The Situation.
For the week of June 15 – 18, Matchpoint Water Asset Management Inc. (MWAM) conducted an intensive study focused on the successful correlation properties of the Primayer Enigma Hy-Q, with emphasis on large transmission mains within the water district owned and operated by Henry County Water Authority. The 24-inch transmission main had hydrant connections ranging from approximately 200 linear feet to over 3,000 linear feet. For all connections located at 600 feet and below, MATCHPOINT also utilized the Primayer Enigma Non-Real Time Correlator to compare the results against the Primayer Enigma Hy-Q.

Over thirty real correlations were run within the week, and leaks were generated within the system via fire hydrants in order to test the sound propagation properties versus the maximum allowable successful correlation distance. With the help of manual coherence and frequency suppression, the Enigma and Enigma Hy-Q were truly put to the test.

The Action.
The site consisted of sixty-five hydrants, mostly located 900-1,000 feet apart. A “leap-frog” method was used by utilizing the last hydrant of the previous set as the first hydrant of the current set. An example:

The colored markers represent three different tests. The red markers are for the first test, the blue are for the second test, and the green are for the third. As you can see, hydrants 3 and 5 were used in two different tests, utilizing the before mentioned “leap-frog” method. MWAM used three Enigma Hy-Q loggers, supplemented with Hydrophones each time, in order to be able to induce leaks via hydrants and measure the maximum distance that leaks can be located.
The outside hydrants were labeled as “boundary hydrants,” and the middle hydrant, where the leak was induced, was labeled “leak.” With some hydrants being up to 1,000 feet apart, the boundary valves were expected to pick up correlations at approximately 2,000 feet. The results are as follows.

**The Results.**
Out of the thirty-three tests, two simulated leaks were induced to test the capabilities of the Primayer Enigma Hy-Q and the Primayer Enigma. One hydrant was opened at a rate of approximately 20-25 GPM. Enigma Hy-Q Loggers (OB1 & OB3) and Enigma Loggers (OA1 & OA3) were set on each side of the hydrant, as well as the hydrant itself (OB2 & OA2). Below is a layout of the pipe network.

As you can see, the left side of the induced leak measured 921 linear feet, while the right side measured 677 linear feet, and in total 1,598 feet. Between Hy-Q Loggers OB1 (left) and OB3 (right), at a frequency between 119 Hz and 285 Hz, the graph shows a confident correlation within one foot of the induced leak. The post-analysis graph is seen below.
A second test was run on a section of pipe measuring 3,955 linear feet. As shown below, the induced leak was set between hydrants measuring 3,003 feet and 952 feet respectively.

After post-analysis of all the graphs generated, the Enigma Loggers did not produce any confident results. The Hy-Q Loggers OB2 and OB3 correlated out of bracket towards OB2. The leak was induced on the hydrant corresponding with Logger OB2. The distance between the two loggers measured 952 feet. A successful correlation could not be run over the entire distance with the Enigma Hy-Q. The out of bracket graph is seen below.

In addition to the Hy-Q Loggers and the Enigma Loggers, three Primayer Phocus 3 Loggers were deployed. Of the three loggers deployed, the only logger to elevate into a higher Leak Confidence Factor was the logger set on the simulated leak. The other two loggers did not elevate. The layout is below.
The Conclusion.

During the course of the week, multiple tests were performed with various dependent and independent variables measured. With the successful correlation of induced leaks, as low as 8 GPM, at over 1,500 linear feet MWAM can confidently market, and offer the Primayer Enigma Hy-Q, as well as the Primayer Enigma Non-Real Time Correlator to assist leak detection programs on large transmission mains. Moreover, we are now assured that we can comprehensively survey 24” water mains at survey points with are over 1000 feet apart. With leak detection on large transmission mains becoming more prevalent, Primayer continues to be at the apex of the market.

Author: Justin Godsey, Project Manager, MWAM

Justin Godsey has been a part of the MWAM team since 2012. With a utility background specializing in water main repair, construction, and maintenance, Justin continues to be a valuable and integral part of the team.