

Twynyroden

Merthyr Tydfil

Drainage Strategy

March 2020



Document Control Sheet

Project Number: 10247

Project: Twynyroden, Merthyr Tydfil

Client: Persimmon Homes East Wales

Document Title: Drainage Strategy & Flood Risk Assessment

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Checked: James Phillips

Revision: /

Status: Approval

Control date: 25.03.2020

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Introduction

- 1.1 This report provides preliminary information on the design strategy of the surface and foul water sewers to serve the proposed development off Oak Tree Rise, Twynyroden, Merthyr Tydfil.
- 1.2 The details of this report demonstrate how the drainage for the development will be discharged and how flows will be managed to prevent increased flooding.
- 1.3 This report includes a statement on the flood risk for the development and outlines what further work, if any, are required should the site progress to detailed design.

2.0 The Site

- 2.1 The development site is located approximately 1km to the west of Merthyr Tydfil town centre in the suburb of Twynyroden with an approximate National Grid Reference of SO 059 057 which can be seen in Figure 1 below.
- 2.2 The site is irregularly shaped scrub lands used as public open space with a public right of way and bridleway crossing the site. The land falls from North to South with a maximum level difference of between 240 and 215m.
- 2.3 An unnamed culverted watercourse runs from North to South. Exact condition is to be confirmed following on site investigation.
- 2.4 The proposed development is bounded by residential developments to the North, East and West with further greenfields and woodland to the South.
- 2.5 Main access will be obtained off Oak Tree Rise located in the North Eastern portion of the development

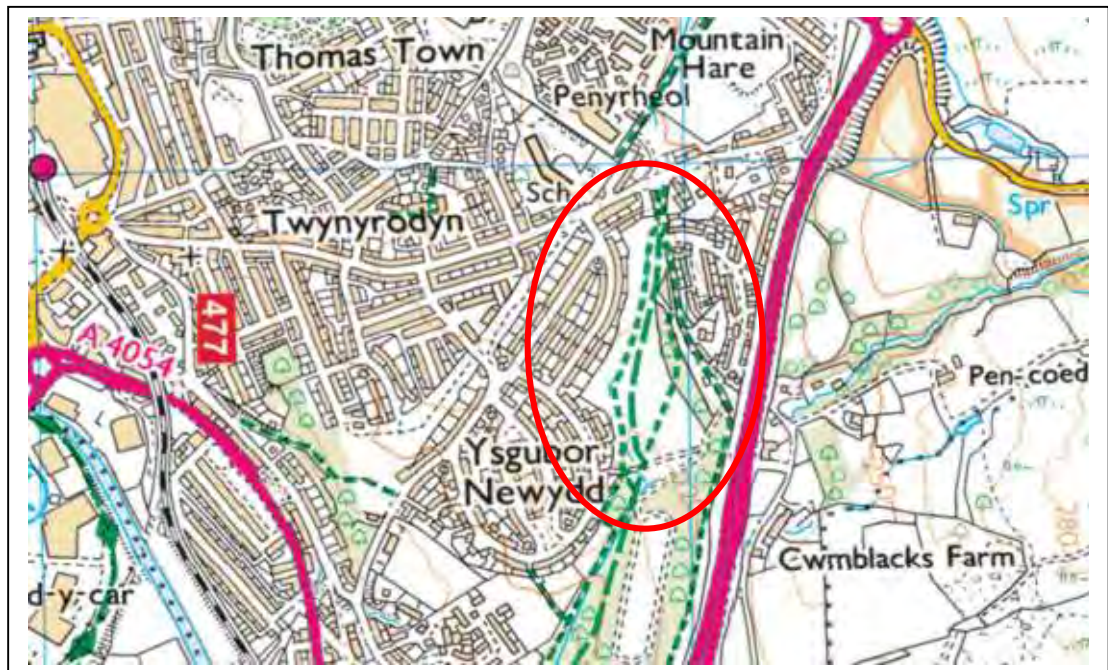


Figure 1 – Site Location

3.0 Ground Conditions

- 3.1 Site investigation works confirm that the site comprises of variable depths in made ground extended to depths of between 0.9 and 14.0m where accurately proven.
- 3.2 The variable thickness of made ground was dictated by the historical topographical nature of the site, and the infilling works undertaken during the reclamation scheme of the 1980s which involved the infilling of former valleys. Hence, the thickness of made ground was variable across the site, with the greatest thicknesses identified in the former valleys, and only a thin veneer of material identified on the edge of the site (edge of the former valleys).

