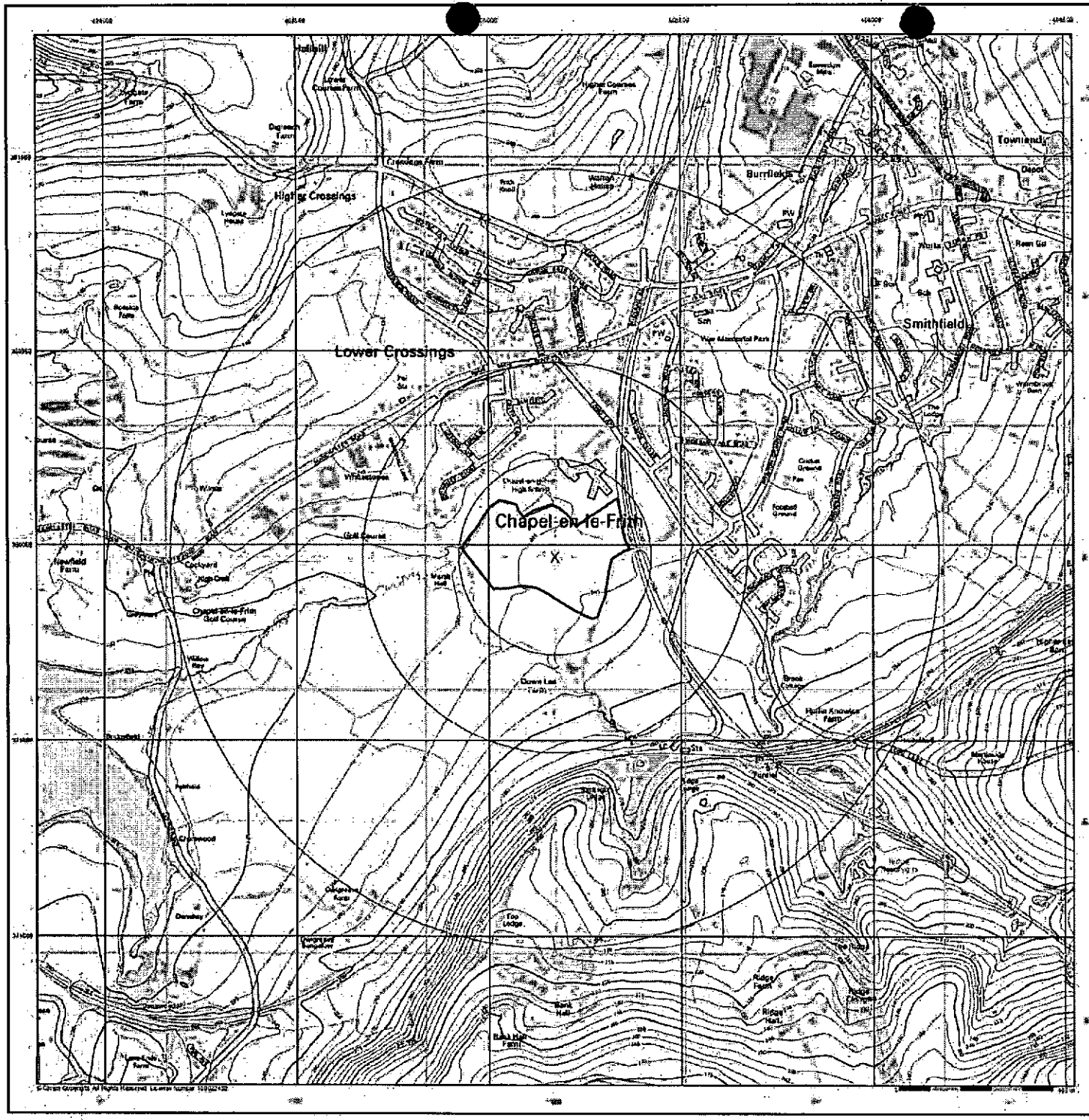


Envirocheck® Flood

EA/NRW Historic Flood Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID

Historic Flood Events Data

- Channel Capacity Exceeded (no raised defences)
- Groundwater/High Water Table
- Local Drainage/Surface Water
- Mechanical Failure
- Obstruction/Blockage - Bridge
- Obstruction/Blockage - Channel
- Obstruction/Blockage - Culvert
- Obstruction/Blockage - Debris Screen
- Operational Failure/ Breach of Defence
- Other
- Overtopping of Defences
- Unknown
- Historical Flood Liabilities

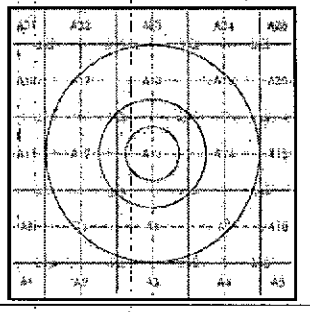
Contours (height in metres)

Standard Contour — Master Contour — Spot Height

Mean Low Water

Mean High Water

EA/NRW Historic Flood Map - Slice A



Order Details

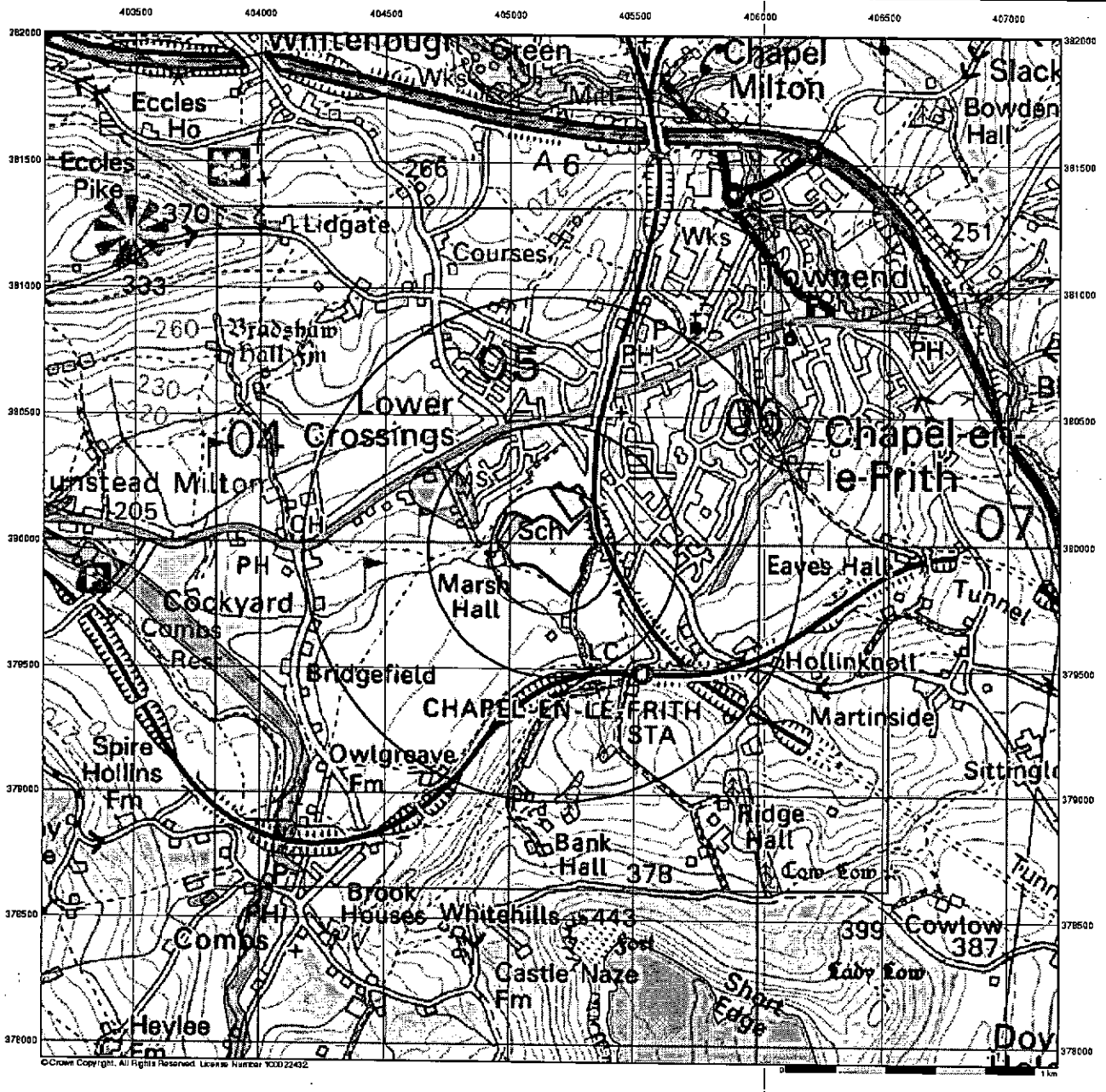
Order Number:	62553750_1_1
Customer Ref:	w1738-141201
National Grid Reference:	405170, 379970
Slice:	A
Site Area (Ha):	0.01
Search Buffer (m):	1000

Site Details

Site at 405190, 379980

Landmark®

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Envirocheck® Flood

BGS Flood Data (1:50,000)

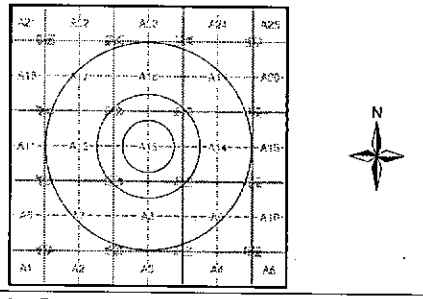
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

