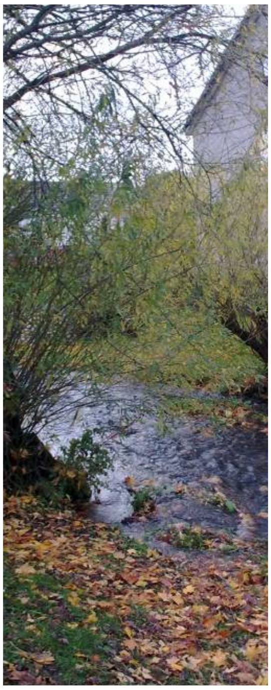  

Mill Burn Flood Risk Review

April 2011

The Highland Council

Mott MacDonald

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Content

Executive Summary

The Mill Burn is a small steep watercourse with much of its length located in the urban area of Inverness. This report considers the flood risk associated with the Mill Burn and its main upper tributaries in Inverness. For this study an existing one-dimensional ISIS hydraulic model was reviewed and updated in order that flood risk maps could be produced for the entire modelled length.

This study suggests that three areas are potentially at risk of flooding when considering flood events up to the 0.5% AEP plus climate change flood. These are the Castle Heather area, along Diriebught Road and the Harbour Road area. Flood alleviation measures have been previously proposed for the Mill Burn in these areas and were modelled and reviewed during the current study. In detail the following works are proposed:

Castle Heather Area: The left bank of the Temple Burn is predicted to overtop during the 50% AEP flood event. To alleviate flooding in the Castle Heather area, it is proposed to construct a flood defence wall approximately 0.9m in height along the left bank of Temple Burn from downstream of Castle Heather Road to Old Edinburgh Road.

Along Diriebught Road: Overtopping of the left bank of the Mill Burn is predicted to occur during the 20% AEP flood event. To alleviate flooding in this area a flood defence wall is proposed along the left bank of the Mill Burn from approximately 80m downstream of Culcabock Road bridge with a height of approximately 0.54m and follow the left bank to the area of Millburn Academy where the height would be approximately 1.0m. To maintain access, it would not be possible to construct the wall in front of Diriebught House. A flood relief channel behind Diriebught House is therefore proposed to bypass this specific area with a control structure within the existing Mill Burn channel to control downstream discharges.

Near the Harbour Road Bridge overtopping of the left bank of the Mill Burn is predicted to occur during the 4% AEP flood event. Minor embankment alterations could increase this to the 2%AEP. To convey higher flows the embankment levels would need to be increased, the channel modified or the Harbour Road culvert increased in capacity. Further option investigation would be required to confirm works in this area.

Glossary

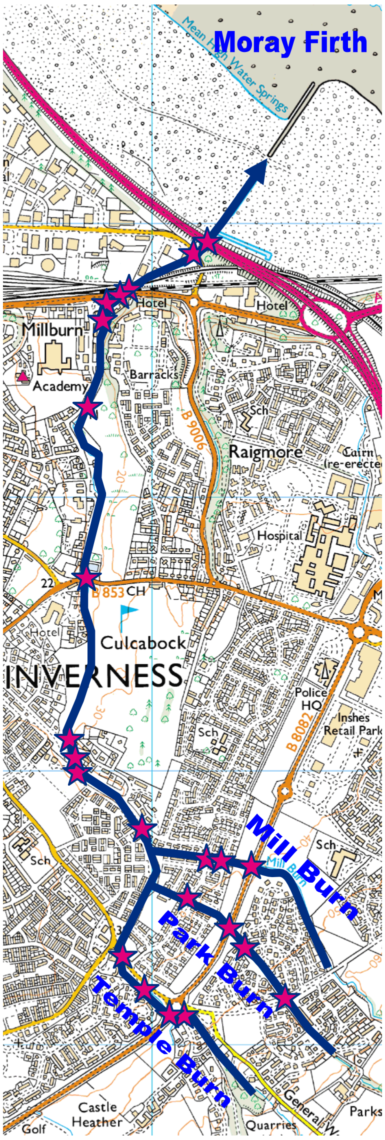
AEP	Annual Exceedance Probability. A flood with a 1% AEP has a statistical probability of being reached or exceeded in each year of 1%. This is often referred to as the "1 in 100 year flood". It should be noted however, that the occurrence of a flood event does not change the statistical probability of another flood occurring. 0.5%AEP = 1 in 200 year flood 1%AEP = 1 in 100 year flood 2%AEP = 1 in 50 year flood 4%AEP = 1 in 25 year flood 10%AEP = 1 in 10 year flood 20%AEP = 1 in 5 year flood 50%AEP = 1 in 2 year flood
FEH	The Flood Estimation Handbook is a Centre for Ecology and Hydrology publication, giving guidance on rainfall and river flood frequency estimation in the UK.
Functional floodplain	The functional floodplain is defined in SPP as generally having greater than 0.5% probability of flooding in any year (less than a 1 in 200 year return period)
ISIS	Industry standard computer hydraulic modelling software, developed by Halcrow and HR Wallingford
mAOD	Levels in meters above Ordnance Datum (Newlyn)
One-dimensional hydraulic model.	A numerical model in which water levels only change along the river, i.e. water levels across the channel are assumed to be the same.
THC	The Highland Council

The report is a factual assessment of flood risk based on the existing available statistical information. The flood risk assessment has been based on the information available at the time of study, to be used to inform relevant parties, and to assist in the planning process. Mott MacDonald is not liable for, and will not give a warranty against, actual flooding of the site, or damage as a result of said flooding.

1. Introduction

1.1 The Mill Burn

Figure 1.1: Mill Burn[1]



★ Bridge
— Watercourse

The Mill Burn flows in a north-westerly direction from the Drummossie Muir hillside through Inverness and into the Moray Firth. It is a steep watercourse with a gradient of approximately 1 in 40 with two main tributaries Park Burn and Temple Burn.

The watercourse has been significantly modified, with the majority of the channel having being straightened with uniform cross-sectional profiles. There are a number of bridges and some sections of the burns have long culverted lengths. Earth embankments have been constructed along some reaches but these do not constitute formal flood alleviation measures.

As the burns are entrenched deeply down most of the hillside, the study area comprised the residential and commercial regions surrounding the burns from an elevation of around 50m AOD. The model extents are shown in Figure 1.1.

1.2 Scope & purpose of study

The Highland Council (THC) commissioned various studies over the years in an effort to gain an understanding of flooding mechanisms, identify areas at risk of flooding and potential flood alleviation solutions along the Mill Burn and its upper tributaries.

Mott MacDonald Ltd was commissioned by THC to review the studies carried out to date and the existing one-dimensional ISIS hydraulic model (reference M-P21-100y.DAT) for the Mill Burn watercourse developed by Mouchel Parkman in 2005.

The aim of this review was to identify the flood risk currently posed by the Mill Burn to properties, the transport network and critical infrastructure. This information will be used to inform the design of a flood alleviation scheme in accordance with the principles of the Flood Risk Management (Scotland) 2009 Act.

[1] Base mapping reproduced from OS Explorer data by permission of Ordnance Survey, on behalf of the Controller of Her Majesty's Stationery Office. Crown Copyright 2008. All rights reserved. Mott MacDonald Ltd licence number 100026791

2. Background

2.1 Data sources

To undertake this review the following data and information were collated and analysed:

- Mill Burn ISIS model reference M-P21-100y.DAT produced by Mouchel Parkman in 2005, supplied with accompanying report.
- Topographical survey information showing cross-sections along specific lengths of each burn surveyed for this project by THC in February 2011.
- Topographical survey information for other specific lengths of the water course provided by THC.
- Mill Burn InfoWorks model between the railway bridge and the A9 Culvert provided by THC.
- LIDAR[2]
- Ordnance Survey Maps
- Data extracts from the FEH CD-Rom[3]

2.2 Historical flooding of the study area

Historic records indicate that there have been various flooding incidents associated with the Mill Burn during 1997, 1999, 2002, 2003 and 2006.

During the course of these floods, residential and commercial properties in the Castle Heather area, along Diriebught Road, along Millburn Road and in the Old Mill Lane area have been affected. In addition parts of Inverness Golf Course have been flooded. None of the anecdotal flood records supplied included photos or any indication as to the source or depth of flooding and as a result could not be used as calibration data for the hydraulic modelling.

2.3 Site inspection

A site inspection of the Mill Burn, Park Burn, Temple Burn and surroundings within the study area was undertaken on 15th December 2010. Sample photographs from the site inspection are shown on the model layout drawings contained in Appendix D .

[2] 3D digital survey of the UK, using Radar, supplied by InfoTerra
[3] FEH CD-Rom V3.0

3. Hydrology

3.1 Hydrological analysis

3.1.1 High flow estimation methodology

The flood estimation methods as outlined in the Flood Estimation Handbook (FEH) have been adopted to assess extreme flows in the Mill Burn. The choice of method is dependant on a variety of factors, such as:

- catchment size and location;
- extent of urbanisation within the catchment;
- availability of gauged records;
- catchment permeability.

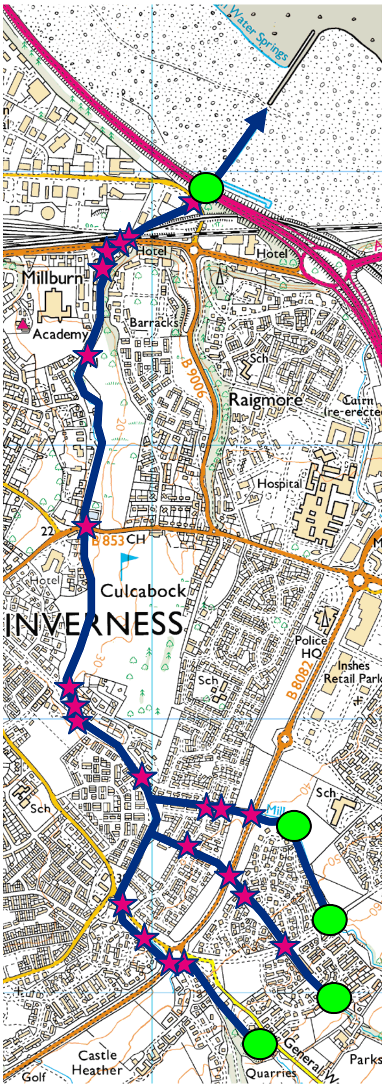
For this review, the FEH Rainfall-Runoff (R-R) Method was used to estimate flood flows at several locations within the Mill Burn catchment. This is considered an appropriate method for small sized catchments where it is difficult to identify suitable analogue sites.

However, an addition check using the FEH Statistical Method was undertaken as a comparison. It was established that the statistical method provides significantly lower estimates of the design flood discharge compared to the rainfall-runoff method. Following a precautionary approach, the R-R method was adopted and only the R-R method is presented in this report.

Four main tributaries contribute to the Mill Burn and a number of urban inflows are included in the hydraulic model to represent the whole Mill Burn catchment. The R-R Method was used to calculate the discharges at four main tributaries, i.e. Mill Burn (upper reach), Park Burn, Temple Burn and an eastern unnamed tributary of the Mill Burn. The remaining discharge was added gradually into the lower reach of the Mill Burn proportionally to the area of each urban catchment. The total inputs of all inflows were designed to achieve the estimated flood flow rates at the downstream boundary of the model.

The estimated design flows for the four main tributaries and at the downstream boundary are summarised in Table 3.1, with full details of methodology given in Appendix A.

Figure 3.1: Main flow estimation points



Bridge
Watercourse
Boundary points

3.1.2 Impact of climate change

It is generally accepted that the Earth's climate is changing. However the predicted impacts of climate change, particularly in a quantifiable state, are subject to significant uncertainty. The general trends across the United Kingdom are for a more varied future climate, with greater extremes of weather. This is likely to lead to an increase in both the severity and frequency of flood events across the UK.

Research on three potential climate change options, based on different greenhouse gas emissions scenarios, was undertaken for the UKCP09[4] report. The key findings of the research are presented for 16 administrative regions throughout the UK. Although these scenarios exist, guidance from SEPA[5] currently recommends adopting a conservative allowance of 20% increase in peak flow. Such an allowance has been adopted for this study for the 1% AEP and 0.5% AEP flood flows.

3.1.3 Summary of design flows

Table 3.1: Mill Burn design flows at examined catchments

Design Flood	Mill Burn – upper reach (m^3/s) NH 68700 43250	Unknown east tributary (m^3/s) NH 68650 43400	Park Burn (m^3/s) NH 68200 43500	Temple Burn (m^3/s) NH 68300 42900	Mill Burn at downstream boundary (m^3/s) NH 67850 45700
50% AEP (1 in 2 year)	0.88	0.14	0.31	0.54	3.13
20% AEP (1 in 5 year)	1.33	0.21	0.48	0.84	4.83
10% AEP (1 in 10 year)	1.58	0.25	0.57	1.01	5.76
4% AEP (1 in 25 year)	1.97	0.32	0.72	1.26	7.2
2% AEP (1 in 50 year)	2.40	0.38	0.86	1.52	8.7
1% AEP (1 in 100 year)	2.82	0.44	1.00	1.76	10.14
1% AEP (1 in 100 year) including climate change allowance	3.39	0.53	1.20	2.11	12.17
0.5% AEP (1 in 200 year)	3.29	0.51	1.16	2.04	11.78
0.5% AEP (1 in 200 year) including climate change allowance	3.95	0.61	1.39	2.45	14.14

[4] The UK Climate Change Projections 2009, available by DEFRA

[5] SEPA (2010) *Technical Flood Risk Guidance for Stakeholders, version 6*

4. Hydraulic Model Review

4.1 Details of previous model

A one-dimensional ISIS hydraulic model was developed by Mouchel Parkman (reference M-P21-100y.DAT). The model covered the following reaches:

- Mill Burn from approximately 20m upstream of the southern distributor road (B8082) culverts to downstream of the Millburn Court culvert.
- Park Burn was modelled from immediately downstream of the southern distributer road culvert to its confluence with Mill Burn.
- Temple Burn extended from just downstream of its confluence with the Druid Burn to its confluence with Mill Burn.

A report was provided with the model, but there was no detail as to the source or location of model cross-sections, inflows, or assumptions made during development of the model.

Therefore steps were taken to provide confidence in the cross-sections used in the model, as follows.:

- During the site inspection cross-sections in the model were compared to what was observed on site. This indicated that the majority of the cross-sections were similar in shape to the observed channel.
- Where survey information was available, sections of the survey was compared to cross-sections in the model and showed a reasonable comparison in most places.

4.2 Review of previous model

The existing ISIS model was reviewed and a number of deficiencies were rectified in the new model (refer to section 5.3). One issue was that the model was an in bank model with no out of bank flow or embankments in the model. Consequently, overtopping of the banks of the burns was not represented in the model.

There was no overtopping mechanism incorporated at bridge or weir locations. Without the overtopping mechanism, the model would allow water to accumulate at the structure rather than flow over the structure once it reached the top of the structure. The overtopping mechanism therefore makes a difference to flood water levels predicted by the model.

5. Hydraulic Modelling

5.1 Model overview

The existing Mouchel Parkman ISIS hydraulic model was used as a basis for the hydraulic modelling work. The model was modified in order to incorporate out of bank flow and bridge overflow and the model was extended both upstream and downstream to incorporate additional development areas.

The revised model schematics can be seen in Appendix B.

5.2 Data sources

In order to construct the revised model, Mott MacDonald utilised information from:

- Cross-section data for the various burns provided by THC, from previous surveys and from survey undertaken in February 2011.
- Site measurements provided by THC for structures such as culverts, trash screens and weirs.
- LIDAR data to obtain road levels at the top of bridges and to extend cross-sections.
- Observations from the site inspection on 15th December 2010 related to channel roughness, bank profiles and location of additional structures.
- Details of the flood alleviation scheme from the 'South West Inverness Flood Relief Scheme – Mill Burn: Outline Design Report' dated October 2005.
- Cross-section data from an InfoWorks hydraulic model between the railway bridge and the A9, provided by THC.

5.3 Amendments to model

Mott MacDonald carried out a number of changes to the initial model so that the revised model represented the existing situation. The changes included:

- Extending the model downstream to the discharge point of the Mill Burn into the Moray Firth.
- Recalculating and repositioning the urban and rural inflows.
- Extending the upstream reach of the Mill Burn to include the channel in the area of Miller Road and Miller Gardens and the earth bunds near Miller Road.
- Incorporating spill units at the bridges and weirs to allow for overtopping where necessary.
- Incorporating additional bridges including the B8082 culvert along Temple Burn, and a private road bridge on Harris Road.

- Updating the lengths between cross-sections to correspond with the descriptions for the cross-sections.
- Replacing the single culvert at Castle Heather Road with three rectangular culverts to represent the existing arrangement of three 900mm diameter culverts.
- Increasing the diameter of the Park Burn culverts from 1.2m to 1.35m based on THC survey data.
- Replacing the single weir near the sluices at the Auld Distillery with two weir units representing the full length of the weir.
- Splitting the model at Harris Road into an upstream and downstream model.

5.4 Assumptions

A number of assumptions and modelling schematisation were made when amending the model. These include:

Figure 5.1: Culcabock Road Bridge

Source: Site Visit December 2010

1) At Culcabock Road Bridge the over bridge spill was set as the opening in the wall at the downstream side of the bridge, as the wall on this same side would generally prevent overtopping directly back into the stream.

2) Culcabock Road Bridge is made of a semi-circular arch bridge that has been extended with a rectangular section. The rectangular section is on the upstream face and has been used as the shape for the head loss calculation as this represents the most significant change in cross-section on the watercourse at this point.

3) All circular culverts were replaced with rectangular openings with the same soffit and invert but narrower in width (compared to the culvert diameter) to provide an equivalent stage discharge relationship through the culvert.

4) Near Dows Diner on the Temple Burn and on the Mill Burn upstream of the southern distributor road, out of bank flow can leave the model, as the natural gradient leads away from the watercourses. This is modelled as a storage area.

5) Where cross-section data were not available from an alternative source, it was assumed that the information in the Mouchel Parkman model was correct.

6) Embankments are assumed not to breach during a flood and measured embankment levels are assumed as low points.

5.5 Model runs

To assess baseline and 'with-scheme' flood water levels, un-steady (adaptive timestep) simulations based on the AEP flows detailed in Table 3.1 were carried out using the revised and proposed model respectively. A minimum and maximum timestep of 1 and 5 seconds respectively was used for the modelling.

5.5.1 Initial conditions

The initial conditions for all of the revised model simulations were generated by running the model with a low flow that kept water levels within the channel.

5.5.2 Boundary conditions

The design discharges from the hydrological analysis, Table 3.1, were applied as the upstream boundary conditions for the revised hydraulic models. These were applied as unsteady hydrograph inflows using the critical storm duration for each catchment. The hydrographs were adjusted in order that the peak flows combined at the same time in the model. For the urban inflows the peak discharges were maintained at a peak level for three to four hours to ensure that the peak flows combined in the hydraulic model.

The hydraulic model was split at Harris Road. The upstream part of the model used a normal flow downstream boundary and the downstream part of the model used a tidal boundary. The inflow to the downstream model was taken 220m upstream of the boundary of the upstream part of the model (upstream model node M1.255JD).

Tidal boundaries were obtained from the 2008 River Ness Flood Alleviation Scheme report. The report uses an extreme water level calculated from the 15 year data set at Clachnaharry and was signed off by SEPA as part of the River Ness Flood Prevention Order. Tide levels are considered to be independent to flows in the Mill Burn. The majority of the Mill Burn model runs used a tidal level of 3.1mAOD.

For sensitivity scenarios (refer to section 5.6), three tidal boundaries for the Moray Firth were used in the model, namely 2.5mAOD (MHWS), 3.21mAOD (20% AEP tide) and 3.84 mAOD (0.5% AEP tide).

5.5.3 Channel roughness – Manning's 'n'

Figure 5.2: Park Burn

Source: Site visit December 2010

The roughness of the river channel and floodplain was modelled using Manning's roughness coefficient 'n'. This was determined from the site inspection and standard tabulated values[6].

The channel is heavily modified and straight along many of the modelled lengths with floodplain areas mainly comprising of pavements and park grassland as can be seen in Figure 5.2. A Manning's 'n' roughness coefficient was taken as 0.03 for the river channel and floodplains, to represent the conditions observed during the site inspection. One exception to this was the Mill Burn channel upstream of the Southern Distributor Road where Manning's was taken as 0.04 due to the burn being more overgrown and meandering. Sensitivity analyses were undertaken on the value of Manning's roughness coefficient used, as discussed in Section 5.6.

5.5.4 Floodplain storage and over bank flow

LIDAR data were used to produce level thematic outlines to identify potential floodplain storage areas where over bank flow could potentially accumulate. Level area relationships were then developed based on the LIDAR for these storage areas.

Upstream of Culcabock Road Bridge over bank flow areas were incorporated as extensions to the channel cross-section. Downstream of Culcabock Road Bridge a combination of spills, flood plain units and reservoir units (storage areas) were used in ISIS to model out of bank flow. These can be seen on the model layouts in Appendix D.

5.5.5 Hydraulic structures

All bridges were modelled in ISIS using the USPBR unit for flat soffits and an arch for arch bridges, using survey data to provide dimensions. Where ISIS predicted a bridge would overtop a spill unit was provided to bypass the bridge and the bridge orifice flow calculation was set with a lower and upper limit of 0.1m. In some scenarios, it was necessary to use a lower and upper limit of 0.15m to improve model convergence. Fixed weirs were put into the model as weir units using survey information. Where the river cross-section was wider than the weir, a spill unit was included to bypass the weir.

[6] Chow (1959) *Open Channel Hydraulics*

In some places the channel was steep or there was a fall but there was no formal weir. In these locations a NOTWEIR unit was used to represent the relevant part of the watercourse.

5.5.6 Calibration and verification

Although historical records of flooding exist, the information obtained in the records was vague with no indication of flood mechanisms or photographs. In addition, the SEPA gauge on the burn is a secondary site which is only accurate for in bank flows. It was not possible therefore to calibrate or verify the revised model. Sensitivity analyses were therefore undertaken to provide confidence in the modelling work.

5.6 Sensitivity analyses

Sensitivity analyses were undertaken on the revised hydraulic models for the 0.5% AEP plus climate change scenario, see Appendix C for full results. Blockage scenarios were only considered at those bridges where water levels were predicted to be near the bridge soffit level. Harbour Road and Old Edinburgh Road culverts were not investigated because the out of bank flow immediately upstream of these bridges would knowingly increase and as a result would distort any sensitivity in levels. In this manner only Castle Heather Road Bridge and Culcabock Road Bridge were investigated for sensitivity to blockage.

