



Residual Pressure

Practical Design Limits for Reliable System Operation

AS2419.1-2005: Clause 2.3.3 + Note 1

2.3.3 Water system supply pressure

The residual pressure adopted shall be the most appropriate that—

- (a) the local water agency determines from system modelling and considers that it can be maintained for 95% of the time;
- (b) the local water agency advises as a minimum pressure obtained or calculated from its records, (excluding the pressures on the 5% of days having the lowest pressures or 5% of the pressures on the lowest pressure day, as appropriate), adjusted for the effect of fire flows;
- (c) is determined from calculations based on adding the required fire flow rate to the 95% availability flow in the water system (see Notes 3 and 4); or
- (d) is determined by testing the water supply system using a method approved by the water supply agency.

NOTES:

- 1 The capability of the water supply system to provide nominated fire flow rates is only acceptable when the residual pressure at the point of connection at the main is not less than a limit as nominated by the water supply agency.

AS2419.1-2021 Appendix L : Expanded Text

L.3 Source water supply pressure

“...Network utility operators may set limits on the demands a fire system may place on a network, due to either operational or customer service considerations. Typical constraints include limiting the impact of fire system maintenance flow tests on surrounding pressures, maintaining network domestic supply pressure stability, limiting mains scouring “dirty water” events, ensuring sufficient capacity for future development, limiting pressure transients ie. “water hammer” etc. This may be reflected in advice provided to the fire system designer or separately in development and connection approval documents provided to others. It is recommended this be checked as an appropriate design due diligence step...”

Design Pressure/Flow Limit Advice

Flow/Pressure Limit Guidelines in place shortly after creation of Design Pressure Advice Service in ~2008

Small sample:

Max Permissible Test Flow (If Applicable)		
Flow (L/s)	HGL (mAHD)	Pressure (kPa)
19	101.5	467

Eg. Aqualogical 2012

Pressure in supply main, relative to the estimated connection RL
 Maximum flow available for testing is limited to 19L/sec as excessive flow beyond this causes more than allowable surrounding pressure drop.

Max Permissible Test Flow (If Applicable)		
Flow (L/s)	HGL (mAHD)	Pressure (kPa)
15	35.6	297

Eg. CWA 2012

3 | 126 Vernon St, Nundah: Maximum fire test flow available is limited to 15L/sec as excess flow may cause surrounding pressure drop by more than the allowable limit

Max Permissible Test Flow (If Applicable)			Comments (If Applicable)
Flow (L/s)	HGL (mAHD)	Pressure (kPa)	
10	65	608	Existing Network: Fire Minimum Available HGL/Pressures. Water main draws to be limited to 10 L/s to avoid exceeding reliable network capacity.

Eg. MDA 2014

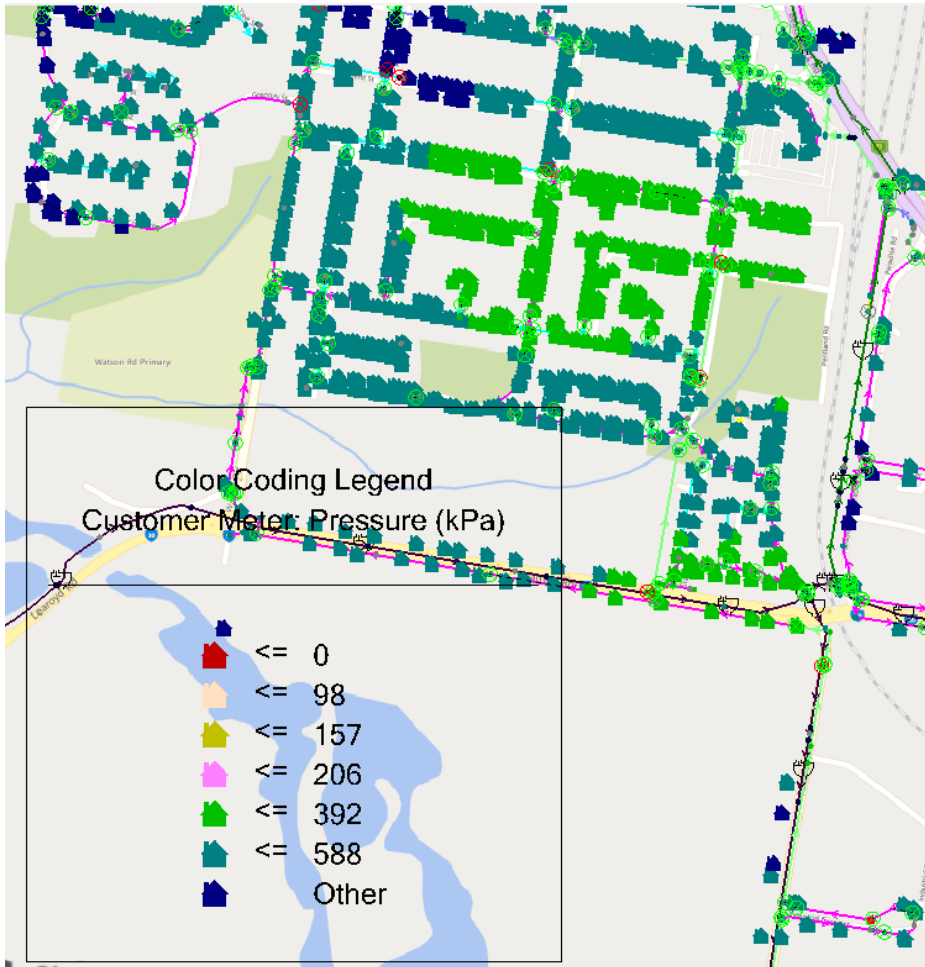
Connection Flow Control – Fire System Test Impacts

