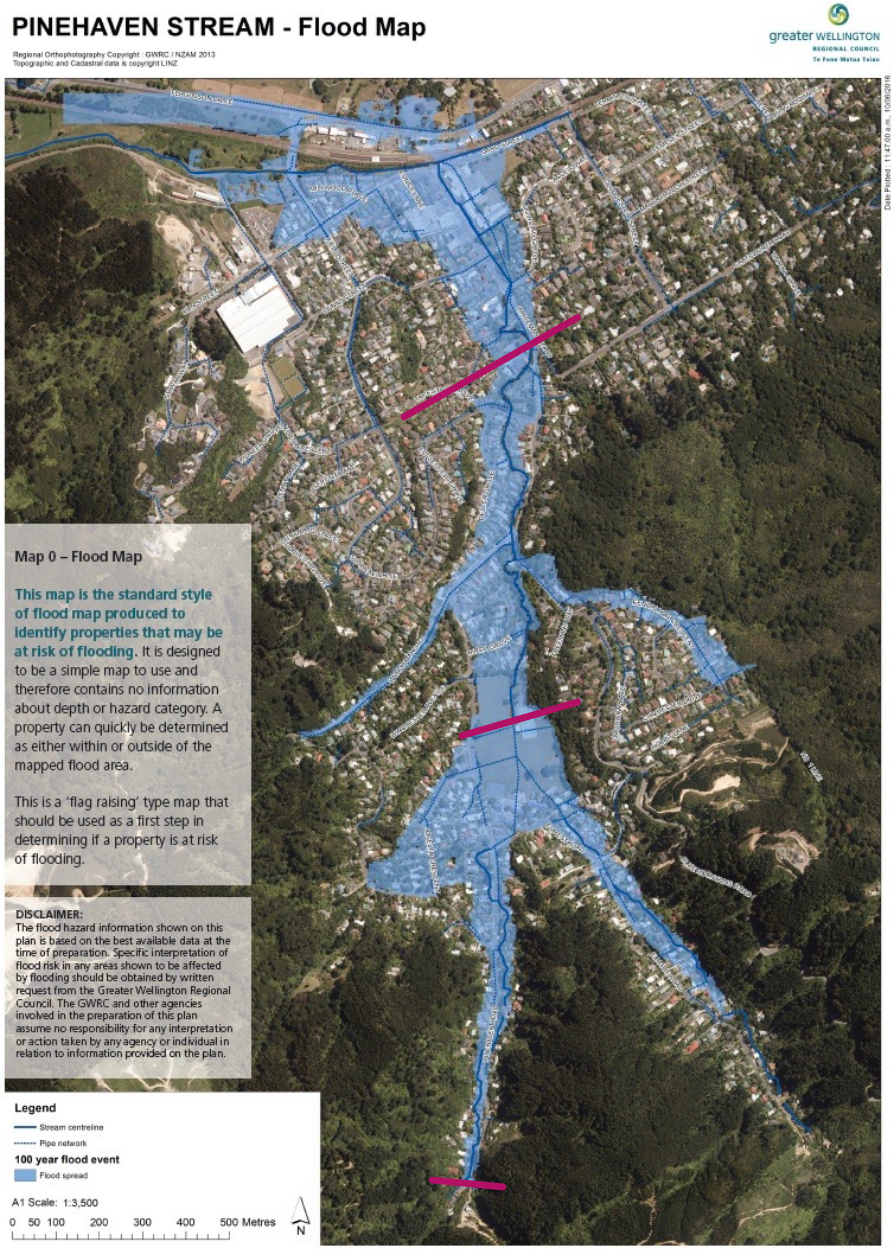
Case Studies 2 – 4 (Dec 2014)



