THE USE OF MODELLING DURING ALL STAGES OF DEVELOPING NEW PRESSURE MANAGED AREAS

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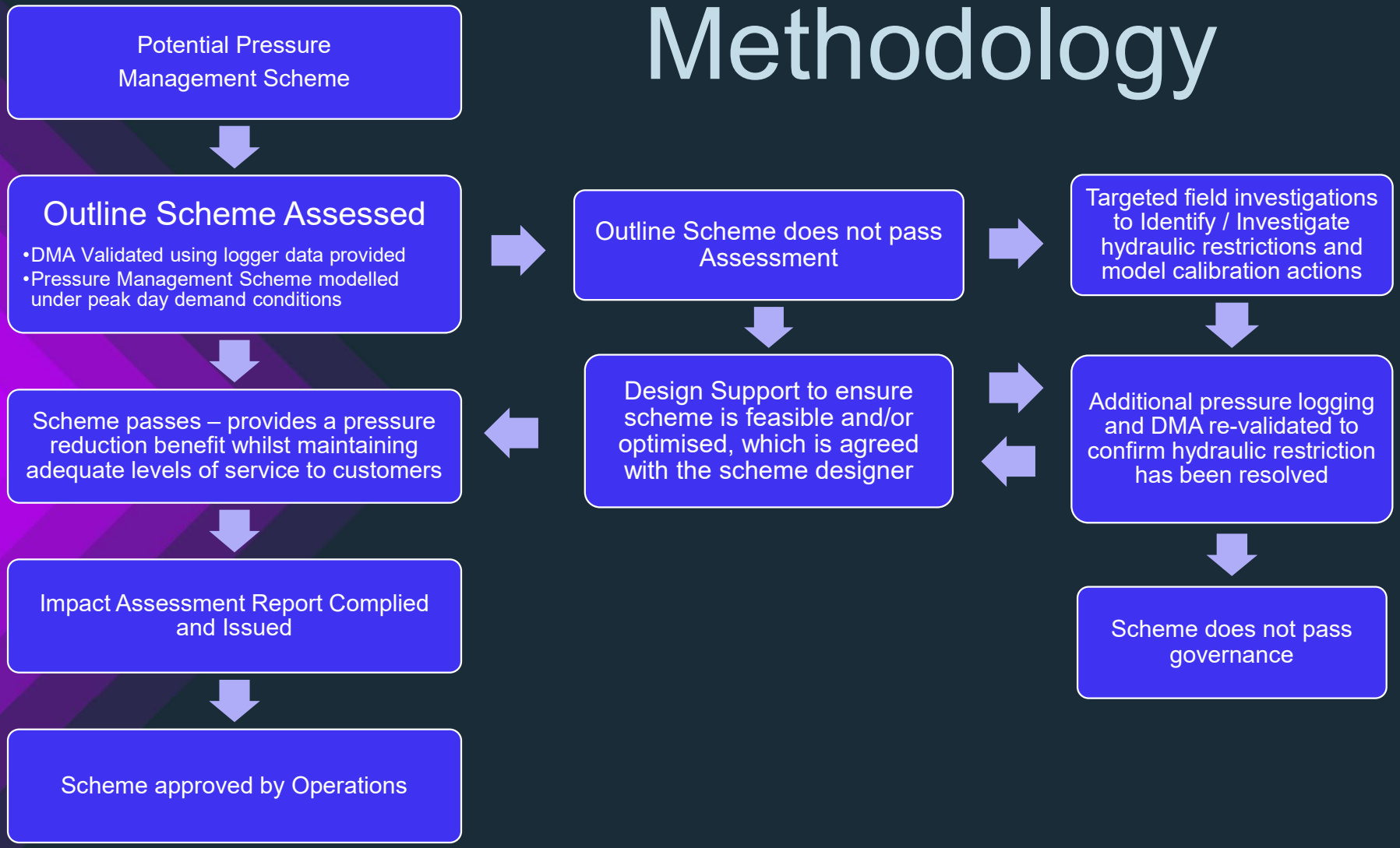
Introduction

- Thames Water (with RPS and Utilitec) are designing pressure management schemes and Modelling Impact Assessments are required as part of the sign-off procedures with Thames Water Operations.

- AtkinsRéalis have a team of modellers who utilise the stock of Thames Water all-mains models to complete the Assessments to demonstrate the feasibility of the new schemes, as well as providing support for the design, construction and commissioning.

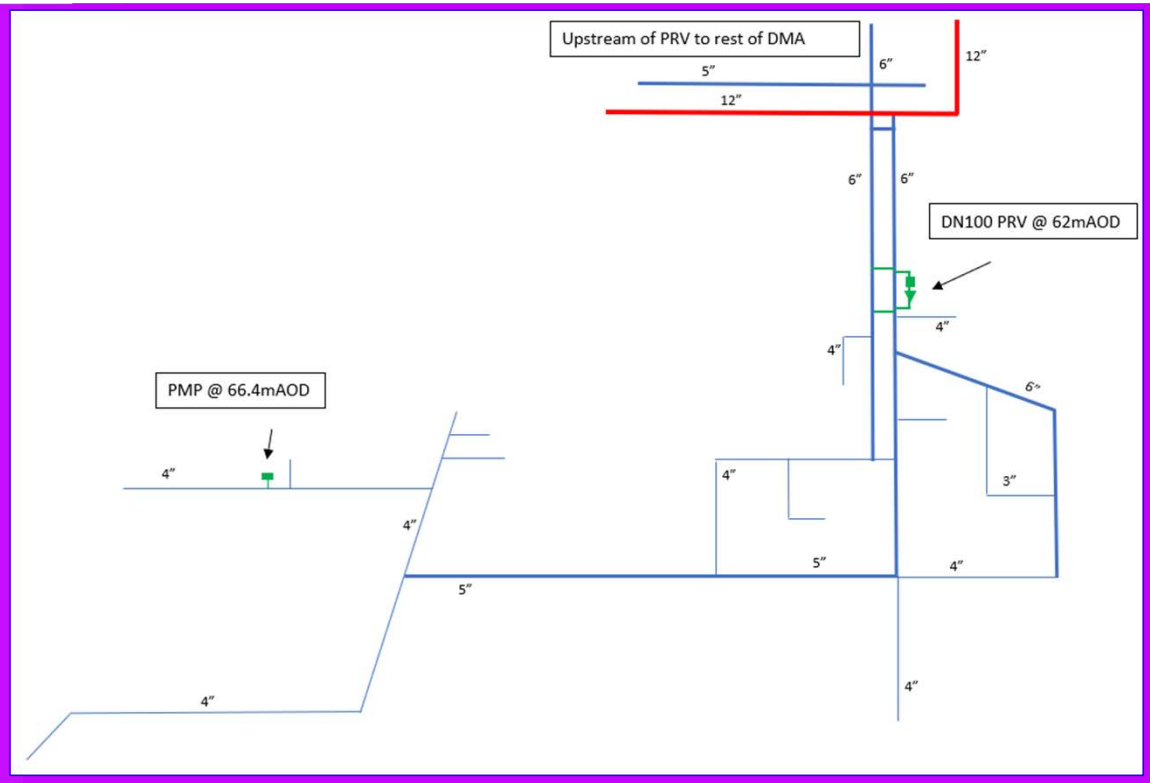
- Schemes are becoming increasingly more complex, and the effective use of network modelling is now an integral part of the full design process, and this will continue into AMP8 as the leakage targets become more challenging to achieve.