Approximately 8,000 Fire Service Connections recorded on Urban Utilities system

- Does not include AS2419.1 Street Hydrants! These are not recorded.
- Queensland Development Code MP6.1 requires AS1851-2012 compliant maintenance testing (ie. “Form 72”)
- AS1851-2012 = Annual Water Supply Proving Test + Monthly Pump Run Checks (Eg. 10 minutes per Diesel)
- If 100% MP6.1 compliance – having to manage the impact of ~8,000-10,000 proving tests per year
- **ie. Up to ~22 – 27 network/customer service high load stress events per day!**

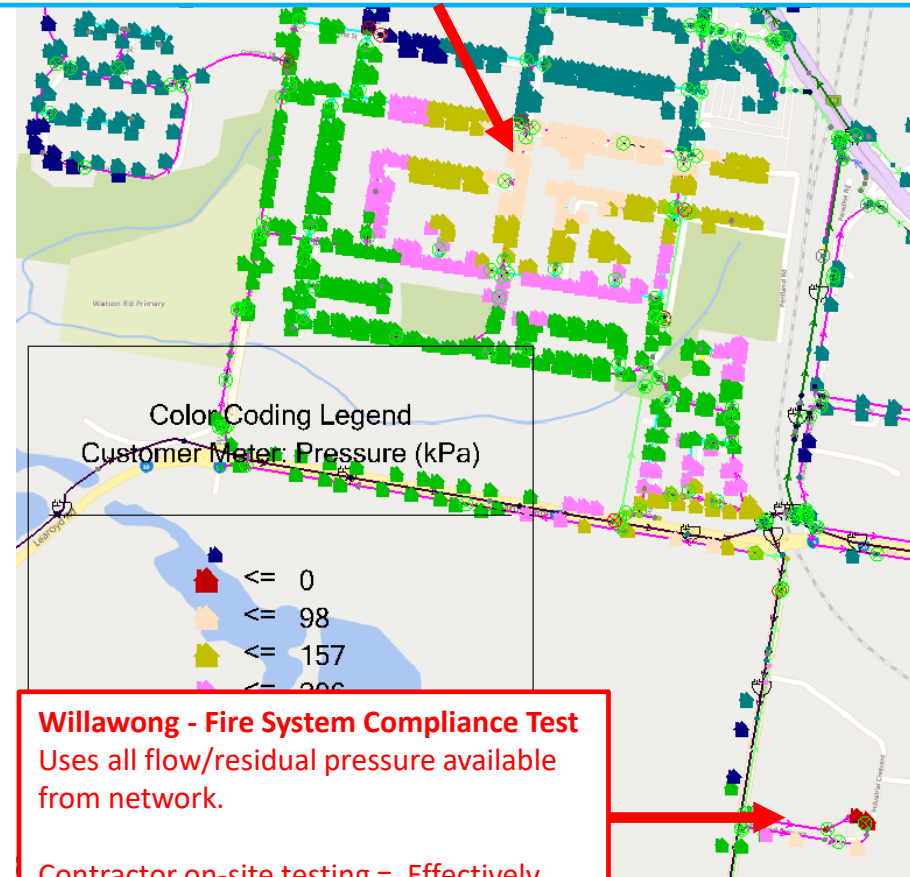
Connection Flow Control – Fire System Test Disruptions