The following results were observed from the sensitivity analysis:

- Adjusting the roughness coefficient by +10%, altered water levels by a maximum of +0.10m (T1.895I, T1.900JU) and generally +0.05m respectively in the upstream and downstream model.
- The roughness coefficient was adjusted by -10%, this altered water levels by a maximum of +0.07m (M1.210JU, M1.210WU, M1.210WspU) and 0.08m (M1.413WU) respectively in the upstream model and downstream model.
- For the downstream model, reducing the downstream boundary from 3.1m AOD to the MHWS level of 2.5m AOD, resulted in a reduction in flood water level at the downstream boundary of -0.2m up to the railway bridge.
- Various inflows were modelled through the models. A 20% increase in flow, this being the difference between the 0.5% AEP and 0.5% AEP plus climate change flow, resulted in water levels changing by a maximum of +0.04 (M1.230I, M1.240I) and +0.12m (M1.820JU) in the upstream and downstream model respectively.
- A blockage scenario at the Castle Heather Road bridge increased flood water levels by a maximum of +0.13m (T1.300JU, T1.300spU,

T1.300U) in the upstream model. There was no change in the flood water levels in the downstream model.
- A blockage scenario at the Culcabock Road bridge increased flood water levels by +0.21m just upstream of the bridge (M1.407i) and is predicted to overtop the bridge.

In general the sensitivity analyses results indicate only minor variation in flood water levels with a change in model parameters and therefore the model is within reasonable limits of accuracy to be expected at 0.25m.

5.7 Model observations

It was noted that in some cases the hydraulic model predicted supercritical flow due to the steepness of the channel. Slots were added to the model cross-sections as standard practice to force subcritical flow to be modelled. Little change in the flow depths were observed from this modification.

The flood bank levels used as spills in the ISIS model were based on cross-section data. The actual flood banks vary continuously in level and thickness and could fail during a flood event at an AEP earlier than predicted by the hydraulic model. As a result the out of bank flows and levels predicted should be treated with caution.

5.8 Option modelling

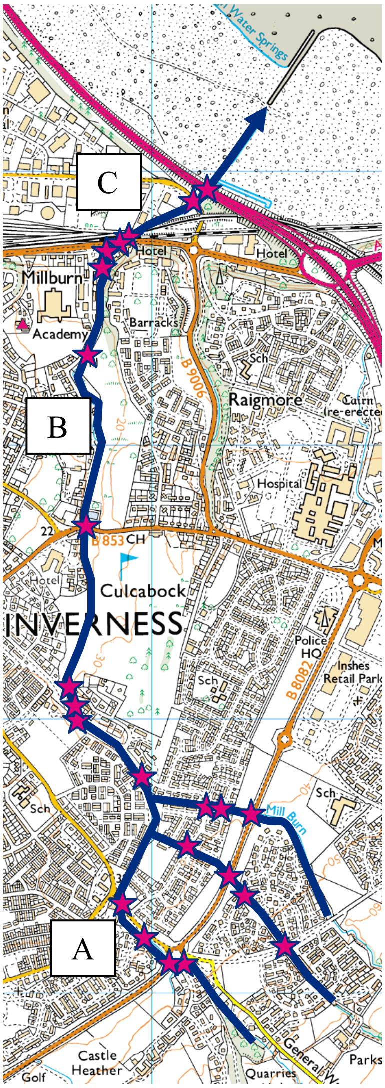
A flood alleviation scheme was previously proposed by Mouchel Parkman as a "Preferred Option". This preferred option proposed works in Castle Heather area, Kingsmill Gardens and along Diriebught Road. The revised modelling work undertaken predicts that works will only be required in the Castle Heather area and along Diriebught Road, with additional works in the Harbour Road area.

For the purpose of hydraulic modelling, the proposed measures were assessed in the following stages with each stage adopting the stage before:
- Stage 1 - a flood defence wall on the left bank of the Temple Burn in the Castle Heather area
- Stage 2 - a flood defence wall along Diriebught Road, with the exception of in front of Diriebught House, where a flood relief channel runs behind Diriebught House due to limited space.
- Stage 3 – constructing embankments along the Mill Burn upstream of the Harbour Road Bridge.

6. Findings of Hydraulic Modelling

6.1 Indicative flood levels

Figure 6.1: Flood Risk Areas



The hydraulic model predicts the following flood risk areas as shown on Figure 6.1.

A. The left bank of the Temple Burn just upstream of Old Edinburgh Road culvert is predicted to be overtopped during the 50% AEP event.

B. Out of bank flow occurs downstream of Culcabock Road. Flood water leaves Mill Burn from the left bank and flows along Diriebught Road before returning to the channel in the vicinity of Millburn Road.

C. The limited capacity of the Harbour Road and A9 culvert acts as a constriction to the flow and is predicted to result in out of bank flow as frequently as the 4% AEP event.

A list of locations with indicative flood water levels is given in Table 6.1.

Indicative flood extents have been determined for a range of design events, based upon superimposing the modelled flood water levels on the LIDAR ground level data. These are presented in Appendix D.

Table 6.1: Indicative flood water levels for locations along Mill Burn and its tributaries

Location	Lowest Ground level (m AOD)	Model Node	Annual Exceedance Probability Flood Water Level (m AOD)								
			50%	20%	10%	4%	2%	1%	1%+CC	0.5%	0.5%+CC
Left bank of Temple Burn near Castle Heather	36.93	T1.405T	37.00	37.13	37.18	37.22	37.26	37.28	37.31	37.33	37.33
2 Old Mill Lane	28.27	M1.335T	27.19	27.38	27.45	27.54	27.67	27.72	27.84	27.92	27.93
1 Old Mill Lane	26.62	M1.380D	25.91	26.06	26.12	26.20	26.31	26.36	26.45	26.51	26.52
11 Kingsmill Gardens	21.64	M1.405G	20.53	20.72	20.78	20.85	20.92	20.95	20.99	21.01	21.01
5, 14 and 15 Kingsmill Gardens	20.69	M1.406G	19.50	19.66	19.73	19.81	19.90	19.94	20.01	20.04	20.05
3 and 4 Kingsmill Gardens	19.57	M1.407G	18.49	18.69	18.78	18.88	18.99	19.10	19.20	19.26	19.31
1 and 2 Kingsmill Gardens	19.5	M1.408U	18.14	18.34	18.42	18.54	18.73	18.86	19.04	19.14	19.19
Diriebught Road near Culcabock Road	18.19	M1.409G	17.63	17.79	17.86	17.95	18.05	18.12	18.20	18.24	18.25
Curling Pond Pavilion	17.7	M1.409G	17.63	17.79	17.86	17.95	18.05	18.12	18.20	18.24	18.25
Diriebught Court Area	11.11	M1.415U	11.03	11.18	11.23	11.28	11.32	11.34	11.36	11.37	11.37
Harbour Road Area	4.04 *	M1.940U	3.25	3.53	3.65	3.89	4.14	4.34	4.44	4.49	4.51

* This level may be an anomaly in the LIDAR information. If in reality the bank level is at least 4.2m AOD (the Harbour Road bridge parapets level) then the flood risk reduces from 4% to 2% AEP.

6.2 Proposed flood alleviation scheme

For each area at flood risk, flood defence measures are proposed. These have been modelled and the effect on the flood water levels downstream of the measures has been assessed.

6.2.1 Castle Heather Area

A flood wall is proposed to defend the Castle Heather area. The maximum difference between the minimum left bank level and the predicted flood water level is shown in Table 6.2. Adding 0.3m freeboard to the difference in levels gives a minimum height range between 0.34m and 0.89m for the flood defence wall above the existing defence level.

Table 6.2: Difference between left bank levels and flood water levels in Castle Heather area

Model Node	Minimum Left Bank Level (m AOD)	Maximum Predicted Water Level (m AOD)	Difference in levels (m)
T1.380i	37.512	37.80	0.288
T1.400i	37.512	37.66	0.148
T1.403i	37.589	37.63	0.041
T1.405T	36.931	37.51	0.579
T1.410JU	36.931	37.52	0.589

Constructing a flood defence wall in the Castle Heather area will increase downstream flood water levels. Table 6.3 compares flood water levels at a number of locations without and with the proposed flood defence wall in the Castle Heather area. The hydraulic model predicts that water levels for the 0.5% AEP plus climate change flood event could be increased by around 0.03m, with up to 0.38m in the vicinity of some bridges.

Table 6.3: Comparison of flood water levels with and without Castle Heather flood defence wall

Location	Lowest Ground Level (m AOD)	Model Node	Minimum Bank Level (m AOD)	Flood water level (m AOD)	
				200 yr + cc	200 yr + cc with flood wall
2 Old Mill Lane	28.27	M1.335T	27.60	27.93	28.04
1 Old Mill Lane	26.62	M1.380JD	26.64	26.52	26.64
11 Kingsmill Gardens	21.64	M1.405G	20.89	21.01	21.04
5, 14 and 15 Kingsmill Gardens	20.69	M1.406G	20.20	20.05	20.13
3 and 4 Kingsmill Gardens	19.57	M1.407G	19.47	19.31	19.52
1 and 2 Kingsmill Gardens	19.50	M1.408JU	19.70	19.19	19.42
Diriebught Road near Culcabock Road	18.19	M1.409G	17.68	18.25	18.28
Curling Pond Pavilion	17.70	M1.409G	17.68	18.25	18.28
Diriebught Court Area	11.11	M1.415U	11.34	11.37	11.38
Harbour Road Area	4.04	M1.940U	4.04	4.51	4.74

6.2.2 Diriebught Road

Along Diriebught Road a flood wall is proposed, to prevent out of bank flow on the left bank. A flood defence wall in front of Diriebught House would hinder access so a flood relief channel is proposed behind

Diriebught House to relieve flood levels. This requires the addition of a control structure at the inlet to restrict flows past Diriebught House.

The maximum difference between the minimum left bank level and the predicted flood water level is shown in Table 6.4. Adding 0.3m freeboard to the difference in levels gives a minimum height of 0.54 to 0.99m for the flood defence wall along Diriebught Road above the existing flood bank level.

Table 6.4: Difference between flood water levels and left bank levels at Diriebught Road

Model Node	Minimum Left Bank Level (m AOD)	Maximum Predicted Water Level (m AOD)	Difference in levels (m)
M1.409G	17.93	18.27	0.34
M1.409i	17.65	18.34	0.69
M1.410G	16.50	17.08	0.58
M1.410i	15.60	16.23	0.63
M1.411G	15.10	14.99	-0.11
M1.411i	13.60	14.16	0.56
M1.417T	10.99	11.23	0.24
M1.418G	10.69	11.04	0.35
M1.420G	10.56	10.81	0.25
M1.420JD	10.18	10.48	0.30

6.2.3 Harbour Road Bridge

The capacity of the channel and Harbour Road bridge is required to be increased. Considering flood embankments alone the maximum difference between the minimum bank level and the predicted flood water level is shown in Table 6.5. Adding 0.3m freeboard to the difference in levels gives minimum heights of 0.62 to 2.70m for the embankment crest to be raised above the existing bank levels after the upstream flood defence walls and relief channel are constructed.

This is a significant increase in flood embankment levels and could be difficult to achieve. Therefore it is recommended to consider further options at the Harbour Road area such as culvert modifications and channel widening.

Table 6.5: Difference between flood water levels with all flood alleviation measures in place and minimum bank levels upstream of Harbour Road Bridge

Model Node	Minimum Bank Level (m AOD)	Maximum Predicted Water Level (m AOD)	Difference in levels (m)
M1.910G	6.120	6.44	0.32
M1.920G	4.830	6.44	1.61
M1.930G	4.400	6.44	2.04
M1.935G	4.360	6.44	2.08
M1.940G	4.040 *	6.44	2.40

* This level may be an anomaly in the LIDAR information. If in reality the bank level is at least 4.2m AOD (the Harbour Road bridge parapets level) then the wall height will be a maximum of 2.54m.

7. Conclusions

This study reviews an existing ISIS hydraulic model and documents the updating to this model to determine the flood risk from the Mill Burn in Inverness. Flood risk maps for the Mill Burn catchment are provided in Appendix D. Flood alleviation measures previously proposed for the Mill Burn have been reviewed as part of the study concluding works to be proposed for the Castle Heather area, along Diriebught Road and in the Harbour Road area.

In the Castle Heather area the left bank is likely to be overtopped during the 50% AEP flood event. To alleviate this, a flood defence wall ranging in height from 0.34m near Castle Heather Road to 0.89m near Old Edinburgh Road is proposed on the left bank of the Temple Burn. Whilst flood levels will be increased as a result of these modifications, the hydraulic model predicts that no new properties will be at risk of flooding.

Along Diriebught Road, the hydraulic model predicts that flood water will overtop the left and right banks of the Mill Burn. When this occurs, flood water overtopping the left bank is likely to flow along Diriebught Road before returning to the channel at Millburn Road. To alleviate flooding along Diriebught Road, a flood defence wall is proposed along the left bank of the Mill Burn. The wall is proposed to start from approximately 80m downstream of Culcabock Road bridge with a height of approximately 0.54m and follow the left bank to the area of Millburn Academy where the height would be 0.99m.

To maintain access, it would not be possible to construct the wall in front of Diriebught House. A flood relief channel behind Diriebught House is therefore proposed to convey flood water around this area with a control structure to constrict flows along the main Mill Burn channel.

In the Harbour Road area the hydraulic model predicts the overtopping of the left bank of the Mill Burn during the 4% AEP flood event. Confirmation of embankment levels or minor embankment alterations could increase this to the 2% AEP as there is some uncertainty in this area. To convey higher flows the embankment levels would need to be increased, the channel modified or the Harbour Road culvert modified. Further option investigation would be required to confirm works in this area.

Previous hydraulic modelling work undertaken by Mouchel Parkman suggested that areas upstream of Culcabock Road bridge such as

Kingsmill Gardens and Old Mill Lane were at risk of flooding during the 0.5% AEP plus climate change event. The revised hydraulic model however indicates that these areas have a negligible risk of flooding during the 0.5% AEP plus climate change event. Therefore it is predicted that no flood alleviation measures are required in these areas.

List of Appendices

Appendix A. Details of hydrological analysis

A.1. Rainfall-Runoff method

The Flood Studies Report (FSR) rainfall-runoff method is one of the principal methods used for estimating the magnitude of the flood of given frequency of occurrence. It has also been adopted in the latest FEH methodology and it is thoroughly elaborated in FEH Volume 4[7]. The peak flows in the Mill Burn have been calculated using the methodology set out in this part of the FEH.

The catchment descriptors have been derived from the FEH CD-ROM v3 and are displaced in Table A.1 below. The two descriptors, namely catchment area and the urbanisation extent have been subjected to a review to achieve the most accurate hydrological estimates. The review is described in the following sections.

Table A.1: FEH catchment characteristics

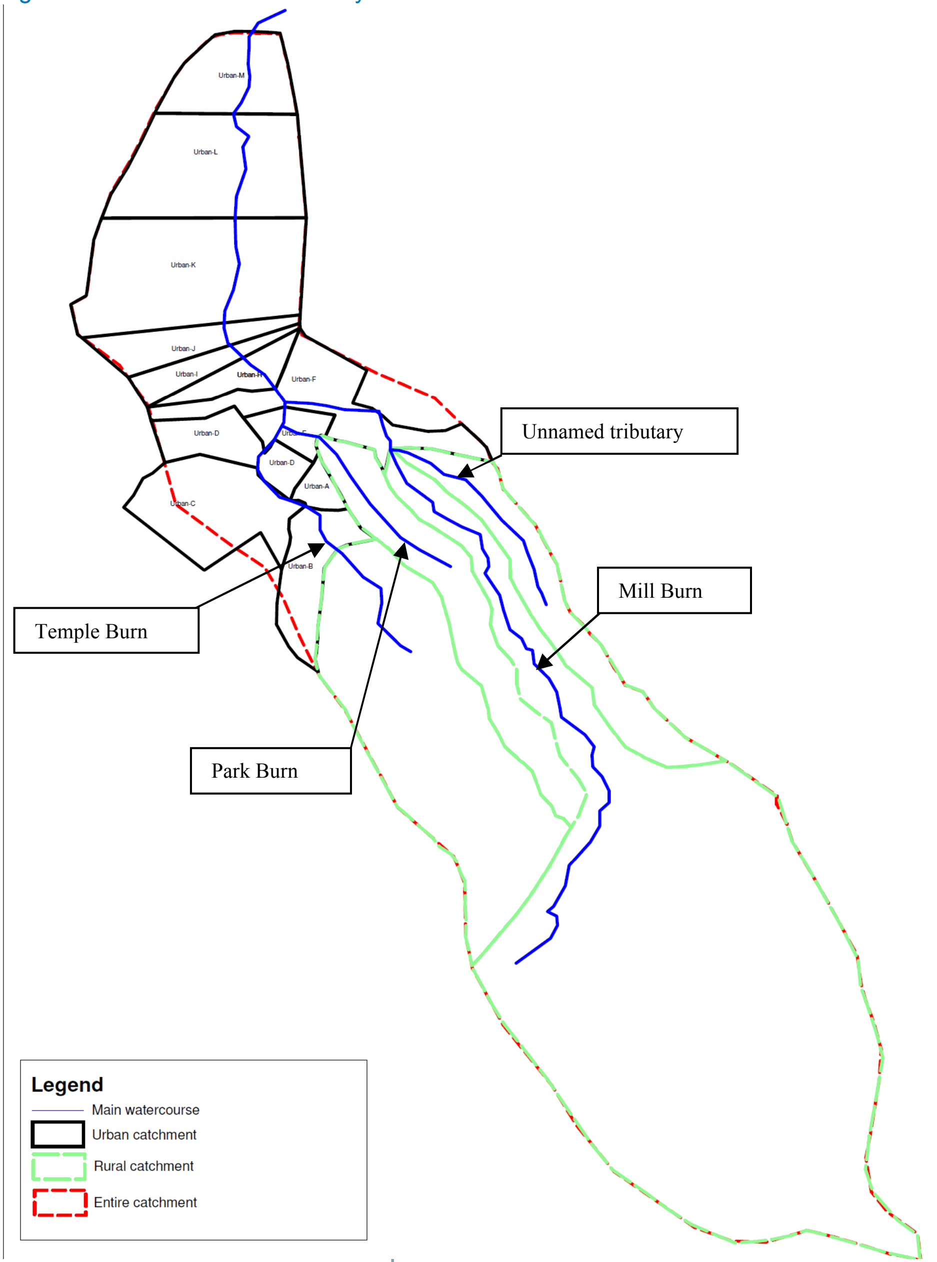
267850	845700	NH 67850 45700		
AREA	9.35			
FARL	135	C	-0.02018	
PROPWET	333	D1	0.38732	
ALTBAR	0.69	D2	0.45258	
ASPBAR	0.716	D3	0.30756	
ASPVAR	4.77	E	0.26331	
BFIHOST	47.4	F	2.26672	
DPLBAR	0.992	C(1km)	-0.02	
DPSBAR	9.3	D1(1km)	0.382	
LDP	0.43	D2(1km)	0.442	
RMED-1H	8.8	D3(1km)	0.322	
RMED-1D	31.8	E(1km)	0.265	
RMED-2D	41.3	F(1km)	2.239	
SAAR	780			
SAAR4170	789			
SPRHOST	27.58			
URBCONC	0.79			
URBEXT1990	0.0694			
URBLOC	0.421			

[7] Flood Estimation Handbook, Volume 4: Restatement and application of the Flood Studies Report rainfall-runoff method, by Helen Houghton-Carr, Institute of Hydrology

A.2. Catchment area review

The catchment area was thoroughly reviewed using the 1 : 10 000 scale map and local contours. The ambiguous boundaries were further confirmed using the site visit information and knowledge of The Highland Council's flood team. The detailed assessment was undertaken for the surface runoff areas and also for the local drainage system catchments which was found to be largely in line with the established catchment boundaries. The catchment outline and its division into the sub-catchments are presented in Figure A.1 below with more detail of the urban inflows shown in Appendix D.

Figure A.1: Catchment boundary outline



A.3. Urban area extent review

The urbanisation extent (URBEXT) is a hydrological factor determining the percentage runoff from the area and its value is the most likely to become out of date. For this reason, special attention was paid to this catchment descriptor.

The FEH CD v3 provides URBEXT at the period of 1990 and 2000. However, a significant amount of new housing development has occurred in the Mill Burn catchment over past decades and the index from 2000 is estimated as not to represent the current situation in the area. This parameter was therefore updated

Sufficiently detailed maps of the last decade's developments that could be used to update the URBEXT index in line with the FEH approach[8] were not available at the time of this assessment. Therefore a statistical approach has been adopted. This used a linear extension of the urbanisation increase in the catchment between 1990 and 2000 and consequently applying a 10% confidence boundary to the extrapolated URBEXT2010 value. The outcome of this assessment is summarised in Table A.2 below and Figure A.2.

Table A.2: Urbanisation growth prediction

Year	Urbext value	Confidence interval (±10%)
URBEXT1990	0.0694	n/a
URBEXT2000	0.0958	n/a
URBEXT2010*	0.122	0.1098 – 0.1342

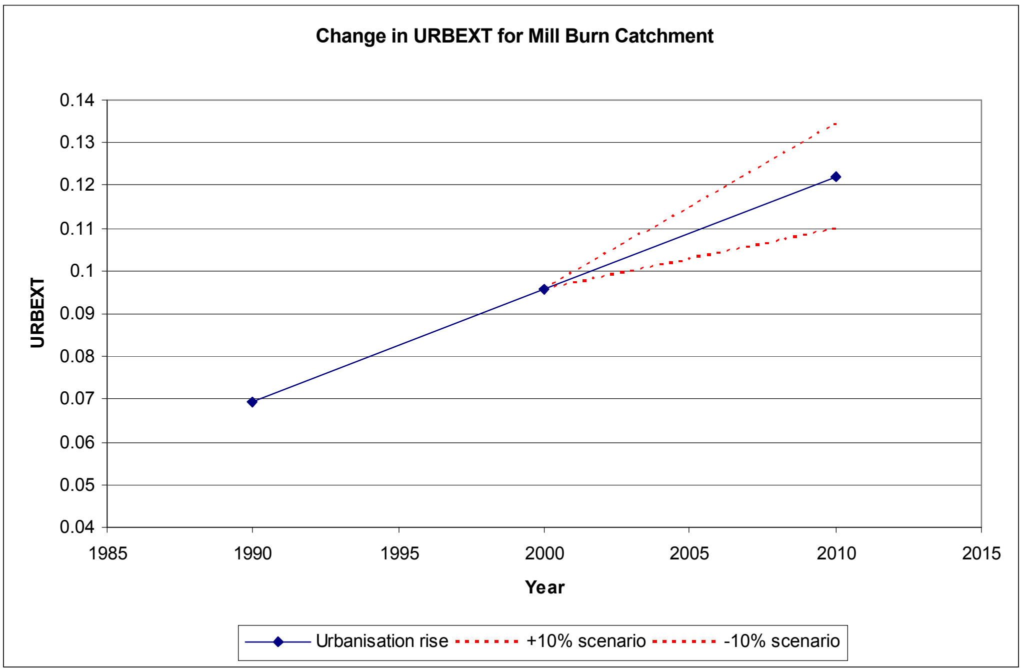
Note: * - returned by FEH CD v3
** - estimated value

Further analysis and R-R calculations with different URBEXT scenarios proved the middle scenario, i.e. URBEXT2010 = 0.122, to be the most conservative, i.e. providing the highest design flood flows. It would be expected that a higher value of URBEXT would increase design flood flows, however, following the FEH recommendations[9], the selection of storm return periods changes at URBEXT value of 0.125. Hence, the catchment with the value over the threshold of 0.125 is regarded as urbanised and therefore lower storm return periods are applied.