BGS Geological Indicators of Flooding

- Coastal
- Inland
- Bodies of Water

BGS Flood Data Map - Slice A



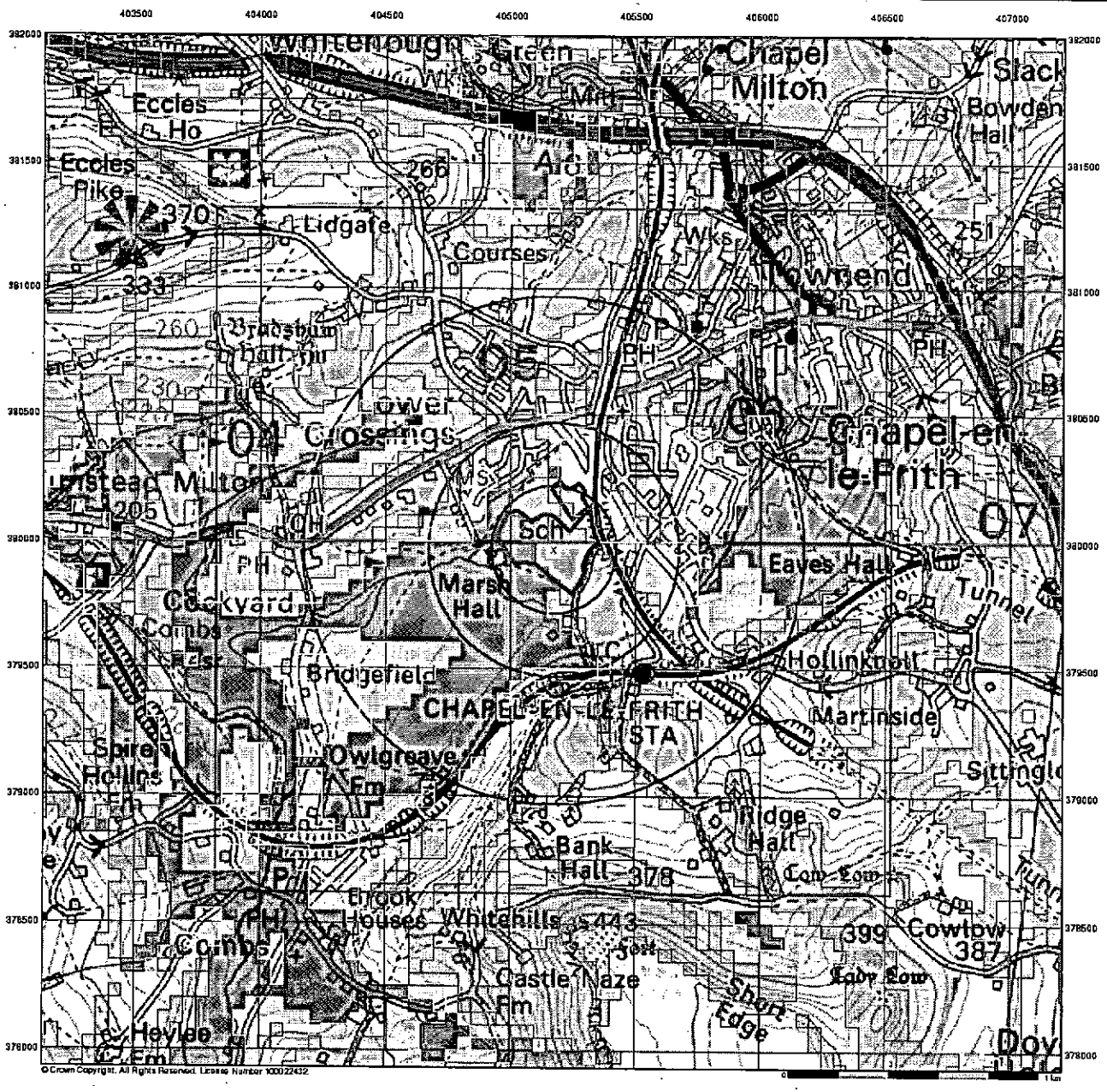
Order Details

Order Number:	62553750_1_1
Customer Ref:	w1738-141201
National Grid Reference:	405170, 379970
Slice:	A
Site Area (Ha):	0.01
Search Buffer (m):	1000

Site Details

Site at 405190, 379980

Landmark Information Group
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



Envirocheck® Flood

BGS Flood Data (1:50,000)

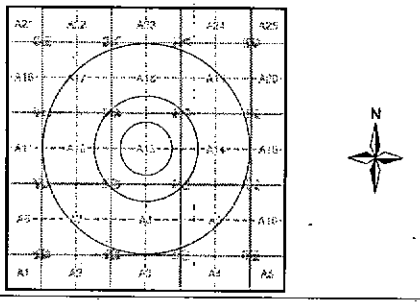
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

BGS Groundwater Flooding Susceptibility

- Potential for Groundwater Flooding to Occur at Surface
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Limited Potential for Groundwater Flooding to Occur

BGS Flood Data Map - Slice A

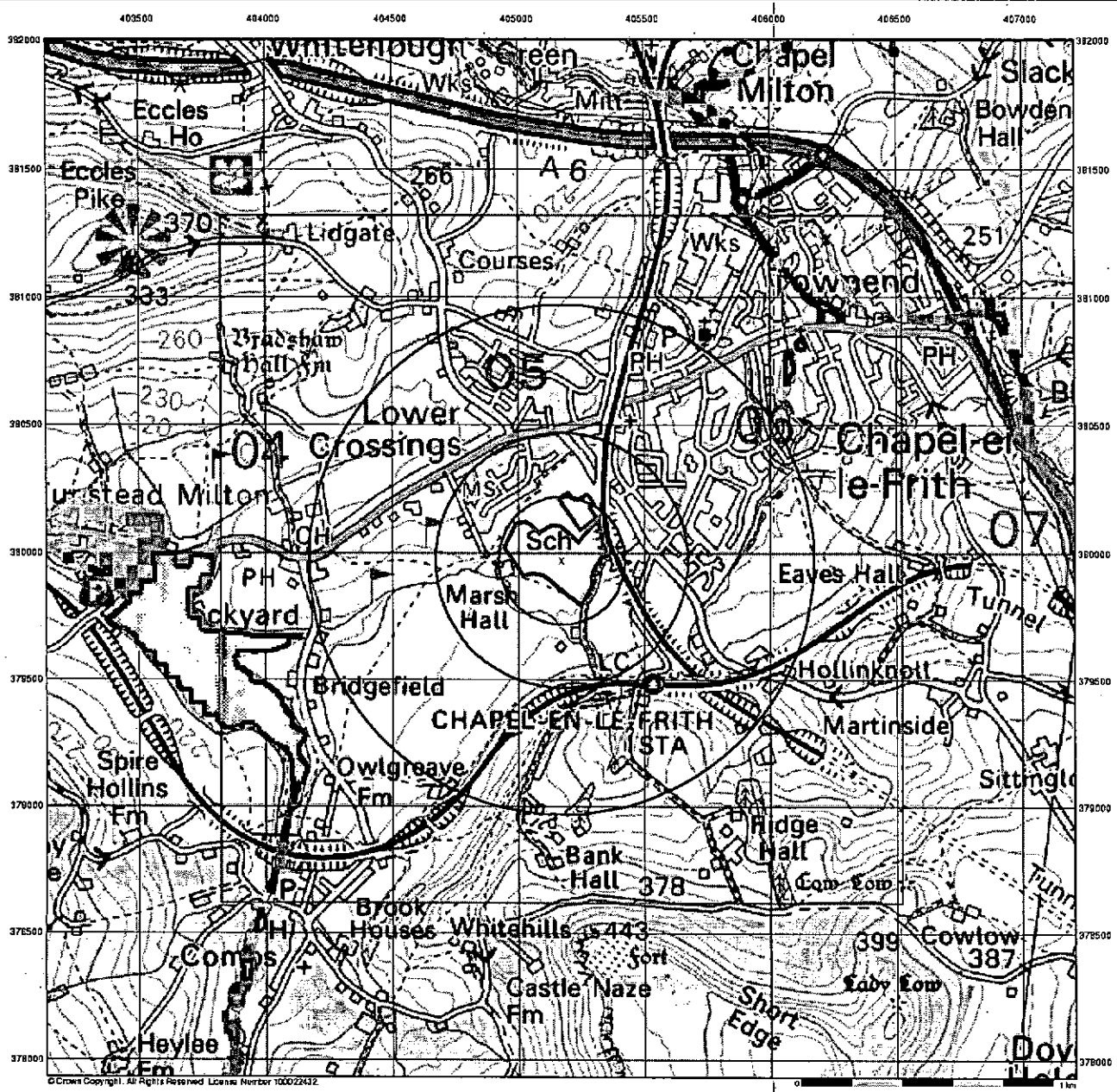


Order Details

Order Number:	62553750_1_1
Customer Ref:	w1738-141201
National Grid Reference:	405170, 379970
Slice:	A
Site Area (Ha):	0.01
Search Buffer (m):	1000

Site Details

Site at 405190, 379980



Envirocheck® Flood

EA/NRW RoFRS Data (1:50,000)

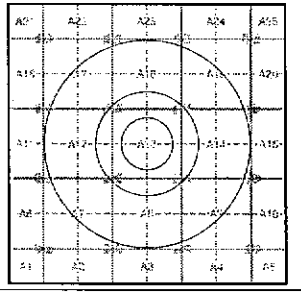
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

Risk of Flooding from Rivers and Sea (RoFRS)

- High Risk
- Medium Risk
- Low Risk
- Very Low Risk

EA/NRW RoFRS Data Map - Slice A



Order Details

Order Number:	62553750_1_1
Customer Ref:	w1738-141201
National Grid Reference:	405170, 379970
Slice:	A
Site Area (Ha):	0.01
Search Buffer (m):	1000

Site Details

Site at 405190, 379980

Landmark Information Group

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Appendix F – United Utilities Sewer Plans and Correspondence

United Utilities

United Utilites Water PLC
Property Searches
Ground Floor Grasmere House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP
DX 715568 Warrington
Telephone 0870 751 0101
Fax Number 0870 7510102
Property.searches@uuplc.co.uk

Waterco Ltd

Eden Court
Lon Parcwr Business Park
Ruthin
LL15 1NJ

Your Ref: W1738-141124
Our Ref: 14/ 1068547
Date: 26/11/2014

FAO:

Dear Sirs

Location: X405132 Y379973

I acknowledge with thanks your request dated 24/11/14 for information on the location of our services.

