sewage quality risks, SE Water with the other Melbourne water businesses has implemented a program for establishing a system for ISO 22000 certification. ISO 22000 includes Hazard Analysis and Critical Control Point (HACCP) as a central component, which will assist integration of trade waste management and other source control programs with the HACCP plans used for water recycling, biosolids recycling and STP management. The development of the system is expected by the end of 2008, leading to certification in 2009.

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## POLLUTANT MANAGEMENT PLANS

The water industry in Melbourne has a formal approach to development of management plans for problematic substances in a priority order. The system involves an annual cycle for determining the priority substances and requires documentation of the problem, identification of the principal origins and development of approaches to reduce loads to the extent practicable. These approaches can be based on regulation (e.g. adoption of a charge, a limit or a treatment requirement) or a partnership approach based on education and incentives.

The substances currently included in this program are TDS at the Western Treatment Plant (WTP), mercury and colour at the Eastern Treatment Plant (ETP) and cadmium.

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### TDS AT THE WTP

Reducing TDS levels in the Western Sewage System has been a major focus for the retail water industry's cleaner production program over the last 3 or 4 years. This focus has resulted in part funding of investigations by individual customers into options for reducing TDS discharges to sewer and also part funding of capital expenditure in some cases. The objective of these programs was to reduce the daily TDS load at the WTP by 60 tonne per day by targeting key City West Water and SE Water customers.

This target has been achieved.

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### MERCURY

There is evidence in the literature that about 40% of the mercury in the sewerage system originates from dental surgeries due to the discharge of amalgam waste. This major source of mercury has been targeted by a joint partnership between the water industry, the Australian Industry Group, the Australian Dental Association (Victorian Branch) and the EPA.

The principal initiative introduced by the partnership has been a rebate program to partially fund the cost of installing amalgam separators in surgeries throughout all of Victoria. SE Water is the water industry representative on the Steering Committee for this project.

The cost of the metropolitan component of the rebate program is \$660,000 over 3 years and SE Water has committed to providing 50%. Additionally SE Water will provide all of the funds to allow the dental association to engage a Project Officer for 3 years to promote and operate the rebate system.

Further major sources of mercury will be identified by the two Smart Water Fund projects described in Section 9.3.

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### COLOUR AT ETP

The colour of effluent from the ETP is a potential issue because of its influence on the visibility of the plume at Boags Rocks and the possible long term aesthetic impacts from the use of Class A recycled water in toilet flushing in dual pipe housing estates.

The current management plan for this 'substance' involves identification of the major trade waste sources, investigations into treatment options and development of target values for effluent colour using customer focus groups.

A major feature of the management plan is the use of colour science to determine trade waste impacts and the effect of lower colour levels on plume visibility at Boags Rocks. Colour science has not been used in the

water industry to date and its use allows the effect of hue to be determined (i.e. colour science allows the effect of a blue trade waste on the brown/yellow colour of effluent to be objectively determined).

It is expected that the investigatory phase of the colour management plan will be completed in the first half of 2009 and this will allow the water industry to develop a suite of actions to achieve practicable reductions.

## CADMIUM

The literature and monitoring data to date does not allow the major sources of cadmium in Melbourne's sewers to be identified. Cadmium has therefore been included in the two Smart Water Fund projects described in Section 9.3.

## WASTELOG

SE Water continued to manage customers producing greasy waste by using the system 'Wastelog' which tracks the cleaning of grease interceptors by private contractors and ultimately reduce the volumes of fats and grease that enter the sewer. This program is a major contributor in reducing sewerage blockages due to fats. Implemented in 1997, Figure 1 demonstrates the considerable reduction in sewer blockages due to the build up of greasy waste in the sewerage network.

