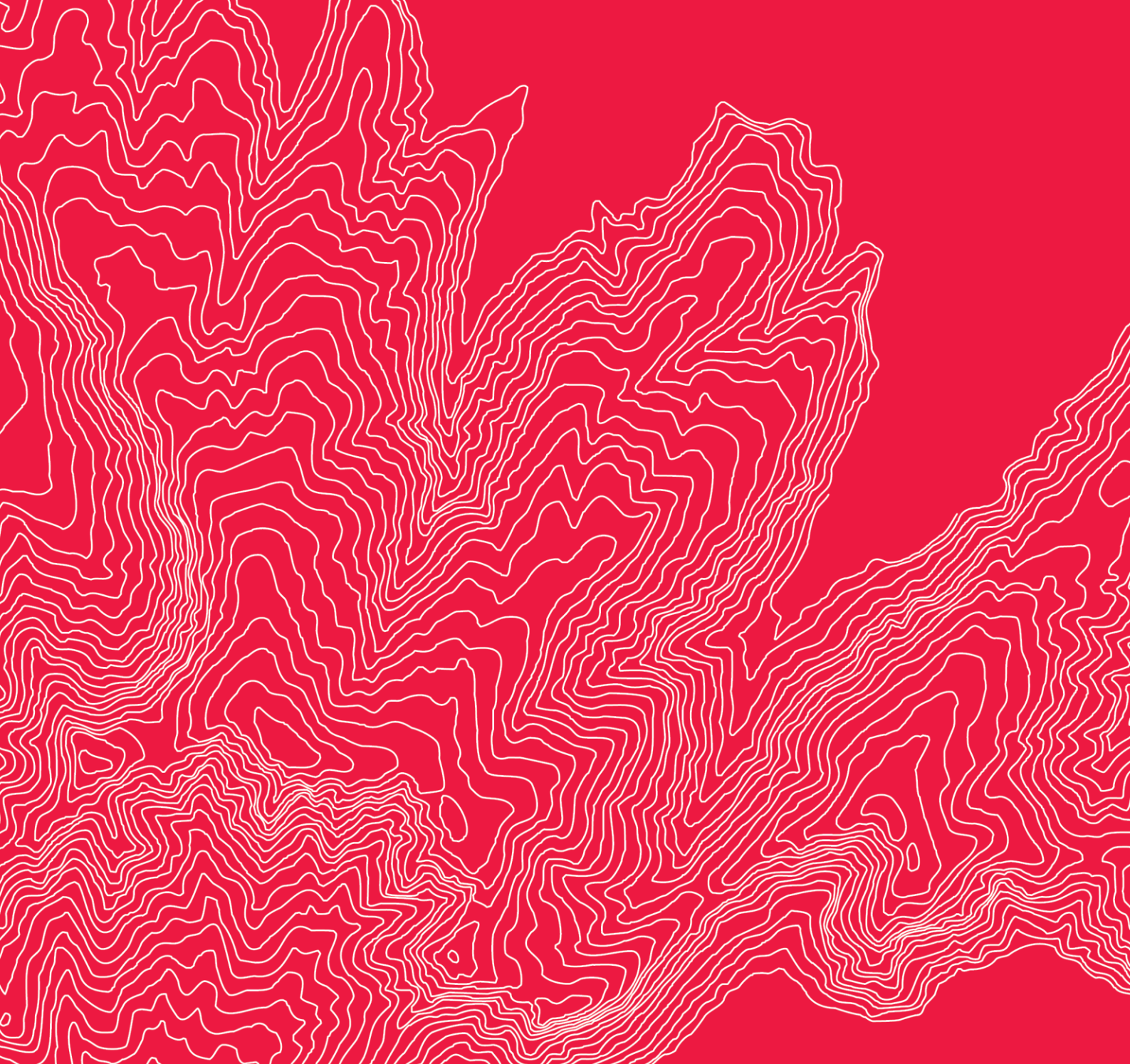




Water Supply Design Report

Cashmere/Hendersons Plan Change

Prepared for Cashmere Park Ltd, G. Ward & R.

