this message by a third party.

United Utilities Group PLC, Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington, WA5 3LP
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Hannah Buchanan

From:	Hannah Buchanan
Sent:	22 November 2021 12:35
To:	'Wastewater Developer Services'
Cc:	Megan Berry
Subject:	Pre-Planning Enquiry - Land off Chippings Lane, Longridge
Attachments:	wastewater_predevelopment_enquiry (HB).pdf; HYD371 Surface Water Run-off Calcs 1.0.pdf; Preliminary Drainage Situation for UU .pdf; LOCATION PLAN.pdf

To whom it may concern,

We are currently preparing a Flood Risk Management Assessment and Drainage Management Strategy to support a residential planning application on land off Chipping Lane in Longridge. As part of the preparation, a drainage management strategy has been devised and at this stage we are seeking to begin discussions with UU with regards to the proposed foul water: attached is the pre-application advice form with supporting information as required.

Surface Water:
The primary method of discharging surface water in accordance with the national drainage hierarchy should ideally be though infiltration; however Soakaway Testing has been recommended to confirm onsite characteristics. Assuming infiltration does not work on the site, the next approach would be to discharge to the nearest watercourse which has been located crossing site (see drainage strategy attached). Detailed design will be required and full consents to be obtained as the application progresses.

Foul Water:
Foul water flows generated by the development are proposed to connect to nearest the public foul water sewer. Review of the UU sewer records identify there to be a foul water pumping station onsite adjacent to the southern boundary. This pumping station has been accounted for within the planning proposals and a public foul water sewer (375mm.dia) associated with the pumping station has been identified onsite adjacent to the southern boundary. Due to the existing land-use onsite, no existing foul water connections to the public sewer network are present. Based on the proposals for the construction of up to 198no. residential units for Phase 2 & 3, the approximate peak foul water flows generated by the development are **9.2l/s.** This is based on 4000 litres per dwelling per 24 hours; the guidance contained within Sewers for Adoption (SfA).

Phase 1 has a separate drainage management strategy as detailed in the approved supporting FRA&DMS (REF: 3/2014/0764), which shows foul from this portion of development will outfall into the foul water system located within Inglewhite Road to the south-east of Phase 1. The proposals are therefore to connect into the nearest public foul water sewer onsite adjacent to the southern boundary or divert flows from Phase 2 & 3 towards the pumping station within Phase 1, subject to confirmation of capacity within this existing infrastructure, which ultimately connects into the public sewer network within Inglewhite Road. Detailed design will be required to confirm feasibility based on the topographic levels following further detailed investigation. At this stage however it is understood that a pumped solution may be required based on the existing topographic levels onsite.

We are ultimately seeking to identify United Utilities preferred points of connection(s) and to confirm any constraints. It is acknowledged that considerable offsite work will likely be required to achieve connection to the public sewer network. Hopefully the summary above and the attached are of assistance and allow agreement in principle to be given, do not hesitate to contact me on the details below should you require any further assistance.

Kind Regards,

Hannah Buchanan *BSc (Hons) GradCIWEM*
Graduate Flood Risk Analyst

BETTS HYDRO
Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Chester +44 (0)1244 289041

hannahbuchanan@betts-associates.co.uk
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SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEOTECHNICAL

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APPENDIX D: LPA/LLFA CORRESPONDENCE

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Megan Berry

From: Freedom of Information <CSSGFreedom@lancashire.gov.uk>
Sent: 02 November 2018 15:15
To: Megan Berry
Subject: Request for Information (945.1747)PH Acknowledgement

Dear Ms Berry

Request for Information Under the Freedom of Information Act (2000) We are writing to acknowledge receipt of your enquiry of 31st October 2018, in which you request the disclosure of information.
We can confirm that your enquiry will now be assigned to an officer who will commence a search for the information you require and they will respond in due course. The deadline date for issuing you with a full response is 28th November 2018. We will endeavour to provide a response well in advance of this date, however, should we envisage any delays, or require more details from you, we will contact you immediately.

If you have any queries about the above, please do not hesitate to contact us, quoting ref. 945.1747.

Yours sincerely,

On Behalf of the Information Governance Team Lancashire County Council PO Box 78 County Hall Preston PR1 8XJ

From: Suds
Sent: 02 November 2018 10:29
To: Freedom of Information <CSSGFreedom@lancashire.gov.uk>
Subject: Historical Flood Information - Freedom of Information

Good morning,

Please see below a request for flooding information under the Freedom of Information Act.

We will start investigating the query but will await your response before we reply. I have logged the query on HAMS under CRNo136238 but have had to log it as Chipping Road as Chipping Lane is not showing on HAMS.

Regards

Helen Lord
Flood Risk Technical Support Officer
Community Services
Lancashire County Council
T: 01772 536275
W: www.lancashire.gov.uk

From: Megan Berry [mailto:meganberry@betts-associates.co.uk]
Sent: 31 October 2018 11:22
To: Suds <suds@lancashire.gov.uk>
Subject: Historical Flood Information - Freedom of Information

F.A.O Flood Risk, Drainage and/or Planning department

Please forward to the correct department/ office

To whom it may concern,

Chippings Lane, Longridge

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the site above (see location plan attached), including details of historical flooding, predicted flood water levels and current drainage issues; this would be greatly appreciated. If there are any specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Megan Berry BSc(Hons) GradCIWEM
Graduate Flood Risk Analyst

BETTS HYDRO
Specialists in Drainage and Flood Risk
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

CHESTER OFFICE - 01244 289041

meganberry@betts-associates.co.uk
www.betts-associates.co.uk

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SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEO-TECHNICAL

Megan Berry

From: Megan Berry
Sent: 31 October 2018 11:22
To: 'contact@ribblevalley.gov.uk'
Subject: Historical Flooding Information - Freedom of Information
Attachments: LOCATION PLAN.pdf

F.A.O Flood Risk, Drainage and/or Planning department

Please forward to the correct department/ office

To whom it may concern,

Chippings Lane, Longridge

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the site above (see location plan attached), including details of historical flooding, predicted flood water levels and current drainage issues; this would be greatly appreciated. If there are any specific requirements that you require in a scope of works for this site please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards

Megan Berry BSc(Hons) GradCIWEM
Graduate Flood Risk Analyst

BETTS HYDRO
Specialists in Drainage and Flood Risk
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY

CHESTER OFFICE - 01244 289041

meganberry@betts-associates.co.uk
www.betts-associates.co.uk

APPENDIX E: LOCATION PLAN

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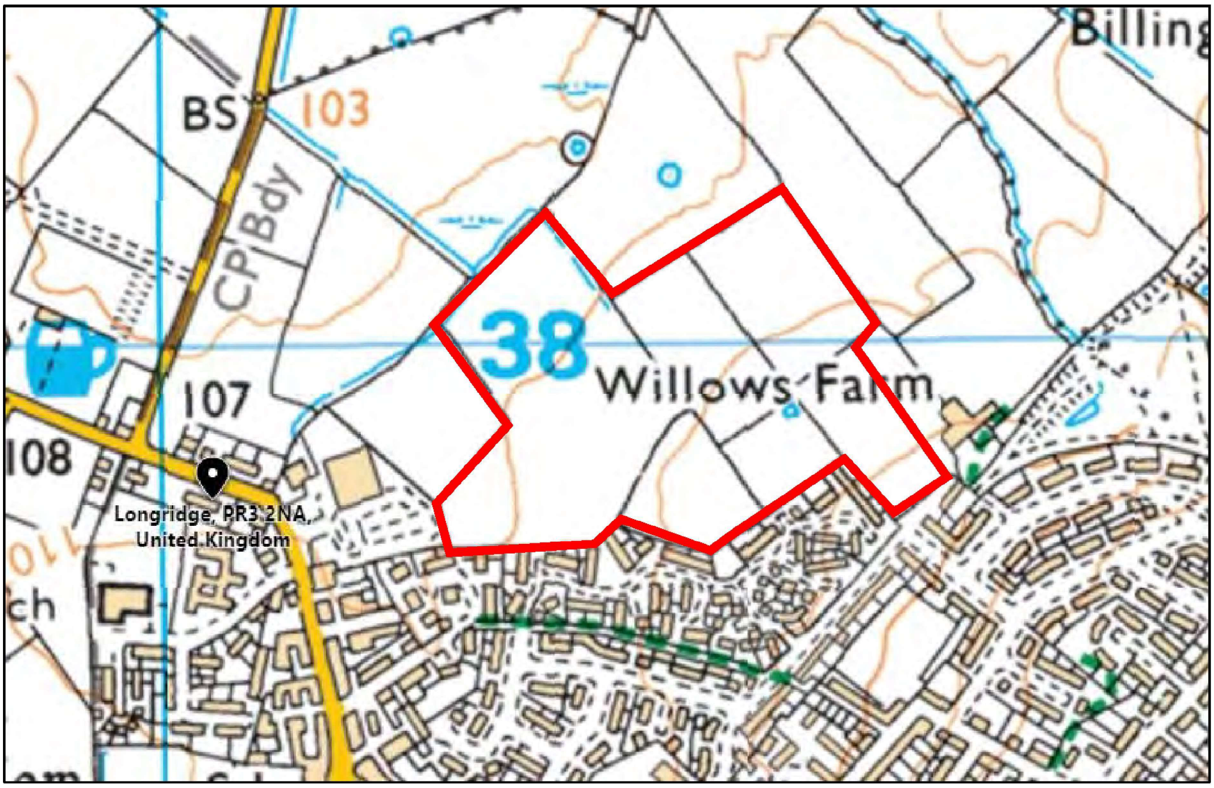
LOCATION PLAN

Chipping Lane, Longridge



OS X (Eastings)	360405
OS Y (Northings)	437794
Nearest Post Code	PR3 3HB
Lat (WGS84)	N53:50:06 (53.834883)
Long (WGS84)	W2:36:11 (-2.603137)
Lat,Long	53.834883,-2.603137
Nat Grid	SD604377 / SD6040537794
mX	-289779
mY	7104425

APPENDIX F: TOPOGRAPHIC SURVEY

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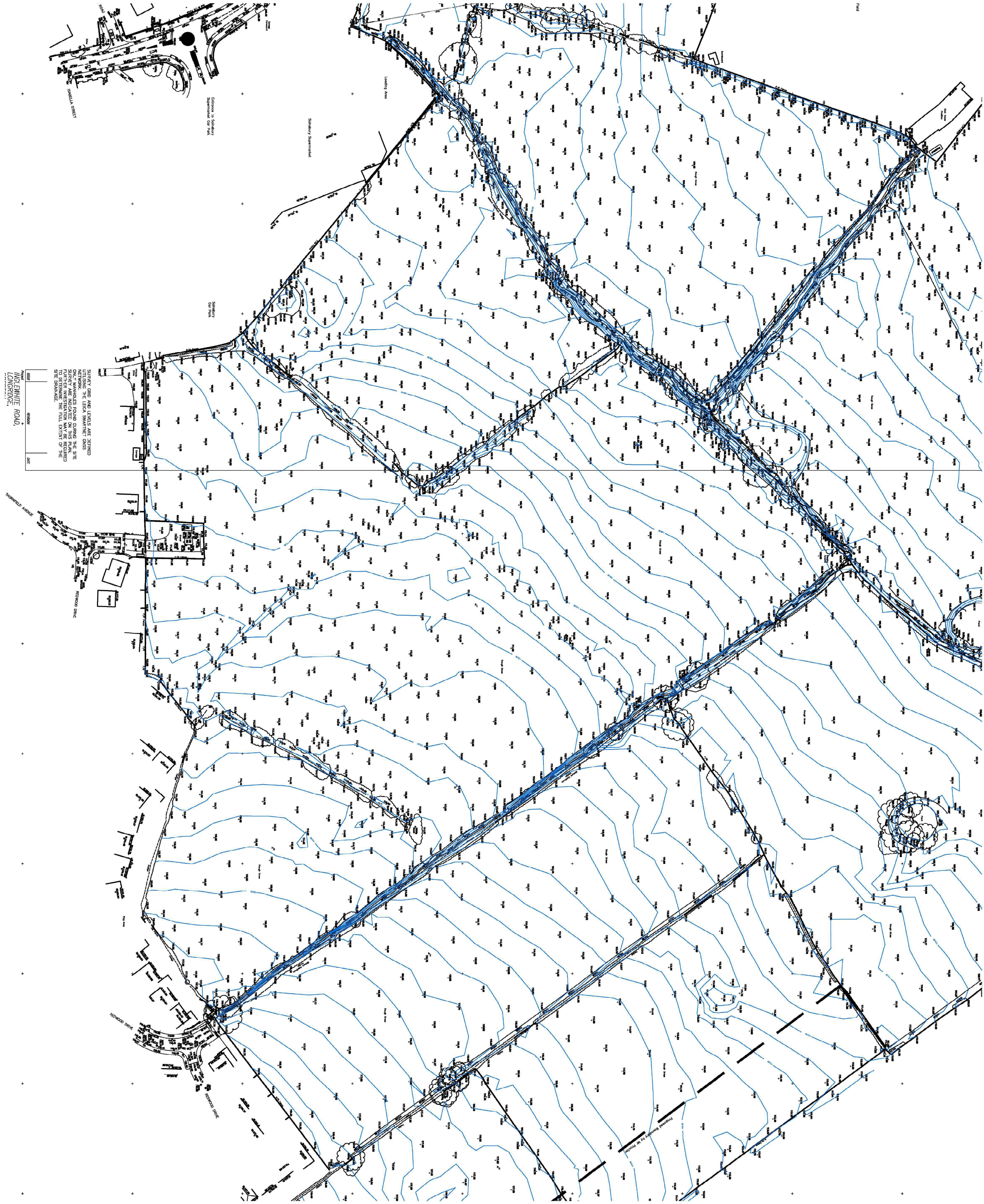
SURVEY GRID AND LEVELS ARE DEFINED UTILISING THE LEICA SMARTNET GNSS NETWORK.
ONLY MANHOLES FOUND DURING THE SITE SURVEY ARE INDICATED ON THIS PLAN. FURTHER INVESTIGATION MAY BE REQUIRED TO DETERMINE THE FULL EXTENT OF THE SITE DRAINAGE.
ISSUE
REVISION
DATE
Project
INGLEWHITE ROAD,
LONGRIDGE,
THORNFIELD AVENUE
REDWOOD DRIVE
Sainsbury Supermarket
Sainsbury Car Park
Loading Area
Field