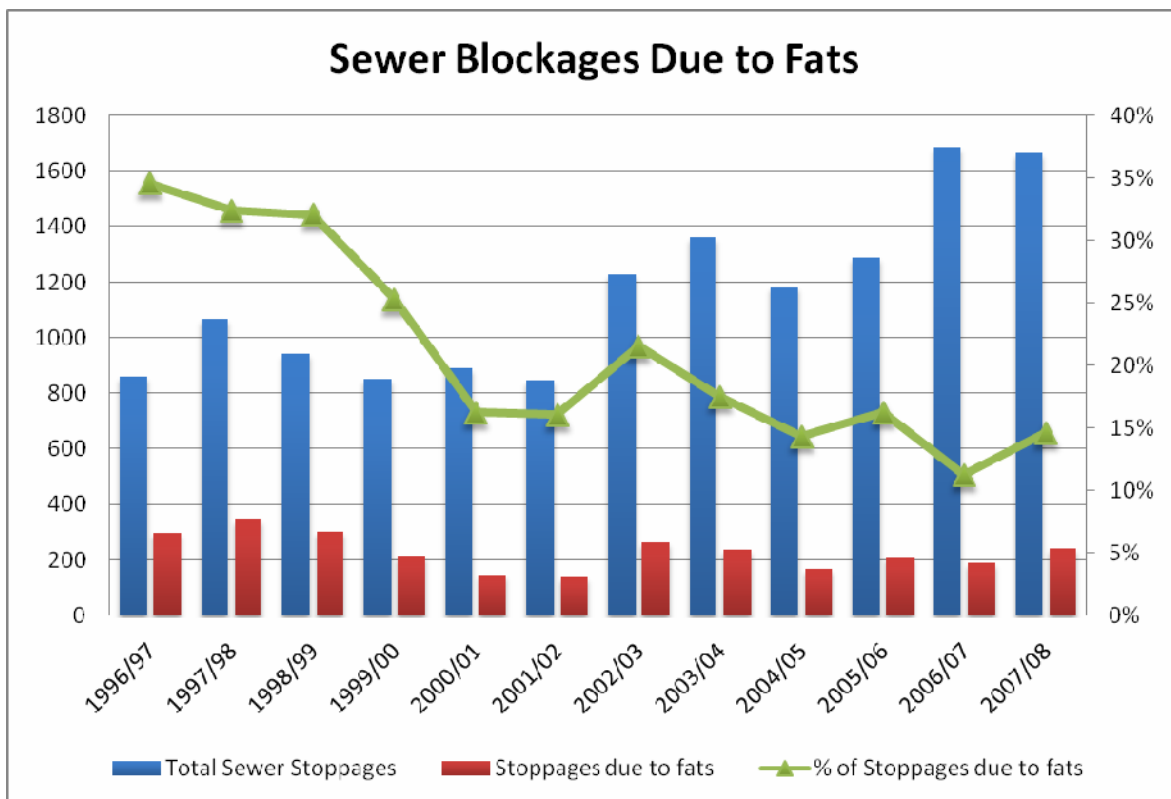



Figure 1 Sewer Stoppages Due to Fats

### 4.1.2 SIGNIFICANT CHANGES TO TRADE WASTE

The Pakenham STP experienced problems that had an adverse affect on the plant. This was thought to be caused by a toxic substance, and as a result Trade Waste conducted an extensive sampling program and in addition increased inspections in the Pakenham area. Although we could not detect any illegal dumping, the surveillance proved successful as the STP has not received a significant toxic inflow at the STP since the

increase in inspections and sampling commenced. Operational changes were made to prevent any adverse impact on the environment.



## 5. RESOURCE RECOVERY

### 5.1 EFFLUENT REUSE

A strategy has been developed that supports the sustainable reuse of recycled water from the STPs. This strategy is in line with the *State Environment Protection Policy (Waters of Victoria)* that encourages reuse of treated wastewater where 'practicable and environmentally beneficial'. This is in-line with SE Water's strategic objective to increase reuse of wastewater.

SE Water, in liaison with the EPA, has developed a 'Wastewater Reuse Management Overview' for reuse management arrangements to clarify understanding and expectations between both parties on issues relating to reuse and Licence compliance.

#### 5.1.1 EFFLUENT REUSE PROGRAMS

SE Water manages a number of schemes to reuse recycled water on-site and provide recycled water to customers. In line with government and SE Water policy, SE Water has significantly increased the percentage of recycled water used from its STPs over the past eleven years, as illustrated in Figures 2 and 3 below.

The metered volume of recycled water decreased this year to 2566 ML compared with last year (2955ML). The decrease is due to a decrease in demand attributed to the relatively cooler weather experienced in February and March than past years (25 days of rainfall totalling 54mm of rain in these two months). Inflows to some of the STPs have dropped due to external use water restrictions, whereby many home owners took advantage of greywater on their own properties instead of discharging to sewer.