Brown

511270

**eliot
sinclair**

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Quality Control Certificate

Eliot Sinclair & Partners Limited

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A	First issue of document		15 December 2022
B	Additional allotments	S Pandrea	28 April 2023

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Appendix A. EPA NET Model Output Plans

Appendix B. Pipe Information

1. Introduction

Eliot Sinclair (ES) has been engaged by Cashmere Park Limited, Geoff Ward and Robert Brown to prepare a preliminary potable water supply model in support of a Plan Change Application, located within the Cashmere Stream and Hendersons Basin catchments, as shown in Figure 1.



Figure 1. Plan Change Zone Boundary

The purpose of this report is to present the hydraulic modelling results for the conceptual water supply design to show that the proposed plan change area can be serviced by the existing water supply network.

The conceptual water supply design has been modelled using the freeware water supply modelling software package EPA NET version 2. Modelling for both the residential and firefighting demand has been carried out.

Residential and firefighting supply pressures were supplied by the Christchurch City Council (CCC) for the water supply input to the model (reference CCC Final WS Rezone Source and Sprinkler Design Pressures Plan (2014)).

The following information is provided within the Appendices.

Appendix A provides the EPA NET model output plans.

Appendix B provides the modelled pipe information.

2. Water Supply Network

2.1. Catchment Area

The area included within the conceptual water supply model comprised of the following land parcels:

- Stages 1 & 2 of the Cashmere Park residential subdivision (already zoned residential).
- The approximate 23 ha plan change area (part of which is already zoned residential).
- The approximate 4.17 ha land neighbouring and to the west of the plan change area (already zoned residential).

The total number of allotments (lots) accounted for within the modelled area is 459.

Figure 2 Shows the land area included within the water supply network model.

