

APPENDIX I: PFRA/SPRA INFORMATION

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Volume Pumps (HVP's) pumps were brought in to extract the excess surface water in to the river system.

In Wrexham County Borough there were no areas identified as significant risk threshold with an affected population, greater than 5,000 people. Within the Wrexham County Borough Council Preliminary Flood Risk Assessment (PFRA) 2011⁶, 20 1km square areas of 200 properties, 20 businesses or 1 critical infrastructure have been identified. These are areas which do not meet the statutory flood risk areas of 5,000 people but areas which are locally significant. These areas are concentrated around Wrexham, Llay Industrial Estate, Wrexham Industrial Estate and urban villages of Gwersyllt, Rhosllanerchrugog, Ruabon, Coedpoeth, Cefn Mawr, Acrefair, Chirk and Glyn Ceiriog, Ceiriog Valley. This local threshold will continue to form the basis of the LFRMS supported by continuing collection of information on local flood events.

The PFRA (2011) 1km² squares show that local flood risk could potentially affect 20,696 properties. The Environment Agency maps on surface water show a total number of 451 properties within areas susceptible to surface water flooding. The Environment Agency Flood map for surface water shows that 1922 properties could potentially be affected by 1 in 30 flood event, and 5312 properties are shown at risk from the 1 in 200 flood map for surface water. To date, the County Borough has received 383 flooding incidents.

The flooding events that have occurred this year 2012-2013 within the County Borough I have varied in size and caused different patterns of events. In April prolonged and heavy rainfall caused problems associated with surface water run off and river flooding alerts in Acrefair and Rossett. The events in July and August were associated with surface water flooding and flash flooding in urban villages of Gwersyllt, Gresford, Marford, Llay and Burton Green. In September, flooding events covered the borough causing surface water and river flooding to the Alyn and surrounding farmland around Holt, Farndon and Rossett.

The flood risk areas for Wrexham are listed in Figure 1.8 shows the PFRA squares in relation to the community council areas and shows how many properties, business or infrastructure could be affected. The table compares this information in relation to the EA Areas Susceptible to Surface Water Flooding and Flood Map for Surface Water, groundwater flooding areas, the historic flood outline and flood zones, canal flooding from Civic Canal and River Trust and sewer flooding from Welsh Water and the historical flooding data captured by the LLFA. The table also shows how these areas relate to the policy areas of the River Dee Catchment Plan and River Dee Basin Management Plan. Figure 1.9 will help identify the highest risk areas for the implementation of measures (L1-11) and forthcoming flood risk maps and flood risk management plans.

Environment Agency River Dee Catchment Flood Management Plan (2010)

Flood risk is the combination of the likelihood (or probability) of a particular flood event occurring and the consequence (or impact) of the flood event if it occurred. within a one year period. This is known as an Annual Exceedance Probability which is expressed as a % AEP and is the probability of a particular flood event (or size) occurring in one year. Flood risk is likely to be exacerbated by climate

⁶ WCBC (2011) Preliminary Flood Risk Assessment
April 2013 Version 3.1

change, and UKC09 projections indicate that rainfall will change significant with 90% probability, wetter winters causing higher river flow, especially when combined with sea level rise and more frequent and intense extreme rainfall events. The main sources of flood risk in Wrexham County Borough include river flooding, surface water flooding, some sewer, ground water and ordinary watercourse flooding.

Flooding has occurred at many locations throughout the River Dee Catchment Flood Management (CFMP) area, mostly from the main River Dee and its major tributaries but also from several small watercourses. Significant floods were recorded in 1890, 1946, and 2000.

The River Dee CFMP ⁷ identifies a number of populated areas which are affected include Rossett, Holt, Wrexham, Coedpoeth and Rhosllanerchrugog. In 2000, flooding was widespread across the catchment to places which have never flooded before

In the River Dee catchment area, a 1% AEP event could affect approximately 4,200 properties. In the County Borough of Wrexham there are considered to be 100-500 number of properties within Wrexham and Bangor on Dee and between 50-100 properties in Cefn Mawr at risk from flooding. This would equate to a flood risk to 0.5% of the population in 2010 and is because large amounts of area that are at risk of flooding from fluvial sources forms agricultural low land areas. There are limitations to this data given the lack of historic records associated with surface water flooding.

The CFMP (2010) has six policy areas cross the catchment area. These policy areas are incorporated into sub area action plans. The key policy options 2, 3 and 4 for Wrexham are listed in Figure 1.7 below.

Figure 1.7 River Dee Catchment Management Policies for Wrexham

Policy 2: Middle Dee, Bangor on Dee and East of the Borough

Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions.

This policy will tend to be applied where the overall level of risk to people and property is low to moderate. It may no longer be value for money to focus on continuing current levels of maintenance of existing defences if we can use resources to reduce risk where there are more people at higher risk. We would therefore review the flood risk management actions being taken so that they are proportionate to the level of risk

Policy 3: Lower Dee (Rossett, Holt Farndon and Main Alyn West of Wrexham)

Areas of low to moderate flood risk where we are generally managing existing flood risk effectively;

This policy will tend to be applied where the risks are currently appropriately managed and where the risk of flooding is not expected to increase significantly in the future. However, we keep our approach under review, looking for improvements and responding to new challenges or information as they emerge. We may review our approach to managing flood defences and other flood

⁷ EA (2010) The River Dee Catchment Management Plan
April 2013 Version 3.1

risk management actions, to ensure that we are managing efficiently and taking the best approach to managing flood risk in the longer term.

Policy 4: Wrexham (Rossett to Erddig and Rhostyllen)

Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change;

This policy will tend to be applied where the risks are currently deemed to be appropriately-managed, but where the risk of flooding is expected to significantly rise in the future. In this case we would need to do more in the future to contain what would otherwise be increasing risk. Taking further action to reduce risk will require further appraisal to assess whether there are socially and environmentally sustainable, technically viable and economically justified options.

The sub areas relevant to Wrexham County Borough include, Sub area 1: Upper Dee, Sub Area 2: Main Alyn, Sub Area 3: Middle Dee, Sub Area 4 Wrexham and Sub Area 5: Lower Dee. For each of these sub areas there are a list of partners, an outline of the issues, and outline of the policy approach required and actions required to implement them.