Methodology



SCHEME EXAMPLES – FROM THAMES VALLEY TO CENTRAL LONDON

- Schemes range in size and complexity:
  - Number of properties - from several 100 to 50,000+
  - Number of DMAs
  - Single feed PMAs to multi-feed PMAs
  - PRV control – fixed outlet or closed loop
  - Areas re-zoned outside of the proposed PMA
  - Number of shuts required
  - Changes to zonal resilience and/or operation.



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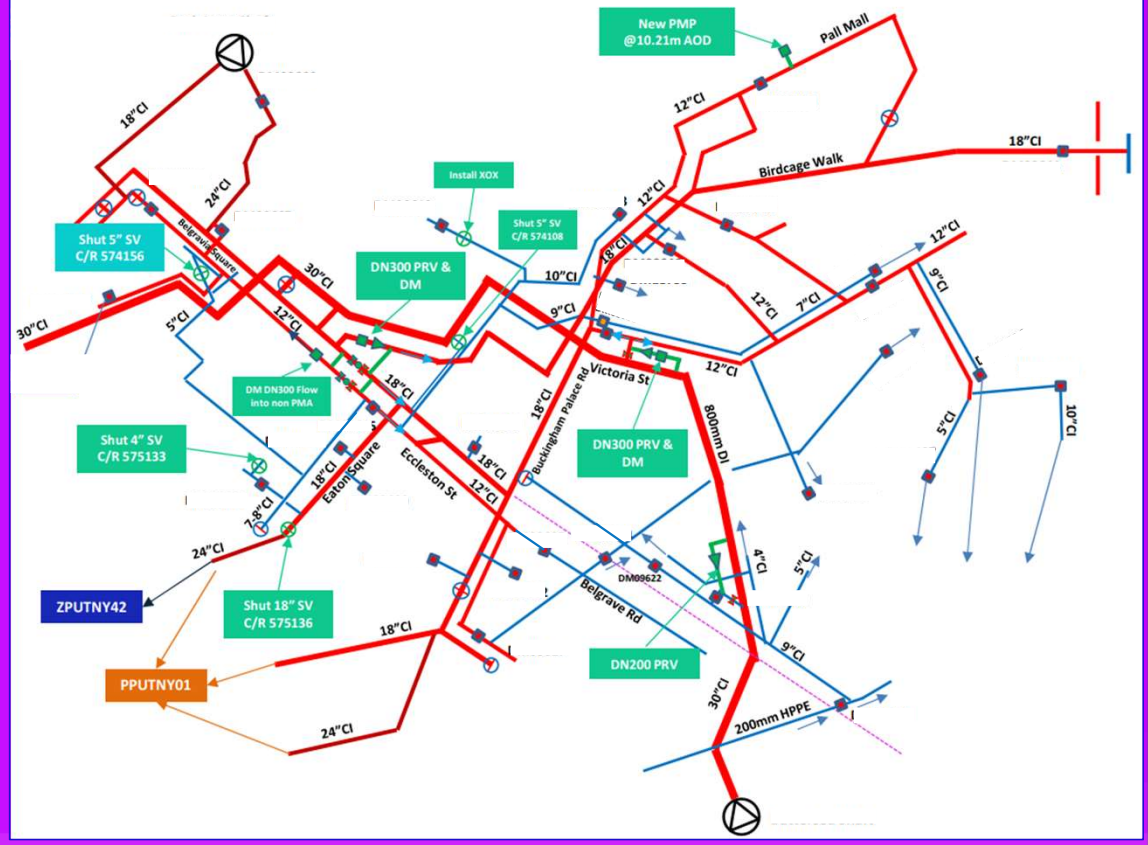
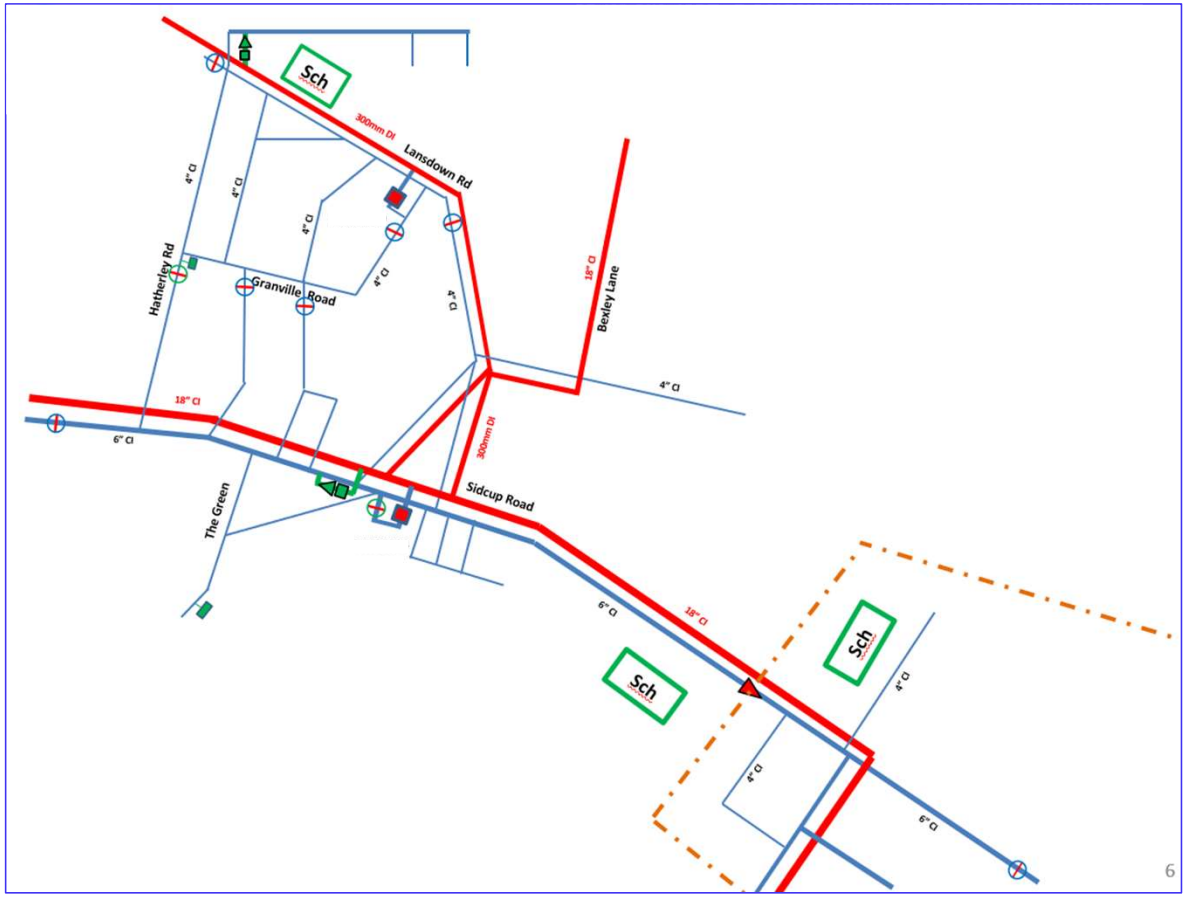