Please find enclosed plans showing the approximate position of our apparatus known to be in the vicinity of this site.
I attach General Condition Information sheets, which details contact numbers for additional services (i.e. new supplies, connections, diversions) which we are unable to deal with at this office. In addition you should ensure they are made available to anyone carrying out any works which may affect our apparatus.

I trust the above meets with you requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please telephone us on 0870 7510101.

[redacted]
Sue McManus
Operations Manager
Property Searches

United Utilities

TERMS AND CONDITIONS - WASTERWATER & WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self construction of water mains) (UUW apparatus) of United Utilities Water PLC ("UUW").

TERMS AND CONDITIONS:

1. This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.

2. This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.

3. In particular, the position and depth of any UUW apparatus shown on the Map are approximate only. UUW strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUW apparatus. The exact location, positions and depths should be obtained by excavation trial holes.

4. The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.

5. The position and depth of UUW apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.

6. This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUW apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.

7. No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUW apparatus by reason of the actual position and/or depths of UUW apparatus being different from those shown on the Map and any information supplied with it.

United Utilities

WASTE WATER SYMBOLOGY

Foul	Surface	Combined	Overflow	
				Manhole
				Manhole, Side Entry
				MainSewer, Public
				MainSewer, Private
				MainSewer, S104
				Rising Main, Public
				Rising Main, Private
				Rising Main, S104
				Highway Drain, Private

Overflow	
	Sludge Main, Public
	Sludge Main, Private
	Sludge Main, S104

Abandoned Pipe

- MainSewer
- Rising Main
- Highway Drain
- Sludge Main

Foul	Surface	Combined	
ST		ST	Septic Tank
			Vent Column
			Network Storage Tank
			Orifice Plate
			Vortex Chamber
			Penstock Chamber
			Blind Manhole

Foul	Surface	Combined	
			WW Site Termination
			Air Valve
			Cascade
			Non Return Valve
			Extent of Survey
			Flow Meter
			Gulley
			Hatch Box
			Head of System
			Hydrobrake / Vortex
			Inlet
			Inspection Chamber
			Bifurcation
			Catchpit
			WW Pumping Station

Foul	Surface	Combined	
			Sludge Pumping Station
			Sewer Overflow
			T Junction/Saddle
			LampHole
			OilInterceptor
			PenStock
			Pump
			RoddingEye
			Soakaway
			Summit
			Valve
			Valve Chamber
			Washout Chamber
			DropShaft
			WW Treatment Works

Foul	Surface	Combined	Overflow	
				Screen Chamber
				Discharge Point
				Outfall

- Control Kiosk
- Unspecified

Legend

MANHOLE FUNCTION		SEWER SHAPE			
FO	Foul	CI	Circular	TR	Trapezoidal
SW	Surface Water	EG	Egg	AR	Arch
CO	Combined	OV	Oval	BA	Barrel
OV	Overflow	FT	Flat Top	HO	HorseShoe
		RE	Rectangular	UN	Unspecified
		SQ	Square		

SEWER MATERIAL			
AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	VC	Vitrified Clay
CO	Concrete	PP	Polypropylene
CSB	Concrete Segment	PF	Pitched Fibre
CSU	Concrete Segment	MA	Masonry, Coursed
CC	Concrete Box Culverted	MA	Masonry, Random
PSC	Plastic/ Steel	RP	Reinforced Plastic
GR	Glass Reinforced	CI	Cast Iron
GRP	Glass Reinforced	SI	Spun Iron
PVC	Polyvinyl Chloride	ST	Steel
PE	Polyethylene	U	Unspecified

CLEAN WATER SYMBOLOGY

PIPE WORK

Live	Proposed	
		Trunk Main - PressurisedMain
		Raw Water Aqueduct - PressurisedMain
		Raw Water Aqueduct - GravityMain
		LDTM Raw Water Distribution - PressurisedMain
		LDTM Raw Water Distribution - GravityMain
		LDTM Treated Water Distribution - PressurisedMain
		LDTM Treated Water Distribution - GravityMain
		Private Pipe - LateralLine
		Distribution Main - PressurisedMain
		Comms Pipe - LateralLine
		Concessionary Service - LateralLine

ABANDONED PIPE

- Trunk Main
- Raw Water Aqueduct
- LDTM Raw Water Distribution
- LDTM Treated Water Distribution
- Private Pipe
- Distribution Main
- Comms Pipe
- Concessionary Service

NODES/FURNITURES

Live	Proposed	
		End Cap
		CC Valve
		AC Valve
		Air Valve
		Sluice Valve
		Non Return Valve
		Pressure Management Valve
		Change of Characterstic
		Anode
		Chlorination Point
		De Chlorination Point
		Bore Hole
		Inlet Point
		Bulk Supply Point
		Fire Hydrant
		Hydrant

Live	Proposed	
		Private Fire Hydrant
		Pump
		Site Termination
		Service Start
		Service End
		Process Meter
		Stop Tap
		Monitor Location
		Strainer Point
		Access Point
		Hatch Box
		IP Point
		Route Marker
		Sampling Station
		Logger Box

PROPERTY TYPES

Live	Proposed	
		Condition Report
		Pipe Bridges
		Tunnels (non carrier)
		Pumping Station
		Water Treatment Works
		Private Treatment Works

Live	Proposed	
		Valve House
		Water Tower
		Service Reservoir
		Supply Reservoir
		Abstraction Point
		Domestic meter
		Commercial meter
		Telemetry Outstation

Legend

MATERIAL TYPES		LINING TYPES	
AC	ASBESTOS CEMENT	CL	CEMENT LINING
CI	CAST IRON	TB	TAR OR BITUMEN
CU	COPPER	EPL	EPOXY RESIN
CO	CONCRETE		
DI	DUCTILE IRON	INSERTION TYPES	
GI	GALVANISED IRON		
GR	GREY IRON	DD	DIE DRAWN
OT	OTHERS	DR	DIRECTIONAL DRILLING
PB	LEAD	MO	MOLING
PV	UPVC	PI	PIPELINE
SI	SPUN IRON	SL	SLIP LINED
ST	STEEL		
UN	UNKNOWN		
PE	POLYETHYLENE		

Conditions and Information regarding wastewater network

These general conditions and precautions apply to the wastewater network of United Utilities

Please ensure that a copy of these conditions is passed to your representative and contractor on site.

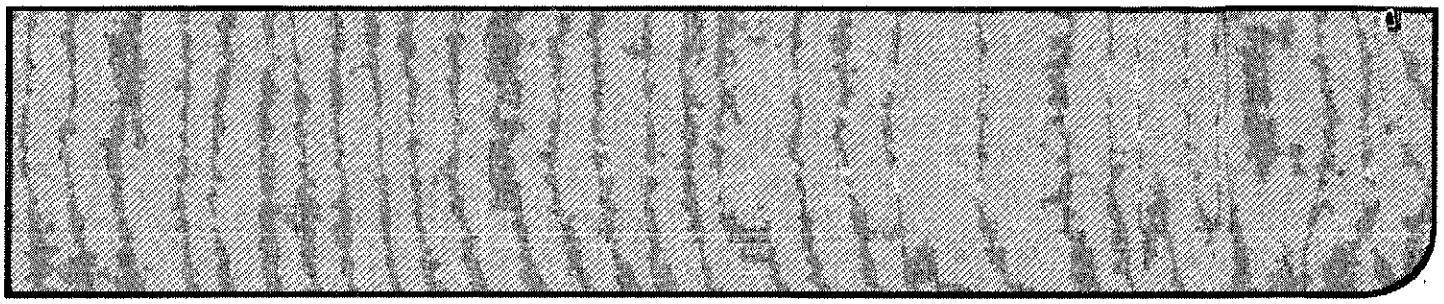
1 United Utilities provides the approximate locations of its sewers according to its records. These records are not necessarily accurate or complete nor do they normally show the positions of every sewer culvert or drain, private connections from properties to the public sewers or the particulars of any private system. No person or company shall be relieved from liability for any damage caused by reason of the actual positions and/or depths being different from those indicated. The records do indicate the position of the nearest known public sewer from which the likely length of private connections can be estimated together with the need for any off site drainage rights or easements.

