

Memorandum

To	Matt Bayliss (Gore District Council)
Copy	
From	Megan Shaw
Office	Christchurch
Date	12 July 2022
File/Ref	3-C2314.00
Subject	Thomas Street Development Water Supply Capacity Assessment

1 Summary

WSP was engaged by Gore District Council (GDC) to complete a water supply network impact assessment for the Thomas Street Development in Gore. The development is approximately 105 ha with 950 lots.

The assessment included:

- Identifying the current system constraints.
- Identifying the impacts on the water supply network with the Thomas Street Development.

2 Assumptions

2.1 Hydraulic Model

The Gore 2016 Average Day Peak Week (ADPW) model in InfoWorks Pro 8.0 was used to carry out the modelling. This model was last updated and calibrated in 2011. The model is likely to be missing upgrades and increased population infill post 2011, which may have an affect on the demand in the network. We recommend carrying out a full model update and calibration to increase the confidence of the results for this modelling assessment.

2.2 Model Operation

We have assumed that the operation of the network is still the same as it was in 2011 (refer to 'Gore SND Mataura Water Supply Model report, 2011, OPUS'). This consists of both the Jacobston and Coopers wells providing for the network. Most of the network is gravity feed from the East Gore and Hilbre Avenue reservoirs. However, there are a series of pumps that boost water to the higher elevation properties – Thomas Street Falls within in this area. Figure 2-1 shows the Gore Network currently in the model, where Thomas Street will be provided by the booster pumps at Hilbre Ave.

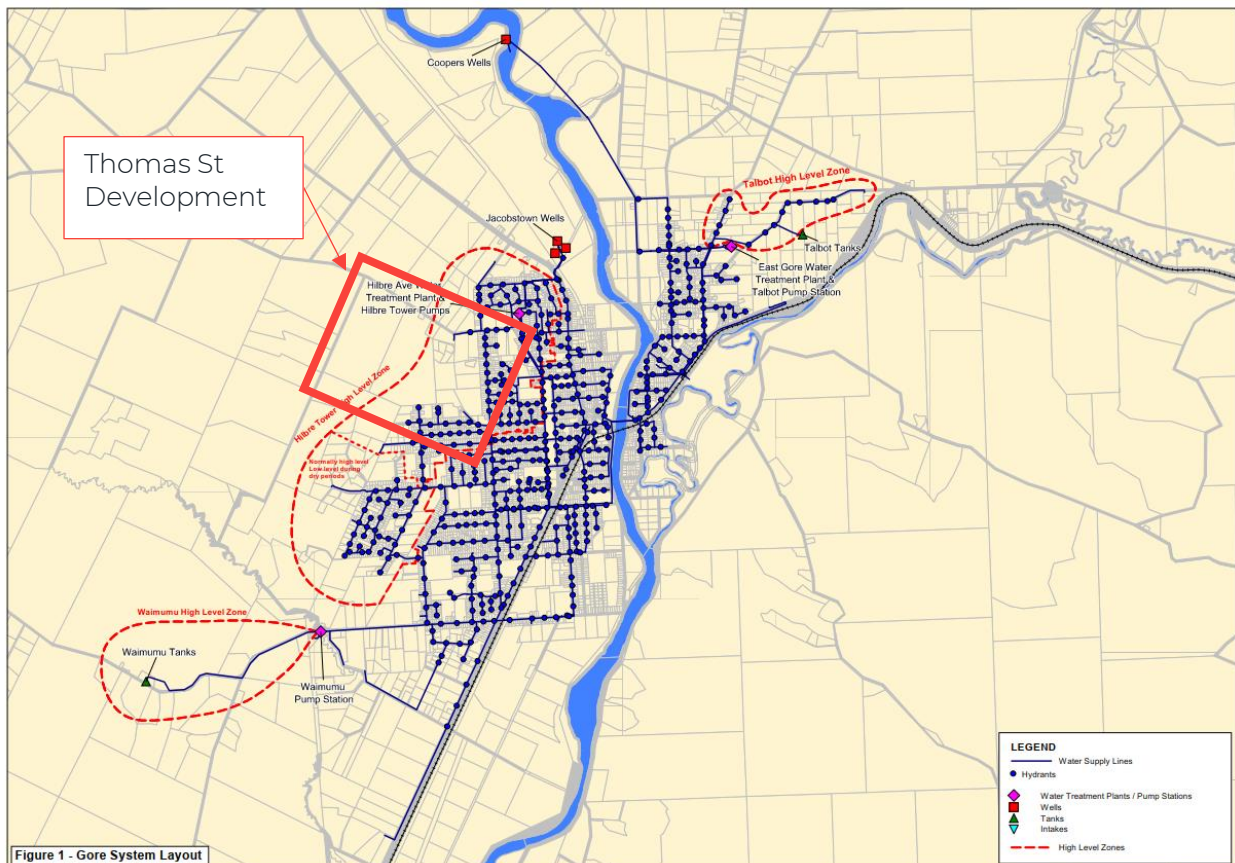


Figure 2-1: Gore Water Supply Network

The model was updated with a few pipe upgrades and additional demand provided by GDC. This included:

- The BUPA Retirement Village – Assumed to have a commercial profile with an average peak day demand of 0.97L/s.
- A DN150 PVC(U) pipe upgrade along Reaby Road and the end of Charlton Road.
- A DN150 PVC(U) new watermain along Falconer Road.

Refer to Appendix A for the location of these.

It is assumed that the pump operation is still the same as when the model was built in 2011. This consists of two booster pumps operating in parallel at the Hilbre Ave Treatment Plant. These provide a peak flow of 27 L/s.

2.3 Thomas Street Development Demands

Table 2-1 summaries the demand that was added to the network and the differences in results when the peaking factor from the peak day model is used. This shows the peak hourly flow is almost half when the peaking factor is reduced.

The leakage value was assumed to be a lower as the current value of 465L/prop/day seems high for a new development.

Table 2-1: Gore Demands

Parameter	Demands Added to the Model for Thomas Street Development	Peaking Factor comparison based on existing model
Number of Properties	950	950
Occupancy rate	3.5	3.5
Litres per person per day	250L/per/day	-
Litres per property per day	875L/prop/day	1,200L/prop/day (Assumed)
Leakage value assumed	200L/prop/day	200L/prop/day
Peaking Factor	5 (From Development Memo)	1.85 (From Model)
Total Demand	831 m ³ /day	1,140 m ³ /day
Design Peak Hourly Demand Flow	48 L/s	24 L/s

3 Methodology

The following methodology was carried out:

- 1.) A DN250 PE100 PN12.5 pipe loop was connected from Frank Street to Crewe Street. This was assumed to have a Colebrook white value of 0.03.
- 2.) A node was added to the middle of this pipe. The elevations in the development vary from 110- 139m. It was assumed that the properties were spread across the following elevations:
 - 15% at 139m (142 Properties)
 - 40% at 130m (380 Properties)
 - 45% at 120m (428 properties)

The initial modelling showed that the Thomas Street development (Peak hourly demand flow 17L/s) did not receive a peak demand of 48 L/s in the 2011 Gore Model. The demand at the Thomas Street was increased to approximately 2,700 properties to artificially achieve the design peak flow of 48 L/s.

3.1 Pressures

The target level of service for the new development is a minimum pressure of 20m. A base model run was carried out without the development. This showed the pressures were already less than 20m at the locations of where the new Thomas Street pipe connection will go, suggesting the development will not achieve 20m of pressure.

When the development was added the level of service was not achieved. A comparison of the pressure in the network with and without the development is shown Figure 3-1.