Case Study 1 – Buildability Assessment

- Original Design:
  - Two new PRVs on Sidcup Rd and Lansdown Rd.
  - Issues around buildability – collaboration with the design team to identify an alternative design.



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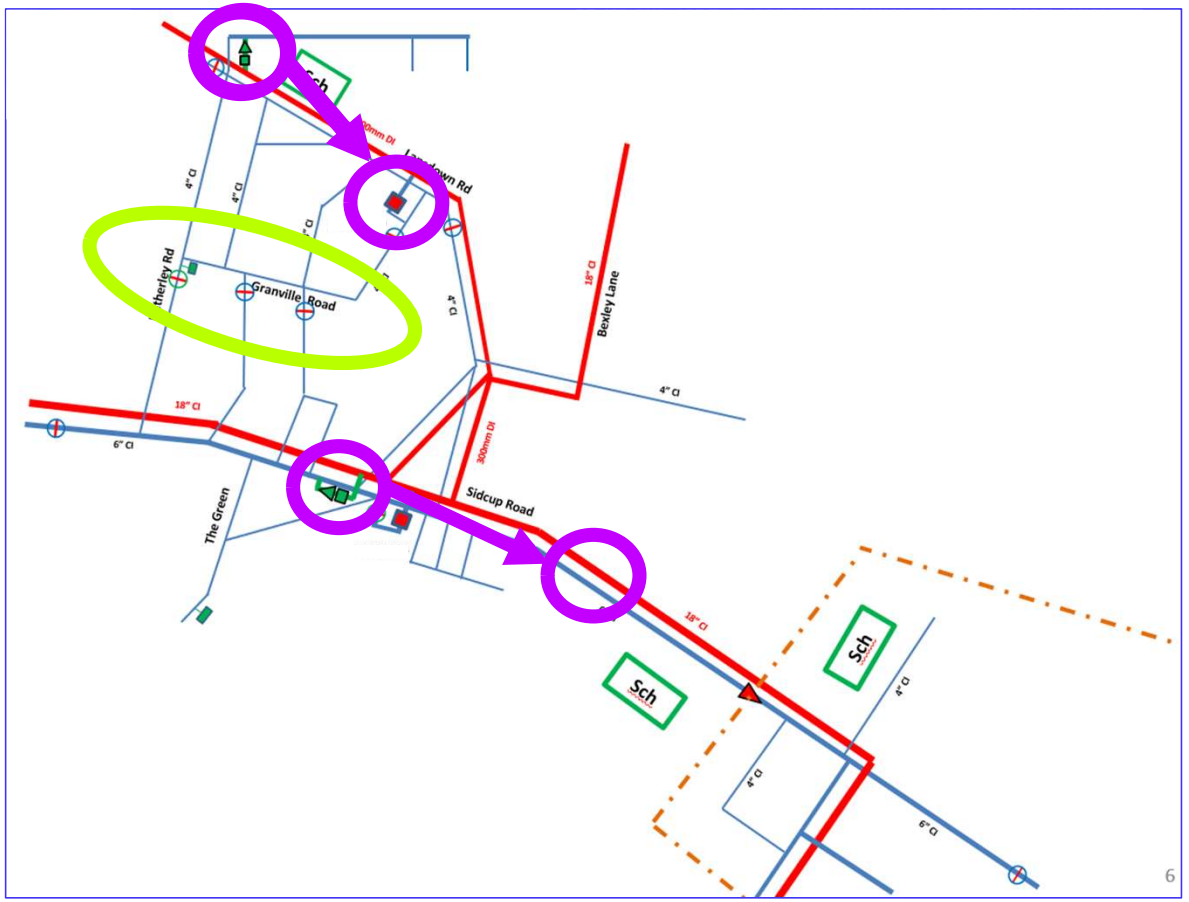
  - Alternative PRV locations had lower PRV inlet pressures due to additional trunk main headlosses.
  - Scheme required to be a single PMA to prevent areas of low pressures.