[8] The FEH approach to the URBEXT is fully described in FEH Volume 5: Catchment descriptors, Chapter 6

[9] FEH Volume 4, Chapter 3, Figure 3.2 – Recommended storm return period to yield flood peak of required return period by design event method

Figure A.2: Urbanisation growth prediction



A.4. Design flows – FEH Rainfall-Runoff Method

Design flows were determined by using standard FEH Rainfall-Runoff Methodology. A single design storm derived from the entire catchment (down to the downstream control point) was used to derive a storm duration, profile and the (total) catchment ARF, which was then applied to each subcatchment. However, the storm depth and antecedent condition were individually derived for each subcatchment.

The flow estimates were undertaken for the four rural catchments at the upper watercourses and also for the entire Mill Burn catchment. Hence, flow estimates for the downstream boundary were calculated and the differences between this and the sum of four rural contributions was distributed among the urban areas at the lower watercourse. To split this difference (also called 'the residual inputs') into the urban areas, the area-weighting method was applied. The detailed output of calculations is presented in Table A.3.

Table Heading Left	Easting	Northing	Catchment Area (Km2)	50% AEP (1 in 2 year)	20% AEP (1 in 5 year)	10% AEP (1 in 10 year)	4% AEP (1 in 25 year)	1% AEP (1 in 100 year)	0.5% AEP (1 in 200 year)	0.5% AEP (1 in 200 year) +cc
New Upper input: MILL-V2	268700	843250	4.387	0.88	1.33	1.58	1.97	2.82	3.29	3.95
Unknown East tributary	268650	843400	0.488	0.14	0.21	0.25	0.32	0.44	0.51	0.61
Upper Input: PARK-V2	268200	843500	0.552	0.31	0.48	0.57	0.72	1.00	1.16	1.39
Upper input: TMPL-V2	268300	842900	1.344	0.54	0.84	1.01	1.26	1.76	2.04	2.45
Total Extent of ISIS Model	268700	843250	4.387	3.13	4.83	5.76	7.2	10.14	11.78	14.14
Additional Residual Inputs										
URBAN-A	268243	843459	0.047	0.020	0.031	0.037	0.046	0.064	0.074	0.09
URBAN-B	268074	843090	0.204	0.086	0.134	0.159	0.199	0.280	0.324	0.39
URBAN-C	267871	843323	0.359	0.150	0.235	0.280	0.349	0.491	0.569	0.68
URBAN-D	267914	843422	0.178	0.075	0.117	0.139	0.173	0.244	0.283	0.34
URBAN-E	268012	843574	0.081	0.034	0.053	0.063	0.079	0.111	0.128	0.15
URBAN-F	267986	843728	0.334	0.140	0.218	0.260	0.325	0.457	0.530	0.64
URBAN-G			0.000	0.000	0.000	0.000	0.000	0.000	0.000	-
URBAN-H	267828	843922	0.104	0.044	0.068	0.081	0.101	0.143	0.165	0.20
URBAN-I	267740	844006	0.100	0.042	0.065	0.078	0.097	0.136	0.158	0.19
URBAN-J	267694	844124	0.160	0.067	0.104	0.125	0.155	0.218	0.253	0.30
URBAN-K	267770	844696	0.672	0.281	0.440	0.524	0.654	0.920	1.067	1.28
URBAN-L	267712	845262	0.520	0.218	0.340	0.406	0.506	0.711	0.825	0.99
URBAN-M	267810	845453	0.253	0.106	0.166	0.198	0.246	0.347	0.402	0.48

Table A.3: Summaru of model inputs

Table Heading Left	Easting	Northing	Catchment Area (Km2)	50% AEP (1 in 2 year)	20% AEP (1 in 5 year)	10% AEP (1 in 10 year)	4% AEP (1 in 25 year)	1% AEP (1 in 100 year)	0.5% AEP (1 in 200 year)	0.5% AEP (1 in 200 year) +cc
New Upper input: MILL-V2	268700	843250	4.387	0.88	1.33	1.58	1.97	2.82	3.29	3.95

Table Heading Left	Easting	Northing	Catchment Area (Km2)	50% AEP (1 in 2 year)	20% AEP (1 in 5 year)	10% AEP (1 in 10 year)	4% AEP (1 in 25 year)	1% AEP (1 in 100 year)	0.5% AEP (1 in 200 year)	0.5% AEP (1 in 200 year) +cc
Unknown East tributary	268650	843400	0.488	0.14	0.21	0.25	0.32	0.44	0.51	0.61
Upper Input: PARK-V2	268200	843500	0.552	0.31	0.48	0.57	0.72	1.00	1.16	1.39
Upper input: TMPL-V2	268300	842900	1.344	0.54	0.84	1.01	1.26	1.76	2.04	2.45
Total Extent of ISIS Model	268700	843250	4.387	3.13	4.83	5.76	7.2	10.14	11.78	14.14
Additional Residual Inputs										
URBAN-A	268243	843459	0.047	0.020	0.031	0.037	0.046	0.064	0.074	0.09
URBAN-B	268074	843090	0.204	0.086	0.134	0.159	0.199	0.280	0.324	0.39
URBAN-C	267871	843323	0.359	0.150	0.235	0.280	0.349	0.491	0.569	0.68
URBAN-D	267914	843422	0.178	0.075	0.117	0.139	0.173	0.244	0.283	0.34
URBAN-E	268012	843574	0.081	0.034	0.053	0.063	0.079	0.111	0.128	0.15
URBAN-F	267986	843728	0.334	0.140	0.218	0.260	0.325	0.457	0.530	0.64
URBAN-G			0.000	0.000	0.000	0.000	0.000	0.000	0.000	-
URBAN-H	267828	843922	0.104	0.044	0.068	0.081	0.101	0.143	0.165	0.20
URBAN-I	267740	844006	0.100	0.042	0.065	0.078	0.097	0.136	0.158	0.19
URBAN-J	267694	844124	0.160	0.067	0.104	0.125	0.155	0.218	0.253	0.30
URBAN-K	267770	844696	0.672	0.281	0.440	0.524	0.654	0.920	1.067	1.28
URBAN-L	267712	845262	0.520	0.218	0.340	0.406	0.506	0.711	0.825	0.99
URBAN-M	267810	845453	0.253	0.106	0.166	0.198	0.246	0.347	0.402	0.48

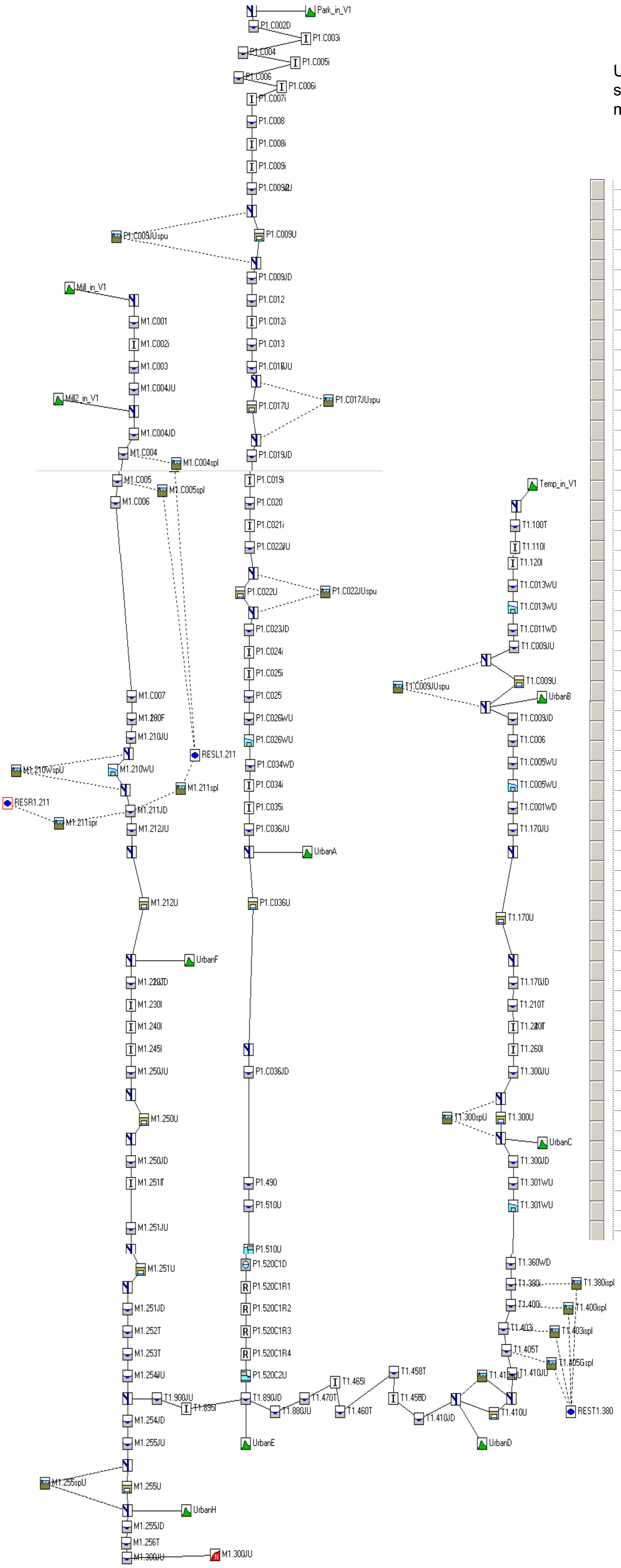
A.5. FEH Statistical Method

The statistical method was undertaken as an additional check and it was recognised that this method is not providing reliable outputs for the catchment in consideration and is leading to underestimation of the flood flow (estimated flows are approximately by 50% lower). For this reason, only the R-R method is presented in this report.

Appendix B. Model schematics

The upstream and downstream model schematics are presented on the following pages in conjunction with the lists of model nodes.

Upstream model schematic (1 of 1) and model node list (1 of 3)



	Mill_in_V1	QTBDY		Mill Burn, 200 yr + CC inflow
	Temp_in_V1	QTBDY		Temple Burn, 200 yr + CC inflow
	Park_in_V1	QTBDY		Park Burn, 200 yr + CC inflow
	Mill2_in_V1	QTBDY		Unnamed tributary of Mill Burn, 200 yr + CC inflow
	UrbanA	QTBDY		Urban inflow A - 200 yr + CC
	UrbanB	QTBDY		Urban inflow B - 200 yr + CC
	UrbanC	QTBDY		Urban inflow C - 200 yr + CC
	UrbanD	QTBDY		Urban inflow D - 200 yr + CC
	UrbanE	QTBDY		Urban inflow E - 200 yr + CC
	UrbanF	QTBDY		Urban inflow F - 200 yr + CC
	UrbanH	QTBDY		Urban inflow H - 200 yr + CC
	Mill_in_V1	JUNCTI	OPEN	
	M1.C001	RIVER	SECTIC	THC survey Feb 2011 C001
	M1.C002i	INTERP		
	M1.C003	RIVER	SECTIC	THC survey Feb 2011 C003
	M1.C004JU	RIVER	SECTIC	THC survey Feb 2011 C004 +0.3
	M1.C004JU	JUNCTI	OPEN	
	M1.C004JD	RIVER	SECTIC	THC survey Feb 2011 C004 +0.3
	M1.C004	RIVER	SECTIC	THC survey Feb 2011 C004
	M1.C005	RIVER	SECTIC	THC survey Feb 2011 C005
	M1.C006	RIVER	SECTIC	THC survey Feb 2011 C006
	M1.C007	RIVER	SECTIC	THC survey Feb 2011 C007
	M1.190F	RIVER	SECTIC	MillBurn - as original
	M1.200F	RIVER	SECTIC	
	M1.210JU	RIVER	SECTIC	Upstream weir (-0.1m)
	M1.210JU	JUNCTI	OPEN	
	M1.210WspU	SPILL		Spill around weir
	M1.210WU	WEIR		MILL BURN, STONE STEPS INTO DISTRIB ROAD CULVERT (0.5m high,
	M1.211JD	JUNCTI	OPEN	
	M1.211JD	RIVER	SECTIC	
	M1.212JU	RIVER	SECTIC	U/s distributor Road - as original
	M1.212JU	JUNCTI	OPEN	
	M1.212U	BRIDGE	USBPR	Mill Burn, Distributor road Bridge, 25m length
	M1.212JD	JUNCTI	OPEN	
	M1.212JD	RIVER	SECTIC	D/s distributor Road
	M1.220T	RIVER	SECTIC	Millburn
	M1.230I	INTERP		
	M1.240I	INTERP		
	M1.245I	INTERP		
	M1.250JU	RIVER	SECTIC	Millburn
	M1.250JU	JUNCTI	OPEN	
	M1.250U	BRIDGE	USBPR	
	M1.250JD	JUNCTI	OPEN	
	M1.250JD	RIVER	SECTIC	Millburn
	M1.251T	RIVER	SECTIC	
	M1.251I	INTERP		
	M1.251JU	RIVER	SECTIC	Millburn, upstream Mason Road bridge
	M1.251JU	JUNCTI	OPEN	
	M1.251U	BRIDGE	USBPR	
	M1.251JD	JUNCTI	OPEN	
	M1.251JD	RIVER	SECTIC	Millburn D/s Mason Road Bridge
	M1.252T	RIVER	SECTIC	Millburn
	M1.253T	RIVER	SECTIC	Millburn

M1.254i	RIVER	SECTIC	Copy of M1.254 +1.3
M1.254JU	RIVER	SECTIC	
Temp_in_V1	JUNCTII	OPEN	
T1.100T	RIVER	SECTIC	TEMPLE BURN, D/S OF CONFLUENCE WITH DRUID BURN - original XS
T1.110I	INTERP		
T1.120I	INTERP		
T1.C013WU	RIVER	SECTIC	TEMPLE BURN, U/S OF HEATHER BANK CULVERT - Was T1.150U - no
T1.C013WU	WEIR		
T1.C011WD	RIVER	SECTIC	TEMPLE BURN, D/S OF HEATHER BANK CULVERT - 0.3m - Was
T1.C009JU	RIVER	SECTIC	TEMPLE BURN, U/S OF Druid Temple Road was T1.160U - C009 -
T1.C009JU	JUNCTII	OPEN	
T1.C009U	BRIDGE	USBPR	Druid Temple Road Bridge
T1.C009JUspu	SPILL		Druid Temple Crescent Road Bridge Spill
T1.C009JD	JUNCTII	OPEN	
T1.C009JD	RIVER	SECTIC	d/s Druid Road Bridge. Copy of T1.C009
T1.C006	RIVER	SECTIC	TEMPLE BURN - Was T1.160D - THC survey C006
T1.C005WU	RIVER	SECTIC	TEMPLE BURN - THC survey C005
T1.C005WU	WEIR		
T1.C001WD	RIVER	SECTIC	TEMPLE BURN -THC survey C001
T1.170JU	RIVER	SECTIC	TEMPLE BURN, U/S OF DISTRIBUTOR ROAD CULVERT
T1.170JU	JUNCTII	OPEN	
T1.170U	BRIDGE	USBPR	DISTRIB RD CULVERT INLET
T1.170JD	JUNCTII	OPEN	
T1.170JD	RIVER	SECTIC	TEMPLE BURN, D/S OF DISTRIB RD USBPR BRIDGE
T1.210T	RIVER	SECTIC	TEMPLE BURN, D/S OF DISTRIBUTOR ROAD culvert - original XS
T1.220T	RIVER	SECTIC	TEMPLE BURN, NEXT TO OLD EDINBURGH ROAD - original XS
T1.240I	INTERP		

T1.260I	INTERP		
T1.300JU	RIVER	SECTIC	TEMPLE BURN, U/S OF CASTLE HEATHER ROAD [EXISTING] - original
T1.300JU	JUNCTII	OPEN	
T1.300U	BRIDGE	USBPR	3No 1m dia - converted to rectangle of 1m high, but 0.7m wide as similar
T1.300spU	SPILL		Castle Heather Road Bridge Overtopping Spill - From LiDAR
T1.300JD	JUNCTII	OPEN	
T1.300JD	RIVER	SECTIC	Temple Burn, copy of section T1.300T D/S of bridge (Mott MacDonald)
T1.301WU	RIVER	SECTIC	Temple Burn, copy of section T1.300T less -0.1m for slope. U/s of weir
T1.301WU	WEIR		Weir d/s of Castle heather road bridge
T1.360WD	RIVER	SECTIC	TEMPLE BURN, OPPOSITE JUNCTION OLD EDINBURGH ROAD /
T1.380i	RIVER	SECTIC	Based on XS 50 from THC survey DOWS_S-1.dwg
T1.400i	RIVER	SECTIC	Based on XS 10 from THC survey PALSDO-1.dwg
T1.403i	RIVER	SECTIC	based on XS 20 from THC survey PALSDO-1.dwg
T1.405T	RIVER	SECTIC	Based on XS 30 from THC survey PALSDO-1.dwg
T1.410JU	RIVER	SECTIC	TEMPLE BURN, U/S OF OLD EDINBURGH ROAD CULVERT - based on
T1.410JU	JUNCTII	OPEN	
T1.410U	BRIDGE	USBPR	Old Edinburgh Road Culvert (1.6 dia), modelled as square bridge (1.2m wide
T1.410spU	SPILL		Old Edinburgh Road Culvert Spill - Levels from LiDAR
T1.410D	JUNCTII	OPEN	
T1.410JD	RIVER	SECTIC	Copy of T1.410JD
T1.450D	RIVER	SECTIC	TEMPLE BURN, D/S OF OLD EDINBURGH ROAD CULVERT - original
T1.455I	INTERP		Interpolate section
T1.458T	RIVER	SECTIC	TEMPLE BURN, lined channel, D/S OF OLD EDINBURGH ROAD
T1.460T	RIVER	SECTIC	NEAR MACKENZIE ROAD - original XS
T1.465I	INTERP		
T1.470T	RIVER	SECTIC	NEAR MACKENZIE ROAD - original XS
T1.880JU	RIVER	SECTIC	TEMPLE BURN, U/S OF CONFLUENCE WITH PARKS FARM BURN -

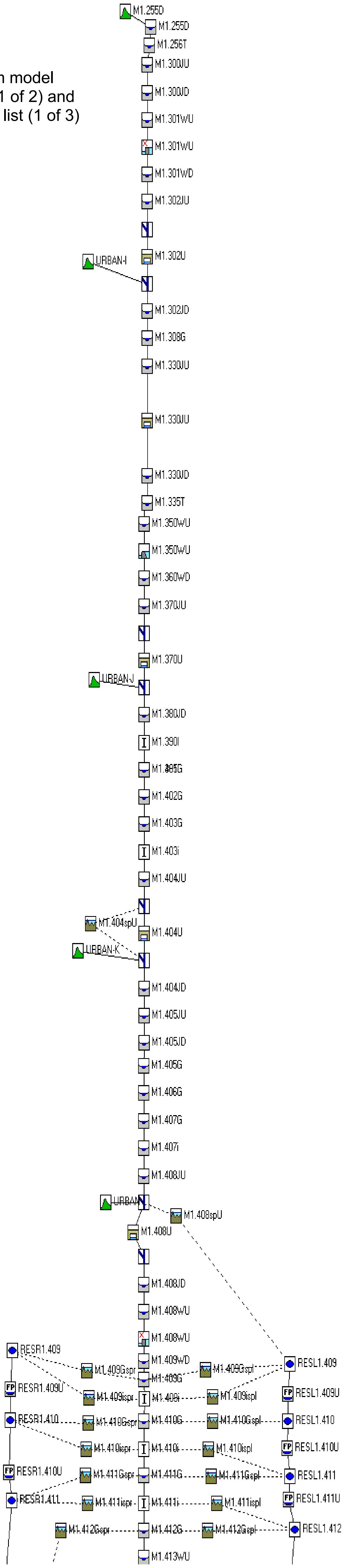
T1.880JU	JUNCTII	OPEN	
T1.890JD	RIVER	SECTIC	TEMPLE BURN, D/S OF CONFLUENCE WITH PARKS FARM BURN -
T1.895I	INTERP		
T1.900JU	RIVER	SECTIC	TEMPLE BURN U/S OF CONFLUENCE WITH MILL BURN - original XS
Park_in_V1	JUNCTII	OPEN	
P1.C002D	RIVER	SECTIC	Section C00C - THC Survey Feb 2011 C002D
P1.C003i	INTERP		
P1.C004	RIVER	SECTIC	Section C00D- THC Survey Feb 2011 C00D
P1.C005i	INTERP		
P1.C006	RIVER	SECTIC	Section C00E- THC Survey Feb 2011 C00E
P1.C006i	INTERP		
P1.C007i	INTERP		
P1.C008	RIVER	SECTIC	THC Survey Feb 2011 C008
P1.C008i	INTERP		
P1.C009i	INTERP		
P1.C009i2	INTERP		
P1.C009JU	RIVER	SECTIC	U/S Stephenson Road Bridge- - THC Survey Feb 2011 C008 adjusted
P1.C009JU	JUNCTII	OPEN	
P1.C009U	BRIDGE	USBPR	THC Survey Feb 2011 - Twin 1.04m circular culverts - Adjusted two
P1.C009JUspu	SPILL		Stevenson Street Spill - levels extracted from LIDAR
P1.C009JD	JUNCTII	OPEN	
P1.C009JD	RIVER	SECTIC	D/s Stephenson Road Bridge - Copy of C009
P1.C012	RIVER	SECTIC	D/s Stephenson Road Bridge- THC Survey Feb 2011 C013, height adjusted
P1.C012i	INTERP		
P1.C013	RIVER	SECTIC	THC Survey Feb 2011 C013
P1.C016	RIVER	SECTIC	THC Survey Feb 2011 C016

