

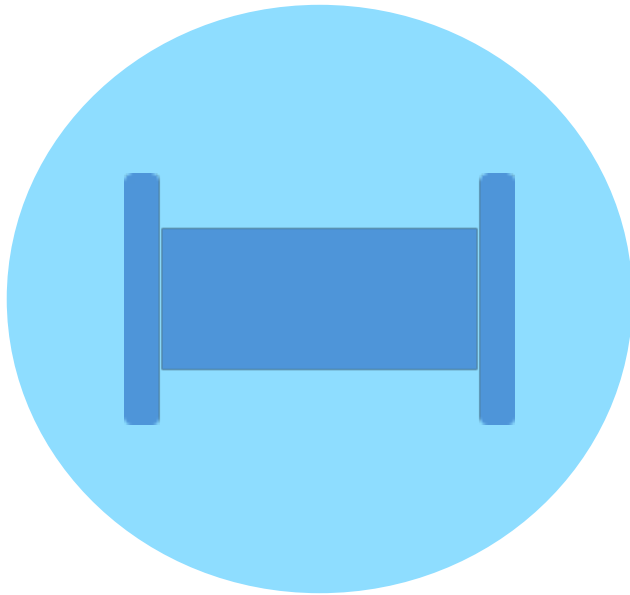
IS THIS THE DAY OF THE CLAMP-ON?

Mikal Willmott (Severn Trent)

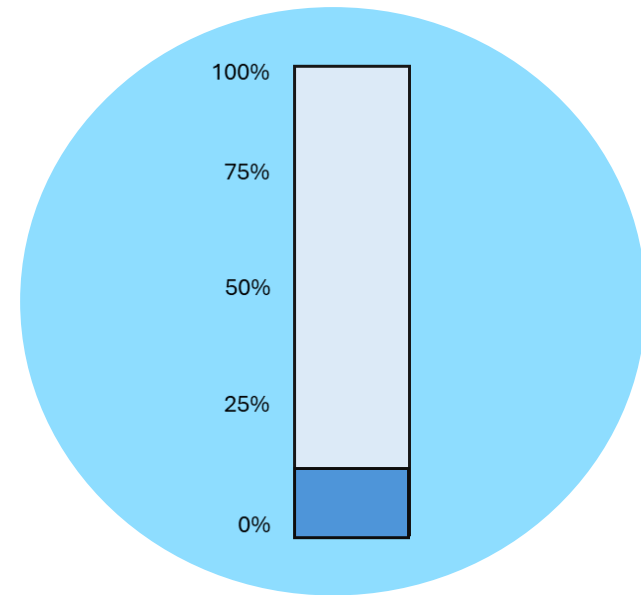
3rd September 2026



TRUNK MAINS IN THE UK



The UK has around 60,000 km of Transmission Mains.

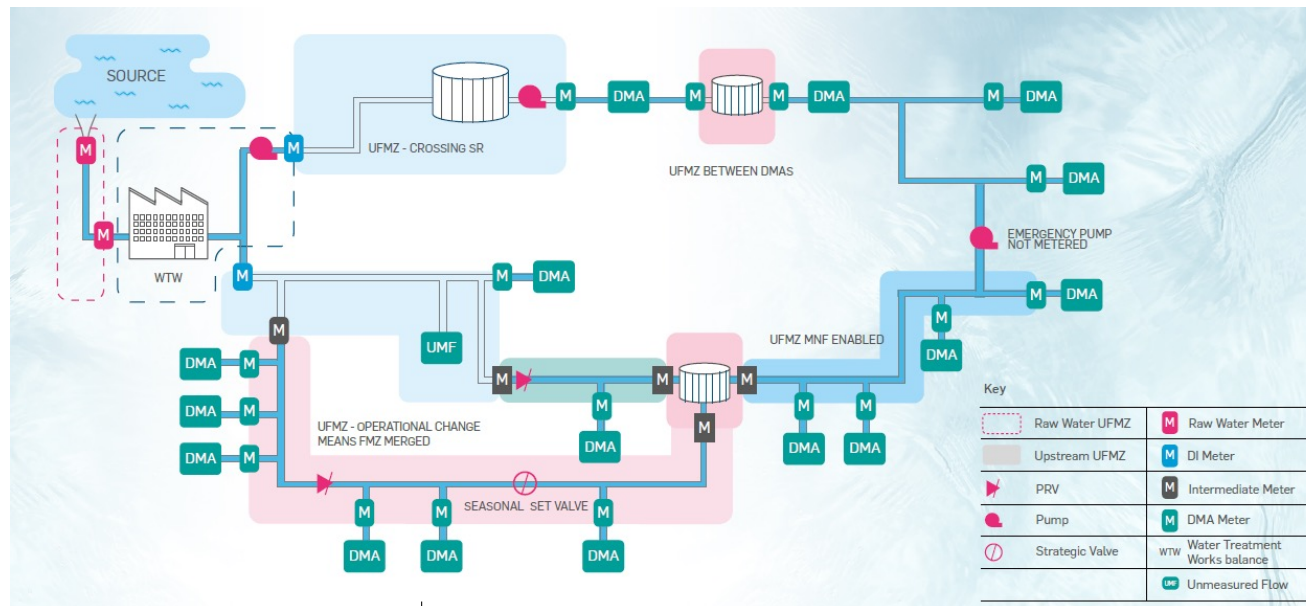


This is around 13% of mains.