- 3.3 No significant groundwater inflows were identified in any of the trial pit excavations, although the soils were noted to be wet/damp or minor water seepages identified in TP1, TP2, TP3, TP8, TP9 and TP12 at depths of between 1.0 and 4.1m. It is probable that such incidences are associated with the presence of perched water in the made ground deposits.
- 3.4 Therefore based on the drilling findings, there is a moderate risk of shallow mining-related ground subsidence occurring in the west half of the site, but a high risk in the east half, largely in the latter case, due to the underlying presence of the Lower Seven Feet seam, and potentially associated workings.
- 3.5 Ground conditions suggest soakaways are not viable, however in accordance with the SAB legislation testing will be carried out to confirm.
- 3.6 Based upon the presence of clay in the topsoil layers and general observation of our site visit, a soil type 4.0 should be considered where calculating QBAR.

4.0 Key Design Criteria

4.1 Existing Surface Water

As indicated above, the proposed site consists of scrubland which, in the main falls from North to South. The culverted watercourse remains an open channel approximately 100m from the northern boundary before entering a 600mm diameter culvert. A secondary open channel is located approximately 50 meters north of the southern boundary prior to flowing into a 600mm culvert. The channel appears to have been installed for local land drainage purposes. OS maps suggest that both culverts above join prior to discharging into an open channel to the south of the development.

4.2 Having considered the overland flow paths, the following can be ascertained:

- 4.2.1 Catchment 1 - Flows from the northern portion of the site i.e. the land north/north east of the culvert inlet are collected in the open ditch and conveyed to the south via the 600mm culvert.
- 4.2.2 Catchment 2 - The middle portion drains to the western boundary with no obvious outlet, however, if we were to interpolate flow paths, the parcel may drain to the southern culvert
- 4.2.3 Catchment 3 - The southern portion (the vast proportion of the site) of the site drains to the southern open ditch.
- 4.2.4 Catchment 4- The most southern portion of the site i.e. south of the track appears to run to the south, probably intercepted by the watercourse.

See Appendix A for Surface Water Catchment Plan

4.3 Proposed Surface Water

The surface water will, as per the existing scenario & drain into the culverted watercourse at intervals as to minimise a single significant volume of attenuation in one location in the southern portion of the site.

See Appendix B for Indicative Basin Locations.

The QBAR for the development has been calculated as 36.7l/s.

Indicative calculations at this stage, suggest that approximately 1200 cube of storage is required, the volume will be divided into a minimum of 3 basins with proportional Qbar values attributed to the proportional area it drains.

A copy of the Microdrainage calculations can be seen in Appendix C

4.4 SABS Legislation

In accordance with the SAB legislation, we must achieve compliance, where possible with the 6 requirements. Our summary of compliance is as follows, however is subject to detailed design, third party input and sign off from the SAB:

- S1 Surface Water Run off Destination - Discharge to watercourse ✓
- S2 Surface water runoff hydraulic control – Discharge to watercourse at Qbar, use of permeable/ macro pervious surfaces, rain gardens, basins, swales ✓
- S3 Water Quality – Typical use of systems mentioned in S2 on residential development ensures compliance ✓
- S4 Amenity – Significant green space has been provided which we anticipate incorporating the drainage within, with provision for paths and benches ✓
- S5 Biodiversity – Significant green space has been provided which we anticipate incorporating the drainage within. Native species of plants and vegetation will be specified. ✓
- S6 Design of drainage for construction, operation and maintenance - The site is to be constructed in line with the guidance set out in Ciria C768 ✓

4.5 Design Criteria

Surface water sewers serving the proposed development will be designed to meet the hydraulic design and construction requirements within “Sewers for Adoption” 7th Edition, SAB legislation and building regulations Part H.

4.6 Climate Change

To consider climate change impact for the 100-year life of the residential development a 30% allowance for the predicted increase in rainfall intensity should be assumed for the design of the surface water drainage in accordance with Technical Advice Note 15 (TAN15) & SAB Legislation.