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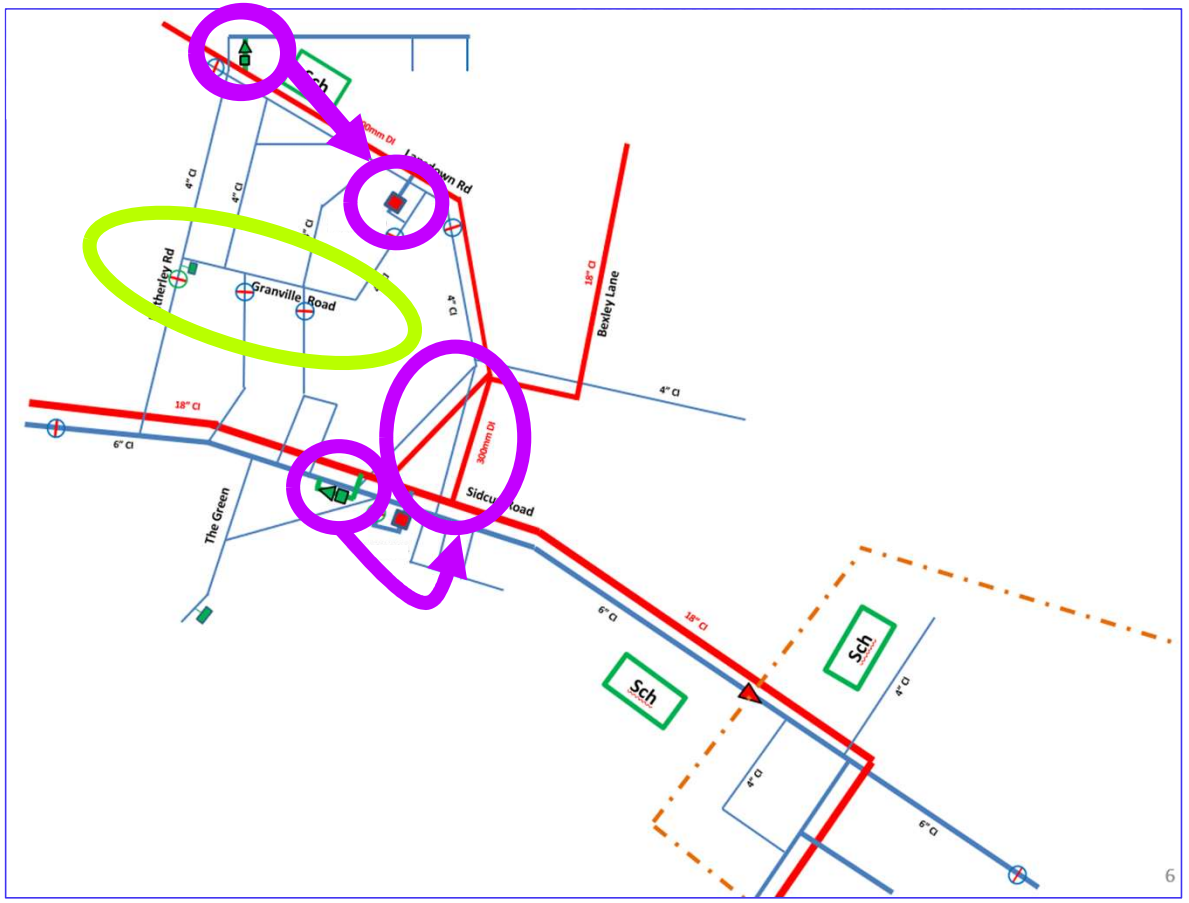
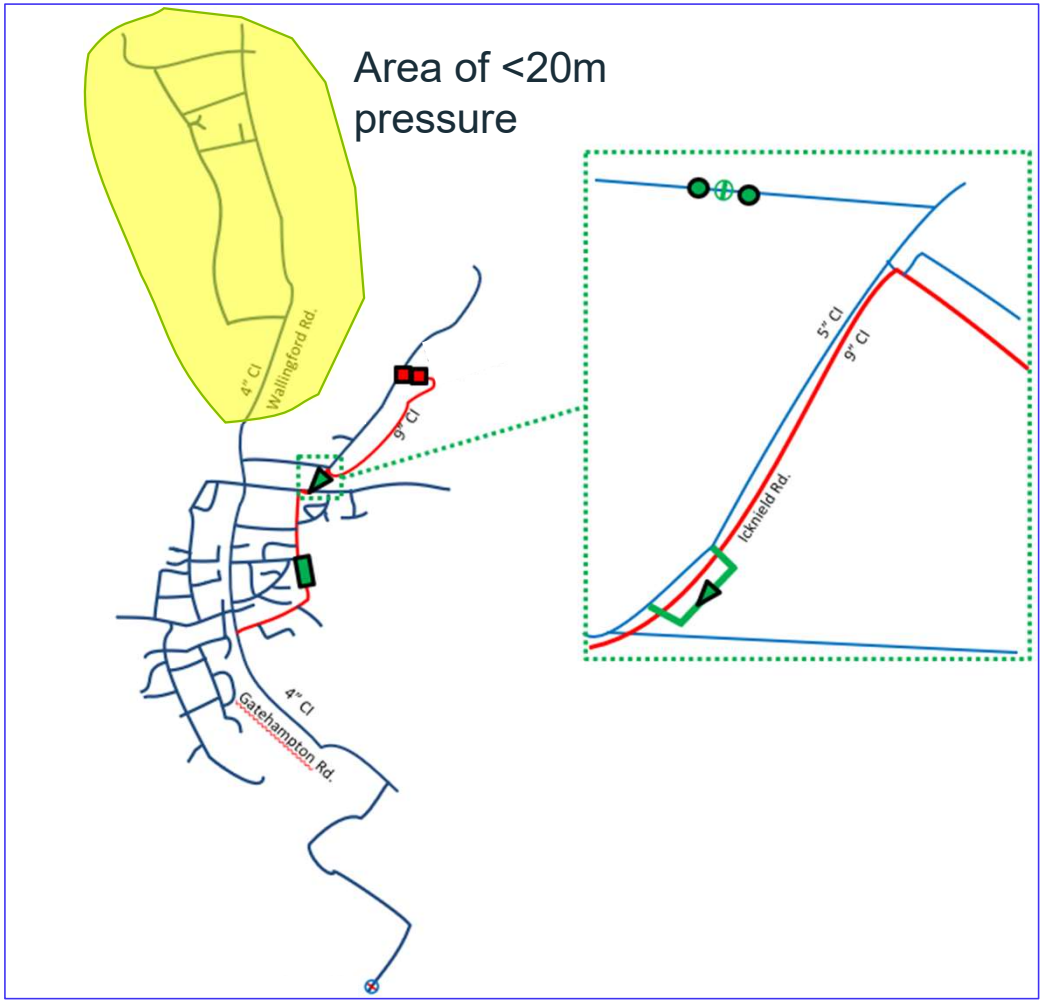
- Further update to design:
  - Site work identified that the Sidcup Rd alternative PRV location is unfeasible.
  - Every alternative modelled – with additional recommendations around site work to identify and resolve hydraulic restrictions, build new cross-connections, and have an additional feed from the trunk main.