Normal Customer Service Pressures



Private Fire System Testing

- 610 Services Impacted
- 330 w/ Pressure less than Urban Utilities Customer Charter
- 170 w/ No Water

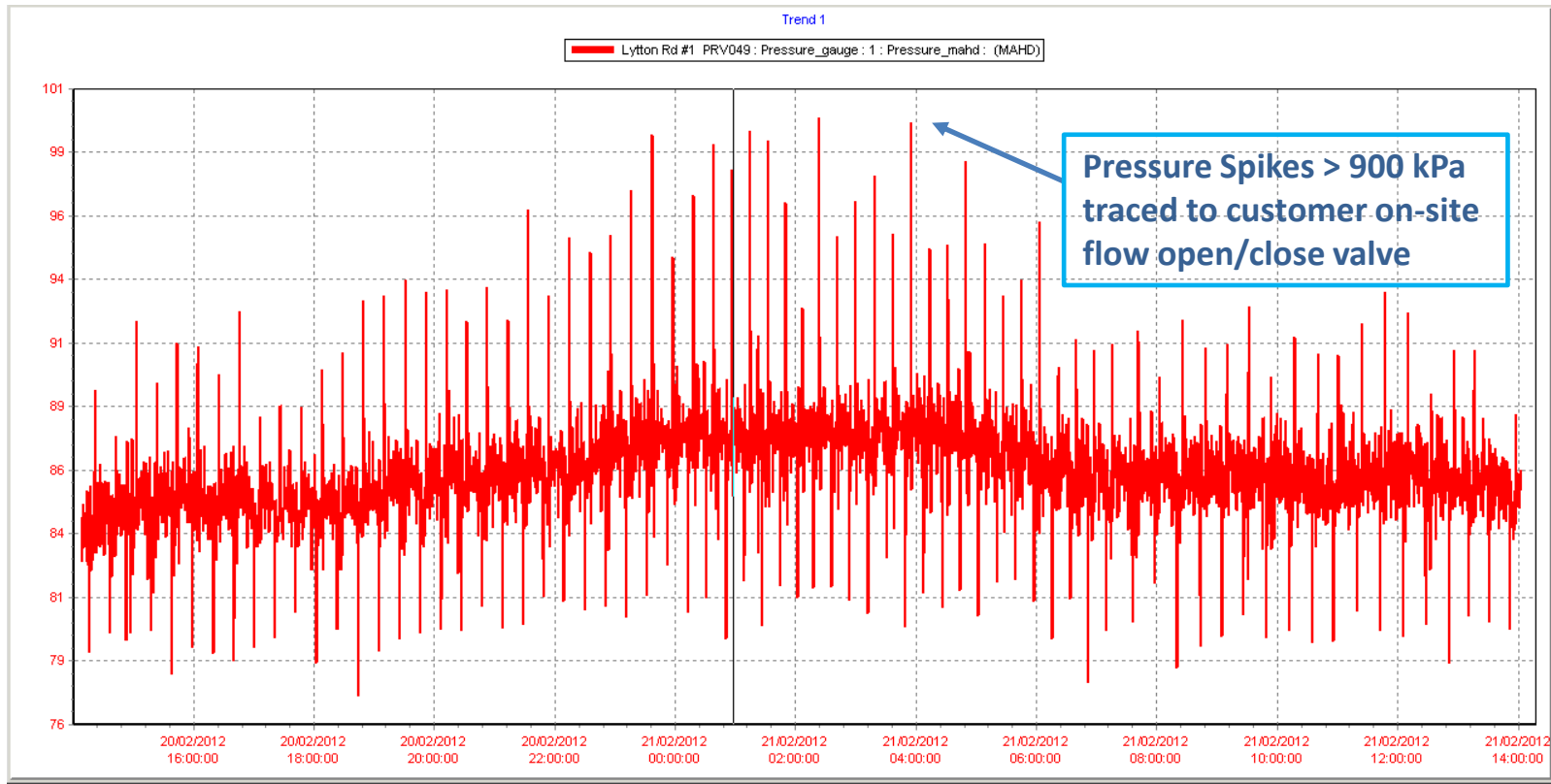


Willawong - Fire System Compliance Test
Uses all flow/residual pressure available from network.

