

STAGE 3 - SECTION 32

CHAPTER 17

RURAL - CRANFORD BASIN

APPENDIX 3 - CRANFORD BASIN PROPOSED REZONING
WATER SUPPLY

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1 Introduction

Opus International Consultants was commissioned by Christchurch City Council (CCC) to assess submissions received by CCC requesting rezoning of properties in the Cranford Basin from Rural 3 to Residential Suburban (RS) under the District Plan Review. There were 3 areas of assessment based on the submissions received (refer Table 2). Each of these submissions have been assessed for the potential impact to the wastewater and water network.

This memo will specifically address the impact to the water network.

The data supplied by Christchurch City Council (CCC) for use during the assessment includes:

- An emailed list of submissions, including submission number.
- Link to the Proposed District Plan, including Planning Maps and all submissions.
- Zone Name Conversion table for City Plan Zones, Phase 2 (Sept 2014)
- CCC *Infrastructure Design Guidelines (IDS), Part 7: Water Supply, v2.2* (Jan 2014). Chart 1 was used to determine the peak living zone design flow.

2 Submissions

CCC has received the following plan change submissions from individuals or collectives, as indicated in table 1 and figure 1:

Table 1: Submissions Requesting District Plan Review

Submitter	Submission No.	Notified Zone	Requested Zone
Grassmere Street Residents Group and Grant Road Holdings	646	Rural 3	RS
Gavin Frederick Case, Margaret Mary Case, Michael Gavin Maurice Case	957	Rural 3	RS
Roger and Lynn Crozier	324	Rural 3	RS