← Upstream model node list (2 of 3)

↓ Upstream model node list (3 of 3)

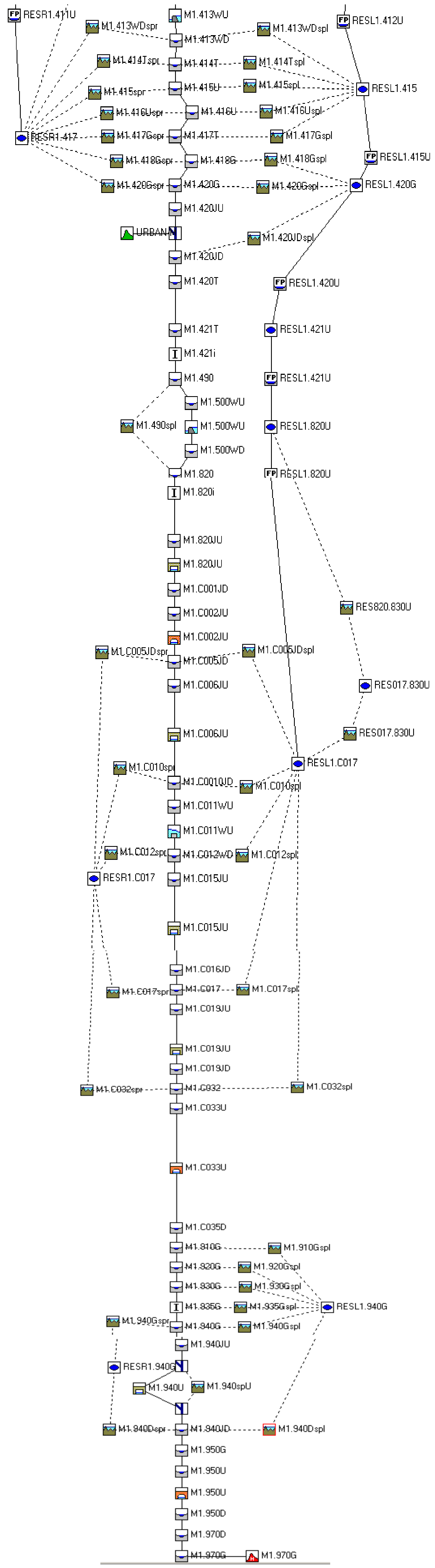
P1.C017JU	RIVER	SECTIC	U/s footbridge- soffit 0.5m below deck as measured by THC Feb 2011 -
P1.C017JU	JUNCTII	OPEN	
P1.C017U	BRIDGE	USBPR	Footbridge- soffit 0.5m below deck as measured by THC Feb 2011
P1.C017JUspu	SPILL		Miller Street Footbridge - Levels from THC survey
P1.C019JD	JUNCTII	OPEN	
P1.C019JD	RIVER	SECTIC	D/s footbridge- THC surveyed Cross-section C019
P1.C019i	INTERP		
P1.C020	RIVER	SECTIC	THC Survey Feb 2011 C020
P1.C021i	INTERP		
P1.C022i	INTERP		
P1.C022JU	RIVER	SECTIC	u/s Miller Road Bridge- - THC Survey Feb 2011 C020 adjusted based on
P1.C022JU	JUNCTII	OPEN	
P1.C022U	BRIDGE	USBPR	Miller Road Bridge - Twin 1m culverts - Adjusted to rectangular 0.84m wide
P1.C022JUspu	SPILL		Miller Street Bridge - Levels from LIDAR
P1.C023JD	JUNCTII	OPEN	
P1.C023JD	RIVER	SECTIC	d/s Millar Road Bridge- THC Survey Feb 2011 C025 adjusted based on
P1.C024i	INTERP		
P1.C025i	INTERP		
P1.C025	RIVER	SECTIC	THC Survey Feb 2011 C025
P1.C026i	INTERP		
P1.C026WU	RIVER	SECTIC	Top of cascade - THC Survey Feb 2011 C026
P1.C026WU	WEIR		
P1.C034WD	RIVER	SECTIC	Bottom of cascade- Copy of P1.C036
P1.C034i	INTERP		
P1.C035i	INTERP		
P1.C036JU	RIVER	SECTIC	U/s Southern Distributer Road- C036, with middle levels reduced to match
P1.C036JU	JUNCTII	OPEN	
P1.C036JD	RIVER	SECTIC	Copy of C036
P1.490	RIVER	SECTIC	PARKS FARM BURN, DOWNSTREAM OF DISTRIBUTOR ROAD - original
P1.510U	RIVER	SECTIC	PARKS FARM BURN, UPSTREAM OF FALCON AVENUE CULVERT -
P1.510U	CULVEF	INLET	- original XS
P1.520C1D	CONDU	CIRCUL	PARKS FARM BURN, FALCON AVENUE CULVERT - U/S END - original
P1.520C1R1	REPLIC		
P1.520C1R2	REPLIC		
P1.520C1R3	REPLIC		
P1.520C1R4	REPLIC		
P1.520C2U	CONDU	CIRCUL	PARKS FARM BURN, FALCON AVENUE CULVERT - D/S END - original
P1.520C2U	CULVEF	OUTLE	- original XS
M1.254JU	JUNCTII	OPEN	
M1.254JD	RIVER	SECTIC	MILL BURN, D/S OF TEMPLE BURN CONFL, RAISED BY 0.1M TO
M1.255JU	RIVER	SECTIC	MILL BURN, NEAR 39 HARRIS ROAD U/S OF FOOTBRIDGE - original XS
M1.255JU	JUNCTII	OPEN	
M1.255U	BRIDGE	USBPR	MILL BURN FOOTBRIDGE OPPOSITE 39 HARRIS ROAD
M1.255spU	SPILL		Spill for bridge opposite 39 Harris Road, level assumed as bridge soffit plus
M1.255JD	JUNCTII	OPEN	
M1.255JD	RIVER	SECTIC	MILL BURN, NEAR 39 HARRIS ROAD D/S OF FOOTBRIDGE - original XS
M1.256T	RIVER	SECTIC	MILL BURN, NEAR 29 HARRIS ROAD
M1.300JU	RIVER	SECTIC	MILL BURN, D/S OF URBAN OUTFALL
M1.300JU	NCDBD		
T1.380ispl	SPILL		Left bank spill near Dowes Diner - from LIDAR
T1.400ispl	SPILL		Left bank spill near Dowes Diner - from LIDAR
T1.403ispl	SPILL		Left bank spill near Dowes Diner - from LIDAR
T1.405Gspl	SPILL		Left bank spill near Dowes Diner - from LIDAR
M1.211spr	SPILL		To update
M1.C005spl	SPILL		From Survey - low section of bank only
M1.C004spl	SPILL		From THC Survey Feb 2011
M1.211spl	SPILL		From LiDAR - Not a flood bank so less efficient
M1.C005spl	SPILL		From Survey - low section of bank only
M1.C004spl	SPILL		From THC Survey Feb 2011
M1.211spl	SPILL		From LiDAR - Not a flood bank so less efficient
RESR1.211	RESER\		to update
RESL1.211	RESER\		Levels from LiDAR
REST1.380	RESER\		

Downstream model schematic (1 of 2) and model node list (1 of 3)



M1.255D	QTBDY		Inflow from upstream model, 200yr + CC
URBAN-I	QTBDY		Surface water runoff from urban area I, 200yr + CC
URBAN-J	QTBDY		Surface water runoff from urban area J, 200yr + CC
URBAN-K	QTBDY		Surface water runoff from urban area K, 200yr + CC
URBAN-L	QTBDY		Surface water runoff from urban area L, 200yr + CC
URBAN-M	QTBDY		Surface water runoff from urban area M, 200yr + CC
M1.255D	RIVER	SECTIC	MILL BURN, NEAR 39 HARRIS ROAD D/S OF FOOTBRIDGE
M1.256T	RIVER	SECTIC	MILL BURN, NEAR 29 HARRIS ROAD
M1.300JU	RIVER	SECTIC	MILL BURN, D/S OF URBAN OUTFALL
M1.300JD	RIVER	SECTIC	MILL BURN, NEAR 23 HARRIS ROAD
M1.301WU	RIVER	SECTIC	MILL BURN, U/S OF DROP TO HARRIS ROAD
M1.301WU	NOTWE		Drop to harris road bridge
M1.301WD	RIVER	SECTIC	Drop to harris road bridge
M1.302JU	RIVER	SECTIC	MILL BURN, U/S OF HARRIS ROAD BRIDGE
M1.302JU	JUNCTI	OPEN	
M1.302U	BRIDGE	USBPR	Harris Road Bridge
M1.302D	JUNCTI	OPEN	
M1.302JD	RIVER	SECTIC	MILL BURN, D/S OF HARRIS ROAD BRIDGE
M1.308G	RIVER	SECTIC	MILL BURN, D/S OF HARRIS ROAD BRIDGE
M1.330JU	RIVER	SECTIC	MILL BURN, U/S OF 19 HARRIS ROAD PRIVATE BRIDGE- THC section
M1.330JU	BRIDGE	USBPR	Private Road Bridge - THC Survey Feb 2011
M1.330JD	RIVER	SECTIC	MILL BURN, D/S OF 19 HARRIS ROAD PRIVATE BRIDGE - copy of
M1.335T	RIVER	SECTIC	MILL BURN, AT FENCELINE OF 19 HARRIS ROAD
M1.350WU	RIVER	SECTIC	MILL BURN, U/S OF OLD MILL LANE WEIR
M1.350WU	RNWEII		OLD MILL LANE WEIR - MAIN SECTION 3.4m WIDE, ALSO 3m @
M1.360WD	RIVER	SECTIC	MILL BURN, D/S OF OLD MILL LANE WEIR
M1.370JU	RIVER	SECTIC	MILL BURN, U/S OF OLD MILL LANE BRIDGE
M1.370JU	JUNCTI	OPEN	
M1.370U	BRIDGE	USBPR	OLD MILL LANE BRIDGE
M1.380D	JUNCTI	OPEN	
M1.380JD	RIVER	SECTIC	MILL BURN, D/S OF OLD MILL LANE BRIDGE
M1.390I	INTERP		
M1.395i	INTERP		
M1.401G	RIVER	SECTIC	Mill Burn, Inverness Golf Course upstream end
M1.402G	RIVER	SECTIC	Mill Burn, Inverness Golf Course NEAR FIRST BRIDGE
M1.403G	RIVER	SECTIC	Mill Burn, Inverness Golf Course BEHIND 8 ERISKAY ROAD
M1.403i	INTERP		
M1.404JU	RIVER	SECTIC	Mill Burn, U/S OF GOLF BRIDGE 4
M1.404JU	JUNCTI	OPEN	
M1.404spU	SPILL		
M1.404U	BRIDGE	USBPR	Golf course bridge
M1.404D	JUNCTI	OPEN	
M1.404JD	RIVER	SECTIC	Mill Burn, D/S OF GOLF BRIDGE 4
M1.405JU	RIVER	SECTIC	Mill Burn, U/S OF URBAN OUTFALL
M1.405JD	RIVER	SECTIC	Mill Burn, Inverness Golf Course BEHIND 28 ERISKAY ROAD
M1.405G	RIVER	SECTIC	Mill Burn, Inverness Golf Course BEHIND 11 KINGSMILL GARDENS
M1.406G	RIVER	SECTIC	Mill Burn, Inverness Golf Course BEHIND 14 KINGSMILL GARDENS
M1.407G	RIVER	SECTIC	Mill Burn, Inverness Golf Course OPPOSITE 3 KINGSMILL GARDENS
M1.407i	RIVER	SECTIC	Copy of M1.407 (-0.22m) - added to improve floodplain definition
M1.408JU	RIVER	SECTIC	Mill Burn, Inverness Golf Course UPSTREAM OF CULCABOCK ROAD
M1.408JU	JUNCTI	OPEN	
M1.408U	BRIDGE	USBPR	Mill Burn, Culcabock Road Bridge - This is a double bridge - square and
M1.408D	JUNCTI	OPEN	
M1.408JD	RIVER	SECTIC	
M1.408WU	RIVER	SECTIC	Copy - 0.05
M1.408WU	NOTWE		
M1.409WD	RIVER	SECTIC	Mill Burn, D/S OF CULCABOCK ROAD BRIDGE - RAISED BY 0.185m
M1.409G	RIVER	SECTIC	Mill Burn, Inverness Golf Course DOWNSTREAM OF CULCABOCK ROAD
M1.409i	INTERP		Interpolated section
M1.410G	RIVER	SECTIC	Mill Burn, Inverness Golf Course DOWNSTREAM OF CURLING PONDS,
M1.410i	INTERP		
M1.411G	RIVER	SECTIC	Mill Burn, Inverness Golf Course NEAR COUNCIL DEPOT GATE, level at
M1.411i	INTERP		
M1.412G	RIVER	SECTIC	Mill Burn, Inverness Golf Course NEAR MIDMILLS ROAD, level at 9m
M1.413WU	RIVER	SECTIC	Mill Burn, Inverness Golf Course UPSTREAM OF DIRIEBUGHT HOUSE
M1.413WU	RNWEII		DIRIEBUGHT HOUSE WEIR
M1.413WD	RIVER	SECTIC	Mill Burn, Inverness Golf Course DOWNSTREAM OF DIRIEBUGHT
M1.414T	RIVER	SECTIC	MILL, U/S OF DIREIBUGHT HO, levels at -0.5 & -0.02 changed from 11.7
M1.415U	RIVER	SECTIC	MILL, 1st BRIDGE AT DIREIBUGHT HO, level at -0.5 & -0.02 changed
M1.416U	RIVER	SECTIC	MILL 2nd BRIDGE AT DIREIBUGHT HOUSE, level at -0.5 changed from
M1.417T	RIVER	SECTIC	MILL, D/S OF DIREIBUGHT HOUSE, level at -0.5 & -0.02 changed from
M1.418G	RIVER	SECTIC	Mill Burn, Inverness Golf Course DOWNSTREAM OF DIRIEBUGHT
M1.420G	RIVER	SECTIC	Mill Burn, Behind Diriebught Road - M1.420 COPIED, level at -2.1 & 0
M1.420JU	RIVER	SECTIC	Mill Burn, Behind Diriebught Road - D/S OF OUTFALL - M1.420 COPIED,
M1.420JU	JUNCTI	OPEN	
M1.420JD	RIVER	SECTIC	Mill Burn, Behind Diriebught Road - M1.420 COPIED, level at 8 changed to
M1.420T	RIVER	SECTIC	Mill Burn, Behind no 7 Diriebught Road
M1.421T	RIVER	SECTIC	Mill Burn, UPSTREAM OF REDUNDANT SLUICES, DIRIEBUGHT ROAD
M1.421i	INTERP		
M1.490	RIVER	SECTIC	Side weir - This represents the rest of the weir, although M1.500WU is the
M1.500WU	RIVER	SECTIC	DUMMY SECTION AT SLUICES
M1.500WU	RNWEII		Elevation from previous model width from THC survey Feb 2011, two weirs
M1.500WD	RIVER	SECTIC	
M1.820	RIVER	SECTIC	
M1.820i	INTERP		
M1.820JU	RIVER	SECTIC	Upstream Millburn Court

Downstream model schematic (2 of 2) and model node list (2 of 3)



M1.820JU	BRIDGE	USBPR	Millburn Court Culvert - THC Survey Feb 2011
M1.C001JD	RIVER	SECTIC	Section C001 - could be same as M1.830 - THC Survey Feb 2011 - Section
M1.C002JU	RIVER	SECTIC	Section C002 - THC Survey Feb 2011 - Section C002
M1.C002JU	BRIDGE	ARCH	Distillery access bridge - From THC survey C005
M1.C005JD	RIVER	SECTIC	Section C005 - THC Survey Feb 2011
M1.C006JU	RIVER	SECTIC	Section C006 - THC Survey Feb 2011 (+0.05)
M1.C006JU	BRIDGE	USBPR	Distillery Carpark bridge - - THC Survey Feb 2011
M1.C0010JD	RIVER	SECTIC	Section C010 - THC Survey Feb 2011
M1.C011WU	RIVER	SECTIC	Section C011 - Copy of C011 adjusted based on C011
M1.C011WU	WEIR		
M1.C012WD	RIVER	SECTIC	Section C012 - Copy of C015U adjusted to match C012
M1.C015JU	RIVER	SECTIC	U/s footbridge - THC Survey Feb 2011 C015
M1.C015JU	BRIDGE	USBPR	Footbridge - THC Survey Feb 2011
M1.C016JD	RIVER	SECTIC	d/s footbridge THC Survey Feb 2011 C016
M1.C017	RIVER	SECTIC	Section C017 - THC Survey Feb 2011 C017
M1.C019JU	RIVER	SECTIC	Upstream Millburn Road Bridge - THC Survey Feb 2011 C019 (-0.2)
M1.C019JU	BRIDGE	USBPR	Millburn Road Bridge - THC Survey Feb 2011
M1.C019JD	RIVER	SECTIC	Downstream Millburn Road Bridge - THC Survey Feb 2011 C019 (-0.2)
M1.C032	RIVER	SECTIC	D/s Millburn road bridge - THC Survey Feb 2011 Section C032
M1.C033U	RIVER	SECTIC	U/s Railway bridge - THC Survey Feb 2011 Section C033
M1.C033U	BRIDGE	ARCH	Railway Culvert - THC Survey Feb 2011
M1.C035D	RIVER	SECTIC	Section 1a of Infoworks model - downstream of railway bridge - Section
M1.910G	RIVER	SECTIC	Section 1b of Infoworks model - Section C036 THC survey
M1.920G	RIVER	SECTIC	Section 1c of Infoworks model (-0.2, based on changes to previous sections
M1.930G	RIVER	SECTIC	Section 2 of Infoworks model
M1.935G	INTERP		
M1.940G	RIVER	SECTIC	Section 3 of Infoworks model
M1.940JU	RIVER	SECTIC	Upstream of Harbour Road Bridge (-0.04)
M1.940JU	JUNCTI	OPEN	
M1.940spU	SPILL		Levels based on LIDAR
M1.940U	BRIDGE	USBPR	Harbour Road Bridge - THC Survey Feb 2011 (3.5 x 0.9)
M1.940JD	JUNCTI	OPEN	
M1.940JD	RIVER	SECTIC	Downstream of Harbour Road Bridge
M1.950G	RIVER	SECTIC	Section 4 of Infoworks model
M1.950U	RIVER	SECTIC	Upstream of A9 culvert
M1.950U	BRIDGE	ARCH	A9 Culvert - THC Survey Feb 2011 - (2.75 x 1.82)
M1.950D	RIVER	SECTIC	Downstream of A9 culvert
M1.970D	RIVER	SECTIC	Downstream A9 culvert
M1.970G	RIVER	SECTIC	D/s boundary
M1.970G	HTBDY		Tidal boundary
RESR1.409U	FLOODF	SECTIC	From LiDAR - section R1.410
RESR1.410U	FLOODF	SECTIC	From LiDAR - section M1.411a
RESR1.411U	FLOODF	SECTIC	From LiDAR - R1.411i
RESL1.409U	FLOODF	SECTIC	From LiDAR - section L1.410
RESL1.410U	FLOODF	SECTIC	From LiDAR - section L1.410i
RESL1.411U	FLOODF	SECTIC	From LiDAR - section L1.411
RESL1.412U	FLOODF	SECTIC	From LiDAR - section L1.413
RESL1.415U	FLOODF	SECTIC	From LiDAR - Section L1.418
RESL1.420U	FLOODF	SECTIC	From LiDAR - Section L1.420T
RESL1.421U	FLOODF	SECTIC	From LiDAR - L1.421T
RESL1.820U	FLOODF	SECTIC	From LiDAR - L1.830
M1.408spU	SPILL		Spill over Calcabock Road bridge 2m wide pedestrian entrance in wall (20.5
M1.409Gspr	SPILL		Levels based on XS data from THC
M1.409Gspl	SPILL		Levels based on XS data from THC
M1.409ispr	SPILL		Levels based on XS data from THC
M1.409ispl	SPILL		Levels based on XS data from THC
M1.410Gspr	SPILL		Levels based on XS data from THCand LiDAR
M1.410Gspl	SPILL		Levels based on XS data from THC and LiDAR

Downstream model node list 3 of 3

M1.410ispr	SPILL		Levels based on LiDAR and XS
M1.410ispl	SPILL		Levels based on LiDAR and XS
M1.411Gspr	SPILL		Levels based on XS and LiDAR
M1.411Gspl	SPILL		From LiDAR and XS
M1.411ispr	SPILL		Levels based on XS data from THC
M1.411ispl	SPILL		Levels based on XS data from THC
M1.413WDspr	SPILL		Based on XS data from THC
M1.413WDspl	SPILL		Based on XS data from THC
M1.412Gspl	SPILL		Based on XS data from THC
M1.412Gspr	SPILL		Based on XS data from THC
M1.414Tspl	SPILL		Levels based XS data from THC
M1.414Tspr	SPILL		Based on XS data from THC survey
M1.415spl	SPILL		Levels based XS data from THC
M1.415spr	SPILL		Based on XS data from THC
M1.416Uspl	SPILL		Levels based on LiDAR and XS
M1.416Uspr	SPILL		Based on XS data from THC survey
M1.417Gspl	SPILL		Levels based on XS data from THC
M1.417Gspr	SPILL		Levels based on XS and LiDAR
M1.418Gspr	SPILL		Levels based on XS and LiDAR
M1.418Gspl	SPILL		Levels based on XS data from THC
M1.420Gspr	SPILL		Levels based on XS data from THC
M1.420JDspl	SPILL		Levels based on XS and LiDAR
M1.420Gspl	SPILL		Levels based on XS data from THC
M1.490spl	SPILL		Weir spill
M1.C005JDspr	SPILL		Levels from XS
M1.C005JDspl	SPILL		Data from XS levels
M1.C010spl	SPILL		Levels from XS
M1.C010spr	SPILL		Levels from XS
M1.C012spl	SPILL		Levels from XS
M1.C012spr	SPILL		Levels from XS
M1.C017spr	SPILL		Levels from XS
M1.C017spl	SPILL		Levels from XS
M1.C032spr	SPILL		Levels from LiDAR
M1.C032spl	SPILL		Levels from LiDAR
RES017.830U	SPILL		Spill between reservoirs on Millburn Road - From LiDAR
RES820.830U	SPILL		From LiDAR
M1.910Gspl	SPILL		Levels from LiDAR
M1.920Gspl	SPILL		Left bank spill, levels from LiDAR
M1.930Gspl	SPILL		Left bank spill, levels from LiDAR
M1.935Gspl	SPILL		Levels from LiDAR
M1.940Gspl	SPILL		Levels from LiDAR
M1.940Dspl	SPILL		Levels from LiDAR
M1.940Gspr	SPILL		Right bank spill - Levels from LiDAR
M1.940Dspr	SPILL		Right bank spill - Levels from LiDAR
RESL1.409	RESER\		From LiDAR
RESL1.410	RESER\		From LiDAR
RESL1.411	RESER\		From LiDAR
RESL1.412	RESER\		From LiDAR
RESL1.415	RESER\		From LiDAR
RESL1.420G	RESER\		From LiDAR
RESL1.421U	RESER\		From LiDAR
RESL1.820U	RESER\		From LiDAR
RESR1.409	RESER\		From LiDAR
RESR1.410	RESER\		From LiDAR
RESR1.411	RESER\		From LiDAR
RESR1.417	RESER\		From LiDAR
RESL1.C017	RESER\		From LiDAR
RESR1.C017	RESER\		From LiDAR
RES017.830U	RESER\		From LiDAR
RESL1.940G	RESER\		From LiDAR
RESR1.940G	RESER\		From LiDAR