Environment Agency River Dee Basin Management Plan (2009)

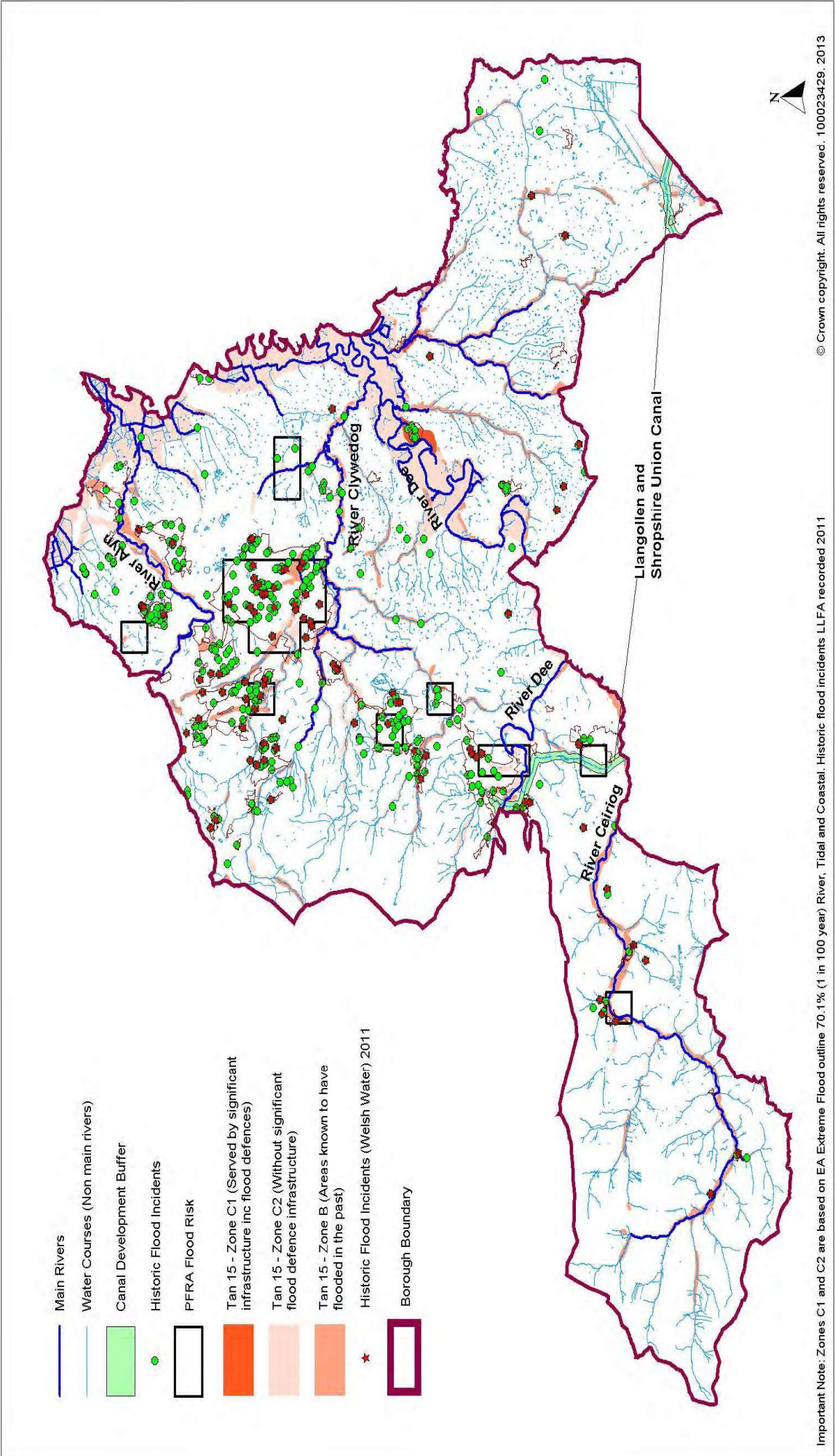
The River Dee is considered as part of a wider river basin including the river, its tributaries and estuary. The source of the Dee is near Bala and the whole basin includes Llyn Tegid Special Area of Conservation (SAC) through to the Dee Estuary (SPA) including reservoirs at Llyn Tegid, Celyn and Brenig. The Dee is of high biodiversity value due to its originally low nutrient status and high quality riparian habitats. Its interest includes a number of species that are typical of high quality rivers with low nutrient levels in the water. Of particular note is the use of the River Dee as a migration route by Atlantic salmon, up to spawning grounds in the river, some of which are within Wrexham County Borough.

The River Basin Management Plan current status of the water environment states that 28% of the surface waters are at good or better ecological/potential status now. 51% of the assessed surface waters are at a good or better ecological status now. 108 surface water bodies have been assessed for ecology and 72 have been assessed for biology. The River Dee and Bala lake is a SAC, is vulnerable to specific flood risk management measures and pressures in relating to canalised stretches altering habitats, collapsing embankments, nutrient levels, provision of water resource locally and to parts of the West Midlands and North West of England, recreational disturbance, siltation from construction and invasive species.

Limitations

There are limitations to the data provided with each source of information varying in format and level of detail. Improvements in the recording system have been identified and are included as a measure of the LFRMS. Once adopted and monitored improvements in flood risk information held by the Lead Local Flood Authority will inform local flood risk management approach and ongoing review of the strategy.

Figure 1.8 Flood Risk Assessment across Wrexham County Borough (Local Flood Risk Management Strategy 2012)



and mapping them against green spaces, initiatives for investment and improvements can be identified. It provides evidence of existing initiatives within the regional area which includes Stamford Brook and Northern Gateway which demonstrate the principles of this policy approach to Lower River Dee and actions required. This action plan forms one of two areas that have been prioritised for green infrastructure investment under the Green Infrastructure Framework.

Natural approaches to flood risk management is more sustainable and cost effective than hard engineering defences and can bring added benefits to wildlife and amenity to regenerated areas and urban spaces. The Environment Agency has conducted research and there evidence to demonstrate the benefits of this approach. Natural approaches can include techniques which use land to temporarily store water away from high risk areas, reconnect rivers to floodplains, lengthening watercourses to a more natural alignment, restoring peat bogs, blocking artificial drainage channels, reforesting floodplains, green roofs, permeable paving, and surface water attenuation ponds

Improvements to the collection of data onto a single mapping system for the local authority ensures that different functions take account or have regard to local flood risk and their interrelatedness. That will facilitate the analysis and monitoring of flood event patterns in relation to existing assets and infrastructure. Highlighting repeat issues or issues in regards to maintenance. The development of an annual asset maintenance schedule will ensure that the required ordinary watercourse consents will be scheduled and pre-application discussions can limit the issues in regards to design, ecology or proposed methods involved. The investigation process and asset register can reduce costs associated with flood damage from flood events and reduce the costs from repetitive actions which do not resolve the issues associated with the source of the flooding. Small measures, that could save long term higher costs associated with the continued flood risk we can anticipate from Climate Changes.