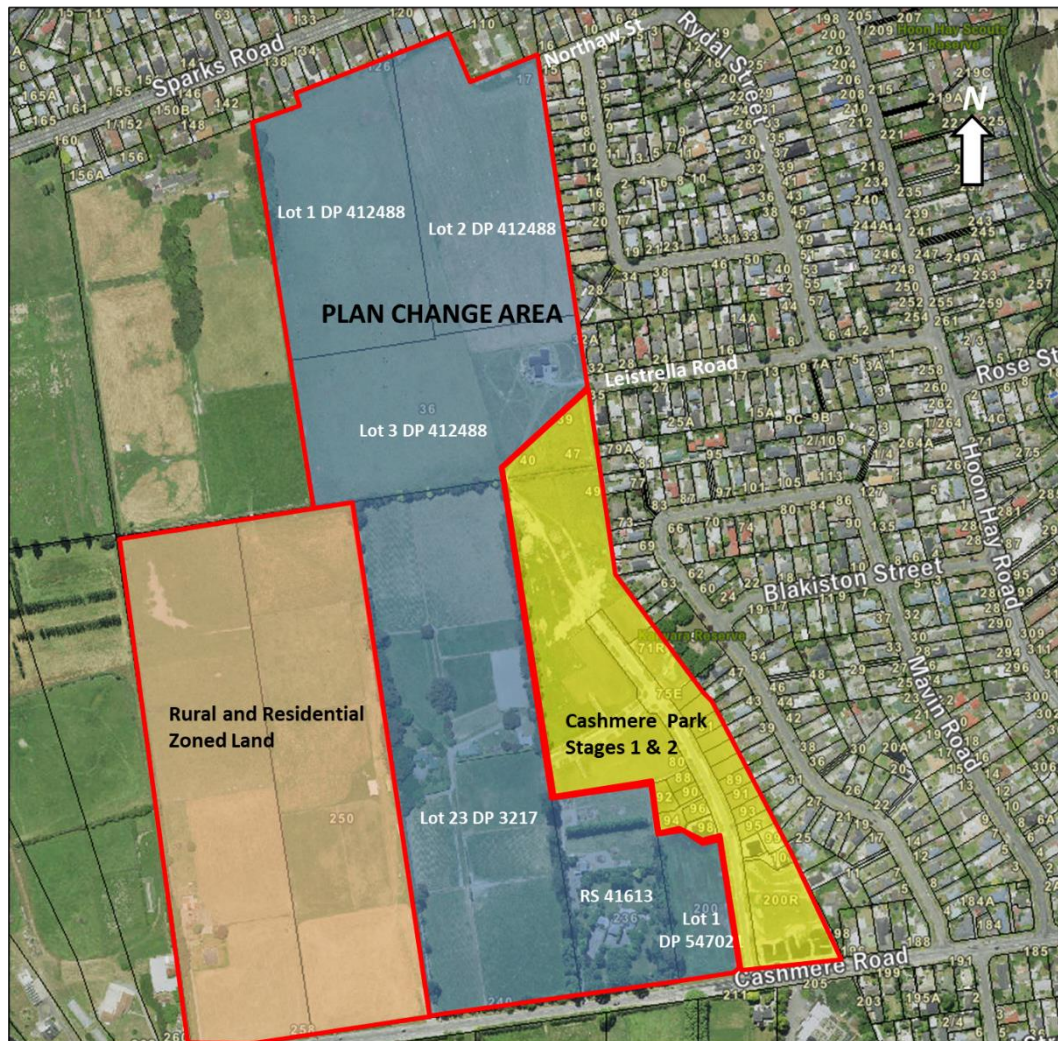


Figure 2. Residential Catchment Included Within The Water Supply Model

2.2. Peak Flow Demand

With a diversity factor applied, in accordance with Chart 1 of the CCC Infrastructure Design Standard (IDS) Part 7 Section 7.5.1, the peak design flow per lot is approximately 0.15 L/s; as shown in Figure 3.