4.7 Foul Water Sewer Design

4.7.1 DCWW public foul sewer is located along the Eastern boundary.

4.7.2 A pumping station will be required to pump foul flows from the development.

4.7.3 Foul sewers serving the proposed development will be designed to meet the hydraulic design and construction requirements within "Sewers for Adoption" 7th Edition. It is intended to offer the foul sewer to Welsh Water for adoption under a Section 104 Agreement in accordance with The Water Industries Act 1991

5 Flood Risk Assessment

5.7 Flood Zone

According to the Natural Resources Wales Flood Zone Map (see figure 2), the site is identified as being located within Flood Zone A

Flood Zone A is defined in the Welsh Assemblies Technical Advice Note 15 (TAN 15) as land assessed having the following annual probability of flooding: -

Flood Zone A “Low Risk”

The Proposed site is considered to be at little or no risk of fluvial or tidal/coastal flooding

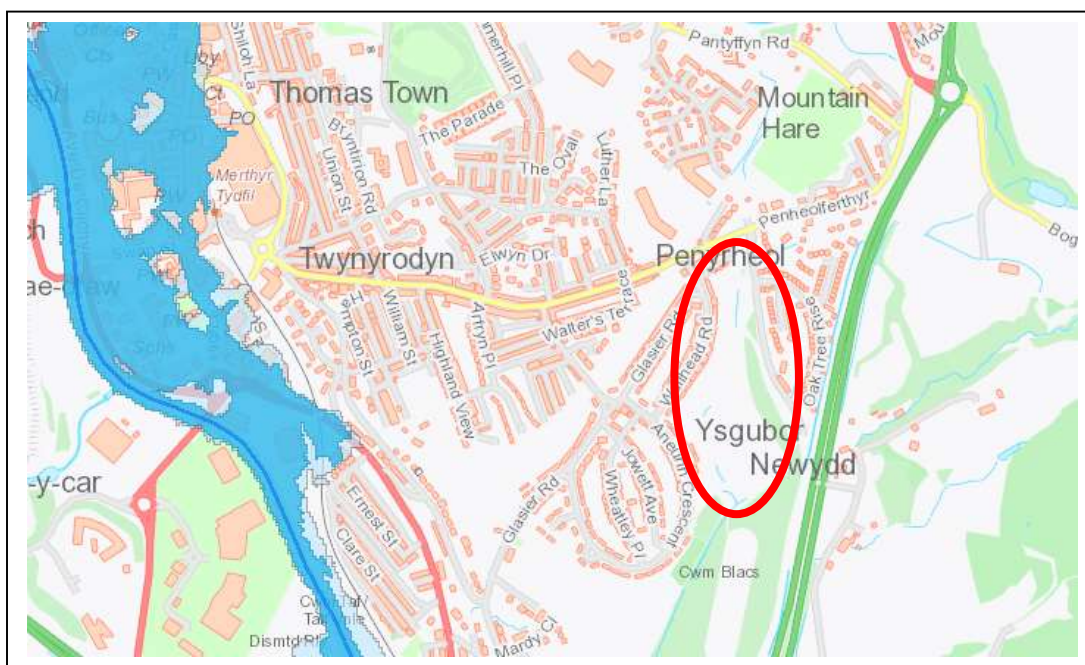


Figure 2 – NRW Flood Maps

5.2 Flood Risk Vulnerability Classification

The Flood Risk Vulnerability Classification of the proposed development (i.e. Residential) is ‘Highly Vulnerable’ in accordance with Figure 2 within TAN 15.

5.3 Flood Risk Vulnerability and Flood Zone Compatibility

In accordance with Section 6, TAN 15, all development is appropriate for the site with it being located within Flood Zone A.

5.4 Flooding Hazards

5.4.1 Fluvial & Tidal

The nearest main watercourse is the River Taff to the West of the site. This does not pose a risk to the site as identified in figure 2.

5.4.2 Surface Water (Overland Flow)

Intense periods of rainfall over a short duration can often lead to overland flow as rainwater is unable to infiltrate into the ground or enter drainage systems. Overland runoff is expected from the undeveloped areas of site to the south and a such a land drainage system should be installed to prevent flooding.