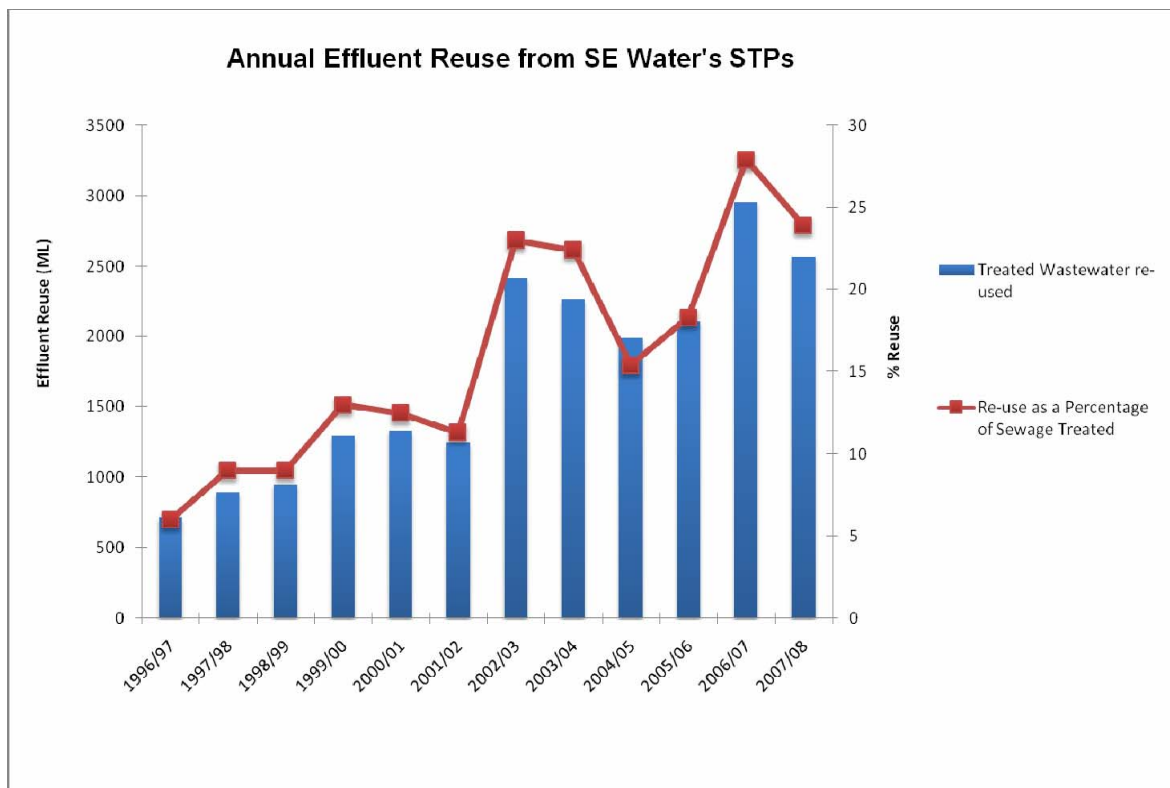


Figure 2 SE Water's Effluent Reuse

NB: The graph above does not include recycled water delivered to customers via the South Eastern Outfall

Reuse volumes quoted in this report have been calculated as the volume of recycled water irrigated on-site, plus the volume supplied to reuse customers plus the volume used in STP processes, as is reported in other SE Water reports to the EPA. The percentage reuse has been calculated as the percentage of influent compared to the STP supplied as recycled water (as defined above). These definitions are slightly different to the Essential Services Commission definitions, and therefore numbers for the same STP can differ. Approximately 6% of the water that is recycled is used for internal processes. In addition to this, SE Water delivers recycled water to a number of customers that are supplied from Melbourne Water's South Eastern Outfall (SEO). 1,304 ML was supplied to customers via the SEO during 2007/08.

The Blind Bight, Lang-Lang and Longwarry STPs treat and store recycled water for the irrigation season. These STPs all achieved 100% reuse and no discharge to waterways occurred. Discrepancies between inflow and the total amount discharged to land and water arise because of a fluctuations in the total volume accumulated in the storage reservoirs and evaporation throughout the year.

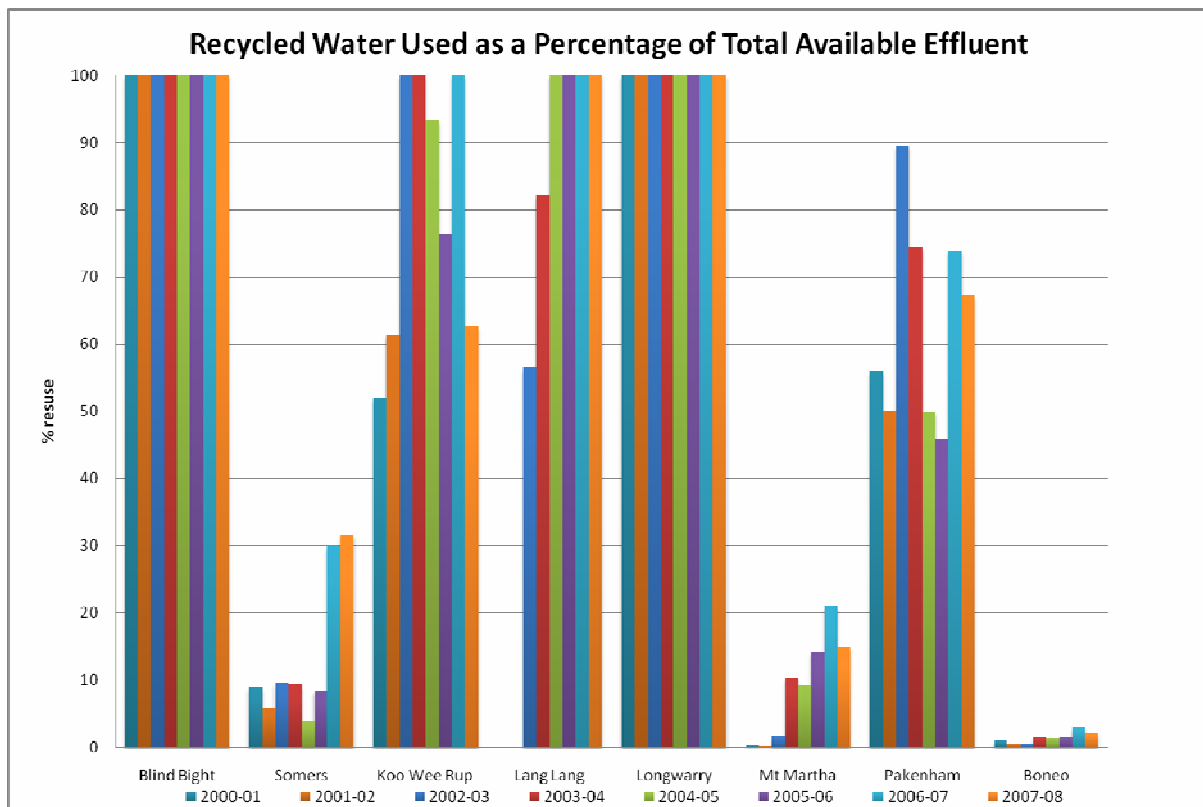


Figure 3 Percentage of Recycled Water Use

### 5.1.2 PROGRAMS TO ASSIST SUSTAINABLE WATER RECYCLING

During 2007/08, SE Water was involved in a number of programs to assist sustainable water recycling. These programs included:

- Undertaking reviews of the practical implications of the National Water Recycling Guidelines and presenting this information in two papers at the AWA Water Recycling Conference in Sydney; and
- Participation in working groups on the Smart Water Funded; range of industrial use of recycled water projects.

