UHCC - PC42 Hearing

Flood Maps Must Be Accurate

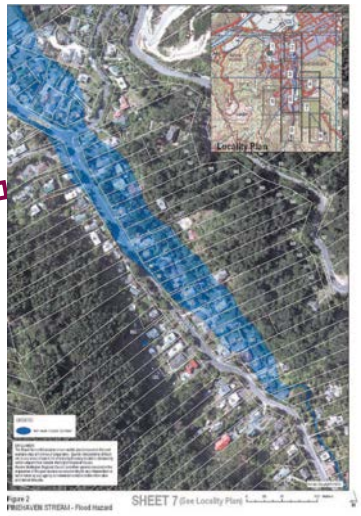
Save Our Hills (Upper Hutt) Inc.

GWRC & UHCC 1-in-100 year flood for 27 Elmslie Rd:

- Topography is wrong
- Flood depth and extent is wrong
- Flood map is inaccurate and misleading
- Not just on Pattinson's property but across the Pinehaven catchment

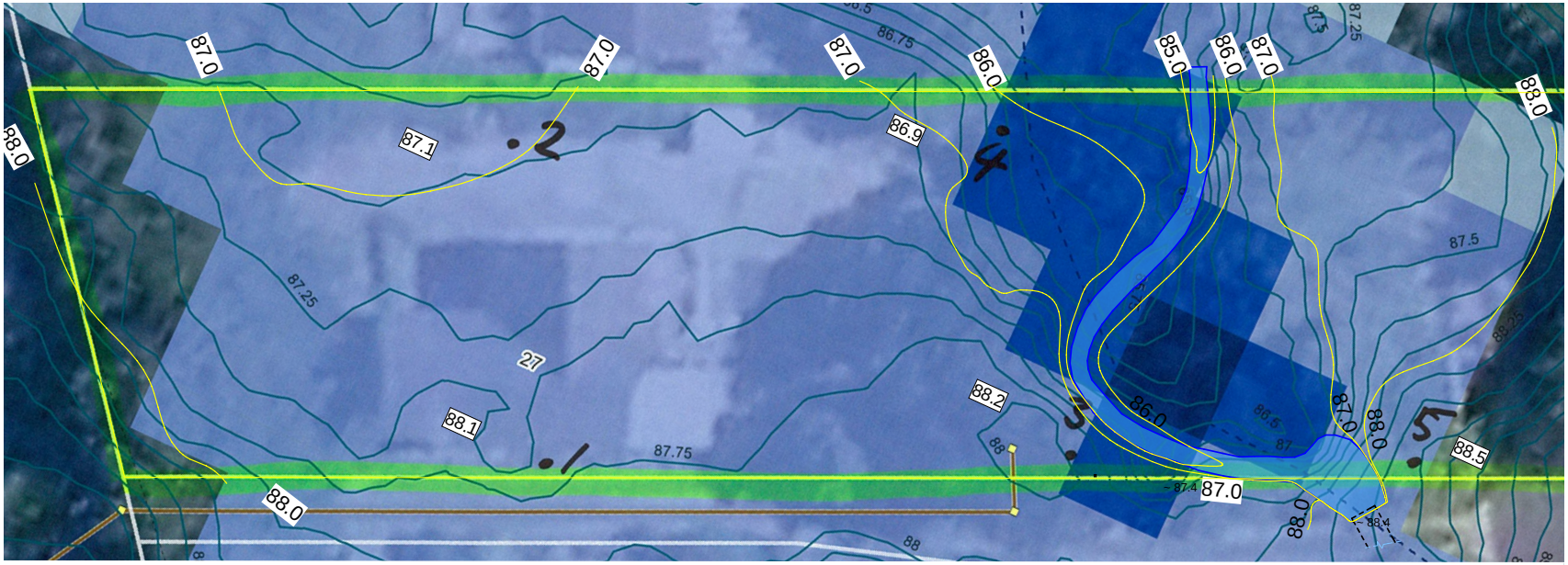
Flood Map intended to be permanent

Lie from SKM consultant at an open day:
"Once the structural works are done, your flood problems will go away."



GWRC Sheet 7 (2010) Even after proposed structural works are finished this flood map will remain the same!

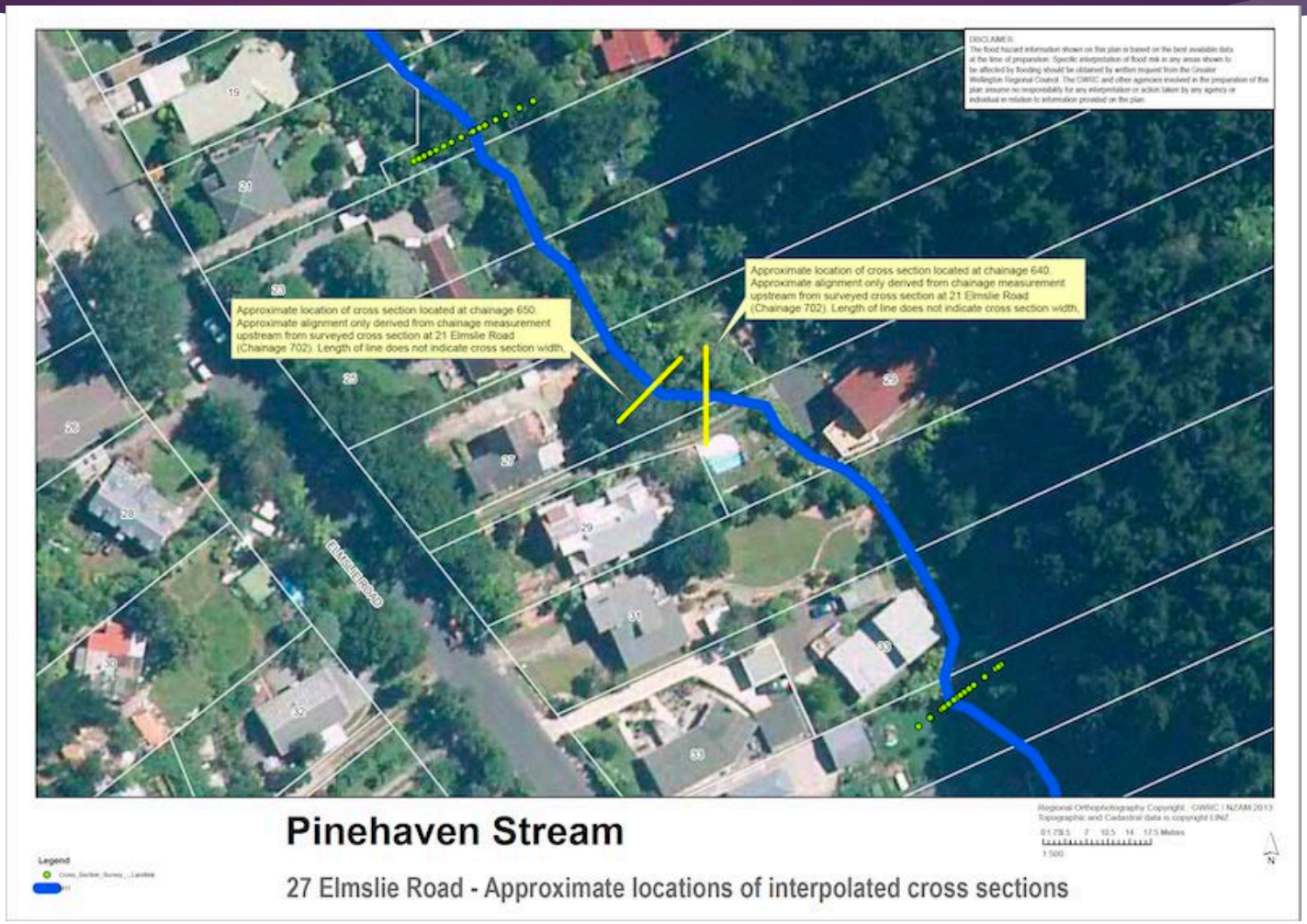
GWRC Topography Wrong for 27 Elmslie Road, Pinehaven – Plan View



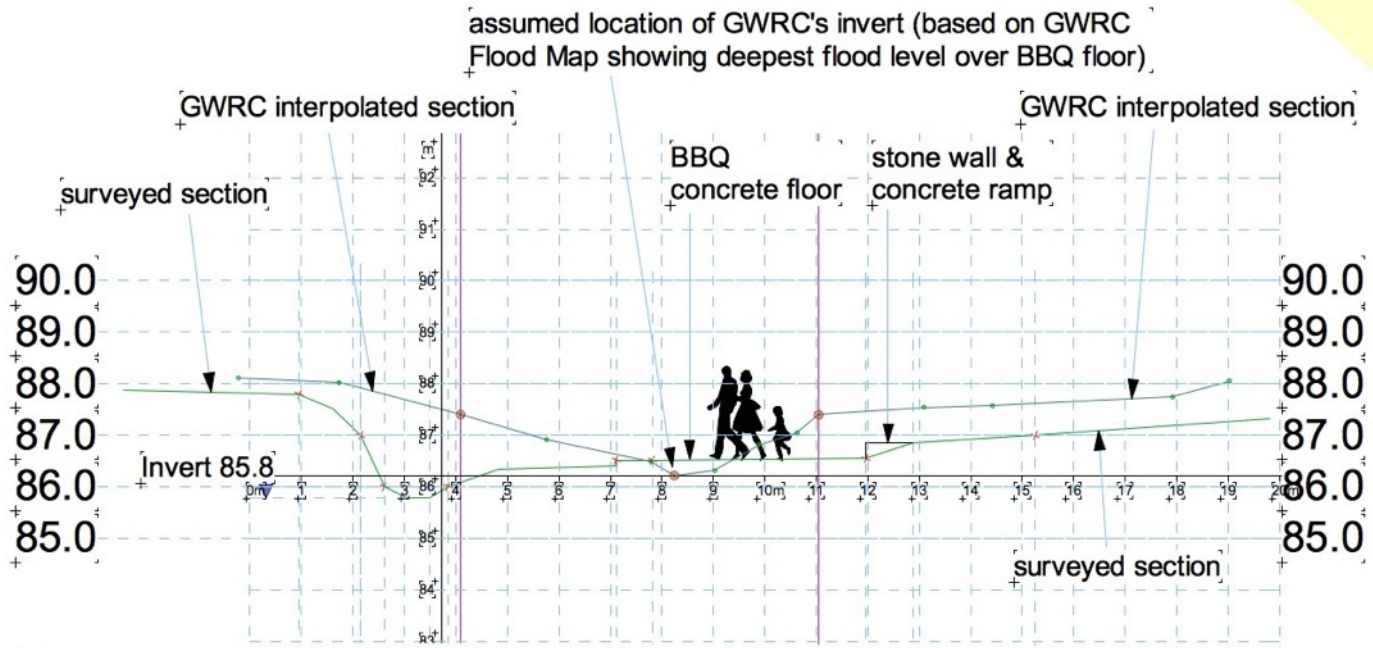
Comparison of Contours 1:200

Comparing Green **GWRC Contours vs Contours from Ground Survey** Yellow

GWRC Topography Wrong for 27 Elmslie Road, Pinehaven – Cross- Section Locations



GWRC Topography Wrong for 27 Elmslie Road, Pinehaven – Cross- Section at Chainage 640