Case Study 2: Dunns Street

Case Study 3: Pinehaven Reserve

Case Study 4: Pinehaven Road

Pinehaven Stream Flood Hazard Assessment_May 2010 Rev E_Vol 1_Figure 14, p24

Case Study 2: Dunns Street

GWRC Pinehaven Stream Flood Calculations for All Sub-Catchments (includes Climate Change)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	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	
0	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	
0	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	
0	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	
0	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	
0	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	
0	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	
0	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	
0	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	
0	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	
0	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	
0	1.553692	2.248911	0.719882	1.352245	1.261454	1.953468	0.888928	0.828751	0.005218	0.459124	0.831507	0.240721	0.014766	0.034363	0.140742	
0	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	
0	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	
0	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	
0	0.820661	1.576048	0.160478	0.757372	0.553877	1.334036	0.289741	0.167272	0.000326	0.017813	0.28396	0.001348	0.000923	0.002148	0.002305	
0	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	
0	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	
0	0.374161	1.121461	0.016104	0.386452	0.156899	0.919132	0.0068	0.014324	0	0.002227	0.017222	0.000168	0.000115	0.000268	0.000288	
0	0.25051	0.980617	0.008052	0.280573	0.061634	0.79154	0.0034	0.007162	0	0.001113	0.008611	0	0	0.000134	0.000144	
0	0.142749	0.845588	0.004026	0.185439	0.030817	0.66983	0.0017	0.003581	0	0.000557	0.004305	0	0	0	0	
0	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	
0	0.027355	0.594464	0.001007	0.036274	0.007704	0.445769	0.000425	0.000895	0	0.000139	0.001076	0	0	0	0	
0	0.013677	0.479298	0.000503	0.018137	0.003852	0.344523	0.000213	0.000448	0	0	0.000538	0	0	0	0	
0	0.006839	0.371868	0.000252	0.009069	0.001926	0.25147	0.000106	0.000224	0	0	0.000269	0	0	0	0	
0	0.003419	0.272996	0.000126	0.004534	0.000963	0.167694	0	0.000112	0	0	0.000135	0	0	0	0	
0	0.00171	0.183794	0	0.002267	0.000482	0.094797	0	0	0	0	0	0	0	0	0	
0	0.000855	0.105889	0	0.001134	0.000241	0.035438	0	0	0	0	0	0	0	0	0	
0	0.000427	0.041952	0	0.000567	0.00012	0.017719	0	0	0	0	0	0	0	0	0	
0	0.000214	0.020976	0	0.000283	0	0.00886	0	0	0	0	0	0	0	0	0	
0	0.000107	0.010488	0	0.000142	0	0.00443	0	0	0	0	0	0	0	0	0	
0	0	0.005244	0	0	0	0.002215	0	0	0	0	0	0	0	0	0	
0	0	0.002622	0	0	0	0.001107	0	0	0	0	0	0	0	0	0	
0	0	0.001311	0	0	0	0.000554	0	0	0	0	0	0	0	0	0	
0	0	0.000655	0	0	0	0.000277	0	0	0	0	0	0	0	0	0	
0	0	0.000328	0	0	0	0.000138	0	0	0	0	0	0	0	0	0	
0	0	0.000164	0	0	0	0	0	0	0	0	0	0	0	0	0	
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	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**

Figure 6-4 shows the 100-year ARI design hydrographs for Pinehaven Reserve and Chatsworth Rd. The one and two-hour events for each are given.

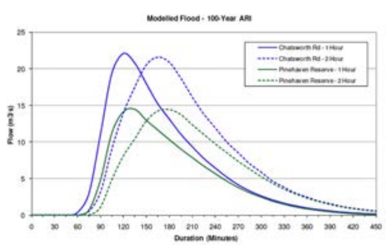


Figure 6-3: Design 100-year ARI Hydrographs

GWRC Pinehaven Stream Flood Hydrology 4 Nov 2008_p48

Dunns St

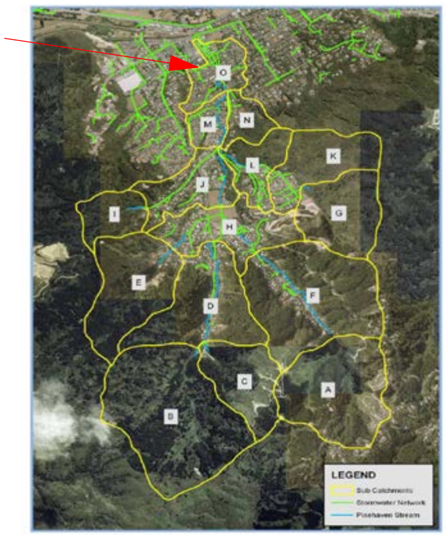


Figure 7 Pinehaven Sub catchments used for Hydraulic Modelling

PRELIMINARY

"The 1/100 year peak values given by GWRC for Chatsworth Road are:

21.2 m3/s for current land use
23.4 m3/s for current land use with climate change
24.2 m3/s for future development"

(from GWRC letter to Stephen Pattinson, 13 August 2014, p7)

Based on information supplied by GWRC
the 1/100 yr flow at Dunns Street is approx.:
23.4 + say 2/3 x 1.2 (sub-catch O) **~ 25 m^3/s**

(which includes climate change)

#Architect Full Address
PHONE: #Architect Phone Number
FAX: #Architect Fax
#Architect E-mail
#Architect Web

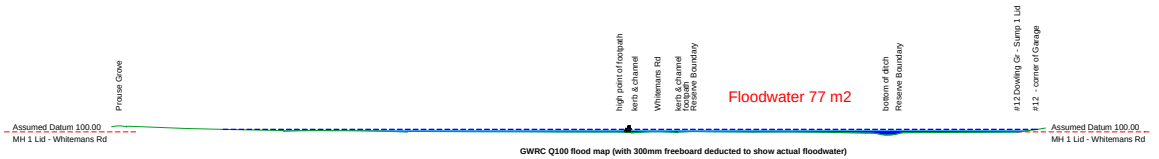
CASE STUDY 2: based on GWRC CALCULATIONS
Cross-Section of GWRC Calculations
Dunns Street (bottom of catchment)

SHEET TITLE: Case Study 2_Calcs
REVISION #:
ISSUED: 23/12/14
PROJECT #: #Pln
SHEET 3

Case Study 2: Dunns Street

GWRC Q100 Flood Map at Dunns St 1:2000

The red mark is where Keith Thomas said the 1976 100-year flood came to on his property at 44 Whitemans Rd (which was before the stormwater drainage network was upgraded to 50-year storm capacity, meaning a 100-year flood today should be less than this mark, not 60m beyond it as shown in this GWRC Q100 flood map)



Dunns St _Cross-Section A-A 1:1000

Assuming a flow velocity of 1m/s, GWRC's flood map at Dunns St is showing about **77 m^3/s** (after deducting 300mm freeboard), which is 3 times GWRC's calculated flow of approximately 25 m^3/s.

PRELIMINARY

#Architect Full Address
PHONE: #Architect Phone Number
FAX: #Architect Fax
#Architect E-mail
#Architect Web

CASE STUDY 2: based on GWRC FLOOD MAP
Cross-Section of GWRC Flood Map
Dunns Street (bottom of catchment)

SHEET TITLE: Case Study 2_Maps
REVISION #:
ISSUED: 23/12/14
PROJECT #: #Pln
SHEET 4

Case Study 3: Pinehaven Reserve

GWRC Pinehaven Stream Flood Calculations for All Sub-Catchments (includes Climate Change)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	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	
0	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	
0	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	
0	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	
0	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	
0	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	
0	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	
0	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	
0	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	
0	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	
0	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	
0	1.553692	2.248911	0.719882	1.352245	1.261454	1.953468	0.888928	0.828751	0.005218	0.459124	0.831507	0.240721	0.014766	0.034363	0.140742	
0	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	
0	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	
0	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	
0	0.820661	1.576048	0.160478	0.757372	0.553877	1.334036	0.289741	0.167272	0.000326	0.017813	0.28396	0.001348	0.000923	0.002148	0.002305	
0	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	
0	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	
0	0.374161	1.121461	0.016104	0.386452	0.156899	0.919132	0.0068	0.014324	0	0.002227	0.017222	0.000168	0.000115	0.000268	0.000288	
0	0.25051	0.980617	0.008052	0.280573	0.061634	0.79154	0.0034	0.007162	0	0.001113	0.008611	0	0	0.000134	0.000144	
0	0.142749	0.845588	0.004026	0.185439	0.030817	0.66983	0.0017	0.003581	0	0.000557	0.004305	0	0	0	0	
0	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	
0	0.027355	0.594464	0.001007	0.036274	0.007704	0.445769	0.000425	0.000895	0	0.000139	0.001076	0	0	0	0	
0	0.013677	0.479298	0.000503	0.018137	0.003852	0.344523	0.000213	0.000448	0	0	0.000538	0	0	0	0	
0	0.006839	0.371868	0.000252	0.009069	0.001926	0.25147	0.000106	0.000224	0	0	0.000269	0	0	0	0	
0	0.003419	0.272996	0.000126	0.004534	0.000963	0.167694	0	0.000112	0	0	0.000135	0	0	0	0	
0	0.00171	0.183794	0	0.002267	0.000482	0.094797	0	0	0	0	0	0	0	0	0	
0	0.000855	0.105889	0	0.001134	0.000241	0.035438	0	0	0	0	0	0	0	0	0	
0	0.000427	0.041952	0	0.000567	0.00012	0.017719	0	0	0	0	0	0	0	0	0	
0	0.000214	0.020976	0	0.000283	0	0.00886	0	0	0	0	0	0	0	0	0	
0	0.000107	0.010488	0	0.000142	0	0.00443	0	0	0	0	0	0	0	0	0	
0	0	0.005244	0	0	0	0.002215	0	0	0	0	0	0	0	0	0	
0	0	0.002622	0	0	0	0.001107	0	0	0	0	0	0	0	0	0	
0	0	0.001311	0	0	0	0.000554	0	0	0	0	0	0	0	0	0	
0	0	0.000655	0	0	0	0.000277	0	0	0	0	0	0	0	0	0	
0	0	0.000328	0	0	0	0.000138	0	0	0	0	0	0	0	0	0	
0	0	0.000164	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
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0	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**

