

Drainage Strategy Note

July 2020 Revision A

1 INTRODUCTION

- 1.1 This document sets out the existing and proposed drainage arrangements associated with the proposed redevelopment of the former St Tydfil's Hospital site, Merthyr Tydfil, for 70 dwellings.
- 1.2 The location of the site is shown in Figure 1.1 below. The former Hospital site is no longer in operation and the majority of the site has been demolished.
- 1.3 The site has an approximate area of 2.06 hectares (ha) and based on topographical survey information and satellite images it is estimated that the site approximately comprised 1.79ha (89%) impermeable catchment area.

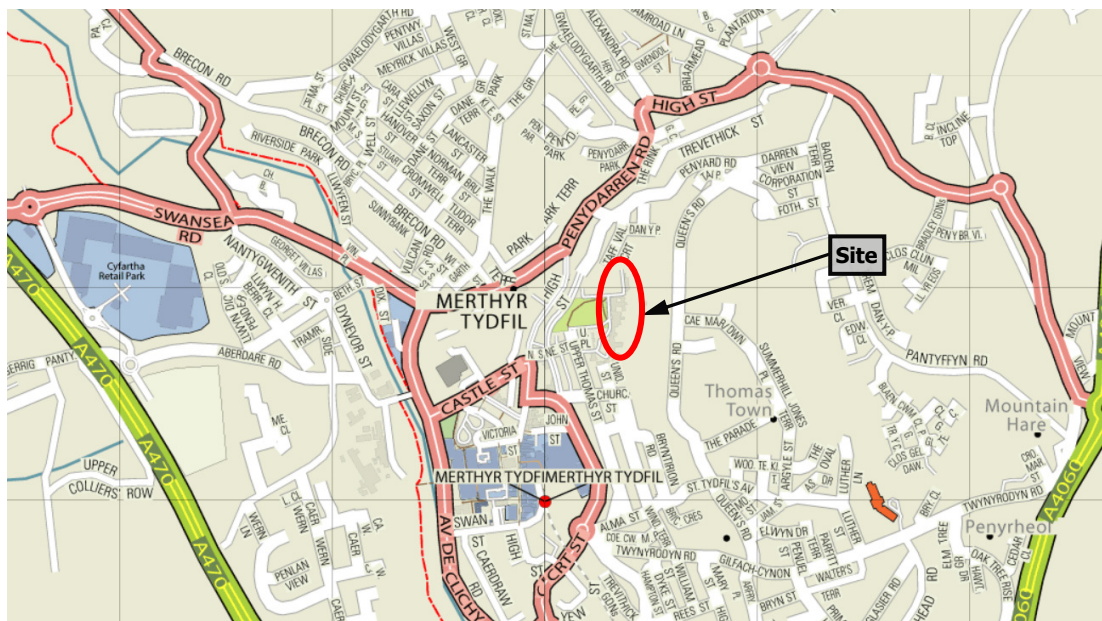


Figure 1.1 – Site Location

2 EXISTING SITUATION

Flood Risk

- 2.1 The nearest major watercourse to the site is the River Taff which is approximately 510m to the west.
- 2.2 NRW Flood Zone mapping indicates that the site is not at risk from flooding. It is therefore considered that the site is suitable for residential development.

Site Investigations

- 2.3 Ground Investigations have not been undertaken to date. Desktop information obtained from UK Wallingford suggests the potential for use of infiltration on site is very low (Soil value 5)
- 2.4 At this stage it is therefore considered that the use of soakaways within the site is not feasible.

Existing Drainage

- 2.5 Sewer Records have been obtained from DCWW and Merthyr Tydfil CBC are included at **Appendix A**.
- 2.6 The records confirm that there is a MTCBC storm drain crossing the site east-west, which outfalls to Nant Morlais to the north-west of the site. The records also confirm that there are existing DCWW combined sewers running north to south within the southern part of the site, which outfall to the wider DCWW combined sewer network to the south.
- 2.7 Topographical survey information and site observations indicate that runoff from the site is separated into a north and south catchment.
- 2.8 The north catchment comprises an approximate impermeable area of 0.69ha and is believed to outfall unrestricted to the existing storm drain crossing the site.
- 2.9 The south catchment comprises an approximate impermeable area of 1.10ha and is believed to outfall unrestricted to the existing DCWW combined sewers in the southern part of the site.
- 2.10 The assumed existing drainage arrangements are indicated on the plan included at **Appendix B**.
- 2.11 Further CCTV survey investigations are to be undertaken to confirm the existing drainage arrangements on site and existing outfall destinations.