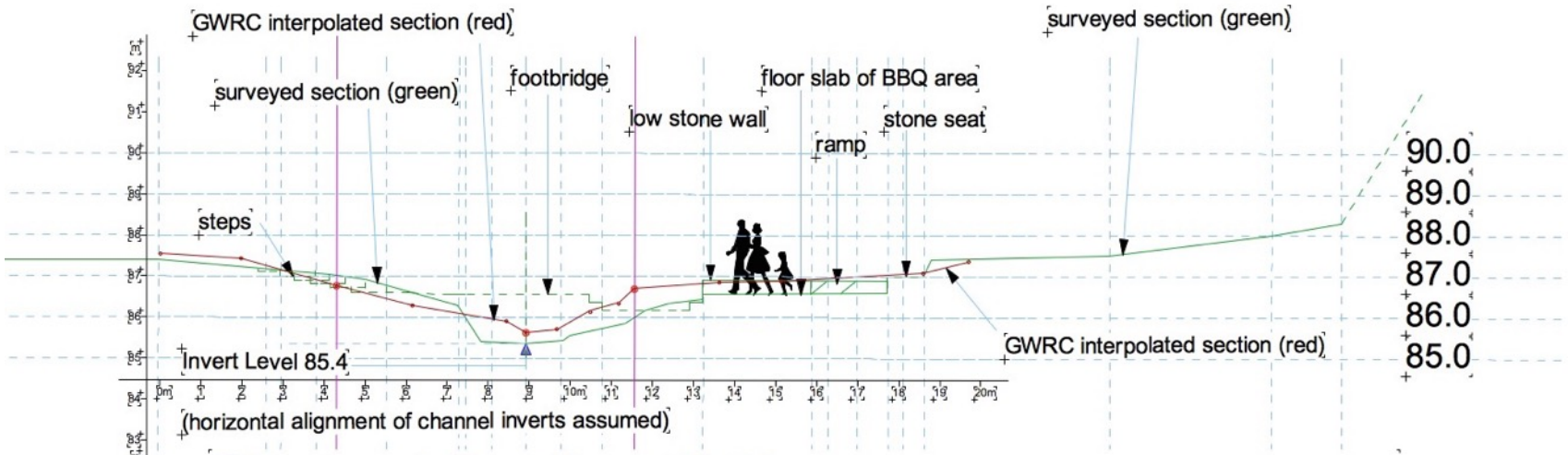


Channel Section Y-Y (based on Topo. Survey) compared with **GWRC Interpolated Section at Chainage 640**

Scale 1:200 @ A4 size

0 1 2 3 4 5

GWRC Topography Wrong for 27 Elmslie Road, Pinehaven – Cross- Section at Chainage 650

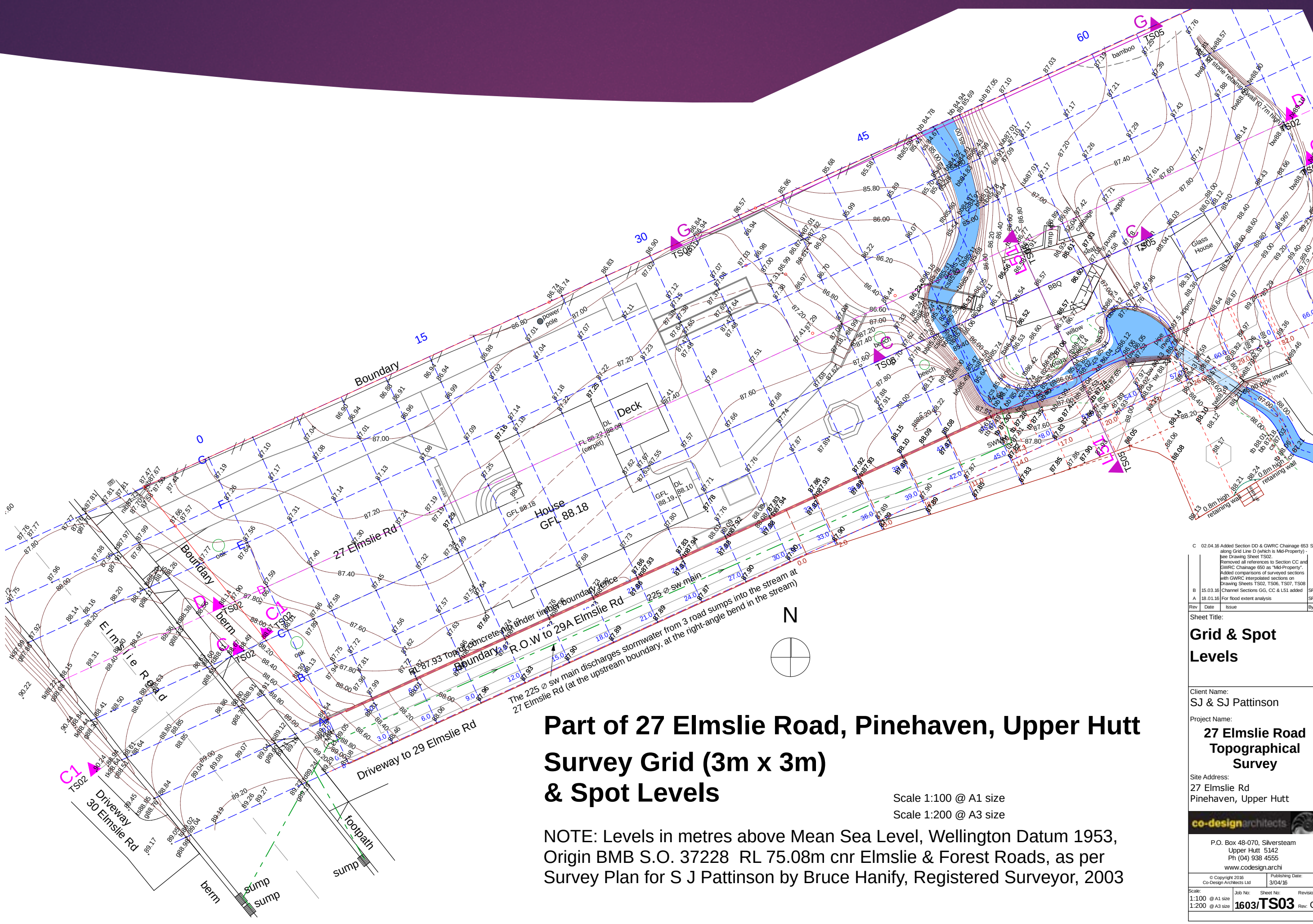


Channel Section M-M (based on Topo. Survey) compared with **GWRC Interpolated Section at Chainage 650**

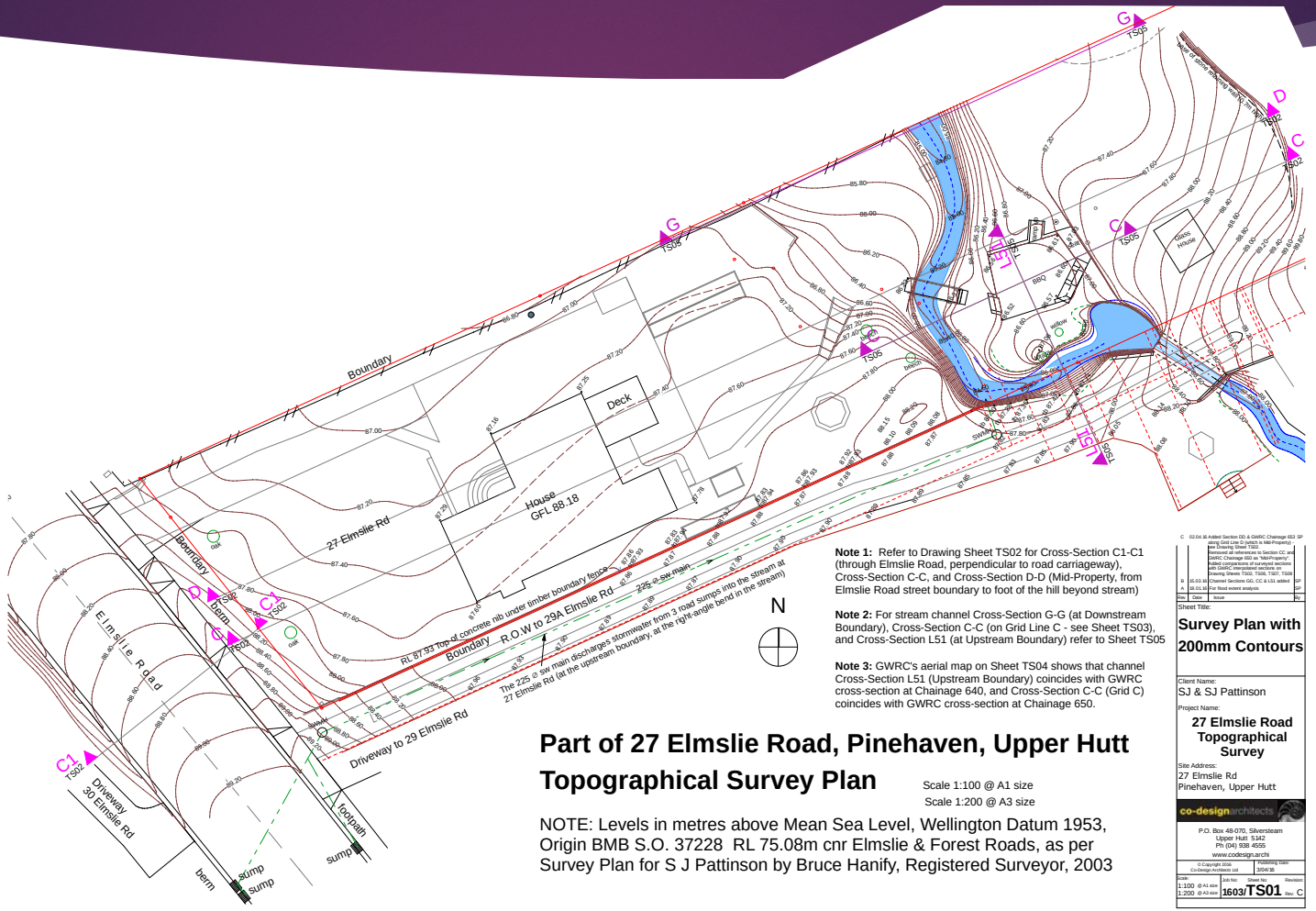
Scale 1:200 @ A4 size

0 1 2 3 4 5

Topo Survey – 27 Elmslie Road



Topo Survey – 27 Elmslie Road



Note 1: Refer to Drawing Sheet TS02 for Cross-Section C1-C1 (through Elmslie Road, perpendicular to road carriageway), Cross-Section C-C, and Cross-Section D-D (Mid-Property, from Elmslie Road street boundary to foot of the hill beyond stream)

Note 2: For stream channel Cross-Section G-G (at Downstream Boundary), Cross-Section C-C (on Grid Line C - see Sheet TS03), and Cross-Section L51 (at Upstream Boundary) refer to Sheet TS05

Note 3: GWRC's aerial map on Sheet TS04 shows that channel Cross-Section L51 (Upstream Boundary) coincides with GWRC cross-section at Chainage 640, and Cross-Section C-C (Grid C) coincides with GWRC cross-section at Chainage 650.

Part of 27 Elmslie Road, Pinehaven, Upper Hutt

Topographical Survey Plan

Scale 1:100 @ A1 size
Scale 1:200 @ A3 size

NOTE: Levels in metres above Mean Sea Level, Wellington Datum 1953, Origin BMB S.O. 37228 RL 75.08m cnr Elmslie & Forest Roads, as per Survey Plan for S J Pattinson by Bruce Hanify, Registered Surveyor, 2003

Rev	Date	Issue	By
C	02.04.18	Added Section DD & GWRC Chainage 653 SP along Grid Line D (which is Mid-Property) on Drawing Sheet TS02	
B	15.03.18	Added Cross-Section CC on GWRC Chainage 660 as "Mid-Property". Added comparisons of surveyed sections with GWRC interpolated sections on Drawing Sheets TS02, TS04, TS07, TS08	
B	15.03.18	Channel Sections GG, CC & L51 added	SP
A	16.01.18	For flood extent analysis	SP

Sheet Title:

Survey Plan with 200mm Contours

Client Name:
SJ & SJ Pattinson

Project Name:

27 Elmslie Road Topographical Survey

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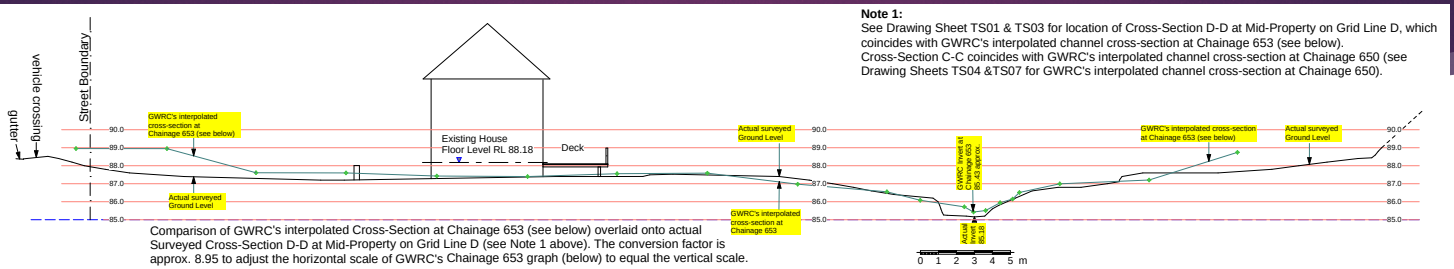
Plotting Date: 16/04/18