The Lead Local Flood Authority has permissive power to designate structures which affect flood risk so the owners can not alter or remove the structures. This designation procedure is assessed and has to satisfy four conditions for the consideration of formal designation. These four conditions are;

- Condition 1: that the designating authority thinks the existence or location of the structure or feature affects a flood risk or coastal erosion risk;
- Condition 2: that the designating authority has flood or coastal erosion risk management functions in respect of the risk which is affected;
- Condition 3: that the structure or feature is not already designated by another authority;
- Condition 4: that the owner of the structure or feature is not a designating authority;

Designation and asset maintenance can reduce the consequences and improve the approaches of flood risk management within the Borough. The flooding events that have occurred this year 2012-2013 within the Borough Council have varied in size and caused different patterns of events. In April prolonged and heavy rainfall caused problems associated with surface water run off and river flooding alerts in Acrefair and Rossett. The events in July and August were associated with surface water flooding and flash flooding in urban villages of Gwersyllt, Gresford, Marford, Llay and Burton Green. In September, flooding events covered the borough

The identification of communities at risk and vulnerable people can be assessed through the careful use of datasets across the Authority. Using the principles of the Community Flood Plans in Rossett and Bangor on Dee, and utilising the databases held on the private rented sector, council owned assets.

Wrexham County Borough Council in partnership with Environment Agency is committed to ensuring that everyone in the County Borough of Wrexham is informed or aware of the risks of local flooding. This awareness and information sharing is important to enable households and businesses to adopt suitable resistance and resilience measures.

In Wales, six pilot studies have been completed, two of these areas include Prestatyn and Pwllheli and provide important lessons in regards to the importance of awareness rising and adaptation to climate change. Climate change and adaptation forms an important role within all flood risk management measures.

The Multi-agency Flood Plan (MAFP) (2010) provides the framework produced by North Wales Resilience Forum and Multi Agency Response Plan for Major Emergencies (2010) for Emergency responses within the Borough. There are flood warning systems in place for Alyn Catchment, Rossett, Lower Dee Valley Llangollen to Chester, Lower Dee and Bangor on Dee.

The Area Flood Partnership includes representatives from the Council's Emergency Management Response Teams, Lead Local Flood Authority, Flood Risk Management Authorities and communities of Bangor on Dee, Rossett. This group hold meetings throughout the year and exercises every three years.

The Local Authority has an Emergency Planning Team (EP) and out of hours service with contact numbers, information and advice available on the website. During working hours flood event calls are dealt with by the Contact Centre through the Pride in Your Streets and passed to; Emergency Planning, Environment, Housing, or Public Protection. Most of the calls received are directed to Environment Street Scene section because of their responsibilities in regards to highways and land drainage.

In an Emergency flooding event, an established emergency response will be initiated. Flooding events are monitored carefully and co-ordination of information and updates across the various departments, external organisations and emergency responders are very important

The LFRMS has the potential to adversely affect such features, especially aquatic features as a result of any flood management measures that are implemented. Construction, land use change, changes in flood regime and frequency or changes in water levels that have the potential to adversely affect nature conservation and biodiversity features. Conversely, such changes present opportunities to enhance the condition of existing habitats and create new habitats. Trees form important character and functions within areas for biodiversity and drainage and flood risk alleviation. Trees within urban areas and Green Networks are important to flood risk management approach of quality, quantity and amenity.

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APPENDIX J: SURFACE WATER CALCULATIONS

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SURFACE WATER RUN-OFF CALCULATION SHEET



Development Land east of Tan y Bont, Rhosrobin, Wrexham
Project No. HYD574

Revision A **Completed by** MB
Date 28/01/2021 **Checked by** KW

Areas			
Total Site	15.760	ha	
Development Area ¹	6.510	ha	
Existing Impermeable	0.000	ha	
Existing Impermeable ²	0.000	ha	
Existing Pervious	15.760	ha	
Existing Pervious ²	0.000	ha	
Proposed total impermeable	4.300	ha	66%

Catchment Characteristics			
SAAR	773	mm	
SPR	0.51		
BFI	0.86		
i ₁	17.5	mm/hr	d ₁ 21.1 mm
i ₃₀	37.5	mm/hr	d ₃₀ 57.5 mm
i ₁₀₀	49.5	mm/hr	d ₁₀₀ 75.9 mm

Run-off Rates			
Pre-development			
Impermeable -----	1yr	0.0	l/s
	30yr	0.0	l/s
	100yr	0.0	l/s
	40mm/hr ³	0.0	l/s
Pervious ⁴ -----	1yr	4.9	l/s
	30yr	10.0	l/s
	100yr	12.2	l/s
	QBar ⁵	5.6	l/s
Total -----	1yr	4.9	l/s
	30yr	10.0	l/s
	100yr	12.2	l/s
Post-development (without control)			
Impermeable ⁶ -----	1yr	209.1	l/s
	30yr	448.5	l/s
	100yr+40%CC	827.8	l/s

Volumes			
Pre-development			
Impermeable -----	1yr	0.0	cu.m
	30yr	0.0	cu.m
	100yr	0.0	cu.m
Pervious ⁴ -----	1yr	627.3	cu.m
	30yr	1443.7	cu.m
	100yr	1954.4	cu.m
Total -----	1yr	627.3	cu.m
	30yr	1443.7	cu.m
	100yr	1954.4	cu.m
Post-development			
Impermeable ⁶ -----	1yr	90.5	cu.m
	30yr	247.1	cu.m
	100yr+40%CC	326.2	cu.m

1/ The 'development area' removes areas of POS and/or landscaped areas of the wider site that are to remain as existing.
 2/ On occasion the existing impermeable area cannot be evidenced to connect and a reduction is applied.
 3/ 50mm/hr is used for BRegs calculations and often used by Water Companies when considering allowable post-development rates of discharge. (Rational Method)
 4/ The Greenfield rates and of run-off have been calculated using the UK SUDS Calculator
 5/ QBar is the estimated flood flow for the 2.33yr return period event and is often used as a post-development rate restriction.
 6/ Post-development run-off is only considered from the impermeable area when the proposed post-development impermeable area >50% in accordance with the EA Guidance Preliminary rainfall runoff management for developments (W5-074/A/TR1/1 rev E (2012)).

