PSA DESIGN

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CIVIL, STRUCTURAL, GEOTECHNICAL TRANSPORT

Our Reference : D2233-L-FRA-01
Your Reference :

10 June 2016

Mr & Mrs Lambert
Spout Farm
Preston Road
Longridge
PR3 3BE

3201605 80P

Dear Sirs,

Proposed Residential Development, Spout Farm, Longridge, PR3 3BE
Flood Risk Assessment & Drainage Strategy

Introduction

PSA Design Ltd has been commissioned by Mr & Mrs Lambert to prepare a Flood Risk Assessment & Drainage Strategy in support of an application for 34 residential dwellings at the above site.

Background

On the 16th January 2014, planning consent was granted for a development on the above site comprising 32 dwellings and alterations to the existing site access following site clearance (App Ref: 3/2013/0782). As part of the previously approved planning application, a Flood Risk Assessment (FRA) and Drainage Strategy were produced. These reports are included for reference within Annex C & D respectively.

The Old Bank House
6 Berry Lane
Longridge
Preston PR3 3JA
T: 01772 786066
F: 01772 786265
E: mail@psadesign.co.uk
www.psadesign.co.uk

ace

FRA

Since the production of the 2013 FRA there have been no changes to the data, mapping and reports that are used to assess potential risk of flooding from the various sources. When compared to the approved layout the revised scheme has no detrimental impact in relation to flood risk.

It is therefore concluded, that in terms of flood risk, the site can be delivered to meet the current requirements set out within Planning Policy Guidance (PPG).

The impacts and effects of the surface water drainage regime, which are integral to the FRA are discussed in further detail below.

Drainage Strategy – Surface Water

The previous approved drainage strategy proposed a surface water connection into the existing culvert serving the site. The revised scheme proposes to use the same. Extensive percolation tests were undertaken on site and none suggested that drainage via infiltration would be feasible.

A predevelopment application was made to UU in February 2016 (Ref DE1881). The correspondence from UU is included in Annex A. UU indicated that if drainage via infiltration wasn't viable due to ground conditions then surface water from the proposed site could be drained into the public sewer network on College Close (some 270m north of the site). The agreed discharge rate was 14l/s. However, given that discharge to a sewer is further down the SuDS hierarchy then the connection into the internal surface water system (which subsequently connects into the local ditch network) continues to be the preferred solution.

An assessment of the impermeable areas associated with the revised scheme has been calculated and illustrated on drawing D2233-D-03. The total area is calculated at 7,330m^2. This is almost identical to the previous scheme which measured 7,300m^2. It is therefore concluded that the existing discharge rates contained within the original approved application are appropriate for the revised scheme. Run-off from the proposed development is therefore set at 10.7 l/s up to and including the 1 in 100yr event + 30% climatic change.

A surface water scheme for the new proposal has been designed and is shown on drawing D2233-D-01. The philosophy behind the design is to utilise porous paving for all driveways and paths. Building roofs, main collector roads and their associated footways will be traditionally drained via a piped system.

In order to restrict surface water run-off from the proposed development a Hydro-Brake flow control manhole has been specified immediately upstream of the outfall into the existing

system. The flow control unit is designed to ensure that the peak run-off rate is maintained to a maximum of 10.7l/s at 1.05m head. The storage required to attenuate the flow has been specified in the form of a Versavoid cellular storage solution. Versavoid has been selected as it is the only approved supplier to various national water companies and it is fully accessible for jetting and camera surveys.

WinDES Microdrainage has been used to calculate the storage requirements. The volume calculated takes no account of the upstream storage available in the remainder of the system and therefore offers a robust assessment. The total volume requirement for the 1 in 100yr + cc event has been calculated at 193.6m^3. The storage tank specified has a capacity of 201.6m^3. The calculations are included in Annex B.

It is therefore concluded that a surface water scheme can be delivered to meet the requirements of Local Authority (LA), Environment Agency (EA) and PPG Guidelines.

Drainage Strategy – Foul Sewage

The previous approved drainage strategy proposed that foul sewers be drained via a sewage treatment plant with an outfall into the above surface water network. Since the original application policy has changed a little which has meant we have further considered a connection into the United Utilities (UU) public sewer. The nearest public foul sewer is located on Preston Road, near its junction with College Close (UU Manhole Ref 1302). This sewer is approximately 270m north of the proposed site and therefore falls within the distance deemed appropriate by the EA. (i.e. 34 properties x 30m = 1,020m).

A predevelopment application was made to UU in February 2016 (Ref DE1881). UU indicated that a free foul discharge could be made into UU MH 1302 subject to a formal application. The correspondence from UU is included in Annex A.

It is therefore proposed to drain the internal site via a gravity fed system, ultimately outfalling in to an appropriately designed pumping station facility. A rising main will then be laid along Preston Road prior to outfalling into UU MH 1302. The formal connection approval will be subject to a S106 application once planning has been granted. The pumping station and associated rising main will also be subject to detailed design and the subsequent approval from UU and/or the LA.

The proposed scheme is illustrated on drawing D2233-D-01 and 02.

It is therefore concluded that subject to detailed design and formal approval from UU that a suitable foul drainage system can be delivered to meet the requirements of the proposed development.

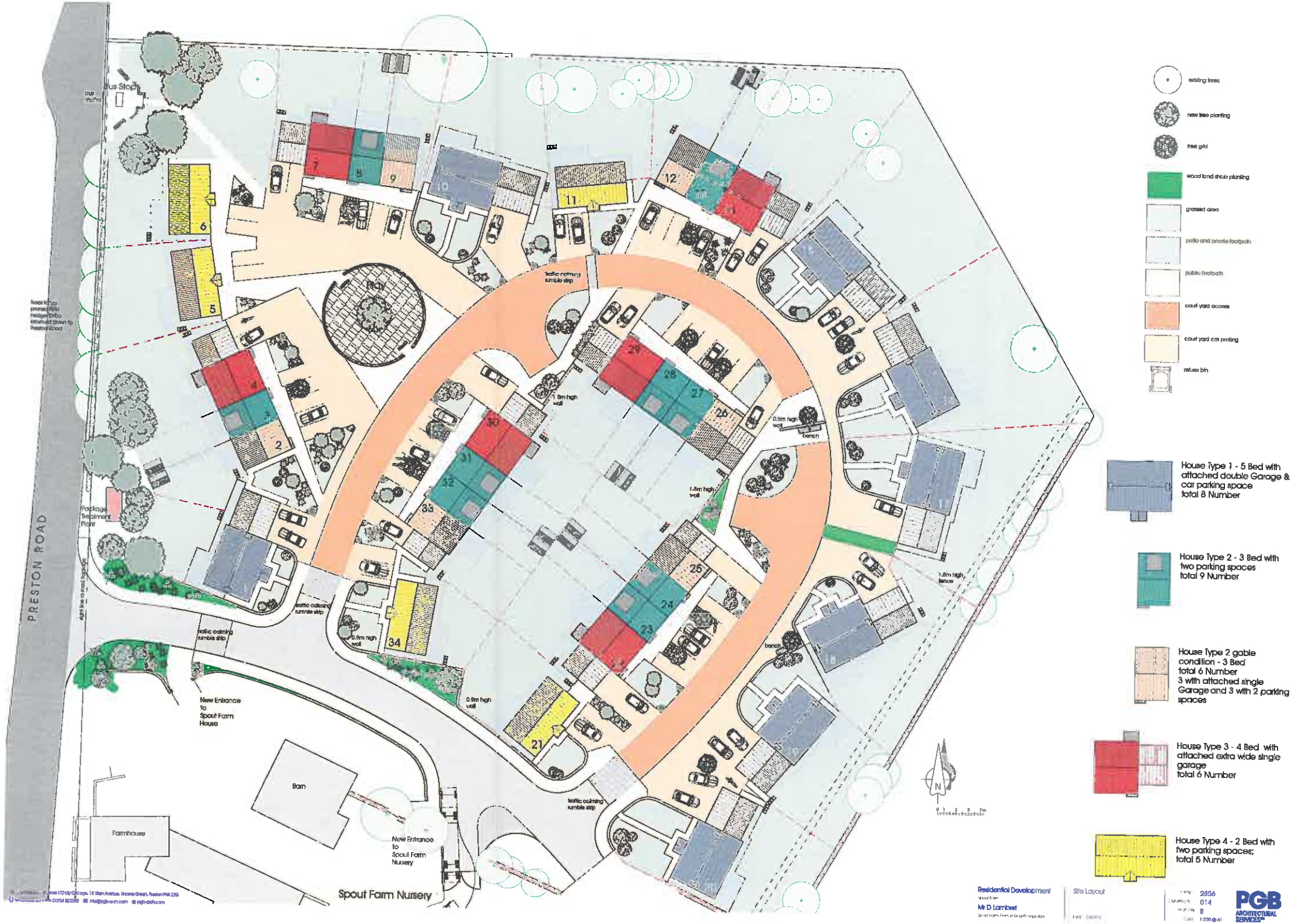
Conclusion

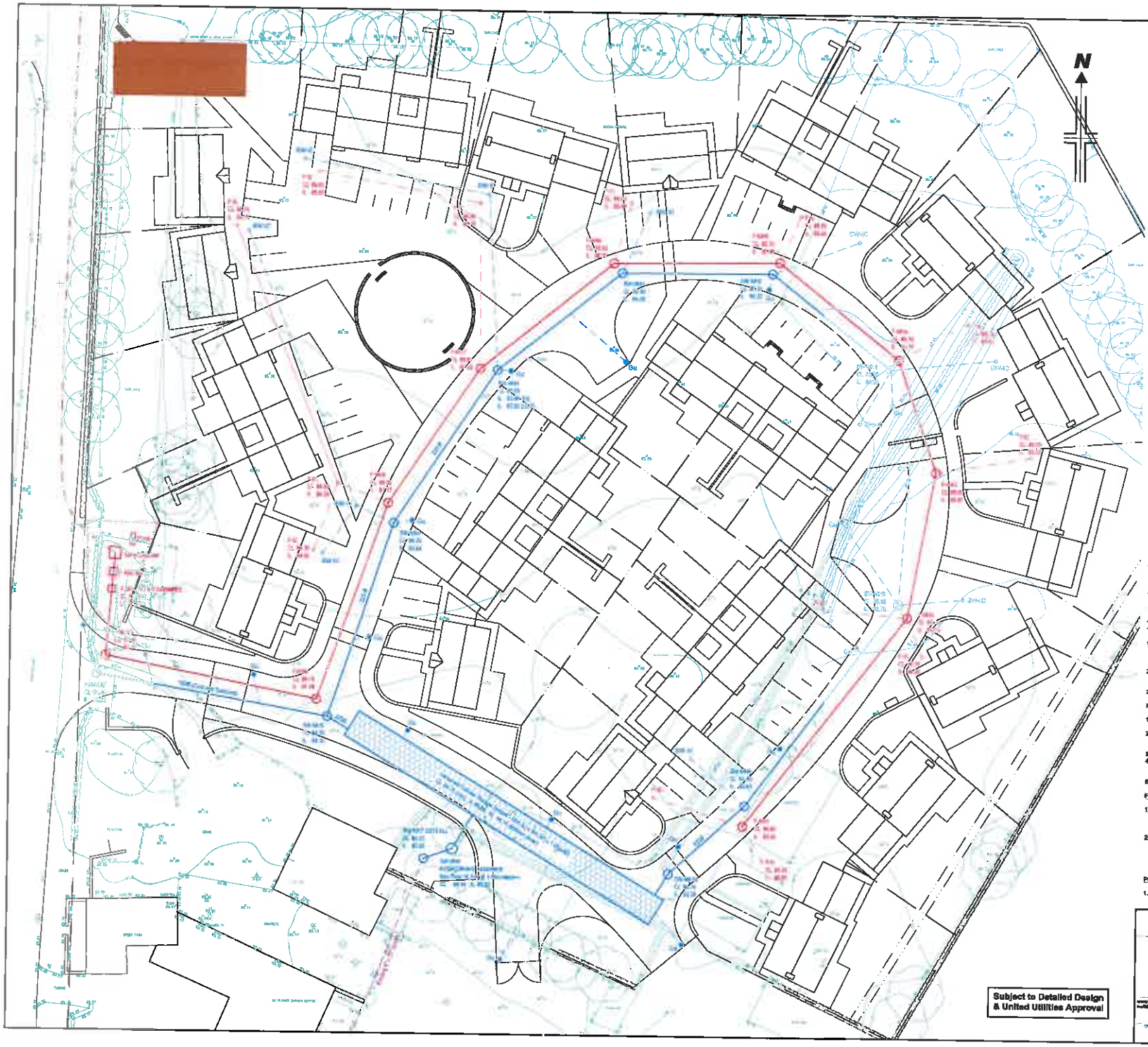
The above assessment, in conjunction with those previously approved, demonstrates that the site is not at risk of flooding and a sustainable and compliant drainage scheme can be delivered to meet with all necessary policies and guidelines.

Yours sincerely,

Graham Sanderson
Director, PSA Design Ltd.