2 Special requirements relative to our sewers may be indicated. United Utilities employees or its contractors will visit any site at reasonable notice to assist in the location of its underground sewers and advise any precautions that may be required to obviate any damage. To arrange a visit or for further information regarding new supplies, connections, diversions, costing, or any notification required under these General Conditions, please call us on **0845 746 2200**.

1 Where public sewers are within a site which is to be developed and do not take any drainage from outside the area, they are from an operational viewpoint redundant. The developer must identify all redundant sewers affected by the development and apply to United Utilities in writing for these sewers to be formally closed. The developer shall bear all related costs of the physical abandonment work.

2 Public sewers within the site that are still live outside the area will be subject to a "Restricted Building zone". This would normally be a surface area equivalent to the depth of the sewer measured from the centre line of the sewer on either side. No construction will be permitted within that zone. The developer should also note that deep and wide rooted trees must not be planted in close proximity to live sewers. Access to public sewers must be maintained at all times and no interference to manholes will be permitted during construction work.

1. Where there is a public sewer along the line of a proposed development/building, arrangements shall be made by the developer at his cost to divert the sewer around the development. Where this is not possible and as a last resort, a "Building Over Agreement" will need to be completed under section 18 of the Building Act 1984. The developer shall design building foundations to ensure that no additional loading is transferred to the sewer and submit such details both to the Local Authority's Building Control Officer and to United Utilities for approval/acceptance. United Utilities on a rechargeable basis would normally undertake all aspects of design work associated with the diversion of any part of the operational wastewater network. For further advice please email wastewaterdeveloperservices@uuplc.co.uk
2. Where there is a non-main river watercourse/culvert passing through the site, the landowner has the responsibility of a riparian owner for the watercourse/culvert and is responsible for the maintenance of the fabric of the culvert and for all works involved in maintaining the unrestricted flow through it. Building over the watercourse/culvert is not recommended. The developer must contact the local authority before any works are carried out on the watercourse/culvert. Where it is necessary to discharge surface water from the site into the watercourse/culvert the developer shall make an assessment of the available capacity of the watercourse/culvert (based on a 1 in 50 year event) and ensure that the additional flow to be discharged into the watercourse/culvert will not cause any flooding. In appropriate cases, flooding may be prevented by on-site storage. The developer shall submit the relevant details required to substantiate his development proposals. Details of any outfall proposed shall also be submitted to the Environment Agency, PO Box 12, Richard Fairclough House, Knutsford Road, Warrington, Cheshire, WA4 1HT for their approval.
3. Where there is a main river watercourse/culvert passing through the site, the developer shall submit all proposals affecting the river to the Environment Agency at the address stated in paragraph 6 for approval/acceptance.



8. Your attention is drawn also to the following:

- **Private drains or sewers which may be within the site.**

On 1 October 2011 all privately owned sewers and lateral drains which communicate with (that is drain to) an existing public sewer as at 1 July 2011 will become the responsibility of the sewerage undertaker. This includes private sewers upstream of pumping stations that have yet to transfer, but excludes lengths of sewer or drain that are the subject of an on-going appeal or which have been excluded from transfer as a result of an appeal or which are on or under land opted-out by a Crown body. The transfer specifically excludes sewers and lateral drains owned by a railway undertaker. Sewers upstream of such assets, however, are transferred. Such assets may not be recorded on the public sewer record currently as it was not a requirement to keep records of previously private sewers and drains.

- **Applications to make connections to the public sewer.**

The developer must write to United Utilities requesting an application form that must be duly completed and returned. No works on the public sewer shall be carried out until a letter of consent is received from United Utilities.

- **Sewers for adoption.** If an agreement for the adoption of sewers under Section 104 of the Water Industry Act 1991 is being contemplated, a submission in accordance with "Sewers for Adoption", Seventh Edition, published by the Water Research Centre (2001) Plc, Henley Road, Medmenham, PO Box 16, Marlow, Buckinghamshire, SL7 2HD will be required, taking into consideration any departures from the general guide stipulated by United Utilities.

Further consultation with United Utilities.

Developers wishing to seek advice or clarification regarding sewer record information provided should contact United Utilities to arrange an appointment. A consultation fee may be charged, details of which will be made available at the time of making an appointment.

9. Combined sewers, foul sewers, surface water sewers, and pumped mains. These are shown separately in a range of colours or markings to distinguish them on our drawings, which are extracts from the statutory regional sewer map. A legend and key is provided on each extract for general use, although not all types of sewer will be shown on every extract.

Combined sewers shown coloured red carries both surface water and foul sewage, especially in areas where there is no separate surface water sewerage system.

Foul sewers coloured brown may also carry surface water and there may be no separate surface water system indicated in the immediate area. Both combined and foul sewers carry wastewater to our treatment works before it can safely be returned to the environment.

Surface water sewers coloured blue on our drawings are intended only to carry uncontaminated surface water (e.g. rainfall from roofs, etc) and they usually discharge into local watercourses. It is important for the protection of the environment and water quality that only uncontaminated surface water is connected to the surface water sewers. Improper connections to surface water sewers from sink wastes, washing machines and other domestic use of water can cause significant pollution of watercourses.

Pumped mains, rising mains and sludge mains will all be subject to pumping pressures and are neither suitable nor available for making new connections.

Highway drains, when included, show as blue and black dashed lines. Highway drains are not assets belonging to United Utilities and are the responsibility of local authorities.

1. For information regarding future proposals for construction of company apparatus please write to United Utilities, PO Box 453, Warrington, WA5 3QN.
2. For information regarding easements, deeds, grants or wayleaves please write to United Utilities Property Solutions, Coniston Buildings, Lingley Mere Business Park, Lingley Green Avenue, Great Sankey, Warrington, WA5 3UU **(Tel: 01925 731 365**

Extract from Map of Public Sewers

The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available.

The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded.

United Utilities will not accept any liability for any damage caused by the actual positions being different from those shown.

LEGEND

Water Course
Overflow Pipe
Sludge Main
Highway Drain

Combined	Surface Water	Foul	Abandoned	
				Public Sewer
				Private Sewer
				Section 104
				Rising Main

X405132 Y379973

Printed By : Angela Gall

Date: 26/11/2014

DO NOT SCALE

Approximate Scale: 1:5000

United Utilities

helping life flow smoothly

Appendix G – Surface Water Runoff Calculations

waterco consultants	Eden Court, Lon Parcwr, Ruthin, 01824 702220	Calculations	ref **w1738**

Client :	S Robinson Developments	no of pages attached: 1 of 14	
Scheme :	Land at Long Lane, Chapel-en-le-Frith	prefix	revision
Section :	Surface Water Runoff	SWR	A

prepared by: Jordan Jones date: 28/11/2014

checked by: Angharad Llewelyn date: 05/12/2014

approved by: Aled Williams date: 05/12/2014

Comparison of pre-development and post-development runoff rates and volumes for greenfield or brownfield sites up to 200 Ha

Site description
Proposed development of land at Long Lane, Chapel-en-le-Frith, High Peak, Derbyshire, SK23 0TA. Development includes the erection of up to 250 residential units with associated access roads, driveways and landscaping. see page SWR14.
National Grid Reference (centre of site) approx. 405185E 379978N

Design Brief
To calculate both pre and post development rainfall runoff in accordance with the Interim Code of Practice for Sustainable Drainage Systems. The peak run-off rates are to be estimated for return periods of up to 100 years and the runoff volumes are also to be calculated for a 1 in 100 year event of 6 hour duration. An allowance for climate change should be included only in the case of the post-development runoff calculation.

Documents Referenced
1. Interim Code of Practice for Sustainable Drainage Systems (ICP-SUDS)(July 2004)
2. I o H Report 124 - Flood Estimation for Small Catchments (Marshall & Bayliss, 1994)
3. FSSR 16 runoff model - Fixed Percentage Runoff Method
4. Wallingford Procedure 1981
5. CIRIA C697 - The SUDS Manual (Feb 2007)

Basis of estimates
The Interim Code of Practice for Sustainable Drainage Systems (July 2004)[1] recommends the use of I o H 124[2] for calculating peak greenfield runoff rates for sites up to 200 Ha. For site less than 50 Ha, the runoff should be calculated for 50 Ha and adjusted in proportion for the actual area. For sites greater than 200 Ha, the FEH runoff model should be used. CIRIA C697[5] recommends the use of the FSSR 16[3] runoff method for calculating the runoff volume for greenfield sites.

For brownfield sites with a recognised drainage system, the Rational Method[4] has been used to calculate the runoff for the impermeable portions of the catchment (pre- & post development). For sites without a proper drainage system, the pre-development runoff is calclulated as for a greenfield site, assuming soil type 5, regardless of type indicated on mapping.

In accordance with National Planning Policy Framework (NPPF) and assuming a 100yr projection, a 30% on peak rainfall intensity increase in rainfall / runoff has been included to allow for the climate change anticipated in the years 2085 - 2115.

Rainfall data is taken from maps in Defra / EA Tech Report W5-074/A Rev D (see page SWR10 & 11).

Standard Average Annual Rainfall and Soil classification from maps in FSR Report (see page SWR8 & 9).

N.B. These calculations are for planning purposes only and will need to be reviewed at the detailed design stage.

waterco consultants	Eden Court, Lon Parcwr, Ruthin, 01824 702220	Calculations	ref : w1738
			prefix - page no. SWR2
Scheme :	Land at Long Lane, Chapel-en-le-Frith		dated :
Section :	Surface Water Runoff		28/11/2014

Basis of calculations

Peak run-off rate based on combination of IOH 124 method & Rational method

Run-off volume based on combination of FSSR 16 method & Rational method

N.B. Rational method used for impervious portion of total area for both pre and post development, allowing for pre-development of site where appropriate.

