

# PRESSURE SEWERS AT TOORADIN, VICTORIA

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## Summary

South East Water Ltd. has successfully trialled a revolutionary new pressure sewer technology in the township of Tooradin, Victoria. The low-invasive technology has improved residential amenity in the township while also delivering immediate environmental gains to the surrounding area by reducing the pollution load on the town's mangrove flats and Western Port Bay. Other benefits have included lower capital and operating costs, and an immediate reduction in pollution by including individual property connections to the sewer as part of the project. The technology has also enabled the local council to bring forward proposed stormwater drainage projects.

## Background

Tooradin is a small township about 60 km south east of Melbourne with around 230 properties including a primary school, hotel sports club and a small commercial area. It has a reputation, however, for having the busiest public toilet block in Victoria, as it is a major stop for tour buses headed for the Phillip Island penguin parade. (Figure 1)

Before the project, properties were generally serviced by septic tanks with sullage discharged to open drains. South East Water needed to find a sewerage solution that would protect the environment as well as public health and would support future growth.

Major challenges included Tooradin's poor soils and very flat topography, its proximity to the coast and its high water-table. This meant that the excavation of

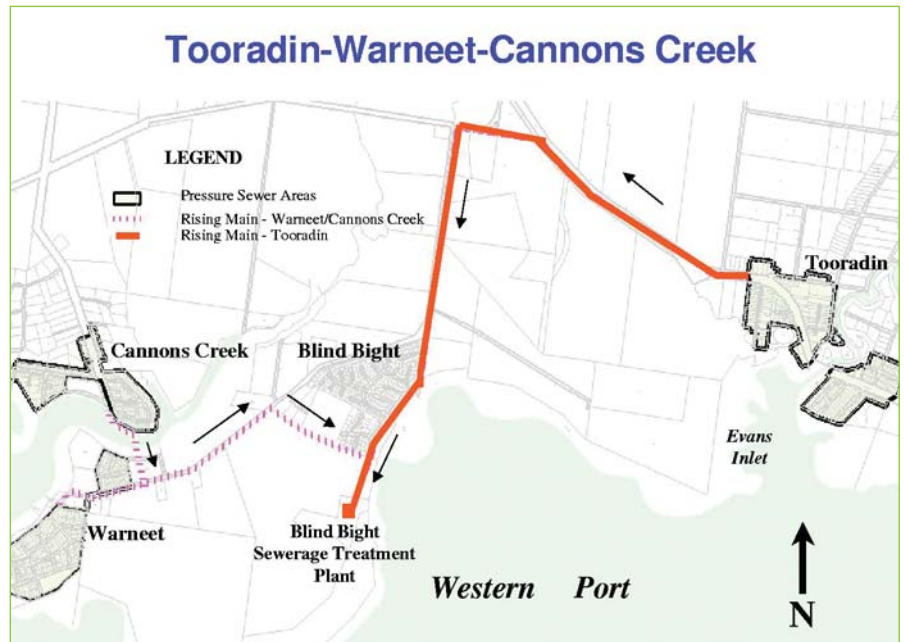


Figure 1. Locality map and routes of the sewers.

trenches deeper than one metre would require extensive de-watering and support.

Through investigating the challenges South East Water became aware of the use of pressure sewer technology in the United States for the past thirty years but never before in Australia.

Before adopting the technology, South East Water considered the financial, social and environmental factors of the technology and visited a number of working pressure sewer sites in the Kansas area of the USA.

Significant amounts of service data was reviewed and carried out life-cycle costing

evaluations were carried out on three options - pressure sewers, vacuum sewers and gravity sewers.

Even with the inclusion of property connections, the pressure sewerage system was in this case significantly lower in both capital and operating costs than the other two options. Consequently, South East Water decided to trial a pressure sewerage system at Tooradin.

## Design

The works at Tooradin were carried out as a 'design and construct' contract.

Each property was provided with an individual pump unit and discharge pipeline to the reticulation network. An isolation valve and a reflux valve were provided on each discharge pipeline at the property boundary.

Isolating valves and flushing points were provided within the reticulation network at appropriate locations. An odour treatment facility was installed on the transfer pipeline to minimise the odour impact at the treatment plant.