Figure 6-4 shows the 100-year ARI design hydrographs for Pinehaven Reserve and Chatsworth Rd. The one and two-hour events for each are given.

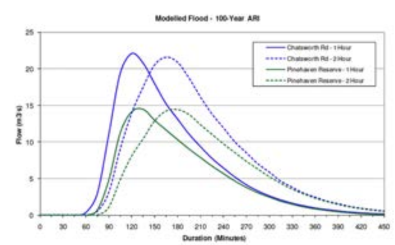


Figure 6-3: Design 100-year ARI Hydrographs

GWRC Pinehaven Stream Flood Hydrology 4 Nov 2008_p48

Pinehaven Reserve

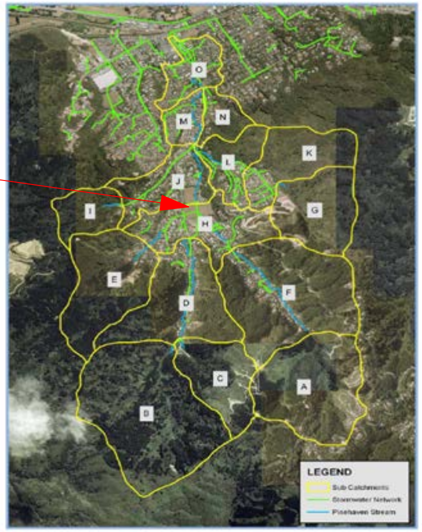


Figure 7 Pinehaven Sub catchments used for Hydraulic Modelling

PRELIMINARY

"At the Pinehaven Reserve the 1 in 100-year flows from the hydrological model are:

14.46 m3/s for the 1-hour duration
14.42 m3/s for the 2-hour duration

These flows are the output from the hydrological model ... "
[so they do not include any allowance for climate change]

(from GWRC letter to Stephen Pattinson, 16 December 2014, p1)

Based on information supplied by GWRC
the 1/100 yr flow at Pinehaven Reserve is approx.:
total of subcatchments A to H **~ 16 m^3/s**

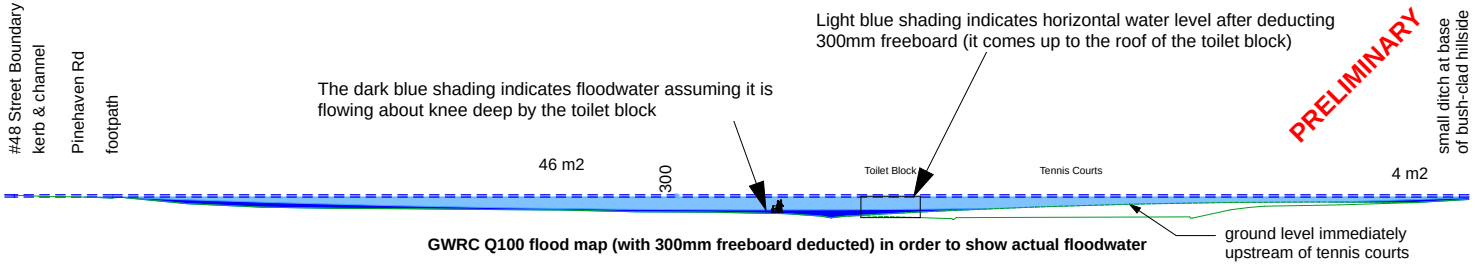
(which includes allowance for climate change)