NB. The catchment characteristics are from the FEH catchment, the UK SUDS Calculator and Microdrainage.
 NB. The rainfall intensities and depths are calculated for the 6hr duration rainfall event (peak summer intensity)

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha):

Methodology

Q_{MED} estimation method:

BFI and SPR method:

HOST class:

BFI / BFIHOST:

Q_{MED} (l/s):

Q_{BAR} / Q_{MED} factor:

Hydrological characteristics

	Default	Edited
SAAR (mm):	759	759
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 30 years:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Growth curve factor 200 years:	2.46	2.46

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):		5.6
1 in 1 year (l/s):		4.93
1 in 30 years (l/s):		9.97
1 in 100 year (l/s):		12.21
1 in 200 years (l/s):		13.78

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Betts Associates Ltd		Page 1
Old Marsh Farm Barns Welsh Road Sealand Flintshire CH5 2LY		
Date 28/01/2021 14:47 File	Designed by MeganBerry Checked by	
Micro Drainage		Source Control 2018.1

Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	18.000
Ratio R	0.322
Areal Reduction Factor	1.00
Area (ha)	6.510
SAAR (mm)	773
CWI	114.419
Urban	0.000
SPR	47.000

Results

Percentage Runoff (%)	48.29
Greenfield Runoff Volume (m³)	1954.408

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Old Marsh Farm Barns Welsh Road Sealand Flintshire CH5 2LY		
Date 28/01/2021 14:47 File	Designed by MeganBerry Checked by	
Micro Drainage		Source Control 2018.1

Greenfield Runoff Volume

FSR Data

Return Period (years)	30
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	18.000
Ratio R	0.322
Areal Reduction Factor	1.00
Area (ha)	6.510
SAAR (mm)	773
CWI	114.419
Urban	0.000
SPR	47.000

Results

Percentage Runoff (%)	46.27
Greenfield Runoff Volume (m³)	1443.709

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Old Marsh Farm Barns Welsh Road Sealand Flintshire CH5 2LY		
Date 28/01/2021 14:46 File	Designed by MeganBerry Checked by	
Micro Drainage		Source Control 2018.1

Greenfield Runoff Volume

FSR Data

Return Period (years)	1
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	18.000
Ratio R	0.322
Areal Reduction Factor	1.00
Area (ha)	6.510
SAAR (mm)	773
CWI	114.419
Urban	0.000
SPR	47.000

Results

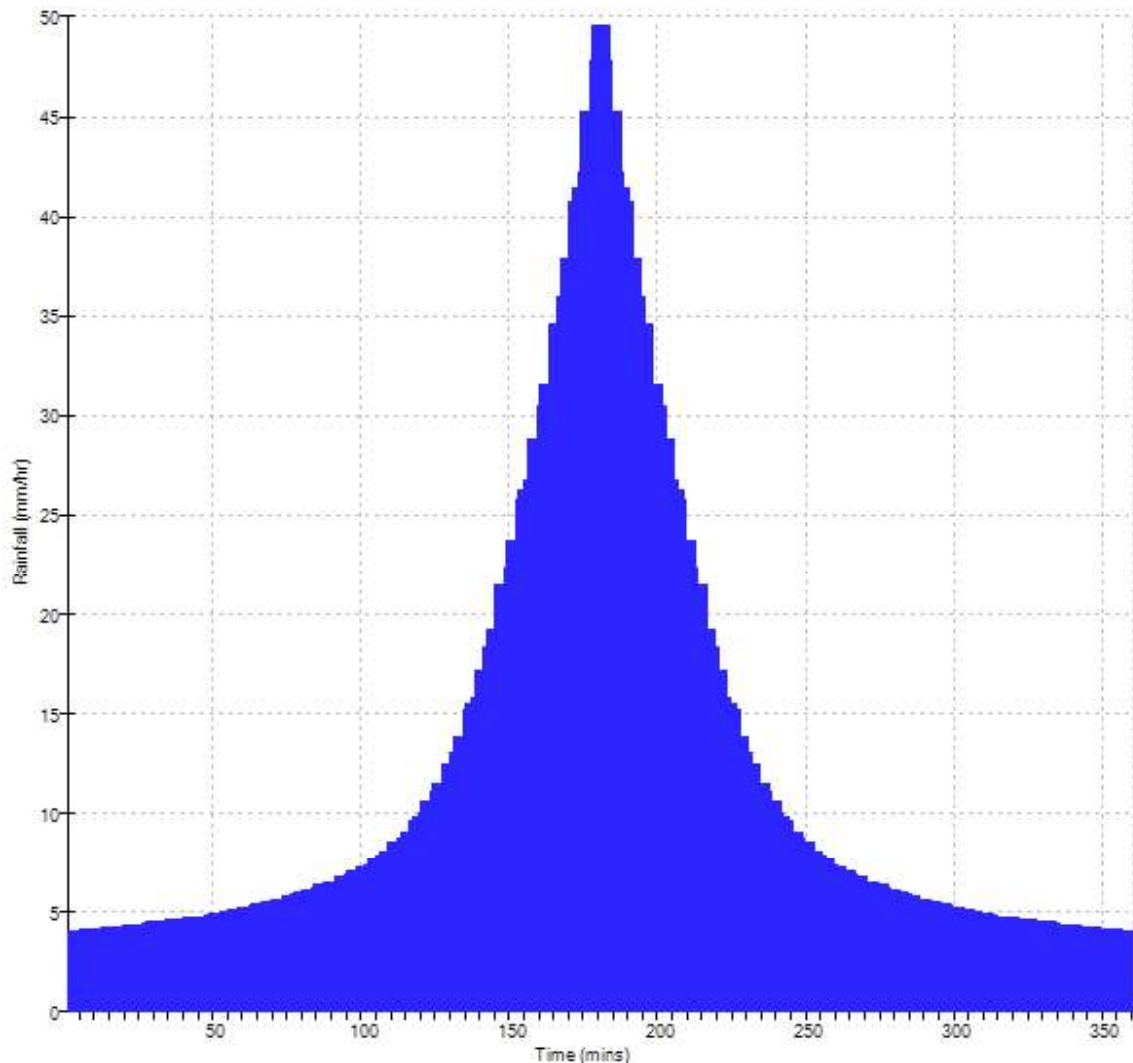
Percentage Runoff (%)	44.35
Greenfield Runoff Volume (m ³)	627.315

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Date 28/01/2021 14:45 File	Designed by MeganBerry Checked by	
Micro Drainage	Network 2018.1	

Rainfall profile

Storm duration (mins) 360

	FEH Data	
FEH Rainfall Version		2013
Site Location	GB 333264 352762 SJ 33264 52762	
Data Type		Point
Peak Intensity (mm/hr)		49.568
Ave. Intensity (mm/hr)		12.645
Return Period (years)		100.0