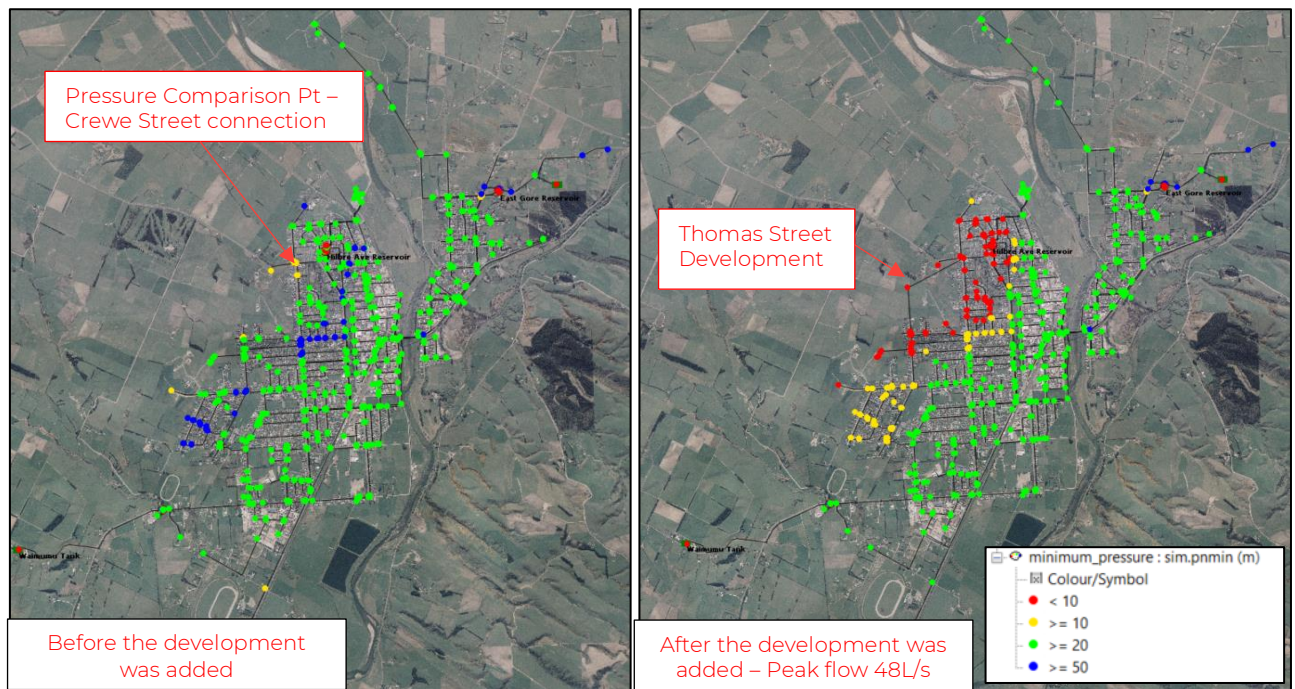


Figure 3-1: Pressure across the network during peak day

Figure 3-1 shows the pressures in the network surrounding the development drop to less than 10m. This is also shown in Figure 3-2, where the pressure at the Crewe Street connection for the development drops from 18 m to -26 m.

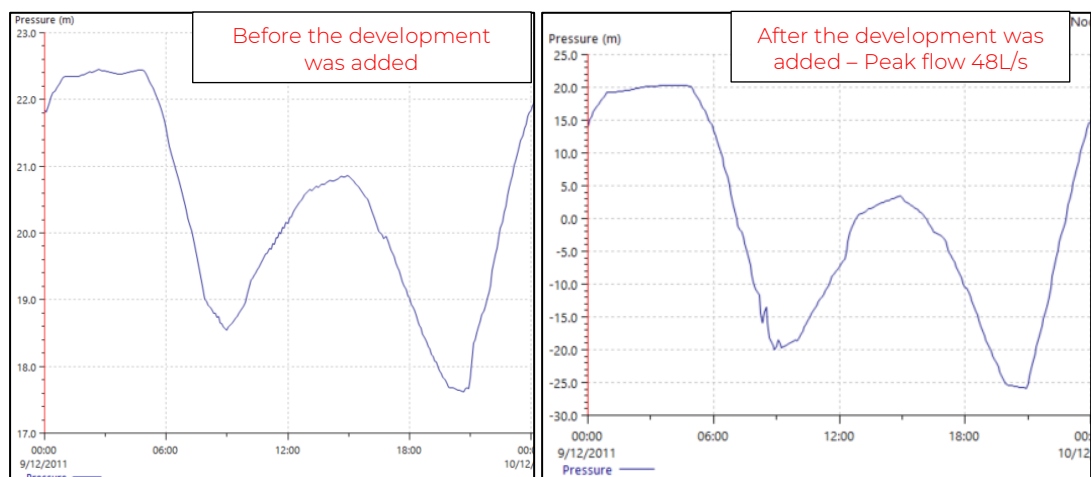


Figure 3-2: Pressure at Crewe Street Connection Current ADPW and with Thomas Street

All properties in the development do not meet a level of service of 20m, as shown for the different development property elevations below in Figure 3-3.