Drawings


Bus Stop
PRESTON ROAD
trees to be pruned into hedge to be trimmed down to Preston Road
Package Treatment Plant
New Entrance to Spout Farm House
New Entrance to Spout Farm Nursery
Barn
Farmhouse
Spout Farm Nursery
traffic calming rumble strip
1.8m high wall
0.9m high wall
1.8m high fence
bench
existing trees
new tree planting
tree grid
wood land shrub planting
grassed area
patio and private footpath
public footpath
court yard access
court yard car parking
refuse bin
House Type 1 - 5 Bed with attached double Garage & car parking space total 8 Number
House Type 2 - 3 Bed with two parking spaces total 9 Number
House Type 2 gable condition - 3 Bed total 6 Number 3 with attached single Garage and 3 with 2 parking spaces
House Type 3 - 4 Bed with attached extra wide single garage total 6 Number
House Type 4 - 2 Bed with two parking spaces; total 5 Number
Residential Development
Mr D Lambert
Site Layout
2856
074
8
1:250 @ A1
PGB ARCHITECTURAL SERVICES



LEGEND

Surface Water

- SW-MH — PROPOSED S.W DRAINAGE WITH 1200mm (min) PCC RING MH 150mm dia. at 1 in 150 (min) gradient U.N.O.
- EXISTING PRIVATE SURFACE WATER
- SW-IC — 450mm Inspection Chamber 150mm dia at 1 in 100 (min) gradient U.N.O.
- Gu — STANDARD ROAD GULLY - 150mm Connection

Foul Water

- F-MH — PROPOSED FOUL WATER DRAINAGE WITH 1200mm PCC RING MH 150mm dia. at 1 in 100 (min) gradient U.N.O.
- UU-MH — EXISTING PUBLIC F.W. SEWER
- F-IC — 450mm I.C. 100mm dia. at 1 in 80 (min) gradient U.N.O.
- F-IC — PROPOSED RISING MAIN

Notes

1. Do not scale from this drawing, work to levels and dimensions shown, if not available refer to notes, if in doubt, refer to Engineer.
2. Drawing to be read in conjunction with all other scheme drawings and relevant specifications.
3. Contractor to be responsible for the location and protection of all existing services.
4. Work to be undertaken in accordance with BFA 7th Edition and Building Regulations - Document H.
5. All drains to be laid soffit to soffit unless otherwise indicated.
6. Steeper gradients may be used instead of backdrops.
7. Cover levels shown are approximate only and should be altered to suit finished surface levels.
8. Minimum depth of cover to crown of pipe without protection should be as follows:
   - 0.38m - Gardens and Pathways with no vehicular loading
   - 0.60m - Driveways, Parking Areas and Narrow Accesses with height restrictions to prevent entry by vehicles with a gross weight in excess of 7.5 tonnes
   - 0.9m - Driveways, Parking Areas and Narrow Accesses with limited access to vehicles with a gross weight in excess of 7.5 tonnes. Agricultural land and public open space.
   - 1.2m - Other Highways and Parking Areas with unrestricted access to vehicles with a gross weight in excess of 7.5 tonnes
9. All rainwater pipes (RWP) to be terminated at roddable gullies connected to a minimum 100mm dia. drain.
10. Unless stipulated otherwise or invert levels are provided, all surface water pipes (carrying roofs free ons RWP/Gully) to be minimum 150mm dia. laid at 1 in 150. Foul sewers from IC's to be minimum 100mm dia laid at 1 in 80. Main Foul sewers to be 150mm dia laid at 1 in 100.
11. All Road Gully connections to be 150mm ø
12. Proposed PCC Manholes & Inspection Chambers and access points are to be as those defined in BFA 7th Edition. MH & IC diameters specified are minimum diameters
13. All internal gullies, plumbing connections, soil stacks, SVPs and all other connections of foul and surface water drains to below ground to be fitted with accessible resting points above slab level.
14. Any drains passing through brick footings are to have r.c. lintels over and flexible joints either side.
15. All drainage passing through external walls to have cement fibre sheet collars provided either side of wall to prevent vermin entry. All drains running under building to be encased in 100mm granular fill.
16. Where drain is within 1m of a building, the trench is filled with concrete up to the underside of the foundations and where the trench is further away than 1m from the building, the trench is filled with concrete to a level below the lowest level for the building equal to the distance from the building, less 150mm.
17. Driveways & associated private access to be porous paved.
18. Threshold drains to be installed where appropriate to ensure no surface water migration in to properties.
19. Drainage indicated on drawing around buildings spaced out for illustrative purposes, exact positions of drains may be altered to suit and determined on site prior to commencement of work (subject to maintaining minimum gradients and cover). Any revisions are to be subject to the approval of the Local Building Inspector.
20. Outfall invert and cover levels to be confirmed prior to commencement. Contractor responsible to ensure that the pipes are in good condition to outfall and if necessary repaired prior to commissioning system.
21. Contractor responsible for the location and protection of all services.

PLUMBING AND WC PROVISIONS:

1. SVP's to be 100mm diameter straight and vertical between top and bottom connection terminating in cast iron 900mm above any opening.
2. SVP to discharge directly into inspection chamber via 100mm-diameter rest bend. Internal SVP's encased in 2 x 12.5mm fireline board and slabs and lined quilt insulation for soundproofing (or otherwise approved)
3. W.C. bodies connected by 100mm-diameter pipe to SVP or directly to drain
4. Wash hand basins, sinks to have 75mm deep seal anti-syphonic traps, discharging respectively through 30mm, 40mm and 40mm diameter waste pipe to SVP or directly to B.I.O. Where washing machines, pipe to be 50mm dia.
5. Soil and waste pipes to have cleaning access at all changes of direction.

Flow Control & Surface Water Attenuation

1. Hydrobrake flow control unit and associated manhole to be as per Hydro International recommendations based on maximum flow of 10.7ls at 1.05m head. System to be fitted strictly in accordance with manufacturers guidelines.
2. Attenuation tank to be Wavecrest system - 50m (L) x 4m (W) x 1.05m (D). Minimum cover to system to be 600mm. Formation level to achieve CBR of 3-5% (150mm concrete base preferred). System to be fitted with necessary property vents and access chambers to allow for jetting and CCTV access. All to be constructed strictly in accordance with manufacturers guidelines. Upstream IC's and MH's immediately prior to connection in to the tank to include a silt trap (min 300mm).

Pumping Station & Rising Main

1. Final details of Pumping arrangement and associated Rising Main to be agreed with United Utilities

Mr & Mrs Lambert

Spout Farm, Longridge

Proposed Foul & Surface Water Drainage Design

Scale: 1:250 @ A1

Drawn	Checked	Approved
GS	GS	

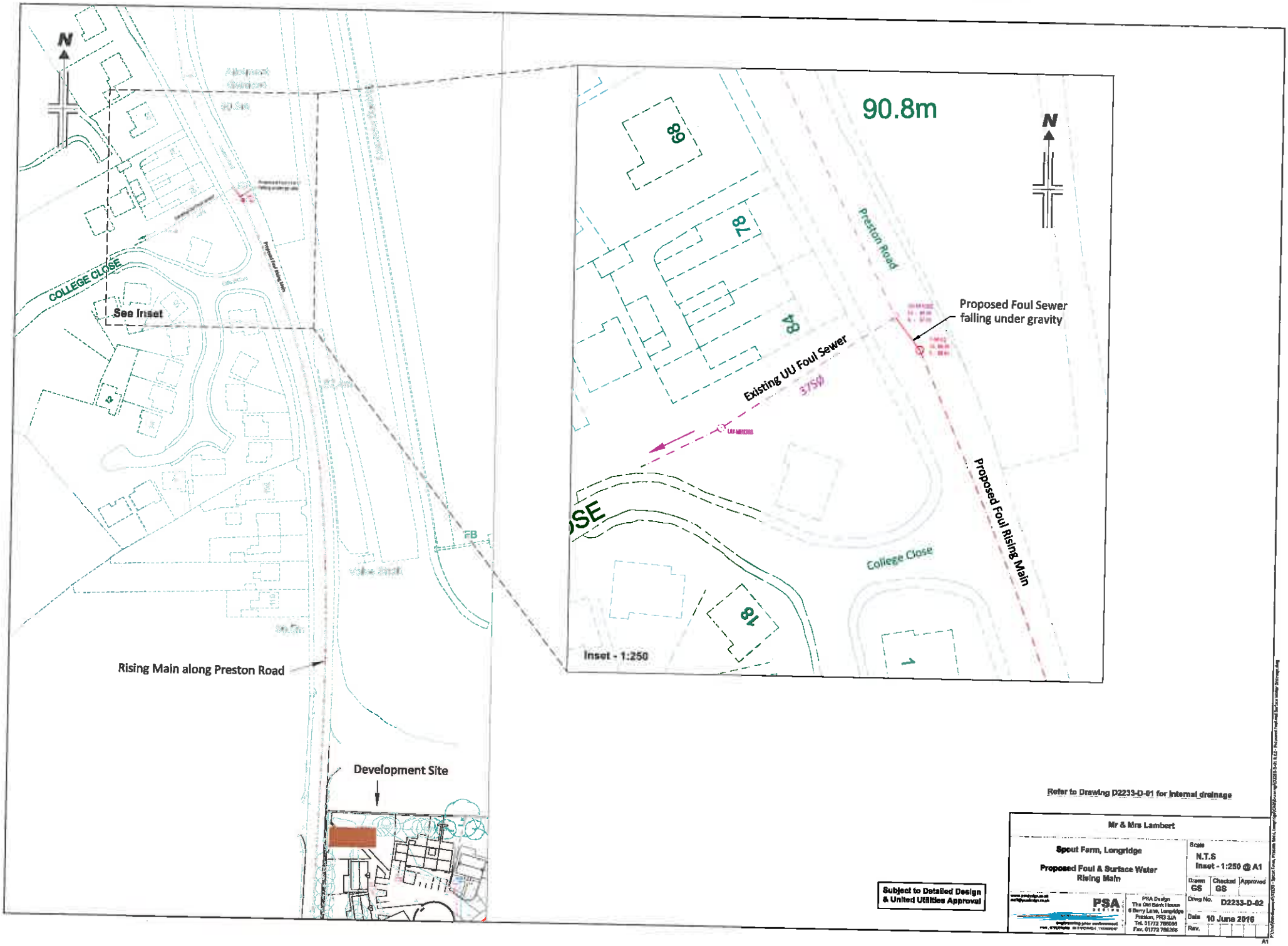
Drwg No. D2233-D-01

Date: 10 June 2016

Rev.

PSA Design
The Old Bank House
8 Berry Lane, Longridge
Preston, PR3 3JA
Tel. 01772 786388
Fax. 01772 784288

A1



Refer to Drawing D2233-D-01 for internal drainage

Subject to Detailed Design & United Utilities Approval

Mr & Mrs Lambert

Spout Farm, Longridge

Proposed Foul & Surface Water Rising Main

Scale: N.T.S Inset - 1:250 @ A1

Drawn: GS | Checked: GS | Approved:

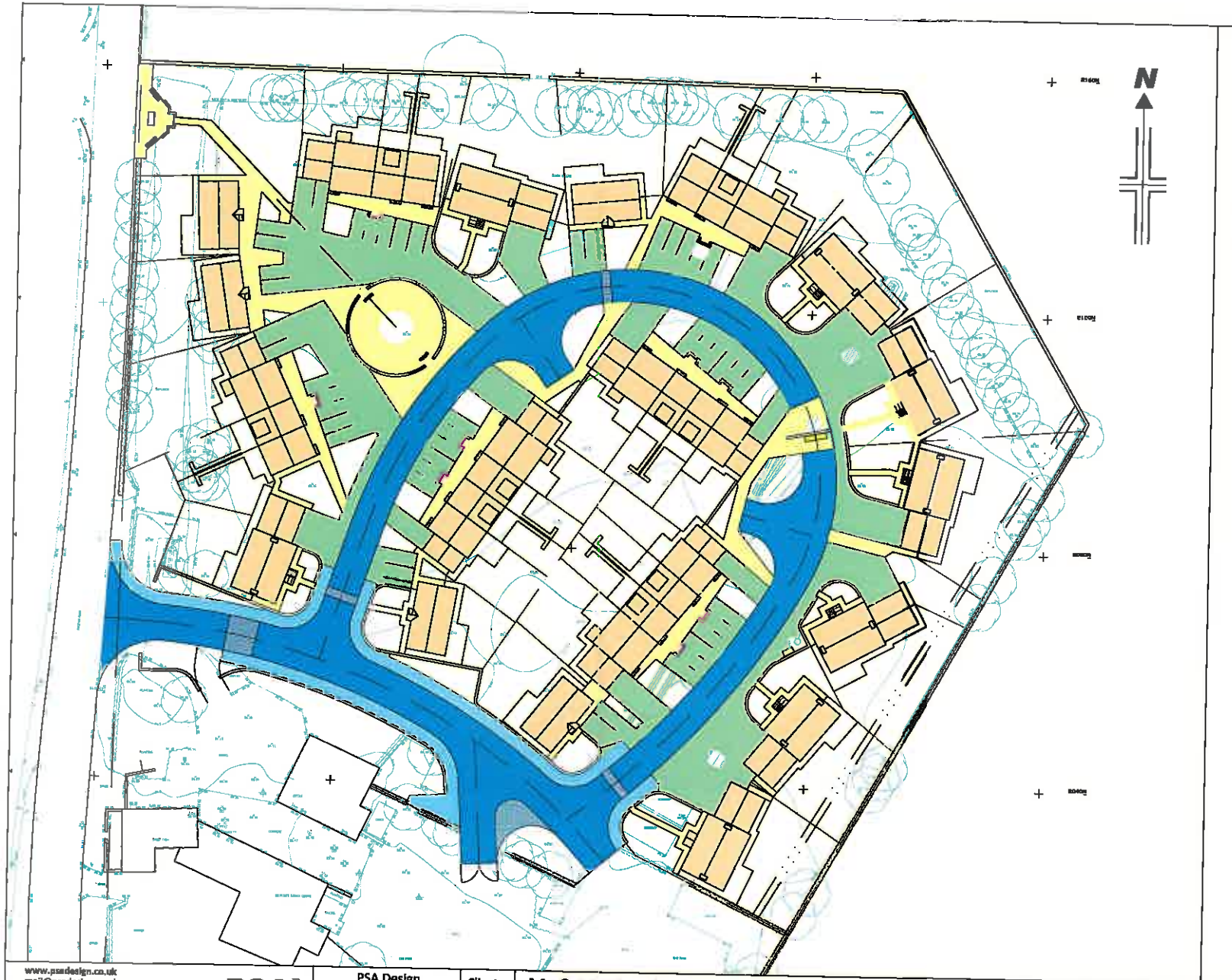
Drwg No. D2233-D-02

Date: 10 June 2016

Rev.

PSA Design
The Old Bank House
6 Berry Lane, Longridge
Preston, PR3 3JA
Tel. 01772 786068
Fax. 01772 786069

A1



Areas

Roads	1,750m²
Footways	365m²
Driveway	2,380m²
Building	2,480m²
Pathway	355m²

TOTAL = 7,330m²

www.psadesign.co.uk
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The Old Bank House
6 Berry Lane, Longridge
Preston, PR3 3JA
Tel. 01772 786066
Fax. 01772 786265

Client	Mr & Mrs Lambert	Drawn	GS	Date	08.06.2016	Drg No.	D2233-D-03
Job	Spout Farm, Longridge	Check	GS				
Title	Impermeable Areas Plan	Appr.	GS	Scale	N.T.S. @ A3	Rev.	