AN END OF BURST AND BACKGROUND ESTIMATES IN THE UK

“The default approach to monitoring trunk mains leakage should be a flow balance approach...Reliance on the BABE approach for reporting trunk main leakage should be phased out by the [utility]”

(Ofwat, PR24 Common Performance Commitments)



THE POPULARITY OF THE ELECTROMAGNETIC METER IN THE UK

97%

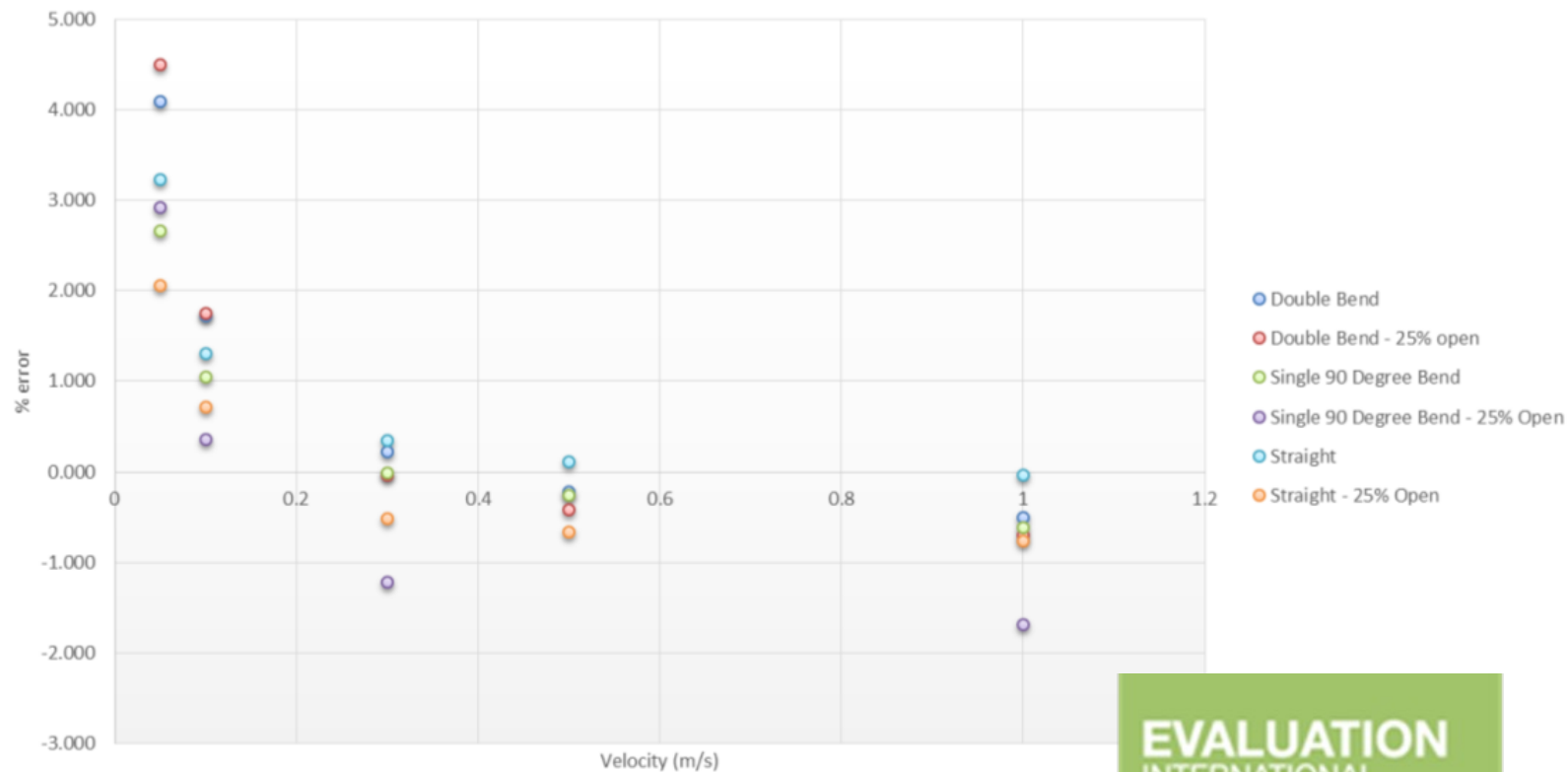
of Distribution Input Meters in the UK
are Electromagnetic Meters

Godley A., Karachountris S., Eglitis J., Improving the Accuracy of Large Flow Meters – Part 1 State of the Knowledge Review, WRc, 2017



ELECTROMAGNETIC METERS ARE HIGHLY ACCURATE

500mm Electromagnetic Meter – 5 Diameter from Disturbance

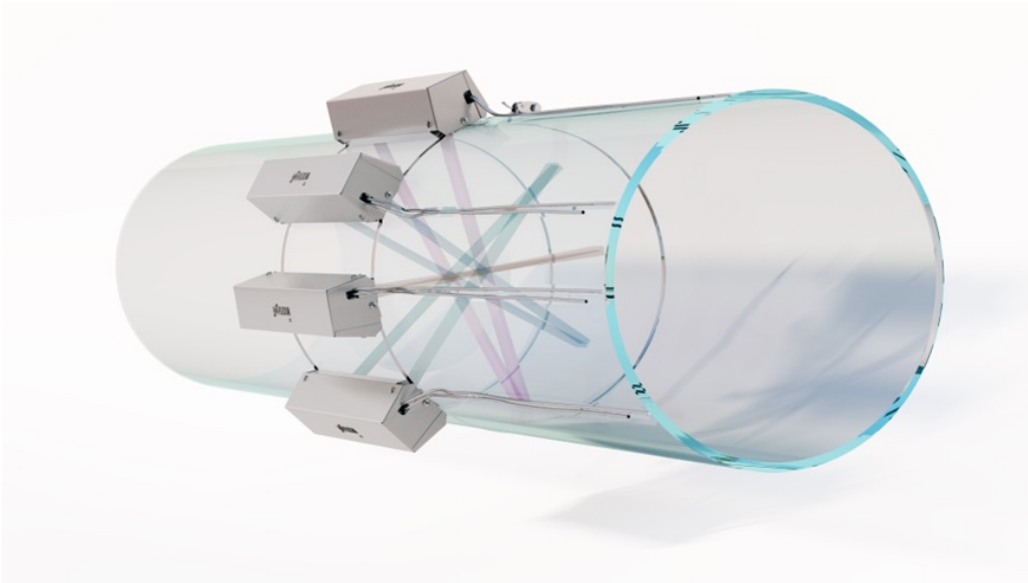


EVALUATION
INTERNATIONAL

THE CHALLENGE OF INSTALLING ELECTROMAGNETIC METERS IN THE UK

- **Regulatory Standards** - Water utilities receive financial penalties if water is not available for more than 3 hours
- **Cost** – Activities like diversions and contingency planning are expensive.
- **Risk** – Long unused valves and fittings increases the likelihood of failure.