APPENDIX G: PROPOSED PLANNING LAYOUT

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WARNING TO HOUSE PURCHASERS
Property Misdescriptions Act 1991

Buyers are warned that this is a working drawing and is not intended to be treated as descriptive material describing, in relation to any particular property or development, any of the specified matters prescribed by any Order made under the above act. The contents of this drawing may be subject to change at any time, and alterations and variations can occur during the progress of the works without revisions of the drawing. Consequently the layout, form, content and dimensions of the finished construction may differ materially from those shown. Nor do the contents of this drawing constitute a contract, part of any contract, or warranty.

SCHEDULE OF ACCOMMODATION

Ref	Barratt Type	House Type	Sqft	No	Total Sqft
AFFORDABLE TYPES					
STANDARD					
DNF	Denford	2 Bedroom affordable mews	624	19	11856
BRN	Brandon	3 Bedroom affordable mews	706	25	17650
ELDERLEY					
BED	Bedale	2 Bed LTH Bungalow	594	7	4158
BEL	Belmont	2 Bed LTH House	731	8	5848
AFFORDABLE TOTAL				59	39512
PRIVATE SALE TYPES					
ELDERLEY					
BED	Bedale	2 Bed LTH Bungalow	594	7	4158
BEL	Belmont	2 Bed LTH House	731	8	5848
STANDARD					
ELL	Ellerton	3 Bed semi-detached house	830	33	27390
MOR	Moresby	3 Bed dual aspect semi-detached house	854	25	21350
KNS	Kingsville	3 bed townhouse	1072	21	22512
LUT	Lutterworth	3 bed detached house	1001	5	5005
ALD	Alderney	4 bed dual aspect detached house	1225	12	14700
DEN	Denby	3 bed detached house	880	8	7040
WIN	Windermere	4 bed detached house	1073	19	20387
THO	Thornton	4 bed detached house	1202	1	1202
PRIVATE SALE TOTAL				139	129592
Total number of units and square footage				198	169104
Gross Site Area in Acres					26.11
Total Undevelopable area in acres					14.15
Net Site Area in Acres					11.96
Density (units per acre)					17
Density (units per hectare)					41
Square foot / Acre					14,139

DRAWING KEY

- (AF) AFFORDABLE DWELLINGS
- (EL) DWELLING FOR THE ELDERLY
- PROPOSED TRIM TRAIL ITEM
- TREE/ HEDGE TO BE REMOVED
- TREE/ HEDGE TO BE RETAINED
- BLOCK PAVIORS (RED)
- PROPOSED INDICATIVE TREE PLANTING
- 1800mm TIMBER GATE

Refer to engineers highway surfacing drawing for details of surfacing to adoptable areas

Rev	Description	Date	Drawn	Chk'd
A	Amended wall of plot 124, amended path for plot 123.	20/10/21	GB	

BARRATT HOMES MANCHESTER

Barratt Homes Manchester
(A division of BDW Trading Ltd)
4 Brindley Road
City Park
Manchester
M16 9HQ
Tel: 0161 872 0161
Fax: 0161 855 2828

Job: CHIPPING LANE LONGRIDGE

Title: PHASE 2 / 3 PLANNING LAYOUT

Design By	Date	Drawing Number	Rev
AA	10-10-18	459-PL06	A
Drawn By	Scale @ A0		
AA	1:500		

APPENDIX H: HYDRAULIC ASSESSMENT

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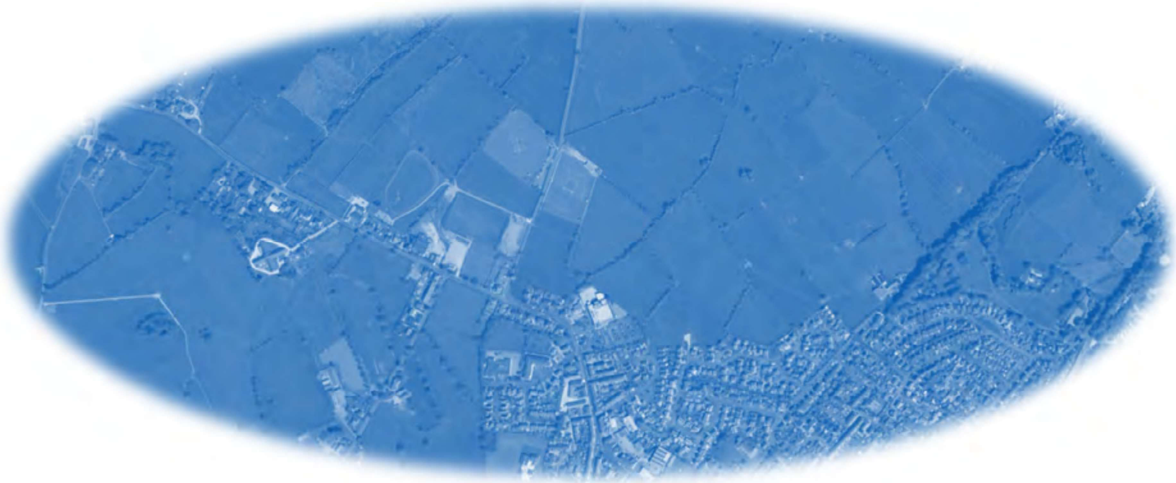
BETTS HYDRO
CONSULTING ENGINEERS

LAND AT CHIPPING LANE, LONGRIDGE

HYDRAULIC ASSESSMENT



For
Barratt Homes Manchester
4 Brindley Road,
City Park,
Manchester,
M16 9HQ.

July 2016

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BETTS HYDRO
CONSULTING ENGINEERS

LAND AT CHIPPING LANE, LONGRIDGE

HYDRAULIC ASSESSMENT

Document Tracking Sheet

Document Reference: HYD068_CHIPPINGLANE_HYDRAULIC_ASSESSMENT
Revision: 1.0
Date of Issue: 8th July 2016
Report Status: FINAL

Prepared by:
Dominic Kearney BEng (Hons), MSc, PhD
Principal Hydraulic Analyst

Checked by:
Richard Nicholas BEng (Hons) MBA
Director

Authorised by:
Rob Ankers
Director

Revision History:

Rev.:	**Date:**	**Status:**	**Prepared by:**	**Checked by:**	**Issued by:**
1.0	04/07/16	Final	DK	RN	DK

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CONTENTS

Figures & Tables

Specialist Software

- Flood Estimation Handbook FEH CD-ROM (v.3.0) – Determination of Catchment Descriptors and depths of rainfall.

- ISIS (3.7) – 2013 - 1D Hydraulic Model

Abbreviations & Acronyms

AEP	Annual Exceedance Probability	mAOD	Metres Above Ordnance Datum
BGL	Below Ground Level	NGR	National Grid Reference
CC	Climate Change	NPPF	National Planning Policy Framework
EA	Environment Agency	OS	Ordnance Survey
FEH	Flood Estimation Handbook	PFRA	Preliminary Flood Risk Assessment
FRA	Flood Risk Assessment	PPS	Planning Policy Statement
FZ	Flood Zone	SFRA	Strategic Flood Risk Assessment
Ha	Hectare	LCC	Lancashire County Council
LLFA	Lead Local Flood Authority	TWL	Top Water Level
LPA	Local Planning Authority	UU	United Utilities

1.0 EXISTING SITE SITUATION

1.1 The proposed development site is located on land at Chipping Lane, Longridge and is directly accessed off Chipping Lane. The Ordnance Survey National Grid Reference (OS NGR) for the site is Eastings 360073, Northings 437980 and the nearest postcode is PR3 2NA.

1.2 The proposed development area is edged in red Figure 1 (below). A location plan is included Appendix A.

Figure 1: Aerial Photograph of site (proposed development area edged in red)

1.3 Two small watercourses enter the site from the south east and south west and flow in a north westerly direction, leaving the site via 600mm diameter culvert outfall by Chipping Lane north of the site.

1.4 The Environment Agency flood zone maps indicated that the site is entirely within Flood Zone 1, implying that the site is at low risk of fluvial flooding.

1.6 From a flood risk perspective it was considered prudent to undertake a hydraulic assessment of the watercourse to assess the peak water levels in the watercourse in both the existing and the post development scenarios.

2.0 DEVELOPMENT PROPOSALS

2.1 The initial proposals are a residential development within the red edge boundary indicated in Figure 2 and in Appendix B.

Figure 2: Indicative Planning Proposals

3.0 CATCHMENT DESCRIPTORS

3.1 The Flood Estimation Handbook (FEH) CD-ROM provided catchment descriptors for Higgin Brook upstream of a point north of the development site. Three smaller sub-catchments (Sub A, Sub B and Sub C) upstream of the 600mm culvert were identified using LiDAR data.

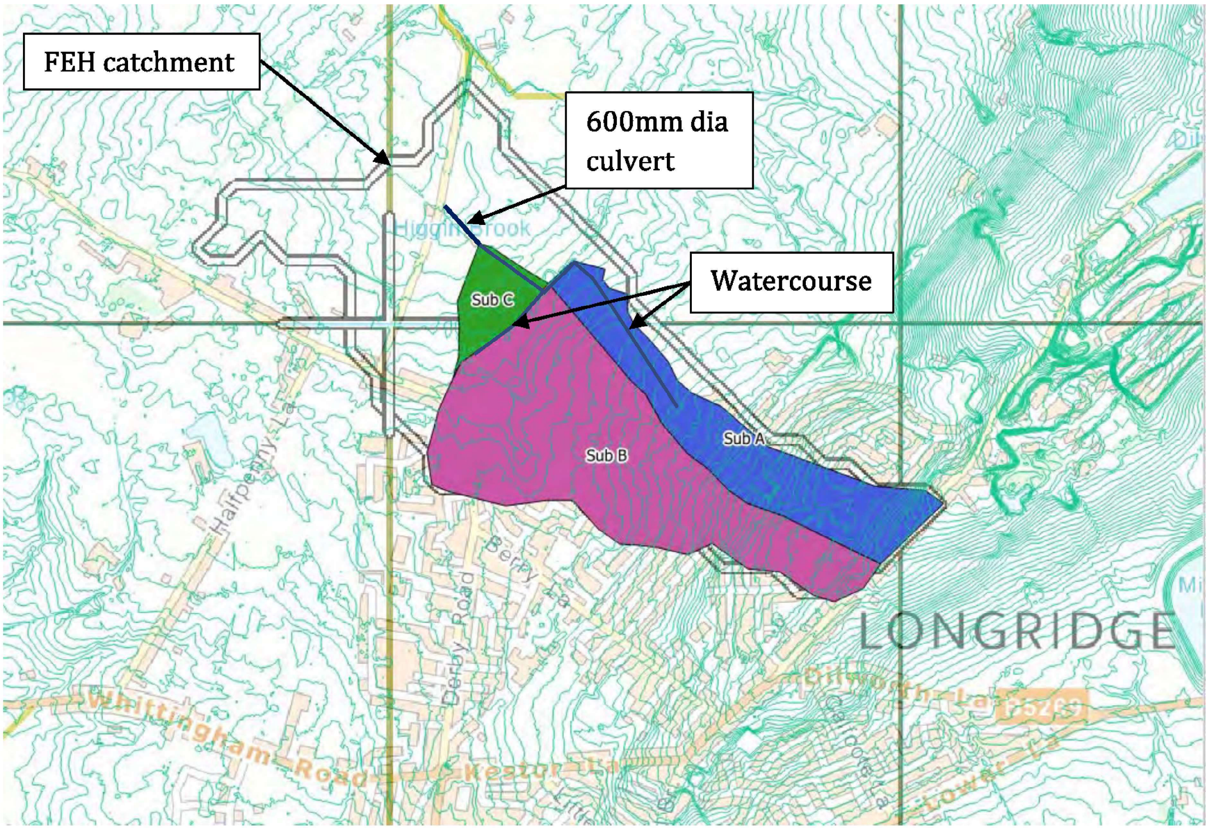

Figure 3: Upstream Sub-catchments

3.2 The FEH Catchment descriptors are summarised below and included in full in Appendix C.

Important Catchment Descriptors: All sub-catchments

DPSBAR (m/km)	22.3	Mean slope between nodes (m/km)
SAAR (mm)	1200	Standard annual average rainfall – 1961-1990
FARL	1.00	Flood attenuation due to reservoirs/lakes (no attenuation)
BFIHOST	0.417	Baseflow index from Hydrology of Soil Types
SPRHOST	35.03	Standard percentage runoff from soil types
PROPWET	0.51	Proportion of time catchment is wet
URBEXT1990	0.1643	Urban extent in 1990 (essentially rural)

3.3 The areas for the sub-catchments were calculated using GIS and mean drainage path length (DPLBAR) was calculated using formula 7.1 from the FEH Volume 5: Catchment Descriptors as follows: $DPLBAR = AREA^{0.548}$. The sub-catchment areas and DPLBAR values are shown in Table 1.