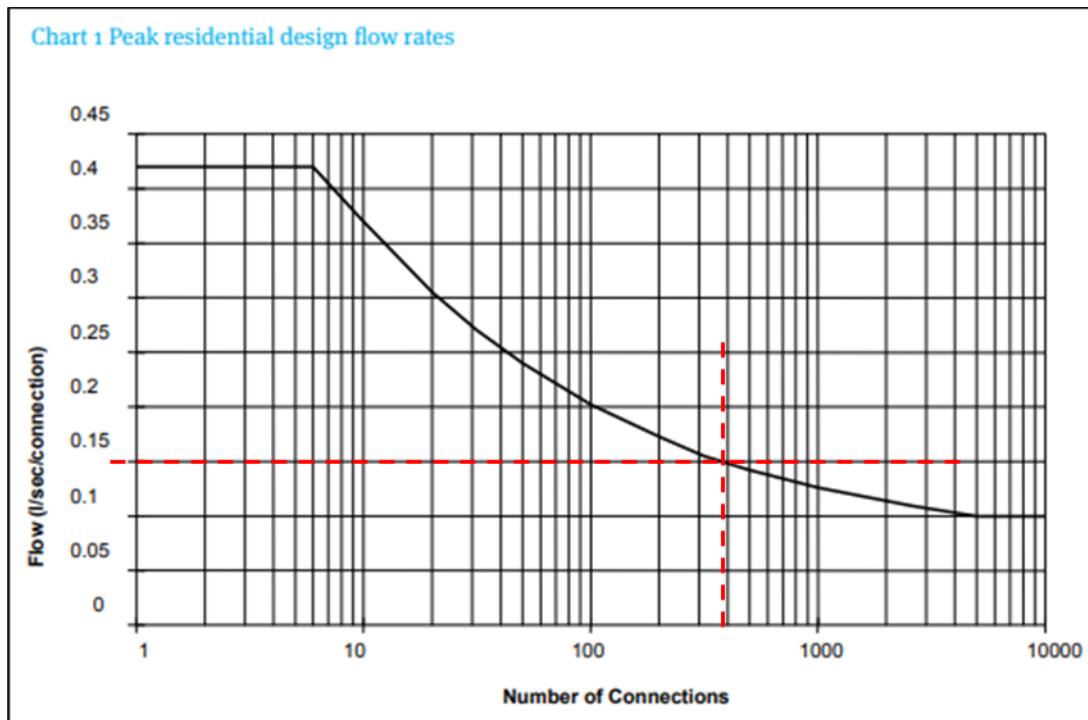


Figure 3. IDS Chart 1 Residential Design Flow Rates

2.3. Points of Supply

The plan change area is located on the boundary between the Central and Sutherlands Water Supply Zones. During the development of Stage 1 of the Cashmere Park residential subdivision, the zone boundary valve was moved to the west down Cashmere Road, to allow the entire Cashmere Park Stages 1, 2 & 3 to fall within the Central Water Supply Zone. The hydraulic water supply model is based on the current boundary valve location and allows for the entire plan change area to be supplied with water from the Central Zone. The undeveloped residential zoned land to the west of the plan change area that has been included within the model may require the zone boundary valve to be moved further to the west, however this potential requirement has not been accounted for within the modelling.

The modelled points of supply are the DN100 water main within Cashmere Road (two points of supply have been taken off this main), the DN100 main within Leistrella Road and the DN200 main within Sparks Road. The CCC Source and Sprinkler Design Pressures Map indicate a sprinkler pressure of 400 kPa for the Central Zone and this minimum residual pressure was used as the basis for modelling.

2.4. Firefighting

Modelling was carried out using two hydrants with the discharge flow at each hydrant set to 12.5 L/s (25 L/s total) and the residential demand set to 60% of the peak load. The hydrants tested were located at the furthest end of the supply main.

2.5. Pipe Sizes

All mains included within the model are DN180 OD PE100.

63 OD MDPE submains and crossovers will provide points of connection to individual residential lots.

3. EPA NET Model Assumption

	Value	Units
Friction factors used		
Plastic pipes, includes fitting losses	0.15	mm
Fire hydrants used	2	
Flow per hydrant	12.5	l/s

Domestic Subdivision check sheet

Fire service Zone	FW2	
Hydrants required	2	
Flow per hydrant	12.5	l/s
Required fire flows and pressures met	Yes	
Number of Lots in model	459	
Flow per Lot (See Chart 1 of IDS Part 7)	0.15	l/s
Can lots be subdivided further hence increase demand	n/a	
Possible ultimate number of lots	Taken account of in model	
Is significant surge expected at the site	No	
Predicted surge pressure	-	kPa
Lowest Residual Mains Pressure	400	kPa
Hence minimum house site pressure (at building site not boundary)	200	kPa
See Table 1 of IDS Part 7		
Minimum calculated pressure at building site	350	kPa
Maximum calculated pressure in system	394	kPa

Does this exceed the PN rating of the associated pipe and fittings	No
Unit headloss less than 0.01 m/m in mains (When firefighting flows not included)	Yes
Operating temperature expected to exceed 20 degrees	No
Reduction factor in strength for temperature - See manufacture data	-
Is the Ground Contaminated	No
Pipe material required for contaminated ground	-
Valve spacing and location allows isolation	Yes
Likelihood of contamination or Stagnation	No
Suitable connections provided for future subdivision	Yes
Capacity provided for future subdivision	Yes

4. EPA NET Version 2 Model Outputs

Appendix A provides plans showing the pressures at the nodes according to the colour coded pressure legend in metres of head. The plans also show the unit headloss in the mains according to the colour coded unit headloss legend. The colours on these legends represent the range of pressures and losses.

Information on the demand and the location of the hydrants tested for firefighting flows has been noted on the output plans.

Appendix B provides full pipe information for the modelled residential demands showing internal diameter, length, pressure ratings, flows, velocity and unit head loss. Full pipe information for the fire flow scenarios has not been included as it would be duplication.

5. Disclaimer

This report has been prepared by Eliot Sinclair & Partners Limited ("Eliot Sinclair") only for the intended purpose as technical supporting documentation in support of a Plan Change Application.