Case Study 2 – Unfeasible Scheme

- Single feed PMA which required a closed valve on a 3” CI main to setup up the PMA.
- 20m target pressure at PMP.
- Peak day model indicates an area with minimum pressures between 15 and 20m. However, there is still scope for pressure management as night-time pressures are 30m+.
- This scheme could pass Thames Water governance if there was no further pressure reduction in the low-pressure area with the PMA setup.



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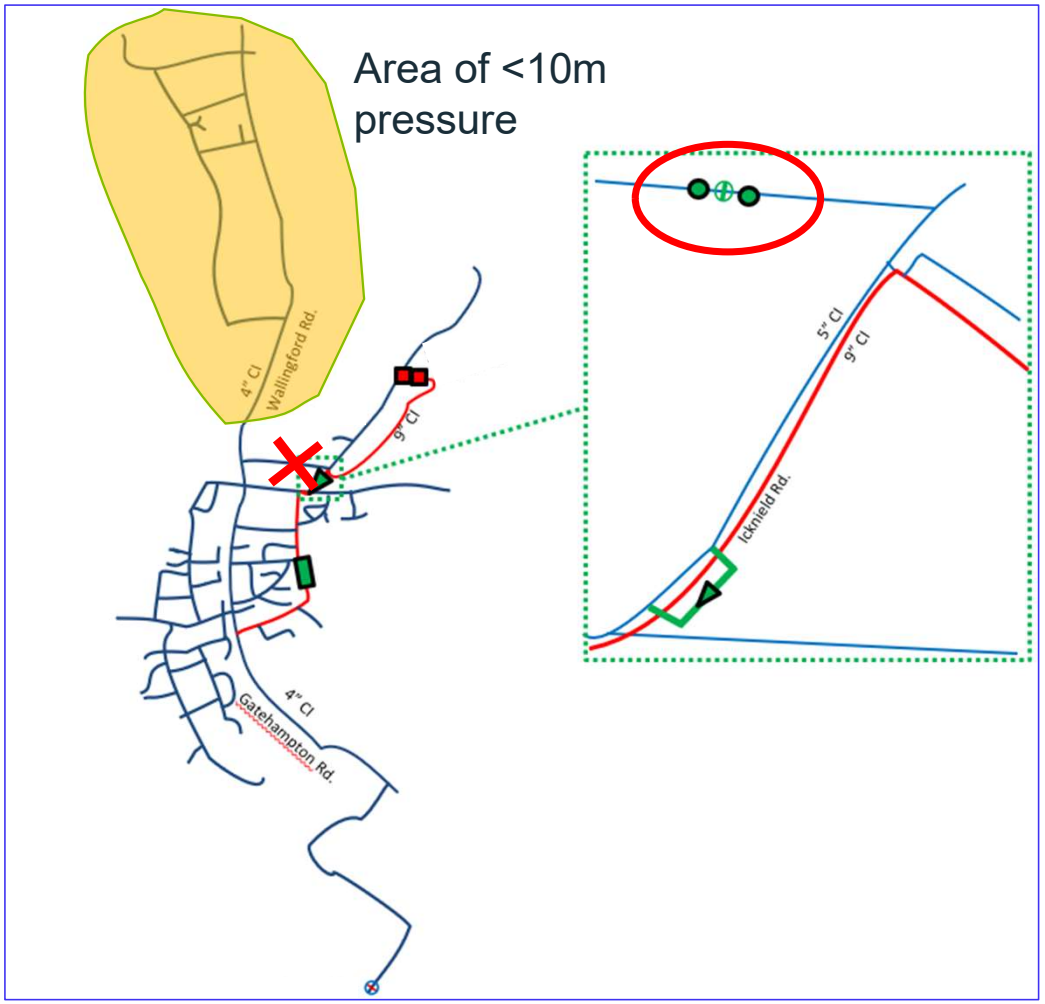
- Setting up the PMA resulting in an area of <10m minimum pressure due to a reduction in capacity.
- Design support with the lead designer to model alternative designs.



