

# OptiFacts



**Optimatics**

Water Systems Optimization

[www.optimatics.com](http://www.optimatics.com)

## Darebin Creek North Catchment Sewer Optimization

Reducing major flow constriction of sewer system

**OPTIMATICS** completed a study with Yarra Valley Water focussing on a major flow constriction which existed in the Darebin Creek North sewer system resulting from a reduction in mains diameter. The flow constriction generates considerable overflow during the one in five year critical design storm.

### KEY POINTS

- World's first commercial GA optimization of a wastewater collection system
- Options analysis for optimization of several distinct cost-competitive strategies

### Project

A distributed Genetic Algorithm (GA) for wastewater collection systems was developed for this project, which performs optimization considering:

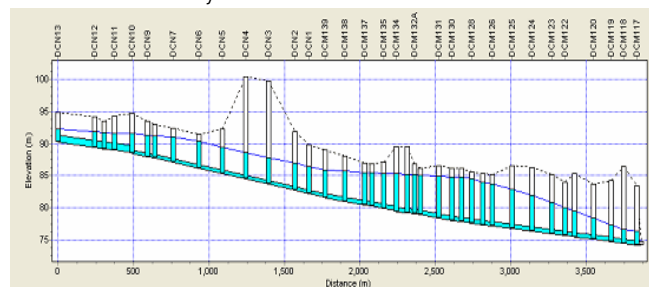
- Pipe, pump and storage costs
- Conduit slope
- Minimum and maximum velocity requirements
- Surchage/freeboard criteria
- Minimising overflow and additional discharge to downstream system
- Political and environmental factors.

The distributed nature of the GA allowed for rapid optimization using a cluster of high speed, multi-processor computers. The cluster was purpose built to cope with the long computational times required for calculating the hydraulics of a wastewater system.

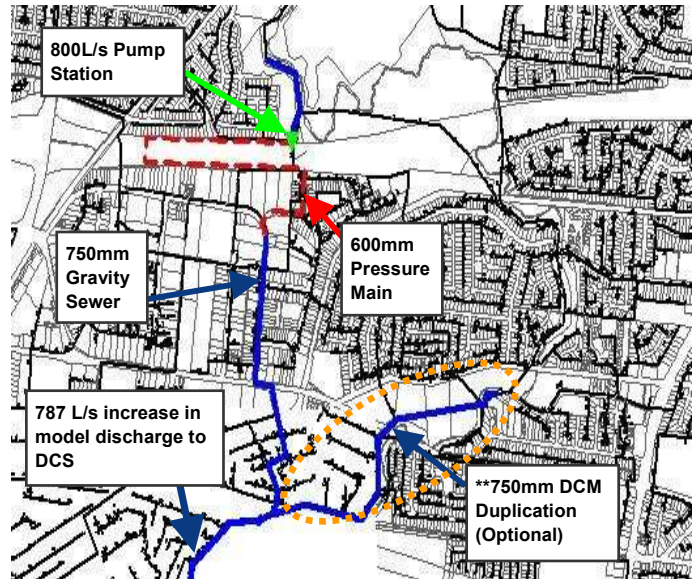
### Key Outcomes

Several options for spillage abatement in the DCN system were identified as follows.

Attenuate the flow by:



**Water elevation profile for one in five year storm event**



**Solution option using FCF, gravity duplication and pumping over hill**

- Providing one or more Flow Control Facilities (FCF) for storage; or
  - Installing flow control valves upstream of the DCN choke.
- Augment the existing system with:
- Gravity sewer duplication; or
  - Redirect flow along 1 of 3 pump/pressure main/gravity main diversion paths.

### Benefits

Together, Yarra Valley Water and Optimatics produced near-optimal designs for each of several distinct improvement strategies. The distributed GA approach was able to provide a significant reduction in capital costs of the order of millions of dollars in each case, with the added benefit of significant improvements in the performance of the system, compared with the current preliminary design using a single FCF to attenuate storm flow in the system. This project is the world's first commercial consulting project to use genetic algorithms for optimization of wastewater collection systems.