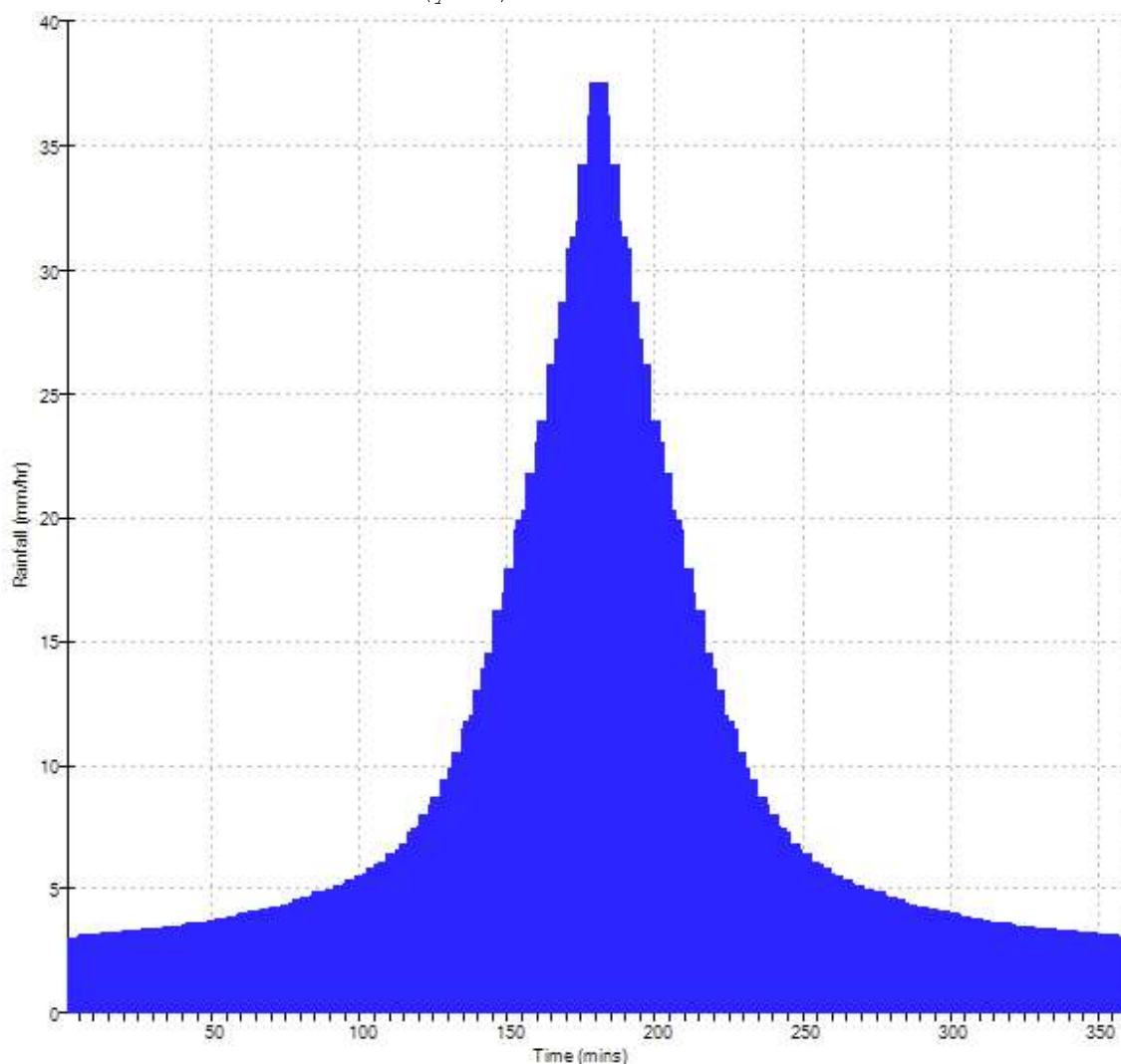


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Date 28/01/2021 14:44 File	Designed by MeganBerry Checked by	
Micro Drainage	Network 2018.1	

Rainfall profile

Storm duration (mins) 360

	FEH Data	
FEH Rainfall Version		2013
Site Location	GB 333264 352762 SJ 33264 52762	
Data Type		Point
Peak Intensity (mm/hr)		37.546
Ave. Intensity (mm/hr)		9.578
Return Period (years)		30.0



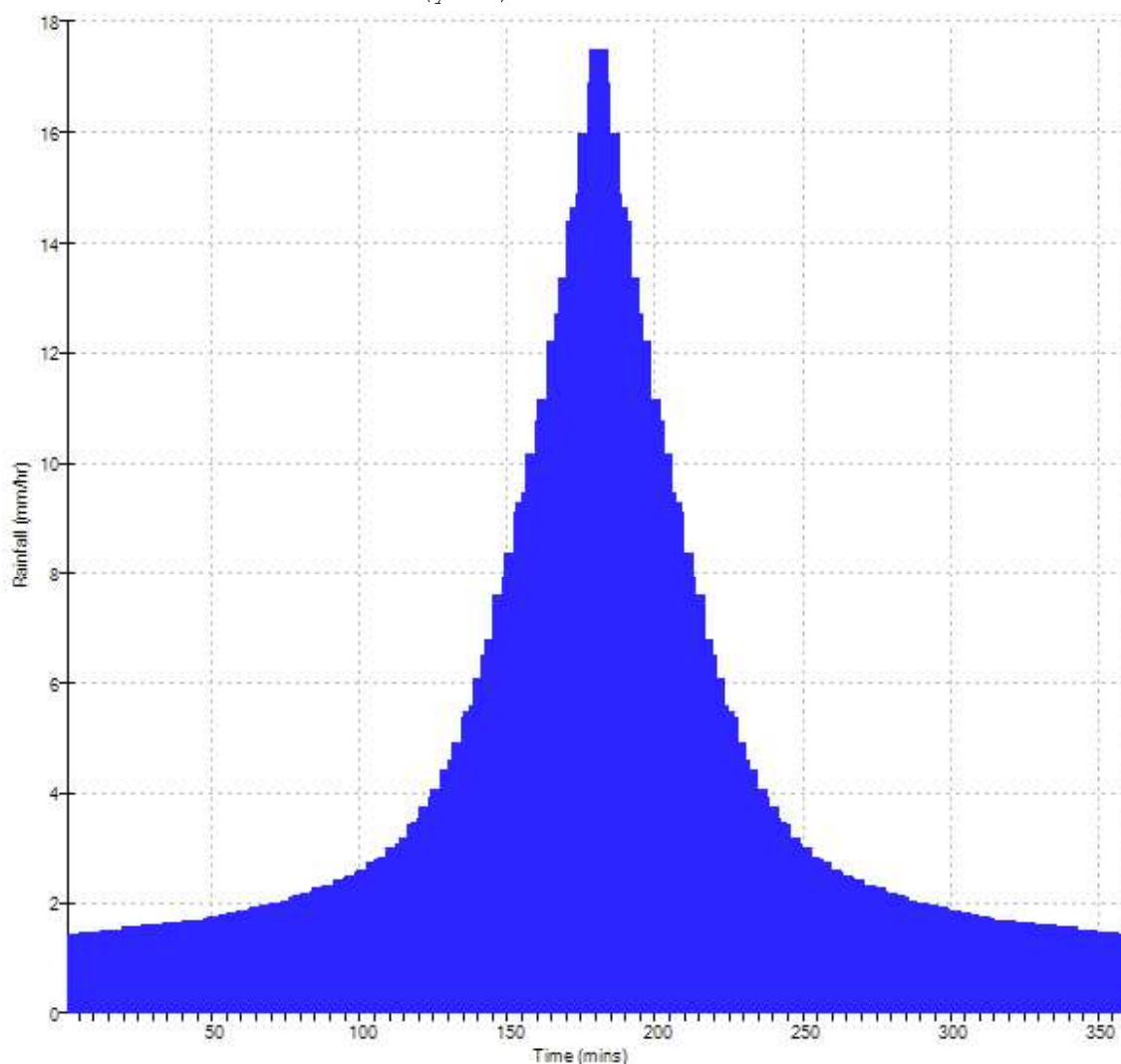
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Old Marsh Farm Barns Welsh Road Sealand Flintshire CH5 2LY		
Date 28/01/2021 14:44 File	Designed by MeganBerry Checked by	
Micro Drainage	Network 2018.1	