Scale: 1:100 @ A1 size, 1:200 @ A3 size
Job No: 1603/
Sheet No: TS01
Revision: Rev. C

Topo Survey – 27 Elmslie Road X-Sections – middle of property

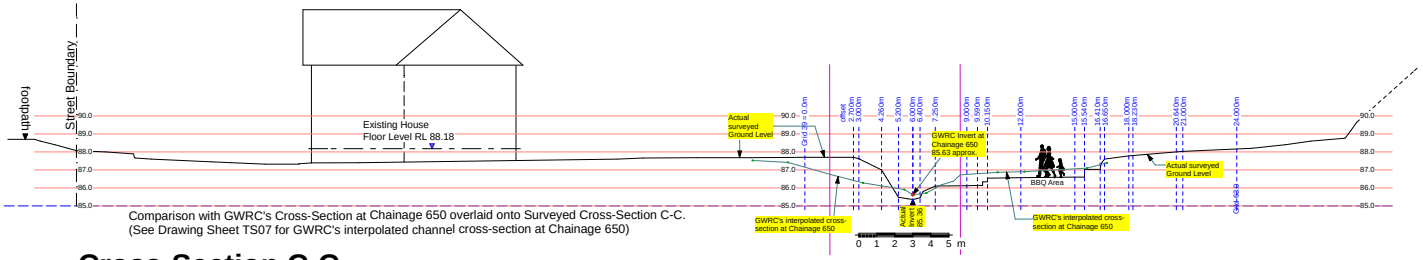


Comparison of GWRC's interpolated Cross-Section at Chainage 653 (see below) overlaid onto actual Surveyed Cross-Section D-D at Mid-Property on Grid Line D (see Note 1 above). The conversion factor is approx. 8.95 to adjust the horizontal scale of GWRC's Chainage 653 graph (below) to equal the vertical scale.

Cross-Section D-D Cross-Section on Grid Line D (see Sheet TS03) through middle of the property from Elmslie Rd street boundary to the foot of the hill beyond the stream

NB: Cross-Section D-D is not at right-angles to the stream channel.

Scale 1:100 @ A1 size

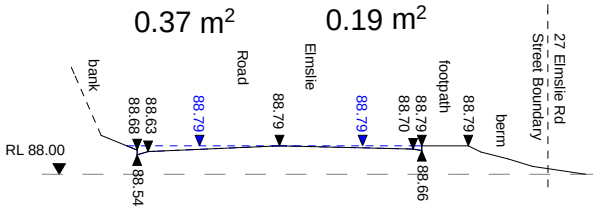


Comparison with GWRC's Cross-Section at Chainage 650 overlaid onto Surveyed Cross-Section C-C.
(See Drawing Sheet TS07 for GWRC's interpolated channel cross-section at Chainage 650)

Cross-Section C-C Cross-Section on Grid Line C (see Sheet TS03) from Elmslie Rd street boundary to the foot of the hill beyond the stream

Scale 1:100 @ A1 size

NB: Cross-Section C-C is at right-angles to the stream channel (See Drawing Sheets TS01, TS05 & TS07).

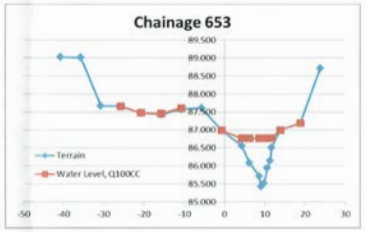


Cross-Section C1-C1

(Cross-Section through Elmslie Road perpendicular to the road)

Scale 1:50 @ A1 size

Note:
The road is slightly tilted in towards the hillside, meaning that the left-hand side of the road carriageway (looking westward down the road) carries about twice the capacity of stormwater (about 0.37m2 measured up to Elevation 88.79) as the right-hand side (about 0.19m2 measured up to Elevation 88.79), the side that 27 Elmslie Rd is on.



Approximate Scale 8.95:1 (Vertical:Horizontal)

GWRC's Graph of interpolated Channel Cross-Section at Chainage 653
Received from GWRC 16 December 2014

NB: GWRC's Chainage 653 is 3m downstream from Chainage 650.
For location of Chainage 650 see GWRC's aerial view on Sheet TS04.
Chainage 650 coincides with Cross-Section C-C.
Chainage 653 coincides with Cross-Section D-D.

C 02.04.16 Added Section DD & GWRC Chainage 653 SP
along Grid Line D (which is Mid-Property) -
see Drawing Sheet TS02.
Removed all references to Section CC and
GWRC Chainage 650 as "Mid-Property".
B 10.03.16 Added GWRC interpolated sections
with GWRC interpolated sections on
Drawing Sheets TS02, TS06, TS07, TS08.
A 18.01.16 Channel Sections GG, CC & LS1 added SP
For Road extent analysis SP
Rev Date Issue By

Sheet Title:
Cross-Sections D-D Mid-Property C-C & C1-C1

Client Name:
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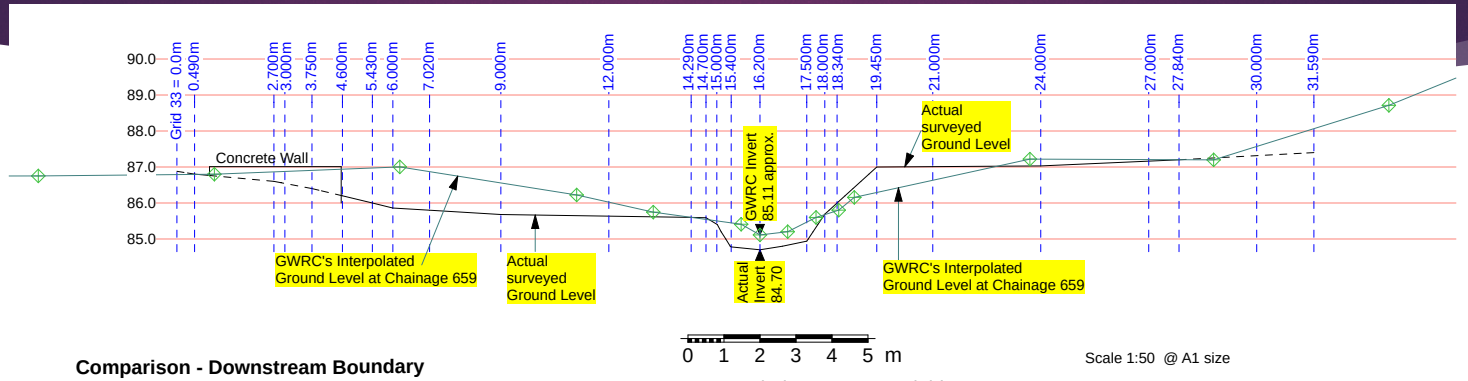
Publishing Date: 1/04/16

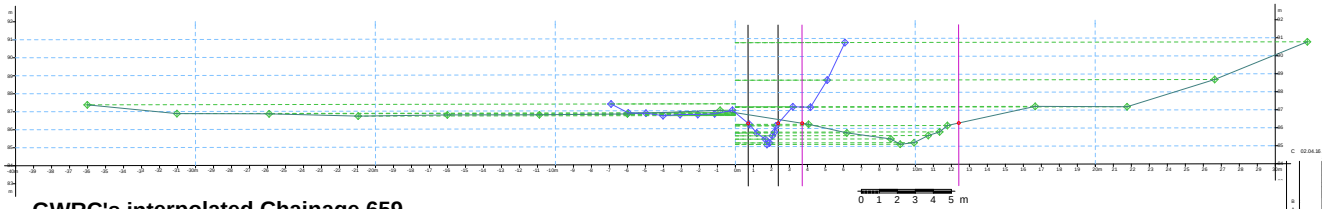
Scale: @ A1 size @ A3 size
Job No: 1603/
Sheet No: TS02
Revision: Rev: C

Topo Survey – 27 Elmslie Road X-Section – downstream boundary



Scale 1:50 @ A1 size

Comparison - Downstream Boundary
Comparison of GWRC's interpolated Downstream Channel Cross-Section at Chainage 659 overlaid onto actual Surveyed Downstream Channel Cross-Section G-G (see Note 1 below)



GWRC's interpolated Chainage 659 adjusted to same scale (in meters) for both X & Y axes

Scale 1:100 @ A1 size

The conversion factor is approx. 5.21 to adjust GWRC's Horizontal Scale to equal the Vertical Scale.

GWRC's Graph of interpolated Channel Cross-Section at Chainage 659 (Downstream Boundary)
27 Elmslie Rd, Pinehaven
Received from GWRC 16 December 2014

Approximate Scale 5.21:1 (Vertical:Horizontal)

Note 1:
See Drawing Sheet TS01 for location of Cross-Section G-G (Downstream Boundary). Cross-Section G-G coincides with GWRC's interpolated stream channel cross-section at Chainage 659).

Sheet Title:
GWRC's Channel Cross-Section Downstream Bdy
Client Name:
SJ & SJ Pattinson
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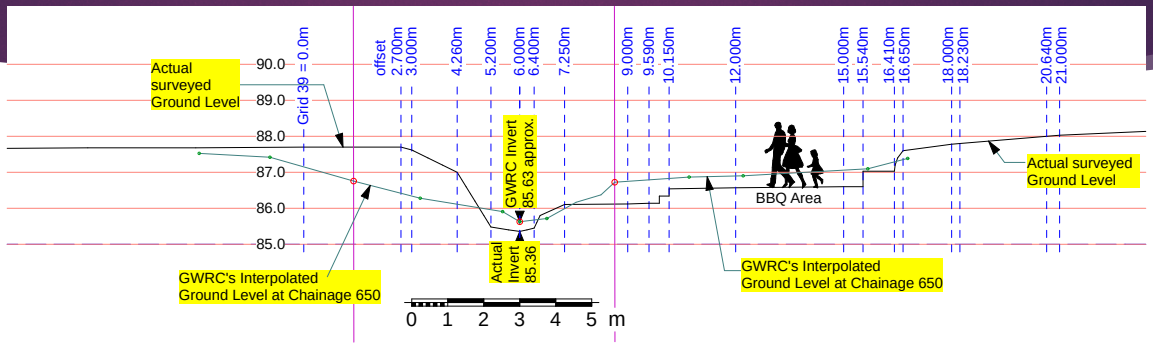
Publishing Date: 1/04/16
Job No: 1603/TS06 Rev: C

Topo Survey – 27 Elmslie Road X-Section – Chainage 650

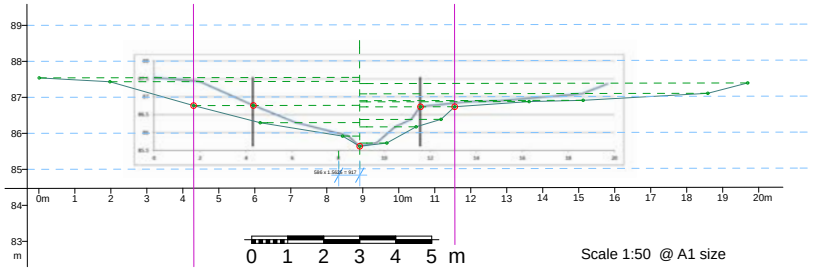


Comparison - Cross-sections at right-angles to stream channel
Comparison of GWRC's interpolated Channel Cross-Section at Chainage 650 overlaid onto actual Surveyed Channel Cross-Section C-C (see Note 1 opp.)

Scale 1:50 @ A1 size

GWRC's interpolated Chainage 650 adjusted to same scale (in meters) for both X & Y axes

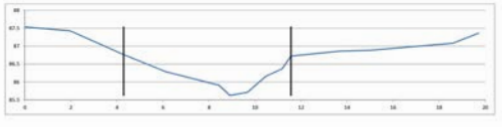
The conversion factor is approx. 1.56 to adjust GWRC's Horizontal Scale to equal the Vertical Scale.



Scale 1:50 @ A1 size

Note 1:
See Drawing Sheet TS01 for location of channel Cross-Section C-C.
Cross-Section C-C coincides with GWRC's interpolated channel cross-section at Chainage 650 (see Drawing Sheet TS04)

GWRC's graph of interpolated Channel Cross-Section at Chainage 650
27 Elmslie Rd, Pinehaven
Received from GWRC 02 October 2014.