P:\Jobs\Development\D2233 - Spout Farm, Preston Road, Longridge\CAD\Drawings\D2233-D-03 - Proposed Impermeable Areas.dwg

Annex A – United Utilities Pre-Development Enquiry

From: McDermott, Daniel [mailto:Daniel.McDermott@uuplc.co.uk]
Sent: 05 February 2016 09:44
To: Scott Cowan
Cc: Wastewater Developer Services
Subject: RE: DE1881 Sprout Farm, Preston Road, Longridge, PR3 3BE due 19.02.2016

Good Morning Scott,

We have carried out an assessment of your application which is based on the information provided; this pre development advice will be valid for 12 months .

Foul will be allowed to drain to the public foul sewer network. Our preferred point of discharge would be to the 375mm foul sewer on B6244 at an unrestricted rate.

Surface water from this site must drain to soak away or some other form of infiltration system but if ground conditions confirm that this is not a viable solution all surface water can drain to the 300mm surface water sewer on College Close at a maximum pass forward flow of 14 l/s.

Please be aware that the public sewerage system is some considerable distance from your proposed development, Although the development will have the right to connect this will be at the developers expense.

Although we may discuss and agree discharge points & rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below

http://www.unitedutilities.com/connecting-public-sewer.aspx

You may wish to offer the proposed new sewers for adoption. United Utilities assess adoption application based on Sewers adoption 6th Edition and for any pumping stations our company addenda document. Please refer to link below to obtain further guidance and application pack:

http://www.unitedutilities.com/sewer-adoption.aspx

Please be aware that on site drainage must be designed in accordance with Building Regulations, National Planning Policy, Planning Conditions and local flood authority guidelines, we would recommend that you laise and make suitable agreements with the relevant statutory bodies.

If I can be of any further assistance please don't hesitate to contact me.

Regards

Daniel McDermott
Assistant Developer Engineer
Developer Services and Planning
Operational Services
United Utilities
T: 01925679409
Unitedutilities.com

Annex B – WinDES Calculations

Rainfall Details

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	18.800	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.300	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.460

Time (mins) from:	to:	Area (ha)
0	4	0.460

Cellular Storage Details

Infil Coef - Base (m/hr) 0.000000 Porosity 0.96
Infil Coef - Sides (m/hr) 0.000000 Invert Level (m) 100.000
Safety Factor 1.0 Ground Level (m) 102.000

Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)
0.00	200.0	200.0	0.70	200.0	275.6	1.40	0.0	308.0	2.10	0.0	308.0
0.10	200.0	210.8	0.80	200.0	286.4	1.50	0.0	308.0	2.20	0.0	308.0
0.20	200.0	221.6	0.90	200.0	297.2	1.60	0.0	308.0	2.30	0.0	308.0
0.30	200.0	232.4	1.00	200.0	308.0	1.70	0.0	308.0	2.40	0.0	308.0
0.40	200.0	243.2	1.10	0.0	308.0	1.80	0.0	308.0	2.50	0.0	308.0
0.50	200.0	254.0	1.20	0.0	308.0	1.90	0.0	308.0			
0.60	200.0	264.8	1.30	0.0	308.0	2.00	0.0	308.0			

Hydro-Brake Outflow Control

Design Head (m) 1.050 Hydro-Brake Type MD6 Invert Level (m) 100.000
Design Flow (l/s) 10.7 Diameter (mm) 135

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	4.4	0.60	9.2	1.60	13.1	2.60	16.7	5.00	23.2	7.50	28.4
0.20	9.2	0.80	9.7	1.80	13.9	3.00	17.9	5.50	24.3	8.00	29.3
0.30	10.0	1.00	10.5	2.00	14.6	3.50	19.4	6.00	25.4	8.50	30.2
0.40	9.8	1.20	11.4	2.20	15.4	4.00	20.7	6.50	26.4	9.00	31.1
0.50	9.4	1.40	12.3	2.40	16.0	4.50	22.0	7.00	27.4	9.50	31.9

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 165 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	10.0	0.0	10.0	100.4517	0.4517	86.8	O K
30 Summer	10.0	0.0	10.0	100.6063	0.6063	116.4	O K
60 Summer	10.0	0.0	10.0	100.7548	0.7548	144.9	O K
120 Summer	10.0	0.0	10.0	100.8573	0.8573	164.6	O K
180 Summer	10.0	0.0	10.0	100.8798	0.8798	168.9	O K
240 Summer	10.0	0.0	10.0	100.8793	0.8793	168.8	O K
360 Summer	10.0	0.0	10.0	100.8623	0.8623	165.6	O K
480 Summer	10.0	0.0	10.0	100.8318	0.8318	159.7	O K
600 Summer	10.0	0.0	10.0	100.7958	0.7958	152.8	O K
720 Summer	10.0	0.0	10.0	100.7573	0.7573	145.4	O K
960 Summer	10.0	0.0	10.0	100.6788	0.6788	130.3	O K
1440 Summer	10.0	0.0	10.0	100.5237	0.5237	100.5	O K
2160 Summer	10.0	0.0	10.0	100.3382	0.3382	64.9	O K
2880 Summer	9.6	0.0	9.6	100.2442	0.2442	46.9	O K
4320 Summer	8.0	0.0	8.0	100.1758	0.1757	33.7	O K
5760 Summer	6.6	0.0	6.6	100.1458	0.1458	27.9	O K
7200 Summer	5.6	0.0	5.6	100.1257	0.1258	24.1	O K
8640 Summer	4.9	0.0	4.9	100.1107	0.1108	21.3	O K
10080 Summer	4.4	0.0	4.4	100.0998	0.0998	19.2	O K
15 Winter	10.0	0.0	10.0	100.5097	0.5097	97.9	O K
30 Winter	10.0	0.0	10.0	100.6858	0.6858	131.7	O K
60 Winter	10.0	0.0	10.0	100.8573	0.8573	164.6	O K
120 Winter	10.4	0.0	10.4	100.9838	0.9838	188.9	O K
180 Winter	10.5	0.0	10.5	101.0088	1.0088	193.6	O K
240 Winter	10.5	0.0	10.5	101.0033	1.0033	192.6	O K
360 Winter	10.4	0.0	10.4	100.9748	0.9748	187.2	O K
480 Winter	10.2	0.0	10.2	100.9258	0.9258	177.7	O K
600 Winter	10.0	0.0	10.0	100.8688	0.8688	166.8	O K
720 Winter	10.0	0.0	10.0	100.8083	0.8083	155.2	O K
960 Winter	10.0	0.0	10.0	100.6833	0.6833	131.2	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	108.38	18
30 Summer	74.81	32
60 Summer	49.39	62
120 Summer	31.44	120
180 Summer	23.72	148
240 Summer	19.26	180
360 Summer	14.37	248
480 Summer	11.65	318
600 Summer	9.89	386
720 Summer	8.65	456
960 Summer	6.99	588
1440 Summer	5.16	840
2160 Summer	3.80	1188
2880 Summer	3.06	1524
4320 Summer	2.24	2204
5760 Summer	1.80	2936
7200 Summer	1.52	3672
8640 Summer	1.32	4408
10080 Summer	1.18	5136
15 Winter	108.38	18
30 Winter	74.81	32
60 Winter	49.39	60
120 Winter	31.44	116
180 Winter	23.72	168
240 Winter	19.26	190
360 Winter	14.37	268
480 Winter	11.65	346
600 Winter	9.89	420
720 Winter	8.65	494
960 Winter	6.99	636

Summary of Results for 100 year Return Period (+30%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
1440 Winter	10.0	0.0	10.0	100.4342	0.4342	83.4	O K
2160 Winter	9.5	0.0	9.5	100.2312	0.2312	44.4	O K
2880 Winter	8.1	0.0	8.1	100.1777	0.1777	34.1	O K
4320 Winter	6.0	0.0	6.0	100.1338	0.1338	25.7	O K
5760 Winter	4.9	0.0	4.9	100.1097	0.1098	21.1	O K
7200 Winter	4.1	0.0	4.1	100.0938	0.0938	18.0	O K
8640 Winter	3.6	0.0	3.6	100.0817	0.0818	15.6	O K
10080 Winter	3.2	0.0	3.2	100.0728	0.0728	13.9	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
1440 Winter	5.16	880
2160 Winter	3.80	1188
2880 Winter	3.06	1500
4320 Winter	2.24	2208
5760 Winter	1.80	2936
7200 Winter	1.52	3672
8640 Winter	1.32	4408
10080 Winter	1.18	5136

Annex C – 2013 FRA

PSA DESIGN

engineering your environment

CIVIL STRUCTURAL GEOTECHNICAL TRANSPORT

Mr D Lambert

Proposed Residential Development, Spout Farm, Preston Road, Longridge

Flood Risk Assessment

D1654 14th August 2013 – Revision A

PSA Design Ltd
Consulting Engineers
The Old Bank House
6 Berry Lane
Longridge
Preston PR3 3JA

Tel. 01772 786066
Fax. 01772 786265

www.psadesign.co.uk
mail@psadesign.co.uk

Document Control Sheet

Proposed Residential Development, Spout Farm, Preston Road, Longridge

Flood Risk Assessment

Job	Date	Issue	Copy
D1654	14th Aug 2013	Rev A	

Originator.....G Sanderson... .....

Checker.....D Wallbank..... .....

Approver.....G Sanderson..... .....

Contents

1. Development & Site Description

1.1. PSA Design has been commissioned by Mr D Lambert of Spout Farm to undertake a Flood Risk Assessment in support of an OUTLINE Planning Application. The proposed development is for the construction of 32 residential dwellings with associated access and parking arrangements.

1.2. The application site consists of an area of land extending to 1.78 hectares and is located off Preston Road, Longridge, Preston. A site location plan is included as Figure 1, with an aerial photo and birds eye view included as Figures 2 and 3

1.3. The site is located at NGR 360260 E 436035 N

1.4. The proposed site layout can be seen on the Architects Layout Drawing 02.

2. Compliance with National Planning Policy Framework (NPPF)

2.1. Under the requirements of NPPF, the Local Authority is required to apply a risk-based sequential test to new developments. This allows them to direct development to areas which are at the lowest probability of flooding.

2.2. Reference the Environment Agency's online flood mapping indicates that the site lies well outside an area at risk of flooding and in accordance with NPPF Technical Guidance is therefore located with Flood Zone 1.

2.3. With reference to Table 2 from NPPF Technical Guidance a development consisting of "dwelling houses" would fall into the "More Vulnerable" classification.

2.4. In accordance with Table 3 the site proposals would therefore be deemed "appropriate"

2.5. Therefore there will be no requirement for a Sequential Test or Exception Test to be carried out for this development.

2.6. As well as the more common direct flood risks associated with rivers and seas, NPPF requires that all sources of flooding are assessed. Those risks are identified and assessed in section 3 below.

3. Sources of Flooding

3.1. Tidal and Fluvial Flood Risk

3.1.1. Environment Agency mapping shows the site lying outwith an area at risk of flooding and therefore within Flood Zone 1.

3.1.2. Flood Zone 1 is defined "Low Probability" and comprises of land assessed as having less than 1 in 1000 annual probability of river or sea flooding (<0.1).

3.1.3. In view of the above there is a very low risk of fluvial/tidal flooding to the site

3.2. Overland Flow

3.2.1 Inspection of the aerial photograph and the topography of the land has not identified any significant areas of hardstanding which could feasibly shed floodwater onto the development.

3.2.2 It is therefore considered flood risk from this source is expected to be very low

3.3. Groundwater Flooding

3.3.1 No detailed ground investigation has been undertaken to date. However it is considered unlikely that ground water flooding would be an issue in this area. Review of the EA mapping suggests the site lies outside a groundwater protection zone..

3.3.2 BGS (British Geological Survey) mapping for the site area shows that the underlying bed rock geology is Warley Wise Grit, consequently the area is not highlighted in the BGS 'areas susceptible to groundwater flooding' dataset.

3.3.3 Given the flat nature of the topography, any ground water flooding would be very shallow and therefore any impact would be negligible.

3.3.4 It is therefore considered flood risk from this source is expected to be extremely low

3.4. Surcharged Sewer Flooding

3.4.1. There are no known United Utilities adopted sewers in the area with properties draining direct to local watercourses / ditches. Foul sewage is generally dealt with via traditional septic tanks or more modern package sewage treatment systems

3.4.2. Given the flat nature of the topography, any sewer flooding would be very shallow and therefore any impact would be negligible

3.4.3. There are some known highway drainage flooding issues some 90m south of the proposed development, however these are isolated to a localised low spot and have no direct pathways into the proposed site. Investigation of the causes of this has identified poor maintenance of the outfall ditch as the likely reason. It is understood that the Local Authority are aware of the issue and it is currently being dealt with.

3.4.4. It is therefore considered flood risk from this source is expected to be extremely low.

3.5. Flooding from Reservoirs, Canals and Lakes.

3.5.1. The Environment Agency mapping shows the area at potential risk of flooding from the reservoirs immediately north of the site. The reservoirs present a risk to the surrounding area should the embankments fail or be overtopped.

3.5.2. As stated on the Environment Agency website, reservoirs in the UK have a good safety record with no incidents resulting in the loss of life since 1925. The Environment Agency as act as the enforcing authority for the Reservoirs Act 1974 in England and Wales. All large reservoirs must be inspected and supervised by reservoir panel engineers. The Environment Agency ensures that reservoirs are regularly inspected and essential safety

work is carried out. Given the high standard of maintenance required, flooding from reservoirs is considered very unlikely.

3.5.3. Local Authorities have recently been tasked with developing emergency plans for reservoir flooding. However due to the recent nature of this responsibility reservoir flood plans for Longridge are not currently available. Section 4.1 of the Level 1 SFRA for Ribble Valley states that "Under DEFRA guidlines, United Utilities, which own and manage some reservoir facilities in the area, are subject to strict controls on the publication of information relating to such matters and do not consider that potential reservoir related flooding issues would be used as grounds to refuse planning permission".