## 5.2 BIOSOLIDS TREATMENT AND APPLICATION

### 5.2.1 BIOSOLIDS PROGRAMS

SE Water's strategy is to use biosolids for agriculture or on-site for landscaping. Sludge is currently dried in drying pans or lagoons where it is then stored until it matures and becomes suitable for these uses.

Individual plans for biosolids use at each STP were completed in 2003 and are being implemented with the priority being biosolids use at Pakenham, Rosebud and Mornington. During 2007/08, the Rosebud STP Sewage Sludge Management Plan was reviewed and updated with the strategy for land application being confirmed.

### 5.2.2 BIOSOLIDS USE

The mass of biosolids used this year was equal to the annual production of biosolids, despite the increase in production at Rosebud (see Figure 4 below). The biosolids use percentage has decreased on last year due to the decommissioning of Cranbourne STP but is expected to increase again next year.

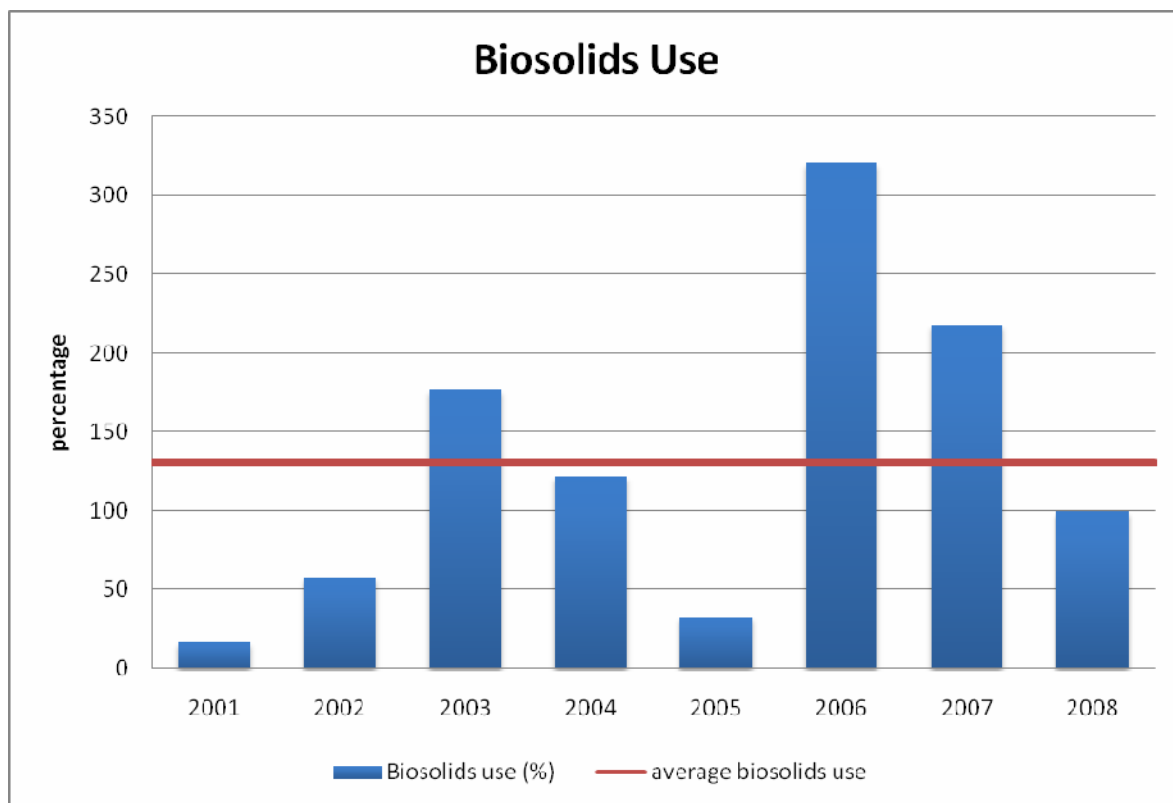


Figure 4 Percentage of biosolids use


### 5.2.3 INITIATIVES TO INCREASE BIOSOLIDS BENEFICIAL USE

SE Water is seeking to maximise the sustainable use of biosolids for agriculture and landscaping on SE Water's land. SE Water is also investigating options for the future use of biosolids off-site for soil conditioning in agriculture.

In 2006, a contract was entered into to utilise biosolids from Pakenham STP for agriculture over the next three years. Biosolids that have matured for more than three years will continue to be used for agriculture on SE Water's land at Pakenham.

Rosebud STP Sludge Management Plan was updated for an additional year to include 2007/08 and an Environment Improvement Plan was approved by the EPA for this to occur. This plan took into account the fact that SE Water purchased a property adjacent to the Rosebud STP that will beneficially utilise the existing store of biosolids as a soil conditioner to improve the nutrient content and increase productivity of the land. This property has an additional benefit of acting as an odour buffer zone to the STP.

The Rosebud Sludge Management Plan will be used as a framework for future sludge management plans at SE Water's other STPs during 2008/09.