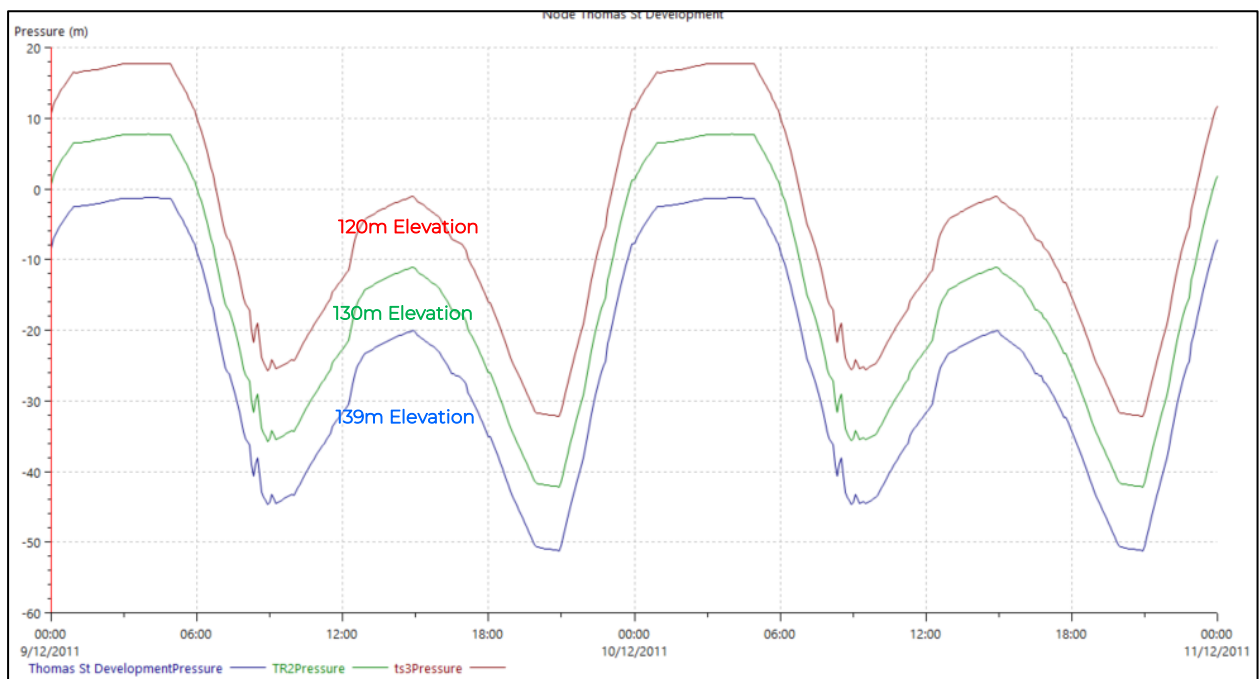


Figure 3-3: Thomas Street Development Pressures at Different Property Elevations Across the Site

3.2 Headlosses

Figure 3-4 shows that both sources (Hilbre Ave and East Gore Sources) outlet pipes are at maximum capacity as the headlosses are high more than 10m/km. Adding the development onto the network increased these headlosses further. Pipe upgrades from the pump station to the development will be required.