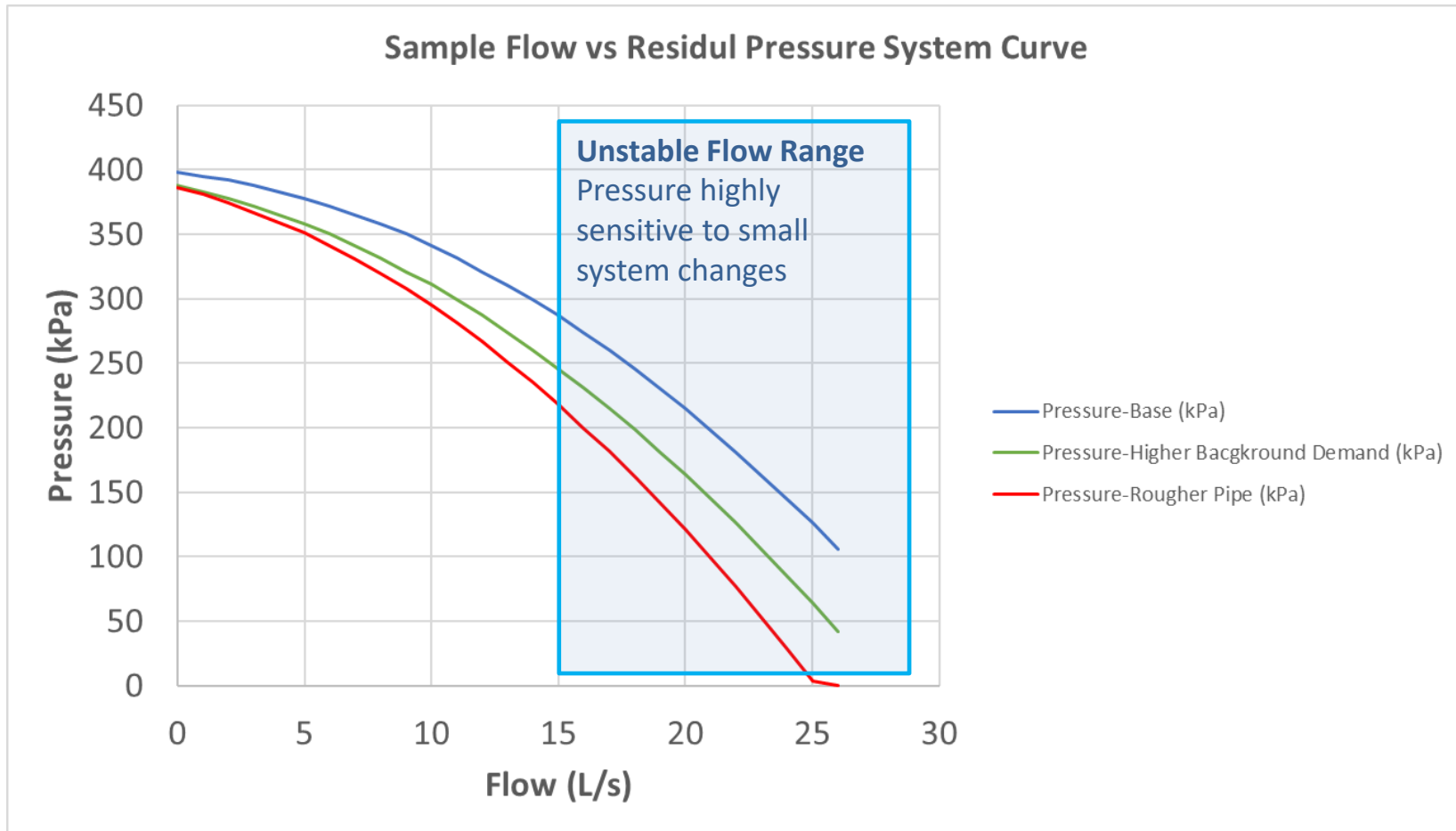
Contractor on-site testing = Effectively mimics a burst main!

Connection Flow Control – Fire System Water Hammer

**Uncontrolled Customer Network Load
= Network Demand + Neighbouring Plumbing Damage**



Avoiding Unreliable Design Pressure / Customer Compliance



Avoiding Unreliable Design Pressure / Customer Compliance

Example Due Diligence/Design Field Test

Flow Rate & Pressure at Fire Hydrant #1	
(l/s)	(kPa)
0	680
5	580
10	290
11.5	70

>200 kPa @ 10 L/s
 However...would be **extremely** unreliable design due to Pressure vs Flow sensitivity

Additional 220 kPa hydraulic loss for 1.5 L/s flow increase!

Pressure Advice Accuracy Limits