Sub-catchment	Area (km^2)	DPLBAR (km)
Sub A	0.093	0.272
Sub B	0.200	0.414
Sub C	0.022	0.123

Table 1: Sub-catchment specific characteristics

4.0 HYDROLOGY

4.1 The Revitalised Flood Hydrograph (ReFH) method was applied for each sub-catchment based on catchment descriptors. The $URBEXT_{1990}$ <0.5 and BFIHOST<0.65 for all sub-catchments, therefore the use of the ReFH method is appropriate.

4.2 This study has considered the 1 in 5 year (20% AEP), 1 in 30 year (3.3% AEP), 1 in 100 year (1% AEP) and the 1 in 100 year (1% AEP) plus climate change (CC) return period flows in the watercourses.

4.3 These are considered to represent conservative flow estimates (i.e. adopts the precautionary approach). The site is considered to be predominantly greenfield and the catchment characteristics from the FEH CD-ROM were utilised. The peak flow estimates are shown in Table 2 below. Full details are shown in Appendix D.

Sub-Catchment	20% AEP	3.3% AEP	1% AEP	1% AEP + CC
Sub A	0.11	0.18	0.24	0.29
Sub B	0.20	0.32	0.45	0.54
Sub C	0.03	0.06	0.08	0.10

Table 2: ReFH Peak Flow Estimates

4.4 The critical storm duration for the largest sub-catchment (Sub B) was 1.065 hours. It was assumed that the same storm would occur in all sub-catchments, as they are adjacent to one another.

4.5 The full hydrographs for all sub-catchments in all return periods are shown in Figures D.1 to D.10 in Appendix D.

5.0 HYDRAULIC MODELLING

Model Details

5.1 An unsteady state 1D model of the watercourse was developed using ISIS for the existing and the proposed development scenarios.

5.2 A topographical survey of the site and watercourse was undertaken and a 3D ground model was generated. Cross sections through the watercourse were generated from the ground model at locations shown in the model schematics shown in Figure 4. The cross sections (Figures E.1 to E.30) and watercourse profile (Figure E.15) are included in Appendix E.

5.3 The watercourse was modelled in the existing scenario for the 20%, 3.3%, 1% and 1% plus climate change AEP events.

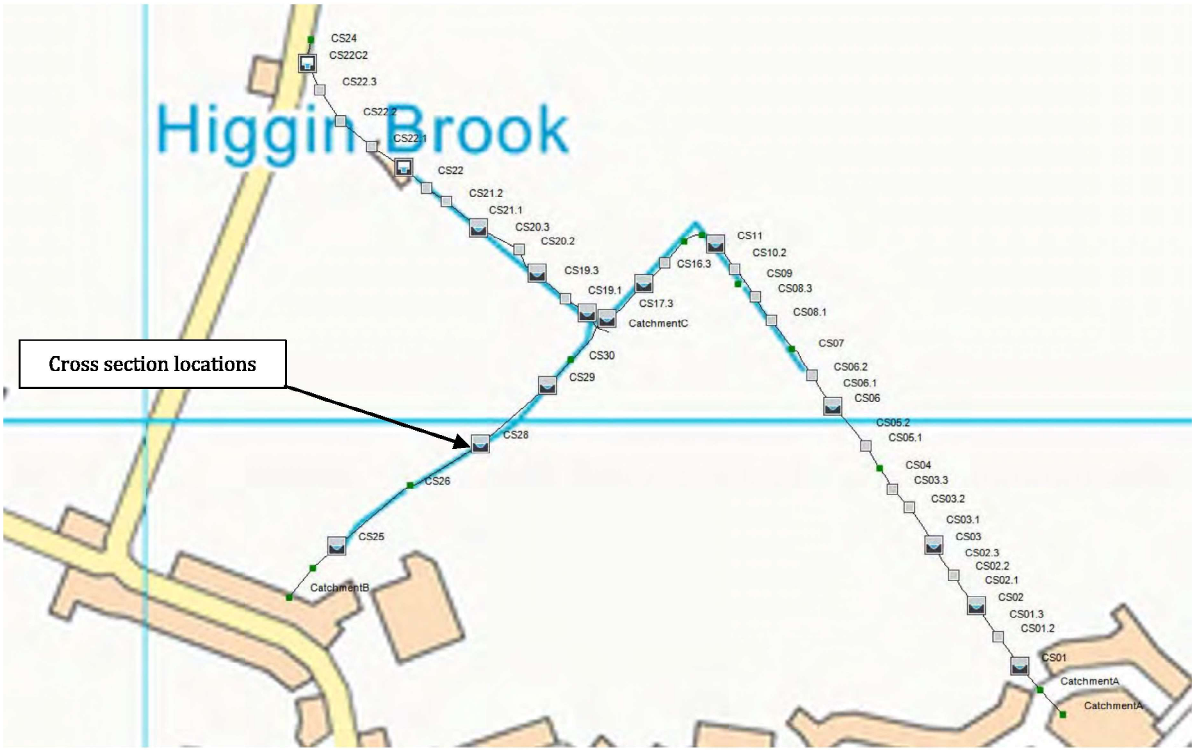

Figure 4: ISIS Model Schematic

5.4 Roughness coefficient allocation was based on aerial imagery. The watercourse channel is straight with some vegetation and as such the channel was assigned a roughness Manning's n value of 0.04 (refer to photographs in Appendix H).

5.5 There are seven structures within the modelled reach of the watercourse:

- 4 no. 300mm diameter pipes;
- 1 no. 525mm diameter pipe;
- 1 no. 575mm diameter pipe;

- 1 no. 600mm diameter pipe.

5.6 Overtopping of the bridges has been modelled in 1-D using a spill unit.

Model Assumptions

5.7 The cross sections were generated from a 3D ground model and so the profile of the channel may not be as true as if cross sections had been specifically surveyed. In some cases, the top water level on the date of the survey may have been used as the bed level. This approach is, however, conservative.

5.8 The diameters of pipes at cross sections 4, 9 and 15 have been assumed to be 300mm due to surveyed information not being available.

Model Results

Existing Scenario

5.7 The hydraulic modelling results including longitudinal profile and cross sections (including peak water levels) are included in Appendix E. Peak water levels for the 20%, 3.3%, 1% AEP and 1% AEP plus climate change events for the existing scenario are shown in Table 3.

5.8 The results show that water levels remain in bank for most of the reach in all AEPs. The peak water level is out of bank at the inlet to the 600mm diameter culvert.

Proposed Scenario

5.9 A 600mm diameter pipe, approximately 26m long, was inserted upstream of cross section number 26 to simulate a proposed crossing. The location of the new crossing is shown in Figure 5.

5.10 The hydraulic modelling results including longitudinal profiles and cross sections (including peak water levels) are included in Appendix F. Peak water levels for the 20%, 3.3%, 1% AEP and 1% AEP plus climate change events for the existing scenario are shown in Table 4.

5.11 Comparison of the existing and post development levels in the 1% AEP plus climate change event shows that peak levels remain largely unchanged, although with some small increases in places. The largest increase is of 27mm at cross section 26/26A, upstream of the proposed new culvert. There is also an increase of 25mm at cross section 25. These increases are relatively small and do not increase flood risk or the likelihood of surcharging of surface water outfalls.

Sensitivity Testing

5.12 Sensitivity testing was carried out on certain key model parameters to determine the effects on the simulated flows and water levels due to controlled changes in accordance with best practice.

5.15 The flow rate was increased by 20% and Manning's n values (channel roughness) were increased and decreased by 20%. These were all undertaken on the 1% AEP flow event (refer to Appendix G for the full sensitivity analysis results).

5.16 The increase in Manning's roughness coefficient, n, resulted in a mean increase in level of 0.022m and a maximum increase of 0.043m, occurring at cross section CS32 at the confluence of sub-catchments A and B. Reducing roughness coefficient by 20% had the effect of maximum decrease in water level of 0.057m. The mean effect was to reduce peak water levels by 0.021m.

5.17 Increasing flow by 20% resulted in a mean increase in peak water level of 0.073m and a maximum of 0.323m occurring at cross section CS07.

5.19 The sensitivity analysis has shown that water levels are not particularly sensitive to changes in channel roughness, with all mean and maximum changes within +/- 0.057m. When the 1% flow was increased by 20%, there were some isolated relatively large increases in water level, the maximum being 0.323m. The mean change was 0.073m and the change throughout most of the modelled reach was less than 0.100m.