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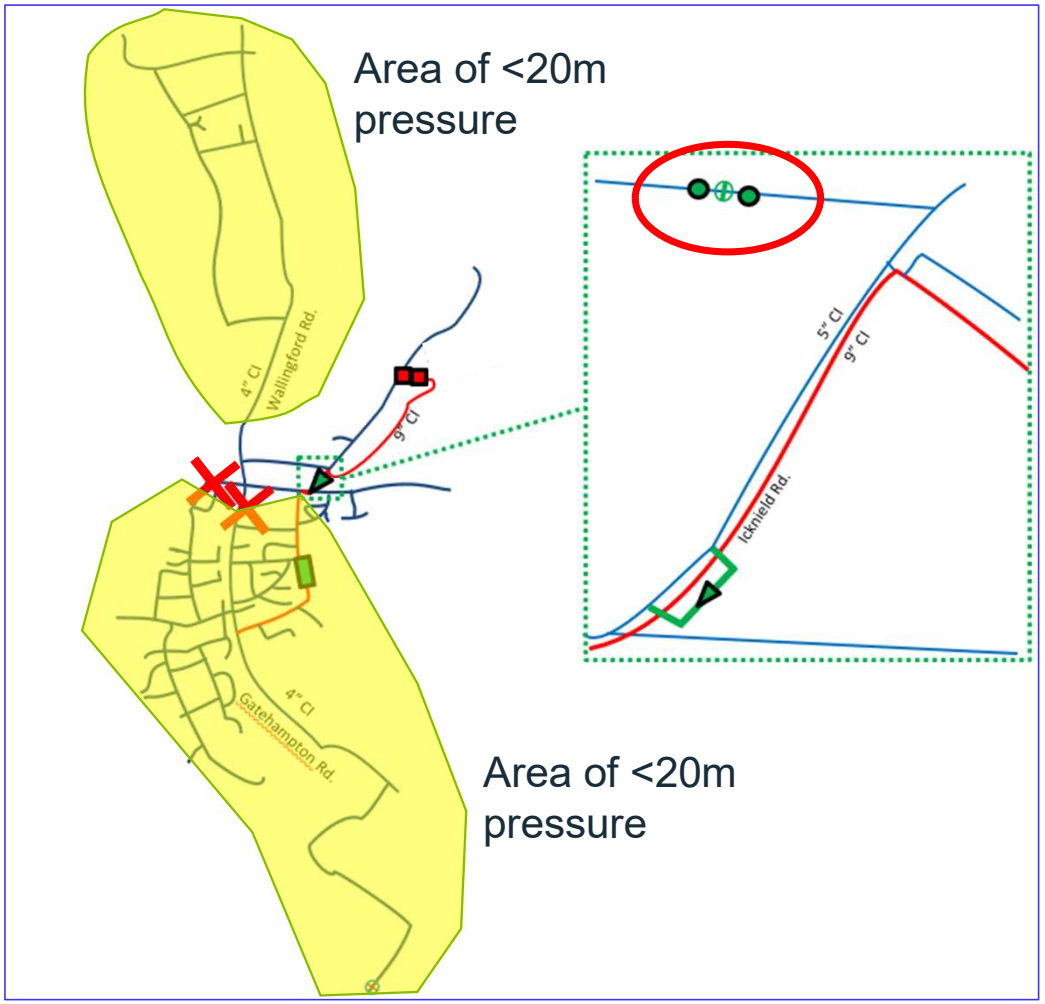
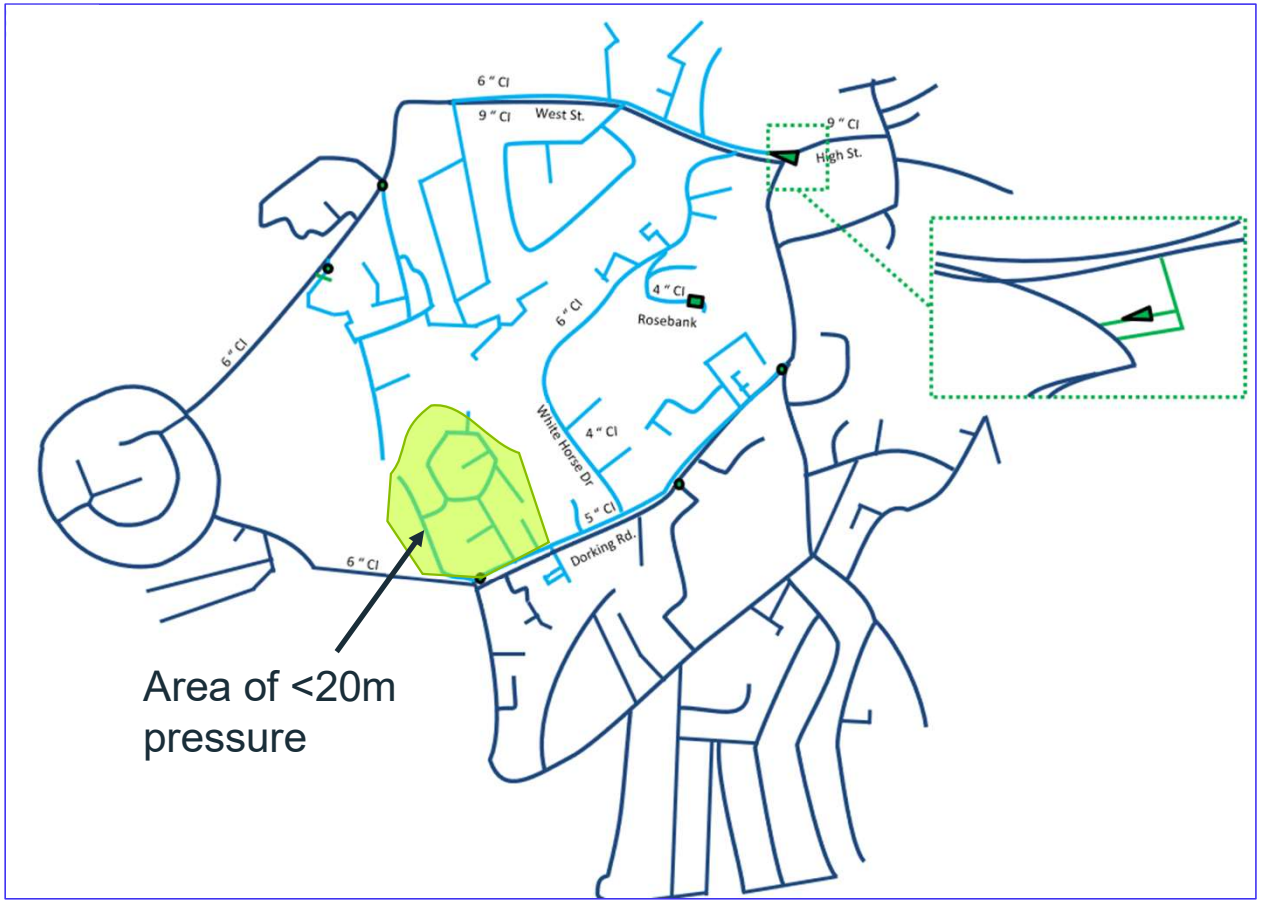
- Setting up the PMA resulting in an area of <10m minimum pressure due to a reduction in capacity.
- Collaboration between modelling and design team to identify alternative designs. The following options were reviewed:
  - Moving the PMA boundary valves so that there is no reduction in network capacity to Northern area. Ultimately creates a new low-pressure area in the Southern part of the DMA.
  - Identify any hydraulic restrictions. Mains upsizing required – insufficient leakage benefit to justify this.
  - 2nd PRV so that there is no reduction in capacity.
  - Review rezone options.
- Modelling at this early stage of design has ensured that an unfeasible scheme is not progressed.



Case Study 3 – Scope for Optimisation

- Single feed PMA, targeting 20m at the PMP.
- 5 closed valves required to setup the PMA, which results in an increase in headloss due to a reduction in capacity.
- This ultimately creates an area with <20m minimum pressure during a peak demand period.
- This area is lower than the original PMP.
- Scope for optimisation:
  - Target original PMP during MNF.
  - Target alternative PMP during peak demand time to overcome headlosses and ensure that an adequate level of service is maintained.