Catchment Details - input data

Proportions of soil type (from maps)

Prop S1	(fraction)		(x 0.15)
Prop S2	(fraction)		(x 0.30)
Prop S3	(fraction)		(x 0.40)
Prop S4	(fraction)		(x 0.45)
Prop S5	(fraction)	1.000	(x 0.50)
Total fraction		1.000	OK - total = 1
Calculated value of SOIL		0.500	
Calculated value of SPR		53.000	

SOIL = (0.15S1+0.3S2+0.4S3+0.45S4+0.5S5) / (S1+S2+S3+S4+S5)
SPR = 10S1 + 30S2 + 37S3 + 47S4 + 53S5

Region number		10	Select from list
AREA	(Ha)	8.0000	(1Ha =0.01Km^2)
SOIL	(fraction)	0.500	Calculated above
SAAR	(mm)	1150	From FSR maps
CWI		124	From FSR graph
M5-60 rainfall (mm)		20.00	From Defra / EA maps
Ratio M5-60/M5-2d		0.30	From Defra / EA maps
M100-6hr rainfall (mm)		70.00	From Defra / EA maps
Storm duration (min)		15	**(To give peak run-off-15 min for small site)**
PIMP Pre-develop (%)		0.00	Provided by client
PIMP Post-develop (%)		40.00	Assumed
Pre-dev drain system?		N/A	If "No", whole site assumed pervious - Soil type 5 & pre-dev PIMP taken as zero in following calcs
Climate change			
Rainfall increase (%)		30	Based on NPPF (for years 2085 - 2115) Applied to post development case only

N.B. These calculations are for planning purposes only and will need to be reviewed at the detailed design stage.

waterco consultants	Eden Court, Lon Parcwr, Ruthin, 01824 702220	Calculations	ref : w1738
			prefix - page no. SWR3
Scheme :	Land at Long Lane, Chapel-en-le-Frith		dated :
Section :	Surface Water Runoff		28/11/2014

Pre- & Post-development peak run-off - Rational Method
(for impervious portions of catchment only)

Input data from sheet 2

Total area (Ha)	8.0000	from sht 2	
Pre dev PIMP (%)	0.00	from sht 2	Or zero if no pre-development drainage
Post dev PIMP (%)	40.00	from sht 2	
Pre-dev Imp area (Ha)	0.0000	calculated	
Post-dev Imp area (Ha)	3.2000	calculated	
M5-60min rain (mm)	20.00	from sht 2	
Ratio "r"	0.30	from sht 2	
Climate change (%)	30	from sht 2	
Storm duration (min)	15.00	from sht 2	

Rational Method

Peak run-off Qi = 2.78 Cv Cr i A

Z1 Factor from table	0.590	pro-rata
Volume coeff Cv	0.75	(Typical 0.75)
Routing coeff Cr	1.30	(Standard value 1.3)

Calculation

M5-Dmin rain (mm)	11.800	M5-60min * Z1 factor
Climate change factor	1.30	Applied to post-development run-off only

Return period	1 yr	30 yr	100 yr
Z2 factor from table	0.614	1.531	1.939
Rainfall (mm)	7.25	18.07	22.88
Rainfall intensity (mm/hr)	29.0	72.3	91.5
Rainfall + CC (mm)	9.43	23.49	29.74
R. Intensity + CC (mm/hr)	37.7	94.0	119.0

Peak run-off rate

Pre-development Qi (l/s)	0.00	0.00	0.00
Post-development Qi(l/s)	326.99	815.32	1032.16

N.B. These calculations are for planning purposes only and will need to be reviewed at the detailed design stage.

waterco consultants	Eden Court, Lon Parcwr, Ruthin, 01824 702220	Calculations	ref : **w1738**
			prefix - page no. SWR4
Scheme :	Land at Long Lane, Chapel-en-le-Frith		dated :
Section :	Surface Water Runoff		28/11/2014

Pre & Post development peak run-off
IOH124 method for pervious areas - Rational method for impervious areas

Input data from sheet 2

Total Area (Ha)	8.0000	from sht 2	
Pre-dev PIMP (%)	0.00	from sht 2	Or zero if no pre-development drainage
Post-dev PIMP (%)	40.00	from sht 3	
Pre-dev Perv area (Ha)	8.0000	Calculated	**< 50 Ha or 0.5 Km2**
Post-dev Perv area (Ha)	4.8000	Calculated	**< 50 Ha or 0.5 Km2**

Region number		10	from sht 2	Pre-dev	
SOIL	(fraction)	0.500	from sht 2	SOIL 0.500	from sht 2 or fixed 0.5
SAAR	(mm)	1150	from sht 2		if no drainage system

Regional growth factors

Multiplier for 1/1 yrs	0.83	FSSR 14 table 1 (lookup table)
Multiplier for 1/30 yrs	1.69	FSSR 14 table 1
Multiplier for 1/100 yrs	2.08	FSSR 14 table 1

Climate change factor 1.3 Applied to post-development run-off only

Mean annual flood Qbar = 0.00108*(AREA/100)^0.89*SAAR^1.17*SOIL^2.17

	Pre-development		Post development	
Qbar' (for 50 Ha) (m3/s)	0.49350	basis of pro-rata	0.49350	basis of pro-rata
Qbar (actual area) (m3/s)	0.07896	pro-rata (A/50)*Qbar'	0.04738	pro-rata (A/50)*Qbar'

Peak flows (IoH 124)

Return period	1 yr	30 yr	100 yr	1 yr	30 yr	100 yr
Multiplier	0.830	1.690	2.080	0.830	1.690	2.080
Peak run-off (m^3/s)	0.06554	0.13344	0.16424	0.03932	0.08007	0.09854
Peak + CC Qp (m^3/s)	n/a	n/a	n/a	0.05112	0.10409	0.12810

Total peak flows (l/s)

Perv area flow-Qp (l/s)	65.54	133.44	164.24	51.12	104.09	128.10
Imp area flow -Qi (l/s)	0.00	0.00	0.00	326.99	815.32	1032.16
Total peak flow Q (l/s)	65.54	133.44	164.24	378.11	919.41	1160.26
Peak flow increase (l/s)				312.57	785.97	996.02

N.B. These calculations are for planning purposes only and will need to be reviewed at the detailed design stage.

waterco consultants	Eden Court, Lon Parcwr, Ruthin, 01824 702220	Calculations	ref : w1738
			prefix - page no. SWR5
Scheme :	Land at Long Lane, Chapel-en-le-Frith		dated :
Section :	Surface Water Runoff		28/11/2014

Pre & Post development run-off volume - FSSR 16
Applied to pervious and impervious areas
For 1 in 100yr 6hr storm

Input data from sheet 2

Total area (Ha)	8.0000	from sht 2	
Pre-dev PIMP (%)	0.00	from sht 2	Or zero if no pre-development drainage
Post-dev PIMP (%)	40.00	from sht 2	
Pre-dev Perv Area (Ha)	8.0000	calculated	
Pre-dev Imp Area (Ha)	0.0000	calculated	
Post-dev Perv Area (Ha)	4.8000	calculated	**Rainfall data**
Post-dev Imp Area (Ha)	3.2000	calculated	(M100-360 min)
SAAR (mm)	1150.0	from sht 2	**Rainfall P (mm)** 70.00 from sht 2
CWI	124	from sht 2	CC factor 1.30 from sht 2
SPR (%)	53.00	from sht 2	**Rainfall Pcc (mm)** 91.00 calculated

DPR_{CWI} (%)		-0.250	calc	0.25*(CWI-125)
DPR_{RAIN} (%)		7.055	calc	0.45*(P-40)^0.7 for P>40mm
PR_p (%)	(perv area)	59.805	calc	SPR + DPR_{CWI} + DPR_{RAIN}
PRi (%)	(imp area)	100.000	defined	100% of impervious area

Storm duration (mins) 360 defined

Run-off volume V = PR/100 * A*10000 * P/1000 = PR * A * P / 10 (m3)

where PR = Percentage run-off — PR_p or PRi (%)
A = Catchment area — A_p or A_i (Ha)
P = Rainfall depth (M100-360) — P or Pcc (mm)
(including climate change for post development only)

	Pre-dev	Post dev
	-	incl CC
Run-off volume- Pervious area (m3)	3349.08	2612.28
Run-off volume- Impervious area (m3)	0.00	2912.00
Total run-off volume (m3)	3349.08	5524.28
Volume increase (m3)		2175.20

N.B. These calculations are for planning purposes only and will need to be reviewed at the detailed design stage.

waterco consultants	Eden Court, Lon Parcwr, Ruthin, 01824 702220	Calculations	ref : w1738
			prefix - page no. SWR6
Scheme :	Land at Long Lane, Chapel-en-le-Frith		dated :
Section :	Surface Water Runoff		28/11/2014

Z1 Factor for England & Wales (Values from BRE 365 - Table 1)