The report is based on:

- Information supplied by the Christchurch City Council for the Stage 1 design of the Cashmere Park residential subdivision.
- Christchurch City Council Infrastructure Design Guideline.
- New Zealand Firefighting Code of Practice SNZ PAS 4509:2008.
- Christchurch City Council services maps.

Where data supplied by Cashmere Park Ltd, G. Ward & R. Brown or other external sources, including previous site investigation reports, have been relied upon, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Eliot Sinclair for incomplete or inaccurate data supplied by other parties.

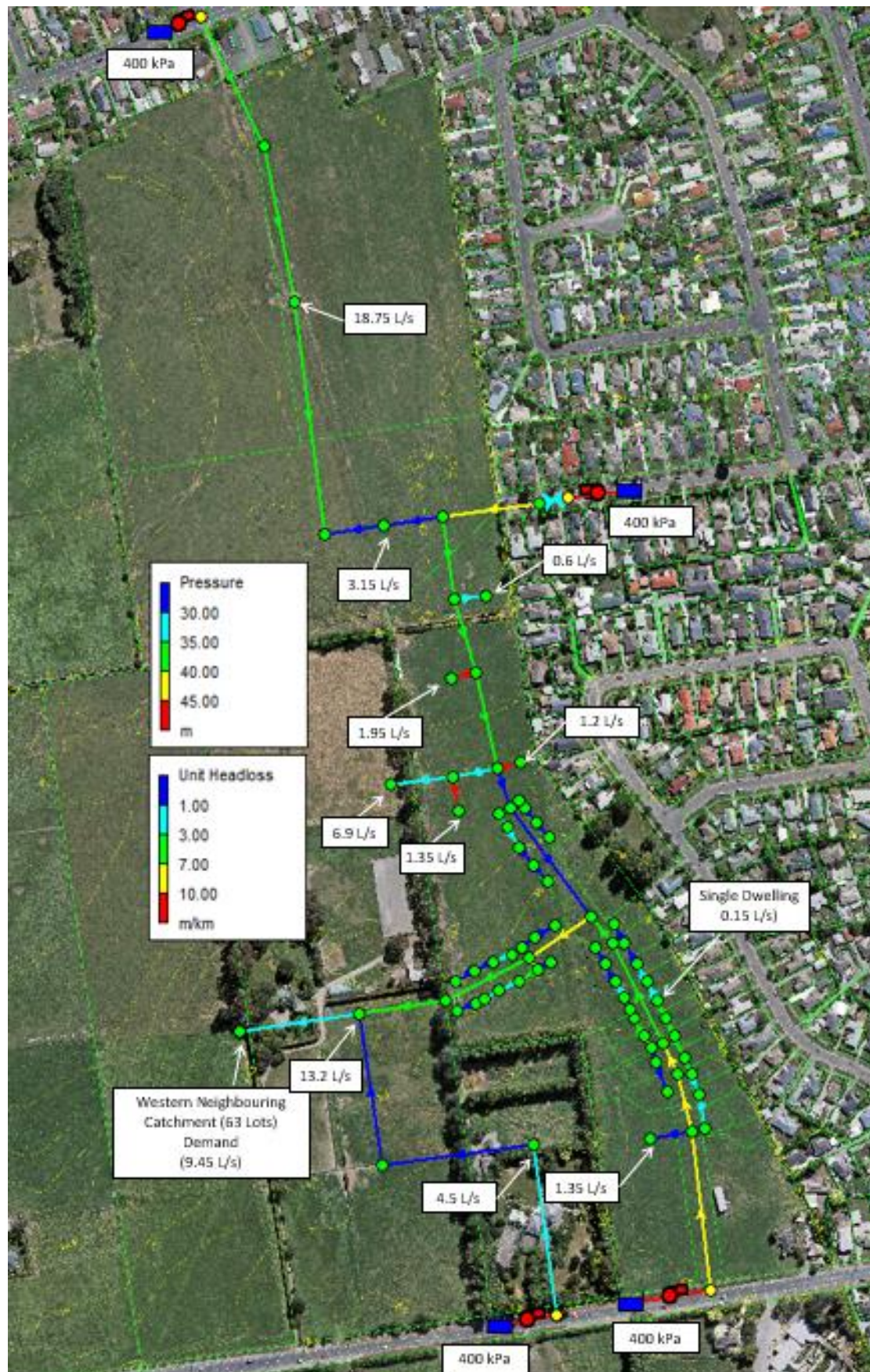
Whilst every care has been taken during our investigation and interpretation of describe conditions to ensure that the conclusions drawn, and the opinions and recommendations expressed are correct at the time of reporting, Eliot Sinclair has not performed an assessment of all possible conditions or circumstances that may exist at the site. Variations in conditions may occur between investigatory locations and there may be conditions that were not detected by the scope of the investigation that was carried out or have been covered over or obscured over time. Eliot Sinclair does not provide any warranty, either express or implied, that all conditions will conform exactly to the assessments contained in this report.