Mott MacDonald

Appendix C. Model results

Maximum flood water levels at upstream model nodes (list 1 of 3)

Node	Initial Conditions	2yr	5yr	10yr	25yr	50yr	100yr	100yr+CC	200yr	200yr+CC	200yr+CC-10% roughness	200yr+CC+10% roughness	Flood wall near Castle Heather	30% blockage Castle Heather culverts only	Difference 200yr+CC+10% roughness less 200yr+CC	Difference 200yr+CC-10% roughness less 200yr+CC	Difference 200yr+CC less 200yr	Difference blockage Castle Heather - 200yr+CC	Difference Dows wall - 200yr+CC
M1.190F	39.86	40.02	40.09	40.13	40.19	40.24	40.44	40.50	40.48	40.46	40.48	40.50	40.46	40.46	0.05	0.03	-0.02	0.00	0.00
M1.200F	39.425	39.61	39.70	39.75	39.81	39.86	40.08	40.14	40.12	40.09	40.15	40.12	40.10	40.10	0.03	0.05	-0.02	0.00	0.00
M1.210JU	39.398	39.60	39.68	39.72	39.77	39.81	40.01	40.07	40.05	40.03	40.09	40.04	40.03	40.03	0.02	0.07	-0.03	0.00	0.00
M1.210WspU	39.398	39.60	39.68	39.72	39.77	39.81	40.01	40.07	40.05	40.03	40.09	40.04	40.03	40.03	0.02	0.07	-0.03	0.00	0.00
M1.210WU	39.398	39.60	39.68	39.72	39.77	39.81	40.01	40.07	40.05	40.03	40.09	40.04	40.03	40.03	0.02	0.07	-0.03	0.00	0.00
M1.211JD	38.586	38.79	38.87	38.91	38.98	39.02	39.24	39.30	39.27	39.27	39.28	39.30	39.27	39.27	0.03	0.01	0.00	0.00	0.00
M1.211spl	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.00	0.00	0.00
M1.211spr	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.00	0.00	0.00
M1.211WD	38.586	38.79	38.87	38.91	38.98	39.02	39.24	39.30	39.27	39.27	39.28	39.30	39.27	39.27	0.03	0.01	0.00	0.00	0.00
M1.211WspD	38.586	38.79	38.87	38.91	38.98	39.02	39.24	39.30	39.27	39.27	39.28	39.30	39.27	39.27	0.03	0.01	0.00	0.00	0.00
M1.212D	38.479	38.65	38.72	38.76	38.81	38.85	39.03	39.08	39.05	39.06	39.06	39.08	39.06	39.06	0.02	0.00	0.02	-0.01	0.00
M1.212JD	38.479	38.65	38.72	38.76	38.81	38.85	39.03	39.08	39.05	39.06	39.06	39.08	39.06	39.06	0.02	0.00	0.02	-0.01	0.00
M1.212JU	38.479	38.65	38.72	38.76	38.81	38.85	39.03	39.08	39.05	39.06	39.06	39.08	39.06	39.06	0.02	0.00	0.02	-0.01	0.00
M1.212U	38.479	38.65	38.72	38.76	38.81	38.85	39.03	39.08	39.05	39.06	39.06	39.08	39.06	39.06	0.02	0.00	0.02	-0.01	0.00
M1.220T	38.242	38.36	38.42	38.45	38.49	38.52	38.66	38.70	38.66	38.69	38.68	38.69	38.69	38.69	0.00	-0.01	0.03	-0.01	0.00
M1.230I	37.743	37.87	37.93	37.95	37.99	38.03	38.16	38.20	38.16	38.20	38.19	38.18	38.20	38.20	-0.02	-0.01	0.04	0.00	0.00
M1.240I	37.326	37.44	37.50	37.53	37.57	37.61	37.73	37.77	37.74	37.78	37.77	37.76	37.78	37.78	-0.02	-0.01	0.04	0.00	0.00
M1.245I	37.107	37.23	37.29	37.32	37.36	37.40	37.52	37.56	37.54	37.57	37.57	37.55	37.57	37.58	-0.02	0.00	0.03	0.01	0.00
M1.250D	36.913	37.04	37.10	37.13	37.17	37.22	37.33	37.36	37.35	37.38	37.38	37.36	37.38	37.39	-0.02	0.00	0.03	0.01	0.00
M1.250JD	36.913	37.04	37.10	37.13	37.17	37.22	37.33	37.36	37.35	37.38	37.38	37.36	37.38	37.39	-0.02	0.00	0.03	0.01	0.00
M1.250JU	36.913	37.04	37.10	37.13	37.17	37.22	37.33	37.36	37.35	37.38	37.38	37.36	37.38	37.39	-0.02	0.00	0.03	0.01	0.00
M1.250U	36.913	37.04	37.10	37.13	37.17	37.22	37.33	37.36	37.35	37.38	37.38	37.36	37.38	37.39	-0.02	0.00	0.03	0.01	0.00
M1.251D	36.079	36.21	36.27	36.30	36.34	36.40	36.49	36.51	36.52	36.52	36.53	36.51	36.51	36.54	0.00	0.01	0.00	0.02	0.00
M1.251I	36.406	36.53	36.59	36.62	36.66	36.71	36.82	36.84	36.84	36.85	36.87	36.85	36.85	36.87	-0.01	0.01	0.01	0.02	0.00
M1.251JD	36.079	36.21	36.27	36.30	36.34	36.40	36.49	36.51	36.52	36.52	36.53	36.51	36.51	36.54	0.00	0.01	0.00	0.02	0.00
M1.251JU	36.079	36.21	36.27	36.30	36.35	36.41	36.53	36.56	36.56	36.57	36.60	36.55	36.56	36.60	-0.02	0.03	0.01	0.03	-0.01
M1.251T	36.8	36.92	36.97	37.00	37.04	37.08	37.19	37.22	37.21	37.23	37.23	37.22	37.23	37.24	-0.02	0.00	0.02	0.01	0.00
M1.251U	36.079	36.21	36.27	36.30	36.35	36.41	36.53	36.56	36.56	36.57	36.60	36.55	36.56	36.60	-0.02	0.03	0.01	0.03	-0.01
M1.252T	35.837	35.99	36.06	36.09	36.14	36.20	36.29	36.31	36.31	36.31	36.32	36.32	36.31	36.33	0.01	0.01	0.00	0.02	0.00
M1.253T	34.48	34.69	34.78	34.82	34.89	35.03	35.10	35.15	35.14	35.13	35.14	35.16	35.12	35.13	0.02	0.01	0.00	-0.01	-0.02
M1.254i	33.276	33.50	33.62	33.67	33.74	33.94	34.01	34.10	34.13	34.13	34.11	34.17	34.21	34.13	0.04	-0.02	0.00	0.00	0.07
M1.254JD	32.256	32.58	32.79	32.87	32.94	33.16	33.27	33.45	33.60	33.61	33.49	33.71	33.96	33.61	0.10	-0.12	0.01	0.00	0.35
M1.254JU	32.256	32.58	32.79	32.87	32.94	33.16	33.27	33.45	33.60	33.61	33.49	33.71	33.96	33.61	0.10	-0.12	0.01	0.00	0.35
M1.255D	31.675	31.98	32.20	32.27	32.37	32.51	32.57	32.64	32.70	32.70	32.63	32.77	32.83	32.70	0.07	-0.07	0.00	0.00	0.13
M1.255JD	31.675	31.98	32.20	32.27	32.37	32.51	32.57	32.64	32.70	32.70	32.63	32.77	32.83	32.70	0.07	-0.07	0.00	0.00	0.13
M1.255JU	31.675	31.98	32.20	32.29	32.55	32.99	33.14	33.37	33.52	33.53	33.45	33.61	33.91	33.53	0.07	-0.09	0.01	0.00	0.38
M1.255spD		31.98	32.20	32.27	32.37	32.51	32.57	32.64	32.70	32.70	32.63	32.77	32.83	32.70	0.07	-0.07	0.00	0.00	0.13
M1.255spU		31.98	32.20	32.29	32.55	32.99	33.14	33.37	33.52	33.53	33.45	33.61	33.91	33.53	0.07	-0.09	0.01	0.00	0.38
M1.255U	31.675	31.98	32.20	32.29	32.55	32.99	33.14	33.37	33.52	33.53	33.45	33.61	33.91	33.53	0.07	-0.09	0.01	0.00	0.38
M1.256T	30.796	31.09	31.31	31.38	31.48	31.61	31.67	31.74	31.80	31.80	31.73	31.86	31.92	31.80	0.06	-0.07	0.00	0.00	0.12
M1.300JU	29.106	29.37	29.57	29.64	29.72	29.84	29.89	29.96	30.02	30.02	29.95	30.08	30.13	30.02	0.06	-0.06	0.00	0.00	0.11
M1.C001	51.445	51.60	51.65	51.68	51.71	51.74	51.77	51.80	51.84	51.83	51.81	51.85	51.83	51.83	0.02	-0.03	-0.01	0.00	0.00
M1.C002i	49.349	49.53	49.58	49.60	49.65	49.68	49.71	49.75	49.80	49.79	49.76	49.81	49.79	49.79	0.02	-0.02	-0.01	0.00	0.00
M1.C003	47.368	47.51	47.57	47.60	47.64	47.68	47.71	47.76	47.80	47.79	47.77	47.82	47.79	47.79	0.02	-0.02	-0.01	0.00	0.00
M1.C004	45.689	45.85	45.91	45.94	45.98	46.02	46.06	46.11	46.17	46.16	46.12	46.19	46.16	46.16	0.03	-0.04	-0.01	0.00	0.00
M1.C004JD	46.006	46.22	46.31	46.35	46.40	46.47	46.51	46.56	46.61	46.60	46.56	46.62	46.60	46.60	0.03	-0.03	-0.01	0.00	0.00
M1.C004JU	46.006	46.22	46.31	46.35	46.40	46.47	46.51	46.56	46.61	46.60	46.56	46.62	46.60	46.60	0.03	-0.03	-0.01	0.00	0.00
M1.C004spl	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.00	0.00	0.00
M1.C005	44.321	44.47	44.54	44.58	44.62	44.70	44.73	44.77	44.79	44.78	44.77	44.79	44.78	44.78	0.01	-0.01	-0.01	0.00	0.00
M1.C005spl	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.00	0.00	0.00
M1.C006	43.3	43.64	43.84	43.92	43.99	44.29	44.30	44.31	44.30	44.27	44.32	44.25	44.27	44.28	-0.02	0.05	-0.03	0.01	0.00
M1.C007	40.504	40.67	40.74	40.77	40.83	40.89	41.05	41.09	41.08	41.05	41.07	41.10	41.06	41.06	0.05	0.02	-0.03	0.01	0.00
Mill_in_V1	51.445	51.60	51.65	51.68	51.71	51.74	51.77	51.80	51.84	51.83	51.81	51.85	51.83	51.83	0.02	-0.03	-0.01	0.00	0.00
Mill2_in_V1	46.006	46.22	46.31	46.35	46.40	46.47	46.51	46.56	46.61	46.60	46.56	46.62	46.60	46.60	0.03	-0.03	-0.01	0.00	0.00
P1.490	40.45	40.45	40.51	40.56	40.65	40.73	40.82	40.94	41.06	41.04	41.04	41.05	41.04	41.04	0.00	-0.01	-0.02	0.00	0.00
P1.510U	40.334	40.33	40.43	40.50	40.61	40.70	40.80	40.92	41.05	41.03	41.03	41.03	41.03	41.03	0.00	0.00	-0.02	0.00	0.00
P1.520C1D	40.015	40.02	40.05	40.08	40.11	40.15	40.18	40.22	40.26	40.25	40.25	40.26	40.26	40.25	0.00	0.00	-0.01	0.00	0.01
P1.520C1R1	38.653	38.65	38.68	38.70	38.74	38.77	38.79	38.83	38.87	38.86	38.86	38.86	38.85	38.86	0.00	0.00	-0.01	0.00	-0.01
P1.520C1R2	37.211	37.21	37.25	37.27	37.31	37.34	37.37	37.41	37.46	37.45	37.45	37.46	37.47	37.45	0.00	0.00	0.00	0.00	0.02
P1.520C1R3	35.869	35.87	35.89	35.91	35.95	35.98	36.00	36.04	36.07	36.07	36.07	36.06	36.04	36.07	-0.01	0.01	-0.01	0.00	-0.02

Maximum flood water levels at upstream model nodes (list 2 of 3)

Node	Initial Conditions	2yr	5yr	10yr	25yr	50yr	100yr	100yr+CC	200yr	200yr+CC	200yr+CC-10% roughness	200yr+CC+10% roughness	Flood wall near Castle Heather	30% blockage Castle Heather culverts only	Difference 200yr+CC+10% roughness less 200yr+CC	Difference 200yr+CC-10% roughness less 200yr+CC	Difference 200yr+CC less 200yr	Difference blockage Castle Heather - 200yr+CC	Difference Dows wall - 200yr+CC
P1.520C1R4	34.405	34.41	34.44	34.47	34.50	34.53	34.56	34.60	34.65	34.64	34.64	34.65	34.68	34.64	0.01	-0.01	0.00	0.00	0.04
P1.520C2U	33.285	33.33	33.48	33.52	33.58	33.63	33.68	33.76	33.85	33.86	33.79	33.92	34.10	33.86	0.07	-0.06	0.00	0.00	0.25
P1.520D	33.228	33.30	33.45	33.48	33.53	33.57	33.61	33.68	33.76	33.77	33.69	33.84	34.04	33.77	0.08	-0.08	0.01	0.00	0.28
P1.C002D	64.552	64.55	64.61	64.63	64.66	64.69	64.71	64.74	64.77	64.76	64.75	64.78	64.76	64.76	0.02	-0.01	0.00	0.00	0.00
P1.C003i	62.85	62.86	62.97	63.00	63.04	63.07	63.10	63.13	63.16	63.16	63.14	63.17	63.16	63.16	0.02	-0.02	-0.01	0.00	0.00
P1.C004	61.397	61.40	61.47	61.51	61.56	61.59	61.63	61.66	61.70	61.69	61.67	61.71	61.69	61.69	0.02	-0.02	-0.01	0.00	0.00
P1.C005i	60.22	60.23	60.31	60.33	60.35	60.38	60.40	60.43	60.46	60.45	60.43	60.47	60.45	60.45	0.02	-0.02	0.00	0.00	0.00
P1.C006	58.901	58.90	58.95	58.96	58.99	59.02	59.04	59.06	59.09	59.08	59.07	59.10	59.08	59.08	0.02	-0.02	-0.01	0.00	0.00
P1.C006i	57.9	57.91	57.96	57.98	58.00	58.03	58.05	58.07	58.10	58.09	58.07	58.11	58.09	58.09	0.01	-0.02	0.00	0.00	0.00
P1.C007i	56.9	56.90	56.95	56.97	57.00	57.03	57.05	57.08	57.12	57.12	57.09	57.14	57.12	57.12	0.02	-0.02	-0.01	0.00	0.00
P1.C008	54.898	54.91	54.98	55.00	55.03	55.06	55.09	55.12	55.16	55.15	55.13	55.17	55.15	55.15	0.02	-0.02	-0.01	0.00	0.00
P1.C008i	54.096	54.10	54.12	54.13	54.16	54.18	54.20	54.23	54.26	54.25	54.24	54.27	54.25	54.25	0.01	-0.02	0.00	0.00	0.00
P1.C009D	52.612	52.61	52.64	52.65	52.67	52.69	52.71	52.74	52.76	52.76	52.74	52.77	52.76	52.76	0.02	-0.01	-0.01	0.00	0.00
P1.C009i	53.351	53.36	53.43	53.47	53.52	53.55	53.56	53.59	53.62	53.61	53.61	53.61	53.61	53.61	0.00	0.00	-0.01	0.00	0.00
P1.C009i2	53.207	53.23	53.41	53.48	53.54	53.57	53.58	53.61	53.63	53.63	53.63	53.61	53.63	53.62	-0.01	0.01	0.00	0.00	0.00
P1.C009JD	52.612	52.61	52.64	52.65	52.67	52.69	52.71	52.74	52.76	52.76	52.74	52.77	52.76	52.76	0.02	-0.01	-0.01	0.00	0.00
P1.C009JDspd	52.612	52.61	52.64	52.65	52.67	52.69	52.71	52.74	52.76	52.76	52.74	52.77	52.76	52.76	0.02	-0.01	-0.01	0.00	0.00
P1.C009JU	53.209	53.23	53.41	53.48	53.54	53.57	53.59	53.61	53.63	53.63	53.64	53.62	53.63	53.63	-0.01	0.01	0.00	0.00	0.00
P1.C009JUspu	53.209	53.23	53.41	53.48	53.54	53.57	53.59	53.61	53.63	53.63	53.64	53.62	53.63	53.63	-0.01	0.01	0.00	0.00	0.00
P1.C009U	53.209	53.23	53.41	53.48	53.54	53.57	53.59	53.61	53.63	53.63	53.64	53.62	53.63	53.63	-0.01	0.01	0.00	0.00	0.00
P1.C012	51.98	51.99	52.03	52.06	52.10	52.13	52.16	52.20	52.23	52.23	52.21	52.24	52.23	52.23	0.02	-0.02	-0.01	0.00	0.00
P1.C012i	50.576	50.58	50.64	50.66	50.69	50.72	50.74	50.77	50.81	50.80	50.78	50.82	50.80	50.80	0.02	-0.02	-0.01	0.00	0.00
P1.C013	49.293	49.30	49.35	49.37	49.42	49.46	49.50	49.54	49.58	49.57	49.55	49.59	49.57	49.57	0.02	-0.02	-0.01	0.00	0.00
P1.C016	48.126	48.13	48.20	48.22	48.25	48.27	48.29	48.33	48.38	48.37	48.34	48.40	48.37	48.37	0.03	-0.03	-0.01	0.00	0.00
P1.C017JU	46.796	46.80	46.85	46.87	46.90	46.94	46.97	47.00	47.03	47.03	47.01	47.04	47.03	47.03	0.02	-0.02	-0.01	0.00	0.00
P1.C017JUspu	46.796	46.80	46.85	46.87	46.90	46.94	46.97	47.00	47.03	47.03	47.01	47.04	47.03	47.03	0.02	-0.02	-0.01	0.00	0.00
P1.C017U	46.796	46.80	46.85	46.87	46.90	46.94	46.97	47.00	47.03	47.03	47.01	47.04	47.03	47.03	0.02	-0.02	-0.01	0.00	0.00
P1.C019D	46.785	46.79	46.85	46.87	46.90	46.94	46.97	47.00	47.03	47.03	47.01	47.04	47.03	47.03	0.02	-0.02	-0.01	0.00	0.00
P1.C019i	45.829	45.83	45.86	45.88	45.90	45.91	45.93	45.96	46.00	45.99	45.97	46.01	45.99	45.99	0.02	-0.02	-0.01	0.00	0.00
P1.C019JD	46.785	46.79	46.85	46.87	46.90	46.94	46.97	47.00	47.03	47.03	47.01	47.04	47.03	47.03	0.02	-0.02	-0.01	0.00	0.00
P1.C019JDspd	46.785	46.79	46.85	46.87	46.90	46.94	46.97	47.00	47.03	47.03	47.01	47.04	47.03	47.03	0.02	-0.02	-0.01	0.00	0.00
P1.C020	45.002	45.01	45.06	45.09	45.14	45.18	45.23	45.27	45.30	45.30	45.29	45.30	45.30	45.30	0.01	-0.01	-0.01	0.00	0.00
P1.C021i	44.487	44.50	44.65	44.72	44.83	44.95	45.05	45.10	45.13	45.13	45.14	45.12	45.13	45.13	-0.01	0.01	-0.01	0.00	0.00
P1.C022i	44.485	44.49	44.65	44.72	44.83	44.95	45.05	45.10	45.13	45.13	45.14	45.12	45.13	45.13	-0.01	0.01	-0.01	0.00	0.00
P1.C022JU	44.481	44.49	44.65	44.72	44.83	44.95	45.05	45.10	45.14	45.13	45.14	45.12	45.13	45.13	-0.01	0.01	0.00	0.00	0.00
P1.C022JUspu	44.481	44.49	44.65	44.72	44.83	44.95	45.05	45.10	45.14	45.13	45.14	45.12	45.13	45.13	-0.01	0.01	0.00	0.00	0.00
P1.C022U	44.481	44.49	44.65	44.72	44.83	44.95	45.05	45.10	45.14	45.13	45.14	45.12	45.13	45.13	-0.01	0.01	0.00	0.00	0.00
P1.C023D	44.215	44.22	44.25	44.27	44.30	44.32	44.33	44.36	44.39	44.38	44.37	44.40	44.38	44.38	0.02	-0.02	-0.01	0.00	0.00
P1.C023JD	44.215	44.22	44.25	44.27	44.30	44.32	44.33	44.36	44.39	44.38	44.37	44.40	44.38	44.38	0.02	-0.02	-0.01	0.00	0.00
P1.C023JDspd	44.215	44.22	44.25	44.27	44.30	44.32	44.33	44.36	44.39	44.38	44.37	44.40	44.38	44.38	0.02	-0.02	-0.01	0.00	0.00
P1.C024i	43.426	43.43	43.46	43.48	43.51	43.53	43.55	43.57	43.59	43.59	43.57	43.61	43.59	43.59	0.02	-0.02	-0.01	0.00	0.00
P1.C025	42.635	42.64	42.69	42.72	42.75	42.78	42.82	42.86	42.90	42.89	42.89	42.90	42.89	42.89	0.01	0.00	-0.01	0.00	0.00
P1.C025i	43.013	43.01	43.04	43.06	43.09	43.11	43.13	43.15	43.18	43.18	43.16	43.19	43.18	43.18	0.02	-0.02	-0.01	0.00	0.00
P1.C026i	42.498	42.50	42.57	42.60	42.65	42.69	42.73	42.79	42.85	42.84	42.84	42.84	42.84	42.84	0.00	0.00	-0.01	0.00	0.00
P1.C026WU	42.498	42.50	42.57	42.60	42.65	42.70	42.74	42.80	42.86	42.85	42.85	42.85	42.85	42.85	0.00	0.00	-0.01	0.00	0.00
P1.C034i	40.768	40.77	40.83	40.88	40.95	41.00	41.06	41.16	41.27	41.26	41.25	41.26	41.26	41.26	0.00	-0.01	-0.02	0.00	0.00
P1.C034WD	40.768	40.77	40.83	40.88	40.95	41.00	41.06	41.16	41.27	41.26	41.25	41.26	41.26	41.26	0.01	0.00	-0.02	0.00	0.00
P1.C035i	40.768	40.77	40.83	40.88	40.95	41.00	41.06	41.16	41.28	41.26	41.25	41.26	41.26	41.26	0.00	0.00	-0.02	0.00	0.00
P1.C036D	40.61	40.61	40.64	40.67	40.72	40.78	40.85	40.96	41.08	41.06	41.05	41.07	41.06	41.06	0.01	-0.01	-0.02	0.00	0.00
P1.C036JD	40.61	40.61	40.64	40.67	40.72	40.78	40.85	40.96	41.08	41.06	41.05	41.07	41.06	41.06	0.01	-0.01	-0.02	0.00	0.00
P1.C036JU	40.769	40.77	40.83	40.88	40.95	41.00	41.06	41.16	41.28	41.26	41.26	41.26	41.26	41.26	0.00	0.00	-0.02	0.00	0.00
P1.C036U	40.769	40.77	40.83	40.88	40.95	41.00	41.06	41.16	41.28	41.26	41.26	41.26	41.26	41.26	0.00	0.00	-0.02	0.00	0.00
Park_in_V1	64.552	64.55	64.61	64.63	64.66	64.69	64.71	64.74	64.77	64.76	64.75	64.78	64.76	64.76	0.02	-0.01	0.00	0.00	0.00
RESL1.211	40.505	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	0.00	0.00	0.00	0.00	0.00
RESL1.C004	40.505	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	0.00	0.00	0.00	0.00	0.00
RESL1.C005	40.505	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	40.51	0.00	0.00	0.00	0.00	0.00
RESR1.211	37.001	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	37.00	0.00	0.00	0.00	0.00	0.00
REST1.380	35.719	35.72	35.72	35.81	36.07	36.36	36.63	36.98	37.17	37.20	37.24	37.16	#N/A	37.23	-0.04	0.05	0.03	0.03	#N/A
REST1.400	35.719	35.72	35.72	35.81	36.07	36.36	36.63	36.98	37.17	37.20	37.24	37.16	#N/A	37.23	-0.04	0.05	0.03	0.03	#N/A
REST1.403i	35.719	35.72	35.72	35.81	36.07	36.36	36.63	36.98	37.17	37.20	37.24	37.16	#N/A	37.23	-0.04	0.05	0.03	0.03	#N/A
REST1.405	35.719	35.72	35.72	35.81	36.07	36.36	36.63	36.98	37.17	37.20	37.24	37.16	#N/A	37.23	-0.04	0.05	0.03	0.03	#N/A