Approximate Scale 1.56:1 (Vertical:Horizontal)

C 02.04.16 Added Section DD & GWRC Chainage 652 SP along Grid Line D (which is Mid-Property) - see Drawing Sheet TS02. Removed all references to Section CC and GWRC Chainage 650 as "Mid-Property". Added Section C-C which coincides more with GWRC interpolated sections on Drawing Sheets TS02, TS06, TS07, TS08.
B (Rev B of this drawing sheet not issued)
A (Rev A of this drawing sheet not issued)

Rev | Date | Issue | By

Sheet Title:
GWRC's Channel Cross-Section at Chainage 650

Client Name:
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Project Name:
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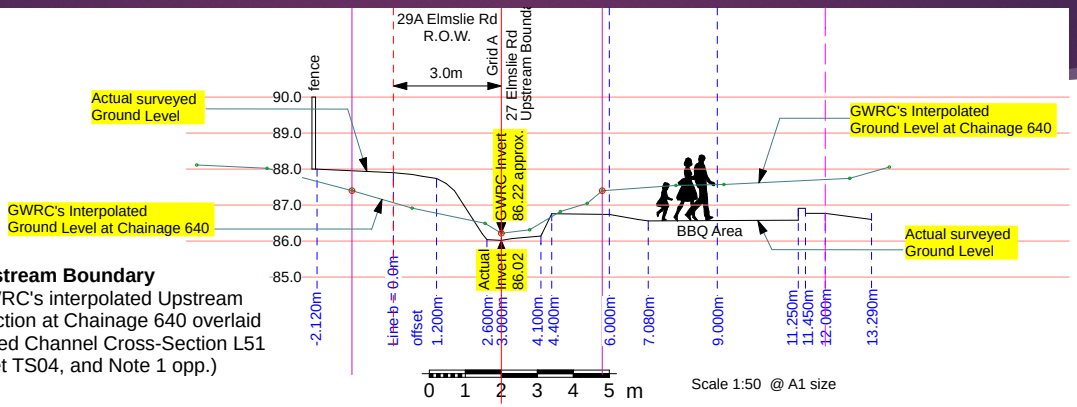
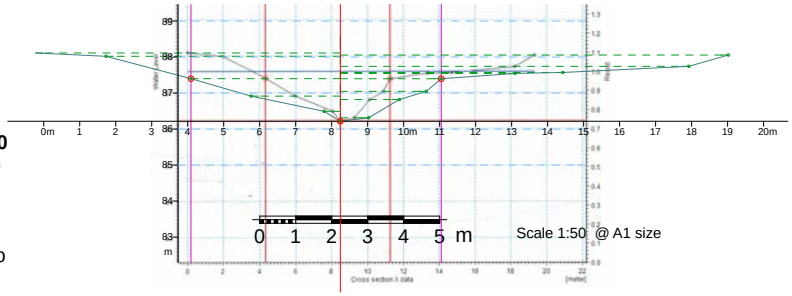
Publishing Date: 1/04/16

Scale: @ A1 size / @ A3 size | Job No: 1603 | Sheet No: TS07 | Revision: Rev. C

Topo Survey – 27 Elmslie Road X-Section – Upstream Boundary



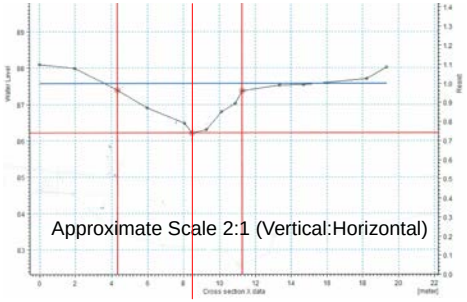
Comparison - Upstream Boundary
Comparison of GWRC's interpolated Upstream Channel Cross-Section at Chainage 640 overlaid onto actual Surveyed Channel Cross-Section L51 (see Drawing Sheet TS04, and Note 1 opp.)



Note 1:
See Drawing Sheet TS01 for location of channel Cross-Section L51 (at Upstream Boundary).
Cross-Section L51 coincides with GWRC's interpolated channel cross-section at Chainage 640 (see Drawing Sheet TS04)

GWRC's interpolated Chainage 640 adjusted to same scale (in meters) for both X & Y axes

The conversion factor is approx. 2.0 to adjust GWRC's Horizontal Scale to equal the Vertical Scale.



GWRC's Graph of interpolated Channel Cross-Section at Chainage 640 (Upstream Boundary), 27 Elmslie Rd, Pinehaven
Received from GWRC 17 June 2014.

Sheet Title:
GWRC's Channel Cross-Section Upstream Bdry

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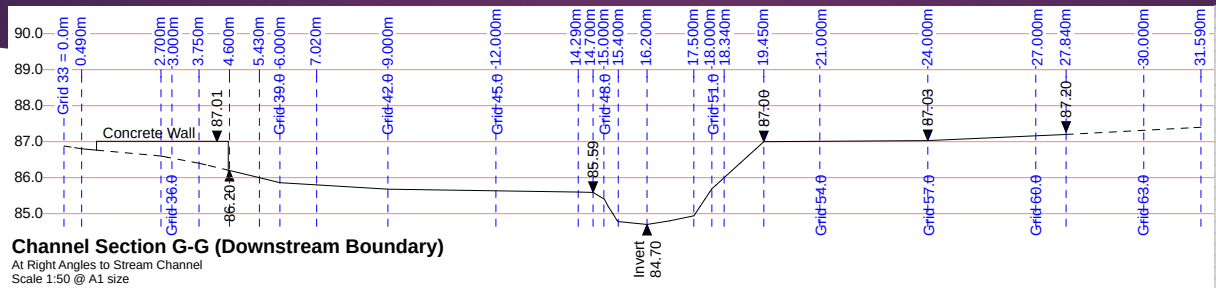
Published Date: 30/04/16

Scale: @ A1 size, @ A3 size

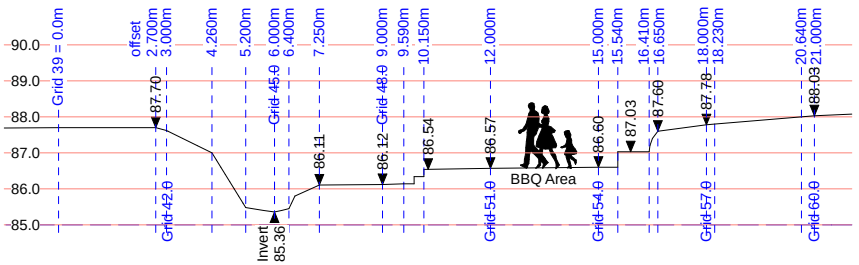
Job No. 1603/TS08 Rev. C

Topo Survey – 27 Elmslie Road Cross-Section data for R J Hall



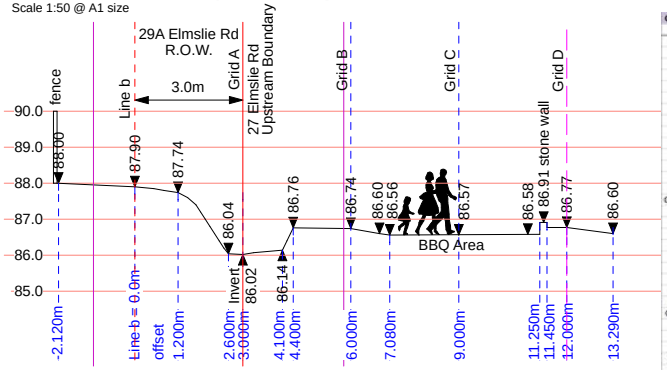
Channel Section G-G (Downstream Boundary)
At Right Angles to Stream Channel
Scale 1:50 @ A1 size

Channel Cross-Section G-G (At Downstream Boundary)		
0 = Grid 33.00	Offset (m)	Elevation
Grid 33.0	0	86.88
(on 25 Elmslie Rd side	0.49	86.80
of low concrete wall)	2.70	86.60
Grid 36.0 (25 Elmslie side)	3.00	86.57
(25 Elmslie Rd side)	3.75	86.40
Top of conc wall (27 Elmslie)	4.57	87.01
	4.60	86.20
	5.43	86.00
Grid 39.0	6.00	85.86
	7.02	85.80
Grid 42.0	9.00	85.68
Grid 45.0	12.00	-
	14.29	85.60
Top of lower left bank	14.70	85.59
Grid 48.0	15.00	85.41
	15.02	85.40
	15.12	85.20
	15.25	85.00
	15.37	84.80
bottom of left bank	15.40	84.78
stream invert	16.20	84.70
	16.83	84.80
bottom of right bank	17.50	84.94
	17.54	85.00
	17.67	85.20
	17.81	85.40
	17.94	85.60
Grid 51.0	18.00	85.69
	18.12	85.80
	18.34	86.00
	18.56	86.20
	18.78	86.40
	19.00	86.60
	19.22	86.80
Top of right bank	19.45	87.00
Grid 54.0	21.00	87.01
Grid 57.0	24.00	87.03
Grid 60.0	27.00	-
	27.84	87.20
Grid 63.0	30.00	-
	31.59	87.40



Channel Section C-C (Grid Line C) At Right Angles to Stream Channel
Scale 1:50 @ A1 size

Channel Cross-Section C-C (along Grid Line C)		
0 = Grid 39.0	Offset (m)	Elevation
Grid 39.0	0	87.70
Top of left bank	2.70	87.70
Grid 42.0	3.00	87.62
	3.04	87.60
	3.45	87.40
	3.86	87.20
	4.26	87.00
	4.39	86.80
	4.51	86.60
	4.63	86.40
	4.76	86.20
	4.88	86.00
	5.00	85.80
	5.13	85.60
bottom of left bank	5.20	85.48
	5.69	85.40
Grid 45.0/stream invert	6.00	85.36
	6.20	85.40
bottom of right bank	6.40	85.45
	6.47	85.60
	6.57	85.80
	7.01	86.00
top of lower right bank	7.25	86.11
Grid 48.0	9.00	86.12
	9.59	86.14
bottom of riser	9.88	86.14
top of riser	9.88	86.34
bottom of riser	10.15	86.34
top of riser	10.15	86.54
Grid 51.0	12.00	86.57
Grid 54.0	15.00	86.60
bottom of seat	15.54	86.60
top of seat	15.54	87.03
back of seat	16.41	87.03
	16.43	87.20
	16.50	87.40
top of right bank	16.65	87.60
Grid 57.0	18.00	87.78
	18.23	87.80
	20.64	88.00
Grid 60.0	21.00	88.03



Channel Section L51 (Upstream Boundary) At Right Angles to Stream Channel
Scale 1:50 @ A1 size

Channel Cross-Section L51 (Upstream Boundary)		
0 = Line b	Offset (m)	Elevation
Fence	-2.12	88.00
Line b	0	87.90
	0.53	87.85
	0.80	87.80
top of left bank	1.20	87.74
	1.47	87.60
	1.70	87.40
	1.83	87.20
	1.96	87.00
	2.09	86.80
	2.21	86.60
	2.34	86.40
	2.47	86.20
bottom of left bank	2.60	86.04
Grid A/Bdy/stream invert	3.00	86.02
	3.30	86.07
bottom of right bank	4.10	86.14
	4.13	86.20
	4.23	86.40
	4.32	86.60
top of right bank	4.40	86.76
Grid B	6.00	86.74
	6.80	86.60
Edge of BBQ floor slab	7.08	86.56
Grid C (centre BBQ area)	9.00	86.57
base of stone wall	11.25	86.58
top of stone wall	11.25	86.91
top of stone wall	11.45	86.91
Grid Level at stone wall	11.45	86.77
Grid D	12.00	86.77
	13.29	86.60

Note 1: Refer to Drawing Sheet TS01 & TS03 for the locations of stream channel Cross-Sections G-G (Downstream Boundary), C-C (Grid Line C) and L51 (Upstream Boundary)

Rev	Date	Issue	By
C	02.04.16	Added Section DD & GWRC Chainage 653 along Grid Line D (which is Mid-Property) - see Drawing Sheet TS02	GP
B	15.03.16	Removed all references to Section CC and GWRC Chainage 650 as "Mid-Property" - Added comparisons of surveyed sections to Consented Cross-Sections - see Drawing Sheets TS02, TS05, TS07, TS08	SP
A		Channel Sections GG, CC & L51 added - Rev A of this drawing sheet not issued.	