## 6. PROTECTING OUR ENVIRONMENT

### 6.1 GREENHOUSE GAS EMISSIONS

SE Water maintains a greenhouse gas inventory which is used to record emissions resulting from SE Water activities at the end of each financial year. The inventory is established in accordance with the World Business Council for Sustainable Development Protocol for Greenhouse Gas Accounting and Reporting and calculations adopted are largely in accordance with Australian Greenhouse Office methods and factors.

In accordance with the SE Water's culture of continuous improvement and in line with SE Water's Corporate Plan strategic direction, a renewable stationary energy figure of 16.3% was achieved for 2007/08. Additionally SE Water is committed to achieving ongoing greenhouse reductions through:

- Continuing methane recovery and reuse for sludge heating at the Mornington STP;
- Continual growth in the purchase of green power, now at 10.6%;
- Continuing to subscribe fleet vehicles to green fleet each year (currently 174 vehicles);
- Generation of additional renewable energy through the introduction of a mini hydro system commissioned in July 2008;
- Continuing Eco-office initiatives including smart metering of electricity consumption; and
- Continuing to participate in WSAA reporting activities.

Estimated greenhouse gas emissions associated with SE Water activities are detailed in Table 28 below. SE Water reports on its greenhouse gas emissions based on the Department of Climate Change guidelines.

Table 28 Estimated Greenhouse Gas Emissions Associated with SE Water's Activities (tCO<sub>2</sub><sup>e</sup>)

Emission/Offset	2007/08	2006/07	2005/06	2004/05
<b>Scope 1</b>				
<b>Non-Transport Diesel</b>	31	5		
<b>Gas</b>	71	98	43	68
<b>Livestock</b>	1279	1331	1907	2493
<b>Vehicles - Fleet</b>	977	1009	981	1045
<b>Wastewater</b>	2966	3138	2639	2517
<b>Total Scope 1</b>	5323	5582	5571	6123
<b>Scope 2</b>				
<b>Electricity</b>	21531	22440	25617	27013
<b>Total Scope 2</b>	21531	22440	25617	27013
<b>Scope 3</b>				
<b>Non-Transport Diesel</b>	2	1		
<b>Gas</b>	7	13	6	
<b>Electricity</b>	1412	1558	3313	
<b>Vehicles - Fleet</b>	46	77	106	
<b>Vehicles - Tankering</b>	7	0	0	
<b>Total Scope 3</b>	1479	1648	3425	
<b>Total emissions</b>	28328	29671	34613	33136
<b>Offsets</b>				
<b>Trees</b>	-248	-556	-1143	-988
<b>Greenfleet</b>	-1030			

<b>Total Offsets</b>	-1278	-556	-1143	-988
<b>Net (tCO<sub>2</sub><sup>e</sup>)</b>	<b>27050</b>	<b>28470</b>	<b>32825</b>	<b>31498</b>

In addition, the water efficient shower head replacement scheme is also contributing to greenhouse gas reductions in the community. Details on the number of shower heads replaced and the estimated associated emission reductions are included in the Table 29 below.

**Table 29 Estimated Greenhouse Gas Reductions Associated with SE Water's Showerhead Replacement Scheme**

<b>Reductions Associated with SE Water's Showerhead Replacement Scheme in 2007/08</b>			
	No. of Showerheads installed	emission factor (tCO <sub>2</sub> <sup>e</sup> /showerhead)	emissions (tCO <sub>2</sub> <sup>e</sup> ) 2007/08
<b>Residential</b>	56,077	2.8	-157,015
<b>Business</b>	7328	2.8	-20,518
<b>Total (tCO<sub>2</sub><sup>e</sup>)</b>			<b>-177,534</b>

For more information about SE Water's energy consumption and GHG emissions, please refer to the website [www.southeastwater.com.au/Reports2008](http://www.southeastwater.com.au/Reports2008) for a GHG factsheet.

## 6.2 BIODIVERSITY

SE Water's service region is naturally rich in biodiversity with an abundance of indigenous flora and fauna.

As part of SE Water's commitment to uphold the State Government's Victorian Biodiversity Strategy, approximately 77,000 plants will be planted over a four year period at the Mornington STP.

So far 4,200 plants have been planted adjacent to Balcombe Creek, and other activities taking place which include pre and post planting weed control; staking and guarding of trees and shrubs; engagement of the community with tree planting days with students from a local primary school and members of Rotary Club; as well as volunteering efforts by SE Water staff.

Additionally, a revegetation project is taking place in the Southern Paddock on the Mornington STP site where 15,000 indigenous trees will be planted in 2008/09. This site provides SE Water the opportunity to increase biodiversity through vegetation establishment. SE Water is currently in negotiations with the EPA over an EIP to beneficially utilise biosolids from the STP to improve the soil quality in the revegetation area.

## 7. AUDITS

SE Water's EMS includes an environmental audit program for the company's STPs, reuse customers, and surveillance/certification audits of the quality system and EMS. These audits are conducted to ensure SE Water is compliant with all regulatory requirements, EPA guidelines, reuse guidelines and the ISO14001 EMS Standard. The outcomes of these audits are used as a measure of continual improvement of SE Water's operations.

### 7.1 QUALITY AND ENVIRONMENT MANAGEMENT SYSTEM SURVEILLANCE AUDITS

SE Water undertakes quality and EMS surveillance audits through external auditors annually. These audits ensure that SE Water is complying with the certification requirements of ISO 9001 (Quality System) and ISO 14001 (Environment Management System) certification.