CLAMP-ON METERS ARE A VERY POPULAR RETROFIT METER



Picture & Graphic Sources: Flexim

HOW ACCURATE ARE CLAMP-ONS METERS?



Wessex Water
YTL GROUP



wrc
independent | trusted | innovative

Dŵr Cymru
Welsh Water



SEVERN
TRENT

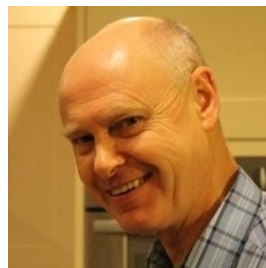
South West
Water

south
east
water



Uisce
Éireann
Irish Water

8 Water Utilities, 1 Regulator,
2 Consultants, 4 Research Partners

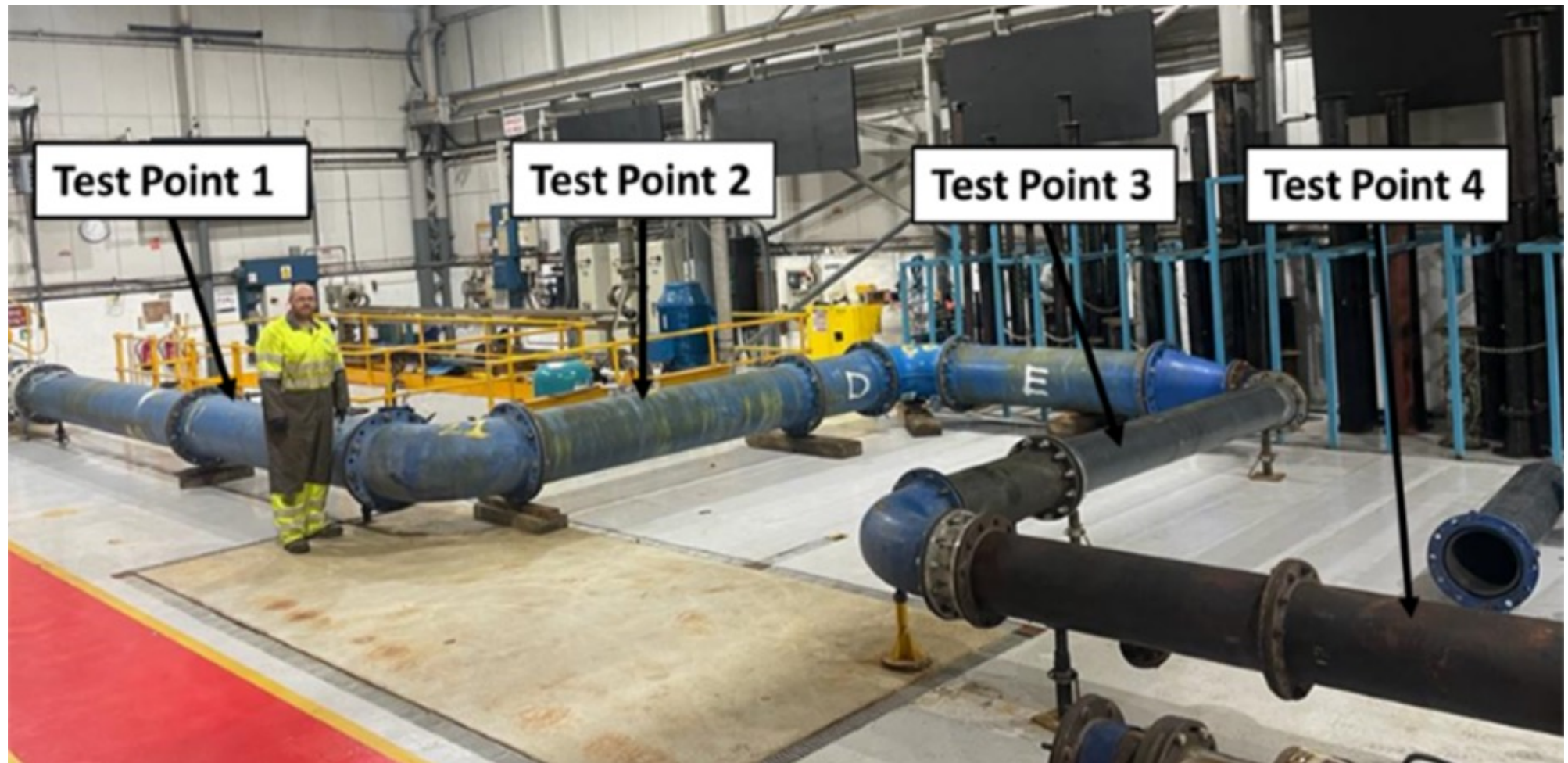


Dr Alun Thomas

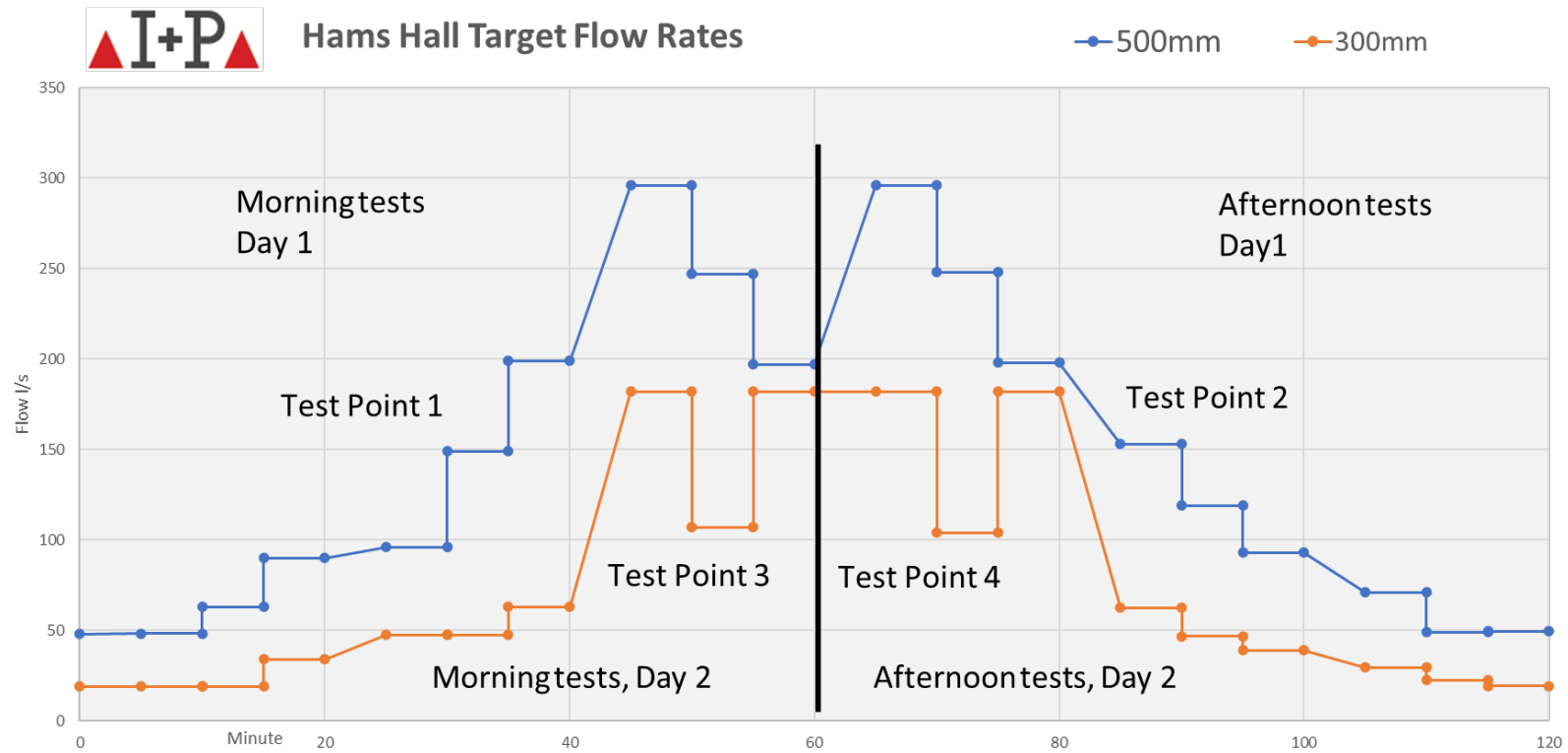


Dave Morris

TEST POINTS



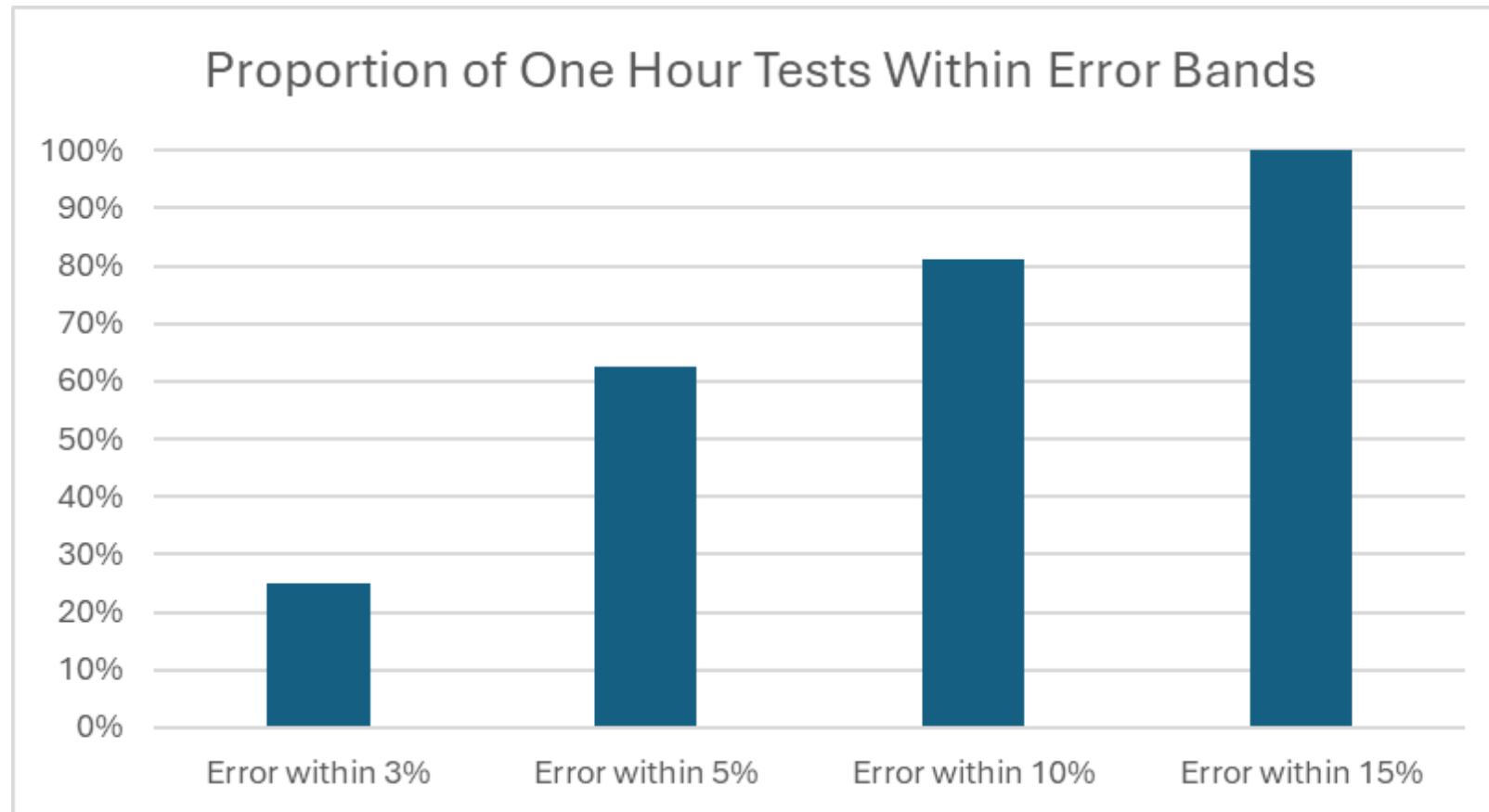
TESTING REGIME