Sheet Title:
Channel Cross-Sections GG, CC & L51

Client Name:
SJ & SJ Pattinson

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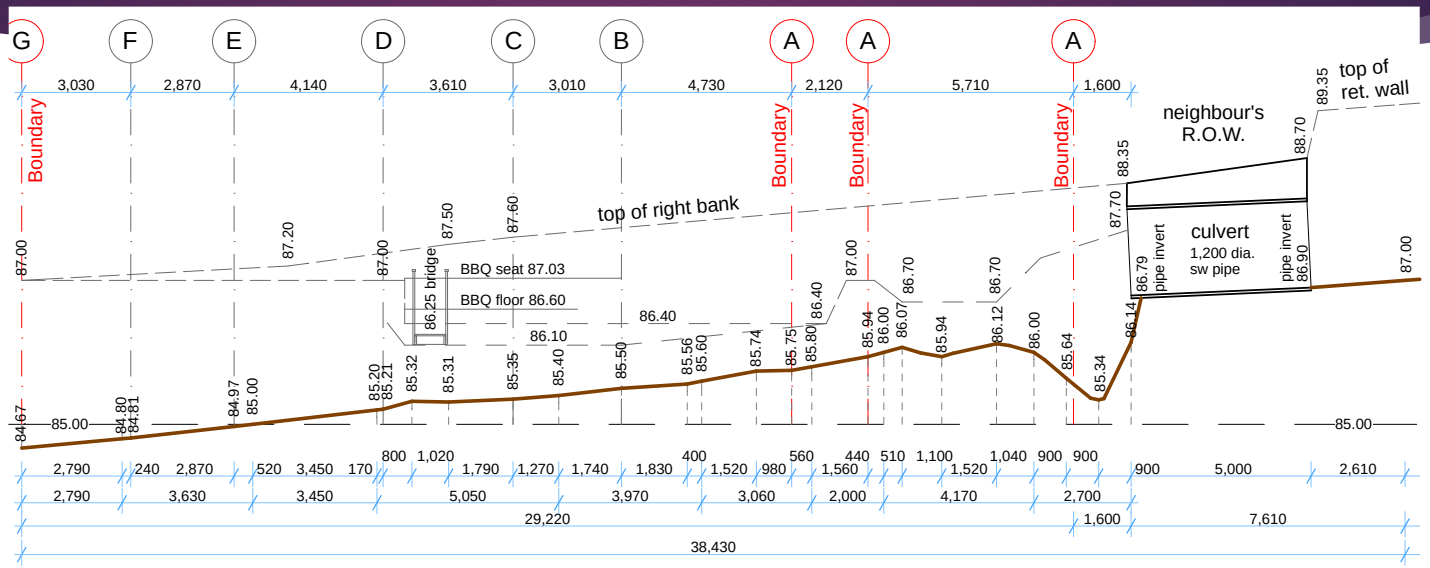
Drawn: 3/04/16
Scale: @ A1 size 1:50, @ A3 size 1:100
Job No.: 1603
Sheet No.: TS05
Revision: Rev. C

Topo Survey – 27 Elmslie Road Invert-Section: True Right Bank



Section Along Stream Invert: True Right Bank (Vertical Scale = 2:1, Horizontal scale = 1:1)

Rev	Date	Issue	By
A	14.6.17	For flood calculations and mapping	SP

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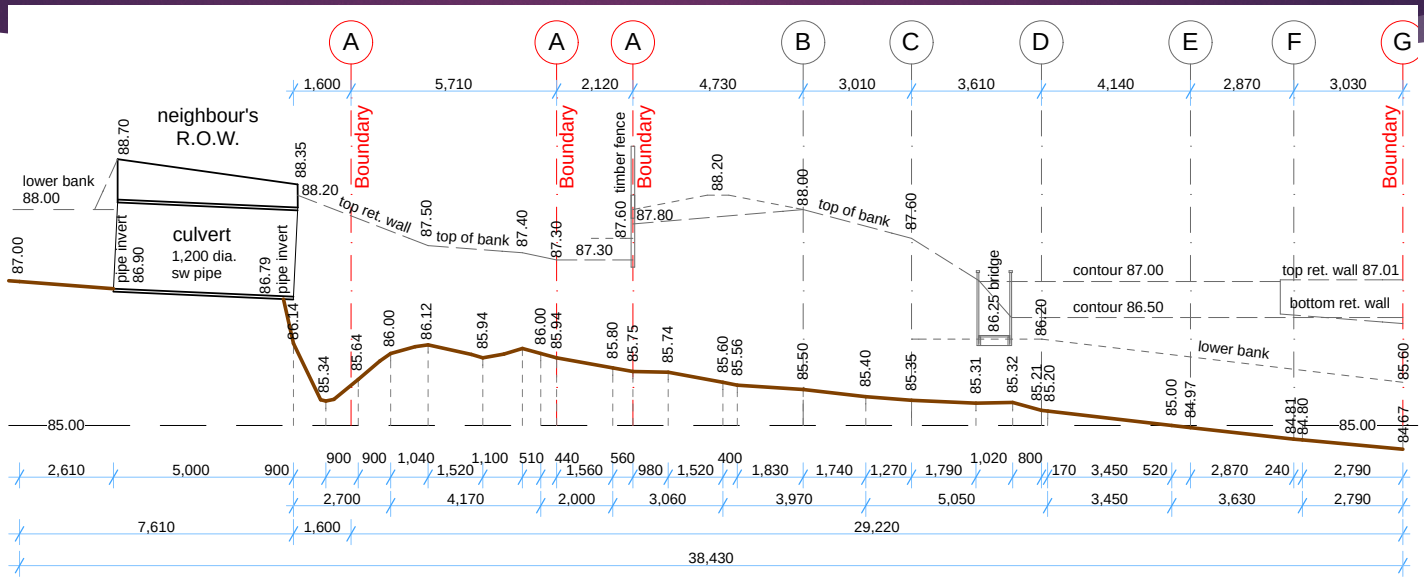
Publishing Date: 14/09/17

Scale: @ A1 size 1:100 @ A3 size

Job No: 1603/ Sheet No: TS14 Revision: Rev. A

Topo Survey – 27 Elmslie Road Invert-Section: True Left Bank



Section Along Stream Invert: True Left Bank (Vertical Scale = 2:1, Horizontal scale = 1:1)

Rev	Date	Issue	By
A	14.6.17	For flood calculations and mapping	SP

Site Address:
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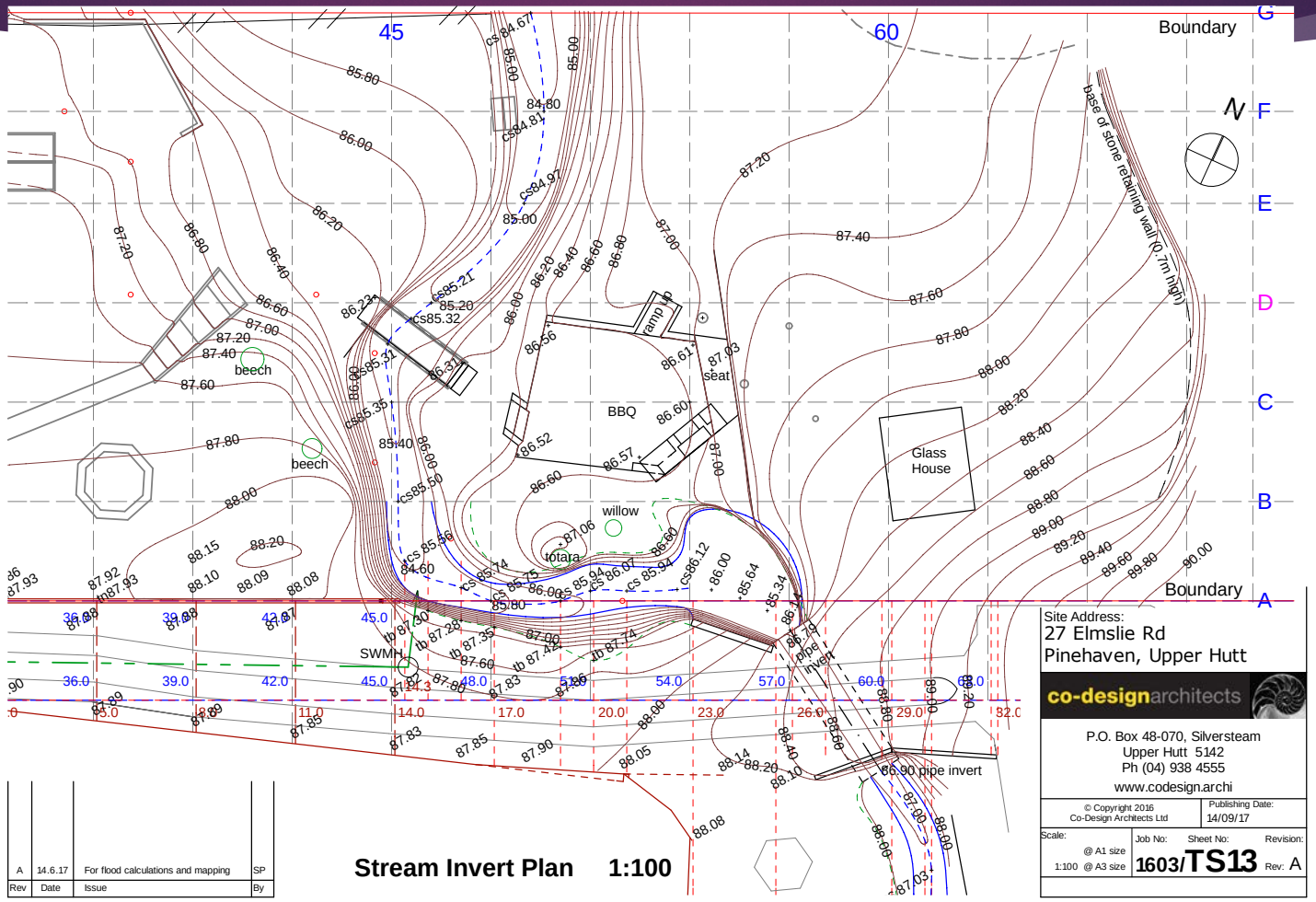
Publishing Date: 14/09/17