5.20 The sensitivity due to these parameters should be taken into account when setting design levels.

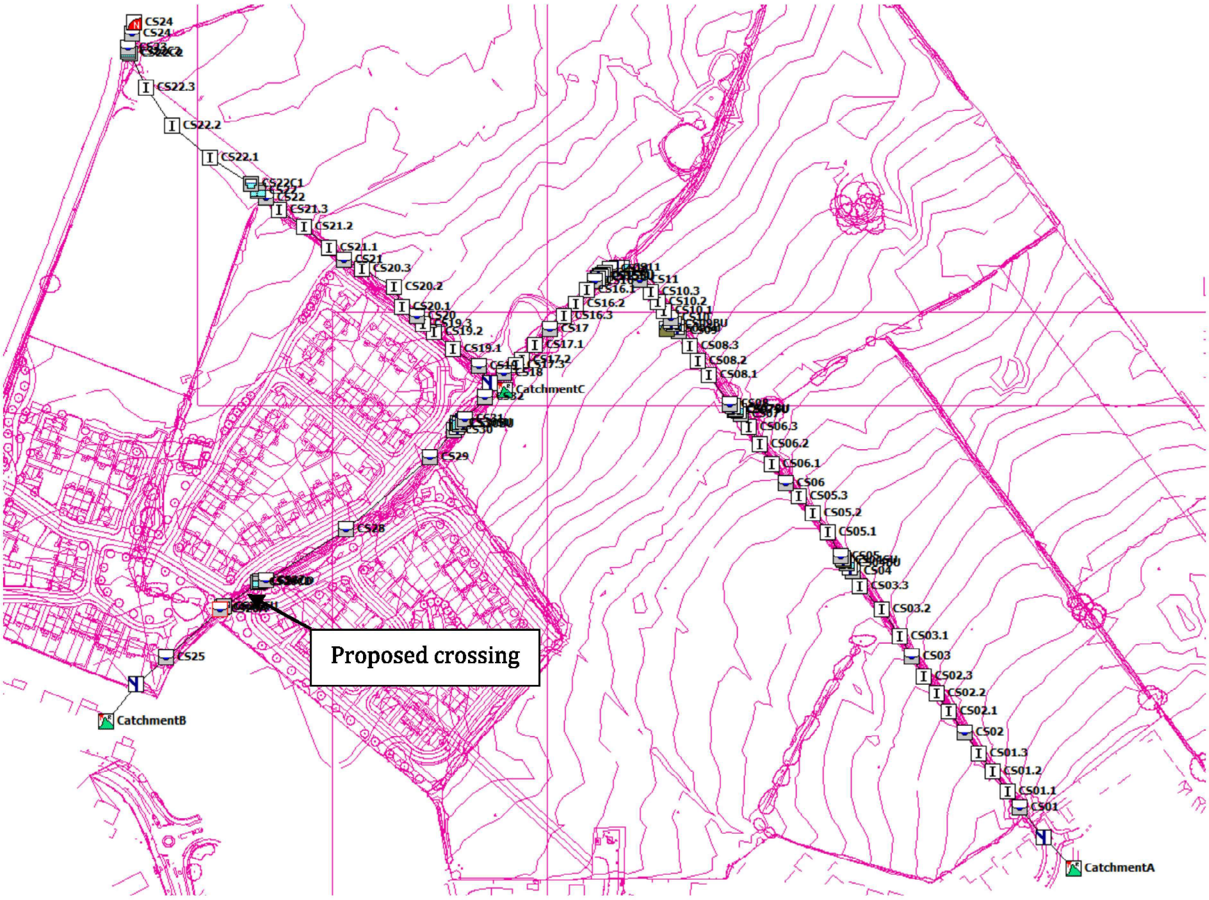

Figure 5: Proposed ISIS model schematic with new crossing

Cross Section	20% AEP (mAOD)	3.3% AEP (mAOD)	1% AEP level (mAOD)	0.1% AEP level (mAOD)
CS01	115.96	116.02	116.06	116.10
CS02	114.79	114.85	114.89	114.92
CS03	113.39	113.45	113.51	113.53
CS04	112.38	112.66	112.88	112.92
CS05	111.36	111.40	111.44	111.47
CS06	109.89	109.92	109.97	110.00
CS07	108.37	108.65	109.08	109.40
CS08	107.86	107.91	107.95	107.97
CS09	107.26	107.51	107.59	107.62
CS10	106.88	106.92	106.97	106.99
CS11	106.39	106.44	106.49	106.51
CS14	105.60	105.85	106.15	106.23
CS15	105.58	105.84	106.15	106.23
CS16	105.14	105.19	105.22	105.25
CS17	103.91	103.92	103.94	103.95
CS18	103.40	103.45	103.50	103.52
CS19	103.40	103.45	103.50	103.52
CS20	102.81	102.88	102.93	103.14
CS21	102.52	102.63	102.84	103.14
CS22	102.40	102.58	102.83	103.14
CS23	101.30	101.39	101.44	101.45
CS24	101.22	101.31	101.35	101.36
CS25	105.85	105.93	106.03	106.13
CS26	105.61	105.76	105.91	106.06
CS27	105.09	105.19	105.27	105.31
CS28	104.81	104.85	104.89	104.92
CS29	104.14	104.23	104.34	104.40
CS30	103.99	104.14	104.27	104.35
CS31	103.63	103.72	103.81	103.85
CS32	103.40	103.45	103.50	103.52

Table 3: Peak 20%, 3.3%, 1% and 0.1% AEP existing water levels

Cross Section	20% AEP (mAOD)	3.3% AEP (mAOD)	1% AEP level (mAOD)	0.1% AEP level (mAOD)
CS01	115.96	116.02	116.06	116.10
CS02	114.79	114.85	114.89	114.92
CS03	113.39	113.45	113.51	113.53
CS04	112.38	112.66	112.88	112.92
CS05	111.35	111.40	111.45	111.47
CS06	109.89	109.92	109.97	110.00
CS07	108.37	108.65	109.08	109.40
CS08	107.86	107.91	107.95	107.97
CS09	107.26	107.50	107.59	107.62
CS10	106.88	106.92	106.97	106.99
CS11	106.39	106.44	106.49	106.51
CS14	105.60	105.85	106.15	106.23
CS15	105.58	105.84	106.15	106.23
CS16	105.14	105.19	105.22	105.25
CS17	103.91	103.92	103.94	103.95
CS18	103.40	103.45	103.50	103.53
CS19	103.40	103.45	103.50	103.53
CS20	102.81	102.88	102.93	103.15
CS21	102.52	102.63	102.84	103.14
CS22	102.41	102.58	102.83	103.14
CS23	101.30	101.39	101.44	101.45
CS24	101.22	101.31	101.35	101.36
CS25	105.86	105.95	106.06	106.15
CS26A	105.67	105.81	105.97	106.09
CS27	105.09	105.19	105.28	105.31
CS28	104.81	104.85	104.89	104.92
CS29	104.14	104.24	104.34	104.41
CS30	103.99	104.14	104.28	104.36
CS31	103.63	103.72	103.81	103.86
CS32	103.40	103.45	103.50	103.53

Table 4: Peak 20%, 3.3%, 1% and 0.1% AEP proposed water levels

6.0 LOW FLOW ANALYSIS

6.1 In order to determine a typical water level above which to set the levels of the surface water outfalls, a low flow analysis was undertaken in accordance with the Institute of Hydrology Report number 108 (IH 108). The analysis included the soil HOST classification, the UK Hydrometric Register and the Flood Estimation Handbook (FEH) CD-ROM.

6.2 An extract from the soil HOST maps is shown in Figure 6, indicating that the soil classification for the catchment is 711m.

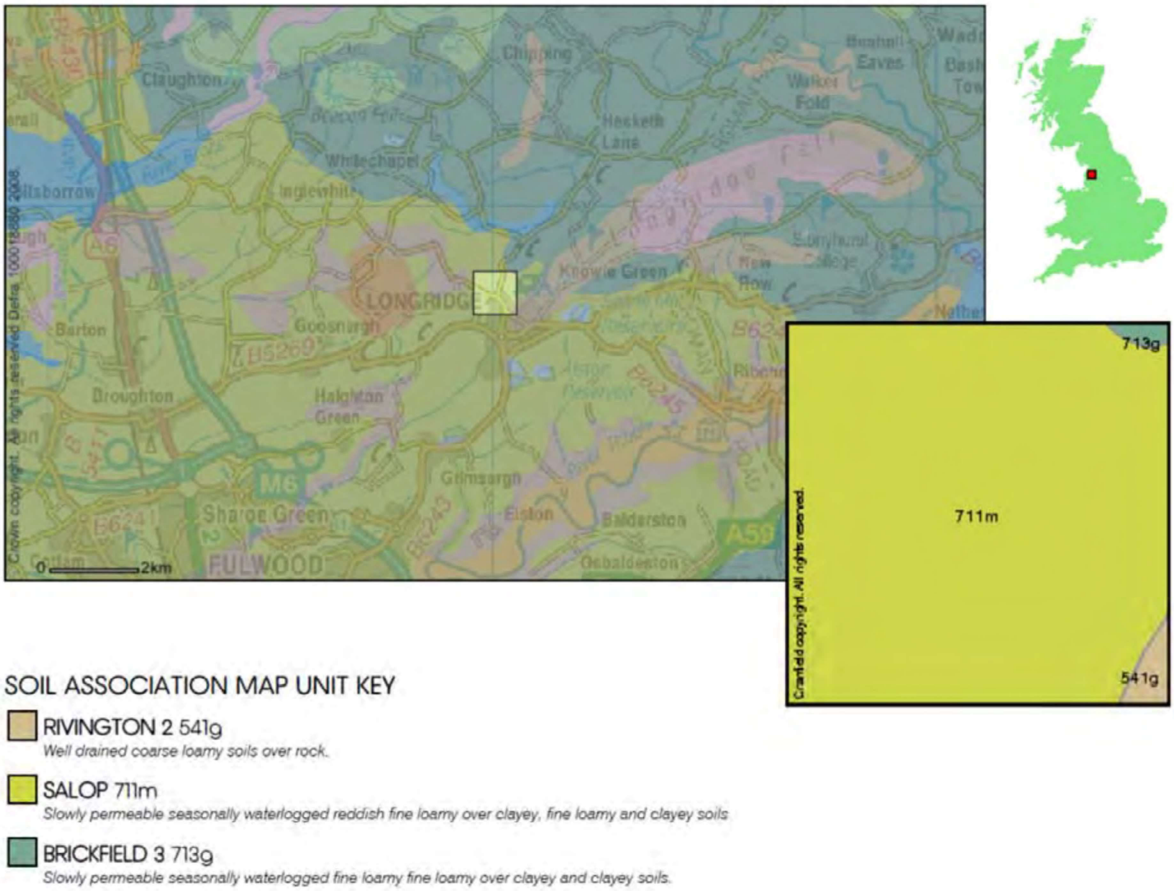

Figure 6: Soil HOST map classification

6.3 The FEH CD-ROM gives the Catchment Area = 0.52km² and standard average annual rainfall, SAAR = 1200mm. The FEH catchment is shown in Figure 7.

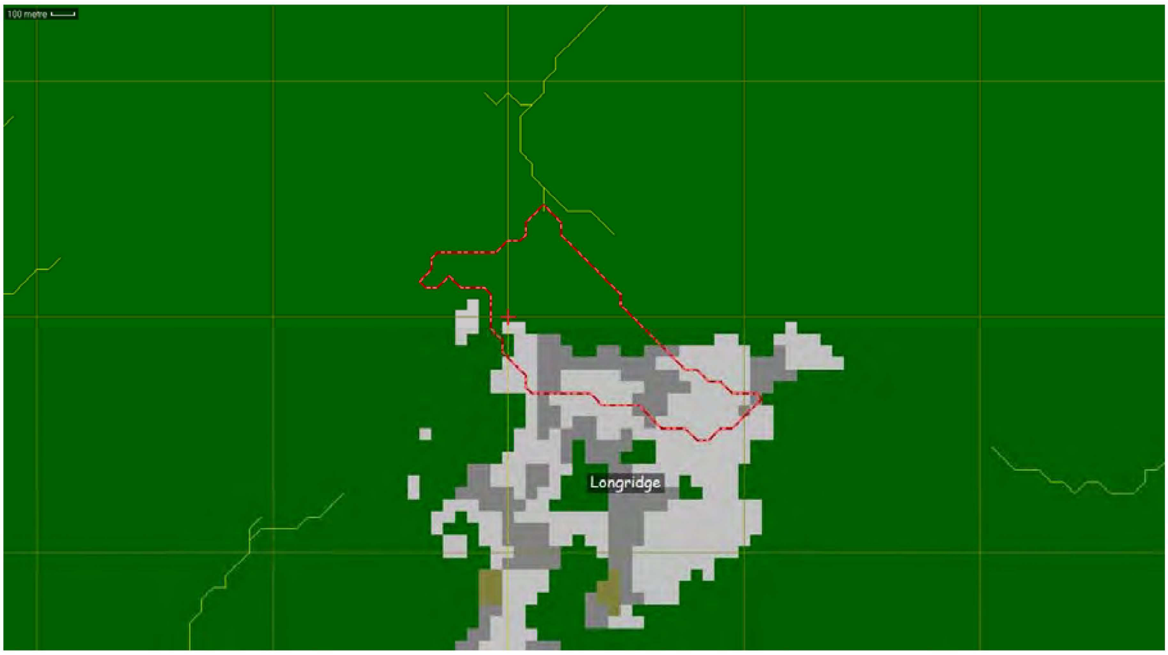

Figure 7: FEH CD-ROM catchment

6.4 From UK Hydrometric Register River Hodder @ Hodder Place (Station Number 71008):

Potential evaporation, PE = 600mm

6.5 From Institute of Hydrology (IH) report 108, section 7.3.2:

Annual Average Runoff Depth (AARD) = SAAR – Losses
Losses = r x PE where r=1 for SAAR>= 850mm

AARD = 1200 – 600
AARD = 600mm

Convert AARD to Mean Flow (MF)

MF = AARD x AREA x (3.17×10^{-5})
MF = 600 x 0.52 x 3.17×10^{-5}
MF = 0.0099 m^3/s

6.6 From IH 108 Appendix 4

Soil type 711m gives the 95 percentile 1-day flow, Q95(1), of 10.7% of mean flow, therefore

Q95(1) = MF x 10.7/100
Q95(1) = 0.0011 m^3/s

6.7 From IH 108 Table 7.1:

Curve 10: Q95(1) percentage of 10.0% is closest to Q95(1) of 10.7% given by soil

Percentile	% Mean Flow	Flow (m^3/s)
2	428.96	0.0425
5	303.93	0.0301
50	52.46	0.0052
80	21.25	0.0021
90	13.75	0.0014
95	10.00	0.0010
99	5.89	0.0006

Table 5: Flow duration

6.8 Flow duration curve is shown in Figure 8.

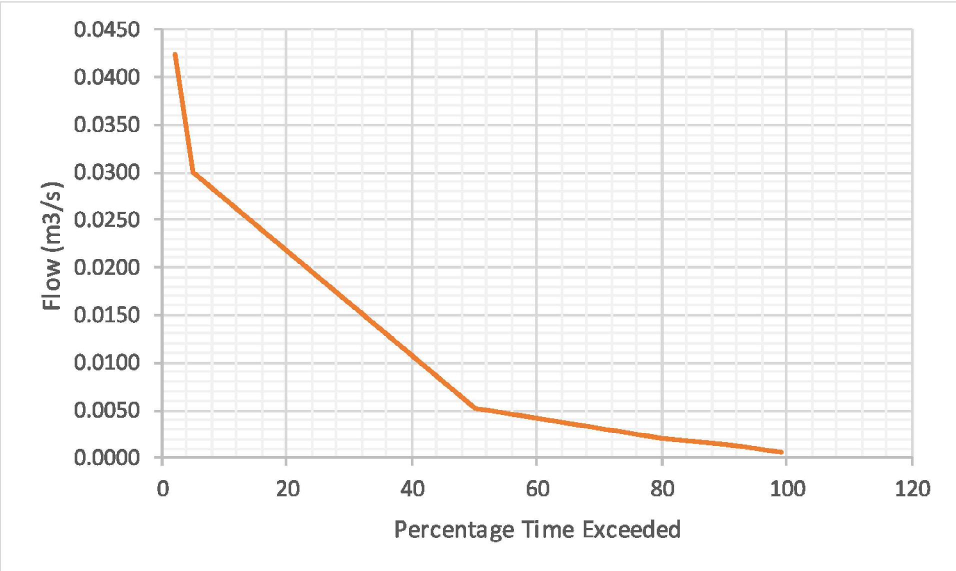

Figure 8: Flow Duration Curve

6.9 The Q95(1) flow of 0.001 m^3/s is too low to be run in the hydraulic model, and so a Manning's equation calculation has been undertaken on a typical cross section to determine the typical water level. The typical cross section is shown in Figure 9.