The exposure of conditions or materials that vary from those described in this report, may require a review of our recommendations. Eliot Sinclair should be contacted to confirm the validity of this report should any of these occur.

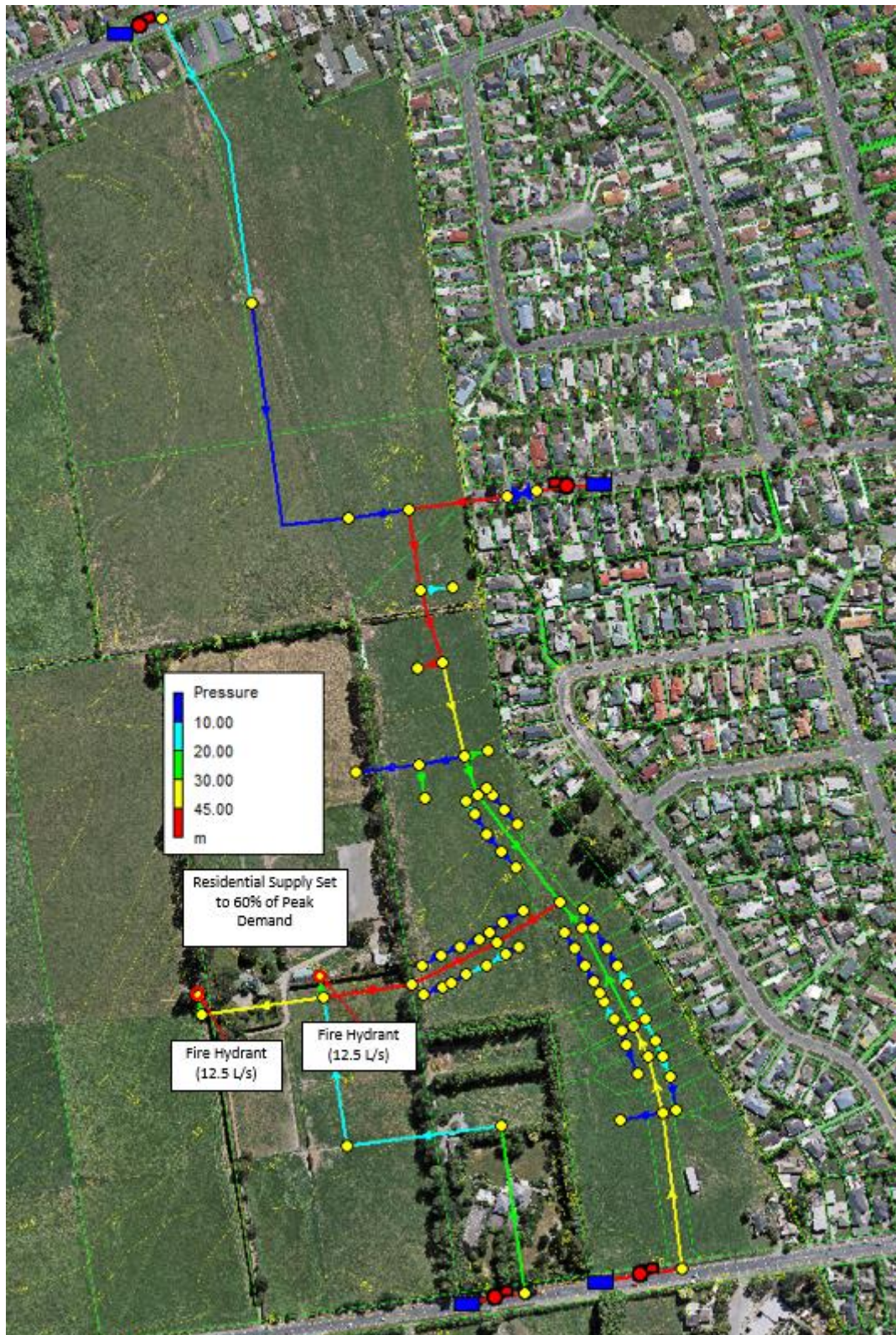
This report has been prepared for the benefit of Cashmere Park Ltd, G. Ward & R. Brown and the Christchurch City Council for the purposes as stated above. No liability is accepted by Eliot Sinclair or any of their employees with respect to the use of this report, in whole or in part, for any other purpose or by any other party.