Ratio	Rainfall Duration (mins)					
r	15	30	60	120	240	360
0.12	0.450	0.670	1.000	1.480	2.170	2.750
0.15	0.480	0.690	1.000	1.420	2.020	2.460
0.18	0.510	0.710	1.000	1.360	1.860	2.250
0.20	0.530	0.723	1.000	1.340	1.800	2.163
0.21	0.540	0.730	1.000	1.330	1.770	2.120
0.24	0.560	0.750	1.000	1.300	1.710	2.000
0.25	0.567	0.753	1.000	1.290	1.687	1.960
0.27	0.580	0.760	1.000	1.270	1.640	1.880
0.30	0.590	0.770	1.000	1.250	1.570	1.780
0.33	0.610	0.780	1.000	1.230	1.530	1.730
0.35	0.617	0.787	1.000	1.223	1.497	1.690
0.36	0.620	0.790	1.000	1.220	1.480	1.670
0.39	0.630	0.800	1.000	1.210	1.460	1.620
0.40	0.633	0.803	1.000	1.207	1.447	1.603
0.42	0.640	0.810	1.000	1.200	1.420	1.570
0.45	0.650	0.820	1.000	1.190	1.380	1.510

Z2 Factors for England & Wales from table 6.2 - Wallingford Procedure

M5 Rain (mm)	Diff (mm)	M1	M30	M100
		1	**30**	100
5.00	5	0.62	**1.45**	1.79
10.00	5	0.61	**1.52**	1.91
15.00	5	0.62	**1.55**	1.99
20.00	5	0.64	**1.58**	2.03
25.00	5	0.66	**1.57**	2.01
30.00	10	0.68	**1.55**	1.97
40.00	10	0.70	**1.50**	1.89
50.00	25	0.72	**1.45**	1.84
75.00	25	0.76	**1.36**	1.64
100.00	50	0.78	**1.32**	1.54
150.00	50	0.78	**1.26**	1.45
200.00		0.78	**1.24**	1.40
N.B. M30 Factors interpolated graphically				

N.B. These calculations are for planning purposes only and will need to be reviewed at the detailed design stage.

waterco consultants	Eden Court, Lon Parcwr, Ruthin, 01824 702220	Calculations	ref : **w1738**
			prefix - page no. SWR7
Scheme :	Land at Long Lane, Chapel-en-le-Frith		dated :
Section :	Surface Water Runoff		28/11/2014

Hydrological Regions (From Defra / EA R&D Tech Report W5-074/A Rev D)

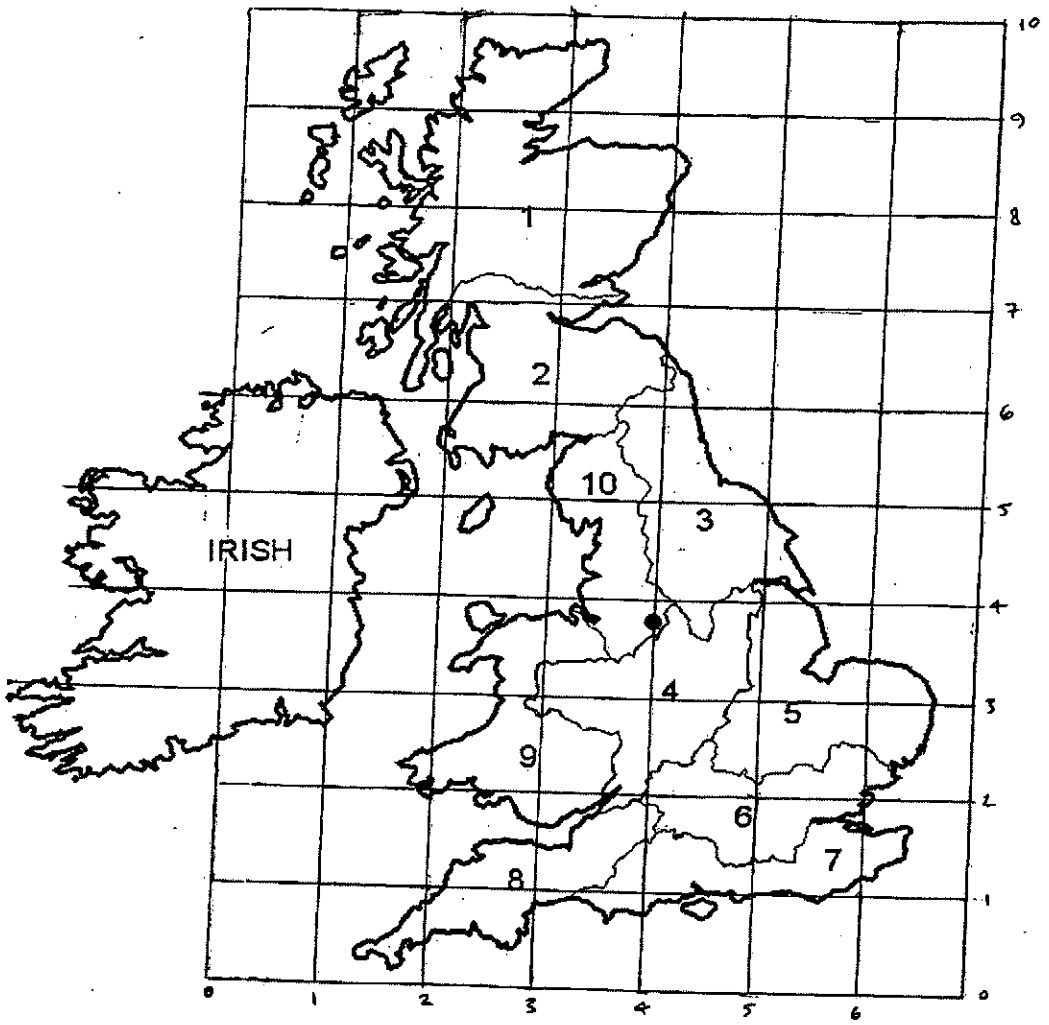


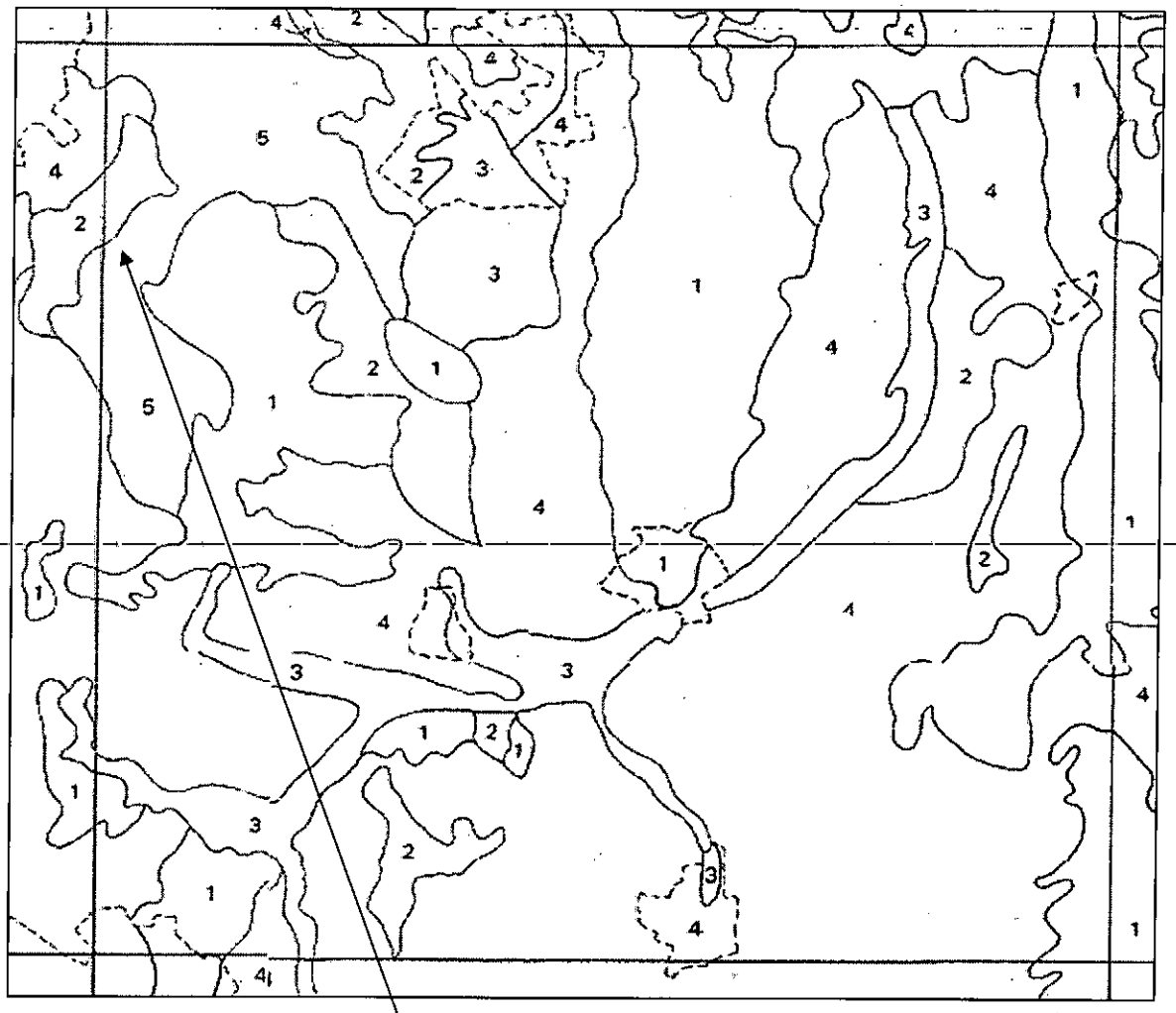
Figure 1.1 Hydrological regions of UK

Grid Ref: - 405185E 379978N - Hydrological Region 10

N.B. These calculations are for planning purposes only and will need to be reviewed at the detailed design stage.