Existing Peak Flow Rates

- 2.12 Existing peak flow rates for the north and south catchment areas have been estimated and are summarised in Table 2.1 below, with simulation results included at **Appendix C**.

Return Period	North Catchment (l/s)	South Catchment (l/s)	Total Peak Flow Rate (l/s)
Q1 Year	71	122	193
Q2 Years	92	158	250
Q30 Years	174	298	472
Q100 Years	224	372	596

Table 2.1 – Existing Peak Flow Rates

- 2.13 The maximum volume of discharge from the site for the 1 in 100-year (360 minutes) storm event is estimated as 1,189m³, with 437m³ in the north catchment and 752m³ in the south.

3 PROPOSED SUDS STRATEGY

- 3.1 The proposed SuDS strategy is shown on the plan included at **Appendix D**.
- 3.2 The proposed site layout comprises a 0.97ha total impermeable catchment area, which equates to a 50% reduction in comparison to the pre-development scenario.

Runoff Destination

- 3.3 Based on desktop information it is considered that the potential for using soakaways in the site is very low, although infiltration tests will be undertaken to confirm this. Should infiltration testing record suitable rates then soakaways will be used where considered feasible.
- 3.4 Should infiltration testing confirm ground conditions are not suitable, then it is proposed to discharge runoff from the north catchment to the existing storm drain crossing the site, which ultimately outfalls to Nant Morlais to the north-west of the site.
- 3.5 As part of these proposals, it is proposed to divert the storm drain through the site to accommodate the site layout, subject to approval from MTCBC.
- 3.6 Should infiltration testing confirm ground conditions are not suitable, then it is proposed to discharge runoff from the south catchment to the existing DCWW combined sewer in Union Place / Upper Thomas Street to the west of the site.
- 3.7 As part of these proposals, it is proposed to abandon the existing DCWW combined sewers in the southern part of the site, to accommodate the site layout, subject to approval from DCWW.

Water Quantity

- 3.8 The development proposals comprise a 50% reduction in the impermeable area within the site, compared to the pre-development scenario. In addition, numerous flow control devices are to be used to restrict flows from plots and various sub-catchments.

3.9 As set out in Tables 3.1 & 3.2 below, this will result in a significant reduction in discharge rates from the site.

Return Period	North Catchment (l/s)	South Catchment (l/s)	Total Peak Flow Rate (l/s)
Q1 Year	19	20	39
Q2 Years	21	24	45
Q30 Years	28	40	68
Q100 Years (+40%)	44	74	118

Table 3.1 – Post Development Peak Discharge Rates

Return Period	North Catchment (l/s)	South Catchment (l/s)	Total Peak Flow Rate (l/s)
Q1 Year	-52	-102	-154 (80%)
Q2 Years	-71	-136	-207 (82%)
Q30 Years	-62	-258	-320 (85%)
Q100 Years	-80	-298	-378 (80%)

Table 3.2 – Pre & Post Development Peak Flow Rate Comparison

3.10 As indicated in Table 3.2, the redevelopment proposals will result in a minimum 80% reduction in peak flow rates from the site.

3.11 Furthermore, it is considered that the proposed peak flow rates set out in Table 3.1 are very robust as they are based on the following assumptions:

- Five-minute concentration time; and
- No SuDS features.

3.12 All surface water runoff will be conveyed through / to at least one of the following SuDS components within the site:

- Permeable Paving;
- Rain Gardens;
- Swales; and
- Rain Garden Box Planters.

3.13 These SuDS components will further reduce peak flow rates through increasing concentration time, reducing flow velocity and providing significant losses through evaporation and evapotranspiration.