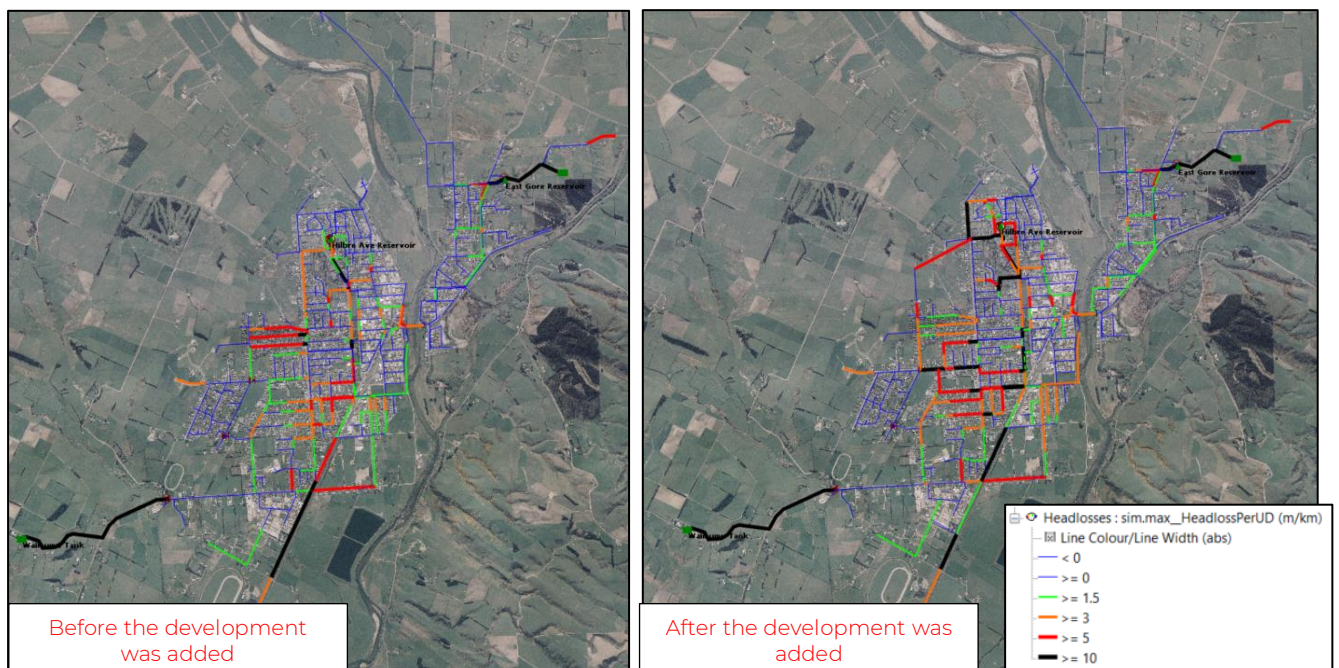


Figure 3-4: Headlosses in the Gore Network During Peak Day

3.3 Pump Operation

The delivery flow from both booster pumps at the Hilbre Avenue Treatment plant increased from 26L/s to 46L/s. However, these pumps are undersized to provide the required pressure at the development. A review of the current consent and water availability will also be required to ensure the future demand can be met.

3.4 Fireflow

A fireflow assessment was not carried out as the level of service for the development cannot be met for a peak day. This will be further investigated in the Optioneering Phase.

4 Conclusions and Recommendations

In summary, the pipes from the Hilbre Avenue pump station to the Thomas Street Development are at maximum capacity and the booster pumps are undersized to meet the level of service for the new development. To achieve the level of service, options may include:

- Upsizing the booster pumps at Hilbre Avenue and upgrading the pipes feeding to the network.
- Exploring options of adding a booster zone and storage at the development area.
- Reviewing water treatment capacity to service the area.

WSP also recommend:

- Checking the additional demand added by the development does not result in the network exceeding the bore consent.
- Reviewing and confirming the design demand before starting the Optioneering Phase.
- Carrying out a full model update before carrying out the Optioneering Phase.

5 Disclaimers and Limitations

This report ('**Report**') has been prepared by WSP exclusively for Gore District Council ('**Client**') in relation to Thomas Street development assessment ('**Purpose**') and in accordance with the Short form Agreement with the Client. The findings in this Report are based on and are subject to the assumptions specified in the Report and the Offer of Service dated 1 July 2022. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

In preparing the Report, WSP has relied upon data, surveys, analyses, designs, plans and other information ('**Client Data**') provided by or on behalf of the Client. Except as otherwise stated in the Report, WSP has not verified the accuracy or completeness of the Client Data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in this Report are based in whole or part on the Client Data, those conclusions are contingent upon the accuracy and completeness of the Client Data. WSP will not be liable in relation to incorrect conclusions or findings in the Report should any Client Data be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

