

Chapter 2

The technology matrices

The choice of a particular leak detection/location technique and technology depends on the operating conditions and construction material of the pipeline in question. To assist in making this determination, four different matrices have been developed.

- (1) Mains fittings only – High Pressure ([Figure 2.1](#))
 - For leakage detection on mains fittings only (no house connections) with pressures greater than 10 m head or 15 psi. Fittings are at a minimum distance of 200 m apart and maximum 500 m
- (2) Mains fittings only – Low Pressure ([Figure 2.2](#))
 - For leakage detection on mains fittings only (no house connections) with pressures less than 10 m head or 15 psi. Fittings are at a minimum distance of 200 m apart and maximum 500 m
- (3) Domestic and mains fittings – High Pressure ([Figure 2.3](#))
 - For leakage detection on all property and mains fittings with pressures greater than 10 m head or 15 psi. Fittings are at a minimum distance of 10 m apart and maximum 50 m
- (4) Domestic and mains fittings – Low Pressure ([Figure 2.4](#))
 - For leakage detection on all property and mains fittings with pressures less than 10 m head or 15 psi. Fittings are at a minimum distance of 10 m apart and maximum 50 m

The matrices consider the following pipeline materials:

- Metallic
 - includes steel, ductile iron and other ferrous materials
- Concrete
 - includes reinforced concrete, pre-stressed concrete pipe (PCP)
- Asbestos cement
- Glass-reinforced plastic (GRP)
- Polyvinyl chloride (PVC)

- Polyethylene
 - MDPE Medium density polyethylene
 - HDPE High density polyethylene

The technologies available are discussed in more detail later in this document. The equipment has been placed in the selected categories where it is reliably successful. The equipment may sometimes be successful in other categories but not reliably so.

Note that new equipment is continuously being developed: these matrices only take into account equipment that was available during the preparation of the matrices (up to December 2018).

2.1 MAIN PIPELINES ONLY – HIGH PRESSURE

This matrix is for leakage detection on mains fittings only (no house connections) with pressures greater than 10 m head or 15 psi. Fittings are at a minimum distance of 200 m apart and maximum 500 m.

Diameter	mm	75	100	150	200	250	300	350	400	450	500	600	700	800	900	1000+
	inches	3	4	6	8	10	12	14	16	18	20	24	28	32	36	40+
Material																
Metallic all	A,B, C,D, F,G	A,B, C,D, F,G	A,B, C,D, F,G	A,B, C,D, F,G	A,B, C,D, F,G	A,B, C,D, F,G	A,C, D,E, F,G	A,C, D,E, F,G	A,C, D,H, F,G	C,D,E, H,I	C,D,E, H,I	D,E, H,I	D,E, H,I	E, H,I	E, H,I	E, H,I
Concrete all	A,C,D	A,C,D	A,C,D	A,C,D	A,C,D	A,D,H	A,D,E	A,D,E	A,D,E	E,I	E,I	E,I	E,I	E,I	E,I	E,I
Asbestos Cement	A,C,D	A,C,D	A,C,D	A,C,D	A,C,D	A,D,H	A,D,E	A,D,E	A,D,E	E,I	E,I	E,I	E,I	E,I	E,I	E,I
GRP	A,D	A,D	A,D	A,D	A,D,H	A,D,H	A,D,E	A,D,E	A,D,E	E,I	E,I	E,I	E,I	E,I	E,I	E,I
PVC	A,D	A,D	A,D	A,D	A,D,H	A,D,H	A,D,E	A,D,E	A,D,E	E,I	E,I	E,I	E,I	E,I	E,I	E,I
Polyethylene all	A,D	A,D	A,D	A,D	A,D,H	A,D,H	A,D,E	A,D,E	A,D,E	E,I	E,I	E,I	E,I	E,I	E,I	E,I

Method A Gas Injection

Method B Traditional Techniques with Manual Listening Stick

Method C Non-Intrusive Acoustic Techniques that is Standard Correlator, Correlating Noise Loggers (Accelerometers)