3.14 Subsequently, it is considered that the proposed peak flow rate reductions set out in Table 3.2 will be significantly increased as a result of the SuDS scheme.

Water Treatment

3.15 In accordance with guidance set out in the *SuDS Manual (Chapter 26 Water Quality)*, the proposed residential land use is classified as a 'Low' pollution hazard level. This is betterment in comparison to the existing Hospital land use which is classified as a 'Medium' pollution hazard level.

3.16 Further to this, the proposed SuDS components are to provide interception of all surface water runoff which will significantly improve the quality of water discharged from the site.

Amenity

3.17 It is considered that the shared space environment with above ground conveyance, SuDS tree pit systems and rain garden box planters will enhance the amenity value of the site and providing an attractive living space.

Biodiversity

3.18 The introduction of SuDS tree pits, rain garden box planters, swales and other vegetation, including the large area of open space to the east of the site, will significantly enhance the biodiversity within the site, in comparison to the existing situation.

Maintenance

3.19 It is understood that all SuDS components serving more than one property is required to be adopted and maintained by the SAB Authority. All other SuDS components will be maintained by the respective homeowner(s).

3.20 All SuDS components are to be maintained in accordance with manufacturer's recommendations and / or guidance set out in the *SuDS Manual*.

4 PROPOSED FOUL DRAINAGE STRATEGY

4.1 The proposed foul drainage strategy is shown on the plan included at **Appendix E**.

4.2 DCWW have been consulted on the proposals and it has been confirmed that the existing public sewer network has available capacity to accommodate the proposed 70 dwellings, with a suitable connection point at Union Place to the west of the site.

4.3 It is proposed to abandon the existing DCWW combined sewers within the site to accommodate the development. This is subject to further consultation with DCWW.

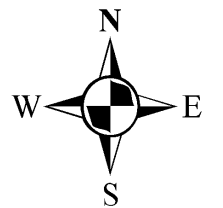
5 CONCLUSION

- 5.1 It is considered that acceptable SuDS and foul drainage strategies can be achieved, whilst the proposed SuDS strategy would provide significant betterment to the existing DCWW combined sewer network and the receiving watercourse.

Appendix A

DCWW & MTCBC Sewer Records

Former St Tydfils Hospital site



LEGEND(Representative of most common features)

Waste network:	Foul chamber	Surface water chamber	Outfall
Combined chamber	LH	Lamphole	
Combined sewer overflow	Storm Overflow	Rising main	
Special purpose chamber	Gravity sewer	Private sewer	
Treatment works	S 104	Private sewer subject to Sect. 104 adoption agreement	
Pumping station	Private Sewer Transfer	Lateral Drain	
	Inspection Chamber		

NB: Sewer symbol colour indicates the type.
RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S24 sewers (for indicative purposes only)

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation.