Both the reticulation network and transfer pipeline were designed to cater for substantial future growth of the town.

## How pressure sewer systems work

In pressure sewer systems, each property is provided with a mini-pump station that is fitted out with a positive displacement grinder pump and storage tank. The unit is powered through the household electrical system and operates on a level switch arrangement. The tank is about one metre in diameter, two metres deep and is located strategically within the property as close as possible to the existing septic tank.

The pump unit is connected to the reticulation system by a polyethylene (PE) pipe. The reticulation network is located within the street reserve at shallow depths, similar to a water main, and also constructed with welded PE pipe. The pump units have the capacity to pump at a significant head - in the case of Tooradin, discharging seven kilometres to the sewerage treatment plant without a re-lift pump station.



**Figure 2.** Installation by auger



**Figure 3.** Lowering the unit into position

## Construction

South East Water installed and trialed a number of different pump units and configurations:

- 200 E-One drywell/wetwell simplex tanks with 225 litres storage
- 3 E-One drywell/wetwell duplex tanks with 570 litres storage
- 20 E-One wetwell simplex tanks with 460 litres storage
- 1 E-One wetwell duplex tank with 1570 litres storage
- 3 Allwaste duplex tanks (Efru pumps) with 2000 litres storage.

The standard pump units were quickly and easily installed using an auger with minimal impact on the customer's property. There were a small number of properties where access was insufficient to allow the auger to be used and the hole for the pump unit was dug by hand. (Figures 2, 3, 4)

The pressure reticulation system was easily constructed using small diameter pipes, laid at a shallow depth without dewatering and in a comparatively short construction time causing minimal disruption to customers. The impact on vegetation and the environment, compared

to the construction of conventional gravity sewers, was also minimal.

## System performance

The new pressure sewer system operates successfully and transfers sewerage seven kilometres to the treatment plant without the need for an intermediate pump station.

A comparison of flow meter records at the treatment plant indicates minimal wet weather inflow/infiltration into the system and a reduction in peak flows as a result of attenuation in the individual property storage tanks (Figure 5).

Infancy failure rate of the pump units and alarm call-outs was initially much higher than expected. Over time, however, as repairs and replacements have been carried out and property owners have become accustomed to how the system operates, the system has become more robust and call-outs have markedly reduced (Figure 6).

## Policy issues

A number of policy issues were addressed:

- **Ownership and maintenance of the pump unit:** South East Water has assumed

ownership and maintenance responsibility for the pump unit and the discharge pipeline from the pump to the reticulation sewer as it was considered unfair to expect an individual to meet repair/renewal costs of the pumps as they arise.

- **Easements for pump unit and pipeline:** The pump unit and discharge pipeline only service the individual property in which they are located, as a result easements were not required.

- **Power Costs:** Customers are required to pay the power costs of about \$20 per annum. This was not an issue for customers, as they saw it as being a reasonable trade-off for saving around \$2000 on their connection costs.

- **New Development:** Developers are required to install the reticulation pipes and to pay an additional fee over and above normal development contributions to meet the cost of pump unit and its installation. South East Water will install pump unit and discharge pipeline to the reticulation system sewer when the land is built on.

## A great system for everyone

The Tooradin project has proved beneficial for all concerned - residents, industry and the environment and is a great

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example of where an innovative solution can deliver financial, environmental and social benefits

## Warneet and Cannons Creek

Due to the success of the pressure sewers project at Tooradin, South East Water is now introducing pressure sewer systems into the nearby towns of Warneet and Cannons Creek, which have similar ground conditions and topography.

Warneet and Cannons Creek will benefit from the experience gained in the Tooradin project and will include improvements in a number of areas.

### Design

For Warneet and Cannons Creek, separate design, pipeline construction and pump installation contracts were adopted.

All customer impact issues (location of pump units, pipelines and plumbing needs for grey-water) were identified and resolved at the design stage. In addition a comprehensive electrical audit was also carried out on each property, which determined the need for power upgrades or switchboard modifications. Our contractor was required to provide a separately wired circuit for the power supply at each property.

### Construction

The following pump units and configurations are being installed at Warneet and Cannons Creek:

- 450 E-One wetwell simplex tanks with 660 litres storage
- 3 E-One wetwell duplex tanks with 1570 litres storage.