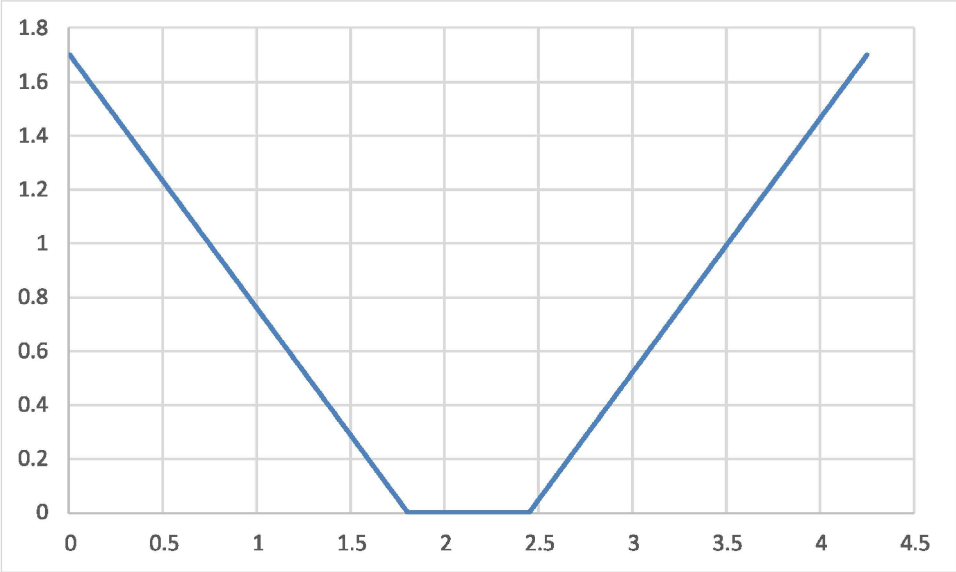

Figure 9: Typical cross section

6.10 Manning's equation is as follows:

$$Q = \frac{AR^{2/3}\sqrt{S}}{n}$$

where Q is flow, A is area of flow, R is hydraulic radius and S is gradient.

6.11 Using the average gradient of 0.025 and a Manning's roughness coefficient of 0.06, Manning's equation yields:

$$A = \frac{Qn}{R^{2/3}\sqrt{S}}$$

$$A = \frac{0.01 \times 0.06}{0.011^{2/3}\sqrt{0.025}}$$

$$A = 0.008\ m^3$$

6.12 The flow area of 0.008m³ corresponds to a depth in the typical channel cross section of 0.012m. It is therefore recommended that the invert levels of surface water outfalls be set at 300mm above this level.

7.0 CONCLUSIONS

6.1 The hydraulic assessment has indicated that peak water levels in the watercourses remain largely within banks for events up to the 1% AEP plus climate change.

6.2 A thorough sensitivity analysis of key parameters has been undertaken and has shown that the model results are not significantly affected by changes in those parameters.

6.3 A low flow analysis was undertaken to determine the Q95(1) flow. The Q95(1) flow was calculated to be $0.001m^3/s$.

6.4 A Manning's equation calculation provided a typical depth in the channel of 0.012m. It is recommended that the invert levels of the surface water outfalls be set at 300mm above the Q95(1) water level.

BIBLIOGRAPHY & REFERENCES

National Planning Policy Framework, CLG (2012).
Planning Practice Guidance, CLG (2014)
Institute of Hydrology Report No. 108 (1992)

Web-based References

Bingmaps – http://www.bing.com/Maps/
British Geological Survey – http://www.bgs.ac.uk/opengeoscience/home.html
Chronology of British Hydrological Events – www.dundee.ac.uk/
CIRIA – http://www.ciria.org/
Cranfield University – http://www.landis.org.uk/soilscapes/
Environment Agency – www.environment-agency.gov.uk/
FloodProBE – http://www.floodprobe.eu/
Flood Forum – http://www.floodforum.org.uk/
Flood London – http://www.floodlondon.com/
Flood Resilience Group – http://www.floodresiliencegroup.org/frg/
Fylde Borough Council– http://www.fylde.gov.uk/
Google Maps – http://maps.google.co.uk/
Lancashire County Council- http://www.lancashire.gov.uk/home/2010/classic/index.asp
Streetmap – http://www.streetmap.co.uk/
United Utilities - http://www.unitedutilities.com/default.aspx

APPENDIX A: LOCATION PLAN

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OS X (Eastings) 360073
OS Y (Northings) 437980
Nearest Post Code PR3 2NA
Lat (WGS84) N53:50:12 (53.836529)
Long (WGS84) W2:36:30 (-2.608205)
Lat,Long 53.836529,-2.608205
Nat Grid SD600379 / SD6007337980

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APPENDIX B: INDICATIVE PLANNING LAYOUT

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WARNING TO HOUSE PURCHASERS
Property Misdescriptions Act 1991

Buyers are warned that this is a working drawing and is not intended to be treated as descriptive material describing, in relation to any particular property or development, any of the specified matters prescribed by any Order made under the above act. The contents of this drawing may be subject to change at any time, and alterations and variations can occur during the progress of the works without revisions of the drawing. Consequently the layout, form, content and dimensions of the finished construction may differ materially from those shown. Nor do the contents of this drawing constitute a contract, part of any contract, or warranty.

SCHEDULE OF ACCOMMODATION

Abb	House Type	Range	Description	Sqft	No	Total Sqft	Percentage
AFFORDABLE TYPES							
ASH	Ashford	CLASSIC	2 bedroom traditional house	634	15	9510	13
BAM	Bampton	CLASSIC	3 bedroom traditional house	737	12	8844	10
BEA	Beadle	CLASSIC	2 Bedroom LTH bungalow	594	5	2970	4
FCX	Foxton	CLASSIC	1 bedroom elderly apartment	653	2	1306	2
FCX	Foxton Est	CLASSIC	1 bedroom elderly apartment	665	2	1330	2
AFFORDABLE TOTAL					35	21960	31
PRIVATE SALE TYPES							
FCX	Foxton	CLASSIC	1 bedroom elderly apartment	653	2	1306	2
FCX	Foxton Est	CLASSIC	1 bedroom elderly apartment	665	2	1330	2
BEA	Beadle	CLASSIC	2 Bedroom LTH bungalow	594	5	2970	4
ASH	Ashford	CLASSIC	2 bedroom traditional house	634	3	1902	3
BAR	Barwick	CLASSIC	3 bed traditional house	831	10	8310	8
MOR	Morpeth	CLASSIC	3 bed dual aspect house	956	16	15296	14
CHE	Cheadle	CLASSIC	3 bed detached house	939	6	5634	5
DEWS	Dewsbury	CLASSIC	3 bedroom traditional house	795	2	1590	2
HELMS	Helmsley	CLASSIC	4 bed 2.5 storey townhouse	1108	9	9972	8
SCM	Somerton	CLASSIC	4 bed detached house	1159	7	8113	6
THO	Thornbury	CLASSIC	4 bed detached house	1203	2	2406	2
KEN	Kennington	CLASSIC	4 bed detached house	1270	6	7620	5
FAR	Farringdon	CLASSIC	3 bed detached house	1082	2	2164	2
LIN	Lincoln	CLASSIC	4 bed dual aspect corner house	1243	10	12430	8
TOTAL					82	81043	69
GRAND TOTAL					118	103003	100

PHASE 1 SITE GROSS AREA: 13.22 ACRES
NON DEVELOPABLE AREA 7.13 ACRES
NET DEVELOPABLE AREA 6.09 ACRES
DENSITY 17242 Sq.ft/acre

Rev	Description	Date	Drawn	Chk'd

BARRATT HOMES
MANCHESTER

Barratt Homes Manchester
(A division of BDW Trading Ltd)
4 Brindley Road
City Park
Manchester
M16 9HQ
Tel: 0161 872 0161
Fax: 0161 855 2828

Job: CHIPPING LANE LONGRIDGE		
Title: PHASE 1 PLANNING LAYOUT		
Design By: AA	Date: 25/11/15	Drawing Number: 459-PL01
Drawn By: AA	Scale @ A1: 1:500	Rev

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APPENDIX C: FEH CATCHMENT DATA & DESCRIPTIONS

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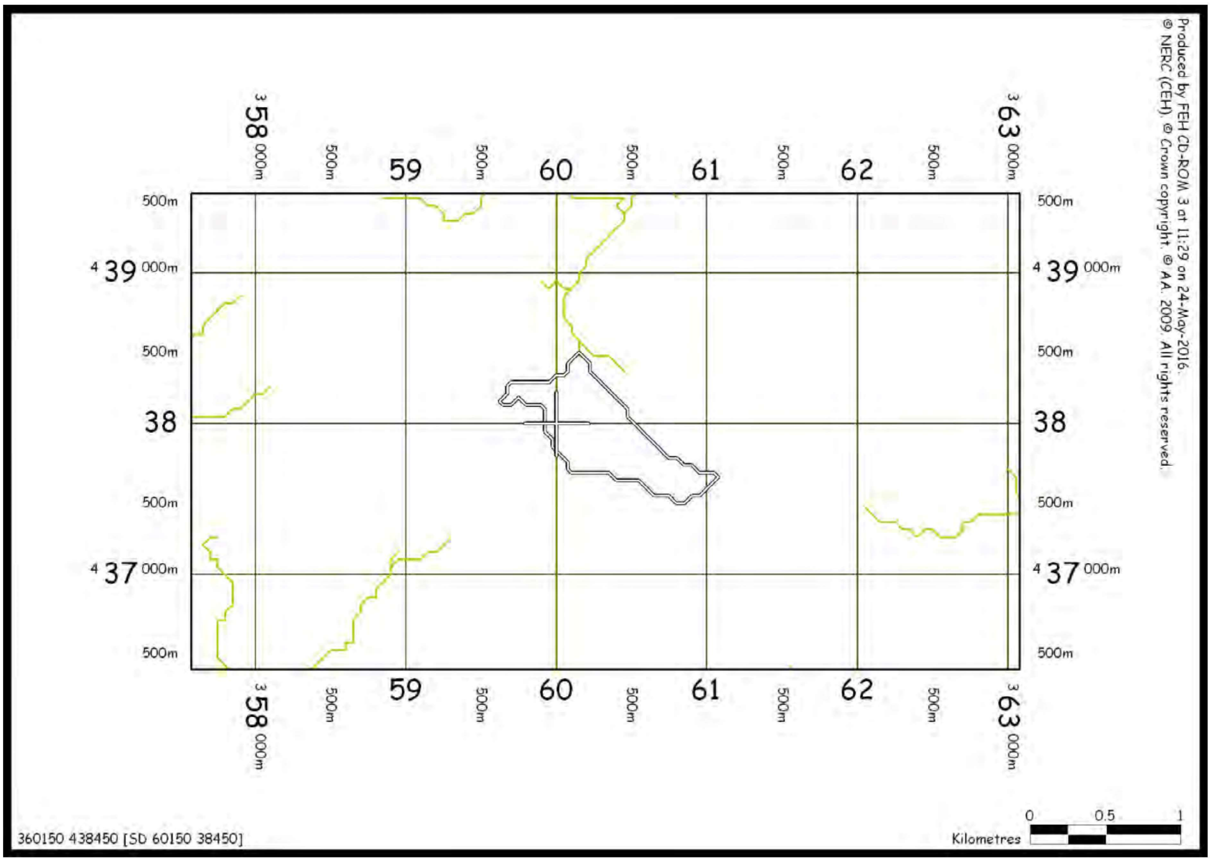
Higgin Brook catchment and catchment characteristics