waterco consultants	Eden Court, Lon Parcwr, Ruthin, 01824 702220	Calculations	ref : w1738
			prefix - page no. SWR8
Scheme :	Land at Long Lane, Chapel-en-le-Frith		dated : 28/11/2014
Section :	Surface Water Runoff		

Soil Classification Chart

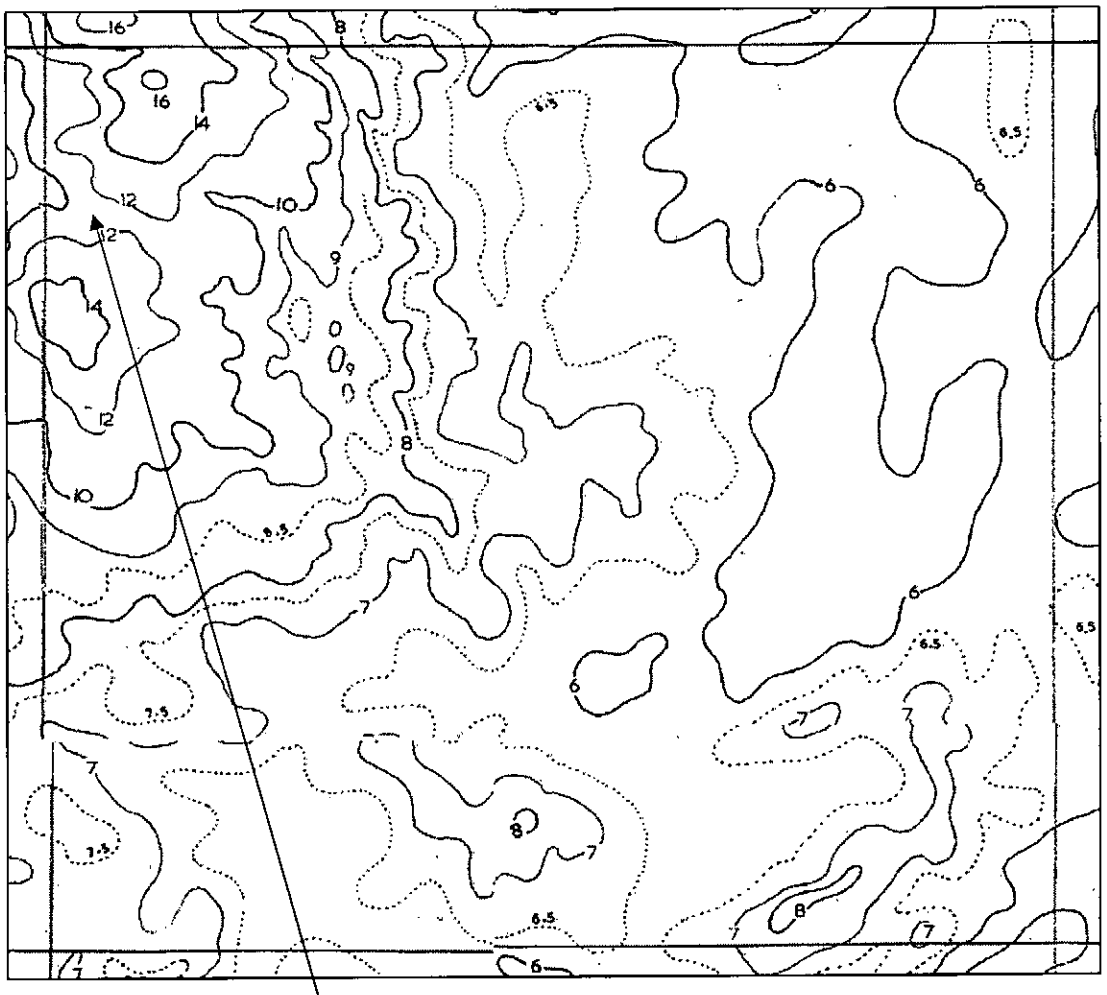


Grid Ref: - 405185E 379978N - Soil Classification = 5

N.B. These calculations are for planning purposes only and will need to be reviewed at the detailed design stage.

waterco consultants	Eden Court, Lon Parcwr, Ruthin, 01824 702220	Calculations	ref : w1738
			prefix - page no. SWR9
Scheme :	Land at Long Lane, Chapel-en-le-Frith		dated :
Section :	Surface Water Runoff		28/11/2014

Standard Annual Average Rainfall (SAAR) Chart



Grid Ref: - 405185E 379978N - SAAR = 1150mm

N.B. These calculations are for planning purposes only and will need to be reviewed at the detailed design stage.

Waterco consultants	Eden Court, Lon Parcwr, Ruthin, 01824 702220	Calculations	ref : **w1738**
			prefix - page no. SWR10
Scheme :	Land at Long Lane, Chapel-en-le-Frith		dated : 28/11/2014
Section :	Surface Water Runoff		

M5-60min Rainfall + r (From Defra / EA R&D Tech Report W5-074/A Rev D)

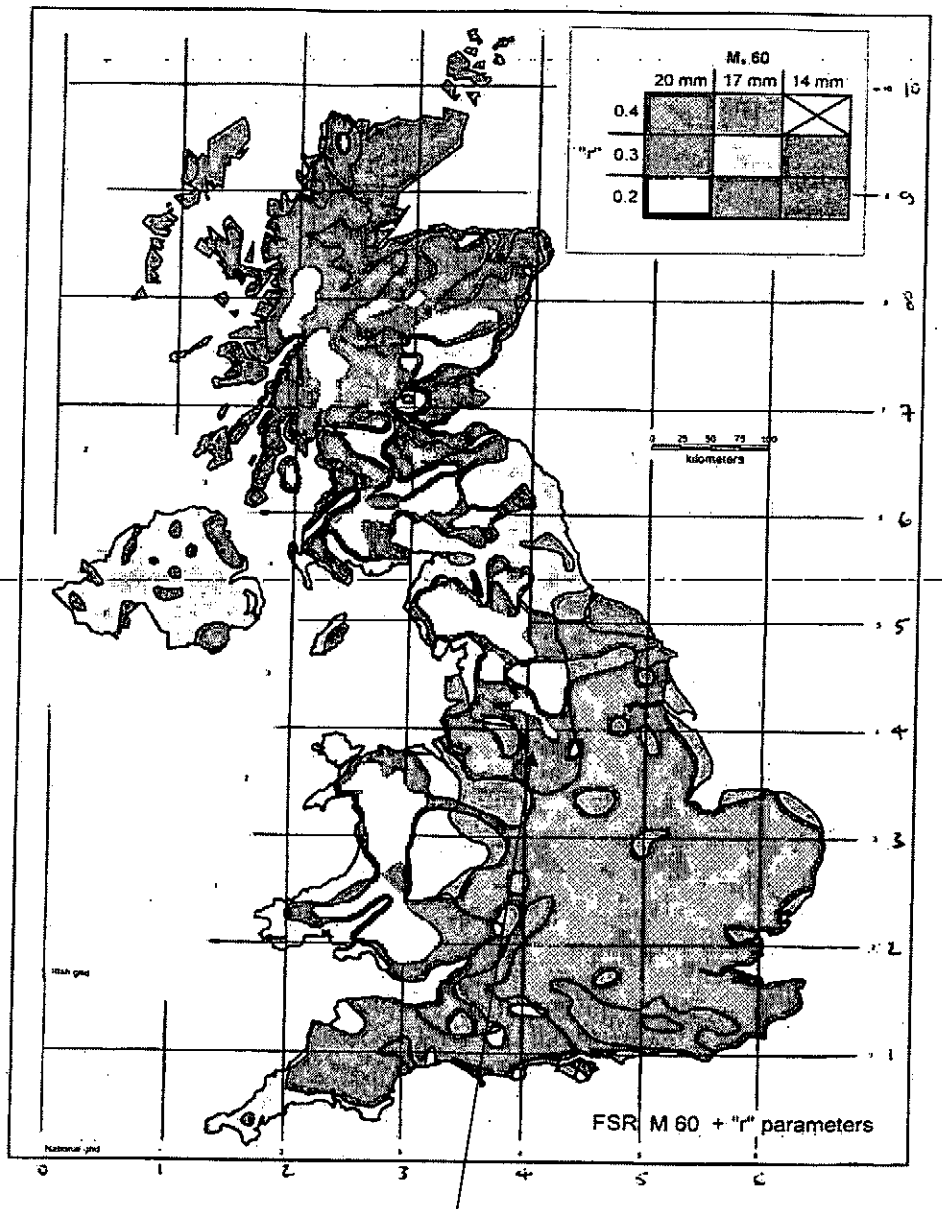


Figure 2 Hydrological rainfall zones of UK

Grid Ref: - 405185E 379978N - M5-60 = 20mm, 'r' = 0.3

N.B. These calculations are for planning purposes only and will need to be reviewed at the detailed design stage.

waterco consultants	Eden Court, Lon Parcwr, Ruthin, 01824 702220	Calculations	ref : w1738
			prefix - page no. SWR11 -
Scheme :	Land at Long Lane, Chapel-en-le-Frith		dated : 28/11/2014
Section :	Surface Water Runoff		

M100 6hr Rainfall (From Defra / EA R&D Tech Report W5-074/A Rev D)