Method D Intrusive Acoustic Techniques that is Standard Correlator or Correlating Noise Loggers (Hydrophones)

Method E Inline Inspection Techniques (Tethered & Free-swimming)

Method F Noise Loggers (Non-Correlating), Non-Intrusive Magnetic Connection

Method G Electronic Amplified Listening Ground Microphone

Method H Large Diameter mains correlator with accelerometers

Method I Large Diameter mains correlator with Hydrophones

Notes:

1. A large diameter mains correlator responds the same as a standard correlator in all circumstances however its processing power is greater, and the sensors are more sensitive rendering it suitable to be used on the larger diameter or non-metallic mains.
2. Satellite leak detection does not use acoustics or pressure to conduct leakage surveys hence it will work for all pipe materials and diameters.
3. Gas injection will work in most scenarios and is not reliant on pipe material nor pressure however the volume of gas required for large diameter pipes would be such that may not be feasible to use.

Figure 2.1 Main pipelines only – high pressure. (Source: Stuart Hamilton)

2.2 MAIN PIPELINES ONLY – LOW PRESSURE

This matrix is for leakage detection on mains fittings only (no house connections) with pressures less than 10 m head or 15 psi. Fittings are at a minimum distance of 200 m apart and maximum 500 m.

Diameter	mm	75	100	150	200	250	300	350	400	450	500	600	700	800	900	1000+
	Inches	3	4	6	8	10	12	14	16	18	20	24	28	32	36	40+
Material																
Metallic all	A,D	A,D	A,D	A,D	A,D	A,D,E	A,D,E	A,D,E	E,I	E,I	E	E	E	E	E	E
Concrete all	A,D	A,D	A,D	A,D	A,D	A,D,E	A,D,E	A,D,E	E,I	E,I	E	E	E	E	E	E
Asbestos Cement	A,D	A,D	A,D	A,D	A,D	A,D,E	A,D,E	A,D,E	E,I	E,I	E	E	E	E	E	E
GRP	A,D	A,D	A,D	A,D	A,D	A,D,E	A,D,E	A,D,E	E,I	E,I	E	E	E	E	E	E
PVC	A,D	A,D	A,D	A,D	A,D	A,D,E	A,D,E	A,D,E	E,I	E,I	E	E	E	E	E	E
Polyethylene all	A,D	A,D	A,D	A,D	A,D	A,D,E	A,D,E	A,D,E	E,I	E,I	E	E	E	E	E	E

Method A Gas Injection

Method B Traditional Techniques with Manual Listening Stick

Method C Non-Intrusive Acoustic Techniques i.e. Standard Correlator, Correlating Noise Loggers (Accelerometers)

Method D Intrusive Acoustic Techniques i.e. Standard Correlator or Correlating Noise Loggers (Hydrophones)

Method E Inline Inspection Techniques (Tethered & Free-swimming)

Method F Noise Loggers (Non-Correlating), Non-Intrusive Magnetic Connection

Method G Electronic Amplified Listening Ground Microphone

Method H Large Diameter mains correlator with accelerometers

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Notes:

1. A large diameter mains correlator responds the same as a standard correlator in all circumstances however its processing power is greater, and the sensors are more sensitive rendering it suitable to be used on the larger diameter or non-metallic mains.
2. Satellite leak detection does not use acoustics or pressure to conduct leakage surveys hence it will work for all pipe materials and diameters.
3. Gas injection will work in most scenarios and is not reliant on pipe material nor pressure however the volume of gas required for large diameter pipes would be such that may not be feasible to use.

Figure 2.2 Mains pipelines only – low pressure. (Source: Stuart Hamilton)

2.3 DOMESTIC AND MAINS FITTINGS – HIGH PRESSURE

This matrix is for leakage detection on all property and mains fittings with pressures greater than 10 m head or 15 psi. Fittings are at a minimum distance of 10 m apart and maximum 50 m.