AREA	0.52	URBLOC1990	1.515
ALTBAR	115	C	-0.025
ASPBAR	325	D1	0.40671
ASPVAR	0.65	D2	0.33211
BFIHOST	0.417	D3	0.41529
DPLBAR	0.77	E	0.29629
DPSBAR	22.3	F	2.45864
FARL	1	C(1 km)	-0.025
LDP	1.58	D1(1 km)	0.404
PROPWET	0.51	D2(1 km)	0.33
RMED-1H	10.5	D3(1 km)	0.417
RMED-1D	39.7	E(1 km)	0.296
RMED-2D	51.6	F(1 km)	2.453
SAAR	1200		
SAAR4170	1137		
SPRHOST	35.03		
URBCONC1990	0.964		
URBEXT1990	0.1643		

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APPENDIX D: REVITALISED FLOOD HYDROGRAPH METHOD OUTPUTS [PEAK FLOW ESTIMATES]

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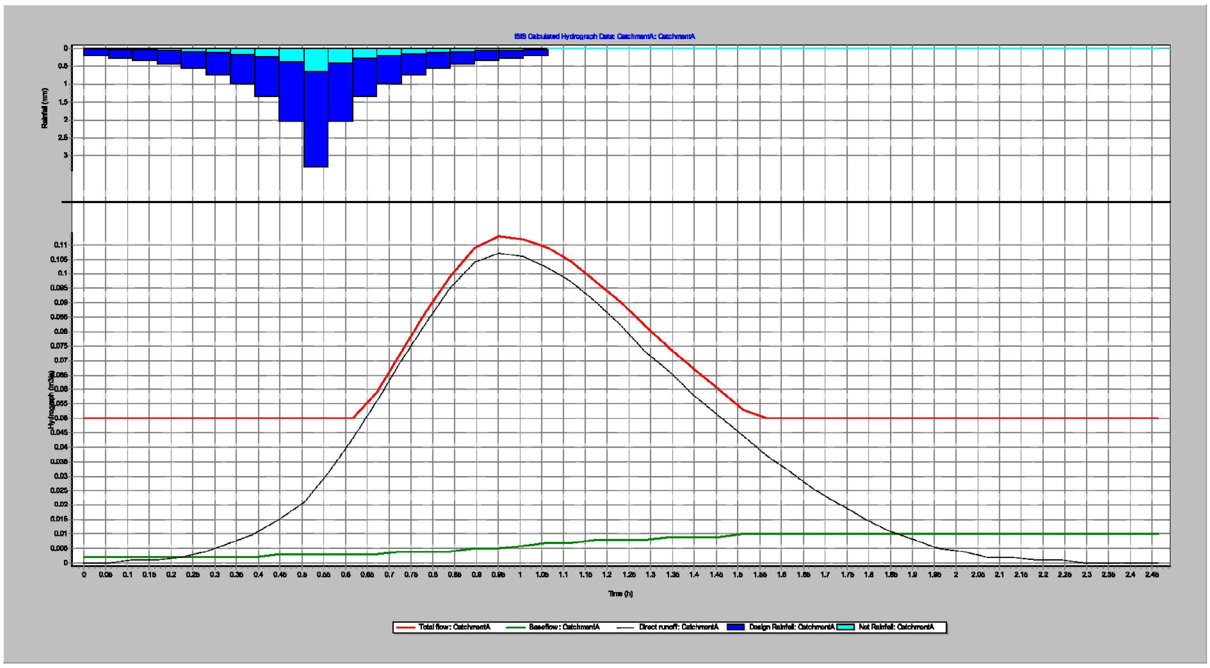