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APPENDIX A

Updates Added to the Network

An aerial photograph overlaid with a technical site plan. The plan shows a residential development area with several streets. A main road at the top is labeled "DE ADVENT". To its right, another road is labeled "200 WEST ROAD". Below these, a curved road is labeled "SANDY HOLLOW DRIVE". Various lots are outlined and numbered, such as 137.0, 139.0, 141.0, 143.0, 145.0, 147.0, 149.0, 151.0, 153.0, 155.0, 157.0, 159.0, 161.0, 163.0, 165.0, 167.0, 169.0, 171.0, 173.0, 175.0, 177.0, 179.0, 181.0, 183.0, 185.0, 187.0, 189.0, 191.0, 193.0, 195.0, 197.0, 199.0, 201.0, 203.0, 205.0, 207.0, 209.0, 211.0, 213.0, 215.0, 217.0, 219.0, 221.0, 223.0, 225.0, 227.0, 229.0, 231.0, 233.0, 235.0, 237.0, 239.0, 241.0, 243.0, 245.0, 247.0, 249.0, 251.0, 253.0, 255.0, 257.0, 259.0, 261.0, 263.0, 265.0, 267.0, 269.0, 271.0, 273.0, 275.0, 277.0, 279.0, 281.0, 283.0, 285.0, 287.0, 289.0, 291.0, 293.0, 295.0, 297.0, 299.0, 301.0, 303.0, 305.0, 307.0, 309.0, 311.0, 313.0, 315.0, 317.0, 319.0, 321.0, 323.0, 325.0, 327.0, 329.0, 331.0, 333.0, 335.0, 337.0, 339.0, 341.0, 343.0, 345.0, 347.0, 349.0, 351.0, 353.0, 355.0, 357.0, 359.0, 361.0, 363.0, 365.0, 367.0, 369.0, 371.0, 373.0, 375.0, 377.0, 379.0, 381.0, 383.0, 385.0, 387.0, 389.0, 391.0, 393.0, 395.0, 397.0, 399.0, 401.0, 403.0, 405.0, 407.0, 409.0, 411.0, 413.0, 415.0, 417.0, 419.0, 421.0, 423.0, 425.0, 427.0, 429.0, 431.0, 433.0, 435.0, 437.0, 439.0, 441.0, 443.0, 445.0, 447.0, 449.0, 451.0, 453.0, 455.0, 457.0, 459.0, 461.0, 463.0, 465.0, 467.0, 469.0, 471.0, 473.0, 475.0, 477.0, 479.0, 481.0, 483.0, 485.0, 487.0, 489.0, 491.0, 493.0, 495.0, 497.0, 499.0, 501.0, 503.0, 505.0, 507.0, 509.0, 511.0, 513.0, 515.0, 517.0, 519.0, 521.0, 523.0, 525.0, 527.0, 529.0, 531.0, 533.0, 535.0, 537.0, 539.0, 541.0, 543.0, 545.0, 547.0, 549.0, 551.0, 553.0, 555.0, 557.0, 559.0, 561.0, 563.0, 565.0, 567.0, 569.0, 571.0, 573.0, 575.0, 577.0, 579.0, 581.0, 583.0, 585.0, 587.0, 589.0, 591.0, 593.0, 595.0, 597.0, 599.0, 601.0, 603.0, 605.0, 607.0, 609.0, 611.0, 613.0, 615.0, 617.0, 619.0, 621.0, 623.0, 625.0, 627.0, 629.0, 631.0, 633.0, 635.0, 637.0, 639.0, 641.0, 643.0, 645.0, 647.0, 649.0, 651.0, 653.0, 655.0, 657.0, 659.0, 661.0, 663.0, 665.0, 667.0, 669.0, 671.0, 673.0, 675.0, 677.0, 679.0, 681.0, 683.0, 685.0, 687.0, 689.0, 691.0, 693.0, 695.0, 697.0, 699.0, 701.0, 703.0, 705.0, 707.0, 709.0, 711.0, 713.0, 715.0, 717.0, 719.0, 721.0, 723.0, 725.0, 727.0, 729.0, 731.0, 733.0, 735.0, 737.0, 739.0, 741.0, 743.0, 745.0, 747.0, 749.0, 751.0, 753.0, 755.0, 757.0, 759.0, 761.0, 763.0, 765.0, 767.0, 769.0, 771.0, 773.0, 775.0, 777.0, 779.0, 781.0, 783.0, 785.0, 787.0, 789.0, 791.0, 793.0, 795.0, 797.0, 799.0, 801.0, 803.0, 805.0, 807.0, 809.0, 811.0, 813.0, 815.0, 817.0, 819.0, 821.0, 823.0, 825.0, 827.0, 829.0, 831.0, 833.0, 835.0, 837.0, 839.0, 841.0, 843.0, 845.0, 847.0, 849.0, 851.0, 853.0, 855.0, 857.0, 859.0, 861.0, 863.0, 865.0, 867.0, 869.0, 871.0, 873.0, 875.0, 877.0, 879.0, 881.0, 883.0, 885.0, 887.0, 889.0, 891.0, 893.0, 895.0, 897.0, 899.0, 901.0, 903.0, 905.0, 907.0, 909.0, 911.0, 913.0, 915.0, 917.0, 919.0, 921.0, 923.0, 925.0, 927.0, 929.0, 931.0, 933.0, 935.0, 937.0, 939.0, 941.0, 943.0, 945.0, 947.0, 949.0, 951.0, 953.0, 955.0, 957.0, 959.0, 961.0, 963.0, 965.0, 967.0, 969.0, 971.0, 973.0, 975.0, 977.0, 979.0, 981.0, 983.0, 985.0, 987.0, 989.0, 991.0, 993.0, 995.0, 997.0, 999.0. The plan also indicates various easement widths: "100 PVC", "160 PVC", and "200 WEST ROAD". There are blue and red lines indicating different types of boundaries or easements. Small blue squares and red diamonds are placed along the lines, possibly indicating specific points of interest or survey markers. The overall layout suggests a large-scale infrastructure project, likely related to water supply or sewerage, given the context of the document title.