3.5.4. In summary, whilst he site area is shown to be in an area at risk of flooding from reservoirs, the probability of flooding from this source is considered to be very low. An emergency response plan specifically aimed to reduce risk from reservoir flooding is currently being developed for the Longridge area, meaning that the residual risk from this source to the proposed development is anticipated to decrease further once they are put into effect.

3.5.5. Review of online aerial and ordnance survey mapping shows no lakes or canals that could be of any risk to the site.

3.5.6. It is therefore considered flood risk from this source is expected to be low.

3.6. Flooding from Artificial Sources

3.6.1. Inspection of the aerial photograph and OS mapping has established that no artificial sources were identified in the vicinity of the site.

3.6.2. Flood risk from this source has not been considered further.

3.7 Review of Ribble Valley Strategic Flood Risk Assessment

3.7.1 The SFRA Level 1 been reviewed. The documents make no mention of any issues at the proposed development site.

4. Surface Water Management

4.1. A requirement of NPPF is to assess the impacts of the surface water run-off from the site. This is addressed and discussed in the following section.

4.2. It is clear that there will be a significant increase in impermeable area as a direct result of the proposed development. A separate Drainage Strategy report has been prepared for the development and this is included as Appendix A.

4.3. The report sets out a clear strategy for dealing with Surface Water run-off in a sustainable manner to meet and exceed the requirements and philosophy defined within NPPF.

5. Conclusions

5.1. It is important to note that this application is for OUTLINE planning with all but access matter reserved.

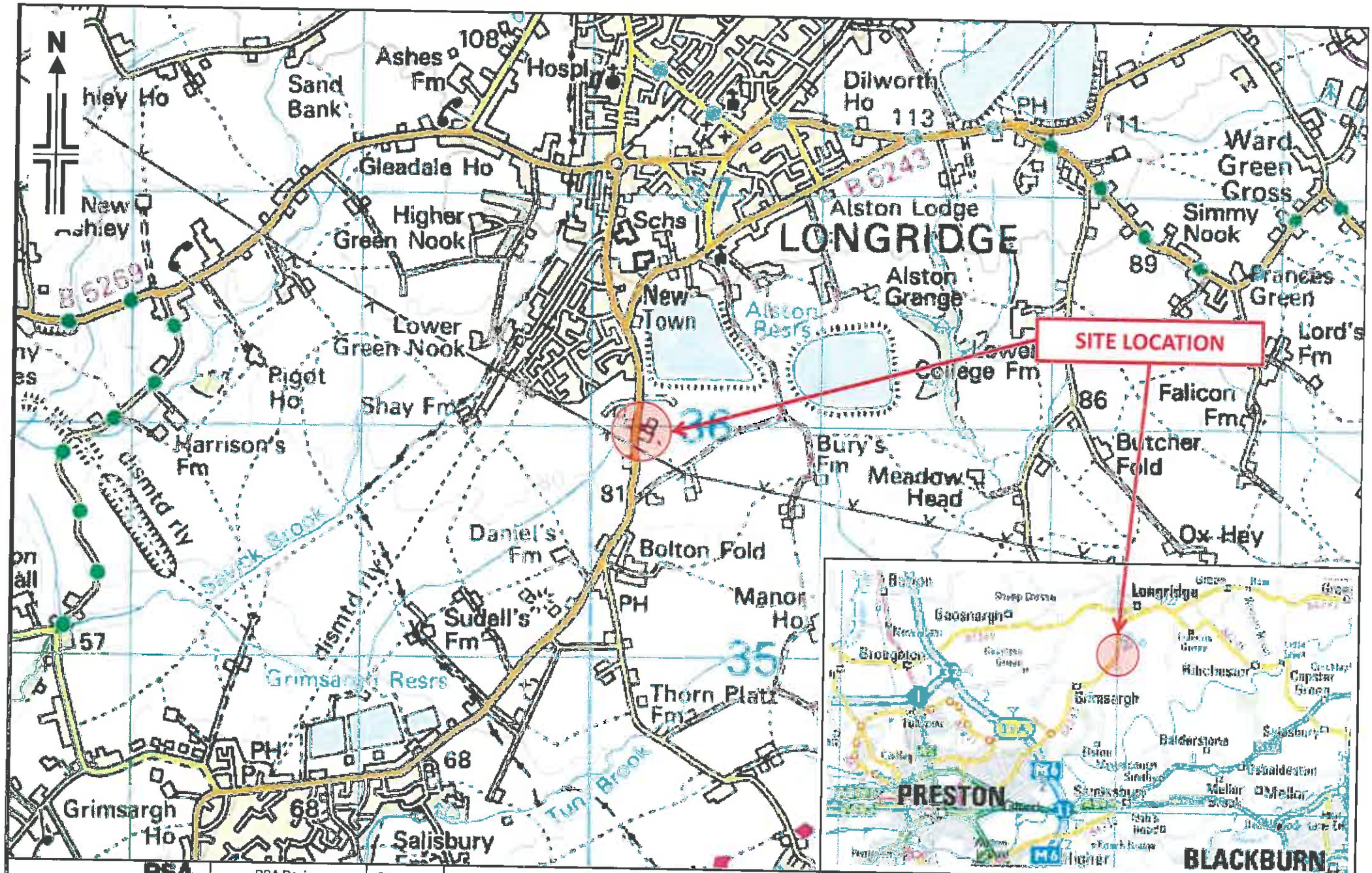
5.2. The site is located in Flood Zone 1 and therefore in accordance with NPPF is "appropriate" for all uses.

5.3. The assessment has indicated that the site is at very low risk from any other sources of flooding.

5.4. Surface water run-off from the site has been assessed within a separate drainage strategy report which outlined a solution to effectively reduce the impact on the local watercourses. Proposed surface water run-off rates, including for an allowance for climatic change, are restricted to the existing discharge rates, and in peak events actually significantly reduced.

It is therefore concluded that the proposed development can be constructed to meet the requirements of NPPF.

Figures & Drawings



PSA	PSA Design The Old Bank House 6 Berry Lane, Longridge Preston, PR3 3JA Tel. 01772 786066	Client	Mr & Mrs Lambert	Drawn	PJB	Date	27.03.13	Drawing No. Figure 1
		Job	Spout Farm, Longridge	Checked	DLW			
		Title	Regional Location Plan	Approved	DLW	Scale	NTS	Rev

PSA	PSA Design The Old Bank House 6 Berry Lane, Longridge Preston, PR3 3JA Tel. 01772 786066	Client	**Mr & Mrs Lambert**	Drawn	PJB	Date	**27.03.13**	Drawing No. **Figure 2**
		Job	**Spout Farm, Longridge**	Checked	DLW			
		Title	**Site Location Plan**	Approved	DLW	Scale	**NTS**	Rev

PSA	PSA Design The Old Bank House 6 Berry Lane, Longridge Preston, PR3 3JA Tel. 01772 786066	Client	**Mr & Mrs Lambert**	Drawn	PJB	Date	**27.03.13**	Drawing No. **Figure 3**
		Job	**Spout Farm, Longridge**	Checked	DLW			
		Title	**Aerial Photo**	Approved	DLW	Scale	**NTS**	Rev


Play
Spout Farm Nursery

Annex D – 2013 Drainage Strategy

PSA DESIGN

engineering your environment

CIVIL STRUCTURAL GEOTECHNICAL TRANSPORT

Mr D Lambert

Proposed Residential Development, Spout Farm, Preston Road, Longridge

Drainage Strategy

D1654 13th Aug 2013 – Revision A

PSA Design Ltd
Consulting Engineers
The Old Bank House
6 Berry Lane
Longridge
Preston PR3 3JA

Tel. 01772 786066
Fax. 01772 786265

www.psadesign.co.uk
mail@psadesign.co.uk

Document Control Sheet

Proposed Residential Development, Spout Farm, Preston Road, Longridge

Drainage Strategy

Job	Date	Issue	Copy
D1654	13th Aug 2013	Rev A	

Originator.....G Sanderson... .....

Checker.....D Wallbank..... .....

Approver.....D Wallbank..... .....

Contents

Figures

Drawings

Appendices

1. Introduction

1.1. PSA Design has been commissioned by Denis Lambert of Spout Farm to undertake a Flood Risk Assessment in support of an OUTLINE Planning Application Ref. The proposed development is for the construction of 37 residential dwellings with associated access and parking arrangements.

1.2. The application site consists of an area of land extending to 1.78 hectares and is located off Preston Road, Longridge, Preston. A site location plan is included as Figure 1, with an aerial photo and birds eye view included as Figures 2 and 3

1.3. The site is located at NGR 360260 E 436035 N

1.4. The proposed site layout can be seen on the Architects Layout.

1.5. The topographical survey and site layout are included as Drawing D1654-D-01

2. Surface Water Drainage Strategy

2.1. The Environment Agency will normally require that, for the range of annual flow rate probabilities, up to and including the 1% annual probability (1 in 100 year event) the developed rate of run-off into a watercourse should be no greater than the undeveloped rate of run-off for the same event. (In the case of brownfield sites, drainage proposals will be measured against the existing performance of the site). Water Authorities normally take a similar approach to that of the Environment Agency, however they would normally ask that flows be restricted to include up to the 3.33% annual probability (1 in 30 year event), whilst demonstrating that the 1 in 100 year event does not pose a threat to the locality (known as designing for exceedance).

2.2. Climate change (CC) will be taken into account by increasing the rainfall intensity by 30% in line with Environment Agency and NPPF Technical Guidance.

3. Existing Site Drainage

3.1. An extensive and intrusive site survey of the existing drainage network has been undertaken by the Client.

3.2. Figure 4, shows the route of the main collector drain that currently serves the site. A series of existing field drains in the form of traditional stone culverts collect water from the site eventually converging and discharging in to the run shown. Rainwater from the roofs of two outbuildings within the application boundary also connects into the main system. These will be demolished as part of the proposals

3.3. The culvert within the field is measured at approximately 9" x 12", giving a X.S.A of 0.07m^2, equivalent of a modern 300mm diameter pipe which has an effective capacity in the region of 80 to 110 l/s.

3.4. The total existing impermeable area is highlighted on drawing D1654-D-01, it has been calculated at 331m^2 (0.0331ha).

3.5. The total proposed impermeable area is also highlighted on drawing D1654-D-01, it has been calculated at 7300m^2 (0.7300ha).

3.6. Run-off rates from the existing development will therefore be made up from a combination of discharge from the existing buildings and that from the natural greenfield run-off.

3.7. IoH 124 report method has been used to assess the greenfield run-off rate from the existing site. The total contributing greenfield area is the difference between the proposed and the existing, therefore, 7300 – 331 = 6969m^2. WinDES Microdrainage has been used to assess the greenfield run-off rates and the output is included in Appendix A. The QBAR run-off rate was calculated at 7.4 l/s.

3.8. WinDES Microdrainage has also been used to assess the run-off rates experienced from the roofed areas of the existing site. These calculations are also included in Appendix A with the results summarised in Table 1 below.

Event	Greenfield Run-off (l/s)	Hardstanding / Roof Run-off (l/s)	Total Existing Run-off (l/s)
Contributing Area	6969m^2	331m^2	-
QBAR	7.4	-	-
1 in 1yr	6.5	4.2	10.7
1 in 30yr	12.6	10.3	22.9
1 in 100yr	15.5	13.2	28.7

Table 1: Existing Runoff Rates

4. Proposed Surface Water Drainage Solution

4.1. The total proposed impermeable area is highlighted on drawing D1653-D-01, it has been calculated at 7300m^2 (0.7300ha).

4.2. The proposed method of dealing with surface water from the proposed development is to mimic that of the existing (as discussed in Section 3 above).

4.3. As the application is in OUTLINE format no formal drainage system has been designed, however it is important to ensure a design is deliverable within the constraints of the site and this drainage strategy seeks to assess that a suitable solution can be provided in line NPPF & SUDs guidelines.

4.4. It must therefore be demonstrated that a suitable drainage proposal can be achieved that discharges to the existing system. In line with best practice three storm return periods will be assessed, the 1 in 1 year, 1 in 30 year and 1 in 100 year event. An allowance for 30% climatic change will be applied.

4.5. It is proposed that the 1 in 1yr + Climatic Change run-off rates will be restricted to the existing 1 in 1yr event rate. This will be restricted by the introduction of a Hydro-brake flow control device unit or similar. This will not only comply with the philosophy of NPPF, but in fact provide

betterment by accounting for climatic change and effectively reducing run-off rates to less than existing during all subsequent and more significant events. The results & impacts of this are clearly shown in Table 2 below.

4.6. WinDES Microdrainage has been used to assess the run-off rates and attenuation requirements for each event. These calculations are included in Appendix B with the results summarised in Table 2 below.

	1 in 1yr Storm *	1 in 30yr Storm *	1 in 100yr Storm *
Existing Run-Off (l/s)	10.7 l/s	22.9 l/s	28.7 l/s
Run-off Restriction	max 10.7 l/s		
Proposed Run-Off (l/s) *	10.7 l/s	13.3 l/s	19.1 l/s
Run-off Rate Reduction Compares to Existing	0 l/s	-9.6 l/s	-9.6 l/s
Attenuation Requirement	84.4 m^3	238.7 m^3	313.1 m^3

Table 2: Existing & Proposed Run-off & Attenuation Requirements
*(* Proposed Run-off Rates include an increase of 30% climatic change allowance)*

4.7. There are many options available to accommodate this storage requirement within the proposed drainage system such as oversized pipes, cellular storage, balancing ponds, swales or lined trenches.

4.8. The system should be designed to accommodate the 1 in 30 year + CC event (239m^3).

4.9. To ensure that a valid option is achievable then in this instance we have calculated the requirements utilising a cellular storage system. These could be in the form of one large unit or several smaller individual systems with their own flow control devices. For the purpose of this assessment a single Cellular Storage option was used within the calculations measuring 25m (L) x 10m (W) x 1m (D) = 240m^3. With reference to the Architects layout it is clear to see there are a number of areas available to accommodate the attenuation facility, whether it is as one unit or smaller individual ones.

4.10. The design should also assess the impact of the 1 in 100 year + CC event exceedance volume of 74.4m^3 (313.1 – 238.7). The site levels should ensure that this flood water is directed to landscaped areas, carriageways, parking areas etc and route water away from property thresholds. If this cannot be readily provided then it may be necessary to increase the size of the attenuation facility.