Case Study 4 – Improving Network Connectivity

- Area of <20m minimum pressure in the peak day model.
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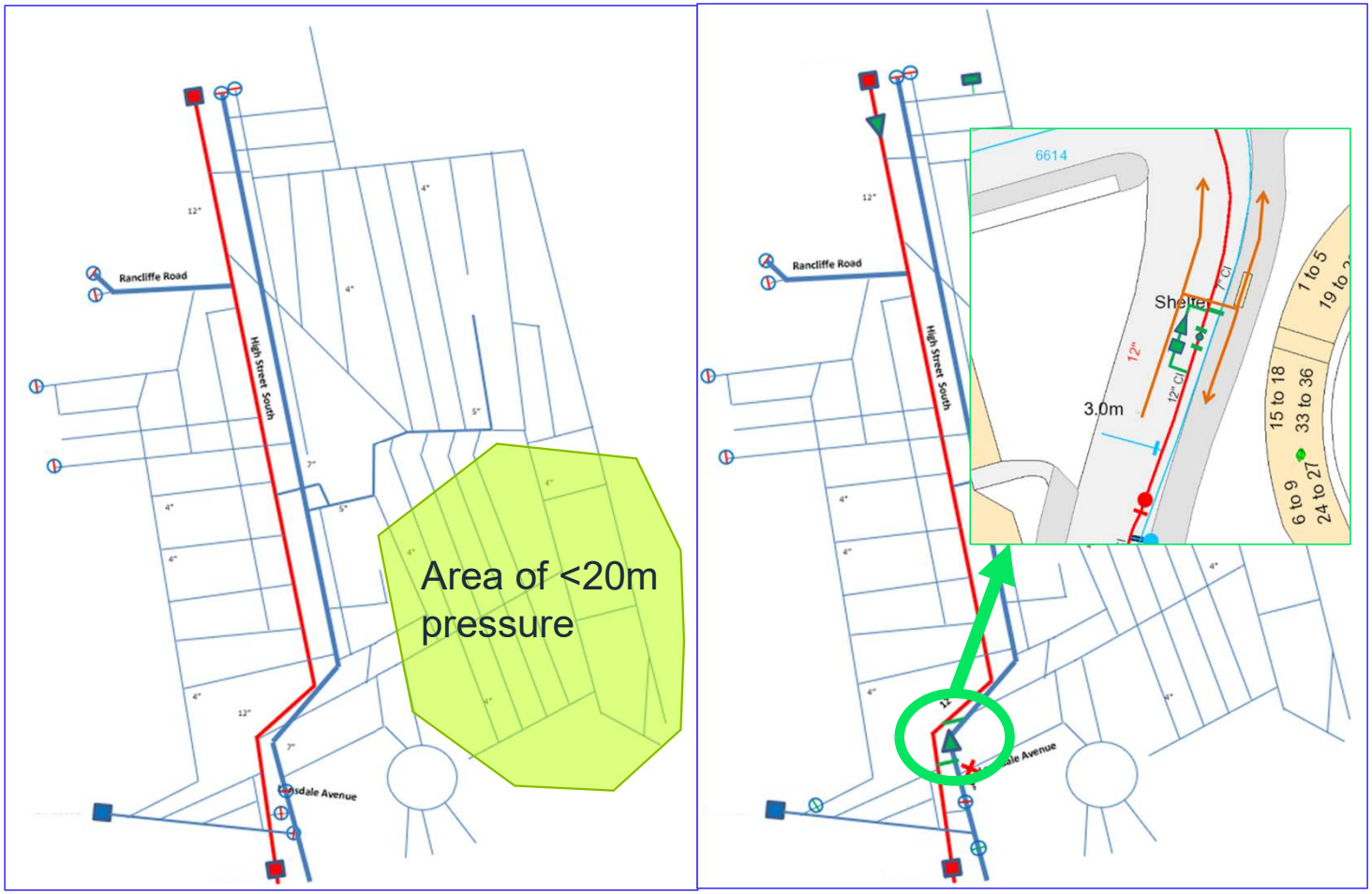
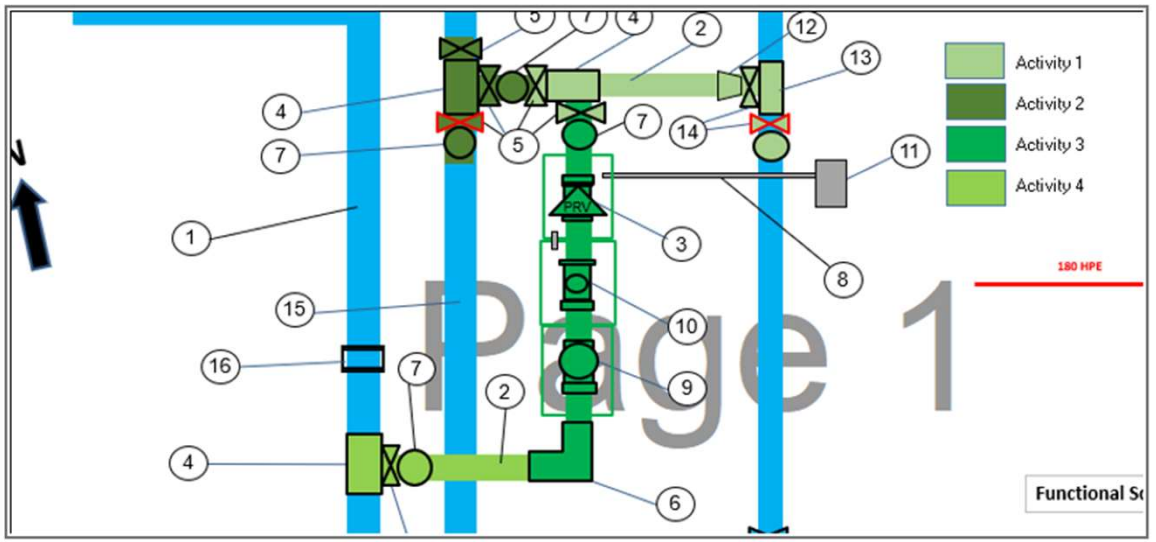
- The original design resulted in minimal change to low pressures as there was a cross connection downstream of the PRV and a closed valve upstream of the PRV.
- Alternative PRV design modelled to improve day-time pressures in low pressure area, which also providing a significant night-time pressure reduction.
- Alternative design results in an improvement in network capacity, whilst not increasing the number of build locations.