NRW maps shows limited evidence of overland flooding from the open channels on site, however upon completing the development which will have a SAB compliant drainage system, overland flooding is considered to pose no risk.

5.4.3 Groundwater Flooding

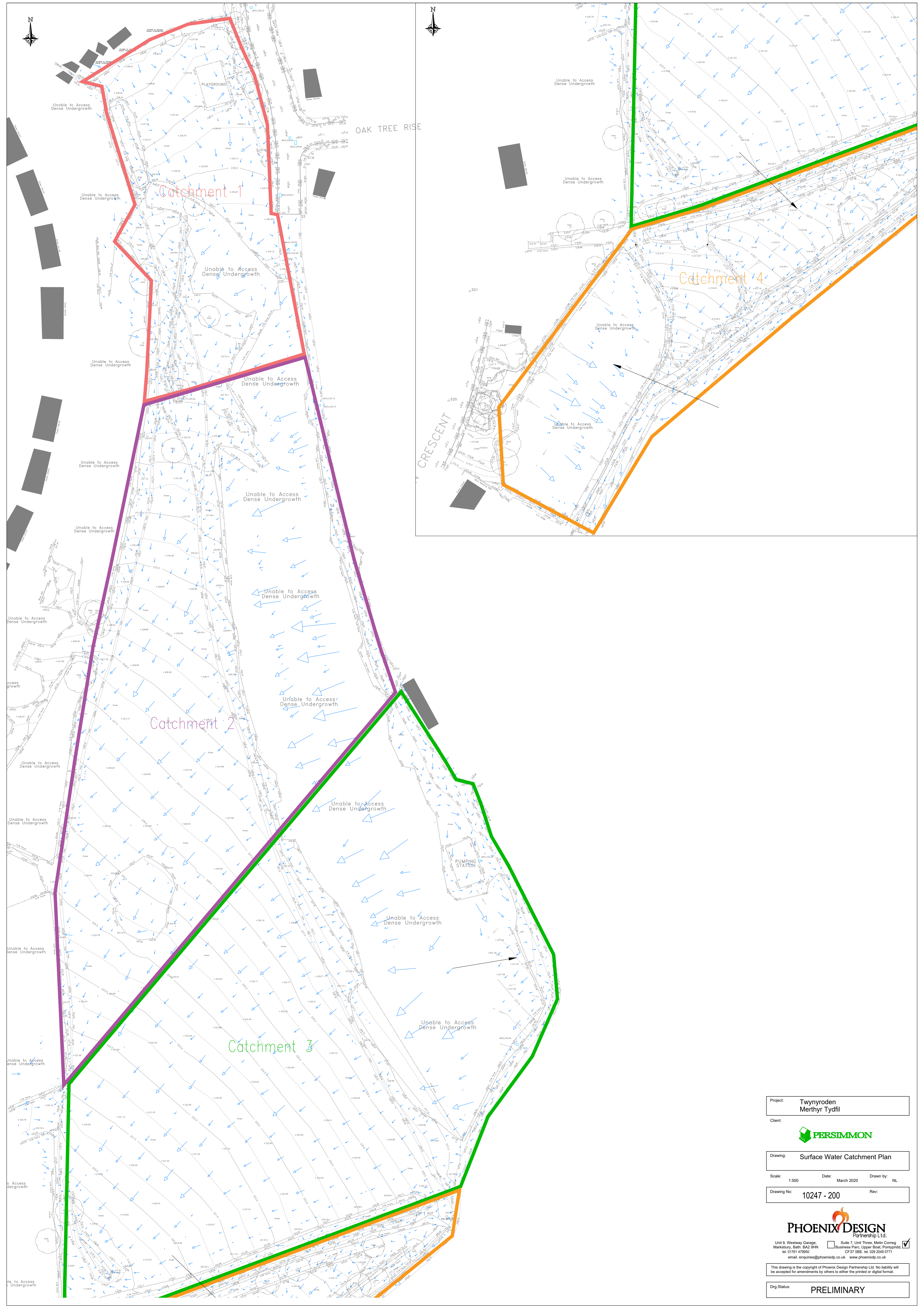
Groundwater flooding is when the water levels in the ground rise above surface elevations, which is most likely to occur in low lying areas underlain by permeable rocks (aquifers).