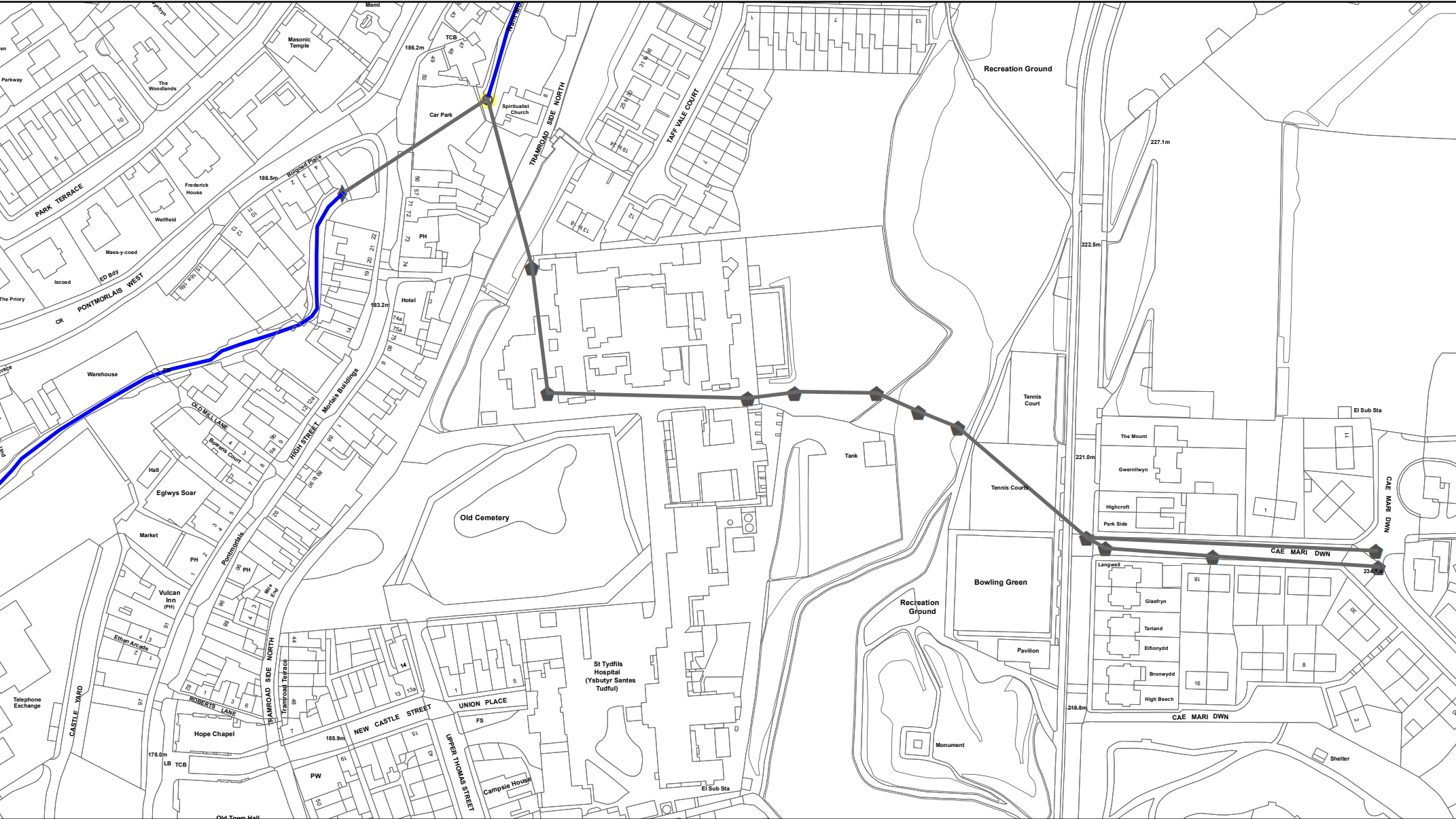
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Service pipes are not generally shown but their presence should be anticipated.