The triennial external certification audit of SE Water's Environmental Management System (EMS) was undertaken during the week of 13th-16th August 2007. The EMS met the requirements of ISO 14001 and certification was recommended. There were no 'non-conformances' identified during the audit. Two 'areas of concern' were noted relating to enhancing environmental awareness training for SE Water staff and also expansion of incident reporting procedures to cover more unusual types of incidents. These items have been closed out to the satisfaction of the external certification organisation.

SE Water also undertakes internal quality and EMS audits annually. The most recent internal EMS audit was undertaken in May 2008. No non-conformances were identified, but six 'opportunities for improvement' have been logged into the improvement system for further investigation and follow up.

### 7.2 ENVIRONMENT AUDITS OF STPS

Environmental audits of all SE Water's STPs are conducted triennially. This is with the exception of the Mornington STP which is audited annually following an agreement reached with the Community Liaison Committee for the STP.

An external EPA accredited auditor undertakes audits of each of SE Water's STPs. These audits verify continued compliance with the relevant licences' requirements and other regulatory obligations for each STP.

Environmental audits were conducted at Mornington, Lang Lang, and Koo Wee Rup STPs in May 2008. There were no non-conformance issues raised during the audits and all STPs audited were found to be compliant with regulatory requirements. A number of opportunities for improvement were recommended by the auditor and have been reported to SE Water's Environment, Health and Safety Committee (EHS Committee). SE Water actioned all recommendations arising from this audit.

Minor opportunities for improvement were identified at the Mornington STP. Work is continuing with the odour management strategy.

### 7.3 REUSE SCHEMES

SE Water field officers undertake audits of reuse sites during the irrigation period. Each customer is notified if there are any issues arising from the inspections.

Consultants CEE were engaged by SE Water to visit existing reuse customers who consume more than 1ML/year to undertake site assessments and reporting in accordance with relevant EPA Guidelines. After these sites were assessed, feedback was provided to SE Water to follow up with the customer as required.

SE Water has developed a Compliance Declaration Form for each client (part of SE Water's EIP) to be submitted biannually. These are analysed by SE Water staff and are followed up with the customer where any discrepancies are found.

Over the past seven years the results of external audits undertaken by an EPA appointed environmental auditor (Industrial Facilities) at reuse sites and has found them to be well managed and in accordance with EPA guidelines. External audits are undertaken at all sites that use more than 1ML per day, dairy farms and high risk areas such as schools. Further audit schedules are being determined by SE Water based on risk and in conjunction with the auditor's recommendations for the 2008/2009 season.

In 2007/08 representatives from the EPA regional office and head office, attended recycled water sites that were under external audit by SE Water. This was a good opportunity for EPA staff to observe how SE Water manages its customers and witness how the guidelines are applied in the field. The response by all EPA staff was positive.

## 8. COMPLAINTS

### 8.1 NOISE

No complaints were made regarding noise at SE Water's STPs during 2007/08.

### 8.2 ODOUR

SE Water occasionally receives public complaints about odours thought to be originating from its STPs.

In accordance with SE Water's Memorandum of Understanding with the EPA on Environmental Performance, SE Water will; record all odour complaints and subsequent actions; and implement odour control plans to address any cause of persistent offensive odour (persistent is defined as 'not resolved and persisting continuously for more than two days').

In addition, SE Water's Quality System includes a procedure for handling customer odour complaints. All odour complaints received by SE Water are investigated within 24 hours and the progress and results of each investigation are reported back to the complainant as soon as practicable.

During the 2007/08 financial year, no odour complaints were received at any of SE Water's STPs. This is the third reporting year in a row where this has been achieved and is a substantial decrease on the four complaints (one substantiated) received at the Mornington STP in 2004/05 and the fifteen (unsubstantiated) complaints received in 2003/04 for the Mornington STP.

A presentation to the EPA on the proposed odour management plan that outlines measures to further reduce odour to the neighbouring properties at the Mornington STP was undertaken in June 2008.

## 9. RESEARCH & DEVELOPMENT

SE Water implements a Research & Development (R&D) program based on the following annual process:

A scan is undertaken in September / October to identify R&D priority areas, based on interviews across SE Water and key external organisations, such as other Melbourne and interstate water utilities, government departments / regulators and research providers. The outputs of completed research projects and key articles in the scientific literature also feed into the process.

Feedback on the R&D priority areas is obtained, including from the Executive team, the Environment Advisory Committee and the Environment Health and Safety Committee (EH&S);

The detailed R&D program for the upcoming financial year is developed in January – March, describing ongoing research projects and new initiatives proposed for development and implementation. This program is presented to the EH&S Committee in June for endorsement;

In August – September the previous year's R&D program is reviewed and presented to the EH&S Committee.

This annual R&D program sits within the R&D strategy, which has a strong focus on partnerships with external research providers to leverage SE Water's financial investment and to build capacity and knowledge through in-kind involvement. While some research projects are undertaken 'in-house' these projects tend to focus on issues that are a relatively high priority for SE Water compared to our partners.