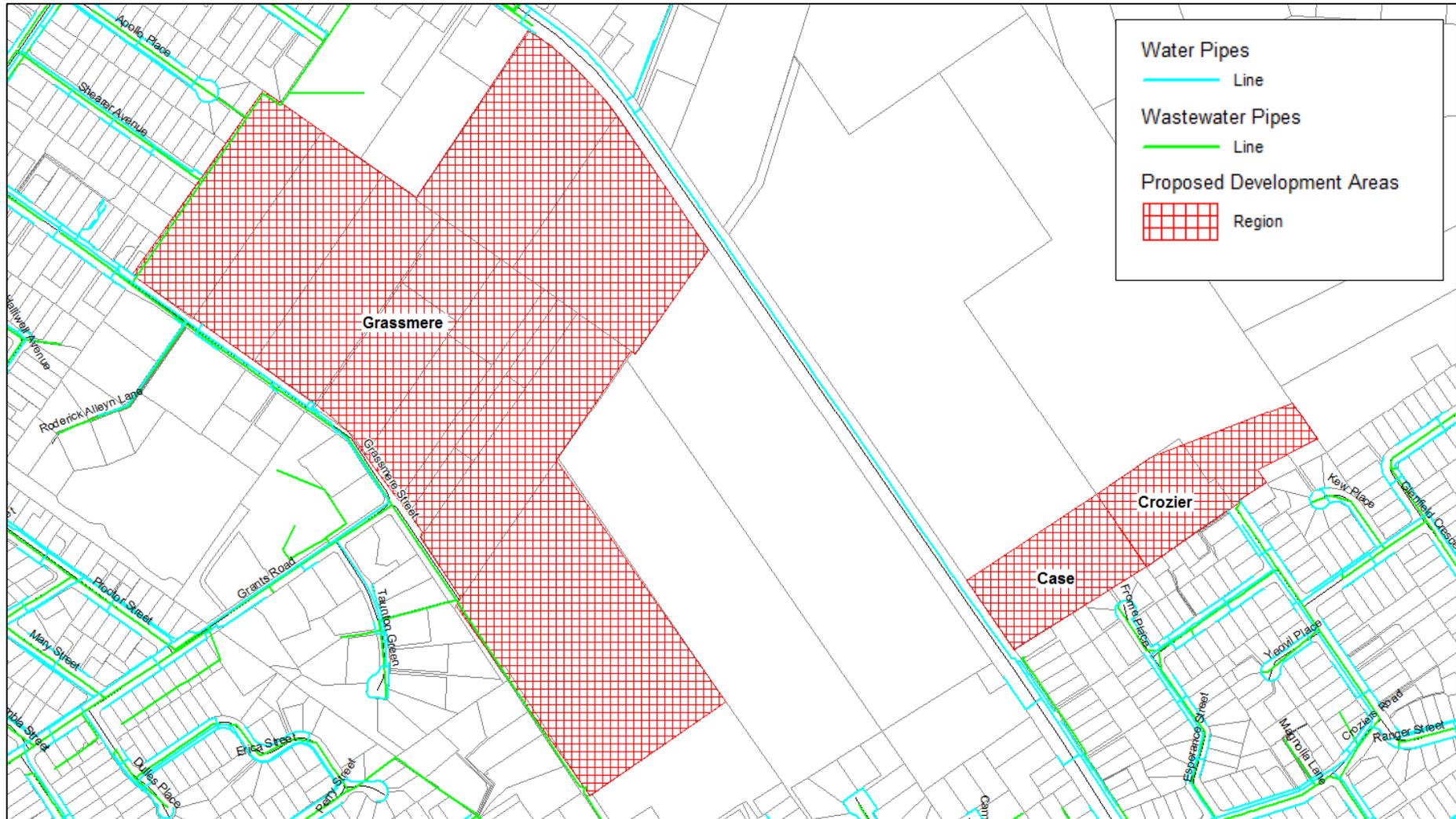


Figure 1: Properties requesting district plan zone change from Rural 3 to Residential Suburban

3 Assessment Approach

In order to assess the impact of the proposed submissions on the water network, the following methodology was undertaken:

1. Each submission was reviewed to detail the exact area of concern and to confirm what the submission was seeking.
2. Using the Zone Name Conversion table supplied by CCC, the Operative District Plan zoning, the Proposed District Plan zoning (Notified zone) and the zoning sought by the submission was confirmed.
3. The Case and Crozier submissions include indicative subdivision plans and the proposed number of new properties have been taken directly from the submissions.
4. The Grassmere Street Residents Group and Grant Road Holdings submission does not include an indicative subdivision plan. CCC have requested that the site be assessed for the following development:
 - 200 households (assuming a similar housing density to the Residential Suburban Peat Constraint Zone or L1B in the Operative Plan)
 - 750 households (assuming a similar housing density to the Residential Suburban Zone or L1 in the Operative Plan)
 - 1500 households (assuming a similar housing density to the Residential Medium Density Zone or L3 in the Operative Plan)
5. The indicative property totals were used to determine the IDS peak design flow rate for each site.
6. A peaking factor was applied to the IDS peak design flow rate to determine the average peak day flow.
7. The property totals and average peak day flow were input into the Christchurch rezoning model with the Christchurch ADPW demand profile applied.