4.11. It is important to note that this system takes no account of the peripheral storage that will be available within the remainder of the proposed drainage network and therefore the storage attenuation requirements are likely to be significantly less. Equally the developer may decide to introduce rainwater harvesting facilities onto the site which would further reduce the attenuation requirements.

4.12. There is also the option at detailed design to incorporate additional sustainable solutions to help reduce the proposed impermeable area. For example, the developer may choose to specify a porous pavement solution to the driveways and parking areas.

5. Foul Drainage

5.1. United Utilities mapping has been purchased and is included in Appendix C. It shows the site does not benefit from public sewers within the area. The existing shop and historic restaurant associated with Spout Farm are currently dealt with via a traditional sewage treatment plant. It is proposed that this system will be abandoned and the sewer will be diverted into the proposed system.

5.2. It is feasible at detailed design stage that dialog may be opened with United Utilities to discuss the financial viability of a sewer requisition into the main sewer. However, as this will need to be a pumped solution, at this stage a proposal is sought to deal with the foul discharge on site.

5.3. Any such system will be subject to approval from the Environment Agency and consents will need to be approved and granted. It is recommended that a maintenance agreement be put in place to ensure the plant receives regular checks in line with the manufacturer's guidelines.

5.4. In terms of sizing the correct sewage treatment plant reference is made to British Water's document "Flows and Loads – 3". Appendix D contains detailed calculations of the predicted peak and average foul discharge rates, together with a predicted "population equivalent".

5.5. Specification and detail of the plant will be undertaken once a final layout has been agreed. It is recommended that the WPL HiPAF Midi Plant be specified which is capable of serving 60 – 250 people. The WPL brand is a United Utilities preferred supplier.

5.6. An area on the Architects plan has been set aside for the sewage treatment plant. It should be located a minimum of 5m away from any habitable room but located within 15m of a hardstanding area that can be accessed by a HGV. The area allocated is more than adequately sized to accommodate the required system.

5.7. Regardless of the final solution, it's clear that there is a means of dealing with foul sewage from the proposed site.

6. Conclusion

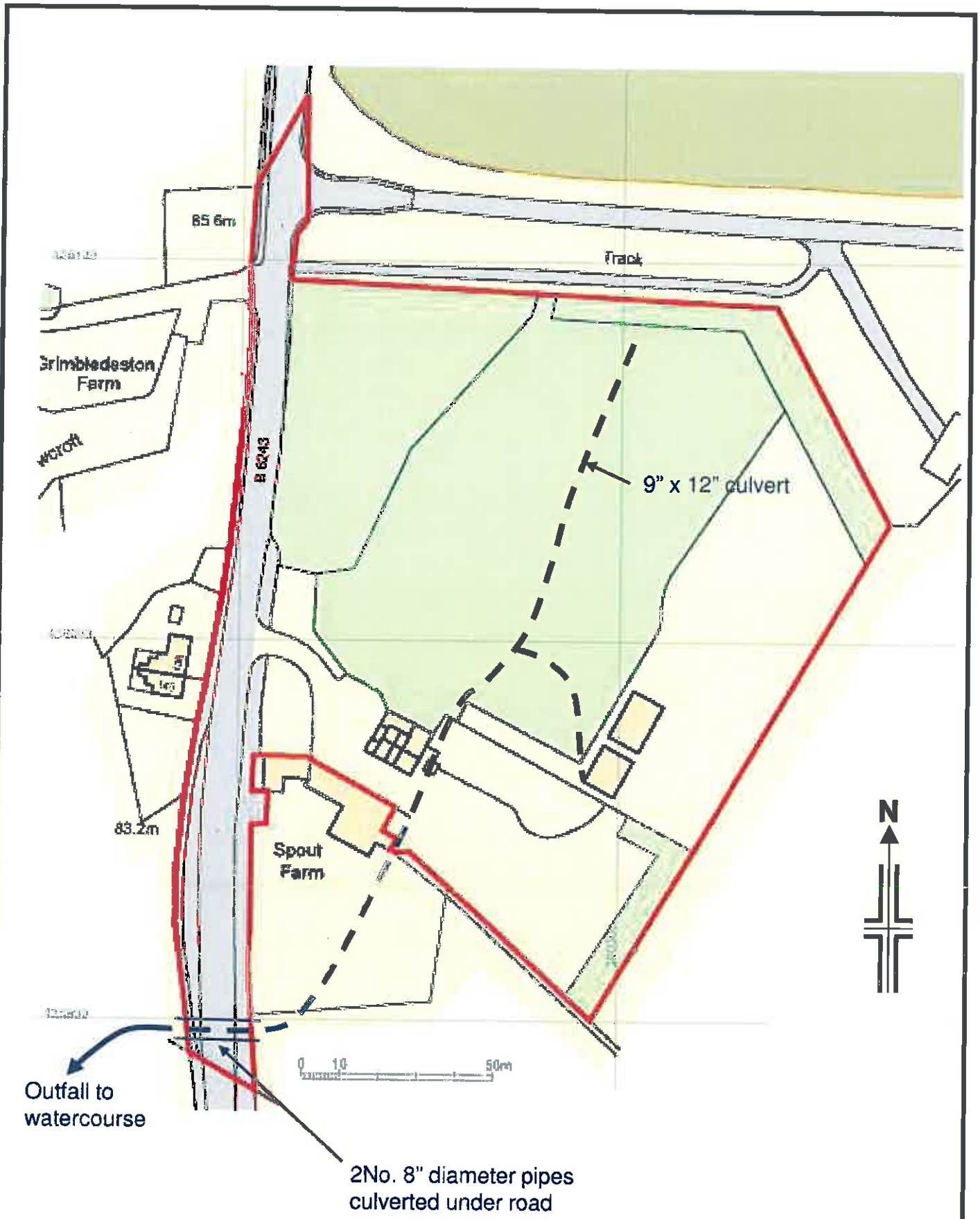
6.1. The strategy outlined above indicates a viable sustainable drainage solution is achievable within the constraints of the site. Detailed design of the system following a successful planning application and final scheme layout can be delivered to meet with NPPF, Environment Agency, Local Authority and United Utilities requirements.

Figures & Drawings

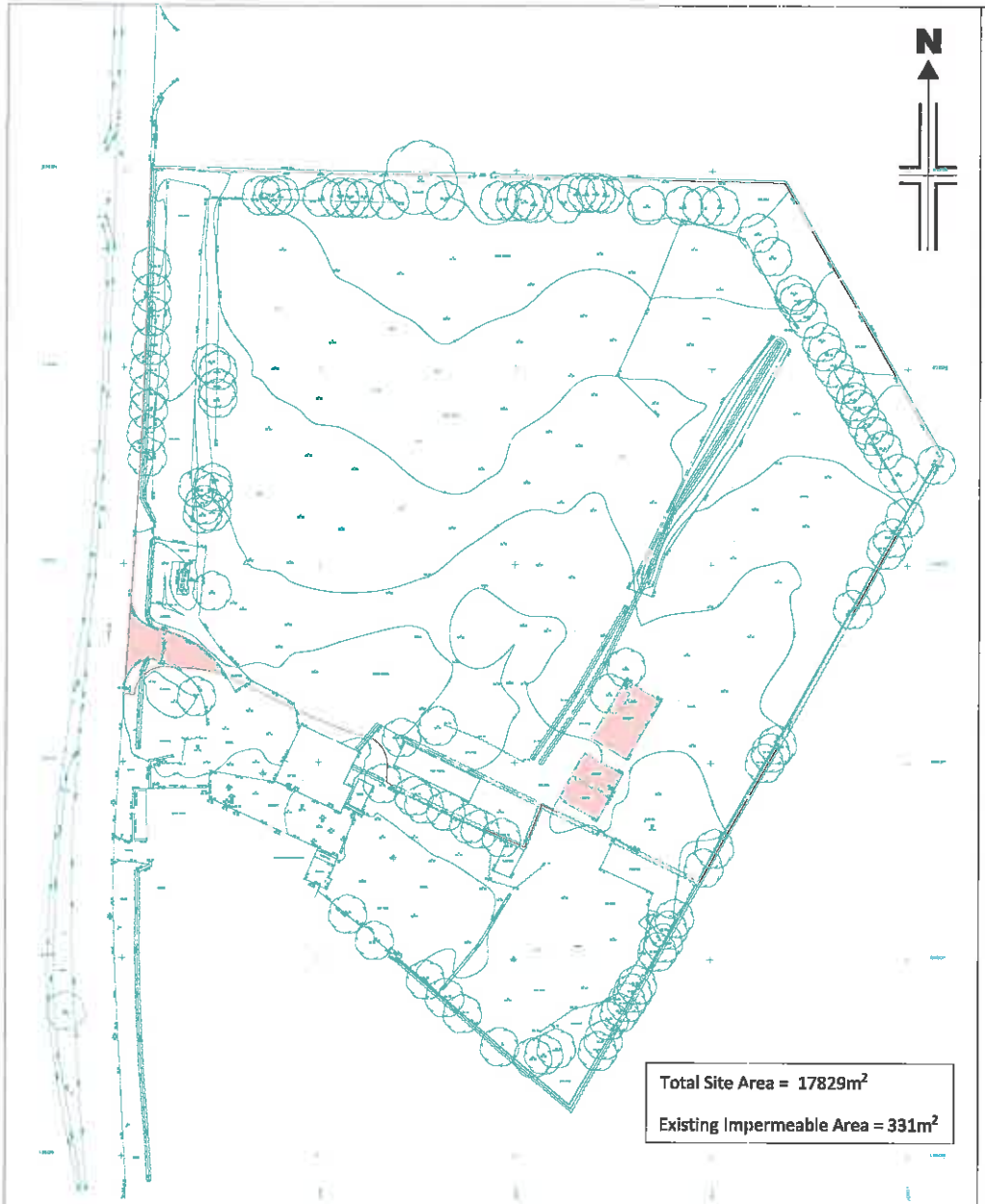
Figure 1 – Site Location
Figure 2 – Aerial Photograph
Figure 3 – Birds Eye View

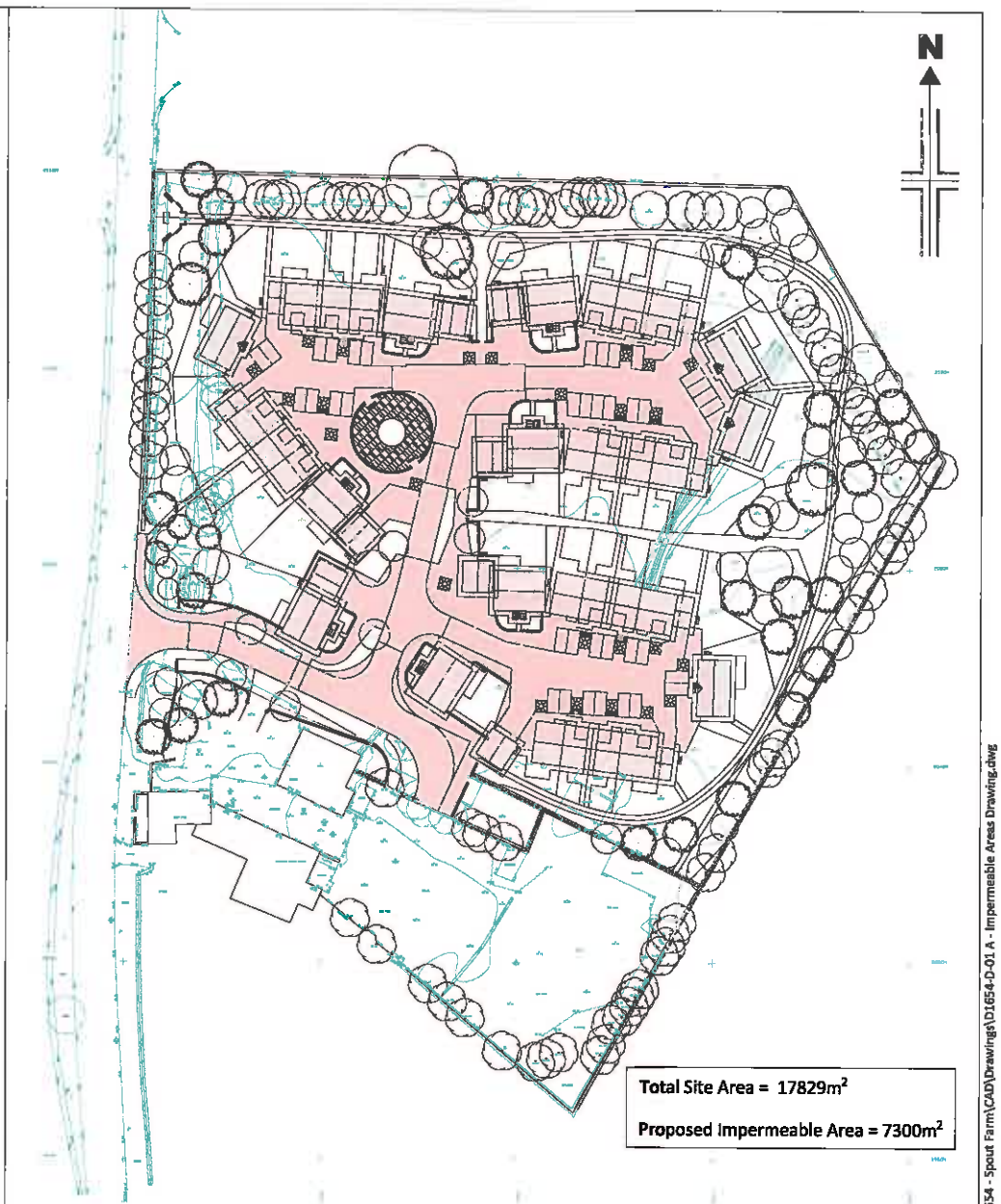
D1653-D-01 – Impermeable Areas Drawing

Architects Layout



PSA Design The Old Bank House 6 Berry Lane, Longridge Preston, PR3 3JA Tel. 01772 786066	Client	Mr & Mrs Lambert	Scale	NTS	Dwg No.	Figure 4
	Job	Spout Farm, Longridge	Drawn PJB / Check GS / Appr GS		Date	05.04.13
	Title	Existing Site Drainage			Rev	