### 9.1 RESEARCH PARTNERSHIPS

The key research partners that SE Water supports through financial subscriptions are:

- Water Quality Research and Australia (WQRA) which undertakes research into drinking water and recycled water quality as well as wastewater management. WQRA replaced the Cooperative Research Centre for Water Quality and Treatment (CRC-WQT) and the associated Wastewater Program;
- The Smart Water Fund, which funds research and innovative projects in water conservation, water recycling and biosolids recycling;
- The Water Services Association of Australia, which funds research into asset management, but also in relation to broader issues of environmental and health risk management;
- The Water and Environment Research Foundation, which is the premier wastewater research organisation in North America, with SE Water joining in 2007; and
- AwwaRF, which is the premier water quality research organisation in North America, with SE Water joining in 2008.

The majority of SE Water's R&D needs are delivered through these partnerships. However, since the research is undertaken by individual providers such as universities, SE Water has relationships with a wide range of research organisations. In addition, there are also direct partnerships with research providers for specific projects. Key organisations within these specific projects include:

- University of New South Wales (water recycling cross detection management);
- University of Wollongong (*E.coli* regrowth in wastewater lagoons);
- University of Queensland (sewer odour and corrosion control);
- RMIT University (assessing risks of dry weather sewer spills);
- University of Melbourne (sustainable septic tank management); and
- CSIRO (asset management and biosolids recycling).

## 9.2 WATER RECYCLING R&D

Reflecting SE Water's strong water recycling program, there is significant research undertaken in this area. Key projects in this area in 2007/08 include:

### INKERMAN OASIS GREYWATER RECYCLING

Finalisation of the validation of the greywater treatment plant at the Inkerman Oasis apartment complex led to the approval of the Recycled Water Quality Management Plan by the DHS and EPA in 2008. This project was an important case study in the application of the *National Water Recycling Guidelines 2006* and it has led to numerous external presentations. As an example, the Membrane bioreactor validation investigations were presented to an AWA Membranes Speciality Conference in February 2007.

### TROUPS CREEK STORMWATER RECYCLING

Water quality monitoring of stormwater during dry and wet weather events within the Troups Creek wetlands and assessing the available yield has been completed. This information has underpinned the functional design for a proposed treatment plant. The monitoring has shown a number of challenges with treating stormwater for high exposure schemes, including low ultra violet transmissivity, high colour, turbidity and iron levels (problematic for disinfection), coupled with insufficient organic loads to support biological treatment. Additional targeted sampling is being undertaken to support detailed design.

In addition to the water quality investigations, SE Water has led the development of a research initiative within the Smart Water Fund to establish faecal source tracking tools to assist pathogen risk assessments with stormwater recycling. This project commenced in early 2008 and once completed, may reduce treatment costs and increase the viability of stormwater recycling.

### SMART WATER FUND

SE Water has played an active role in a number of Smart Water Fund projects targeted at improved management of sewage issues including:

#### DOMESTIC SEWAGE STUDY

This project is described in some detail in Section 9.3. SE Water is a member of the working group for this project.

#### SOURCE OF INDUSTRIAL CONTAMINANTS

This project is also described in some detail in Section 9.3. SE Water is the project manager for this study.

#### INDUSTRIAL ECOLOGY

The objective of this investigation is to identify a practicable project in Melbourne that will reduce discharges to sewer by exchanging wastes between neighbouring trade waste customers. The work will be completed in 2008 and SE Water is the project manager.

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## GREY WATER TREATMENT TEST FACILITY

The purpose of this Smart Water Fund project is to develop a factory based test facility to allow verification testing of novel grey water treatment plants. The objective is to provide this facility to private sector entrepreneurs to reduce the cost of developing and implementing new systems.

The facility has been constructed at the CSIRO offices in Highett and was used to test several technologies during 2007/08.

SE Water was the Smart Water Fund project manager for this work.

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## OTHER

SE water is also the Project Manager for a number of other Smart Water Fund projects including pilot scale trialling of an aerobic biological process for removing phosphorus from treated sewage, laboratory testing of a catalysed photochemical process for removing colour from treated sewage and pilot scale verification of pathogen removal rates in activated sludge STPs.

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## CROSS-CONNECTION MANAGEMENT

SE Water is participating in two research proposals to improve detection methods for cross-connections between recycled water and drinking water plumbing. Both projects are currently being delivered by external research providers with SE Water providing financial and in-kind support. One of the projects was successful in receiving a highly competitive Australian Research Council Linkage Grant.

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## RECYCLED WATER PERCEPTIONS

SE Water was the Melbourne water company representative for a CRC-WQT study on community perceptions of recycled water.

## 9.3 SEWAGE TREATMENT PLANT RESEARCH AND DEVELOPMENT

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### MANAGEMENT OF FOAMING AND BULKING IN ACTIVATED SLUDGE STPS

SE Water has had an ongoing partnership with La Trobe University to enhance the management of activated sludge STPs through improved control of foaming and sludge bulking events. Both these events can result in deterioration in effluent quality. In 2004, the research program identified the two causative agents typically responsible for foaming at SE Water STPs, while in 2005/06 the research focused on development of micro-arrays as innovative tools for monitoring foam causing organisms. In 2005/06, the partnership was successful in receiving an Australian Research Council Linkage Grant, with Melbourne Water also involved as the second industry partner. This research grant will focus on the development and application of biocontrol methods for addressing foaming and bulking. While La Trobe University had initial challenges in attracting post doctoral research fellows to undertake the research, this project is now on track.