8. The three development sites have been modelled inclusively for the following scenarios shown in table 2.

Table 2: Model Scenarios

Scenario	No New Properties at Grassmere/ Cranford Street Site	No New Properties at Case Site	No New Properties at Crozier Site
1	200	9	30
2	750	9	30
3	1500	9	30

4 Assumptions

We have made the following assumptions during this investigation:

1. The Averill pump station will be rebuilt with similar or improved pumping capacity as pre-earthquake.
2. IDS design peak flow rates are inclusive of leakage.



3. The proposed rezoning of the Christchurch water supply is carried out, which will place the developments in the future Saint Albans water supply zone.

5 Results and Analysis

5.1 Water Balance Analysis

Any new development in the Cranford Basin will be supplied from the Saint Albans water supply zone after rezoning of the Christchurch water supply is carried out.

The water balance assessment, undertaken during the detailed design phase of the water supply rezoning project, identified peak hour demand currently exceeds normal pumping capacity for the Saint Albans water supply zone:

Normal operating capacity = 3,067 m³/hr

Peak hour demand = 3,167 m³/hr

Current operational deficit = 100 m³/hr

The deficit of available capacity in the area near the Cranford Basin means currently pumps operate at flows above their normal operating ranges during peak demand. The pump operation results in substantial pressure drops in the zone. The lack of local pumping capacity will continue to be an issue with the proposed rezoning to create the Saint Albans water supply zone.