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PSA Design
The Old Bank House
6 Berry Lane, Longridge
Preston, PR3 3JA
Tel. 01772 786066
Fax. 01772 786265

Client	Mr & Mrs Lambert	Drawn	PJB	Date	28.03.13	Drg No.	D1654-D-01
Job	Spout Farm, Longridge	Check	GS				
Title	Impermeable Areas Plan	Appr.	GS	Scale	1:1000 @ A3	Rev.	A

P:\Jobs\Development\D1654 - Spout Farm\CAD\Drawings\D1654-D-01 A - Impermeable Areas Drawing.dwg

Appendix A

Existing Run-off Rates

IH 124 Mean Annual Flood

Input

Return Period (years)	1	SAAR (mm)	1000.000	Urban	0.000
Area (Ha)	0.697	Soil	0.450	Region Number	10

Results l/s

	QBAR Rural	7.4
	QBAR Urban	7.4
Q	1 year	6.5
Q	1 year	6.5
Q	2 years	6.9
Q	5 years	8.8
Q	10 years	10.3
Q	20 years	11.7
Q	25 years	12.2
Q	30 years	12.6
Q	50 years	13.8
Q	100 years	15.5
Q	200 years	17.6
Q	250 years	18.2
Q	1000 years	22.6

Appendix B

Proposed Run off Rates and Attenuation Requirements

Summary of Results for 1 year Return Period (+30%)

Half Drain Time : 78 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	8.5	0.0	8.5	100.1768	0.1767	42.4	O K
30 Summer	9.8	0.0	9.8	100.2233	0.2232	53.6	O K
60 Summer	10.3	0.0	10.3	100.2657	0.2657	63.8	O K
120 Summer	10.7	0.0	10.7	100.3027	0.3027	72.6	O K
180 Summer	10.7	0.0	10.7	100.3172	0.3172	76.2	O K
240 Summer	10.7	0.0	10.7	100.3223	0.3222	77.4	O K
360 Summer	10.7	0.0	10.7	100.3142	0.3142	75.4	O K
480 Summer	10.7	0.0	10.7	100.2998	0.2997	72.0	O K
600 Summer	10.5	0.0	10.5	100.2847	0.2847	68.3	O K
720 Summer	10.3	0.0	10.3	100.2692	0.2692	64.6	O K
960 Summer	10.0	0.0	10.0	100.2417	0.2417	58.0	O K
1440 Summer	9.6	0.0	9.6	100.2002	0.2002	48.0	O K
2160 Summer	8.1	0.0	8.1	100.1673	0.1672	40.1	O K
2880 Summer	7.1	0.0	7.1	100.1452	0.1453	34.9	O K
4320 Summer	5.8	0.0	5.8	100.1168	0.1168	28.0	O K
5760 Summer	4.9	0.0	4.9	100.0983	0.0983	23.6	O K
7200 Summer	4.3	0.0	4.3	100.0863	0.0863	20.8	O K
8640 Summer	3.9	0.0	3.9	100.0772	0.0773	18.6	O K
10080 Summer	3.5	0.0	3.5	100.0703	0.0703	16.9	O K
15 Winter	9.5	0.0	9.5	100.1982	0.1982	47.6	O K
30 Winter	10.2	0.0	10.2	100.2537	0.2537	60.9	O K
60 Winter	10.7	0.0	10.7	100.3022	0.3022	72.6	O K
120 Winter	10.7	0.0	10.7	100.3402	0.3402	81.7	O K
180 Winter	10.7	0.0	10.7	100.3517	0.3517	84.4	O K
240 Winter	10.7	0.0	10.7	100.3512	0.3512	84.3	O K
360 Winter	10.7	0.0	10.7	100.3288	0.3287	78.8	O K
480 Winter	10.7	0.0	10.7	100.3008	0.3007	72.2	O K
600 Winter	10.4	0.0	10.4	100.2747	0.2747	65.9	O K
720 Winter	10.1	0.0	10.1	100.2507	0.2507	60.1	O K
960 Winter	9.7	0.0	9.7	100.2107	0.2107	50.6	O K
1440 Winter	8.2	0.0	8.2	100.1702	0.1703	40.9	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	34.35	17
30 Summer	23.33	31
60 Summer	15.52	52
120 Summer	10.18	86
180 Summer	7.94	120
240 Summer	6.64	156
360 Summer	5.11	224
480 Summer	4.25	290
600 Summer	3.68	354
720 Summer	3.27	416
960 Summer	2.72	538
1440 Summer	2.10	768
2160 Summer	1.61	1128
2880 Summer	1.34	1500
4320 Summer	1.04	2208
5760 Summer	0.86	2944
7200 Summer	0.74	3672
8640 Summer	0.66	4408
10080 Summer	0.59	5136
15 Winter	34.35	17
30 Winter	23.33	31
60 Winter	15.52	58
120 Winter	10.18	92
180 Winter	7.94	132
240 Winter	6.64	170
360 Winter	5.11	240
480 Winter	4.25	308
600 Winter	3.68	372
720 Winter	3.27	434
960 Winter	2.72	550
1440 Winter	2.10	792

Summary of Results for 1 year Return Period (+30%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
2160 Winter	6.6	0.0	6.6	100.1353	0.1353	32.4	O K
2880 Winter	5.6	0.0	5.6	100.1133	0.1133	27.2	O K
4320 Winter	4.4	0.0	4.4	100.0882	0.0883	21.1	O K
5760 Winter	3.7	0.0	3.7	100.0732	0.0733	17.6	O K
7200 Winter	3.2	0.0	3.2	100.0638	0.0638	15.3	O K
8640 Winter	2.8	0.0	2.8	100.0567	0.0567	13.6	O K
10080 Winter	2.6	0.0	2.6	100.0512	0.0512	12.3	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
2160 Winter	1.61	1148
2880 Winter	1.34	1504
4320 Winter	1.04	2244
5760 Winter	0.86	2944
7200 Winter	0.74	3672
8640 Winter	0.66	4400
10080 Winter	0.59	5136

Rainfall Details

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	1	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	18.800	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.300	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.730

Time (mins) from:	to:	Area (ha)
0	4	0.730

Cellular Storage Details

Infil Coef - Base (m/hr) 0.000000 Porosity 0.96
Infil Coef - Sides (m/hr) 0.000000 Invert Level (m) 100.000
Safety Factor 1.0 Ground Level (m) 102.000

Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)
0.00	250.0	200.0	0.70	250.0	242.0	1.40	0.0	260.0	2.10	0.0	260.0
0.10	250.0	206.0	0.80	250.0	248.0	1.50	0.0	260.0	2.20	0.0	260.0
0.20	250.0	212.0	0.90	250.0	254.0	1.60	0.0	260.0	2.30	0.0	260.0
0.30	250.0	218.0	1.00	250.0	260.0	1.70	0.0	260.0	2.40	0.0	260.0
0.40	250.0	224.0	1.10	0.0	260.0	1.80	0.0	260.0	2.50	0.0	260.0
0.50	250.0	230.0	1.20	0.0	260.0	1.90	0.0	260.0			
0.60	250.0	236.0	1.30	0.0	260.0	2.00	0.0	260.0			

Hydro-Brake Outflow Control

Design Head (m) 0.542 Hydro-Brake Type MD5 Invert Level (m) 100.000
Design Flow (l/s) 10.7 Diameter (mm) 149

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	5.0	0.60	10.9	1.60	16.8	2.60	21.4	5.00	29.7	7.50	36.4
0.20	9.6	0.80	12.0	1.80	17.8	3.00	23.0	5.50	31.2	8.00	37.6
0.30	10.7	1.00	13.3	2.00	18.8	3.50	24.9	6.00	32.6	8.50	38.8
0.40	10.6	1.20	14.6	2.20	19.7	4.00	26.6	6.50	33.9	9.00	39.9
0.50	10.6	1.40	15.7	2.40	20.6	4.50	28.2	7.00	35.2	9.50	41.0

Summary of Results for 30 year Return Period (+30%)

Half Drain Time : 175 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	10.7	0.0	10.7	100.4487	0.4487	107.6	O K
30 Summer	10.9	0.0	10.9	100.5947	0.5948	142.8	O K
60 Summer	11.7	0.0	11.7	100.7353	0.7353	176.4	O K
120 Summer	12.3	0.0	12.3	100.8348	0.8348	200.4	O K
180 Summer	12.5	0.0	12.5	100.8648	0.8648	207.6	O K
240 Summer	12.5	0.0	12.5	100.8738	0.8738	209.7	O K
360 Summer	12.5	0.0	12.5	100.8718	0.8718	209.2	O K
480 Summer	12.4	0.0	12.4	100.8533	0.8533	204.8	O K
600 Summer	12.2	0.0	12.2	100.8283	0.8283	198.7	O K
720 Summer	12.0	0.0	12.0	100.7998	0.7998	191.9	O K
960 Summer	11.7	0.0	11.7	100.7403	0.7403	177.6	O K
1440 Summer	11.1	0.0	11.1	100.6248	0.6248	149.9	O K
2160 Summer	10.7	0.0	10.7	100.4662	0.4662	111.9	O K
2880 Summer	10.7	0.0	10.7	100.3422	0.3422	82.2	O K
4320 Summer	9.8	0.0	9.8	100.2197	0.2197	52.8	O K
5760 Summer	8.5	0.0	8.5	100.1772	0.1772	42.5	O K
7200 Summer	7.4	0.0	7.4	100.1517	0.1518	36.4	O K
8640 Summer	6.5	0.0	6.5	100.1332	0.1333	32.0	O K
10080 Summer	5.8	0.0	5.8	100.1188	0.1188	28.6	O K
15 Winter	10.7	0.0	10.7	100.5052	0.5052	121.3	O K
30 Winter	11.3	0.0	11.3	100.6718	0.6718	161.2	O K
60 Winter	12.3	0.0	12.3	100.8333	0.8333	200.0	O K
120 Winter	13.1	0.0	13.1	100.9563	0.9563	229.6	O K
180 Winter	13.3	0.0	13.3	100.9873	0.9873	236.9	O K
240 Winter	13.3	0.0	13.3	100.9943	0.9943	238.7	O K
360 Winter	13.2	0.0	13.2	100.9828	0.9828	235.9	O K
480 Winter	13.0	0.0	13.0	100.9488	0.9488	227.8	O K
600 Winter	12.7	0.0	12.7	100.9063	0.9063	217.5	O K
720 Winter	12.4	0.0	12.4	100.8603	0.8603	206.5	O K
960 Winter	11.9	0.0	11.9	100.7663	0.7663	183.9	O K
1440 Winter	10.9	0.0	10.9	100.5872	0.5873	140.9	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	84.00	18
30 Summer	57.35	33
60 Summer	37.60	62
120 Summer	23.92	118
180 Summer	18.13	146
240 Summer	14.80	178
360 Summer	11.13	248
480 Summer	9.07	318
600 Summer	7.74	386
720 Summer	6.79	456
960 Summer	5.53	588
1440 Summer	4.12	852
2160 Summer	3.07	1228
2880 Summer	2.49	1560
4320 Summer	1.85	2248
5760 Summer	1.50	2944
7200 Summer	1.27	3672
8640 Summer	1.11	4408
10080 Summer	1.00	5136
15 Winter	84.00	18
30 Winter	57.35	32
60 Winter	37.60	60
120 Winter	23.92	116
180 Winter	18.13	166
240 Winter	14.80	188
360 Winter	11.13	266
480 Winter	9.07	344
600 Winter	7.74	418
720 Winter	6.79	492
960 Winter	5.53	636
1440 Winter	4.12	908

Summary of Results for 30 year Return Period (+30%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
2160 Winter	10.7	0.0	10.7	100.3497	0.3497	83.9	O K
2880 Winter	9.9	0.0	9.9	100.2308	0.2307	55.4	O K
4320 Winter	7.8	0.0	7.8	100.1618	0.1618	38.8	O K
5760 Winter	6.4	0.0	6.4	100.1302	0.1303	31.3	O K
7200 Winter	5.5	0.0	5.5	100.1103	0.1103	26.4	O K
8640 Winter	4.8	0.0	4.8	100.0957	0.0958	23.0	O K
10080 Winter	4.3	0.0	4.3	100.0858	0.0858	20.6	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
2160 Winter	3.07	1252
2880 Winter	2.49	1560
4320 Winter	1.85	2244
5760 Winter	1.50	2944
7200 Winter	1.27	3672
8640 Winter	1.11	4408
10080 Winter	1.00	5144

Rainfall Details

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	30	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	18.800	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.300	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.730

Time (mins) from:	to:	Area (ha)
0	4	0.730

Cellular Storage Details

Infil Coef - Base (m/hr) 0.000000 Porosity 0.96
Infil Coef - Sides (m/hr) 0.000000 Invert Level (m) 100.000
Safety Factor 1.0 Ground Level (m) 102.000

Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)
0.00	250.0	200.0	0.70	250.0	242.0	1.40	0.0	260.0	2.10	0.0	260.0
0.10	250.0	206.0	0.80	250.0	248.0	1.50	0.0	260.0	2.20	0.0	260.0
0.20	250.0	212.0	0.90	250.0	254.0	1.60	0.0	260.0	2.30	0.0	260.0
0.30	250.0	218.0	1.00	250.0	260.0	1.70	0.0	260.0	2.40	0.0	260.0
0.40	250.0	224.0	1.10	0.0	260.0	1.80	0.0	260.0	2.50	0.0	260.0
0.50	250.0	230.0	1.20	0.0	260.0	1.90	0.0	260.0			
0.60	250.0	236.0	1.30	0.0	260.0	2.00	0.0	260.0			

Hydro-Brake Outflow Control

Design Head (m) 0.542 Hydro-Brake Type MD5 Invert Level (m) 100.000
Design Flow (l/s) 10.7 Diameter (mm) 149

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	5.0	0.60	10.9	1.60	16.8	2.60	21.4	5.00	29.7	7.50	36.4
0.20	9.6	0.80	12.0	1.80	17.8	3.00	23.0	5.50	31.2	8.00	37.6
0.30	10.7	1.00	13.3	2.00	18.8	3.50	24.9	6.00	32.6	8.50	38.8
0.40	10.6	1.20	14.6	2.20	19.7	4.00	26.6	6.50	33.9	9.00	39.9
0.50	10.6	1.40	15.7	2.40	20.6	4.50	28.2	7.00	35.2	9.50	41.0