**EXACT LOCATIONS OF ALL APPARATUS
TO BE DETERMINED ON SITE.**

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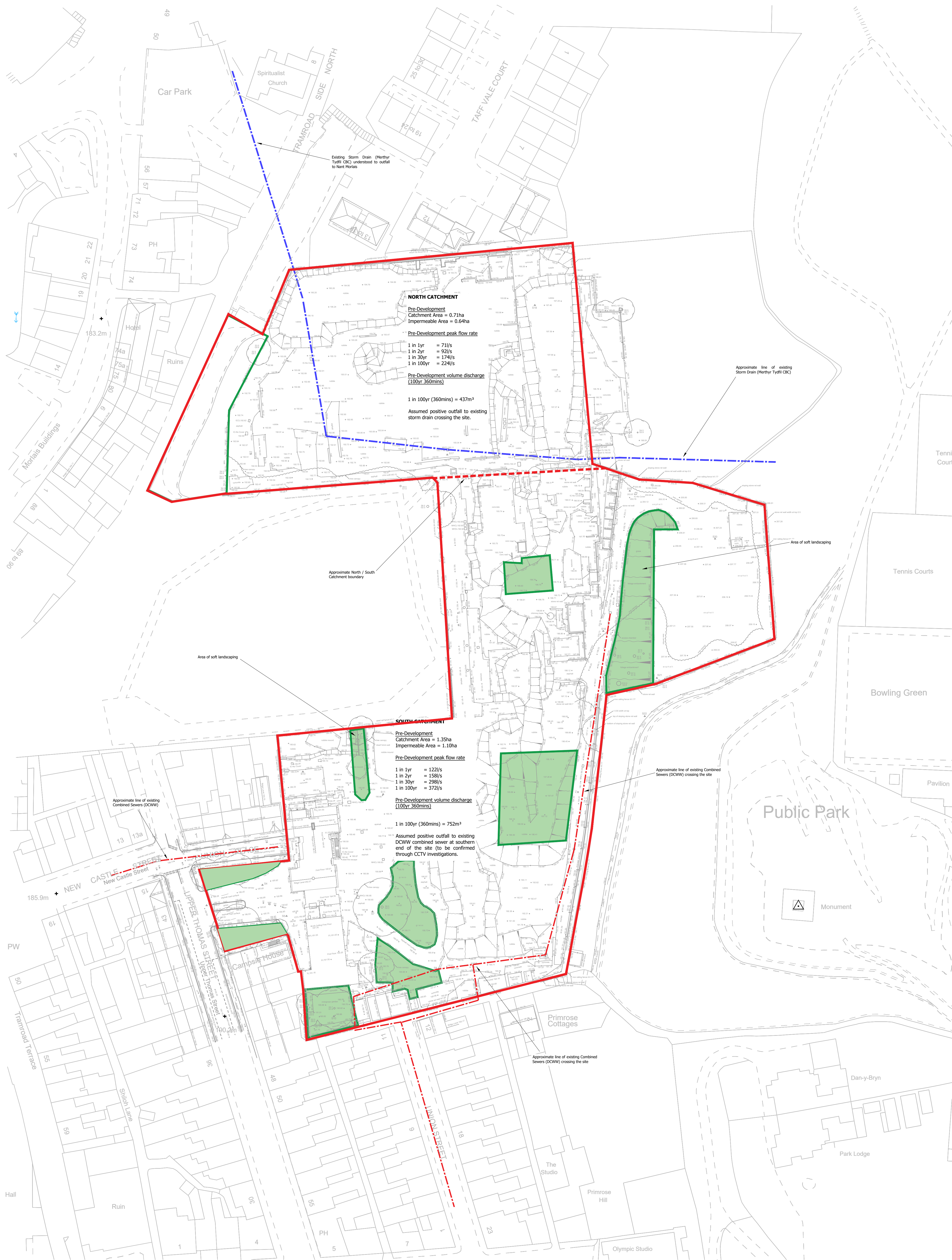
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Appendix B

Existing Drainage Arrangement



Appendix C

Existing Storm Simulations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.200	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
Pre-dev North 1	0.640	5.00	10.000	1200	2.000
Pre-dev North 2	0.000		10.000	1350	2.500
Pre-dev South 1	1.100	5.00	10.000	1200	2.000
Pre-dev South 2	0.000		10.000	1350	2.500

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	Pre-dev North 1	Pre-dev North 2	10.000	0.600	8.000	7.500	0.500	20.0	375	5.04	38.5
2.000	Pre-dev South 1	Pre-dev South 2	10.000	0.600	8.000	7.500	0.500	20.0	375	5.04	38.5

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	4.067	449.2	66.7	1.625	2.125	0.640	0.0	97	2.952
2.000	4.067	449.2	114.7	1.625	2.125	1.100	0.0	129	3.422

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	10.000	20.0	375	Circular_Default Sewer Type	10.000	8.000	1.625	10.000	7.500	2.125
2.000	10.000	20.0	375	Circular_Default Sewer Type	10.000	8.000	1.625	10.000	7.500	2.125

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	Pre-dev North 1	1200	Manhole	Adoptable	Pre-dev North 2	1350	Manhole	Adoptable
2.000	Pre-dev South 1	1200	Manhole	Adoptable	Pre-dev South 2	1350	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Pre-dev North 1	10.000	2.000	1200				
				0	1.000	8.000	375
Pre-dev North 2	10.000	2.500	1350		1	1.000	7.500
							375
Pre-dev South 1	10.000	2.000	1200				
				0	2.000	8.000	375
Pre-dev South 2	10.000	2.500	1350		1	2.000	7.500
							375