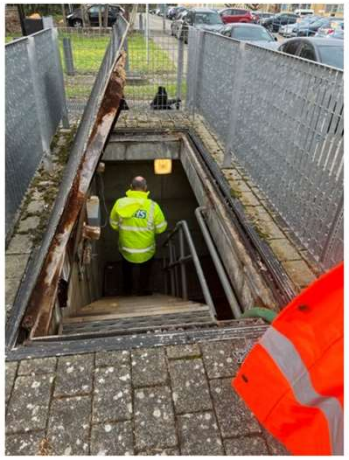
Case Study 5 – Construction and Commissioning Support

- Construction / commissioning support provided to ensure feasibility of the proposed activities and recommend timings to ensure that adequate levels of service are maintained.
- Activity 1 – 3-hour day-time isolation on a 3” CI main with minimal impact to customer pressures.
- Activity 2 – night isolation of 6” UPVC main, which would only be feasible at night-time (i.e., 00:00 – 06:00).
- Activity 3 – 10-day isolation of short section of 6” UPVC, which would require an overland connection and an infusion from the neighbouring DMA.
- Activity 4 – night isolation of 6” UPVC and 180mm HPPE main, which would require an overland connection at night-time, and two infusions from the neighbouring DMAs if the isolation had to carry on into the day.



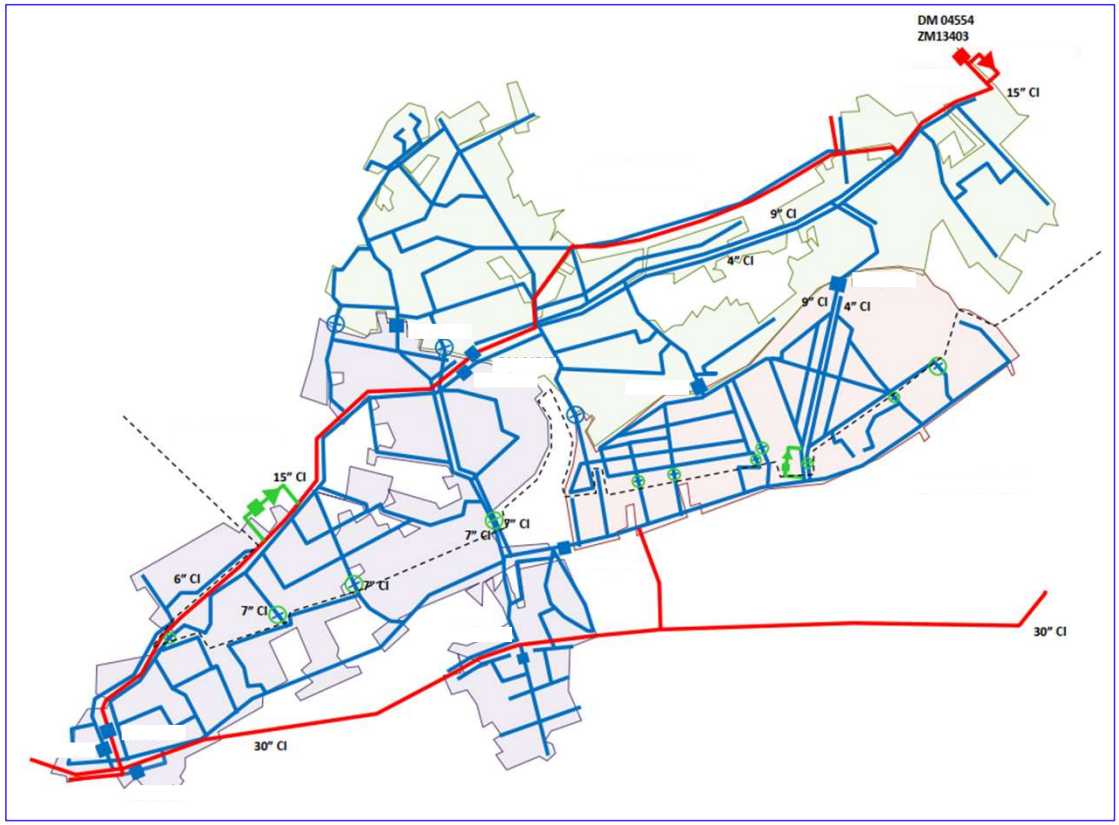
Case Study 6 – Site Investigations

- Unmetered LMC identified from the demand analysis and pressure validation.
- The proposed scheme would split the DMA and reduce capacity.
- The LMC demand ultimately results in the scheme being unfeasible.
- Site work carried out to identify LMC point of connection, volume of water required, current storage and valve operation.
- Next steps: change the valve type and control to ensure that the LMC storage is filling during the night-time. Re-model scheme with updated LMC demand -> Issue report for feasible pressure management scheme.



Case Study 7 – Zonal Review

- Triple-feed PMA, which requires 2 new PRVs and the optimisation of an existing PRV and would result in a reduction in network resilience to the wider zone.
- Further work undertaken:
  - PMA resilience review – modelling undertaken to ensure that the scheme is feasible due to an outage of upstream sources.
  - Zonal resilience review:
    - Data review to identify historical site outages and impact to the wider zone.
    - Modelling review to understand how the wider zone would operate when a source is out of supply, and is there a reduction in wider resilience due to the commissioning of this scheme?
  - Scope for dynamic boundary valves to bypass the new PRVs and/or PMA boundary valves to ensure that there is not a reduction in network resilience.



Outcomes and looking ahead

- Modelling involved early on in the design process, with greater collaboration between design and modelling teams, to ensure better outcomes for customers.
- The project ensures that only feasible schemes are progressed forward.
- Targeted field work to reduce time spent on site.

- Looking ahead into AMP8, which continued pressures on water companies to reduce their leakage, pressure management schemes represent an important tool and will likely become more challenging as further pressure reductions are required.
- To ensure that leakage saving continue from pressure management, there needs to be continued collaboration between network modellers, engineers, designers and site technicians.

thank you

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