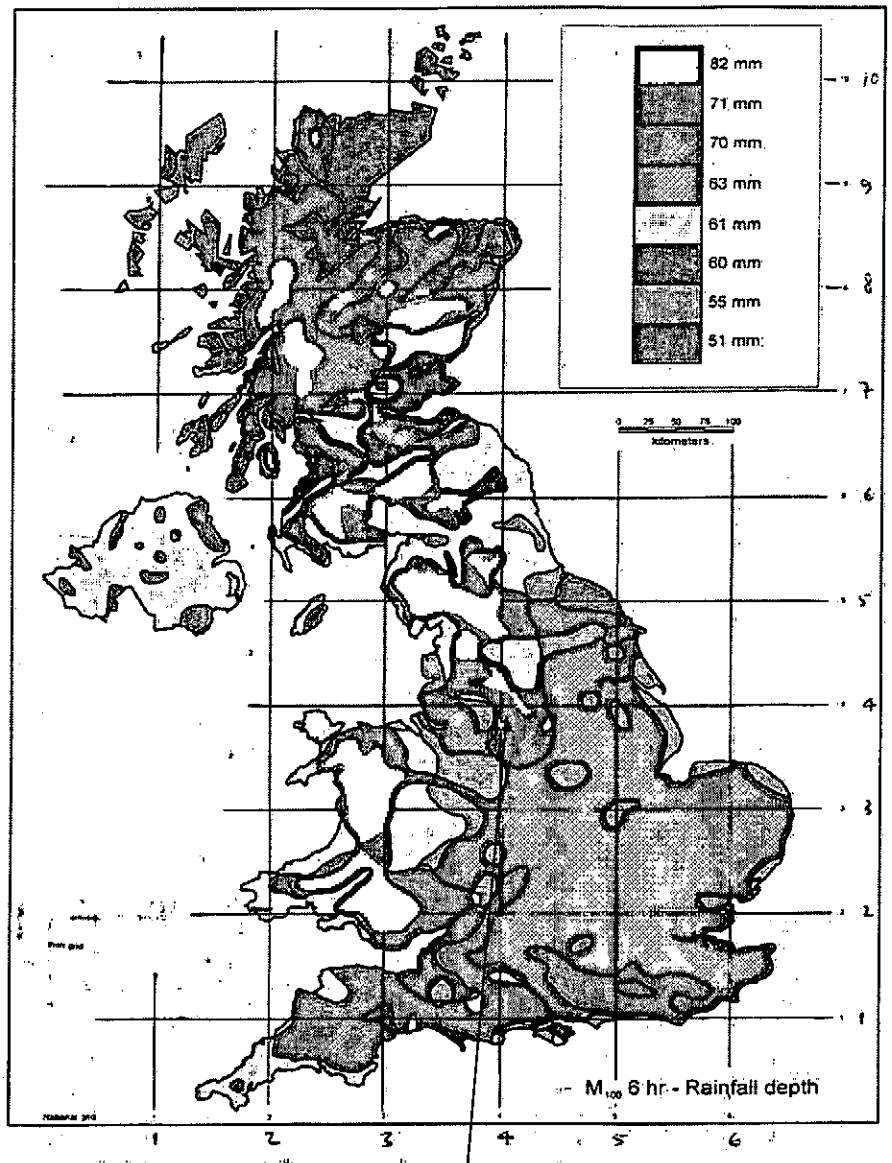


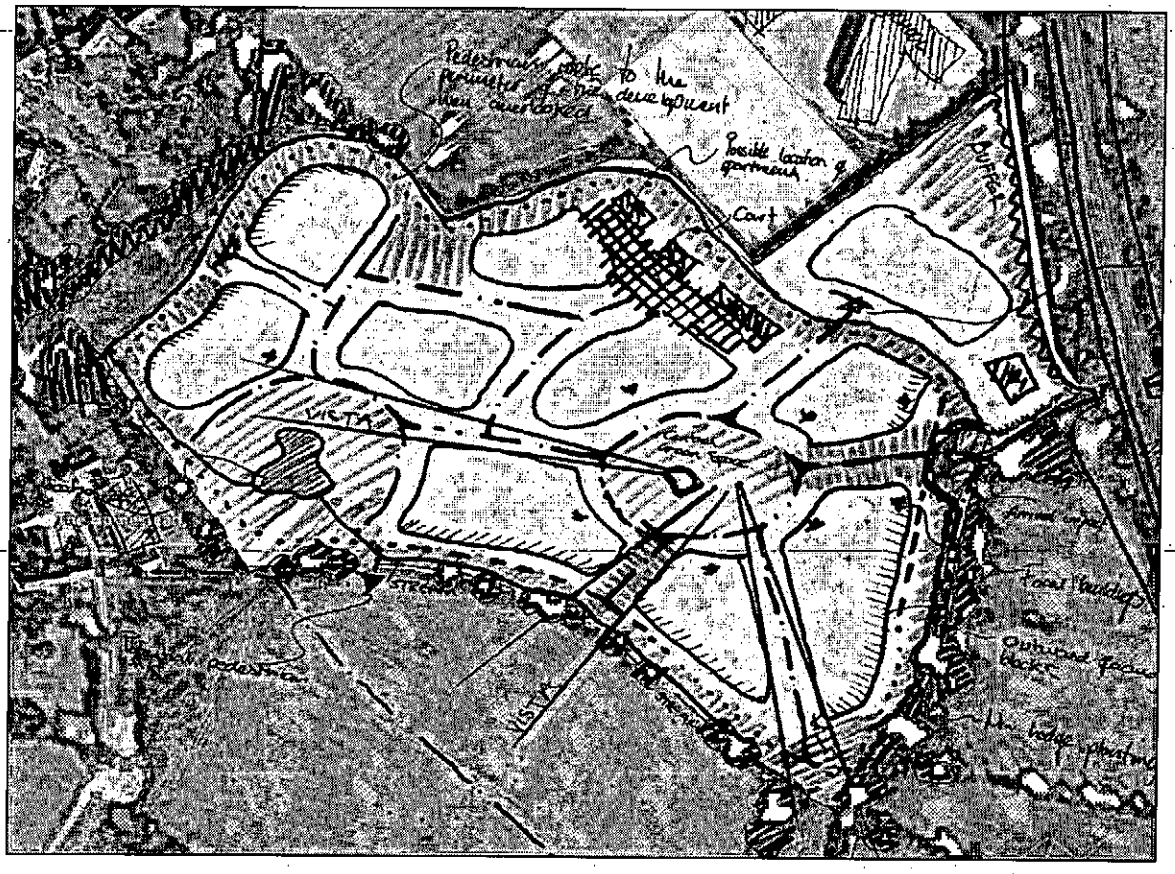
Figure 3.1 100 year 6 hour rainfall depths of UK

Grid Ref: - 405185E 379978N - M100-6hr Rainfall = 70mm

N.B. These calculations are for planning purposes only and will need to be reviewed at the detailed design stage.

waterco consultants	Eden Court, Lon Parcwr, Ruthin, 01824 702220	Calculations	ref : w1738
			prefix - page no. SWR14
Scheme :	Land at Long Lane, Chapel-en-le-Frith		dated : 28/11/2014
Section :	Surface Water Runoff		

Post-development Area



Total Area = 8ha
Permeable Area = 60% = 48,000m²
Impermeable Area = 40% = 32,000m² (assumed)

N.B. These calculations are for planning purposes only and will need to be reviewed at the detailed design stage.

Appendix H – Storm Water Storage Calculations

waterco	Eden Court, Lon Parcwr, Ruthin, 01824 702220	**Calculations**	ref	w1738
Client:	S Robinson Developments		Page 1 of	1
Scheme:	Land at Long Lane, Chapel-en-le-Frith		Prefix	SWS
Section:	Storm Water Storage		revision	A
Prepared by:	Jordan Jones		date:	02/12/2014
Checked by:	Angharad Llewelyn		date:	05/12/2014
Approved by:	Aled Williams		date:	05/12/2014

Surface Water Attenuation - Required Storage Volume

Storm return frequency-once in	100	years
M5-60 min rainfall	20	mm
Ratio M5-60 / M5-2day - R	0.3	ratio
Climate change increase	30	%
Impervious Area (A) (Ha)	3.2000	Ha (provided by client)
Allowable discharge (Qa)	65.000	l/s (subject to agreement)
Discharge Coefficient (Cd)	0.840	
Routing Coefficient (Cr)	1.300	(typical 0.75 summer / 0.84 winter)
O/A Coefficient (C = Cd * Cr)	1.092	(standard value)
Climate change adj factor (Fc)	1.300	

Storage Volume required = (Qr-Qa)*D*60 (Litres)

SW Run-off (Qr) = 2.78 C i A * Fc

Storm duration (D) (Minutes)	(Hrs)	rainfall (mm/hr)	Run-off rate (L/s)	Storage Vol (m3)	
5	0.08	139.6	1762.539	509.3	
10	0.17	107.6	1359.431	776.7	
15	0.25	88.7	1120.203	949.7	
30	0.5	61.4	775.258	1278.5	
45	0.75	48.3	609.606	1470.4	
60	1	40.6	512.728	1611.8	
90	1.5	31.0	392.070	1766.2	
120	2	25.6	322.695	1855.4	
150	2.5	21.8	275.411	1893.7	
180	3	19.2	242.569	1917.7	**Critical storm
240	4	15.6	196.892	1899.2	
360	6	11.7	147.395	1779.7	
480	8	9.5	119.361	1565.6	
600	10	8.1	102.014	1332.5	
720	12	7.1	89.144	1043.0	
1440	24	4.2	53.458	0.0	
2880	48	2.5	31.049	0.0	

Design Storage requirement 1917.7 m3