Any additional development in the Cranford Basin will increase the deficit and reduce system performance in the Saint Albans water supply zone. Table 3 indicates the number of properties and the peak flows rates estimated from IDS for the proposed development sites:

Table 3: Design Flow Rates for Proposed Development Sites

Site	No of Properties	IDS Peak Design Flow (m ³ /hr)
Grassmere / Cranford Street – Scenario 1	200	126
Grassmere / Cranford Street – Scenario 2	750	432
Grassmere / Cranford Street – Scenario 3	1500	540
Case	9	12
Crozier	30	29

Based on the water balance exercise, up to four additional pumps with 180 m³/hr pumping capacity will be required to meet peak hour demand for the existing situation plus developed sites.

5.2 Network Capacity in Cranford Basin Area

A network limitation near the Grassmere pump station was identified as part of the rezoning project. Most pump stations in Christchurch are connected with DN300 pipes, or at least DN200 pipes, which allows flows to be moved between pump stations as needed. The Grassmere pump station pumps into smaller mains on Main North Road, and then linking

into DN200 pipes to link to other nearby pump stations. Figure 2 shows the DN200 and above pipes in the vicinity of the Grassmere pump station.

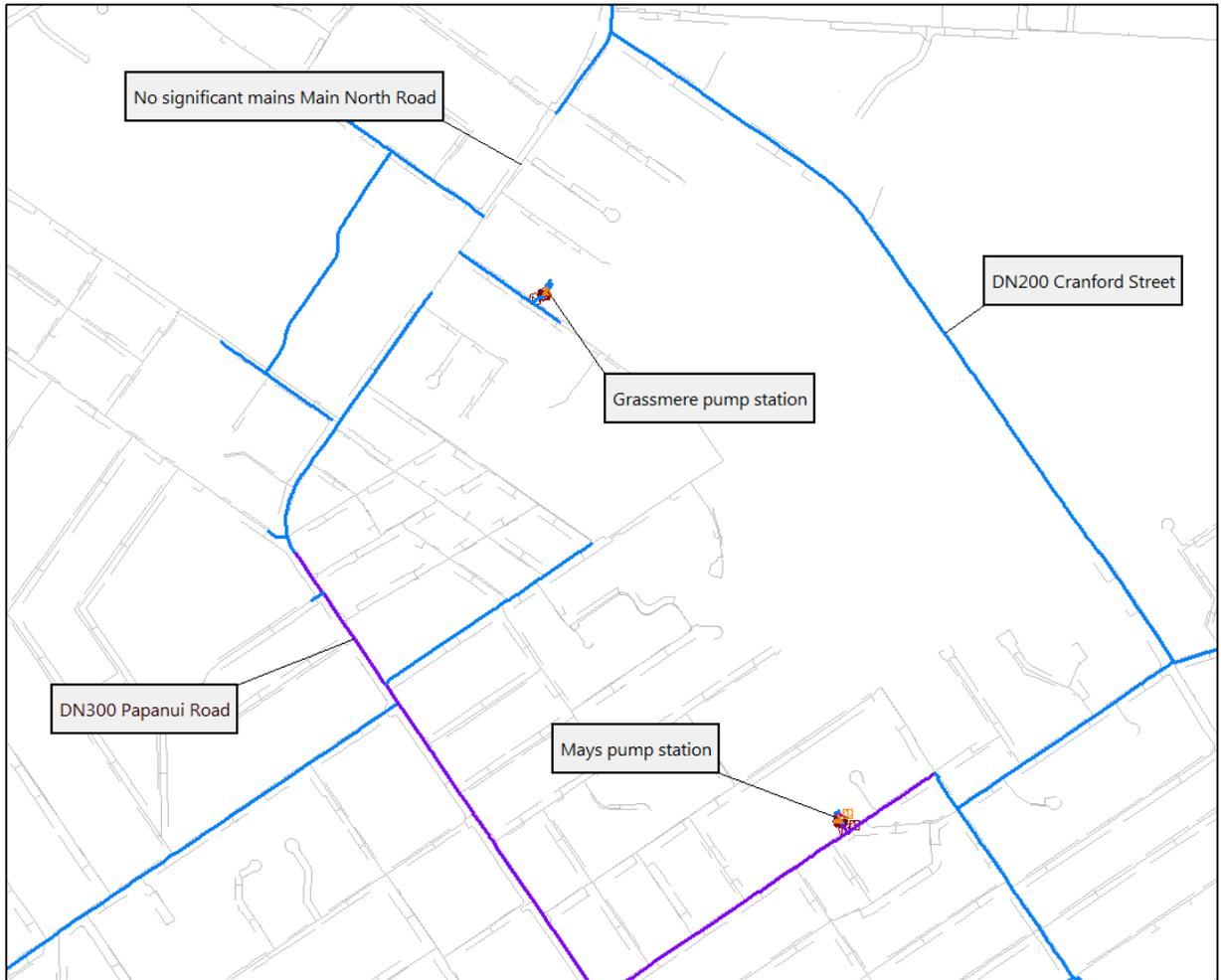


Figure 2: DN200 and Larger Pipes near Grassmere Pump Station

The network limitation around Grassmere pump station may result in more significant issues for the proposed development than the water balance analysis would indicate.



5.3 Model Results – Scenario 1

Development scenario 1 involves 200 properties in the Grassmere Street / Cranford Street area, along with development of the Crozier and Case areas.

Development scenario 1 causes water pressures in the north eastern section of the Saint Albans water supply zone to fall below the level of service of 300 kPa for minimum residual pressure during peak demand if there are no upgrades installed.

Two options were considered to resolve the water pressure issues. There is spare well capacity at the Mays Road pumping station, and an additional pump was modelled at this site. A new pump at Mays Road improved water pressures but not enough to meet the LOS.

The second solution was to include a new pumping station with one 180 m³/hr pump near the Case property, and this provided adequate LOS for the new developments and existing properties in the area. The upgrade identified for scenario 1 is shown in Figure 3.