Scale: 1:100 @ A1 size @ A3 size

Job No: 1603/ Sheet No: TS15 Revision: Rev. A

Topo Survey – 27 Elmslie Road Stream Channel – Plan View



Data from A. Allan (GWRC) to S, Pattinson, 30.9.2014

2. The data used to create the Q100 flood hazard map came from the spreadsheet supplied on the 30th September 2014.

A. Allan (GWRC)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
0:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:15:00	0.545458	0.628528	0.367677	0.455799	0.495021	0.559581	0.400479	0.43444	0.263545	0.360254	0.367605	0.299268	0.205842	0.241496	0.300165
1:30:00	1.040384	1.209356	0.693293	0.870635	0.940647	1.075597	0.757781	0.818622	0.474846	0.672714	0.695961	0.554655	0.371998	0.434097	0.55295
1:45:00	1.443619	1.692488	0.951323	1.209791	1.300461	1.503791	1.043337	1.122553	0.624069	0.914438	0.958738	0.748549	0.490261	0.569285	0.741945
2:00:00	1.876241	2.208537	1.230375	1.573363	1.687396	1.961364	1.351325	1.451431	0.795642	1.178196	1.242042	0.961886	0.625462	0.725442	0.951503
2:15:00	2.275105	2.689552	1.483862	1.909182	2.042434	2.387337	1.632379	1.749908	0.941581	1.41468	1.500757	1.151183	0.741017	0.857765	1.135849
2:30:00	2.495016	2.97786	1.606346	2.097089	2.230501	2.64034	1.77418	1.892866	0.964157	1.514168	1.632149	1.22115	0.761737	0.875657	1.196021
2:45:00	2.534386	3.070882	1.597595	2.135655	2.250476	2.718146	1.776157	1.880099	0.868905	1.477417	1.635654	1.173219	0.69148	0.78464	1.134246
3:00:00	2.411165	2.9888	1.470085	2.03982	2.118815	2.638774	1.651773	1.726378	0.666672	1.31699	1.523609	1.018084	0.538546	0.594824	0.961492
3:15:00	2.186416	2.79798	1.268057	1.860127	1.892288	2.461726	1.448196	1.484194	0.397972	1.078802	1.339164	0.795528	0.334118	0.343763	0.718995
3:30:00	1.968389	2.610986	1.07524	1.685494	1.673612	2.288417	1.252855	1.253308	0.174216	0.8554	1.162035	0.590183	0.161213	0.137452	0.49874
3:45:00	1.757373	2.427924	0.892263	1.516124	1.463183	2.118958	1.066239	1.034506	0.010436	0.648212	0.992648	0.404211	0.029532	0.068726	0.304176
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4:15:00	1.357716	2.074073	0.559045	1.194115	1.068956	1.79208	0.721622	0.637244	0.002609	0.290776	0.679215	0.10471	0.007383	0.017181	0.01844
4:30:00	1.169871	1.903547	0.41097	1.042024	0.88632	1.634936	0.565187	0.461553	0.001305	0.147215	0.536513	0.005391	0.003692	0.008591	0.00922
4:45:00	0.990656	1.737483	0.277311	0.896312	0.714309	1.482196	0.420731	0.303829	0.000652	0.035625	0.404344	0.002696	0.001846	0.004295	0.00461
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5:15:00	0.660606	1.419424	0.064416	0.625677	0.406255	1.190652	0.174347	0.057297	0.000163	0.008906	0.177122	0.000674	0.000461	0.001074	0.001152
5:30:00	0.511386	1.267818	0.032208	0.501798	0.273114	1.052266	0.077942	0.028649	0	0.004453	0.086564	0.000337	0.000231	0.000537	0.000576
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6:30:00	0.05471	0.716731	0.002013	0.102942	0.015409	0.554409	0.00085	0.001791	0	0.000278	0.002153	0	0	0	0
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7:45:00	0.00171	0.183794	0	0.002267	0.000482	0.094797	0	0	0	0	0	0	0	0	0
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8:45:00	0.000107	0.010488	0	0.000142	0	0.00443	0	0	0	0	0	0	0	0	0
9:00:00	0	0.005244	0	0	0	0.002215	0	0	0	0	0	0	0	0	0
9:15:00	0	0.002622	0	0	0	0.001107	0	0	0	0	0	0	0	0	0
9:30:00	0	0.001311	0	0	0	0.000554	0	0	0	0	0	0	0	0	0
9:45:00	0	0.000655	0	0	0	0.000277	0	0	0	0	0	0	0	0	0
10:00:00	0	0.000328	0	0	0	0.000138	0	0	0	0	0	0	0	0	0
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11:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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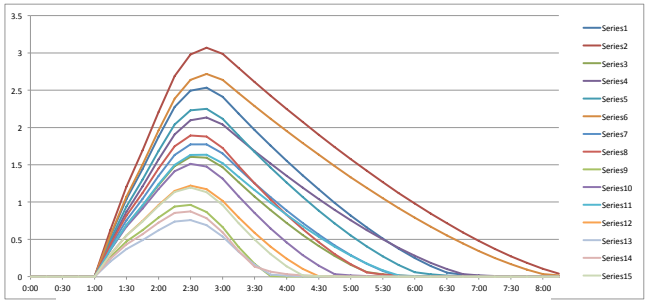
12:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2.534386	3.070882	1.606346	2.135655	2.250476	2.718146	1.776157	1.892866	0.964157	1.514168	1.635654	1.22115	0.761737	0.875657	1.196021	26.153458



100yr_CC hydrog...ts.xlsx

CC = Hydrology data includes Allowance for climate change

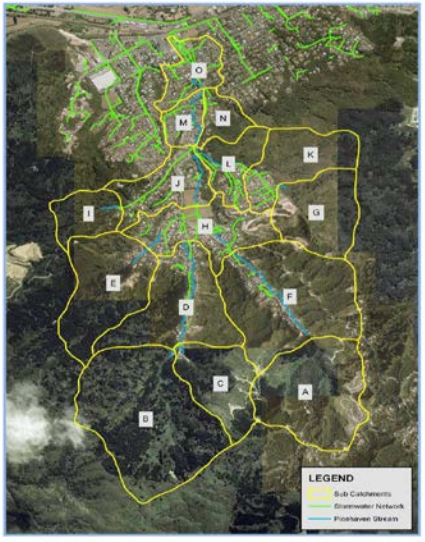


Figure 7 Pinehaven Sub catchments used for Hydraulic Modelling

Latest version of Pinehaven FMP (6 Sept 2016) appears incorrect

Says “The information does not include the effects of climate change.”

This appears to be wrong – the figures in the table match the data from A. Allan on 30 September 2014 which, according to A. Allan DOES include allowance for climate change

GWRC_Pinehaven-printing-FMP-volume-1-update-6-September-2016_Appendix E Pinehaven Hydrology Summary

Appendix E Pinehaven Hydrology Summary

The information presented on the following pages is extracted from the full Pinehaven Stream Flood Hydrology report, [published on 5th September 2008, MWH]. Reference should be made to the full hydrology report when considering hydrology within the Pinehaven catchment, and the extract within this appendix should not be relied upon in isolation.

Hydrology is one component of modelling flood risk, and alone does not provide a complete picture of flood risks within a catchment. The table below shows the results of peak flow calculations made to develop the hydraulic (flood) model at a subcatchment level. The subcatchment locations are shown in the map below.

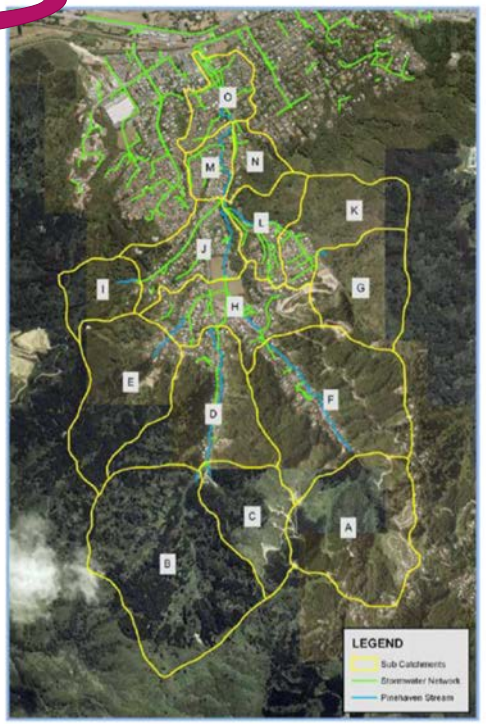
[illegible] for reference purposes, and should not be used as a substitute for detailed, site specific assessments.

The information does not include the effects of climate change.

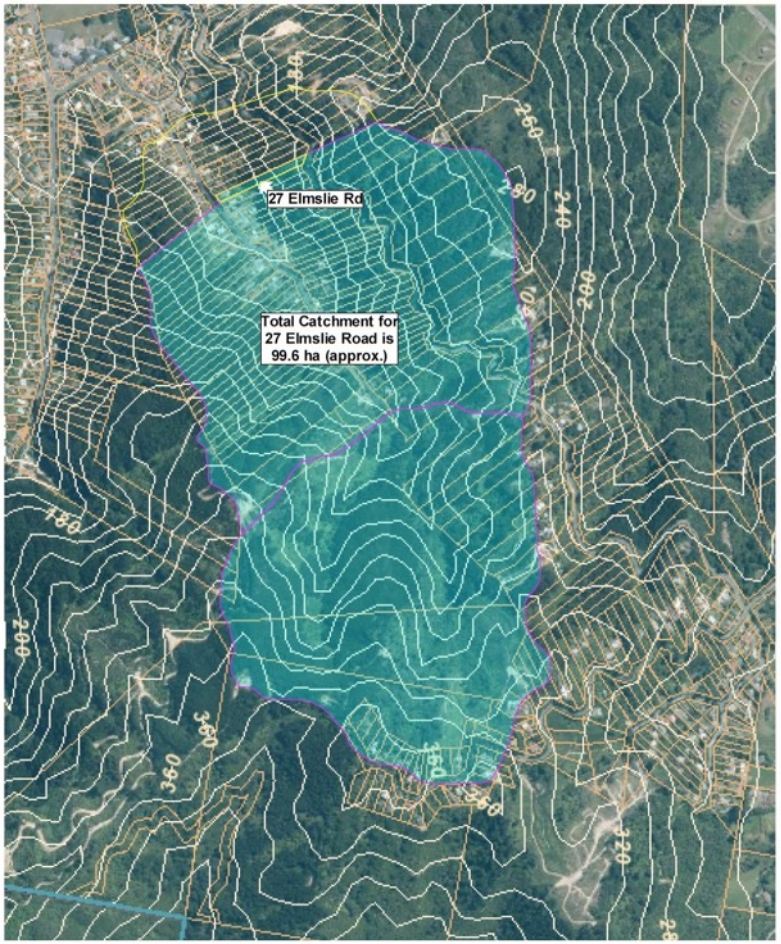
SUBCATCHMENT	PEAK FLOW (m^3/s, rounded 2dp)
A	2.54
B	3.08
C	1.61
D	2.14
E	2.26
F	2.72
G	1.78
H	1.90
I	0.97
J	1.52
K	1.64
L	1.23
M	0.77
N	0.88
O	1.20
TOTAL	26.16

1-in-100 year peak flow hydrology for the Pinehaven Stream subcatchments A-O, developed for Hydraulic Modelling of the Pinehaven Stream Floodplain. Values shown do not include the effects of climate change.

Total shows accumulated total of all flow peaks, and does not represent the flow total at the bottom of the catchment, due to time to concentration.



Catchment – 27 Elmslie Road



Catchment Area 1:10000

R J Hall – 27 Elmslie Road
4.45 cumecs – Plan View

Floodwater extent (Mannings n = 0.1 i.e. assumes very rough channel)

300mm Freeboard (contains test Mannings n = 0.3 i.e. assumes channel blocked with debris)