Around 95% of the reticulation lines have been installed using directional drilling, further reducing impact on the environment and resulting in an even shorter construction period.



Figure 4. Installation of pump unit & switchboard completed.

To avoid blockages, all reticulation lines were flushed out with high volume flows and inspected before the commissioning of any pump units. In addition the pump installation contractor was required to connect properties in a systematic manner (street by street).

The pump installation contract included all works within the customer's property (pump installation, discharge pipeline, plumbing connection and electrical work).

### System performance

The installation and connection of all pump units are being independently audited and a greater emphasis on customer education has resulted in an infancy failure rate of less than 1% and minimal callouts.

All call-outs are monitored/attended by South East Water's maintenance contractor and, as pump units were purchased directly from the manufacturer, all warranty repair records are returned direct to South East Water. Although at an early stage, alarm call-outs and pump replacements are much lower than experienced at Tooradin.

Through connecting to the sewerage system properties in the areas experienced reduced running costs, no septic tank

odours, and the removal of potential problems to the environment.

### Conclusion

These projects has been a great success with the pressure sewer technology proving to have great advantages over gravity sewers when used in areas with a topography and geology such as Tooradin. South East Water will continue to lead in the area of pressure sewer technology and will share its experience with other water authorities, both locally and internationally.

### About South East Water

South East Water is a state-owned company, which provides water and sewerage services to customers in the south-east of Melbourne.

The company manages:

- infrastructure and assets valued at in excess of \$1.0 billion (209 sewage pumping stations, 81 water pumping stations, 71 reservoirs and major water tanks, and 10 local sewage treatment plants);
- 8,000 kilometres of water supply mains; and
- 7,300 kilometres of sewer mains.

South East Water services 1.3 million customers, who live in an area of approximately 3,640 square kilometres from Port Melbourne to Portsea and from Mordialloc to some 40 kilometres east of Berwick.

During the past financial year, the company delivered 166,103 ML (millions of litres) of water, and collected 113,176 ML of wastewater.

### The Authors

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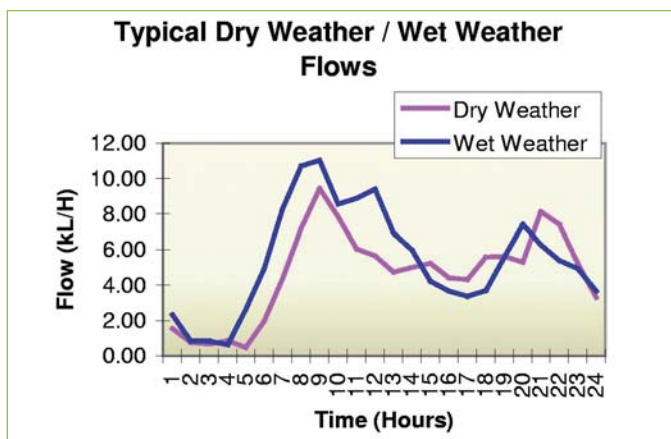


Figure 5. Typical dry weather/wet weather flows

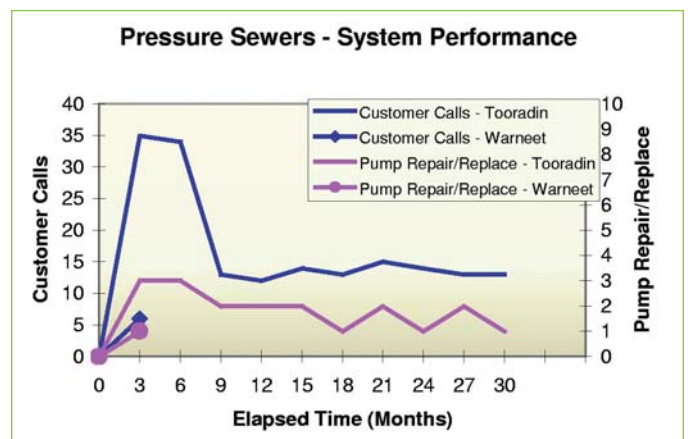


Figure 6. Pressure sewers - system performance.