Maximum flood water levels at upstream model nodes (list 3 of 3)

Node	Initial Conditions	2yr	5yr	10yr	25yr	50yr	100yr	100yr+CC	200yr	200yr+CC	200yr+CC-10% roughness	200yr+CC+10% roughness	Flood wall near Castle Heather	30% blockage Castle Heather culverts only	Difference 200yr+CC+10% roughness less 200yr+CC	Difference 200yr+CC-10% roughness less 200yr+CC	Difference 200yr+CC less 200yr	Difference blockage Castle Heather - 200yr+CC	Difference Dows wall - 200yr+CC
T1.100T	52.314	52.43	52.50	52.54	52.59	52.63	52.67	52.72	52.78	52.77	52.74	52.80	52.77	52.77	0.03	-0.03	-0.01	0.00	0.00
T1.110I	49.762	49.89	49.96	49.99	50.04	50.08	50.11	50.16	50.20	50.19	50.16	50.22	50.19	50.19	0.03	-0.03	-0.01	0.00	0.00
T1.120I	47.42	47.53	47.59	47.61	47.65	47.69	47.71	47.76	47.80	47.79	47.77	47.82	47.79	47.79	0.02	-0.02	-0.01	0.00	0.00
T1.170D	41.692	41.79	41.87	41.90	41.96	42.00	42.05	42.11	42.16	42.16	42.12	42.20	42.16	42.16	0.04	-0.04	0.00	0.00	0.00
T1.170JD	41.692	41.79	41.87	41.90	41.96	42.00	42.05	42.11	42.16	42.16	42.12	42.20	42.16	42.16	0.04	-0.04	0.00	0.00	0.00
T1.170JU	41.701	41.81	41.88	41.92	41.97	42.02	42.07	42.13	42.19	42.19	42.16	42.22	42.19	42.19	0.03	-0.03	0.00	0.00	0.00
T1.170U	41.701	41.81	41.88	41.92	41.97	42.02	42.07	42.13	42.19	42.19	42.16	42.22	42.19	42.19	0.03	-0.03	0.00	0.00	0.00
T1.210T	41.396	41.52	41.57	41.59	41.63	41.66	41.70	41.75	41.79	41.79	41.76	41.82	41.79	41.79	0.03	-0.03	0.00	0.00	0.00
T1.220T	40.736	40.81	40.87	40.90	40.95	40.99	41.03	41.09	41.14	41.13	41.10	41.17	41.13	41.13	0.04	-0.04	0.00	0.00	0.00
T1.240I	39.998	40.22	40.27	40.30	40.34	40.40	40.44	40.51	40.56	40.56	40.53	40.58	40.56	40.58	0.02	-0.02	0.00	0.02	0.01
T1.260I	39.708	40.16	40.19	40.20	40.21	40.22	40.24	40.25	40.27	40.27	40.28	40.28	40.29	40.38	0.02	0.01	0.00	0.11	0.02
T1.300D	39.286	39.40	39.44	39.47	39.51	39.55	39.59	39.64	39.68	39.69	39.68	39.69	39.69	39.69	0.01	-0.01	0.01	0.00	0.00
T1.300JD	39.286	39.40	39.44	39.47	39.51	39.55	39.59	39.64	39.68	39.69	39.68	39.69	39.69	39.69	0.01	-0.01	0.01	0.00	0.00
T1.300JU	39.693	40.16	40.19	40.19	40.20	40.21	40.22	40.23	40.25	40.24	40.27	40.24	40.27	40.37	0.00	0.03	0.00	0.13	0.03
T1.300spD	39.286	39.40	39.44	39.47	39.51	39.55	39.59	39.64	39.68	39.69	39.68	39.69	39.69	39.69	0.01	-0.01	0.01	0.00	0.00
T1.300spU	39.693	40.16	40.19	40.19	40.20	40.21	40.22	40.23	40.25	40.24	40.27	40.24	40.27	40.37	0.00	0.03	0.00	0.13	0.03
T1.300U	39.693	40.16	40.19	40.19	40.20	40.21	40.22	40.23	40.25	40.24	40.27	40.24	40.27	40.37	0.00	0.03	0.00	0.13	0.03
T1.301WU	39.207	39.30	39.37	39.41	39.46	39.50	39.55	39.60	39.65	39.65	39.65	39.65	39.65	39.65	0.00	0.00	0.01	0.00	0.00
T1.360WD	38.127	38.23	38.31	38.34	38.39	38.43	38.47	38.52	38.57	38.58	38.54	38.61	38.57	38.58	0.04	-0.04	0.01	0.00	-0.01
T1.380i	37.349	37.45	37.52	37.55	37.60	37.64	37.68	37.72	37.74	37.75	37.73	37.77	37.80	37.75	0.02	-0.02	0.01	0.00	0.05
T1.380ispl	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	0.00	0.00	0.00	0.00	#N/A
T1.400i	37.166	37.26	37.34	37.37	37.42	37.46	37.49	37.54	37.56	37.56	37.54	37.58	37.66	37.56	0.02	-0.02	0.01	0.00	0.09
T1.400ispl	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	0.00	0.00	0.00	0.00	#N/A
T1.403i	37.136	37.18	37.24	37.28	37.33	37.37	37.40	37.45	37.47	37.48	37.46	37.49	37.63	37.48	0.02	-0.02	0.01	0.00	0.16
T1.403ispl	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	0.00	0.00	0.00	0.00	#N/A
T1.405Gspl	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	0.00	0.00	0.00	0.00	#N/A
T1.405T	36.884	37.00	37.13	37.18	37.22	37.26	37.28	37.31	37.33	37.33	37.32	37.34	37.51	37.33	0.01	-0.01	0.00	0.00	0.17
T1.410D	36	36.10	36.18	36.19	36.21	36.22	36.23	36.24	36.24	36.25	36.23	36.28	36.44	36.26	0.03	-0.03	0.01	0.00	0.19
T1.410JD	36	36.10	36.18	36.19	36.21	36.22	36.23	36.24	36.24	36.25	36.23	36.28	36.44	36.26	0.03	-0.03	0.01	0.00	0.19
T1.410JU	36.139	36.56	36.93	37.00	37.06	37.10	37.12	37.15	37.17	37.19	37.24	37.15	37.52	37.22	-0.03	0.05	0.02	0.03	0.33
T1.410spD	36	36.10	36.18	36.19	36.21	36.22	36.23	36.24	36.24	36.25	36.23	36.28	36.44	36.26	0.03	-0.03	0.01	0.00	0.19
T1.410spU	36.139	36.56	36.93	37.00	37.06	37.10	37.12	37.15	37.17	37.19	37.24	37.15	37.52	37.22	-0.03	0.05	0.02	0.03	0.33
T1.410U	36.139	36.56	36.93	37.00	37.06	37.10	37.12	37.15	37.17	37.19	37.24	37.15	37.52	37.22	-0.03	0.05	0.02	0.03	0.33
T1.450D	35.732	35.82	35.88	35.89	35.91	35.92	35.93	35.94	35.94	35.95	35.92	35.97	36.10	35.95	0.02	-0.02	0.01	0.00	0.15
T1.455I	35.049	35.12	35.18	35.19	35.20	35.21	35.22	35.24	35.24	35.24	35.22	35.27	35.41	35.24	0.02	-0.02	0.01	0.00	0.16
T1.458T	34.474	34.56	34.62	34.63	34.64	34.65	34.66	34.67	34.67	34.68	34.66	34.71	34.87	34.69	0.03	-0.02	0.01	0.00	0.19
T1.460T	34.458	34.55	34.61	34.62	34.63	34.64	34.65	34.66	34.66	34.67	34.65	34.69	34.86	34.67	0.02	-0.02	0.01	0.00	0.19
T1.465I	33.831	33.92	33.98	34.00	34.02	34.03	34.04	34.06	34.07	34.08	34.05	34.11	34.32	34.08	0.03	-0.04	0.01	0.00	0.24
T1.470T	33.339	33.47	33.60	33.62	33.65	33.68	33.71	33.75	33.81	33.82	33.74	33.89	34.11	33.82	0.07	-0.08	0.01	0.00	0.29
T1.880JU	33.228	33.30	33.45	33.48	33.53	33.57	33.61	33.68	33.76	33.77	33.69	33.84	34.04	33.77	0.08	-0.08	0.01	0.00	0.28
T1.890JD	33.228	33.30	33.45	33.48	33.53	33.57	33.61	33.68	33.76	33.77	33.69	33.84	34.04	33.77	0.08	-0.08	0.01	0.00	0.28
T1.895I	32.622	32.76	32.93	32.99	33.05	33.22	33.32	33.48	33.61	33.62	33.50	33.72	33.97	33.62	0.10	-0.12	0.01	0.00	0.35
T1.900JU	32.256	32.58	32.79	32.87	32.94	33.16	33.27	33.45	33.60	33.61	33.49	33.71	33.96	33.61	0.10	-0.12	0.01	0.00	0.35
T1.C001WD	41.765	41.88	41.96	42.00	42.06	42.11	42.16	42.22	42.29	42.28	42.25	42.32	42.28	42.28	0.04	-0.04	0.00	0.00	0.00
T1.C005WU	42.634	42.75	42.83	42.87	42.93	42.99	43.04	43.11	43.18	43.18	43.18	43.18	43.18	43.18	0.00	0.00	0.00	0.00	0.00
T1.C006	43.016	43.10	43.16	43.19	43.23	43.27	43.31	43.36	43.41	43.41	43.39	43.42	43.41	43.41	0.02	-0.02	0.00	0.00	0.00
T1.C009D	43.336	43.41	43.47	43.49	43.53	43.56	43.59	43.63	43.66	43.66	43.63	43.68	43.66	43.66	0.03	-0.03	0.00	0.00	0.00
T1.C009JD	43.336	43.41	43.47	43.49	43.53	43.56	43.59	43.63	43.66	43.66	43.63	43.68	43.66	43.66	0.03	-0.03	0.00	0.00	0.00
T1.C009JDspd	43.336	43.41	43.47	43.49	43.53	43.56	43.59	43.63	43.66	43.66	43.63	43.68	43.66	43.66	0.03	-0.03	0.00	0.00	0.00
T1.C009JU	43.341	43.43	43.50	43.53	43.58	43.64	43.69	43.76	43.85	43.83	43.82	43.84	43.83	43.83	0.01	-0.01	-0.02	0.00	0.00
T1.C009JUspu	43.341	43.43	43.50	43.53	43.58	43.64	43.69	43.76	43.85	43.83	43.82	43.84	43.83	43.83	0.01	-0.01	-0.02	0.00	0.00
T1.C009U	43.341	43.43	43.50	43.53	43.58	43.64	43.69	43.76	43.85	43.83	43.82	43.84	43.83	43.83	0.01	-0.01	-0.02	0.00	0.00
T1.C011WD	44.353	44.46	44.52	44.54	44.57	44.59	44.62	44.65	44.69	44.68	44.66	44.70	44.68	44.68	0.02	-0.02	-0.01	0.00	0.00
T1.C013WU	45.451	45.59	45.69	45.74	45.81	45.88	45.94	46.03	46.12	46.10	46.10	46.10	46.10	46.10	0.00	0.00	-0.02	0.00	0.00
Temp_in_V1	52.314	52.43	52.50	52.54	52.59	52.63	52.67	52.72	52.78	52.77	52.74	52.80	52.77	52.77	0.03	-0.03	-0.01	0.00	0.00
UrbanA	40.769	40.77	40.83	40.88	40.95	41.00	41.06	41.16	41.28	41.26	41.26	41.26	41.26	41.26	0.00	0.00	-0.02	0.00	0.00
UrbanB	43.336	43.41	43.47	43.49	43.53	43.56	43.59	43.63	43.66	43.66	43.63	43.68	43.66	43.66	0.03	-0.03	0.00	0.00	0.00
UrbanC	39.286	39.40	39.44	39.47	39.51	39.55	39.59	39.64	39.68	39.69	39.68	39.69	39.69	39.69	0.01	-0.01	0.01	0.00	0.00
UrbanD	36	36.10	36.18	36.19	36.21	36.22	36.23	36.24	36.24	36.25	36.23	36.28	36.44	36.26	0.03	-0.03	0.01	0.00	0.19
UrbanE	33.228	33.30	33.45	33.48	33.53	33.57	33.61	33.68	33.76	33.77	33.69	33.84	34.04	33.77	0.08	-0.08	0.01	0.00	0.28
UrbanF	38.479	38.65	38.72	38.76	38.81	38.85	39.03	39.08	39.05	39.06	39.06	39.08	39.06	39.06	0.02	0.00	0.02	-0.01	0.00
UrbanH	31.675	31.98	32.20	32.27	32.37	32.51	32.57	32.64	32.70	32.70	32.63	32.77	32.83	32.70	0.07	-0.07	0.00	0.00	0.13

Maximum flood water levels at downstream model nodes (list 1 of 4)