TEST RESULT

Test Point	Average Absolute Error	Lowest Absolute Error	Highest Absolute Error
1	2.4 %	0.8 %	4.2 %
2	8.3 %	3.2 %	13.0 %
3	2.8 %	0.1 %	5.9 %
4	6.1 %	3.5 %	11.0 %

ONLY A QUARTER OF TESTS HAD ERRORS OF LESS THAN 3%



FLUID DYNAMICS

- **Fluid Dynamics** play a key role in measurement accuracy
 - Hence the difference between Test Point 1 & Test Point 2



FLUID DYNAMICS

- **Fluid Dynamics** play a key role in measurement accuracy
 - Hence the difference between Test Point 1 & Test Point 2
 - The coning down from 500mm to 300mm, seems to have “improved” the fluid dynamics



VELOCITY

- Increasing **Velocity**, increases accuracy

Groupings	Average Abs. Error (%)
Low (0.3-0.4m/sec)	6.42%
Medium (0.6-0.9m/sec)	5.16%
High (1.2-2.5m/sec)	4.58%

CORRECTION FACTORS

- **Correction Factors** improve accuracy
 - Two suppliers used the exact same equipment, only one used correction factors.
 - The supplier that used correction factors got more accurate results.

Test Point	Absolute Error (%)	
	Supplier who did NOT use correction factors	Supplier who did use correction factors
Test Point 1	2.52%	3.54%
Test Point 2	14.63%	10.70%
Test Point 3	6.02%	1.59%
Test Point 4	11.41%	6.20%