The ground investigation encountered perched ground water, and as such is not considered to pose a risk.

6 Summary

- 6.1 This report provides information on the surface & foul water drainage as required by the undertaking given by Persimmon Homes East Wales.
- 6.2 Surface water will drain to the existing watercourse that runs through the site.
- 6.3 Foul drainage shall discharge to the existing public system to the east of the development, initially by pumping station.
- 6.4 Climate change impact for the 100-year life of the residential development a 30% allowance for the predicted increase in rainfall intensity has been assumed for the design of the surface water drainage in accordance with Technical Advice Note (TAN 15) & SAB Legislation.
- 6.5 The site is located within Flood Zone A and considered to be at little or no risk of fluvial or tidal/coastal flooding.

Appendix A
Surface Water Catchment Plan



Project: Twynyroden Merthyr Tydfil

Client: 

Drawing: Surface Water Catchment Plan

Scale: 1:500 Date: March 2020 Drawn by: NL

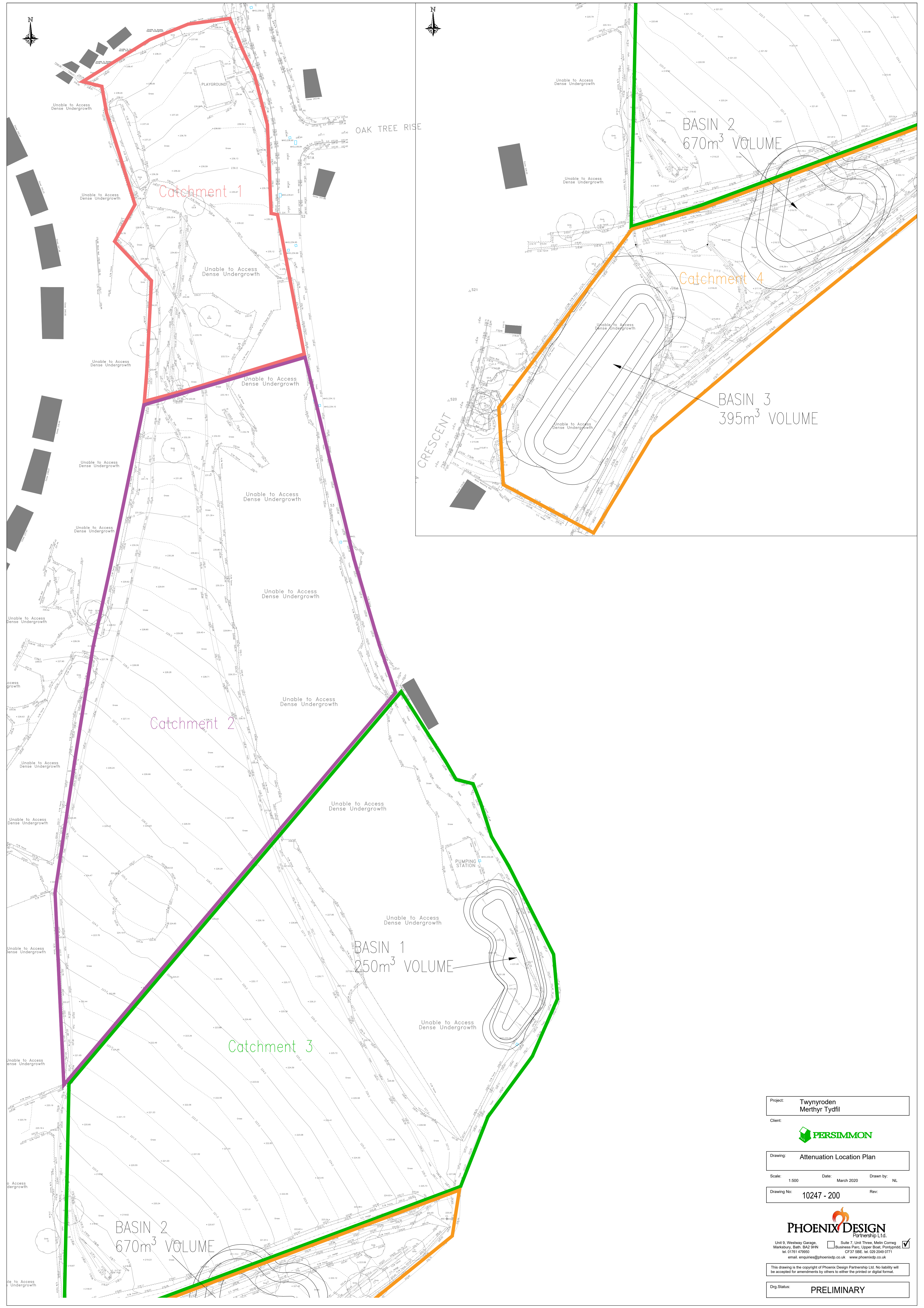
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Dwg Status: PRELIMINARY