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 176 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	10.9	0.0	10.9	100.5853	0.5852	140.5	O K
30 Summer	12.0	0.0	12.0	100.7878	0.7878	189.0	O K
60 Summer	13.3	0.0	13.3	100.9873	0.9873	236.9	O K
120 Summer	18.9	0.0	18.9	102.0102	2.0102	263.4	FLOOD
180 Summer	18.9	0.0	18.9	102.0202	2.0202	272.9	FLOOD
240 Summer	18.9	0.0	18.9	102.0222	2.0222	275.3	FLOOD
360 Summer	18.9	0.0	18.9	102.0212	2.0212	274.2	FLOOD
480 Summer	18.9	0.0	18.9	102.0157	2.0157	268.7	FLOOD
600 Summer	18.8	0.0	18.8	102.0092	2.0092	261.9	FLOOD
720 Summer	18.8	0.0	18.8	102.0027	2.0027	255.8	FLOOD
960 Summer	13.6	0.0	13.6	101.0368	1.0368	247.2	O K
1440 Summer	12.6	0.0	12.6	100.8938	0.8938	214.5	O K
2160 Summer	11.6	0.0	11.6	100.7128	0.7128	171.0	O K
2880 Summer	10.8	0.0	10.8	100.5567	0.5567	133.7	O K
4320 Summer	10.7	0.0	10.7	100.3197	0.3197	76.7	O K
5760 Summer	9.8	0.0	9.8	100.2202	0.2202	52.9	O K
7200 Summer	8.8	0.0	8.8	100.1833	0.1832	43.9	O K
8640 Summer	7.7	0.0	7.7	100.1598	0.1598	38.4	O K
10080 Summer	6.9	0.0	6.9	100.1423	0.1423	34.2	O K
15 Winter	11.2	0.0	11.2	100.6583	0.6583	158.0	O K
30 Winter	12.6	0.0	12.6	100.8878	0.8878	213.0	O K
60 Winter	18.9	0.0	18.9	102.0117	2.0117	264.7	FLOOD
120 Winter	19.0	0.0	19.0	102.0487	2.0487	301.7	FLOOD
180 Winter	19.1	0.0	19.1	102.0582	2.0582	311.3	FLOOD
240 Winter	19.1	0.0	19.1	102.0602	2.0602	313.1	FLOOD
360 Winter	19.1	0.0	19.1	102.0552	2.0552	308.3	FLOOD
480 Winter	19.0	0.0	19.0	102.0442	2.0442	297.1	FLOOD
600 Winter	18.9	0.0	18.9	102.0307	2.0307	283.8	FLOOD
720 Winter	18.9	0.0	18.9	102.0182	2.0182	271.4	FLOOD
960 Winter	18.8	0.0	18.8	102.0002	2.0002	253.3	FLOOD
1440 Winter	12.7	0.0	12.7	100.8953	0.8953	214.8	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	108.38	18
30 Summer	74.81	33
60 Summer	49.39	62
120 Summer	31.44	106
180 Summer	23.72	138
240 Summer	19.26	170
360 Summer	14.37	240
480 Summer	11.65	308
600 Summer	9.89	376
720 Summer	8.65	442
960 Summer	6.99	598
1440 Summer	5.16	866
2160 Summer	3.80	1256
2880 Summer	3.06	1616
4320 Summer	2.24	2292
5760 Summer	1.80	2952
7200 Summer	1.52	3672
8640 Summer	1.32	4408
10080 Summer	1.18	5136
15 Winter	108.38	18
30 Winter	74.81	32
60 Winter	49.39	60
120 Winter	31.44	116
180 Winter	23.72	148
240 Winter	19.26	184
360 Winter	14.37	262
480 Winter	11.65	336
600 Winter	9.89	406
720 Winter	8.65	476
960 Winter	6.99	604
1440 Winter	5.16	924

Summary of Results for 100 year Return Period (+30%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
2160 Winter	11.1	0.0	11.1	100.6333	0.6333	151.9	O K
2880 Winter	10.7	0.0	10.7	100.3967	0.3967	95.2	O K
4320 Winter	9.5	0.0	9.5	100.1977	0.1977	47.5	O K
5760 Winter	7.7	0.0	7.7	100.1588	0.1588	38.1	O K
7200 Winter	6.5	0.0	6.5	100.1332	0.1333	31.9	O K
8640 Winter	5.7	0.0	5.7	100.1152	0.1153	27.6	O K
10080 Winter	5.1	0.0	5.1	100.1018	0.1018	24.4	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
2160 Winter	3.80	1320
2880 Winter	3.06	1672
4320 Winter	2.24	2248
5760 Winter	1.80	2944
7200 Winter	1.52	3672
8640 Winter	1.32	4408
10080 Winter	1.18	5136

Rainfall Details

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	18.800	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.300	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.730

Time (mins) from:	to:	Area (ha)
0	4	0.730

Cellular Storage Details

Infil Coef - Base (m/hr) 0.000000 Porosity 0.96
Infil Coef - Sides (m/hr) 0.000000 Invert Level (m) 100.000
Safety Factor 1.0 Ground Level (m) 102.000

Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)
0.00	250.0	200.0	0.70	250.0	242.0	1.40	0.0	260.0	2.10	0.0	260.0
0.10	250.0	206.0	0.80	250.0	248.0	1.50	0.0	260.0	2.20	0.0	260.0
0.20	250.0	212.0	0.90	250.0	254.0	1.60	0.0	260.0	2.30	0.0	260.0
0.30	250.0	218.0	1.00	250.0	260.0	1.70	0.0	260.0	2.40	0.0	260.0
0.40	250.0	224.0	1.10	0.0	260.0	1.80	0.0	260.0	2.50	0.0	260.0
0.50	250.0	230.0	1.20	0.0	260.0	1.90	0.0	260.0			
0.60	250.0	236.0	1.30	0.0	260.0	2.00	0.0	260.0			

Hydro-Brake Outflow Control

Design Head (m) 0.542 Hydro-Brake Type MD5 Invert Level (m) 100.000
Design Flow (l/s) 10.7 Diameter (mm) 149

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	5.0	0.60	10.9	1.60	16.8	2.60	21.4	5.00	29.7	7.50	36.4
0.20	9.6	0.80	12.0	1.80	17.8	3.00	23.0	5.50	31.2	8.00	37.6
0.30	10.7	1.00	13.3	2.00	18.8	3.50	24.9	6.00	32.6	8.50	38.8
0.40	10.6	1.20	14.6	2.20	19.7	4.00	26.6	6.50	33.9	9.00	39.9
0.50	10.6	1.40	15.7	2.40	20.6	4.50	28.2	7.00	35.2	9.50	41.0

Appendix C

United Utilities Sewer Record Mapping

OS Sheet No: SD5936SE

Scale 1:1250 Date: 13-Aug-2012

Printed by: Angela Gall

Refno	Cover	Form	Type	Invert	Size	x/Easy	Slope/Grid	Detail	Length
5001		C	V		1350	606		CC	25.52
5003		C	F						
5004		C	C	91.57	1275		C	CO	25.91
5101	94.63	C	M	91.26	1050		C	CO	31.66
5102		C	M		1050		C	CO	150.21
5201		C	M		1050		C	CO	51.26
5202		C	C		750		C	CO	41.84
5301	89.38	C	M	83.86	750		C	CO	40.66
7000	89.57	S	M	83.53	675		C	CO	1153 23.66
7001	93.57	F	M						
7002		C	M						
7003	94.46	C	M	82.70	525		C	CO	488 36.86
7101	94.89	F	M	83.34	300		C	VC	88 11.99
7102	95.4	C	M	82.68	525		C	CO	449 74.75
7103		S	F						
7104	94.62	C	M	82.46	525		C	CO	488 71.79
7105		F	C	83.16	750		C	CO	398 15.67
7201	92.97	F	M	84.28	750		C	VC	24 78.78
7204	92.91	C	M	84.17	750		C	CO	42 94.24
7205	92.53	F	M	85.85	300		C	VC	66 101.69
7301	91.21	C	M	86.34	750		C	CO	19.81
7302	91.29	C	M						
7303	89.46	C	M	87.27	300		S	CO	5.19
7304		F	M		300		E	Vc	96.36
7305		C	J		750		S	CO	73.94
7101	89.38	F	M	83.17	375		S	CO	179 44.26
5102	89.48	F	M	83.61	375		S	CO	785 53.88
5103	89.24	S	M	84.16	225		S	VC	570 13.61
5104	89.47	F	M	83.36	375		S	CO	195 31.21
5105	89.66	S	M	83.7	675		S	CO	111 25.88
5106	89.63	F	M	83.36	375		S	CO	230 8.87
5107	89.41	S	M	83.81	450		S	CO	451 9.92
5108	89.66	S	M	84.61	600		S	CO	359 72.56
5109	89.66	S	M	83.77	600		S	CO	439 36.14
5110	89.56	S	M	84.53	225		E	VC	135 24.74
5111		F	M		150		E	Vc	37.46
5401		F	M		300		E	VC	4.76
5402	89.2	F	M	90.25	300		S	VC	667 10.76
5403		F	M		300		S	CI	9.54
5404	94.48	F	M	90.17	300		S	Vc	7.45
5101	89.66	S	M	84.96	450		S	CO	228 37.33
5103		F	M		150		S	VC	28.62
5104	89.52	S	M	84.29	600		S	CO	388 25.18
5104		F	M		150		S	VC	33.3
5105	89.36	S	M	84.66	450		S	CO	32.81
5106		F	M		150		S	VC	33.61
5107		F	M		150		S	VC	14.16
5108	89.6	S	M	84.36	600		S	CO	145 14.68
5109	89.31	S	M	85.1	225		S	VC	39 16.13
5110		F	M		150		S	VC	39.39
5111	89.89	S	M	84.67	450		S	CO	275 16.28
5112	89.49	S	M	84.65	450		S	CO	295 28.64
5113		F	M		150		S	VC	23.27
5114	89.65	F	M	85.55	375		S	CO	161 28.24
5115	89.19	S	M	85.81	225		S	CO	795 23.79
5116	87.25	F	M	84.39	375		S	CO	66 66.77
5117	87.19	S	M	83.85	450		S	CO	884 44.19
5201	87.31	S	M	83.66	225		S	VC	69 21.8
5202	87.89	S	M	83.95	450		S	CO	668 63.51
5203	87.61	S	M	85.46	225		S	CO	178 66.29
5401	93.22	F	M	90.41	300		S	VC	63.3
5402		F	S	90.52	300		S	VC	362 47.16

WASTE WATER SYMBOLOGY

MANHOLE
FOUL SURFACE COMBINED DUAL
SIDE ENTRY MANHOLE
PRIVATE SEWER
ABANDONED SEWER
SITE TERMINATION
T-JUNCTION (SADDLE)
AIRVALVE
LAMP HOLE
CASCADE
OIL INTERCEPTOR
CONTROL KIOSK
PENSTOCK
CONTROL VALVE
RODDING EYE
GULLEY
SOAKAWAY
HATCHBOX
TUMBLING BAY
HEADWALL
UNSPECIFIED
HYDROBRAKE
VALVE
INLET
WASHOUT
GHOST NODE (no. GM - Rising Main) & GM Dual Function
DIFFERENTIATING NODE (CHANGE OF CHARACTERISTIC)
CATCHPIT
SIDE ENTRY CATCHPIT
CHAMBER
SIDE ENTRY CHAMBER
DROPSHAFT
SIDE ENTRY DROPSHAFT
SHEET EDGE
VENT COLUMN
SEWER OVERFLOW
DISCHARGE POINT (OUTFALL)
TANK
WASTE WATER TREATMENT WORKS
PUMPING STATION
EJECTOR STATION
SLUDGE PUMPING STATION

Note - ALL flow direction arrows are BLUE - colour not significant

NODE TABLE ABBREVIATIONS

MANHOLE FUNCTION

- F Foul
- S Surface
- C Combined
- T Transition
- O Overflow
- U Unspecified

MANHOLE / NODE TYPE

- M Manhole
- J Junction
- L Lamphole
- H Hatchbox
- R Rodding Eye
- F Outfall
- V Combined Sewer Overflow
- P Pumping Station
- S Soakaway
- D Dual Function Manhole
- W Treatment Works
- Z Ghost in Rising Main
- C Cascade
- Y Gulley
- E Ejector
- O Oil Injector
- I Inlet
- B Hydrobrake
- T Vent Column
- X Valve
- U Unspecified
- Q Expediency Node
- G Ghost (to allow pipe bends)

SEWER SHAPE

- C Circular
- E Egg
- O Oval
- F Flat Top
- R Rectangular
- S Square
- T Trapezoidal
- A Arch
- B Barrel
- H Horseshoe
- U Unspecified

SEWER MATERIAL

- AC Asbestos Cement
- BR Brick
- CI Cast Iron
- SI Spun (Grey) Iron
- CO Concrete
- CS Concrete Segments (Bolted)
- CS Concrete Segments (Unbolted)
- CC Concrete Box Culvert
- DI Ductile Iron
- GR Glass Reinforced Concrete
- GR Glass Reinforced Plastic
- PS Plastic / Steel Composite
- PV Polyvinyl Chloride
- PE Polyethylene
- RP Reinforced Plastic Matrix
- ST Steel
- VC Vitrified Clay (All Clayware)
- PP Polypropylene
- PF Pitch Fibre
- MA Masonry - In Regular Courses
- MA Masonry - Randomly Coursed
- U Unspecified