CASE STUDY 3: based on **GWRC CALCULATIONS**
Cross-Section of GWRC Calculations
Pinehaven Reserve (middle of catchment)

#Architect Full Address
PHONE: #Architect Phone Number
FAX: #Architect Fax
#Architect E-mail
#Architect Web

SHEET TITLE: Case Study 3_Calcs
REVISION #:
ISSUED: 23/12/14
PROJECT #: #Pin
SHEET 5

Case Study 3: Pinehaven Reserve



Cross-Section at Pinehaven Reserve 1:500

GWRC Q100 Flood map at Pinehaven Reserve 1:2000

Assuming a flow velocity of 1m/s, GWRC's flood map at Pinehaven Reserve is showing about

50 m^3/s

(after deducting 300mm freeboard), which is 3 times GWRC's calculated flow of approximately 16 m^3/s.

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CASE STUDY 3: based on GWRC FLOOD MAP

Cross-Section of GWRC Flood Map
Pinehaven Reserve (middle of catchment)

SHEET TITLE: Case Study 3_Maps
REVISION #:
ISSUED: 23/12/14
PROJECT #: #Pin

SHEET 6

Case Study 4: Top of Pinehaven Rd

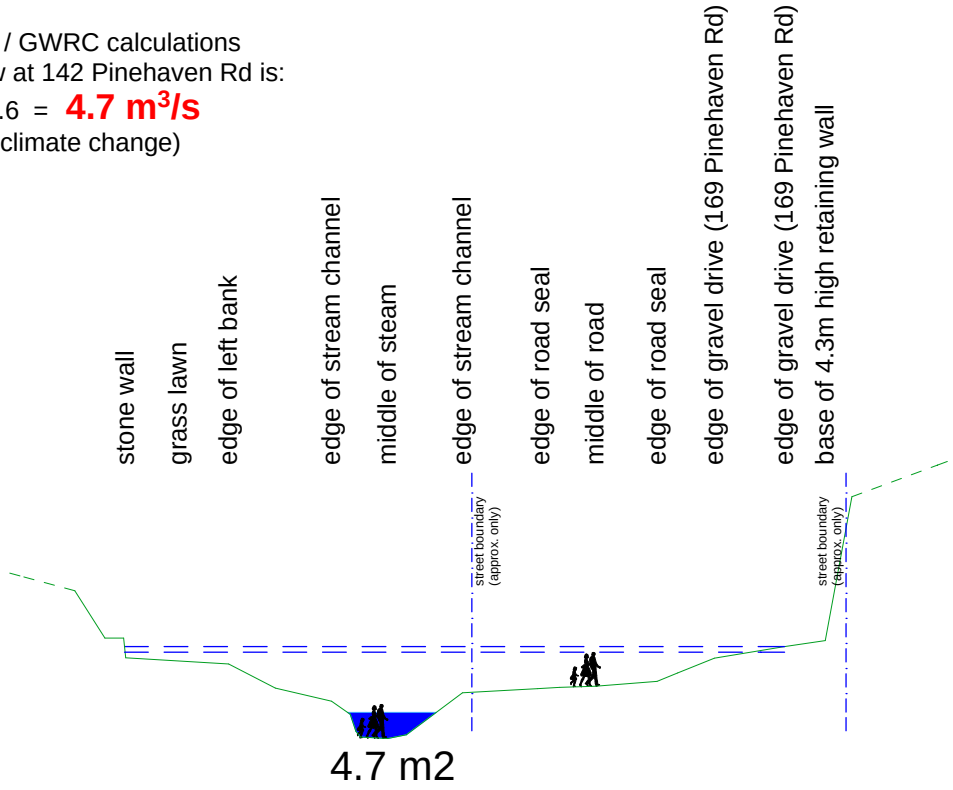
GWRC Pinehaven Stream Flood Calculations for All Sub-Catchments (includes Climate Change)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
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

GWRC spreadsheet shows the discharge for sub-catchments B + C = 4.6 m^3/s (which includes climate change).