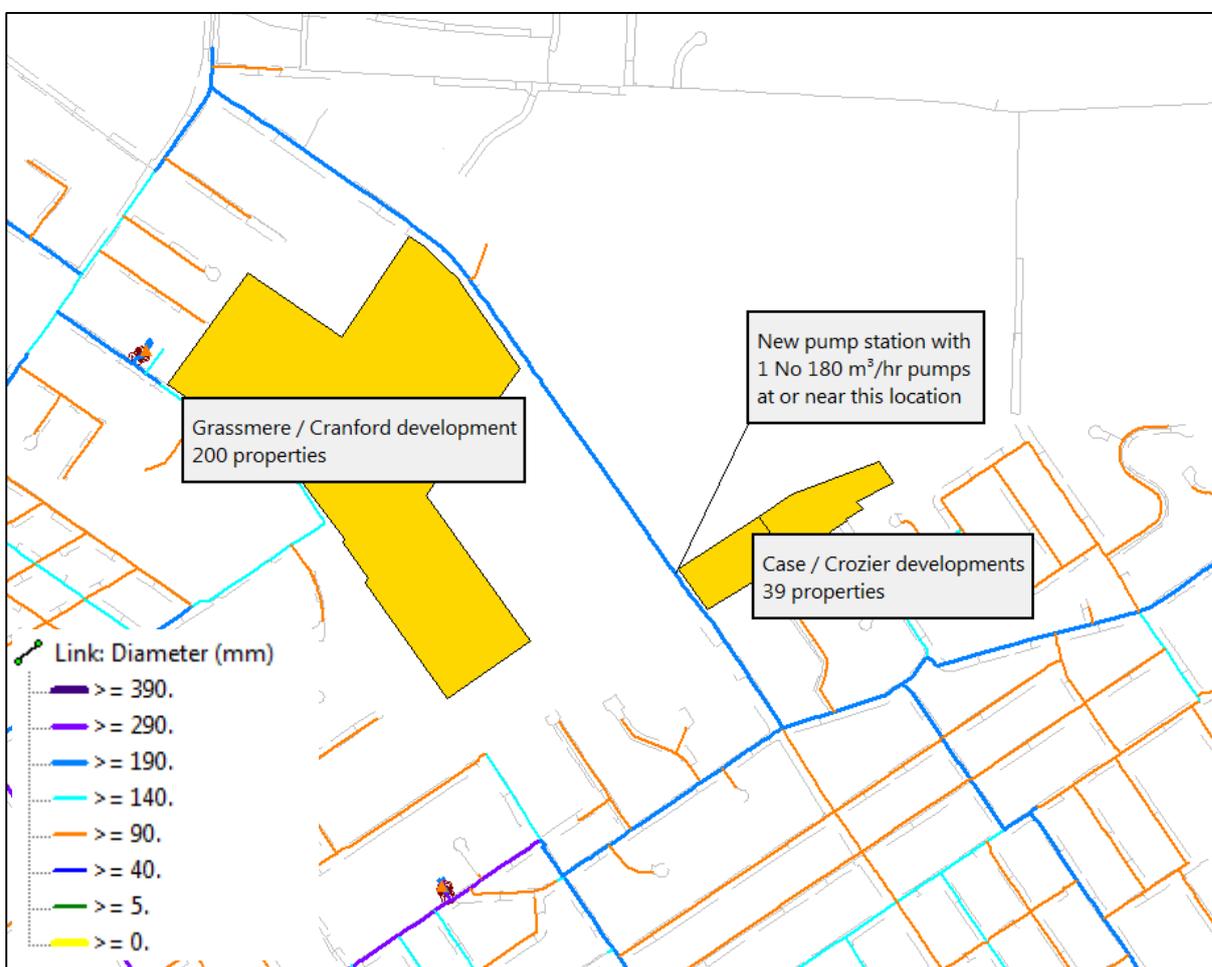


Figure 3: Upgrades Identified for Scenario 1



5.4 Model Results – Scenario 2

Development scenario 2 involves 750 properties in the Grassmere Street / Cranford Street area, along with the development of the Crozier and Case areas.

Development scenario 2 causes pumps to be running substantially beyond their normal operating points, resulting in low pressures across the zone, and pressures of less than 100 kPa along Cranford Street.

The water balance assessment indicated three new 180 m³/hr pumps would be required to service the proposed development. Adding the three new pumps to the model did not fully resolve the pressure issues in the area, and an upgrade of 340 m of DN200 pipe along Main North Road from the Grassmere pump station to the Cranford Road intersection was also required.

The combination of a significant new pump station and pipe upgrade along Main North Road provided adequate LOS for the new developments and existing properties in the area. The upgrades identified for scenario 1 are shown in Figure 4, with the proposed pipe upgrade shown in red.