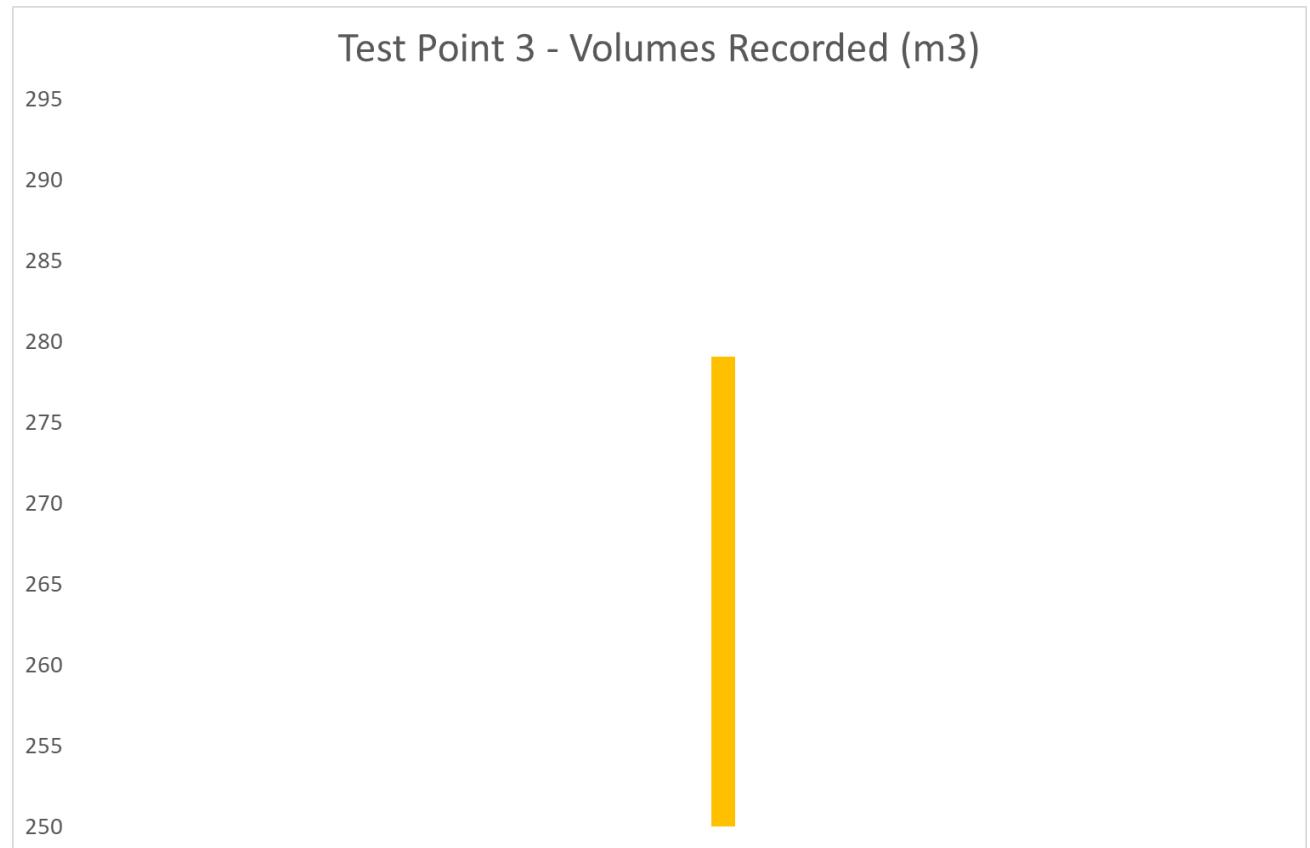
ADDITIONAL PATHS

- **Additional Paths** de-risks the chance of significant error

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Actual Flow: 279_{m3}



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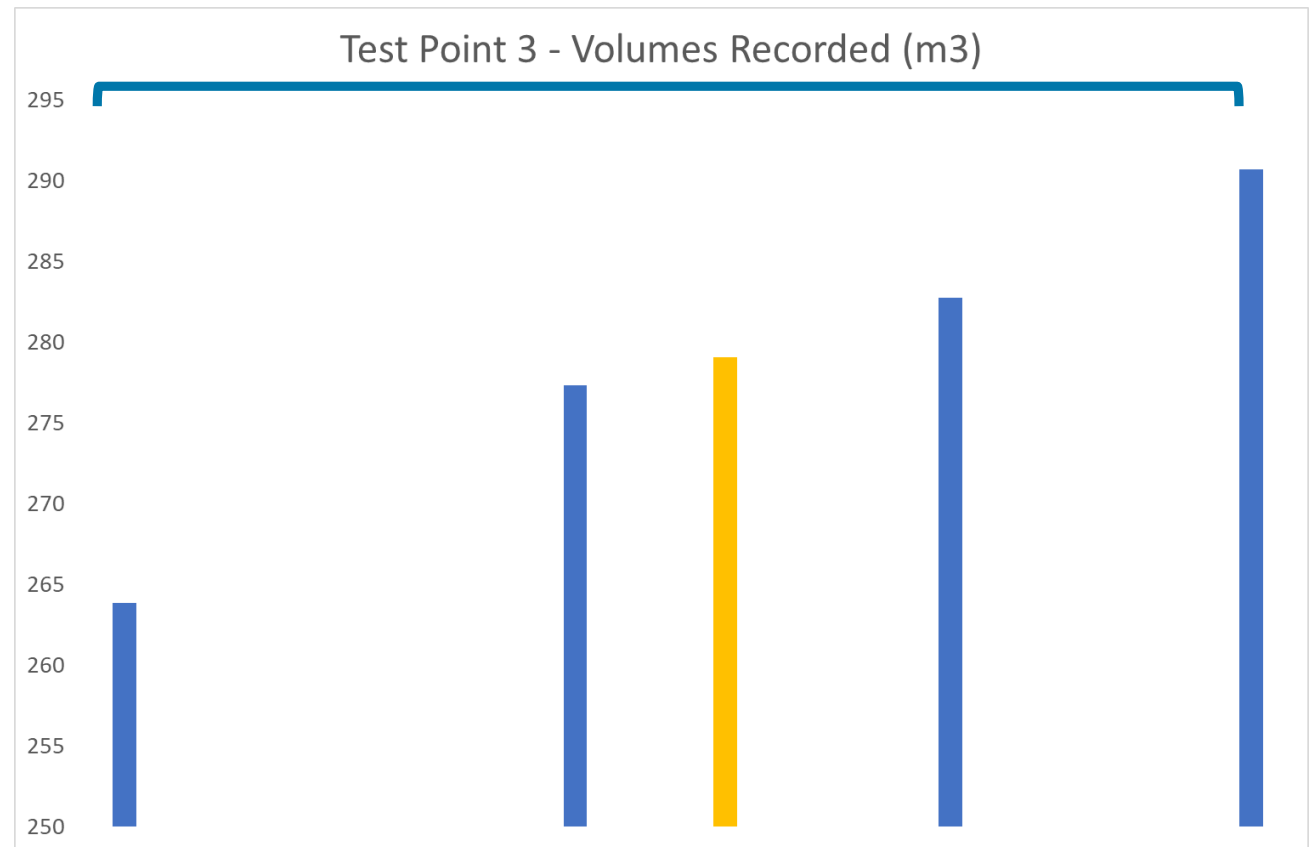
Actual Flow: 279_{m3}