OS Sheet No: SD5936SE

Scale 1:1250 Date: 13-Aug-2012

62 Nodes

Sheet 1 of 1

United Utilities

SEWER RECORDS

Reline	Cover	Fame	Type	Invert	Dia.x	Dia.y	Shape	Matl	Qual	Length
6101	86.09	S	M	84.64	150		C	CO	200	66.37
6102		F	M		150		C	VC		16.88
6103	86.31	F	M	85.53	150		C	VC		24.16
6104	86.06	S	M	85.17	225		C	VC	45	16.71
6201	86.32	F	M	83.83	375		C	CO	-153	80.13
6202		F	M		150		C	VC		40.88
6203	87.91	S	M	86.39	225		C	VC	37	42.12
6204	87.05	S	M							
6205		S	M		450		C	CO		28.47
6301	88.32	F	M	85.97	375		C	CO	1800	89.31
6302	7.14	S	M	84.83	375		C	CO	167	100.02
6401	83.65	F	M	80.96	375		C	VC	269	68.61
6402	84.29	F	M	80.68	300		C	VC	301	64.26
6403		C	M							3.7
6404		C	M							
6405		F	D				E			4.66
6406		C	M							
6407		F	M				E			13.16
6408		F	M							
6409		S	M				E			7.66
6410		F	J							
6411		F	Q				E			7.25
1301	89.86	S	M	86.61	225		C	VC	165	16.71
1302		F	M		150		C	VC		22.74
1303	89.64	S	M	86.49	225		C	VC	194	16.5
1304	87.39	S	M	86.36	300		C	VC	326	36.82
1305		F	M		150		C	VC		11.89
1306	87.36	F	M	85.14	150		C	VC		14.84
1307		C	M		150		C	VC		16.76
1308		F	P		150					5.12
1309		F	P		150		C	PVC		112.01
1301	91.17	F	M	89.62	225		E	CO	45	49.15
1302	89.79	F	M	87.89	375		E	CO	78	92.69
1303	89.8	F	M	87.69	375		E	CO	89	14.16
1304	89.69	S	M	84.83	300		E	VC	169	32.5
1305	89.34	F	M	86.62	375		E	CO	18	89.17
1306	88.16	S	M	85.23	300		E	VC	133	36.7
1401	88.68	F	M	84.83	225		E	VC	31	61.92
1402	93.16	F	M	91.67	300		E	VC	318	37.53
1403	93.94	F	M	90.43	375		E	CO	38	46.6
1404		F	E	91.67	375		E	CO	37	51.68

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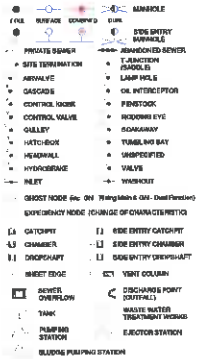
WASTE WATER SYMBOLOGY



Note - ALL flow direction arrows are BLUE - colour not significant

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R Rodding Eye	O Oil Injector
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	T Vent Column
P Pumping Station	X Valve
S Soakaway	U Unspecified
D Dual Function Manhole	Q Expediency Node
	G Ghost (to allow pipe bends)
W Treatment Works	

SEWER SHAPE

C Circular	T Trapezoidal
E Egg	A Arch
O Oval	B Barrel
F Flat Top	H Horseshoe
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S Square	

SEWER MATERIAL

AC	Asbestos Cement
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SI	Spun (Grey) Iron
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GR	Glass Reinforced Plastic
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PE	Polyethylene
RP	Reinforced Plastic Matrix
ST	Steel
VC	Vitrified Clay (All Clayware)
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PF	Pitch Fibre
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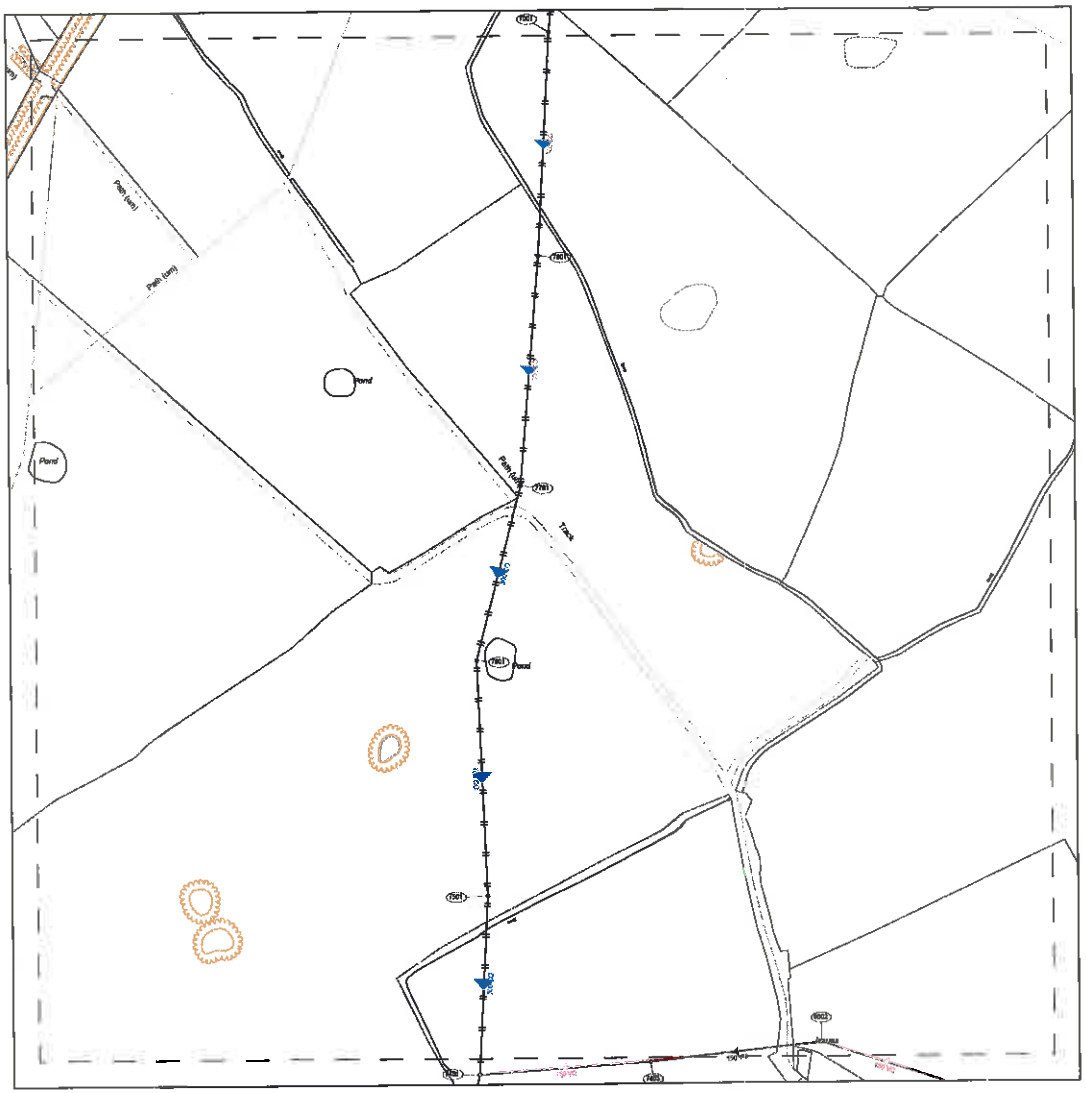
OS Sheet No: SD6036SW
Scale 1:1250 Date: 13-Aug-2012
41 Nodes
Sheet 1 of 1

United Utilities
SEWER RECORDS



OS Sheet No: SD5935NE

Scale 1:1250 Date: 13-Aug-2012

Printed by: Angela Gall

WASTE WATER SYMBOLOGY

MANHOLE
SIDE ENTRY MANHOLE
PRIVATE SEWER
ABANDONED SEWER
SITE TERMINATION
T-JUNCTION (SADDLE)
AIRVALVE
LAMPHOLE
CASCADE
OIL INTERCEPTOR
CONTROL KNOCK
PENSTOCK
CONTROL VALVE
RODDING EYE
GULLEY
SOAKAWAY
HATCHBOX
TUMBLING BAY
HEADWALL
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HYDROBRAKE
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SIDE ENTRY CATCHPIT
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SIDE ENTRY CHAMBER
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SIDE ENTRY DROPSHAFT
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SEWER OVERFLOW
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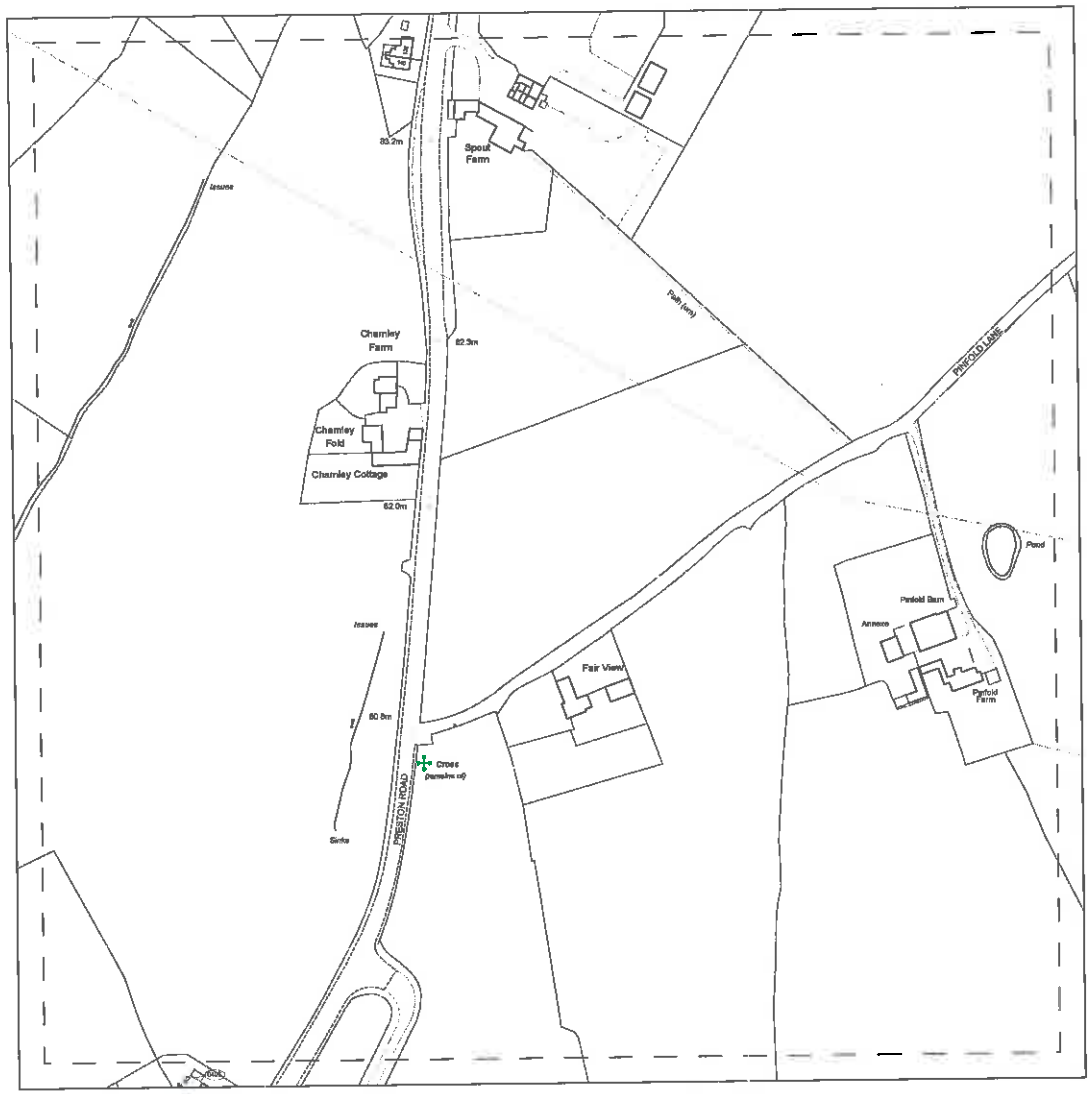
OS Sheet No: SD5935NE
Scale 1:1250 Date: 13-Aug-2012
5 Nodes
Sheet 1 of 1

United Utilities
SEWER RECORDS



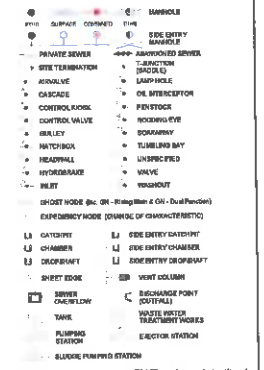
There are no nodes in SD6035NW.

OS Sheet No: SD6035NW

Scale 1:1250 Date: 13-Aug-2012

Printed by: Angela Gall

WASTE WATER SYMBOLOGY



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OS Sheet No: SD6035NW
Scale 1:1250 Date: 13-Aug-2012
No Nodes
Sheet 1 of 1

United Utilities
SEWER RECORDS

Appendix D

Foul Discharge Calculations

Foul Discharge Estimates (subject to detailed layout)

Subject to detailed design

Peak Run-off Calculation

Appliance	Total No.	Discharge Units per appliance (l/s)	
2/3 Bed Dwelling			
Sink	1	0.8	0.8
Bath	1	0.8	0.8
WC	2	2.0	4.0
Wash Hand Basin	2	0.5	1
Shower	1	0.6	0.6
Dish Washer	1	0.8	0.8
Washing Machine (6kg)	1	0.8	0.8
	Discharge Units per House Type		**8.8**
	No. of house's of this type		**19**
			167.2
4 Bed Dwelling			
Sink	2	0.8	1.6
Bath	1	0.8	0.8
WC	3	2.0	6.0
Wash Hand Basin	3	0.5	1.5
Shower	2	0.6	1.2
Dish Washer	1	0.8	0.8
Washing Machine (6kg)	1	0.8	0.8
	Discharge Units per House Type		**12.7**
	No. of house's of this type		**13**
			165.1
	Total Discharge units into system **(∑DU)**		**332.3**
	Waste water flowrate = Qww = K √∑DU		
	Based on Frequent use, K =		0.5
Peak Run-off	Qww = litres / second		**9.11** l/s

Note - Above calculations undertaken in accordance with BS EN 12056-2:2000

British Water Code of Practice - Flows and Loads - 3

Population

2/3 Bed Property	19	Population = 95
4 Bed Property	13	Population = 78
		Total P = 173
		Reduction Factor 0.8
		Adjusted Population 139

Estimated Average Flow	**Litres per day**	**25,020**
	Litres per minute	**17.38**
	Litres per second	**0.29**