Node	Initial Conditions	2yr	5yr	10yr	25yr	50yr	100yr	100yr+CC	200yr	200yr+CC	200yr+CC-10% roughness	200yr+CC+10% roughness	200yr + 5yr tide	200yr + MHWS tide	5yr+200yr tide	Flood wall near Castle Heather	Flood wall along Diriebught Rd	30% blockage Castle Heather culverts only	30% Blockage Culcabock Road only	Difference 200yr+CC+10% roughness less 200yr+CC	Difference 200yr+CC-10% roughness less 200yr+CC	Difference 200yr+CC less 200yr+CC+MHWS	Difference 200yr+CC less 200yr	Difference block Castle Heather, no blockage	Difference block Culcabock Road, no blockage
M1.255D	31.911	32.00	32.21	32.29	32.38	32.52	32.57	32.65	32.71	32.71	32.644	32.77	32.708	32.708	32.213	32.84	32.84	32.71	32.71	0.06	-0.07	-0.001	0.00	0.00	0.00
M1.256T	30.961	31.05	31.27	31.34	31.44	31.57	31.62	31.70	31.76	31.76	31.695	31.818	31.76	31.76	31.268	31.88	31.88	31.76	31.76	0.06	-0.07	0.000	0.00	0.00	0.00
M1.300JI	29.376	29.45	29.63	29.70	29.79	29.90	29.95	30.04	30.10	30.10	30.055	30.148	30.098	30.098	29.632	30.22	30.22	30.10	30.10	0.05	-0.04	-0.001	0.00	0.00	0.00
M1.300JI	29.43	29.51	29.70	29.77	29.85	29.96	30.02	30.10	30.16	30.16	30.1	30.221	30.159	30.159	29.702	30.28	30.28	30.16	30.16	0.06	-0.06	-0.001	0.00	0.00	0.00
M1.301W	28.08	28.11	28.21	28.24	28.30	28.37	28.41	28.49	28.55	28.55	28.506	28.591	28.548	28.548	28.205	28.66	28.66	28.55	28.55	0.04	-0.04	-0.001	0.00	0.00	0.00
M1.301W	28.591	28.65	28.82	28.88	28.97	29.10	29.16	29.26	29.35	29.35	29.346	29.346	29.345	29.345	28.816	29.51	29.51	29.35	29.35	0.00	0.00	-0.001	0.00	0.00	0.00
M1.302D	27.988	28.02	28.10	28.14	28.19	28.26	28.30	28.38	28.43	28.44	28.382	28.486	28.433	28.433	28.103	28.54	28.54	28.44	28.44	0.05	-0.05	-0.003	0.00	0.00	0.00
M1.302JI	27.988	28.02	28.10	28.14	28.19	28.26	28.30	28.38	28.43	28.44	28.382	28.486	28.433	28.433	28.103	28.54	28.54	28.44	28.44	0.05	-0.05	-0.003	0.00	0.00	0.00
M1.302JI	27.999	28.03	28.13	28.17	28.22	28.30	28.34	28.43	28.49	28.49	28.449	28.531	28.489	28.489	28.127	28.61	28.61	28.49	28.49	0.04	-0.04	-0.002	0.00	0.00	0.00
M1.302U	27.999	28.03	28.13	28.17	28.22	28.30	28.34	28.43	28.49	28.49	28.449	28.531	28.489	28.489	28.127	28.61	28.61	28.49	28.49	0.04	-0.04	-0.002	0.00	0.00	0.00
M1.308G	27.748	27.78	27.88	27.92	27.99	28.08	28.12	28.22	28.29	28.29	28.228	28.342	28.285	28.285	27.88	28.40	28.40	28.29	28.29	0.05	-0.06	-0.003	0.00	0.00	0.00
M1.330JI	27.305	27.37	27.54	27.61	27.70	27.83	27.88	28.00	28.09	28.10	28.028	28.149	28.091	28.091	27.539	28.21	28.21	28.10	28.10	0.05	-0.07	-0.004	0.00	0.00	0.00
M1.330JI	27.306	27.37	27.54	27.61	27.70	27.83	27.88	28.00	28.09	28.10	28.028	28.149	28.091	28.091	27.539	28.21	28.21	28.10	28.10	0.05	-0.07	-0.004	0.00	0.00	0.00
M1.335T	27.121	27.19	27.38	27.45	27.54	27.67	27.72	27.84	27.92	27.93	27.87	27.97	27.922	27.922	27.38	28.04	28.04	27.93	27.93	0.04	-0.05	-0.003	0.00	0.00	0.00
M1.350W	26.754	26.80	26.93	26.98	27.05	27.15	27.19	27.27	27.33	27.33	27.334	27.334	27.331	27.331	26.925	27.47	27.47	27.33	27.33	0.00	0.00	-0.003	0.00	0.00	0.00
M1.360W	25.889	25.95	26.13	26.20	26.30	26.46	26.54	26.71	26.83	26.84	26.791	26.882	26.825	26.825	26.126	27.15	27.15	26.84	26.84	0.05	-0.04	-0.010	0.01	0.00	0.00
M1.370JI	25.882	25.94	26.11	26.19	26.29	26.45	26.52	26.68	26.80	26.81	26.765	26.856	26.798	26.798	26.114	27.13	27.13	26.81	26.81	0.05	-0.04	-0.010	0.01	0.00	0.00
M1.370U	25.882	25.94	26.11	26.19	26.29	26.45	26.52	26.68	26.80	26.81	26.765	26.856	26.798	26.798	26.114	27.13	27.13	26.81	26.81	0.05	-0.04	-0.010	0.01	0.00	0.00
M1.380D	25.861	25.91	26.06	26.12	26.20	26.31	26.36	26.45	26.51	26.52	26.479	26.558	26.512	26.512	26.061	26.64	26.64	26.52	26.52	0.04	-0.04	-0.007	0.01	0.00	0.00
M1.380JI	25.861	25.91	26.06	26.12	26.20	26.31	26.36	26.45	26.51	26.52	26.479	26.558	26.512	26.512	26.061	26.64	26.64	26.52	26.52	0.04	-0.04	-0.007	0.01	0.00	0.00
M1.390I	25.849	25.90	26.04	26.09	26.17	26.27	26.32	26.42	26.47	26.48	26.434	26.52	26.471	26.471	26.039	26.59	26.59	26.48	26.48	0.04	-0.04	-0.007	0.01	0.00	0.00
M1.395i	25.816	25.86	25.98	26.03	26.10	26.19	26.23	26.32	26.38	26.38	26.322	26.439	26.375	26.375	25.984	26.48	26.48	26.38	26.38	0.06	-0.06	-0.005	0.00	0.00	0.00
M1.401G	25.799	25.84	25.97	26.01	26.08	26.17	26.22	26.31	26.36	26.36	26.305	26.413	26.357	26.357	25.966	26.46	26.46	26.36	26.36	0.05	-0.06	-0.006	0.01	0.00	0.00
M1.402G	24.947	25.00	25.15	25.21	25.28	25.39	25.44	25.54	25.61	25.61	25.539	25.668	25.605	25.605	25.149	25.72	25.72	25.61	25.61	0.06	-0.07	-0.006	0.01	0.00	0.00
M1.403G	23.944	24.02	24.22	24.30	24.40	24.51	24.57	24.66	24.73	24.74	24.659	24.8	24.728	24.728	24.224	24.85	24.85	24.74	24.74	0.07	-0.08	-0.007	0.01	0.00	0.00
M1.403i	23.054	23.16	23.27	23.33	23.37	23.47	23.51	23.57	23.60	23.60	23.567	23.634	23.598	23.598	23.273	23.67	23.67	23.60	23.60	0.03	-0.03	-0.003	0.00	0.00	0.00
M1.404D	22.2	22.29	22.47	22.54	22.62	22.71	22.76	22.84	22.88	22.89	22.839	22.94	22.876	22.876	22.474	22.98	22.98	22.89	22.89	0.05	-0.05	-0.015	0.01	0.00	0.00
M1.404JI	22.2	22.29	22.47	22.54	22.62	22.71	22.76	22.84	22.88	22.89	22.839	22.94	22.876	22.876	22.474	22.98	22.98	22.89	22.89	0.05	-0.05	-0.015	0.01	0.00	0.00
M1.404JI	22.2	22.30	22.47	22.54	22.97	23.04	23.08	23.12	23.14	23.15	23.136	23.153	23.141	23.141	22.474	23.19	23.19	23.15	23.15	0.01	-0.01	-0.004	0.00	0.00	0.00
M1.404s	22.2	22.29	22.47	22.54	22.62	22.71	22.76	22.84	22.88	22.89	22.839	22.94	22.876	22.876	22.474	22.98	22.98	22.89	22.89	0.05	-0.05	-0.015	0.01	0.00	0.00
M1.404s	22.2	22.30	22.47	22.54	22.97	23.04	23.08	23.12	23.14	23.15	23.136	23.153	23.141	23.141	22.474	23.19	23.19	23.15	23.15	0.01	-0.01	-0.004	0.00	0.00	0.00
M1.404U	22.2	22.30	22.47	22.54	22.97	23.04	23.08	23.12	23.14	23.15	23.136	23.153	23.141	23.141	22.474	23.19	23.19	23.15	23.15	0.01	-0.01	-0.004	0.00	0.00	0.00
M1.405G	20.441	20.53	20.72	20.78	20.85	20.92	20.95	20.99	21.01	21.01	20.99	21.029	21.006	21.006	20.721	21.04	21.04	21.01	21.01	0.02	-0.02	-0.005	0.00	0.00	0.00
M1.405JI	21.64	21.75	21.99	22.06	22.14	22.23	22.27	22.33	22.36	22.37	22.332	22.406	22.36	22.361	21.987	22.43	22.43	22.37	22.37	0.04	-0.04	-0.010	0.01	0.00	0.00
M1.405JI	21.715	21.83	22.06	22.13	22.22	22.31	22.36	22.42	22.46	22.47	22.423	22.507	22.455	22.455	22.061	22.54	22.54	22.47	22.47	0.04	-0.04	-0.012	0.01	0.00	0.00
M1.406G	19.432	19.50	19.66	19.73	19.81	19.90	19.94	20.01	20.04	20.05	20.006	20.081	20.037	20.037	19.661	20.13	20.13	20.05	20.07	0.03	-0.04	-0.012	0.01	0.00	0.02
M1.407G	18.392	18.49	18.69	18.78	18.88	18.99	19.10	19.20	19.26	19.31	19.284	19.332	19.259	19.259	18.694	19.52	19.52	19.31	19.51	0.02	-0.03	-0.050	0.05	0.00	0.20
M1.407i	18.149	18.23	18.43	18.51	18.62	18.78	18.95	19.14	19.24	19.29	19.284	19.303	19.242	19.242	18.425	19.51	19.51	19.29	19.50	0.01	-0.01	-0.051	0.05	0.00	0.21
M1.408D	18.027	18.14	18.33	18.41	18.52	18.66	18.74	18.87	18.95	18.98	18.98	18.986	18.945	18.945	18.329	19.13	19.13	18.98	19.05	0.00	0.00	-0.038	0.04	0.00	0.06
M1.408JI	18.027	18.14	18.33	18.41	18.52	18.66	18.74	18.87	18.95	18.98	18.98	18.986	18.945	18.945	18.329	19.13	19.13	18.98	19.05	0.00	0.00	-0.038	0.04	0.00	0.06
M1.408JI	18.029	18.14	18.34	18.42	18.54	18.73	18.86	19.04	19.14	19.19	19.19	19.196	19.138	19.138	18.338	19.42	19.42	19.19	19.47	0.00	0.00	-0.055	0.05	0.00	0.27
M1.408s	18.029	18.14	18.34	18.42	18.54	18.73	18.86	19.04	19.14	19.19	19.19	19.196	19.138	19.138	18.338	19.42	#N/A	19.19	19.47	0.00	0.00	-0.055	0.05	0.00	0.27
M1.408U	18.029	18.14	18.34	18.42	18.54	18.73	18.86	19.04	19.14	19.19	19.19	19.196	19.138	19.138	18.338	19.42	19.42	19.19	19.47	0.00	0.00	-0.055	0.05	0.00	0.27
M1.408W	18.02	18.13	18.33	18.41	18.52	18.66	18.74	18.87	18.94	18.98	18.981	18.981	18.942	18.942	18.325	19.13	19.13	18.98	18.98	0.00	0.00	-0.039	0.04	0.00	0.00
M1.409G	17.545	17.63	17.79	17.86	17.95	18.05	18.12	18.20	18.24	18.25	18.216	18.27	18.239	18.239	17.79	18.28	18.27	18.25	18.25	0.02	-0.04	-0.013	0.01	0.00	0.00
M1.409G	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.409G	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.409i	17.13	17.23	17.40	17.47	17.56	17.66	17.72	17.82	17.90	17.95	17.837	18.011	17.898	17.898	17.399	18.05	18.34	17.95	17.95	0.06	-0.11	-0.052	0.05	0.00	0.00
M1.409is	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.409is	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.409W	17.645	17.73	17.89	17.96	18.05	18.16	18.23	18.31	18.34	18.34	18.291	18.389	18.337	18.337	17.891	18.38	18.37	18.34	18.34	0.05	-0.05	-0.005	0.00	0.00	0.00
M1.410G	16.341	16.43	16.59	16.65	16.74	16.83	16.89	16.99	17.03	17.04	16.998	17.061	17.026	17.026	16.59	17.07	17.08	17.04	17.04	0.02	-0.04	-0.015	0.02	0.00	0.00
M1.410G	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.410G	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.410i	15.466	15.56	15.71	15.77	15.85	15.94	15.98	16.02	16.04	16.05	16.024	16.057	16.038	16.038	15.712	16.06	16.23	16.05	16.04	0.01	-0.02	-0.007	0.01	0.00	0.00
M1.410is	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.410is	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.411G	14.381	14.46	14.61	14.66	14.74	14.81	14.86	14.91	14.93	14.94	14.916	14.942	14.929	14.929	14.606	14.96	14.99	14.94	14.94	0.01	-0.02	-0.008	0.01	0.00	0.00
M1.411G	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00

Maximum flood water levels at downstream model nodes (list 2 of 4)

Node	Initial Conditions	2yr	5yr	10yr	25yr	50yr	100yr	100yr+CC	200yr	200yr+CC	200yr+CC-10% roughness	200yr+CC+10% roughness	200yr + 5yr tide	200yr + MHWS tide	5yr+200yr tide	Flood wall near Castle Heather	Flood wall along Diriebught Rd	30% blockage Castle Heather culverts only	30% Blockage Culcabock Road only	Difference 200yr+CC+10% roughness less 200yr+CC	Difference 200yr+CC-10% roughness less 200yr+CC	Difference 200yr+CC less 200yr+CC+MHWS	Difference 200yr+CC less 200yr	Difference block Castle Heather, no blockage	Difference block Culcabock Road, no blockage
M1.411G	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.411i	13.434	13.53	13.65	13.70	13.77	13.85	13.89	13.94	13.96	13.97	13.947	13.981	13.96	13.96	13.652	14.01	14.16	13.97	13.97	0.01	-0.03	-0.012	0.01	0.00	0.00
M1.411ispl	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.411ispr	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.412G	12.927	13.04	13.10	13.13	13.16	13.19	13.21	13.23	13.24	13.24	13.221	13.257	13.237	13.237	13.099	13.25	13.55	13.24	13.24	0.02	-0.02	-0.004	0.00	0.00	0.00
M1.412Gsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.412Gsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.413WD	11.313	11.44	11.62	11.69	11.75	11.80	11.81	11.82	11.82	11.83	11.817	11.828	11.822	11.822	11.624	11.83	11.49	11.83	11.82	0.00	-0.01	-0.003	0.00	0.00	0.00
M1.413WD	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.413WD	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.413WU	11.897	12.02	12.21	12.28	12.35	12.44	12.48	12.52	12.53	12.54	12.618	12.454	12.534	12.534	12.212	12.56	12.05	12.54	12.54	-0.09	0.08	-0.008	0.01	0.00	0.00
M1.414T	11.059	11.19	11.38	11.44	11.49	11.55	11.57	11.58	11.59	11.59	11.587	11.578	11.587	11.587	11.378	11.60	11.29	11.59	11.59	-0.01	0.00	-0.002	0.00	0.00	0.00
M1.414Tsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.414Tsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.415spl	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.415spr	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.415U	10.903	11.03	11.18	11.23	11.28	11.32	11.34	11.36	11.37	11.37	11.371	11.33	11.368	11.368	11.179	11.38	11.21	11.37	11.37	-0.04	0.00	-0.004	0.00	0.00	0.00
M1.416U	10.916	11.05	11.15	11.16	11.17	11.20	11.21	11.23	11.23	11.24	11.232	11.215	11.234	11.234	11.145	11.24	11.24	11.24	11.24	-0.02	0.00	-0.002	0.00	0.00	0.00
M1.416Usp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.416Usp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.417Gsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.417Gsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.417T	10.905	11.04	11.13	11.13	11.13	11.13	11.13	11.16	11.18	11.19	11.13	11.267	11.182	11.182	11.125	11.25	11.23	11.19	11.19	0.07	-0.06	-0.012	0.01	0.00	0.00
M1.418G	10.631	10.77	10.90	10.96	11.01	11.04	11.05	11.07	11.08	11.08	11.101	11.036	11.075	11.075	10.896	11.09	11.04	11.08	11.08	-0.04	0.02	-0.003	0.00	0.00	0.00
M1.418Gsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.418Gsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.420G	9.824	9.91	10.06	10.12	10.20	10.28	10.32	10.38	10.41	10.42	10.392	10.457	10.405	10.405	10.055	10.46	10.81	10.42	10.42	0.04	-0.03	-0.013	0.01	0.00	0.00
M1.420Gsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.420Gsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.420JD	9.581	9.67	9.80	9.85	9.91	9.97	10.01	10.05	10.07	10.08	10.032	10.146	10.069	10.069	9.8	10.12	10.48	10.08	10.08	0.06	-0.05	-0.013	0.01	0.00	0.00
M1.420JDs	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.420JU	9.581	9.67	9.80	9.85	9.91	9.97	10.01	10.05	10.07	10.08	10.032	10.146	10.069	10.069	9.8	10.12	10.48	10.08	10.08	0.06	-0.05	-0.013	0.01	0.00	0.00
M1.420T	9.293	9.36	9.47	9.52	9.57	9.63	9.66	9.69	9.71	9.72	9.65	9.803	9.709	9.709	9.469	9.75	10.36	9.72	9.72	0.08	-0.07	-0.012	0.01	0.00	0.00
M1.421i	8.556	8.67	8.81	8.86	8.94	9.02	9.06	9.11	9.13	9.15	9.139	9.172	9.132	9.132	8.806	9.19	10.29	9.15	9.15	0.02	-0.01	-0.017	0.02	0.00	0.00
M1.421T	8.598	8.69	8.82	8.87	8.94	9.00	9.04	9.08	9.10	9.11	9.104	9.134	9.099	9.099	8.815	9.15	10.28	9.11	9.11	0.02	-0.01	-0.014	0.01	0.00	0.00
M1.490	8.577	8.69	8.83	8.89	8.97	9.04	9.09	9.14	9.16	9.18	9.171	9.196	9.16	9.16	8.83	9.22	10.29	9.18	9.18	0.02	-0.01	-0.017	0.02	0.00	0.00
M1.490spl	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.500WD	6.831	6.86	6.86	6.88	6.93	6.99	7.03	7.08	7.13	7.14	7.105	7.206	7.127	7.127	6.863	7.25	10.30	7.14	7.14	0.06	-0.04	-0.015	0.02	0.00	0.00
M1.500WU	8.559	8.68	8.83	8.90	8.99	9.07	9.12	9.17	9.20	9.22	9.215	9.236	9.199	9.199	8.832	9.26	10.35	9.22	9.22	0.02	0.00	-0.019	0.02	0.00	0.00
M1.820	6.414	6.47	6.58	6.63	6.71	6.80	6.86	6.93	6.98	6.99	6.984	7.035	6.978	6.978	6.575	7.16	10.30	6.99	6.99	0.04	-0.01	-0.016	0.02	0.00	0.00
M1.820i	6.001	6.07	6.19	6.25	6.34	6.44	6.49	6.56	6.67	6.72	6.677	6.818	6.671	6.671	6.186	7.05	10.25	6.72	6.72	0.09	-0.05	-0.053	0.05	0.00	0.00
M1.820JU	5.709	5.84	6.04	6.12	6.23	6.35	6.41	6.49	6.64	6.76	6.649	6.918	6.644	6.643	6.036	7.11	10.26	6.76	6.75	0.16	-0.11	-0.117	0.12	0.00	-0.01
M1.820spr	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.910G	4.539	4.64	4.80	4.85	4.94	5.01	5.05	5.11	5.14	5.16	5.1	5.254	5.168	5.14	4.79	5.21	6.44	5.16	5.16	0.09	-0.06	-0.019	0.02	0.00	0.00
M1.910Gsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.920G	4.413	4.51	4.66	4.71	4.77	4.83	4.88	4.94	4.98	5.00	4.954	5.044	4.997	4.979	4.647	5.06	6.44	5.00	5.00	0.04	-0.05	-0.022	0.02	0.00	0.00
M1.920Gsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.930G	4.286	4.37	4.51	4.55	4.60	4.66	4.70	4.75	4.78	4.80	4.758	4.874	4.828	4.776	4.489	4.92	6.44	4.80	4.80	0.07	-0.04	-0.023	0.02	0.00	0.00
M1.930Gsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.935G	3.544	3.63	3.79	3.86	4.01	4.19	4.38	4.48	4.52	4.54	4.547	4.592	4.591	4.512	3.967	4.69	6.44	4.54	4.54	0.05	0.00	-0.032	0.02	0.00	0.00
M1.935Gsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.940D	3.134	3.17	3.26	3.31	3.42	3.55	3.71	3.77	3.80	3.82	3.793	4.341	4.288	3.748	3.628	4.61	4.47	3.82	3.82	0.52	-0.03	-0.073	0.02	0.00	0.00
M1.940Dsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.940Dsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.940G	3.219	3.30	3.56	3.68	3.91	4.15	4.36	4.46	4.51	4.54	4.536	4.644	4.622	4.499	3.899	4.74	6.44	4.54	4.54	0.11	0.00	-0.037	0.02	0.00	0.00
M1.940Gsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.940Gsp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.940JD	3.134	3.17	3.26	3.31	3.42	3.55	3.71	3.77	3.80	3.82	3.793	4.341	4.288	3.748	3.628	4.61	4.47	3.82	3.82	0.52	-0.03	-0.073	0.02	0.00	0.00
M1.940JU	3.171	3.25	3.53	3.65	3.89	4.14	4.34	4.44	4.49	4.51	4.513	4.628	4.607	4.476	3.892	4.74	6.44	4.51	4.51	0.12	0.00	-0.036	0.02	0.00	0.00
M1.940spD	3.134	3.17	3.26	3.31	3.42	3.55	3.71	3.77	3.80	3.82	3.793	4.341	4.288	3.748	3.628	4.61	#N/A	3.82	3.82	0.52	-0.03	-0.073	0.02	0.00	0.00

Mott MacDonald

Maximum flood water levels at downstream model nodes (list 3 of 4)