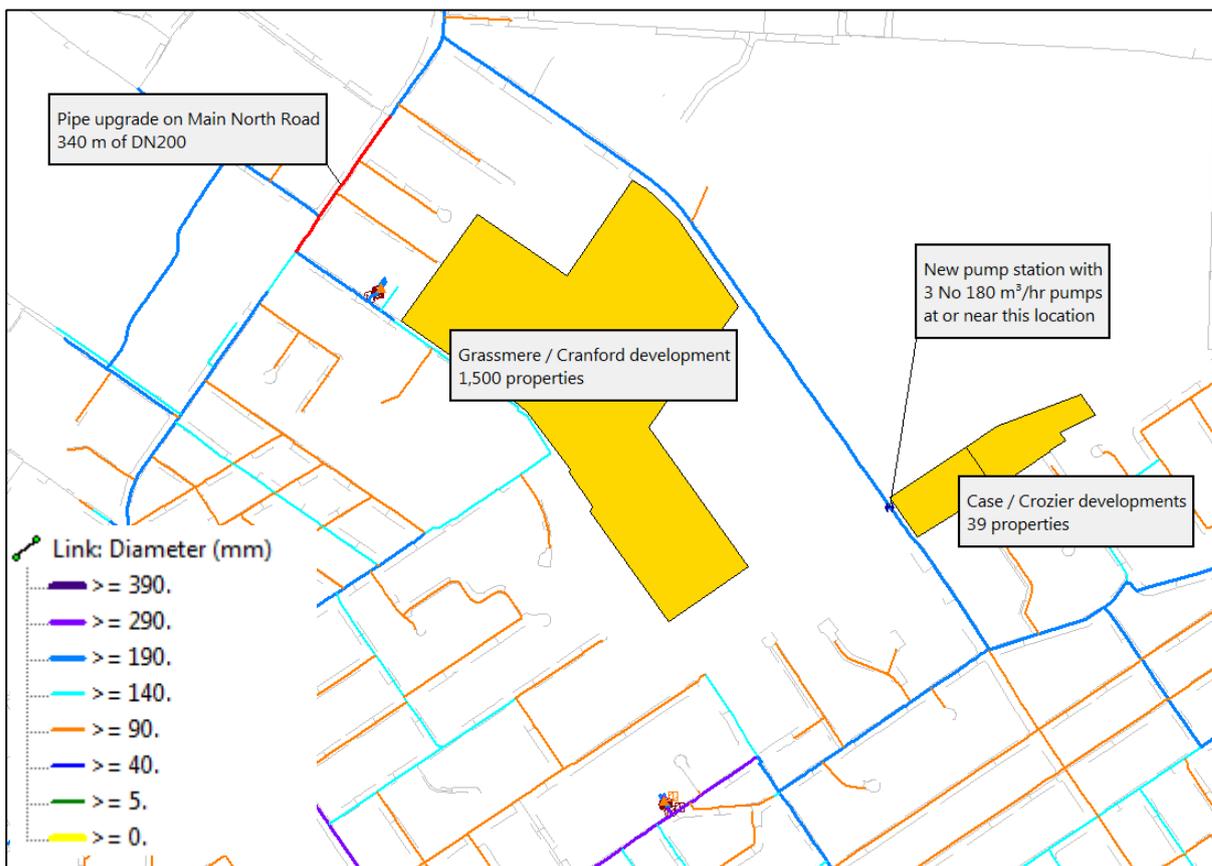


Figure 4: Upgrades Identified for Scenario 2

5.5 Model Results – Scenario 3

Development scenario 3 involves 1,500 properties in the Grassmere Street / Cranford Street area, along with the development of the Crozier and Case areas.

Development scenario 3 causes pumps to be running substantially beyond their normal operating points, resulting in low pressures across the zone, and negative pressures in the model. Negative pressures could not occur in reality (as no demand would be possible from properties with negative pressure), and this result indicates an inability to supply all properties in the area without increasing source capacity.

The water balance assessment indicated four new 180 m³/hr pumps would be required to service the proposed development. Adding the three new pumps to the model did not fully resolve the pressure issues in the area, and an upgrade of 440 m of DN200 pipe along Main North Road from the Grassmere pump station to the Cranford Road intersection, and also from the Grassmere pump station south-west to the end of the existing DN200, was required.

The combination of a significant new pump station and pipe upgrade along Main North Road provided adequate LOS for the new developments and existing properties in the area. The upgrades identified for scenario 1 are shown in Figure 5.