Path A: 264_{m3}

Path B: 277_{m3}

Path C: 283_{m3}

Path D: 291_{m3}



ADDITIONAL PATHS

- **Additional Paths** de-risks the chance of significant error

Actual Flow: 279_{m3}

Path A&B: 271_{m3}

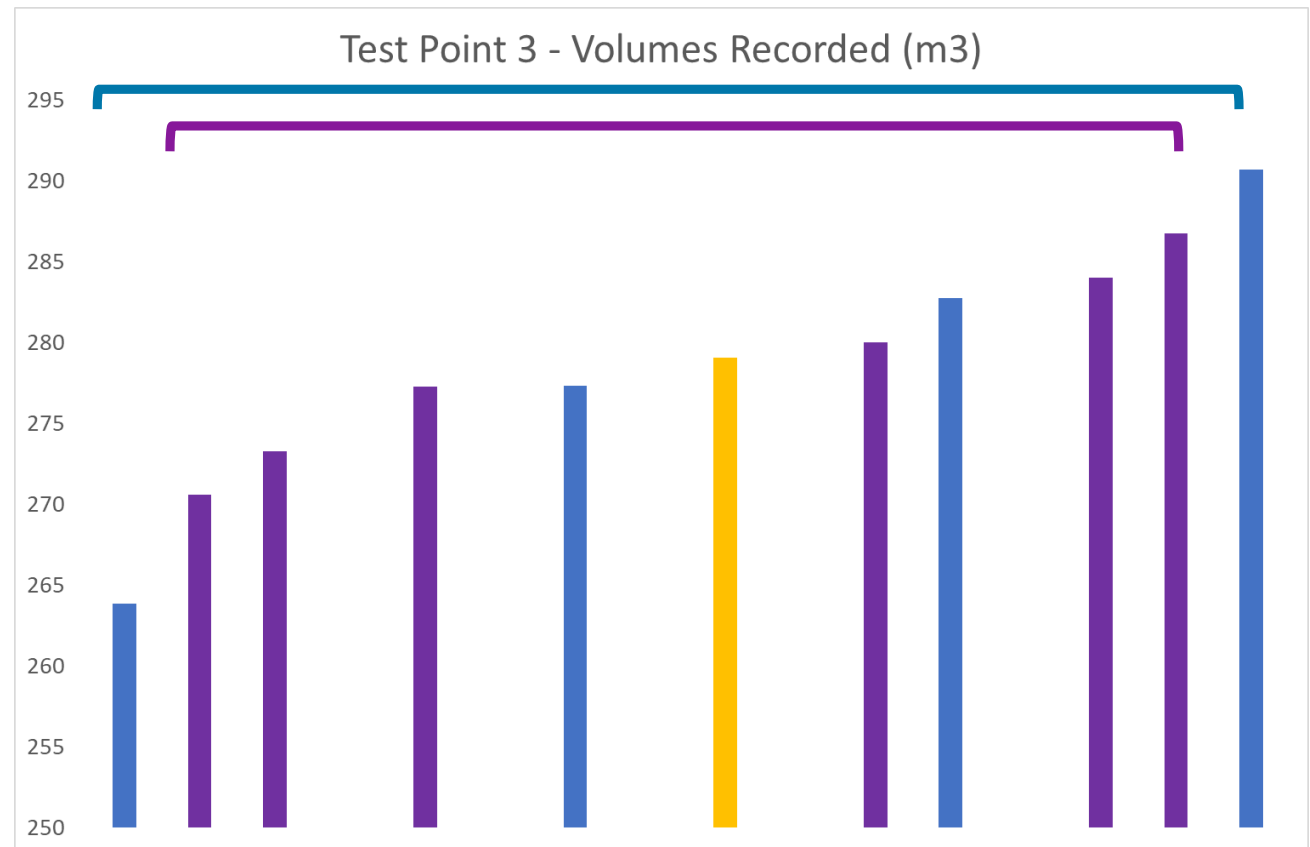
Path A&C: 274_{m3}

Path A&D: 278_{m3}

Path B&C: 280_{m3}

Path B&D: 284_{m3}

Path C&D: 287_{m3}



ADDITIONAL PATHS

- **Additional Paths** de-risks the chance of significant error

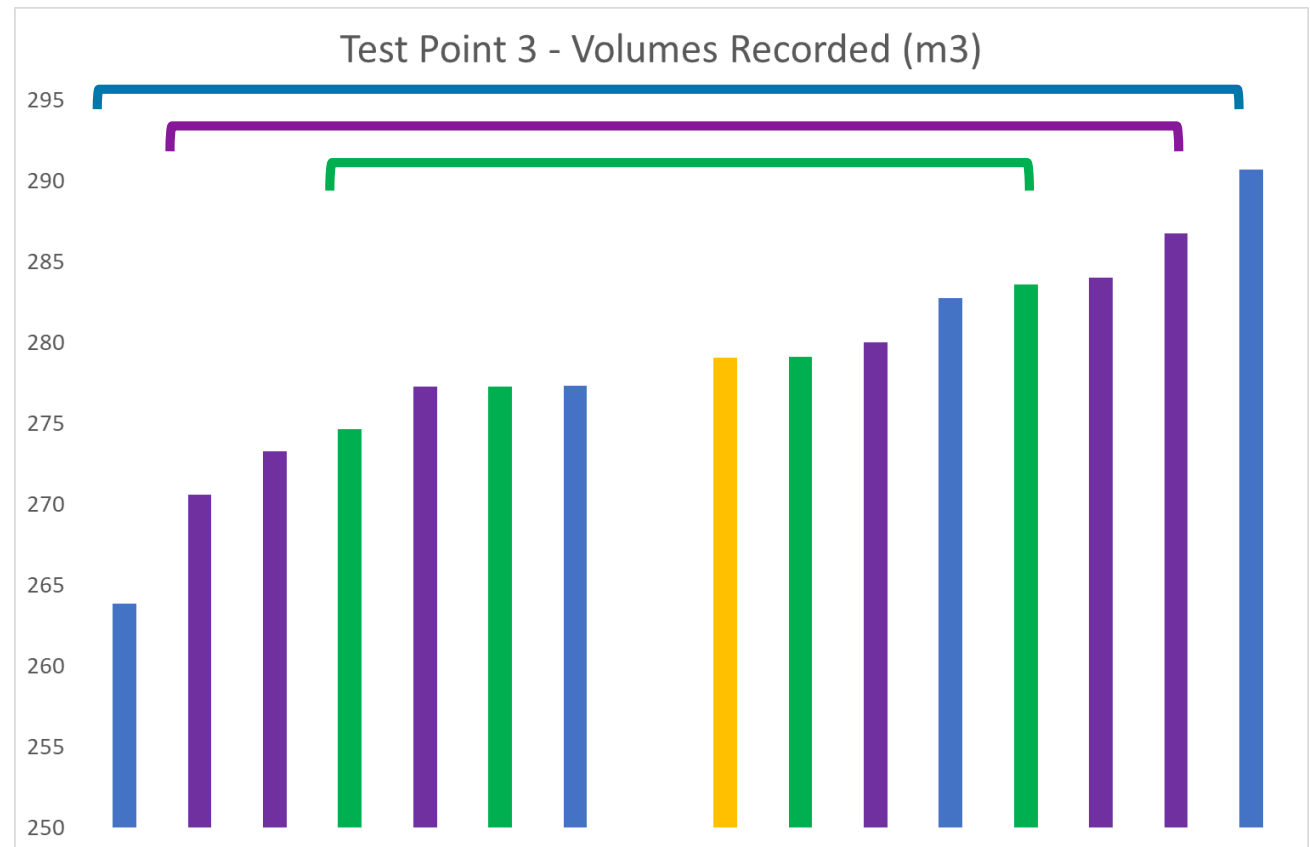
Actual Flow: 279_{m3}

Path A&B&C: 275_{m3}

Path A&B&D: 277_{m3}

Path A&C&D: 279_{m3}

Path B&C&D: 284_{m3}

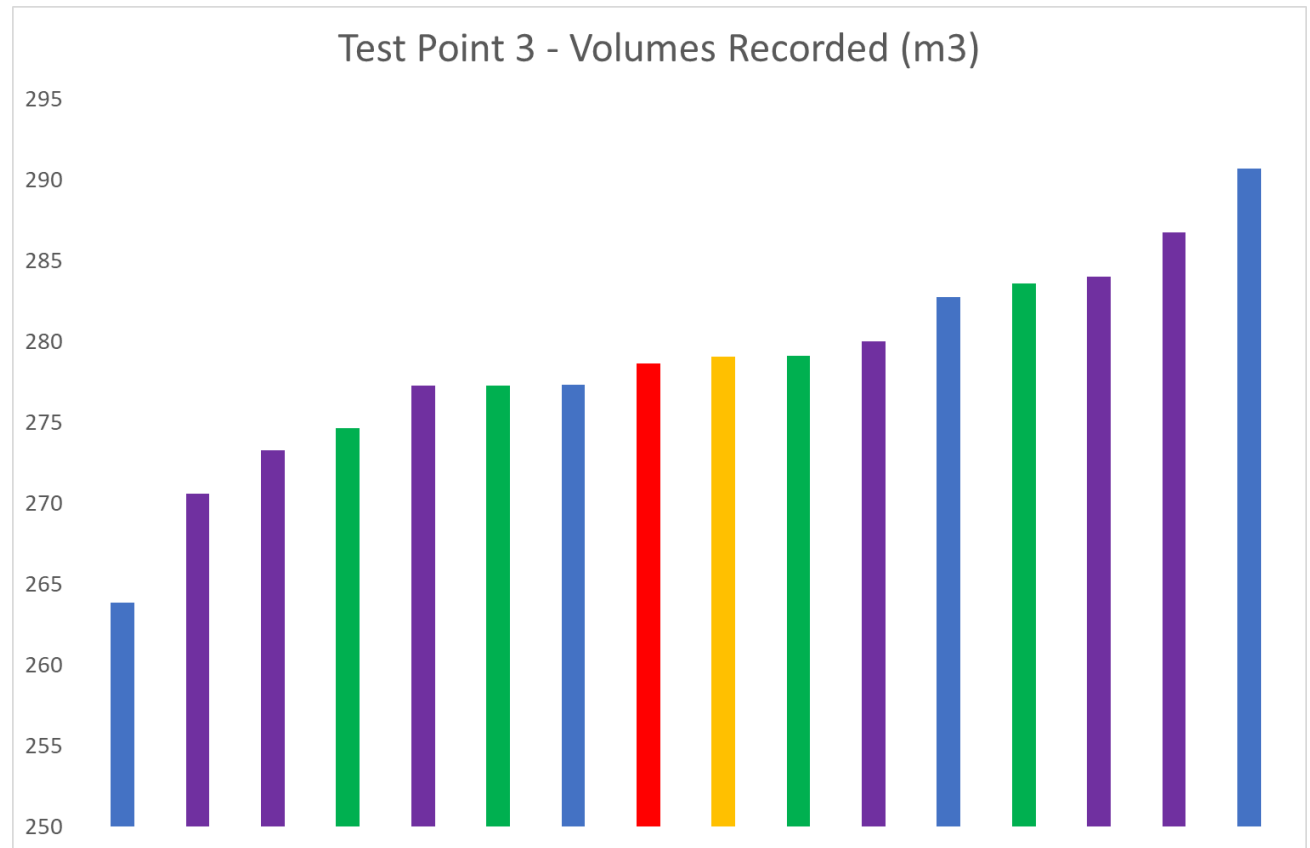


ADDITIONAL PATHS

- **Additional Paths** de-risks the chance of significant error

Actual Flow: 279_{m3}

Path A&B&C&D: 279_{m3}



LARGEST ERRORS

Test Point	1 -Path	2 - Path	3 - Path	4 - Path
3	5.46%	3.22%	1.62%	0.15%

LARGEST ERRORS

Test Point	1 -Path	2 - Path	3 - Path	4 - Path
1	1.92%	1.67%	1.40%	1.05%
2	4.59%	4.21%	3.65%	3.25%
3	5.46%	3.22%	1.62%	0.15%
4	10.29%	6.43%	4.75%	3.54%

TAKE AWAYS

- Find the best hydraulic location possible
 - Get as far downstream from a disturbance as possible
- Increase Velocity
 - Installing on two smaller mains rather than one large main, is likely to bring more accurate results
- Use Correction Factors
 - Manufacturers need to explain these better
- Maximise The Number of Paths



WITH SPECIAL THANKS TO:

DR ALUN THOMAS (I&P SERVICES) 

DAVE MORRIS (I&P SERVICES) 

ANDY GODLEY (WRC) 

Report summary can be found on Research Gate