Figure D.1 Sub-catchment A 1 in 5 year (20% AEP) flow hydrograph

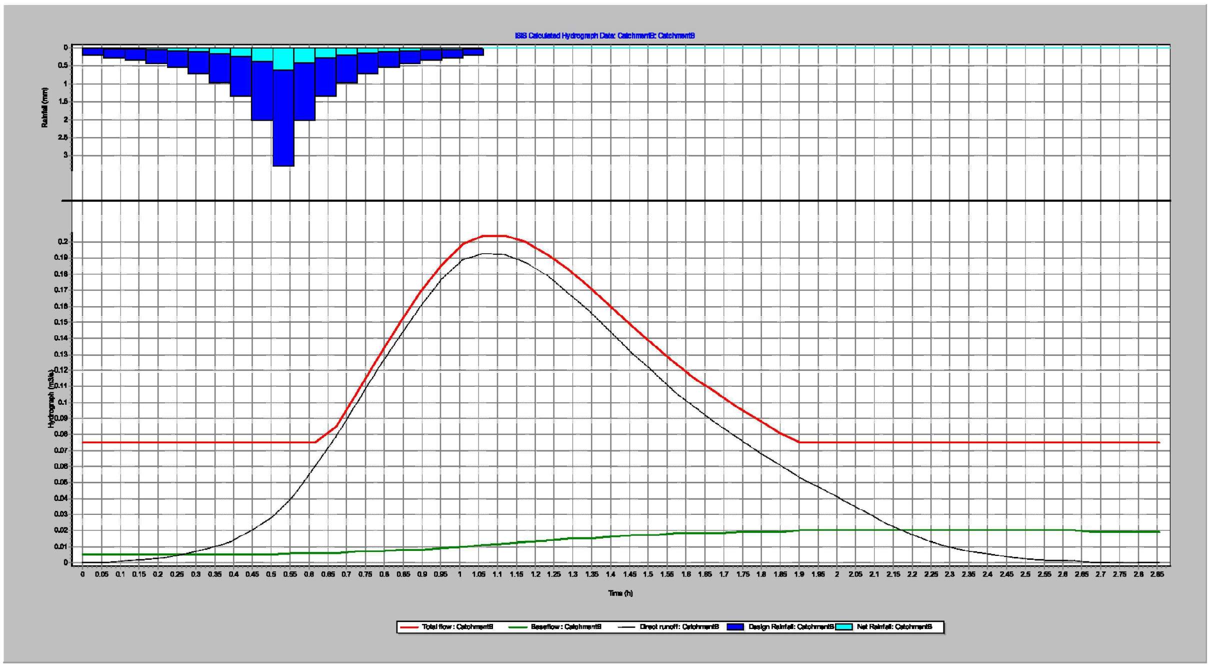

Figure D.2 Sub-catchment B 1 in 5 year (20% AEP) flow hydrograph

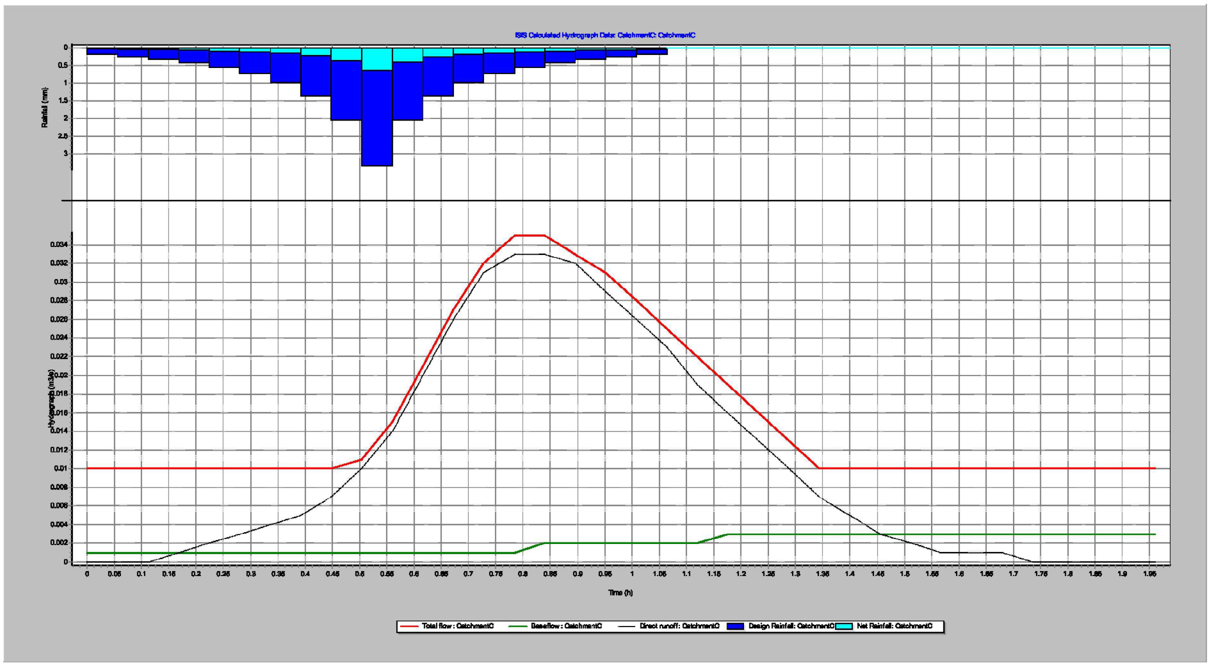

Figure D.3 Sub-catchment C 1 in 5 year (20% AEP) flow hydrograph

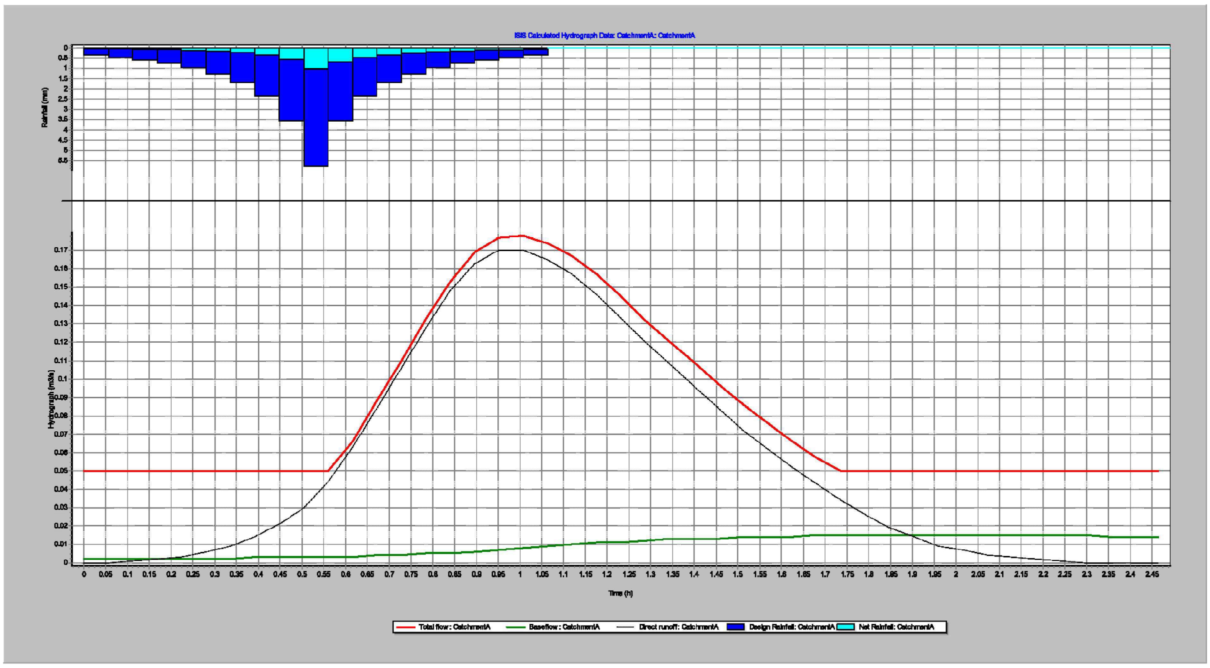

Figure D.4 Sub-catchment A 1 in 30 year (3.3% AEP) flow hydrograph

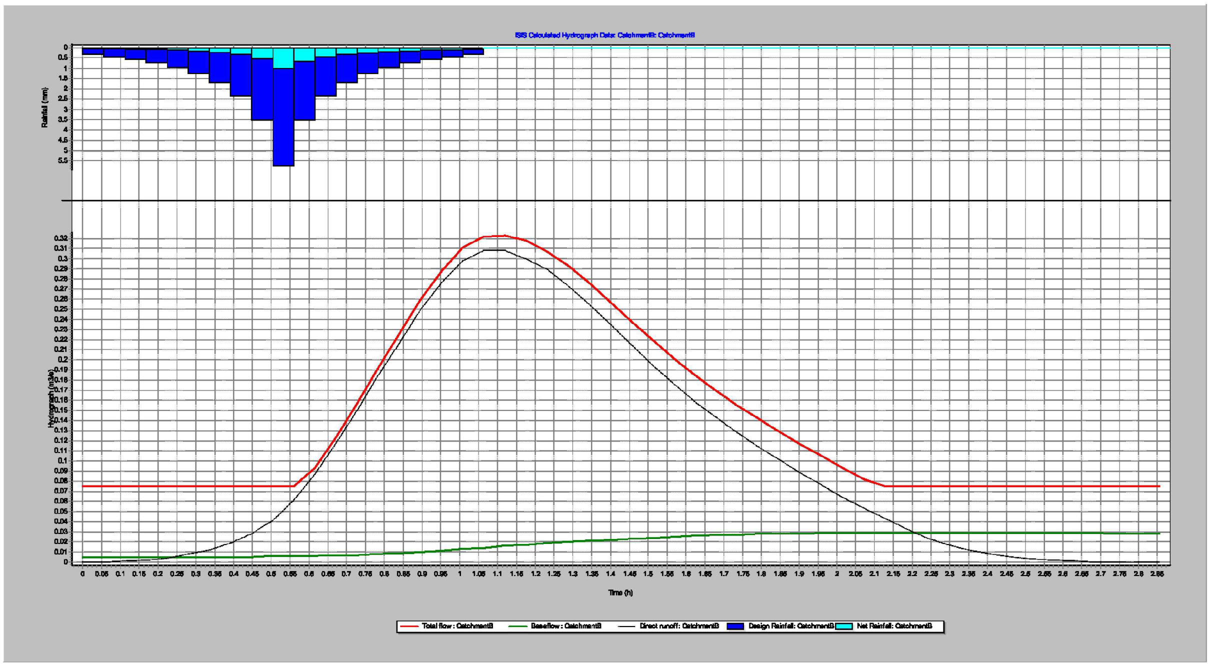

Figure D.5 Sub-catchment B 1 in 30 year (3.3% AEP) flow hydrograph

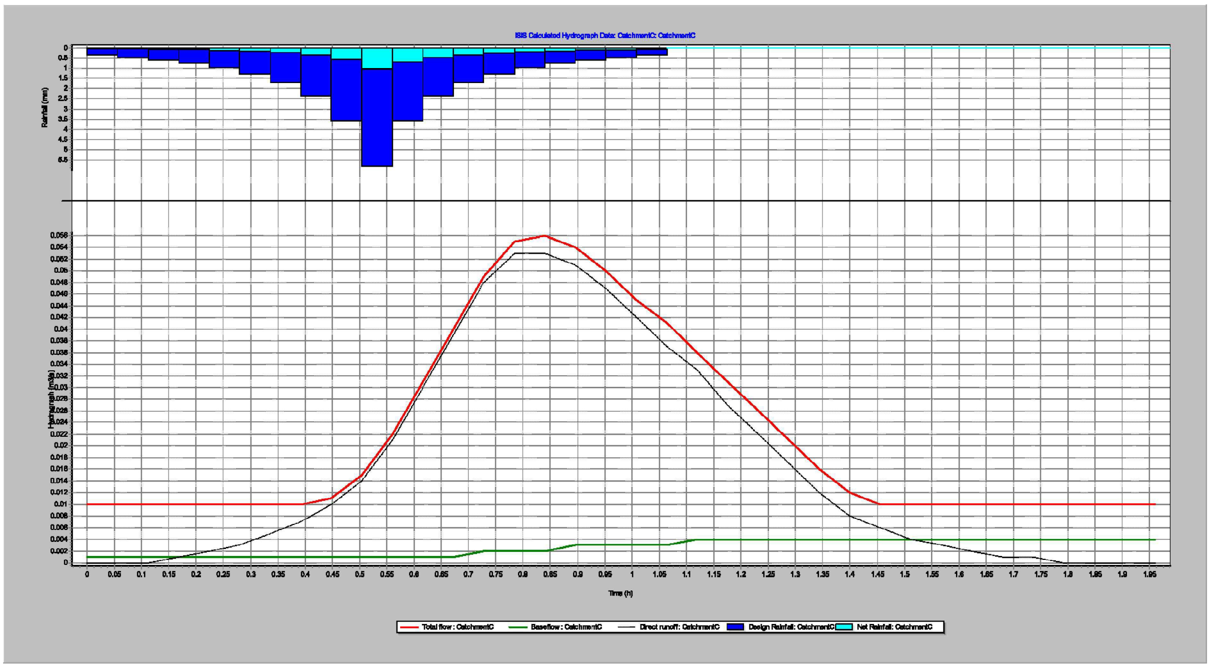

Figure D.6 Sub-catchment C 1 in 30 year (3.3% AEP) flow hydrograph

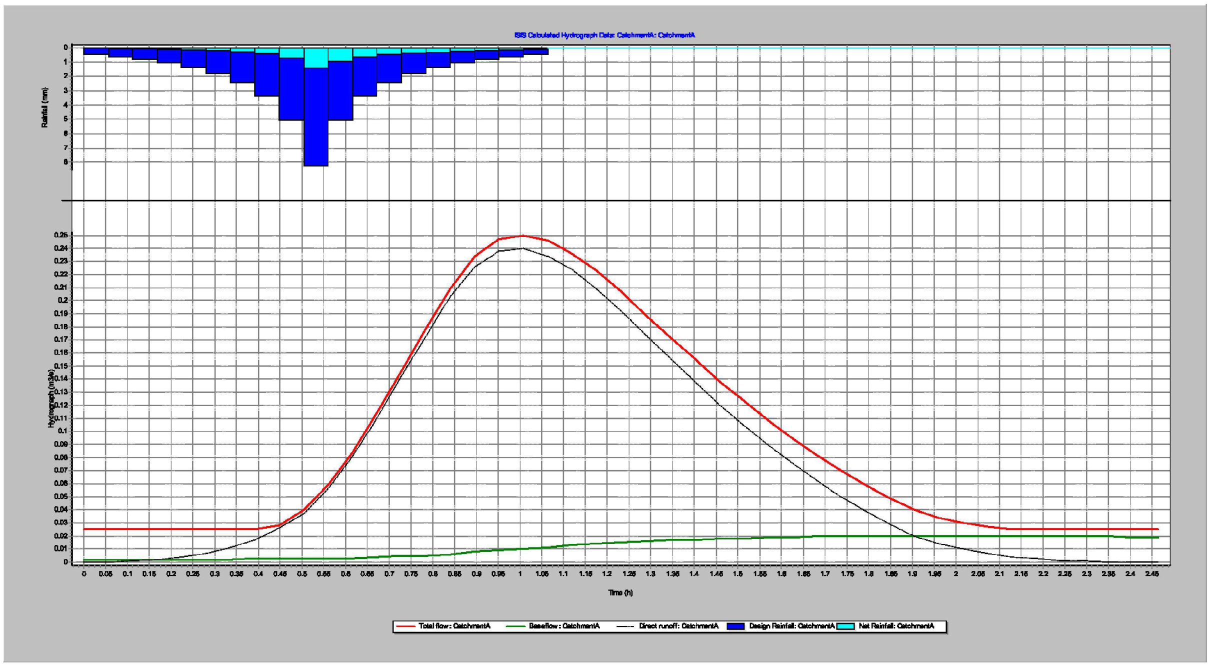

Figure D.7 Sub-catchment A 1 in 100 year (1% AEP) flow hydrograph

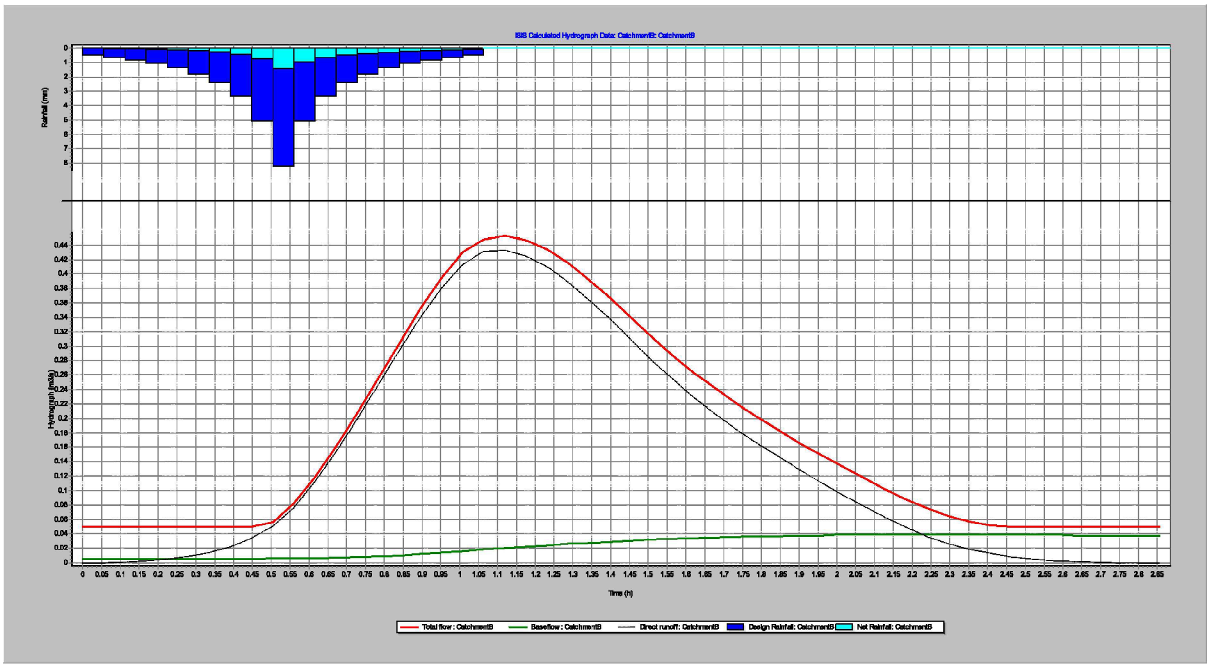

Figure D.8 Sub-catchment B 1 in 100 year (1% AEP) flow hydrograph

