

# Case Study - 600mm Trunk Main Leak Detection

*New South Wales, Australia*

## Introduction

Leak detection of trunk mains using leak correlation techniques has always been viewed as being of potentially limited success for the basic reasons of poor sound propagation, scarcity of accessible fittings and limited signal recording and process capabilities.

## Enigma

With the recent introduction of Enigma digital noise correlation and signal coherence frequency analysis processing software these previous limitations have been far exceeded.

## Client

TCK Construction installed the trunk main for Hunter Water the Water authority for the Hunter region also covering the city of Newcastle in NSW.

## Project *December 2006*

A new **600 mm** DICL (ductile iron concrete lined) water main had recently been commissioned to supply additional water to the south coast townships of New South Wales, north of Sydney.

The main had to undergo a pressure test to ensure it passed the standards before it was commissioned. The test was performed against two closed inline valves.

The test failed to hold pressure and losses of approximately 10 litres per minute were measured at 1200 kpa pressure.

It was suspected a leak was the cause of the pressure test failure. Another leak detection company was commissioned to undertake the leakage detection of the main but failed to find any leakage or cause of pressure drop.

Detection Services Pty Ltd (Aus) was commissioned to undertake another investigation to determine where the failure was occurring.

Enigma loggers were placed at established access points on mains, see attached deployment plans.

Accelerometer sensors were used as no hydrophone access was available.

The initial test involved the deployment of 6 Enigma loggers / accelerometers on various mains fittings from air valves to scours covering a total of 580.7 metres.

The Enigmas were collected and data transferred to a PC for post processing.

## Site conditions

The main was isolated from the flow by closing two in line valves and pressurising this isolated section with an external pressure source.

The final test operational pressure was between 500 and 600 kpa less than 50% of the original test pressure. The original losses were 10 litres per minute at 1200 kpa, with the reduced pressure it could be assumed the real losses at the lower pressure would be less than 5 litres per minute.

## Results

The raw unprocessed data provided 6 conclusive cross correlation peaks at the same location using six separate cross correlation points. Additional post processing of the data achieved a total of 15 cross correlations.

The findings all correlated to the closed valve at logger 6 location at the down stream end of the test section.

Further inspection of this location found no evidence of leakage at this location. The valve was electronically sounded with no conclusive evidence of a leak.

It was then decided to drop the pressure on the up stream side (test section) of the valve to further increase the pressure differential ratio on either side of the valve, as the pressure differential increased, audible evidence was heard on the test valve, further verification determined the valve was faulty and "letting by".

**N.B.** These exceptional results are based on using Enigma accelerometer sensors only (sensors attached to the external fittings of the mains). If hydrophones were employed (acoustic sensors fitted into the water column) even greater correlation distances would expect to be achieved with the Enigma

The following tables show the actual correlation results achieved.

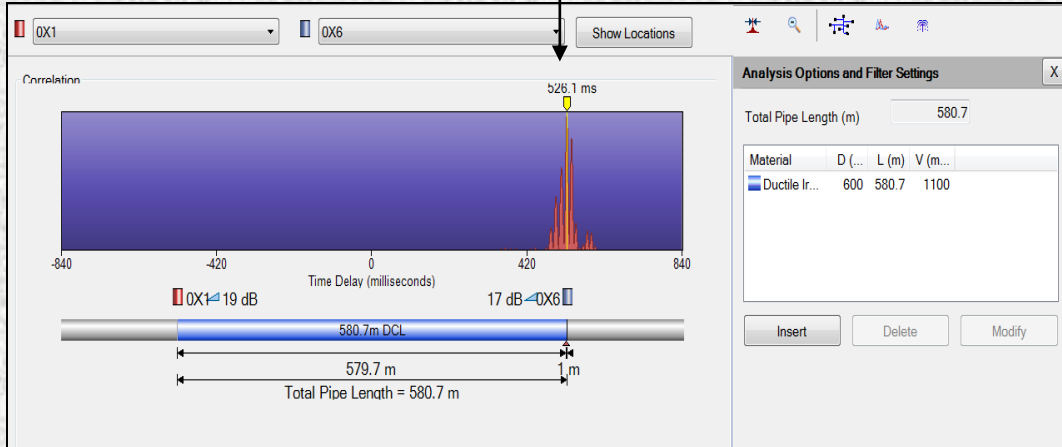
**DETECTION SOLUTIONS**

Phone Australia - 1300 885 383  
New Zealand - 0800 800 618

**Table A Processed data**

Loggers 1 to 6 distance **580.7 metres**

Strong correlation at closed valve

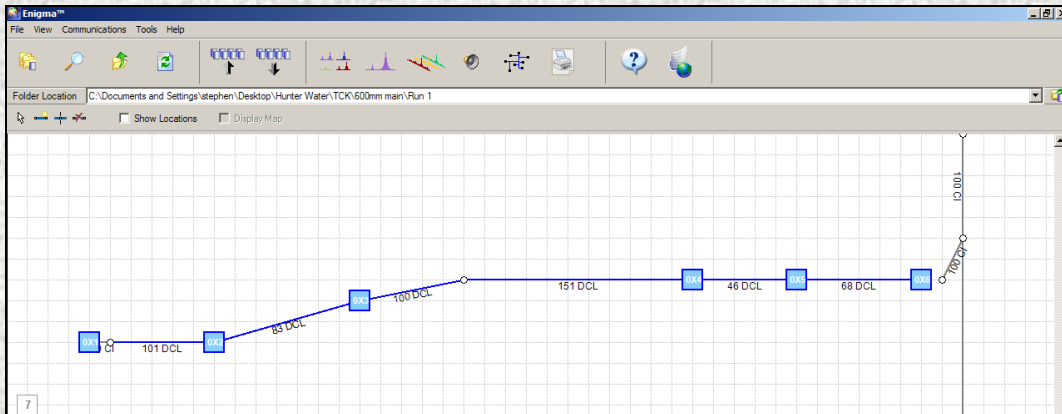


**Data A - above:**

This result shows the correlation noise source to be at the closed valve at down stream section which the pressure test was performed against. All correlation results from this test correlated to this point confirming the source of noise was from

this valve. Again this test shows the leakage point at one end of the correlation suggesting this distance could easily be increased by 100% and still be as effective.

**Table B**



The above table provided a graphical outline of the locations of the logger deployments.

All six loggers correlated the same noise source at the downstream closed valve.