Appendix A. EPA NET Model Output Plans

DOMESTIC PRESSURES AND HEADLOSSES



FIREFIGHTING PRESSURES





INTERNAL PIPE DIAMETERS



Appendix B. Pipe Information

Link ID	Length m	Diameter mm	Roughness mm	Flow LPS	Velocity m/s	Unit Headloss m/km
Pipe 3	121.82	152.7	0.15	19.49	1.06	8.10
Pipe 4	45.24	152.7	0.15	18.14	0.99	7.05
Pipe 5	26.50	152.7	0.15	18.14	0.99	7.05
Pipe 6	10.44	50.9	0.15	1.95	0.96	26.60
Pipe 7	18.62	50.9	0.15	0.90	0.44	6.14
Pipe 8	13.98	50.9	0.15	0.75	0.37	4.37
Pipe 9	16.96	50.9	0.15	0.60	0.29	2.90
Pipe 10	25.92	50.9	0.15	0.45	0.22	1.71
Pipe 11	10.41	50.9	0.15	1.65	0.81	19.32
Pipe 12	11.15	50.9	0.15	0.30	0.15	0.82
Pipe 13	24.08	50.9	0.15	0.15	0.07	0.23
Pipe 14	10.74	50.9	0.15	1.05	0.52	8.20
Pipe 15	15.79	50.9	0.15	0.90	0.44	6.14
Pipe 16	85.93	152.7	0.15	14.54	0.79	4.61
Pipe 17	25.63	152.7	0.15	14.54	0.79	4.61
Pipe 18	57.28	152.7	0.15	19.35	1.06	7.99
Pipe 19	73.38	152.7	0.15	16.95	0.93	6.19
Pipe 20	15.04	50.9	0.15	0.90	0.44	6.14
Pipe 21	14.69	50.9	0.15	0.75	0.37	4.37
Pipe 22	17.19	50.9	0.15	0.60	0.29	2.90
Pipe 23	14.69	50.9	0.15	0.45	0.22	1.71
Pipe 24	19.09	50.9	0.15	0.30	0.15	0.82
Pipe 25	16.48	50.9	0.15	0.15	0.07	0.23
Pipe 26	9.13	50.9	0.15	1.20	0.59	10.55
Pipe 27	13.03	50.9	0.15	0.30	0.15	0.82
Pipe 28	17.19	50.9	0.15	0.15	0.07	0.23
Pipe 29	10.03	50.9	0.15	0.60	0.29	2.90
Pipe 30	15.04	50.9	0.15	0.45	0.22	1.71
Pipe 31	16.50	50.9	0.15	0.30	0.15	0.82
Pipe 32	16.48	50.9	0.15	0.15	0.07	0.23
Pipe 33	11.54	50.9	0.15	1.05	0.52	8.20
Pipe 34	11.54	50.9	0.15	0.15	0.07	0.23
Pipe 35	16.89	50.9	0.15	0.75	0.37	4.37
Pipe 36	17.24	50.9	0.15	0.60	0.29	2.90
Pipe 37	12.91	50.9	0.15	0.45	0.22	1.71
Pipe 38	7.16	50.9	0.15	0.30	0.15	0.82
Pipe 39	15.77	50.9	0.15	0.15	0.07	0.23
Pipe 40	8.00	50.9	0.15	0.60	0.29	2.90
Pipe 41	7.38	50.9	0.15	0.45	0.22	1.71