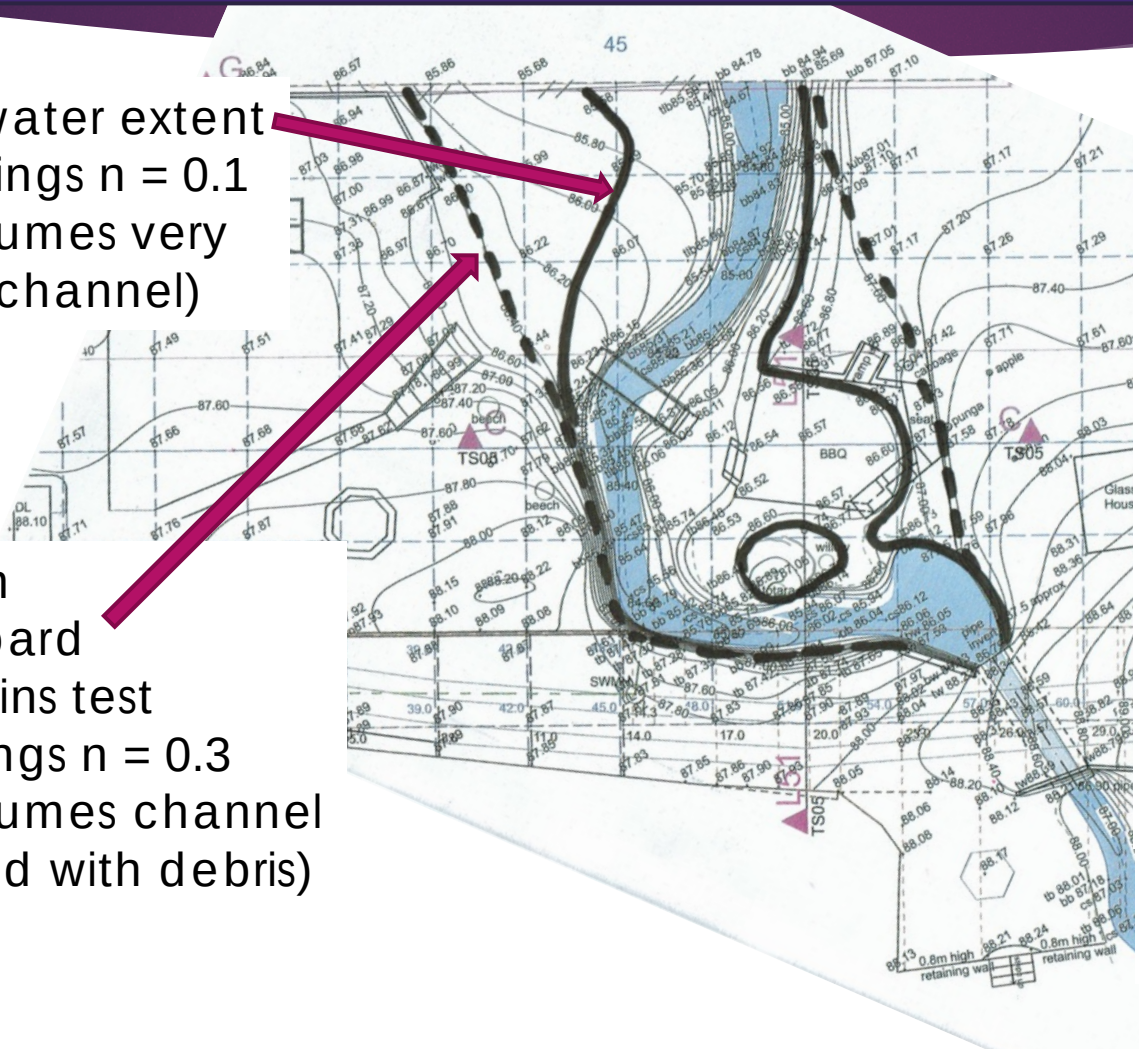
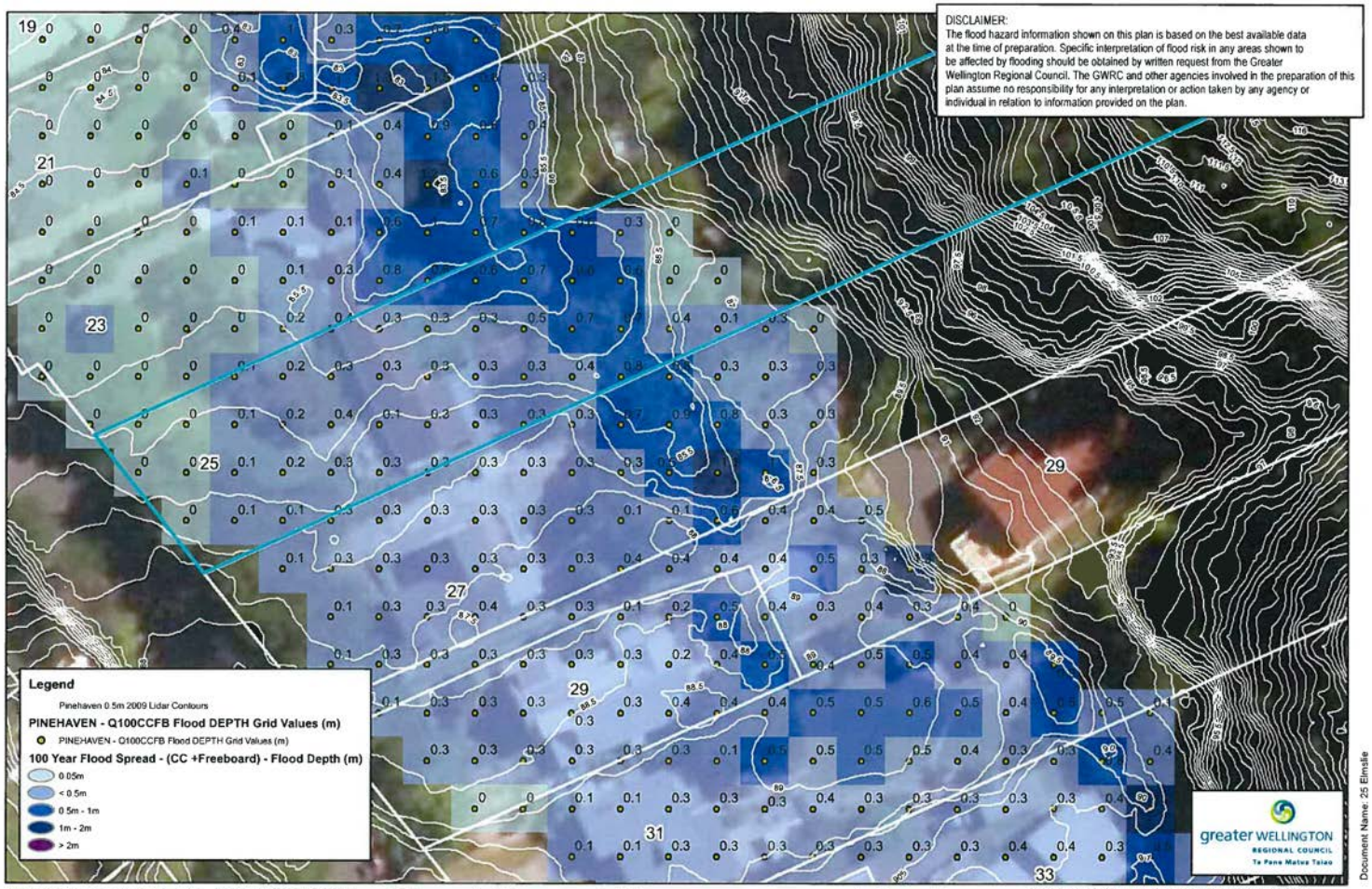


Table 3: Mannings 'n'
Paragraphs 2.3.4, 3.2.1, 4.1.6, 4.1.8, 4.1.11 and 4.2.1

Description	Value of 'n'
Circular pipes	
HDPE and uPVC	0.011
Ceramic and concrete	0.013
Culverts	
Cast-in-situ concrete	0.015
Corrugated metal	0.025
Open stream	
Straight uniform channel in earth and gravel in good condition	0.0225
Unlined channel in earth and gravel with some bends and in fair condition	0.025
Channel with rough stoney bed or with weeds on earth bank and natural streams with clean straight banks	0.03
Winding natural streams with generally clean bed but with some poolsand shoals	0.035
Winding natural stream with irregular cross-section and some obstruction with vegetation and debris	0.045
Irregular natural stream with obstruction from vegetation and debris	0.06
Very weedy irregular winding stream obstructed with significant overgrown vegetation and debris	0.1

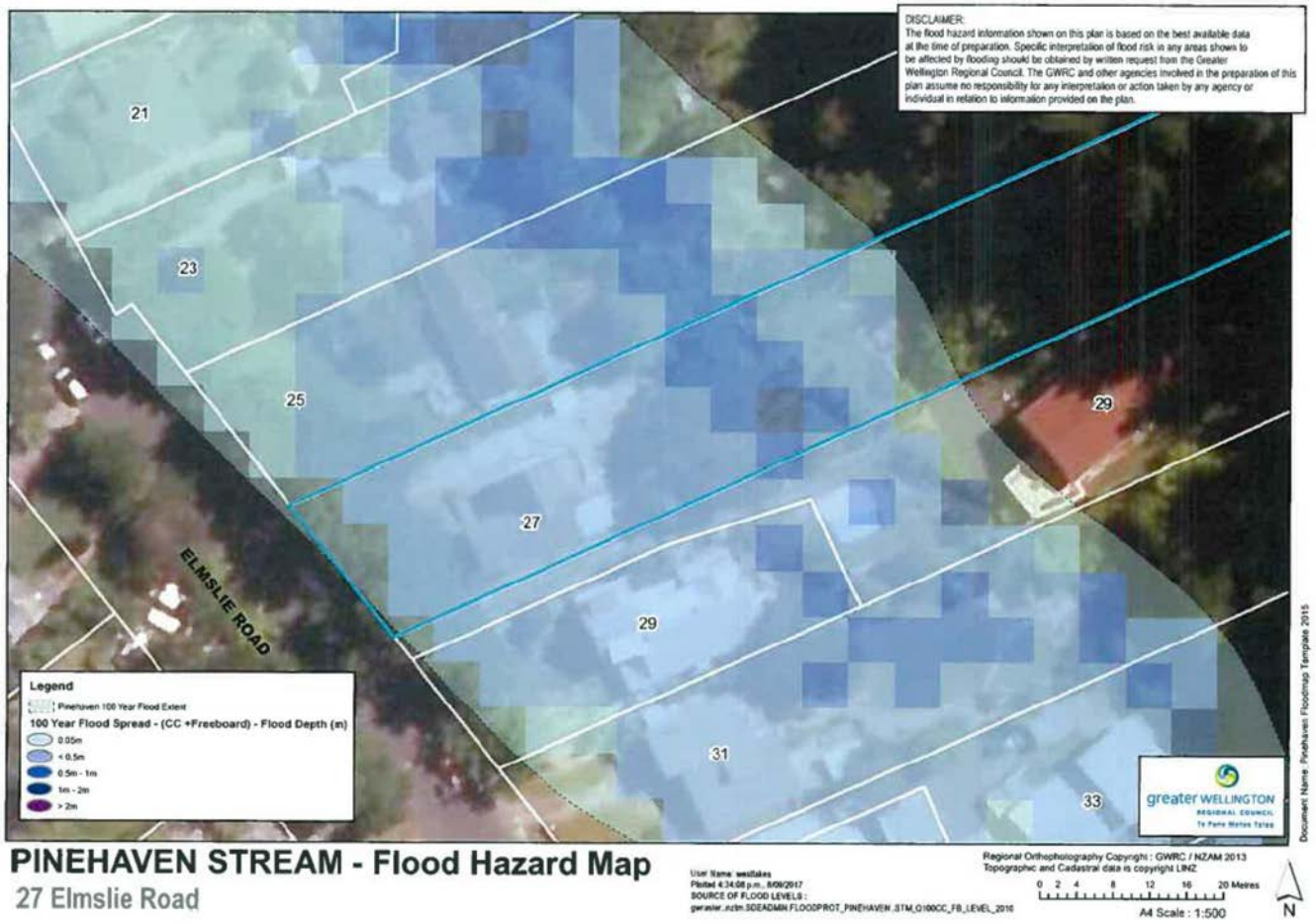
NZBC E1/VM1 Surface Water Table 3: Mannings 'n' (roughness coefficient)