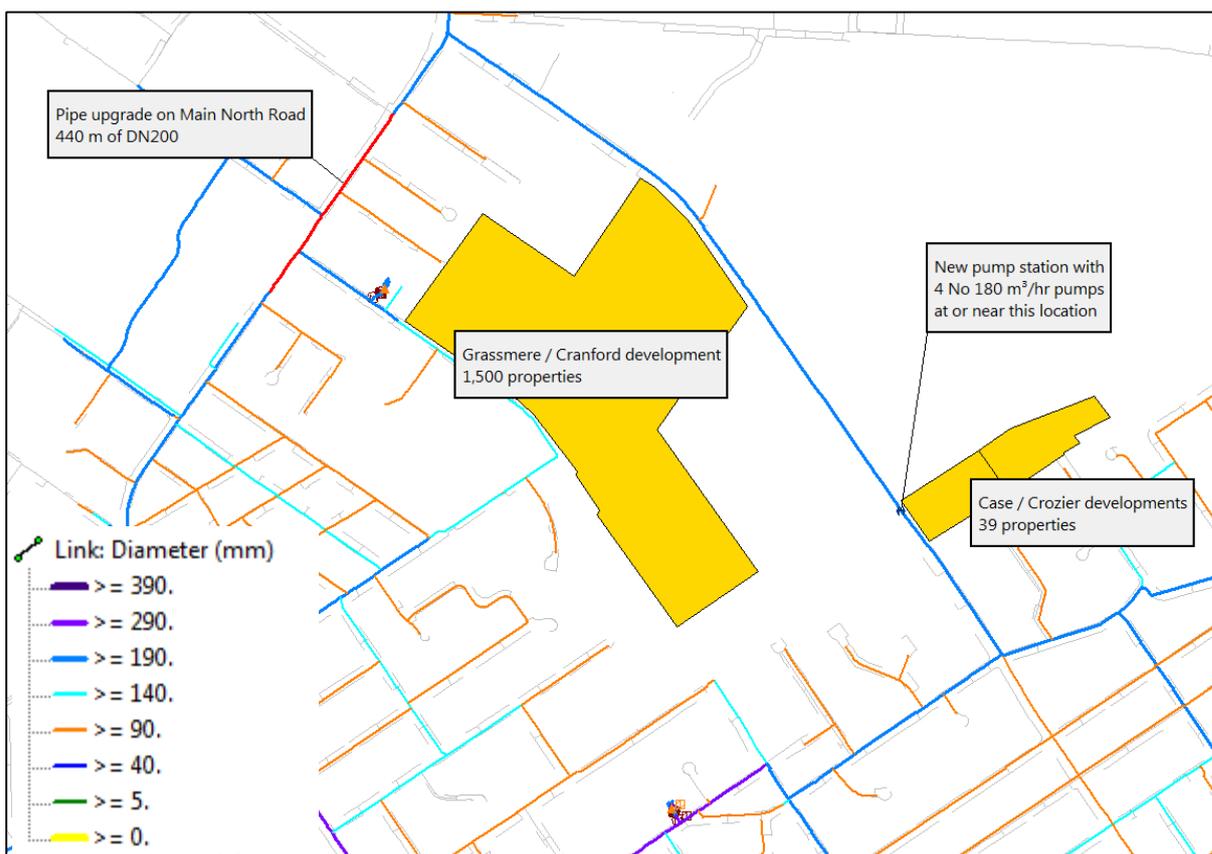


Figure 5: Upgrades Identified for Scenario 3

5.6 Summary of Results

Water supply servicing for the development of properties in the Cranford Basin is challenging because of the lack of pump capacity in the area, and a lack of significant sized pipes around the Grassmere pump station.

Each of the three development scenarios are able to be serviced, but require upgrades to the source capacity and network to meet LOS requirements. The upgrades required for each development scenario are summarised in Table 4.

Table 4: Upgrade Summary

Scenario	Pipe Upgrade	Pump Upgrade
Scenario 1 – 200 properties in Grassmere Street area	None required	New station with 1 No 180 m ³ /hr pump
Scenario 2 – 750 properties in Grassmere Street area	340 m of DN200 on Main North Road	New station with 3 No 180 m ³ /hr pump
Scenario 3 – 1,500 properties in Grassmere Street area	440 m of DN200 on Main North Road	New station with 4 No 180 m ³ /hr pump