Rainfall profile

Storm duration (mins) 360

FEH Data

FEH Rainfall Version	2013
Site Location	GB 333264 352762 SJ 33264 52762
Data Type	Point
Peak Intensity (mm/hr)	17.505
Ave. Intensity (mm/hr)	4.466
Return Period (years)	2.0



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APPENDIX K: DRAINAGE PLANS

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DO NOT SCALE

LEGEND

- Site Boundary
- Wat's Dyke
- Railway
- Public Foul Water MH
- Public Foul Water Sewer
- Topogrophis Survey

REV	DATE	BY	DESCRIPTION	CHK
A	21/01/21	KW	PRELIMINARY FOR REVIEW	RN
DRAWING STATUS:				



BETTS HYDRO
CONSULTING ENGINEERS

Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel 01247 288178 enquiries@betts-associates.co.uk



Castle Green
HOMES

PROJECT:
Land East of Tan y Bont,
Main Road, Rosrobin,
Wrexham

TITLE: Pre-Development Drainage Plan				
DATE: JAN 2021	SCALE @ SIZE: NTS @ A3	DRAWN: MB	CHECKED: RN	REV: A
PROJECT No: HYD574	DRAWING No: 200			

DO NOT SCALE

LEGEND

- Site Boundary
 - Railway
 - Wats Dyke
 - Public Foul Water Sewer
 - Permeable Driveways
 - Infiltration Basin
 - Proposed Foul Water Sewer
 - Proposed Surface Water Sewer
- Site Layout K

B	04/08/21	MB	PRELIMINARY FOR REVIEW	RN
REV	DATE	BY	DESCRIPTION	CHK
DRAWING STATUS:				

BETTS HYDRO
CONSULTING ENGINEERS
Unit 6, Old Mans Farm Barns, Welsk Road, Sealand, Flintshire CH5 2LY
Tel: 01274 288178 enquiry@betts-engineers.co.uk



PROJECT:
Land East of Tan y Bont,
Main Road, Rostrolin,
Wrexham

TITLE:
Post-Development
Drainage Plan

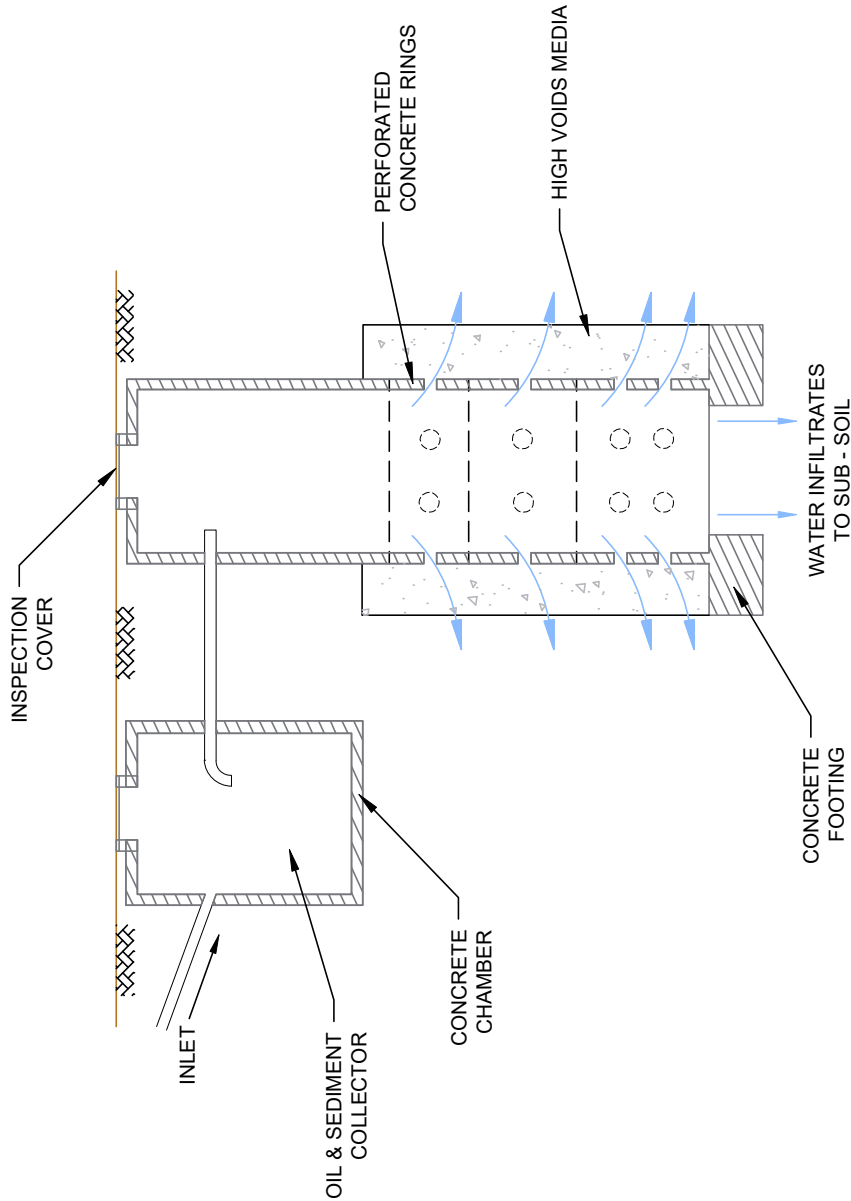
DATE: AUG 2021	SCALE @ SIZE: NTS @ A3	DRAWN: MB	CHECKED: RN
PROJECT NO: HYD574	DRAWING NO: 201	REV: A	