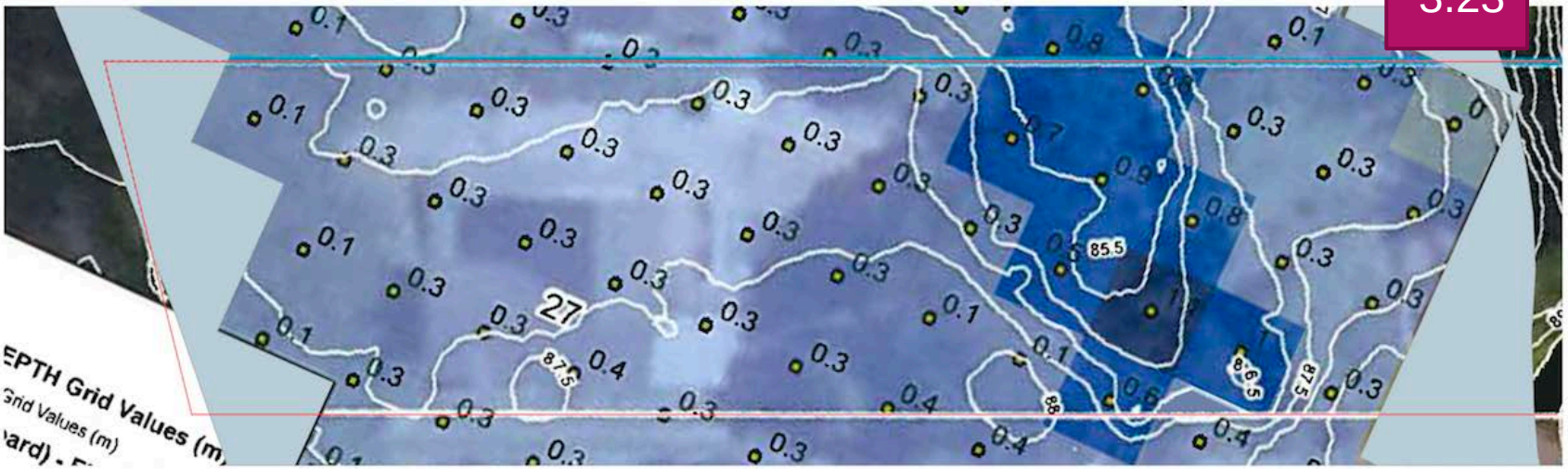
GWRC - 27 Elmslie Rd, 4.45 cumecs, 2017



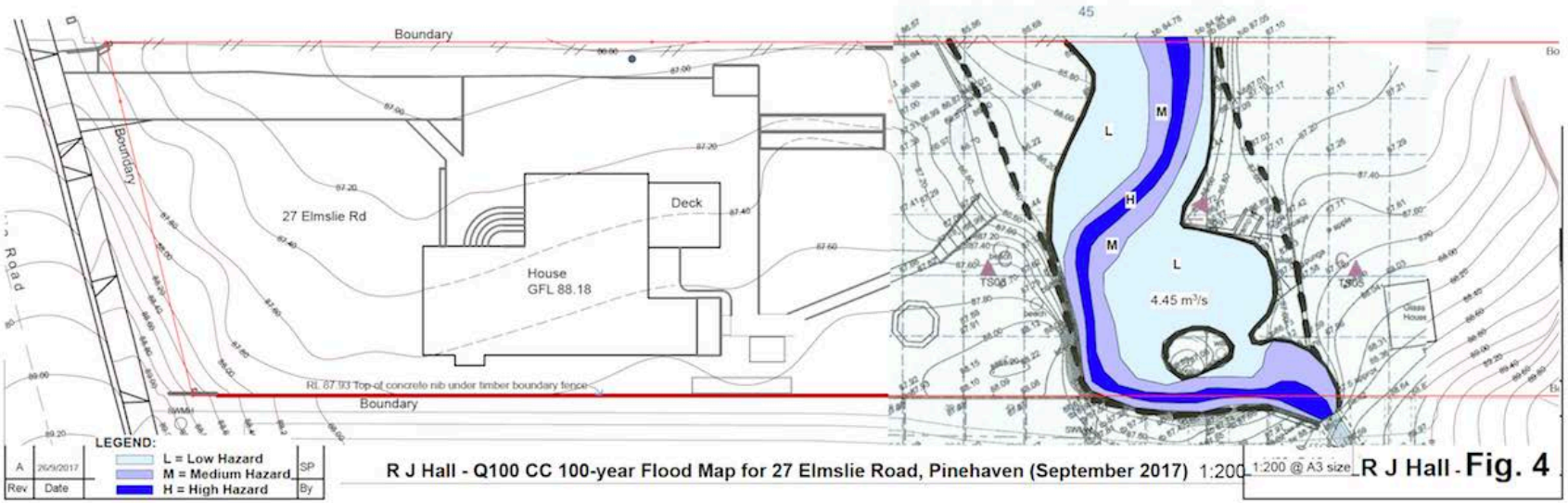
GWRC - 27 Elmslie Rd, 4.45 cumecs, 19.9.2017

Figure 1: Smoothed flood hazard map extent overlaying modelled results.



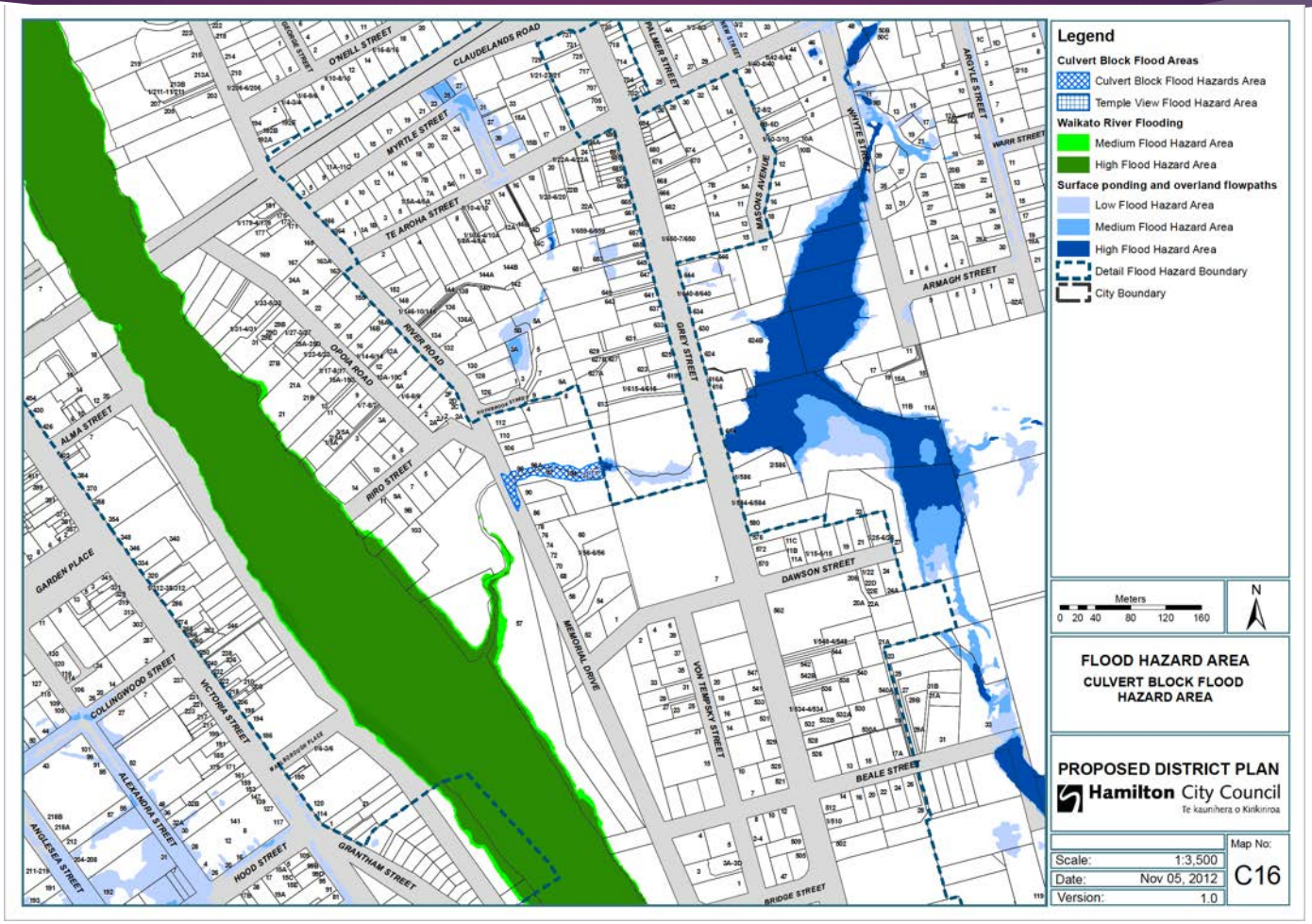


#27 GWRC - Q100 CC 100-year Flood Map for 27 Elmslie Road, Pinehaven (September 2017) 1:200 @ A3 size



R J Hall - Q100 CC 100-year Flood Map for 27 Elmslie Road, Pinehaven (September 2017) 1:200 @ A3 size R J Hall - **Fig. 4**

HAMILTON CITY COUNCIL – NSW GOVERNMENT METHOD



HAMILTON CITY COUNCIL – NSW GOVERNMENT METHOD

What do the different 'flood hazard areas' mean?

The available flood information has been split into five flood hazard areas. The differences between them reflect the nature of the information Council holds.

1. **Temple View Flood Hazard Area** (already known information)

These areas are susceptible to flooding associated with small-scale farm dams and secondary flow paths that are part of the Waipa Flood Prevention Scheme. The extent of this hazard area is based on a one in 100 year flood event. This information is already shown in the current Operative District Plan, being included as part of the Environmental Protection Overlay (EPO).

2. **Culvert Block Flood Hazard Area** (already known information)

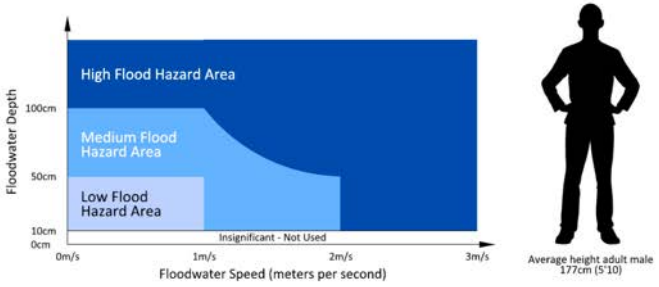
The Culvert Block Flood Hazard Area applies upstream of significant culverts along the gully system. These represent the maximum effect of a culvert becoming blocked whereby water backs up the gully until it eventually flows over the accessway or road above the culvert. This hazard area is already shown in the current Operative District Plan, being included as part of the EPO.

3-5.High, Medium and Low Flood Hazard Areas (new information)

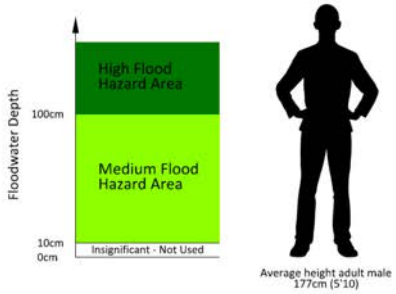
These areas have been identified from computer modelling as part of Council's ongoing Catchment Management Plan programme. The areas have been identified on maps which have been produced by modelling and flood hazard experts.

This modelling creates a picture of what flooding may look like from an extreme rainfall event (i.e. a 1 in 100 year event). Two sets of modelling are used, one for the Waikato River corridor dealing with river flooding and another for sub-catchments in the city dealing with overland flowpaths and ponding flooding. The land affected has been divided and mapped into high, medium and low categories, according to the different flood water depths and velocities that the models show could occur in an extreme rainfall event.

The flood hazard areas for **overland flowpath and ponding** flooding elsewhere in the City are defined by the following depths and velocities.



Flood hazard areas in the **Waikato River corridor** are defined using the following depths.



Depth and velocity (speed) are the key factors in determining the effect of flood water on people and property. This is summarised in the table below:

Floodwater Depth	Floodwater Velocity (metres per second)	Depth x Velocity	Effect on people and property
0 to 10cm	Any velocity	-	At this depth, surface water is unlikely to be a hazard to people and unlikely to cause damage to property.
10 to 50cm	<1.0m/s	-	At this depth and velocity flood hazards are normally traversable by emergency vehicles and damage to property is minor to moderate. People can usually stand but more vulnerable people can be more significantly affected (e.g. children, elderly, injured, physically disabled). Scour/erosion of building foundations are unlikely to occur.
50 to 100cm	<2.0m/s	-	At this depth and velocity the stability of people in water is at risk.. Damage to property can be financially significant.
>100cm	>2.0m/s	>1	At velocities greater than 2 metres per second the stability of buildings and their foundations can be significantly affected, as the force of the water can scour building supports. At depths greater than 1m significant damage to building and risk to life is very likely.

Note
The effect on property depends in part on the floor height of a building. Where the water is **not flowing** (i.e. ponding) a building with floor heights above the height of the flood water and an adequate freeboard is unlikely to suffer significant damage, whereas a building with floor heights below the height of the water is likely to suffer inundation damage (e.g. water and silt damage).

How GWRC, UHCC and their consultants turn a puddle into a flood hazard:

1. Add 300mm freeboard to puddle (average depth 25mm), colour the freeboard blue and call the freeboard water.
   (It will cover the entire flat part of the property.)

2. Deduct 100mm (from the edge of the freeboard) and show 300mm floodwater on the flood maps over the entire flat part of the property, or

3. Deduct 100mm (from the top of the freeboard) but still show 300mm floodwater on the flood maps over the entire flat part of the property.

R J Hall – Expert Evidence Key Points

#12 – The Pattinson's support the concept of flood hazard plans

#12 – The Upper Hutt City Council Flood Maps do not accurately define areas of hazard in any meaningful form and need to be revised to do so

#19 – 4.45 cumec including 300 freeboard is contained within the primary channel

#19 – Mapping in the manner [GWRC] have is in my view wrong and … creating a misleading impression

#22 & 23 – There could not possibly be1.00 cumec of overland flow on the land

#27 – I estimate the depth of overland flow … in the order of 11 to 13 mm … by no stretch of the imagination could we describe these conditions as hazardous

#28 - It is difficult to see how 300 freeboard is necessary at all on 27 Elmslie Road … on the berm area

#30 – Ponding … is not an accurate description of what is likely to be occuring on that land and accordingly creates a misleading impression

#32 – Freeboard applied in this way creates a very confusing and misleading impression of the nature of the flooding present if at all and fails to clarify the scale of the hazard in any meaningful way. In reality it has the effect of concealing the actual flood conditions that may be present at a site and fails to quantify the true nature of the flood hazards that may be present

#33d – The situation on the Pattinson's property and the deficiencies evident in both the UHCC and GWRC Flood Hazards Maps are likely to be present elsewhere in the catchment … a critical review … needs to be undertaken to ensure what is eventually produced serves the purpose of presenting Flood Hazard information across the catchment in an informative and accurate way that can readily be understood by the community.

… We ask the Commissioner for all of the above