Diameter	mm	75	100	150	200	250	300	350	400	450	500	600	700	800	900	1000+
	Inches	3	4	6	8	10	12	14	16	18	20	24	28	32	36	40+
Material																
Metallic all	A,B,C, D,F,G	A,B,C, D,F,G	A,B,C, D,F,G	A,B,C, D,F,G	A,B,C, D,F,G	A,B,C, D,F,G	A,C,D, E,F,G	A,C,D, E,F,G	A,C,D, E,F,G	C,D,E, F,G	C,D,E, F,G,H,I	C,D, E,H,I	C,D, E,H,I	D,E H,I	D,E H,I	D,E H,I
Concrete all	A,C, D,F,G	A,C, D,F,G	A,C, D,F,G	A,D	A,D	A,D	A,D,E	A,D,E	A,D,E	E,I	E,I	E,I	E,I	E,I	E,I	E,I
Asbestos Cement	A,C, D,F,G	A,C, D,F,G	A,C, D,F,G	A,C, D	A,C, D	A,C, D	A,D, E	A,D, E	A,D, E	E,I	E,I	E,I	E,I	E,I	E,I	E,I
GRP	A,C, D,F,G	A,C, D,F,G	A,C, D,F,G	A,C, D	A,C, D	A,C, D	A,D, E	A,D, E	A,D, E	E,I	E,I	E,I	E,I	E,I	E,I	E,I
PVC	A,C, D,F,G	A,C, D,F,G	A,C, D,F,G	A,D	A,D	A,D	A,D, E	A,D, E	A,D, E	E,I	E,I	E,I	E,I	E,I	E,I	E,I
Polyethylene all	A,C, D,F,G	A,C, D,F,G	A,C, D,F,G	A,D	A,D	A,D	A,D, E	A,D, E	A,D, E	E,I	E,I	E,I	E,I	E,I	E,I	E,I

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Notes:

1. A large diameter mains correlator responds the same as a standard correlator in all circumstances however its processing power is greater, and the sensors are more sensitive rendering it suitable to be used on the larger diameter or non-metallic mains.
2. Satellite leak detection does not use acoustics or pressure to conduct leakage surveys hence it will work for all pipe materials and diameters.
3. Gas injection will work in most scenarios and is not reliant on pipe material nor pressure however the volume of gas required for large diameter pipes would be such that may not be feasible to use.

Figure 2.3 Domestic and mains fittings – high pressure. (Source: Stuart Hamilton)

2.4 DOMESTIC & MAINS FITTINGS – LOW PRESSURE

This matrix is for leakage detection on all property and mains fittings with pressures less than 10 m head or 15 psi. Fittings are at a minimum distance of 10 m apart and maximum 50 m.

Diameter	mm	75	100	150	200	250	300	350	400	450	500	600	700	800	900	1000+
	inches	3	4	6	8	10	12	14	16	18	20	24	28	32	36	40+
Material																
Metallic all	A,C, D,F	A,C, D,F	A,C, D,F	A,C, D,F	A,D	A,D,E,I	A,D,E,I	A,D,E,I	A,D,E,I	E,I	E,I	E	E	E	E	E
Concrete all	A,D	A,D	A,D	A,D	A,D	A,D,E,I	A,D,E,I	A,D,E,I	A,D,E,I	E,I	E,I	E	E	E	E	E
Asbestos Cement	A,D	A,D	A,D	A,D	A,D	A,D,E,I	A,D,E,I	A,D,E,I	A,D,E,I	E,I	E,I	E	E	E	E	E
GRP	A,D	A,D	A,D	A,D	A,D	A,D,E,I	A,D,E,I	A,D,E,I	A,D,E,I	E,I	E,I	E	E	E	E	E
PVC	A,D	A,D	A,D	A,D	A,D	A,D,E,I	A,D,E,I	A,D,E,I	A,D,E,I	E,I	E,I	E	E	E	E	E
Polyethylene all	A,D	A,D	A,D	A,D	A,D	A,D,E,I	A,D,E,I	A,D,E,I	A,D,E,I	E,I	E,I	E	E	E	E	E

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Figure 2.4 Domestic and mains fittings – low pressure. (Source: Stuart Hamilton)