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### ELEVATED E.COLI IN LAGOONS

As also described in the 2005/06 report, there have been historical periods of elevated *E.coli* levels in the final lagoon of the Longwarry STP. While the STP has remained within EPA guideline limits, the reasons for the elevated levels have been a focus of SE Water research. In 2007 SE Water participated in a research initiative with the Queensland EPA and the University of Wollongong to investigate *E.coli* regrowth in effluent lagoons

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and to assess the significance of sources such as birds. The final report on the research has not been completed and therefore there is not yet a decision on the future directions of the research.

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#### BOAGS ROCKS SCIENTIFIC STUDIES

The Boags Rocks outfall has been the subject of extensive, ongoing study by Melbourne Water, undertaken in conjunction with EPA and also SE Water. In September 2006, Melbourne Water submitted a series of scientific studies to EPA. The studies described the environmental, health and aesthetic implications of a range of management options for the Boags Rocks outfall.

Since the submission of these studies, the primary focus of SE Water research investigations has been:

Monitoring of micro-organism removal in SE Water's STPs discharging to Boags Rocks, to assist future Class A upgrades at these STPs; and

Investigations into sources of colour in sewage received at the Eastern Treatment Plant and the costs and benefits of source reduction programs in terms of addressing plume visibility at Boags Rocks.

#### 9.4 ODOUR MANAGEMENT R&D

Sewerage system odours can potentially be released from the transfer network and from the actual treatment processes, such as biosolids digestion.

To manage risks of odour complaints from the sewerage network, SE Water has a program that involves dosing odour suppressing chemicals into problem sewers or treating the odorous air as it leaves the sewers. There is a research program to support these activities, which has primarily involved dosing sewers with chemical and biological additives and monitoring the changes in odour release. This has been supported by studies to optimise the dosing strategies. Additives investigated by SE Water include; 'Ferrox'; 'Biosol'; and 'Sulphox' and technical papers on the projects have been presented at conferences.

SE Water is a participant in a major ARC funded research initiative that is being led by the University of Queensland and involves a range of other water businesses. The research is examining factors influencing odour generation and the effectiveness of a wide range of management approaches. The SE Water contribution is significant, with \$70,000 per annum being provided.

There has been a significant and ongoing program of research to examine the odour risk associated with different biosolids management options as discussed below in 9.5. Previous research has focused on odour release during treatment in solar dryers, while the research program in 2007/08 used a pilot plant to investigate Temperature Phased Anaerobic Digestion. A number of presentations have been provided on the research, including the acceptance of a paper at an International odour management conference in late 2008 in Barcelona, Spain.

#### 9.5 BIOSOLIDS MANAGEMENT AND RECYCLING

As outlined in previous reports, there has been a significant program since 2003 to trial the performance of a solar sludge-drying technology at the Rosebud STP. These trials supported the Rosebud upgrade works approval submitted in 2007.

Since 2007, the treatment aspects of the research program have primarily focused on evaluation of advanced digestion processes, with ongoing pilot plant trials being undertaken.

SE Water also has a strong focus on supporting research to ensure the sustainability of biosolids recycling. The program is primarily delivered by external providers, with SE Water providing financial and/or in-kind support:

The National Biosolids Research Program (NBRP) has undertaken extensive research to ensure appropriate management of inorganic compounds during biosolids land application. The current program is completed and the research reports were released in 2008. SE Water project managed the Victorian involvement in the NBRP on behalf of VicWater and the Pakenham STP was used as one of the experimental sites. Building from nutrient research under the NBRP, SE Water has driven the development of further research into biosolids nutrient management, leading to a research stream being implemented within the SmartWater Fund.

The Smart Water Fund is also funding research into pathogen and nutrient decay during air-drying of biosolids. This will assist the identification of additional markets for biosolids and fit-for-purpose treatment objectives. SE Water is the lead industry representative for the project and is also providing in-kind support.

## 9.6 DECENTRALISED AND TRANSFER SYSTEM RESEARCH

SE Water has a major program to provide sewage services to townships with poorly performing septic tank systems. This program seeks to address environmental and health impacts from the septic tanks and will involve in excess of \$20 million expenditure per annum. Therefore, there is a research focus on exploring whether compared to the current centralised treatment model; there are opportunities for innovative and sustainable solutions. In previous research, high level evaluations of potential decentralised STPs have been undertaken and a groundwater model was developed to underpin risk assessments of current septic tank systems and alternative sewage management strategies. There has also been an ongoing partnership with the University of Melbourne into the factors influencing the environmental sustainability of septic tank leachate fields.

In 2007/08, the primary focus has been on working with VicWater to assess current barriers to decentralised systems. This will enable the targeting of further research in 2008/09.

SE Water has had a strong historical focus on research into sewage network asset management, particularly in relation to improving the understanding of asset life and predicting failure events. The asset management program has significantly strengthened at a National level, and SE Water is currently involved in a range of WSAA led research initiatives, including the development of guidelines for condition assessment of pressure sewers and development of a sewer blockage modelling capacity.

In 2006/07 this program expanded into research on the assessment of environmental and health risks from system failures, with SE Water leading the development of a partnership with Melbourne Water, EPA and RMIT University to investigate the significance of reticulation network and household level sewage spills during dry weather. SE Water has also led the development of an innovative technology for the diversion to sewer of contaminated dry weather stormwater flows.