Based on MWH / GWRC calculations
the 1/100 yr flow at 142 Pinehaven Rd is:
B + C = 3.1 + 1.6 = **4.7 m^3/s**
(which includes climate change)

PRELIMINARY



Cross-Section at 142 Pinehaven Road 1:200

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CASE STUDY 4: based on GWRC CALCULATIONS
Cross-Section of GWRC Calculations
142 Pinehaven Rd (top of catchment)

SHEET TITLE: Case Study 4_Calcs
REVISION #:
ISSUED: 23/12/14
PROJECT #: #Pin
SHEET 7

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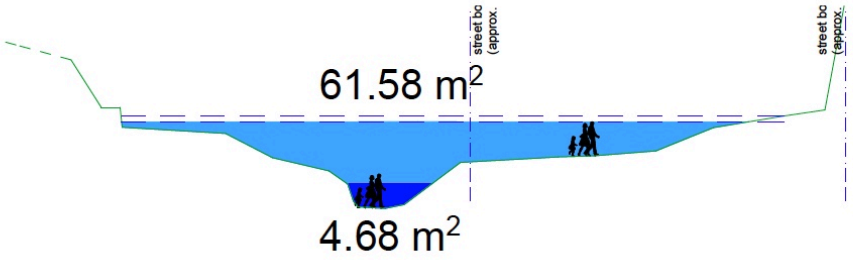
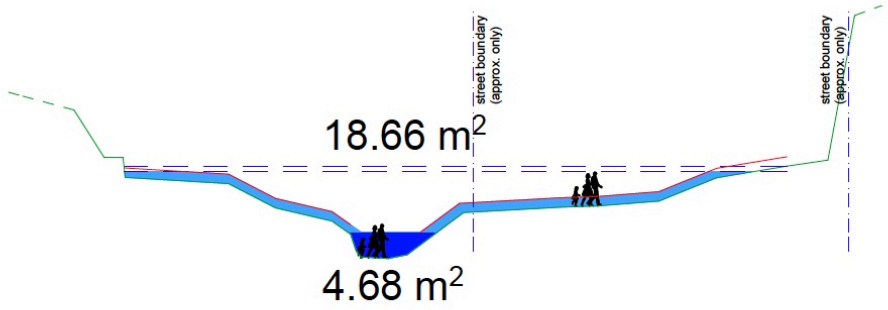
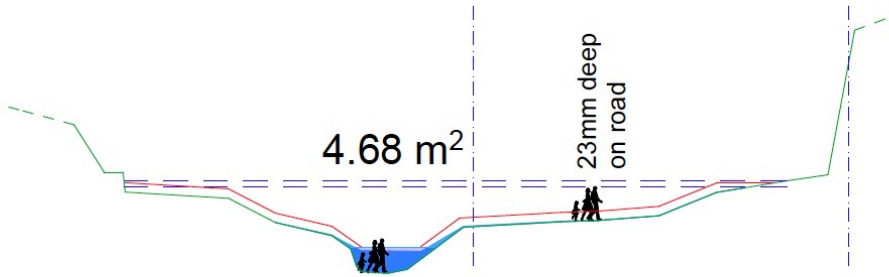
Case Study 4: Top of Pinehaven Rd



Cross-Section at 142 Pinehaven Road 1:200





Pinehaven Rd Aerial 1:1000

Assuming a flow velocity of 1m/s, GWRC's flood map at 142 Pinehaven Rd is showing about

~19 m³/s

(after deducting freeboard), which is 3 times GWRC's calculated flow of approximately 4.7 m³/s.

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CASE STUDY 4: based on GWRC FLOOD MAP

Cross-Section of GWRC Flood Map
142 Pinehaven Rd (top of catchment)

SHEET
SHEET TITLE: Case Study 4_Maps
REVISION #:
ISSUED: 23/12/14
PROJECT #: #Pin

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