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.200	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
30	0	0	0
100	0	0	0

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Pre-dev North 1	10	8.113	0.113	71.7	0.8543	0.0000	OK
15 minute winter	Pre-dev North 2	10	7.600	0.100	71.2	0.0000	0.0000	OK
15 minute winter	Pre-dev South 1	10	8.157	0.157	123.2	1.8995	0.0000	OK
15 minute winter	Pre-dev South 2	10	7.632	0.132	122.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	Pre-dev North 1	1.000	Pre-dev North 2	71.2	2.765	0.158	0.2577	33.1
15 minute winter	Pre-dev South 1	2.000	Pre-dev South 2	122.0	3.127	0.272	0.3904	56.9

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Pre-dev North 1	10	8.132	0.132	92.9	0.9941	0.0000	OK
15 minute winter	Pre-dev North 2	10	7.614	0.114	92.2	0.0000	0.0000	OK
15 minute winter	Pre-dev South 1	10	8.185	0.185	159.7	2.2421	0.0000	OK
15 minute winter	Pre-dev South 2	10	7.652	0.152	158.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	Pre-dev North 1	1.000	Pre-dev North 2	92.2	2.937	0.205	0.3142	42.9
15 minute winter	Pre-dev South 1	2.000	Pre-dev South 2	158.0	3.303	0.352	0.4788	73.6

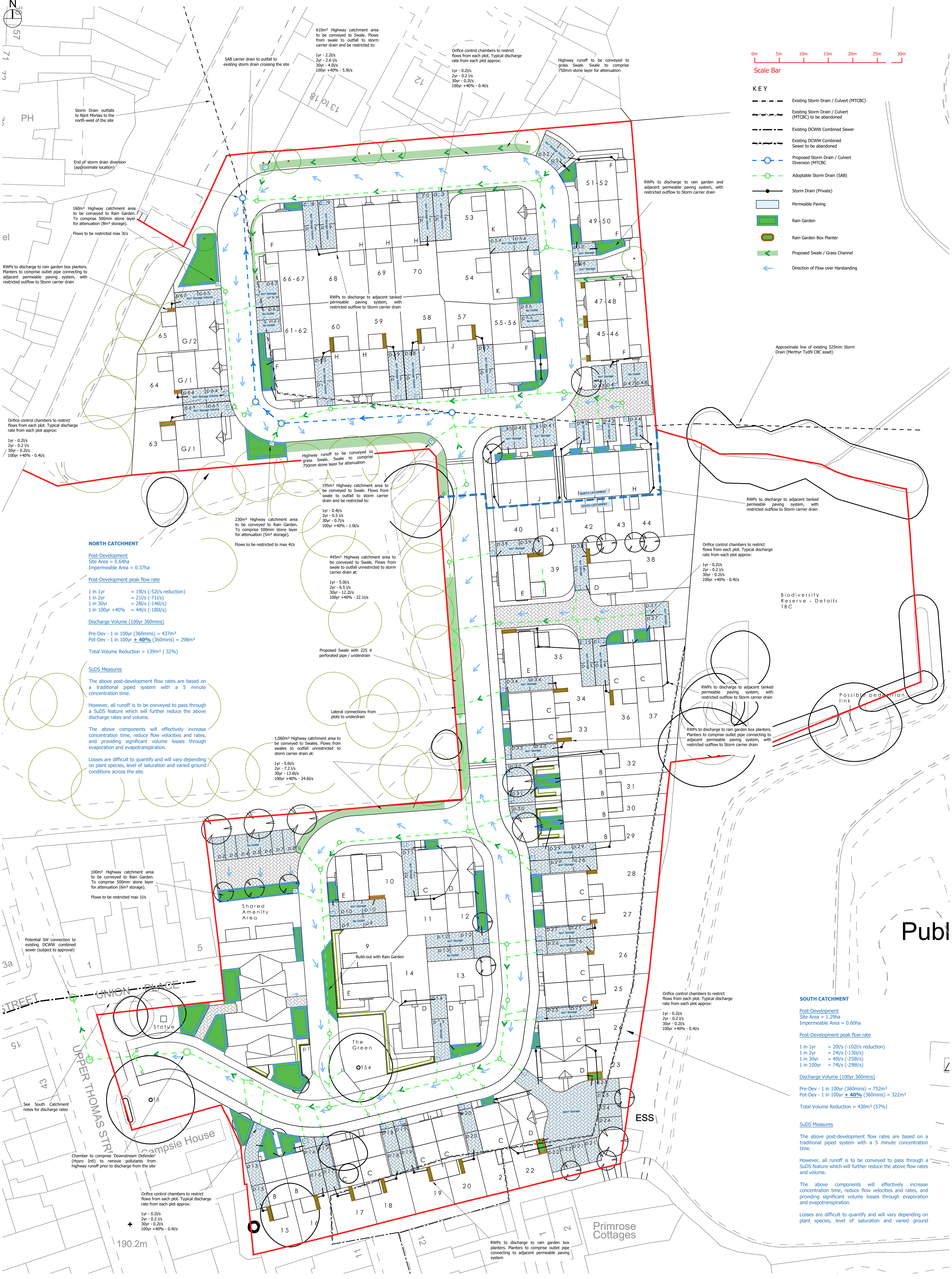
Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Pre-dev North 1	10	8.197	0.197	175.1	1.4837	0.0000	OK
15 minute winter	Pre-dev North 2	10	7.660	0.160	174.0	0.0000	0.0000	OK
15 minute winter	Pre-dev South 1	10	8.295	0.295	301.0	3.5794	0.0000	OK
15 minute winter	Pre-dev South 2	10	7.719	0.219	297.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	Pre-dev North 1	1.000	Pre-dev North 2	174.0	3.368	0.387	0.5169	80.8
15 minute winter	Pre-dev South 1	2.000	Pre-dev South 2	297.5	3.693	0.662	0.7998	138.8