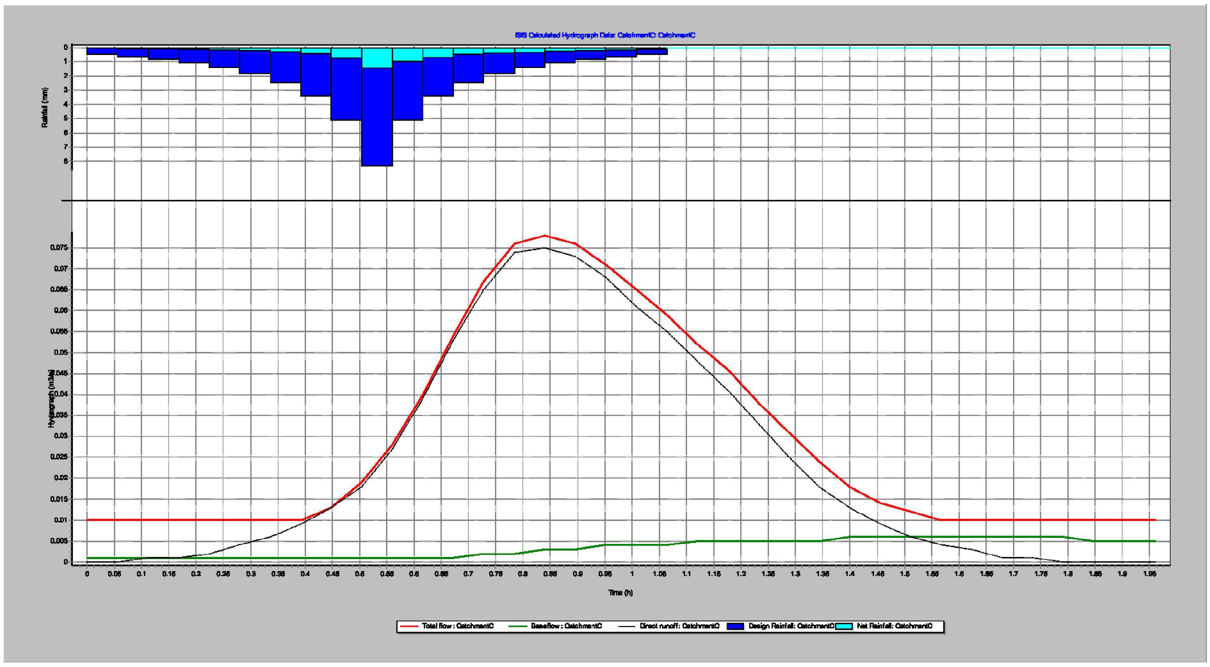

Figure D.9 Sub-catchment C 1 in 100 year (1% AEP) flow hydrograph

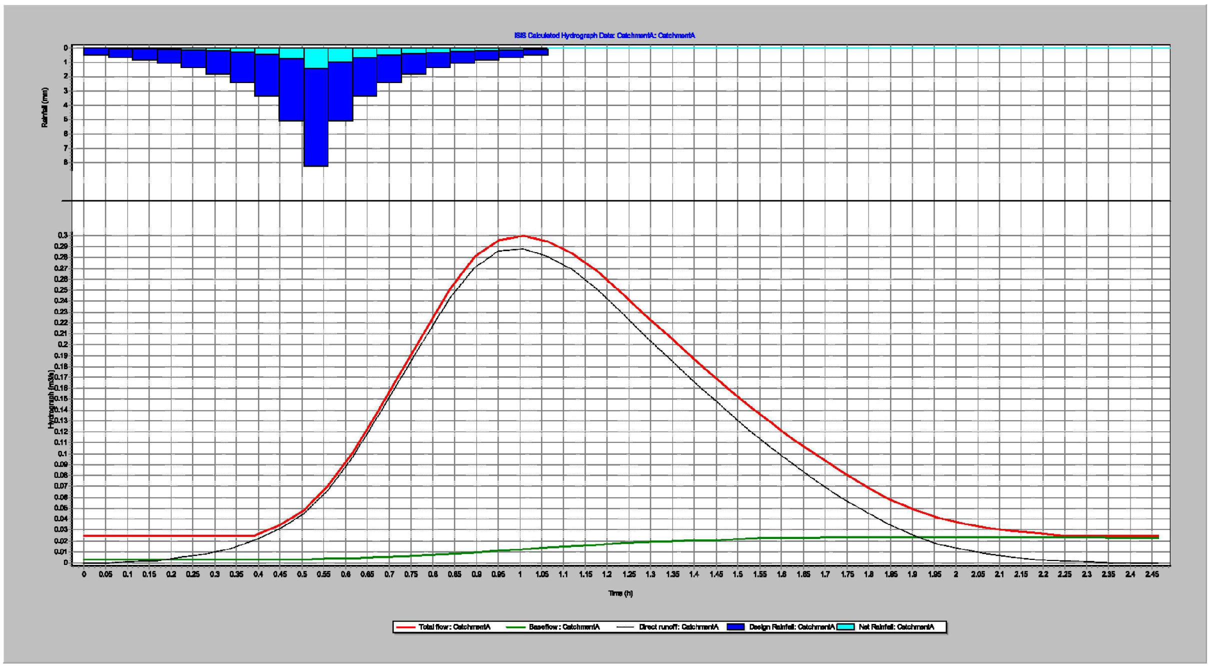

Figure D.9 Sub-catchment A 1 in 100 year (1% AEP) plus climate change flow hydrograph

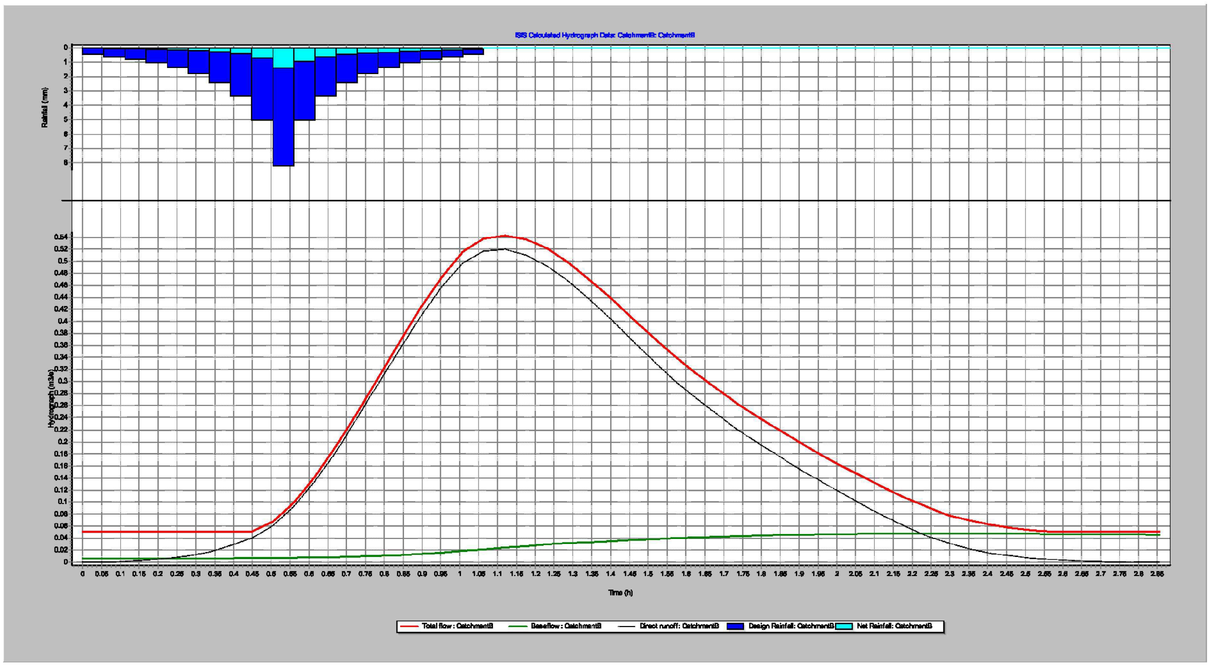

Figure D.9 Sub-catchment B 1 in 100 year (1% AEP) plus climate change flow hydrograph

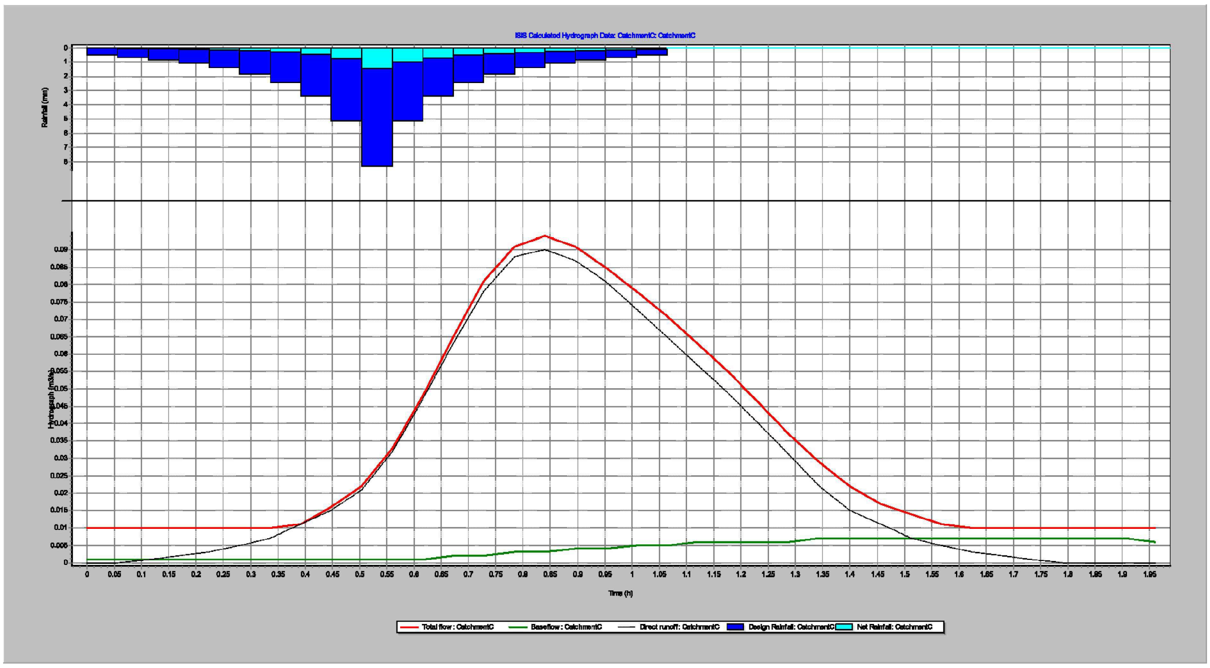

Figure D.10 Sub-catchment C 1 in 100 year (1% AEP) plus climate change flow hydrograph

APPENDIX E: ISIS OUTPUTS: EXISTING SCENARIO SCHEMATIC, LONG-SECTION AND CROSS-SECTIONS

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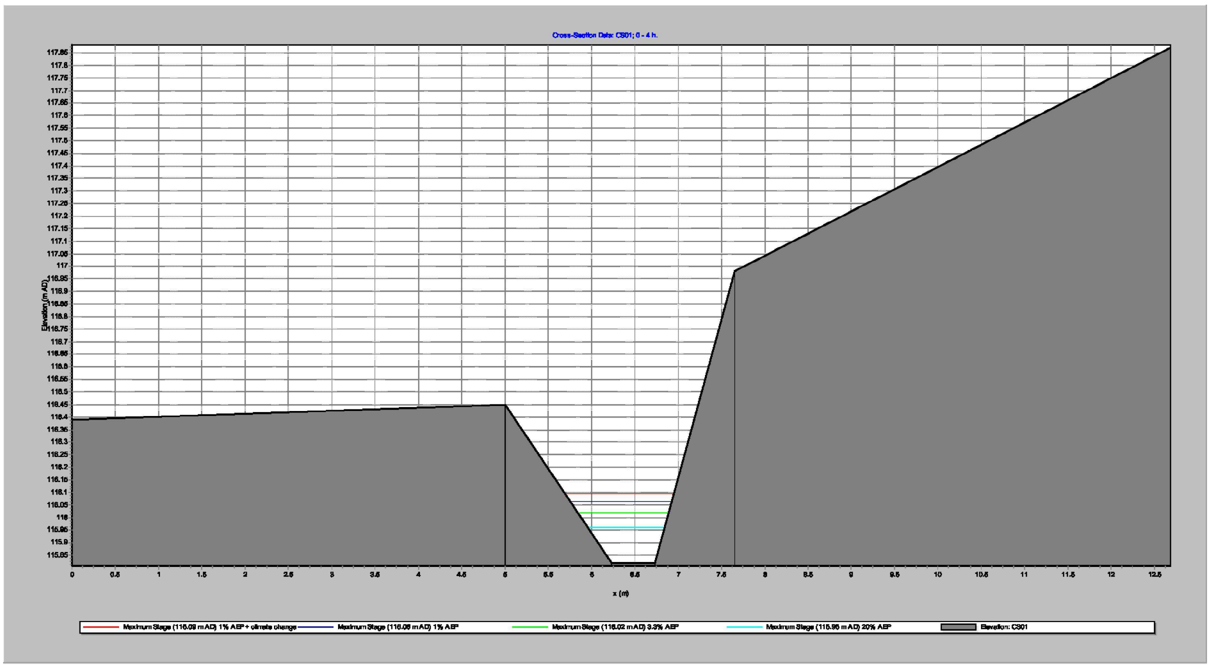

Figure E.1 Peak levels at cross section CS01

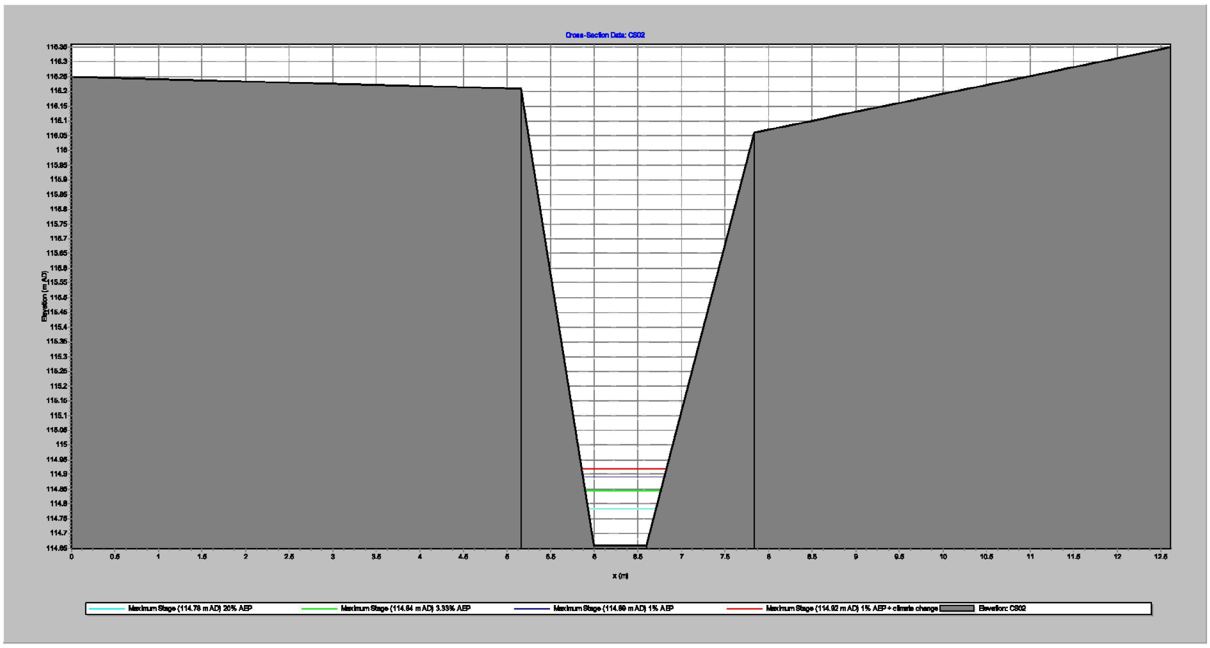

Figure E.2 Peak levels at cross section CS02