Node	Initial Conditions	2yr	5yr	10yr	25yr	50yr	100yr	100yr+CC	200yr	200yr+CC	200yr+CC-10% roughness	200yr+CC+10% roughness	200yr + 5yr tide	200yr + MHWS tide	5yr+200yr tide	Flood wall near Castle Heather	Flood wall along Diriebught Rd	30% blockage Castle Heather culverts only	30% Blockage Culcabock Road only	Difference 200yr+CC+10% roughness less 200yr+CC	Difference 200yr+CC-10% roughness less 200yr+CC	Difference 200yr+CC less 200yr+CC+MHWS	Difference 200yr+CC less 200yr	Difference block Castle Heather, no blockage	Difference block Culcabock Road, no blockage
M1.940spU	3.171	3.25	3.53	3.65	3.89	4.14	4.34	4.44	4.49	4.51	4.513	4.628	4.607	4.476	3.892	4.74	#N/A	4.51	4.51	0.12	0.00	-0.036	0.02	0.00	0.00
M1.940U	3.171	3.25	3.53	3.65	3.89	4.14	4.34	4.44	4.49	4.51	4.513	4.628	4.607	4.476	3.892	4.74	6.44	4.51	4.51	0.12	0.00	-0.036	0.02	0.00	0.00
M1.950D	3.034	3.10	3.10	3.10	3.10	3.11	3.18	3.22	3.24	3.25	3.226	3.264	3.311	3.104	3.499	3.28	3.26	3.25	3.25	0.02	-0.02	-0.141	0.01	0.00	0.00
M1.950G	3.117	3.13	3.20	3.23	3.33	3.51	3.68	3.71	3.72	3.72	3.696	4.314	4.262	3.627	3.631	4.58	4.47	3.72	3.72	0.59	-0.03	-0.095	0.00	0.00	0.00
M1.950U	3.124	3.15	3.23	3.28	3.39	3.55	3.70	3.73	3.75	3.75	3.737	4.317	4.266	3.676	3.638	4.59	4.47	3.75	3.75	0.56	-0.02	-0.078	0.01	0.00	0.00
M1.970D	3.1	3.10	3.10	3.10	3.10	3.10	3.10	3.11	3.11	3.11	3.106	3.109	3.215	3.1	3.501	3.11	3.11	3.11	3.11	0.00	0.00	-0.007	0.00	0.00	0.00
M1.970G	3.1	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.10	3.1	3.1	3.21	2.5	3.5	3.10	3.10	3.10	3.10	0.00	0.00	-0.600	0.00	0.00	0.00
M1.C0010J	5.618	5.72	5.87	5.94	6.03	6.12	6.17	6.23	6.28	6.31	6.276	6.358	6.278	6.278	5.874	6.43	6.89	6.31	6.31	0.04	-0.04	-0.035	0.04	0.00	0.00
M1.C001JD	5.715	5.82	5.98	6.05	6.15	6.25	6.31	6.38	6.54	6.63	6.538	6.735	6.538	6.537	5.981	6.86	8.95	6.63	6.62	0.11	-0.09	-0.089	0.09	0.00	0.00
M1.C002JU	5.695	5.81	5.98	6.06	6.18	6.31	6.37	6.45	6.70	6.77	6.711	6.851	6.699	6.699	5.979	6.96	8.97	6.77	6.76	0.09	-0.05	-0.067	0.07	0.00	0.00
M1.C005JD	5.66	5.75	5.87	5.93	6.01	6.10	6.15	6.20	6.50	6.55	6.505	6.615	6.503	6.502	5.872	6.70	7.22	6.55	6.55	0.06	-0.05	-0.049	0.05	0.00	0.00
M1.C005JD	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.C005JD	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.C006JU	5.582	5.69	5.84	5.91	6.00	6.09	6.14	6.20	6.51	6.56	6.516	6.614	6.507	6.507	5.843	6.70	7.29	6.56	6.55	0.06	-0.04	-0.049	0.05	0.00	0.00
M1.C010sp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.C010sp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.C011W	5.603	5.70	5.86	5.92	6.02	6.10	6.15	6.21	6.26	6.30	6.267	6.342	6.264	6.264	5.859	6.42	6.88	6.30	6.30	0.04	-0.03	-0.036	0.04	0.00	0.00
M1.C012sp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.C012sp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.C012W	5.407	5.49	5.62	5.68	5.75	5.83	5.89	6.00	6.06	6.10	6.056	6.144	6.061	6.06	5.623	6.23	6.74	6.10	6.10	0.04	-0.04	-0.039	0.04	0.00	0.00
M1.C015JU	5.308	5.38	5.51	5.56	5.63	5.70	5.75	5.84	5.89	5.92	5.882	5.97	5.892	5.892	5.51	6.03	6.64	5.92	5.92	0.05	-0.04	-0.032	0.03	0.00	0.00
M1.C016JD	5.321	5.40	5.54	5.59	5.66	5.74	5.79	5.88	5.93	5.96	5.922	6.005	5.93	5.929	5.536	6.06	6.62	5.96	5.96	0.04	-0.04	-0.032	0.03	0.00	0.00
M1.C017	5.123	5.20	5.34	5.40	5.48	5.57	5.64	5.74	5.80	5.84	5.813	5.866	5.803	5.802	5.342	5.95	6.60	5.84	5.84	0.03	-0.03	-0.036	0.04	0.00	0.00
M1.C017sp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.C017sp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.C019JD	4.912	5.00	5.14	5.21	5.29	5.38	5.44	5.53	5.58	5.61	5.595	5.635	5.582	5.581	5.141	5.71	6.56	5.61	5.61	0.02	-0.02	-0.031	0.03	0.00	0.00
M1.C019JU	4.924	5.00	5.14	5.21	5.29	5.38	5.44	5.53	5.58	5.61	5.595	5.635	5.582	5.581	5.143	5.71	6.66	5.61	5.61	0.02	-0.02	-0.031	0.03	0.00	0.00
M1.C032	4.703	4.80	4.98	5.06	5.16	5.26	5.34	5.46	5.54	5.58	5.559	5.597	5.539	5.536	4.974	5.72	6.59	5.58	5.57	0.02	-0.02	-0.040	0.04	0.00	0.00
M1.C032sp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	#N/A	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.C032sp	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	-9999.99	0.00	0.00	0.000	0.00	0.00	0.00
M1.C033U	4.684	4.78	4.92	4.99	5.07	5.15	5.21	5.32	5.39	5.43	5.416	5.462	5.398	5.391	4.918	5.58	6.59	5.43	5.43	0.03	-0.02	-0.042	0.04	0.00	0.00
M1.C035D	4.672	4.76	4.88	4.93	5.00	5.04	5.08	5.14	5.18	5.20	5.173	5.241	5.186	5.177	4.874	5.27	6.43	5.20	5.20	0.04	-0.03	-0.022	0.02	0.00	0.00
RES017.83	5.791	5.79	6.56	6.58	6.60	6.63	6.66	6.70	6.72	6.73	6.734	6.724	6.72	6.72	6.561	6.78	#N/A	6.73	6.73	-0.01	0.00	-0.012	0.01	0.00	0.00
RES017.83	6.951	6.95	7.15	7.18	7.19	7.21	7.23	7.26	7.28	7.29	7.294	7.286	7.284	7.284	7.152	7.33	#N/A	7.29	7.29	-0.01	0.00	-0.009	0.01	0.00	0.00
RES820.83	6.951	6.95	7.15	7.18	7.19	7.21	7.23	7.26	7.28	7.29	7.294	7.286	7.284	7.284	7.152	7.33	#N/A	7.29	7.29	-0.01	0.00	-0.009	0.01	0.00	0.00
RES820.83	6.821	6.82	7.89	7.92	7.95	8.00	8.03	8.08	8.11	8.12	8.122	8.111	8.108	8.108	7.891	8.17	#N/A	8.12	8.12	-0.01	0.00	-0.012	0.01	0.00	0.00
RESL1.408	16.661	16.66	16.66	16.66	16.66	16.66	16.66	16.66	16.66	17.03	16.661	17.227	16.661	16.661	16.661	17.31	#N/A	17.03	16.98	0.20	-0.37	-0.366	0.37	0.00	-0.05
RESL1.409	16.661	16.66	16.66	16.66	16.66	16.66	16.66	16.66	16.66	17.03	16.661	17.227	16.661	16.661	16.661	17.31	#N/A	17.03	16.98	0.20	-0.37	-0.366	0.37	0.00	-0.05
RESL1.409	15.071	15.07	15.07	15.07	15.07	15.07	15.07	15.68	15.84	15.89	15.738	16.066	15.839	15.839	15.071	16.17	#N/A	15.89	15.89	0.18	-0.15	-0.051	0.05	0.00	-0.01
RESL1.409	16.661	16.66	16.66	16.66	16.66	16.66	16.66	16.66	16.66	17.03	16.661	17.227	16.661	16.661	16.661	17.31	#N/A	17.03	16.98	0.20	-0.37	-0.366	0.37	0.00	-0.05
RESL1.409	16.661	16.66	16.66	16.66	16.66	16.66	16.66	16.66	16.66	17.03	16.661	17.227	16.661	16.661	16.661	17.31	#N/A	17.03	16.98	0.20	-0.37	-0.366	0.37	0.00	-0.05
RESL1.410	15.071	15.07	15.07	15.07	15.07	15.07	15.07	15.68	15.84	15.89	15.738	16.066	15.839	15.839	15.071	16.17	#N/A	15.89	15.89	0.18	-0.15	-0.051	0.05	0.00	-0.01
RESL1.410	14.131	14.13	14.13	14.13	14.13	14.33	14.77	14.90	14.98	15.01	14.922	15.091	14.976	14.976	14.131	15.13	#N/A	15.01	15.00	0.08	-0.08	-0.030	0.03	0.00	0.00
RESL1.410	14.131	14.13	14.13	14.13	14.13	14.33	14.77	14.90	14.98	15.01	14.922	15.091	14.976	14.976	14.131	15.13	#N/A	15.01	15.00	0.08	-0.08	-0.030	0.03	0.00	0.00
RESL1.410	15.071	15.07	15.07	15.07	15.07	15.07	15.07	15.68	15.84	15.89	15.738	16.066	15.839	15.839	15.071	16.17	#N/A	15.89	15.89	0.18	-0.15	-0.051	0.05	0.00	-0.01
RESL1.411	14.131	14.13	14.13	14.13	14.13	14.33	14.77	14.90	14.98	15.01	14.922	15.091	14.976	14.976	14.131	15.13	#N/A	15.01	15.00	0.08	-0.08	-0.030	0.03	0.00	0.00
RESL1.411	11.601	11.60	11.60	11.60	11.60	11.74	11.89	12.04	12.11	12.15	12.077	12.217	12.114	12.114	11.601	12.27	#N/A	12.15	12.14	0.07	-0.07	-0.031	0.03	0.00	0.00
RESL1.411	11.601	11.60	11.60	11.60	11.60	11.74	11.89	12.04	12.11	12.15	12.077	12.217	12.114	12.114	11.601	12.27	#N/A	12.15	12.14	0.07	-0.07	-0.031	0.03	0.00	0.00
RESL1.411	14.131	14.13	14.13	14.13	14.13	14.33	14.77	14.90	14.98	15.01	14.922	15.091	14.976	14.976	14.131	15.13	#N/A	15.01	15.00	0.08	-0.08	-0.030	0.03	0.00	0.00
RESL1.412	11.601	11.60	11.60	11.60	11.60	11.74	11.89	12.04	12.11	12.15	12.077	12.217	12.114	12.114	11.601	12.27	#N/A	12.15	12.14	0.07	-0.07	-0.031	0.03	0.00	0.00
RESL1.412	9.811	10.39	10.92	10.96	11.00	11.04	11.06	11.11	11.13	11.14	11.112	11.185	11.132	11.132	10.921	11.20	#N/A	11.14	11.14	0.04	-0.03	-0.012	0.01	0.00	0.00
RESL1.412	11.601	11.60	11.60	11.60	11.60	11.74	11.89	12.04	12.11	12.15	12.077	12.217	12.114	12.114	11.601	12.27	#N/A	12.15	12.14	0.07	-0.07	-0.031	0.03	0.00	0.00
RESL1.413	9.811	10.39	10.92	10.96	11.00	11.04	11.06	11.11	11.13	11.14	11.112	11.185	11.132	11.132	10.921	11.20	#N/A	11.14	11.14	0.04	-0.03	-0.012	0.01	0.00	0.00
RESL1.414	9.811	10.39	10.92	10.96	11.00	11.04	11.06	11.11	11.13	11.14	11.112	11.185	11.132	11.132	10.921	11.20	#N/A	11.14	11.14	0.04	-0.03	-0.012	0.01	0.00	0.00
RESL1.415	9.811	10.39	10.92	10.96	11.00	11.04	11.06	11.11	11.13	11.14	11.112	11.185	11.132	11.132	10.921	11.20	#N/A	11.14	11.14	0.04	-0.03	-0.012	0.01	0.00	0.00
RESL1.415	8.399	8.40	8.67	8.70	8.74	8.80	8.84	8.92	8.96	8.98	8.982	8.964	8.958	8.958	8.673	9.05	#N/A	8.98	8.98	-0.01	0.00	-0.020	0.02	0.00	0.00
RESL1.415	9.811	10.39	10.92	10.96	11.00	11.04	11.06	11.11	11.13	11.14	11.112	11.185	11.132	11.132	10.921	11.20	#N/A	11.14	11.14	0.04	-0.03	-0.012	0.01	0.00	0.00
RESL1.416	9.811	10.39	10.92	10.96	11.00	11.04	11.06	11.11	11.13	11.14	11.112	11.185	11.132	11.132	10.921	11.20	#N/A	11.14	11.14	0.04	-0.03	-0.012	0.01	0.00	0.00
RESL1.417	9.811	10.39	10.92	10.96	11.00	11.04	11.06	11.11	11.13	11.14	11.112	11.185	11.132	11.132	10.921	11.20	#N/A	11.14	11.14	0.04	-0.03	-0.012	0.01	0.00	0.00
RESL1.418	8.399	8.40	8.67	8.70	8.74	8.80	8.84	8.92	8.96	8.98	8.982	8.964	8.958	8.958	8.673	9.05	#N/A	8.98	8.98	-0.01	0.00	-0.020	0.02	0.00	0.00

Mott MacDonald

Maximum flood water levels at downstream model nodes (list 4 of 4)

Node	Initial Conditions	2yr	5yr	10yr	25yr	50yr	100yr	100yr+CC	200yr	200yr+CC	200yr+CC-10% roughness	200yr+CC+10% roughness	200yr + 5yr tide	200yr + MHWS tide	5yr+200yr tide	Flood wall near Castle Heather	Flood wall along Diriebught Rd	30% blockage Castle Heather culverts only	30% Blockage Culcabock Road only	Difference 200yr+CC+10% roughness less 200yr+CC	Difference 200yr+CC-10% roughness less 200yr+CC	Difference 200yr+CC less 200yr+CC+MHWS	Difference 200yr+CC less 200yr	Difference block Castle Heather, no blockage	Difference block Culcabock Road, no blockage
RESL1.420	7.686	7.71	8.08	8.10	8.12	8.16	8.18	8.22	8.25	8.26	8.259	8.249	8.246	8.246	8.079	8.30	#N/A	8.26	8.26	-0.01	0.00	-0.011	0.01	0.00	0.00
RESL1.420	8.4	8.40	8.67	8.70	8.74	8.80	8.84	8.92	8.96	8.98	8.982	8.964	8.958	8.958	8.673	9.05	#N/A	8.98	8.98	-0.01	0.00	-0.020	0.02	0.00	0.00
RESL1.420	8.399	8.40	8.67	8.70	8.74	8.80	8.84	8.92	8.96	8.98	8.982	8.964	8.958	8.958	8.673	9.05	#N/A	8.98	8.98	-0.01	0.00	-0.020	0.02	0.00	0.00
RESL1.420	8.399	8.40	8.67	8.70	8.74	8.80	8.84	8.92	8.96	8.98	8.982	8.964	8.958	8.958	8.673	9.05	#N/A	8.98	8.98	-0.01	0.00	-0.020	0.02	0.00	0.00
RESL1.421	6.821	6.82	7.89	7.92	7.95	8.00	8.03	8.08	8.11	8.12	8.122	8.111	8.108	8.108	7.891	8.17	#N/A	8.12	8.12	-0.01	0.00	-0.012	0.01	0.00	0.00
RESL1.421	7.686	7.71	8.08	8.10	8.12	8.16	8.18	8.22	8.25	8.26	8.259	8.249	8.246	8.246	8.079	8.30	#N/A	8.26	8.26	-0.01	0.00	-0.011	0.01	0.00	0.00
RESL1.820	5.791	5.79	6.56	6.58	6.60	6.63	6.66	6.70	6.72	6.73	6.734	6.724	6.72	6.72	6.561	6.78	#N/A	6.73	6.73	-0.01	0.00	-0.012	0.01	0.00	0.00
RESL1.820	6.821	6.82	7.89	7.92	7.95	8.00	8.03	8.08	8.11	8.12	8.122	8.111	8.108	8.108	7.891	8.17	#N/A	8.12	8.12	-0.01	0.00	-0.012	0.01	0.00	0.00
RESL1.910	3.397	3.40	3.59	4.17	4.38	4.43	4.50	4.55	4.58	4.60	4.583	4.654	4.635	4.571	3.69	4.74	#N/A	4.60	4.59	0.06	-0.01	-0.024	0.02	0.00	0.00
RESL1.920	3.397	3.40	3.59	4.17	4.38	4.43	4.50	4.55	4.58	4.60	4.583	4.654	4.635	4.571	3.69	4.74	#N/A	4.60	4.59	0.06	-0.01	-0.024	0.02	0.00	0.00
RESL1.930	3.397	3.40	3.59	4.17	4.38	4.43	4.50	4.55	4.58	4.60	4.583	4.654	4.635	4.571	3.69	4.74	#N/A	4.60	4.59	0.06	-0.01	-0.024	0.02	0.00	0.00
RESL1.935	3.397	3.40	3.59	4.17	4.38	4.43	4.50	4.55	4.58	4.60	4.583	4.654	4.635	4.571	3.69	4.74	#N/A	4.60	4.59	0.06	-0.01	-0.024	0.02	0.00	0.00
RESL1.940	3.397	3.40	3.59	4.17	4.38	4.43	4.50	4.55	4.58	4.60	4.583	4.654	4.635	4.571	3.69	4.74	#N/A	4.60	4.59	0.06	-0.01	-0.024	0.02	0.00	0.00
RESL1.940	3.397	3.40	3.59	4.17	4.38	4.43	4.50	4.55	4.58	4.60	4.583	4.654	4.635	4.571	3.69	4.74	#N/A	4.60	4.59	0.06	-0.01	-0.024	0.02	0.00	0.00
RESL1.C00	5.791	5.79	6.56	6.58	6.60	6.63	6.66	6.70	6.72	6.73	6.734	6.724	6.72	6.72	6.561	6.78	#N/A	6.73	6.73	-0.01	0.00	-0.012	0.01	0.00	0.00
RESL1.C01	5.791	5.79	6.56	6.58	6.60	6.63	6.66	6.70	6.72	6.73	6.734	6.724	6.72	6.72	6.561	6.78	#N/A	6.73	6.73	-0.01	0.00	-0.012	0.01	0.00	0.00
RESL1.C01	5.791	5.79	6.56	6.58	6.60	6.63	6.66	6.70	6.72	6.73	6.734	6.724	6.72	6.72	6.561	6.78	#N/A	6.73	6.73	-0.01	0.00	-0.012	0.01	0.00	0.00
RESL1.C01	5.791	5.79	6.56	6.58	6.60	6.63	6.66	6.70	6.72	6.73	6.734	6.724	6.72	6.72	6.561	6.78	#N/A	6.73	6.73	-0.01	0.00	-0.012	0.01	0.00	0.00
RESL1.C03	5.791	5.79	6.56	6.58	6.60	6.63	6.66	6.70	6.72	6.73	6.734	6.724	6.72	6.72	6.561	6.78	#N/A	6.73	6.73	-0.01	0.00	-0.012	0.01	0.00	0.00
RESR1.409	16.661	16.66	16.66	16.66	16.66	17.25	17.32	17.44	17.52	17.57	17.46	17.621	17.52	17.52	16.661	17.65	17.87	17.57	17.56	0.06	-0.11	-0.045	0.05	0.00	0.00
RESR1.409	14.801	14.80	14.80	14.80	14.80	14.80	14.80	14.81	14.95	14.97	14.844	14.996	14.948	14.948	14.801	15.00	15.18	14.97	14.97	0.03	-0.12	-0.019	0.02	0.00	0.00
RESR1.409	16.661	16.66	16.66	16.66	16.66	17.25	17.32	17.44	17.52	17.57	17.46	17.621	17.52	17.52	16.661	17.65	17.87	17.57	17.56	0.06	-0.11	-0.045	0.05	0.00	0.00
RESR1.409	16.661	16.66	16.66	16.66	16.66	17.25	17.32	17.44	17.52	17.57	17.46	17.621	17.52	17.52	16.661	17.65	17.87	17.57	17.56	0.06	-0.11	-0.045	0.05	0.00	0.00
RESR1.410	14.801	14.80	14.80	14.80	14.80	14.80	14.80	14.81	14.95	14.97	14.844	14.996	14.948	14.948	14.801	15.00	15.18	14.97	14.97	0.03	-0.12	-0.019	0.02	0.00	0.00
RESR1.410	13.411	13.41	13.41	13.41	13.41	13.41	13.41	13.41	13.60	13.61	13.411	13.612	13.602	13.602	13.411	13.62	13.73	13.61	13.61	0.01	-0.20	-0.005	0.00	0.00	0.00
RESR1.410	14.801	14.80	14.80	14.80	14.80	14.80	14.80	14.81	14.95	14.97	14.844	14.996	14.948	14.948	14.801	15.00	15.18	14.97	14.97	0.03	-0.12	-0.019	0.02	0.00	0.00
RESR1.410	14.801	14.80	14.80	14.80	14.80	14.80	14.80	14.81	14.95	14.97	14.844	14.996	14.948	14.948	14.801	15.00	15.18	14.97	14.97	0.03	-0.12	-0.019	0.02	0.00	0.00
RESR1.411	13.411	13.41	13.41	13.41	13.41	13.41	13.41	13.41	13.60	13.61	13.411	13.612	13.602	13.602	13.411	13.62	13.73	13.61	13.61	0.01	-0.20	-0.005	0.00	0.00	0.00
RESR1.411	9.541	10.08	10.73	10.76	10.80	10.83	10.85	10.87	10.88	10.89	10.888	10.875	10.88	10.88	10.73	10.91	11.07	10.89	10.89	-0.01	0.00	-0.006	0.01	0.00	0.00
RESR1.411	13.411	13.41	13.41	13.41	13.41	13.41	13.41	13.41	13.60	13.61	13.411	13.612	13.602	13.602	13.411	13.62	13.73	13.61	13.61	0.01	-0.20	-0.005	0.00	0.00	0.00
RESR1.411	13.411	13.41	13.41	13.41	13.41	13.41	13.41	13.41	13.60	13.61	13.411	13.612	13.602	13.602	13.411	13.62	13.73	13.61	13.61	0.01	-0.20	-0.005	0.00	0.00	0.00
RESR1.412	9.541	10.08	10.73	10.76	10.80	10.83	10.85	10.87	10.88	10.89	10.888	10.875	10.88	10.88	10.73	10.91	#N/A	10.89	10.89	-0.01	0.00	-0.006	0.01	0.00	0.00
RESR1.413	9.541	10.08	10.73	10.76	10.80	10.83	10.85	10.87	10.88	10.89	10.888	10.875	10.88	10.88	10.73	10.91	#N/A	10.89	10.89	-0.01	0.00	-0.006	0.01	0.00	0.00
RESR1.414	9.541	10.08	10.73	10.76	10.80	10.83	10.85	10.87	10.88	10.89	10.888	10.875	10.88	10.88	10.73	10.91	#N/A	10.89	10.89	-0.01	0.00	-0.006	0.01	0.00	0.00
RESR1.415	9.541	10.08	10.73	10.76	10.80	10.83	10.85	10.87	10.88	10.89	10.888	10.875	10.88	10.88	10.73	10.91	#N/A	10.89	10.89	-0.01	0.00	-0.006	0.01	0.00	0.00
RESR1.416	9.541	10.08	10.73	10.76	10.80	10.83	10.85	10.87	10.88	10.89	10.888	10.875	10.88	10.88	10.73	10.91	#N/A	10.89	10.89	-0.01	0.00	-0.006	0.01	0.00	0.00
RESR1.417	9.541	10.08	10.73	10.76	10.80	10.83	10.85	10.87	10.88	10.89	10.888	10.875	10.88	10.88	10.73	10.91	11.07	10.89	10.89	-0.01	0.00	-0.006	0.01	0.00	0.00
RESR1.418	9.541	10.08	10.73	10.76	10.80	10.83	10.85	10.87	10.88	10.89	10.888	10.875	10.88	10.88	10.73	10.91	11.07	10.89	10.89	-0.01	0.00	-0.006	0.01	0.00	0.00
RESR1.420	9.541	10.08	10.73	10.76	10.80	10.83	10.85	10.87	10.88	10.89	10.888	10.875	10.88	10.88	10.73	10.91	11.07	10.89	10.89	-0.01	0.00	-0.006	0.01	0.00	0.00
RESR1.940	2.901	2.90	2.90	2.90	2.90	4.14	4.35	4.45	4.50	4.52	4.523	4.635	4.613	4.486	2.901	4.74	#N/A	4.52	4.52	0.11	0.00	-0.037	0.02	0.00	0.00
RESR1.940	2.901	2.90	2.90	2.90	2.90	4.14	4.35	4.45	4.50	4.52	4.523	4.635	4.613	4.486	2.901	4.74	#N/A	4.52	4.52	0.11	0.00	-0.037	0.02	0.00	0.00
RESR1.C00	5.701	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.701	5.701	5.701	5.701	5.701	5.70	6.72	5.70	5.70	0.00	0.00	0.000	0.00	0.00	0.00
RESR1.C01	5.701	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.701	5.701	5.701	5.701	5.701	5.70	6.72	5.70	5.70	0.00	0.00	0.000	0.00	0.00	0.00
RESR1.C01	5.701	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.701	5.701	5.701	5.701	5.701	5.70	6.72	5.70	5.70	0.00	0.00	0.000	0.00	0.00	0.00
RESR1.C01	5.701	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.701	5.701	5.701	5.701	5.701	5.70	6.72	5.70	5.70	0.00	0.00	0.000	0.00	0.00	0.00
RESR1.C03	5.701	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.70	5.701	5.701	5.701	5.701	5.701	5.70	6.72	5.70	5.70	0.00	0.00	0.000	0.00	0.00	0.00
URBAN-I	27.988	28.02	28.10	28.14	28.19	28.26	28.30	28.38	28.43	28.44	28.382	28.486	28.433	28.433	28.103	28.54	28.54	28.44	28.44	0.05	-0.05	-0.003	0.00	0.00	0.00
URBAN-J	25.861	25.91	26.06	26.12	26.20	26.31	26.36	26.45	26.51	26.52	26.479	26.558	26.512	26.512	26.061	26.64	26.64	26.52	26.52	0.04	-0.04	-0.007	0.01	0.00	0.00
URBAN-K	22.2	22.29	22.47	22.54	22.62	22.71	22.76	22.84	22.88	22.89	22.839	22.94	22.876	22.876	22.474	22.98	22.98	22.89	22.89	0.05	-0.05	-0.015	0.01	0.00	0.00
URBAN-L	18.029	18.14	18.34	18.42	18.54	18.73	18.86	19.04	19.14	19.19	19.19	19.196	19.138	19.138	18.338	19.42	19.42	19.19	19.47	0.00	0.00	-0.055	0.05	0.00	0.27
URBAN-M	9.581	9.67	9.80	9.85	9.91	9.97	10.01	10.05	10.07	10.08	10.032	10.146	10.069	10.069	9.8	10.12	10.48	10.08	10.08	0.06	-0.05	-0.013	0.01	0.00	0.00

Appendix D. Drawings

Appendix E. Cross-sections and elevations

Supplied on attached CD