Appendix B
Indicative Basin Locations



Project: Twynyroden Merthyr Tydfil



Drawing: Attenuation Location Plan

Scale: 1:500 Date: March 2020 Drawn by: NL

Drawing No: 10247 - 200 Rev:

PHOENIX DESIGN
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Appendix C

Microdrainage Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 1600 Urban 0.000
Area (ha) 4.100 Soil 0.400 Region Number Region 9

Results l/s

QBAR Rural 36.7
QBAR Urban 36.7

Q100 years 80.0

Q1 year 32.3
Q30 years 64.7
Q100 years 80.0

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Titan House Lewis Road Cardiff, CF24 5BS		
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Innovyze	Source Control 2018.1.1	

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

Half Drain Time : 308 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	216.056	0.556	0.0	36.6	36.6	359.4	0 K
30 min Summer	216.321	0.821	0.0	36.6	36.6	530.1	0 K
60 min Summer	216.634	1.134	0.0	36.6	36.6	732.4	0 K
120 min Summer	216.942	1.442	0.0	36.6	36.6	931.2	0 K
180 min Summer	217.067	1.567	0.0	36.6	36.6	1012.6	0 K
240 min Summer	217.134	1.634	0.0	36.6	36.6	1055.7	0 K
360 min Summer	217.191	1.691	0.0	36.6	36.6	1092.2	0 K
480 min Summer	217.211	1.711	0.0	36.6	36.6	1105.4	0 K
600 min Summer	217.214	1.714	0.0	36.6	36.6	1106.9	0 K
720 min Summer	217.205	1.705	0.0	36.6	36.6	1101.4	0 K
960 min Summer	217.168	1.668	0.0	36.6	36.6	1077.5	0 K
1440 min Summer	217.059	1.559	0.0	36.6	36.6	1007.1	0 K
2160 min Summer	216.869	1.369	0.0	36.6	36.6	884.4	0 K
2880 min Summer	216.622	1.122	0.0	36.6	36.6	724.7	0 K
4320 min Summer	216.231	0.731	0.0	36.6	36.6	472.1	0 K
5760 min Summer	215.987	0.487	0.0	36.6	36.6	314.9	0 K
7200 min Summer	215.837	0.337	0.0	35.9	35.9	218.0	0 K
8640 min Summer	215.743	0.243	0.0	34.6	34.6	157.3	0 K
10080 min Summer	215.685	0.185	0.0	33.3	33.3	119.6	0 K
15 min Winter	216.131	0.631	0.0	36.6	36.6	407.4	0 K
30 min Winter	216.432	0.932	0.0	36.6	36.6	601.9	0 K
60 min Winter	216.797	1.297	0.0	36.6	36.6	837.6	0 K
120 min Winter	217.150	1.650	0.0	36.6	36.6	1065.7	0 K
180 min Winter	217.307	1.807	0.0	36.6	36.6	1167.0	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	100.646	0.0	406.3	28
30 min Summer	74.363	0.0	600.8	41
60 min Summer	52.662	0.0	851.7	70
120 min Summer	35.497	0.0	1148.0	126
180 min Summer	27.508	0.0	1334.1	184
240 min Summer	22.929	0.0	1482.8	240
360 min Summer	17.658	0.0	1713.4	306
480 min Summer	14.625	0.0	1892.0	372
600 min Summer	12.613	0.0	2039.8	438
720 min Summer	11.163	0.0	2165.6	508
960 min Summer	9.187	0.0	2376.5	650
1440 min Summer	6.965	0.0	2703.3	930
2160 min Summer	5.294	0.0	3082.2	1348
2880 min Summer	4.365	0.0	3387.9	1732
4320 min Summer	3.346	0.0	3895.4	2428
5760 min Summer	2.792	0.0	4333.9	3112
7200 min Summer	2.438	0.0	4729.6	3760
8640 min Summer	2.180	0.0	5076.6	4496
10080 min Summer	1.984	0.0	5388.3	5152
15 min Winter	100.646	0.0	455.2	28
30 min Winter	74.363	0.0	672.9	42
60 min Winter	52.662	0.0	953.5	70
120 min Winter	35.497	0.0	1285.4	126
180 min Winter	27.508	0.0	1494.9	182