Link ID	Length m	Diameter mm	Roughness mm	Flow LPS	Velocity m/s	Unit Headloss m/km
Pipe 41	7.38	50.9	0.15	0.45	0.22	1.71
Pipe 42	14.25	50.9	0.15	0.30	0.15	0.82
Pipe 43	15.29	50.9	0.15	0.15	0.07	0.23
Pipe 44	10.03	50.9	0.15	0.75	0.37	4.37
Pipe 45	12.22	50.9	0.15	0.60	0.29	2.90
Pipe 46	17.99	50.9	0.15	0.45	0.22	1.71
Pipe 47	17.13	50.9	0.15	0.30	0.15	0.82
Pipe 48	17.02	50.9	0.15	0.15	0.07	0.23
Pipe 49	104.54	152.7	0.15	-4.82	0.26	0.58
Pipe 51	31.39	152.7	0.15	-6.17	0.34	0.91
Pipe 52	74.58	152.7	0.15	-15.62	0.85	5.29
Pipe 53	58.73	152.7	0.15	-17.57	0.96	6.63
Pipe 54	63.55	152.7	0.15	-18.17	0.99	7.08
Pipe 55	25.56	50.9	0.15	0.60	0.29	2.90
Pipe 56	19.62	50.9	0.15	1.95	0.96	26.60
Pipe 57	19.03	50.9	0.15	1.20	0.59	10.55
Pipe 58	48.31	152.7	0.15	6.90	0.38	1.13
Pipe 59	7.55	50.9	0.15	0.75	0.37	4.37
Pipe 60	9.67	50.9	0.15	0.60	0.29	2.90
Pipe 61	14.69	50.9	0.15	0.45	0.22	1.71
Pipe 62	15.10	50.9	0.15	0.30	0.15	0.82
Pipe 63	14.00	50.9	0.15	0.15	0.07	0.23
Pipe 65	68.15	152.7	0.15	16.80	0.92	6.09
Pipe 67	93.57	152.7	0.15	9.45	0.52	2.03
Pipe 71	32.24	152.7	0.15	1.35	0.07	0.06
Pipe 72	75.27	152.7	0.15	21.00	1.15	9.36
Pipe 68	1000	152.7	0.15	10.35	0.57	2.41
Pipe 69	1000	152.7	0.15	5.85	0.32	0.83
Pipe 70	116.58	152.7	0.15	5.85	0.32	0.83
Pipe 73	26.68	50.9	0.15	-1.35	0.66	13.19
Pipe 74	35.11	152.7	0.15	-8.25	0.45	1.57
Pipe 76	110.11	152.7	0.15	19.07	1.04	7.77
Pipe 77	120.93	152.7	0.15	19.07	1.04	7.77
Pipe 78	178.52	152.7	0.15	0.32	0.02	0.00
Pipe 80	46.56	152.7	0.15	-0.32	0.02	0.00
Pipe 81	46.72	152.7	0.15	-2.83	0.15	0.22
Pump 2	#N/A	#N/A	#N/A	21.00	0.00	-40.20
Pump 64	#N/A	#N/A	#N/A	19.64	0.00	-40.20
Pump 50	#N/A	#N/A	#N/A	10.50	0.00	-40.20