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APPENDIX L: SUDS EXAMPLES

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DO NOT SCALE



SOAKAWAY DETAILS
(INCLUDING PRE-TREATMENT DEVICE)

REV	DATE	BY	DESCRIPTION	CHK

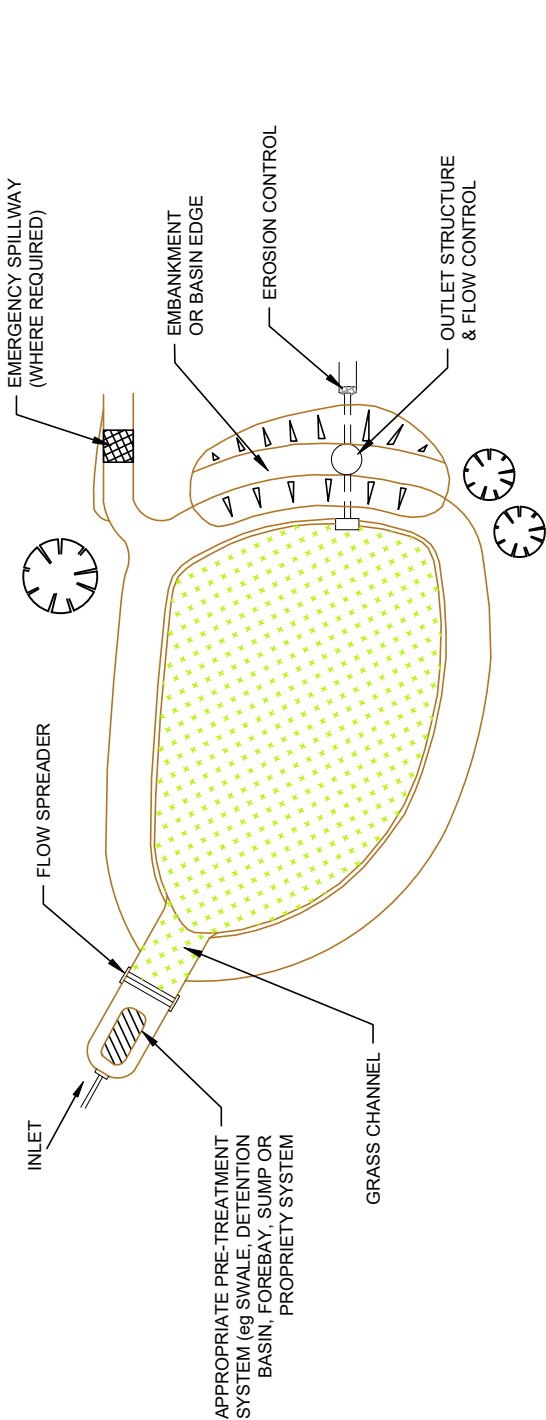
DRAWING STATUS: PRELIMINARY



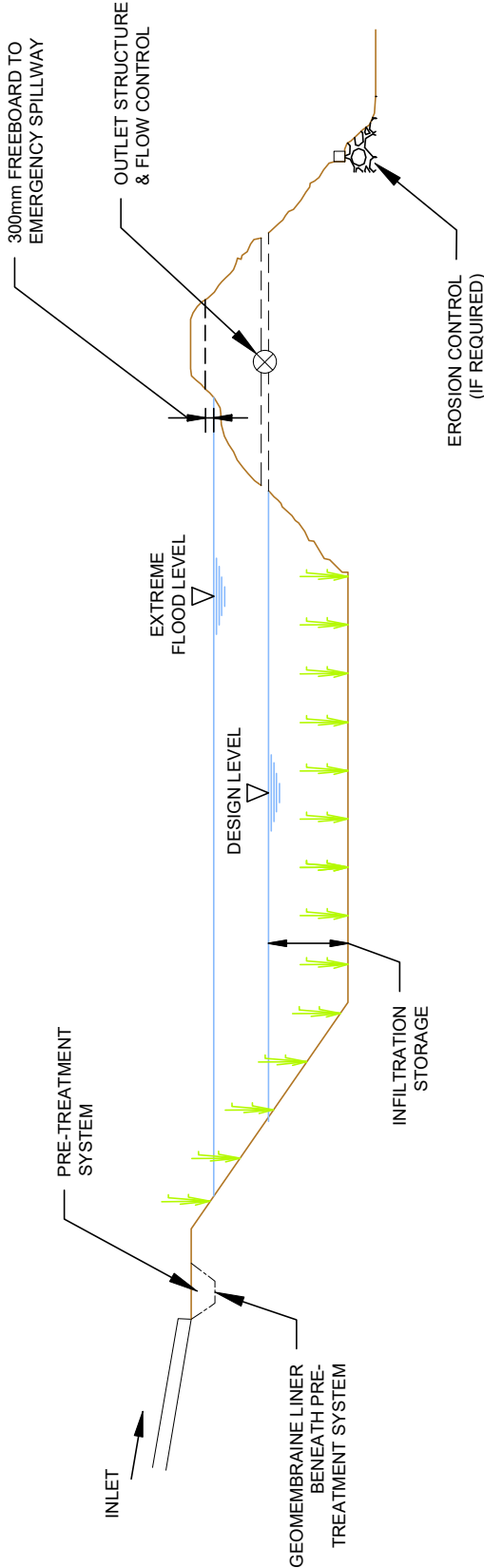
BETTS ASSOCIATES
CIVIL AND STRUCTURAL ENGINEERS
Unit 15, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire CH5 2LY
Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk

PROJECT:			
TYPICAL SUDDS DETAIL			
TITLE:			
SOAKAWAYS			
DATE: SEP 2014	SCALE @ A3	SIZE: CP	CHECKED: RDN
PROJECT No: BETTS		DRAWING No: 108	
REV:		A	

DO NOT SCALE



PLAN VIEW



ELEVATION

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY

BETTS ASSOCIATES
CIVIL AND STRUCTURAL ENGINEERS
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Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk

PROJECT:

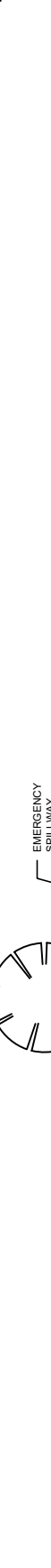
TYPICAL SUDDS DETAIL

TITLE:

INFILTRATION BASINS

DATE:	SCALE:	SIZE:	DRAWN:	CHECKED:	PROJECT No:	DRAWING No:	REV:
SEP 2014	1:1	A3	CP	RDN	BETTS	109	A

DO NOT SCALE



The diagram illustrates a trench cross-section with the following labeled components:

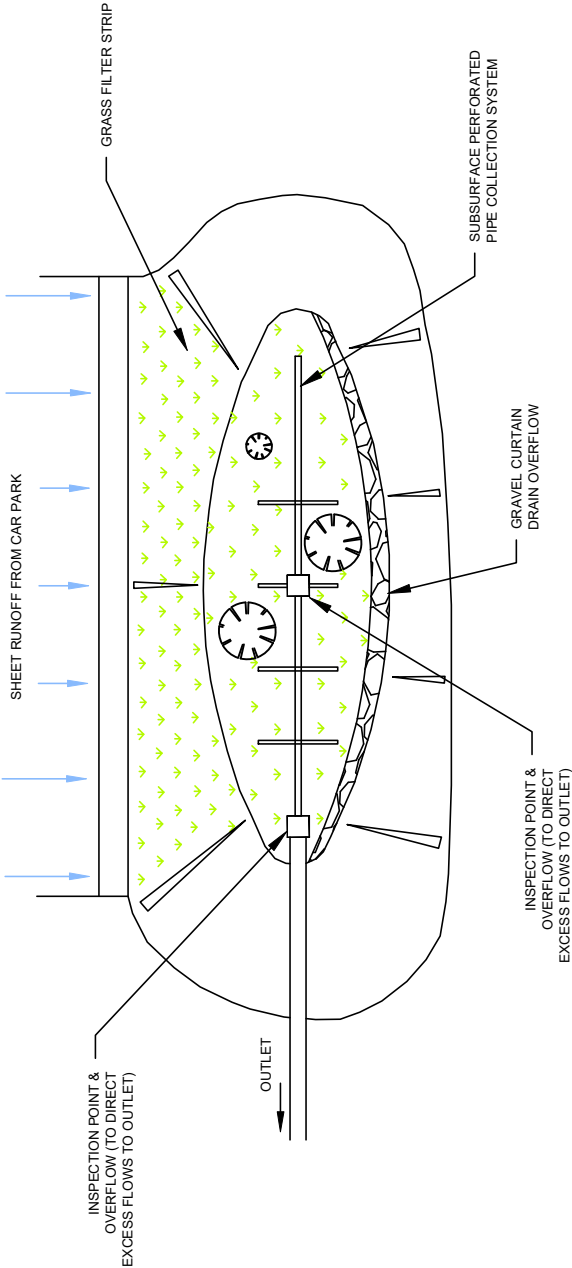
- PERMEABLE MATERIAL (IF REQUIRED)**: Located at the top left, pointing to the upper part of the trench wall.
- OUTLET STRUCTURE & FLOW CONTROL**: Located at the top right, pointing to the structure at the end of the trench.
- MAINTENANCE ACCESS**: Located at the bottom left, pointing to a vertical access point in the trench wall.



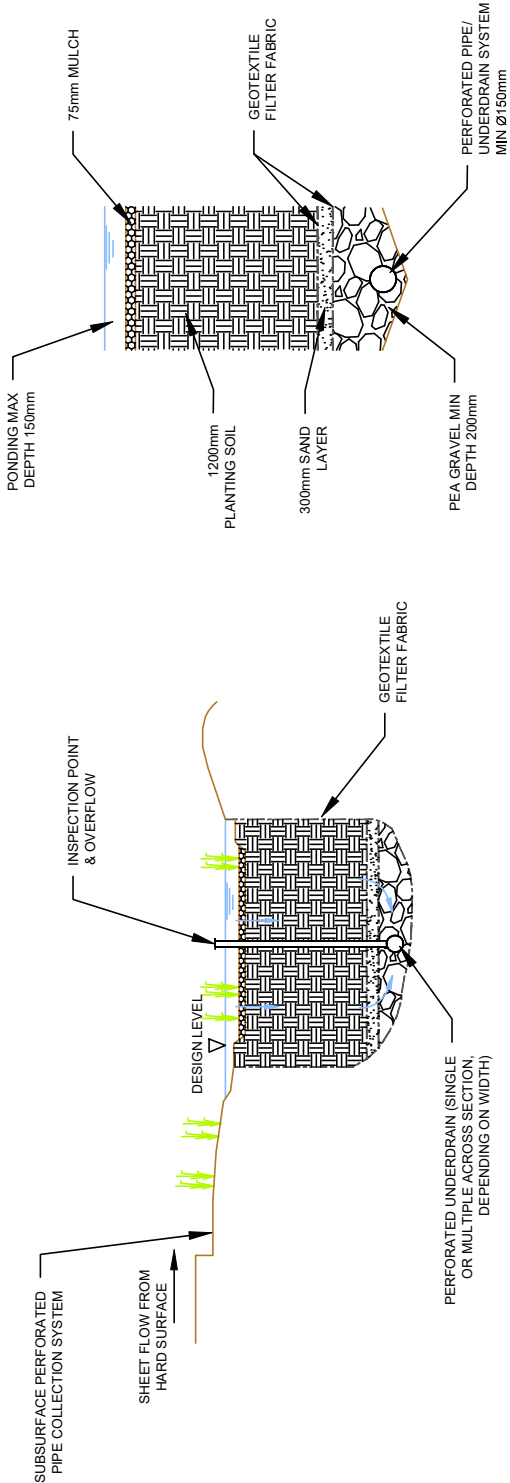
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DATE:	SCALE	SIZE:	DRAWN:	CHECKED:
SEP 2014	A3		CP	RDN
PROJECT No:		DRAWING No:		REV:
BETTS		111		A

DO NOT SCALE



PLAN VIEW



PROFILE

TYPICAL SECTION

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY



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PROJECT:

TYPICAL SUDS DETAIL

TITLE:

BIORETENTION APPLICATIONS

DATE:	SCALE:	SIZE:	DRAWN:	CHECKED:
SEP 2014	CP	A3	CP	RDN
PROJECT No:	BETTS	DRAWING No:	112	REV: A

APPENDIX M: NOTES OF LIMITATIONS

The data essentially comprised a study of available documented information from various sources together with discussions with relevant authorities and other interested parties. There may also be circumstances at the site that are not documented. The information reviewed is not exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. If additional information becomes available which might impact our conclusions, we request the opportunity to review the information, reassess the potential concerns and modify our opinion if warranted.

It should be noted that any risks identified in this report are perceived risks based on the available information.

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