Appendix D

SuDS Strategy Plan



NORTH CATCHMENT

Post-Development
Site Area = 0.64ha
Impermeable Area = 0.37ha

Post-Development peak flow rate

1 in 1yr = 191/s (-52/s reduction)
1 in 2yr = 211/s (-71/s)
1 in 30yr = 288/s (-146/s)
1 in 100yr +40% = 441/s (-180/s)

Discharge Volume (100yr 360mins)

Pre-Dev - 1 in 100yr (360mins) = 437m³
Pot-Dev - 1 in 100yr **+40%** (360mins) = 298m³
Total Volume Reduction = 139m³ (32%)

SuDS Measures

The above post-development flow rates are based on a traditional piped system with a 5 minute concentration time.

However, all runoff is to be conveyed to pass through a SuDS feature which will further reduce the above discharge rates and volume.

The above components will effectively increase concentration time, reduce flow velocities and rates, and providing significant volume losses through evaporation and evapotranspiration.

Losses are difficult to quantify and will vary depending on plant species, level of saturation and varied ground conditions across the site.

SOUTH CATCHMENT

Post-Development
Site Area = 1.29ha
Impermeable Area = 0.60ha

Post-Development peak flow rate

1 in 1yr = 201/s (-102/s reduction)
1 in 2yr = 241/s (-136/s)
1 in 30yr = 401/s (-250/s)
1 in 100yr = 741/s (-298/s)

Discharge Volume (100yr 360mins)

Pre-Dev - 1 in 100yr (360mins) = 752m³
Pot-Dev - 1 in 100yr **+40%** (360mins) = 322m³
Total Volume Reduction = 430m³ (57%)

SuDS Measures

The above post-development flow rates are based on a traditional piped system with a 5 minute concentration time.

However, all runoff is to be conveyed to pass through a SuDS feature which will further reduce the above flow rates and volume.

The above components will effectively increase concentration time, reduce flow velocities and rates, and providing significant volume losses through evaporation and evapotranspiration.

Losses are difficult to quantify and will vary depending on plant species, level of saturation and varied ground

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Appendix E

Foul Drainage Strategy Plan