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m ³)	Status
240 min Winter	217.396	1.896	0.0	36.6	36.6	1225.0	0 K
360 min Winter	217.467	1.967	0.0	36.6	36.6	1270.5	0 K
480 min Winter	217.483	1.983	0.0	36.6	36.6	1281.0	0 K
600 min Winter	217.479	1.979	0.0	36.6	36.6	1278.6	0 K
720 min Winter	217.458	1.958	0.0	36.6	36.6	1264.7	0 K
960 min Winter	217.385	1.885	0.0	36.6	36.6	1217.6	0 K
1440 min Winter	217.190	1.690	0.0	36.6	36.6	1091.8	0 K
2160 min Winter	216.859	1.359	0.0	36.6	36.6	878.2	0 K
2880 min Winter	216.426	0.926	0.0	36.6	36.6	598.1	0 K
4320 min Winter	215.918	0.418	0.0	36.5	36.5	270.1	0 K
5760 min Winter	215.709	0.209	0.0	33.9	33.9	135.1	0 K
7200 min Winter	215.644	0.144	0.0	30.9	30.9	92.7	0 K
8640 min Winter	215.620	0.120	0.0	27.7	27.7	77.4	0 K
10080 min Winter	215.603	0.103	0.0	25.2	25.2	66.7	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
240 min Winter	22.929	0.0	1661.0	236
360 min Winter	17.658	0.0	1918.3	340
480 min Winter	14.625	0.0	2118.7	388
600 min Winter	12.613	0.0	2284.3	466
720 min Winter	11.163	0.0	2426.2	544
960 min Winter	9.187	0.0	2661.7	702
1440 min Winter	6.965	0.0	3027.5	1006
2160 min Winter	5.294	0.0	3451.1	1456
2880 min Winter	4.365	0.0	3794.3	1800
4320 min Winter	3.346	0.0	4362.9	2436
5760 min Winter	2.792	0.0	4854.0	3064
7200 min Winter	2.438	0.0	5297.0	3680
8640 min Winter	2.180	0.0	5685.7	4408
10080 min Winter	1.984	0.0	6034.7	5136

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.200	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 2.156

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.539	4 8	0.539	8 12	0.539	12 16	0.539

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Model Details

Storage is Online Cover Level (m) 218.000

Cellular Storage Structure

Invert Level (m) 215.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	680.0	0.0	2.000	680.0	0.0	2.100	0.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0243-3670-2100-3670
Design Head (m) 2.100
Design Flow (l/s) 36.7
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 243
Invert Level (m) 215.400
Minimum Outlet Pipe Diameter (mm) 300
Suggested Manhole Diameter (mm) 2100

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.100	36.7	Kick-Flo®	1.333	29.5
Flush-Flo™	0.613	36.6	Mean Flow over Head Range	-	31.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

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)
0.100	8.0	0.800	36.2	2.000	35.8	4.000	50.0	7.000	65.6
0.200	24.7	1.000	35.1	2.200	37.5	4.500	53.0	7.500	67.9
0.300	33.7	1.200	32.7	2.400	39.1	5.000	55.8	8.000	70.0
0.400	35.5	1.400	30.2	2.600	40.7	5.500	58.4	8.500	72.1
0.500	36.4	1.600	32.2	3.000	43.6	6.000	60.9	9.000	74.2
0.600	36.6	1.800	34.1	3.500	46.9	6.500	63.3	9.500	76.1