



SPACE STUDIOS, MANCHESTER

Flood Risk Assessment & Drainage Strategy Statement

For: Manchester City Council

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1 INTRODUCTION

- 1.1 Integra Consulting has been commissioned by Manchester City Council to undertake a Flood Risk Assessment (FRA) in accordance with the National Planning Policy Guidance, for a proposed site redevelopment consisting of two large stage buildings, adjoining workshop and offices in addition to associated external hardstanding areas. This document has been prepared to accompany the planning application for the site redevelopment.
- 1.2 The objective of the FRA was to identify potential flooding issues and any consequent implications on the proposed development. Existing and proposed surface water drainage for the development are considered in detail.
- 1.3 The FRA has been undertaken in accordance with the pro-forma guidance contained in:
 - Department for Communities and Local Government document 'National Planning Practice Guidance: Flood Risk and Coastal Change',
 - Manchester City, Salford City and Trafford Councils Level 2 Hybrid Strategic Flood Risk Assessment produced by JBA Consulting dated March 2011,
 - DEFRA / Environment Agency publication report SC030219 Rainfall Runoff Management for Developments dated October 2013.

2 STANDARDS AND LIMITATIONS

- 2.1 This report has been prepared solely for use by Manchester City Council. It shall not be relied upon or transferred to any other party without prior written authorisation of Integra Consulting.
- 2.2 The findings and opinions in this report are based on information derived from a variety of different sources. Integra Consulting do not accept any liability for the accuracy or otherwise of any information provided by third parties.
- 2.3 It should be noted that some aspects considered in this study may be subject to change with time. Therefore, consideration should be given to reviewing such issues to confirm that no changes have taken place, either at the site, ground conditions or within the relevant legislation at the detailed design stage.
- 2.4 It should be noted that detailed drainage design will be undertaken at a later stage. The outline drainage proposals presented in this document are therefore subject to further detailed design work.

3 CURRENT SITUATION

3.1 Site Location and Description

The site is located in an industrial area of West Gorton, approximately 3km to the east of Manchester city centre. The approximate National Grid Reference for the site is E386814 N396919. The site is approximately 1.4 hectares in area and, following recent demolition of a tower block and surrounding buildings, consist of a large expanse of stoned up hardstanding area currently being used for vehicle parking.

The site is bounded by studio buildings to the north (under the same ownership), hardstanding area & workshops to the east (same ownership), and adopted highways Wenlock Way and Kniveton Road to the south and west boundaries respectively.

Site location plans are contained in Appendix 1.

3.2 Hydrology and Flooding

Following review of the EA flood mapping, the full 3xtents of the site boundary lie wholly within Flood Zone 1 which relates to an annual probability of river flooding of less than 1 in 1000.

The risk from surface water flooding is classified as low to very low (refer to Appendix 2 for EA flood maps).

The far eastern end of the proposed site is noted to be at risk of flooding from reservoirs. However, this is on the extreme edge of the flood risk area, and maximum flood water depth is noted to be <0.3m. In addition to this reservoirs in the area are under the control of United Utilities and as such are maintained under the 1975 Reservoirs Act to 1 in 10,000 year flow standard. This form of flood risk is rare and remote.

It is noted that the potential development is classified as 'less vulnerable' in accordance with Table 2 of the Flood Risk and Coastal Change Guidance.

3.3 Watercourse and Surface Water Features

The nearest significant natural surface water feature is Corn Brook. The watercourse flows from east to west entering a culvert around 400m north east of the site boundary, the culvert then passes through the adjacent development site approximately 120m to the north east of the application site boundary. At this point the culvert is approximately 2700mm in height and 1800mm in width. Corn Brook then continues (culverted) running westwards below buildings to the north of Bennett Street.

3.4 Existing Site Drainage

The site formerly accommodated a tower block, associated surrounding buildings and external hardstanding areas. Previous drainage survey work was carried out which identified that the western half of the site drained via an on site combined drainage system, eventually connecting into the 375mm diameter public combined sewer located within Wenlock Way to the south. The eastern half of the site was drained via separate surface and foul water sewers, discharging to the existing offsite building drainage directly to the north. It is noted that this drainage then continues running northwards and eventually connects into the 300mm diameter public combined sewer located within Bennett Street

4 PROPOSED DEVELOPMENT

4.1 Development Proposals

The proposed development comprises a planning application to develop the site into two large stage buildings with a central building containing workshops and offices, along with associated external hardstanding areas (refer to Appendix 4 for details of proposed masterplan).

The proposed development is classed as 'less vulnerable' in Table 2 of the Flood Risk and Coastal Change Guidance.

The proposed development will be situated entirely within Flood Zone 1.

4.2 Surface Water Drainage Proposals

It should be noted that detailed drainage design will be undertaken at a later stage. The outline drainage proposals presented in this document are therefore subject to further design work.

The surface water drainage strategy for the application site shall consider the three tiered approach as noted in the Building Regulations H3 when assessing the options for post development surface water disposal:

- i) Sustainable Urban Drainage Systems (SUDS)
 - ii) Discharge of surface water off site direct to watercourse
 - iii) Discharge to adopted sewer
-
- i) Discharging via SUDS methods:

SUDS are made up of one or more structures built to manage surface water runoff. They are used in conjunction with good management of the site to prevent flooding and pollution. There are four general methods of control:

- Filter strips and swales
- Filter drains and permeable surfaces
- Infiltration devices
- Basins and Ponds

Site investigation works have been carried out across the site and it has been established that the site is underlain by shallow made ground deposits which overlies glacial clay deposits of up to 7m in thickness. Accordingly, due to permeability issues SUDS methods which rely on infiltration are deemed unsuitable.

In addition to the above, historical uses at the site have resulted in a degree of contamination present in the ground and thus any form of infiltration should be avoided due to the underlying risk associated with contamination.

In terms of SUDS measures which do not rely on infiltration, these are typically surface level site features which can take up large areas of site development (e.g. ponds, basins, swales etc). Given the dense urban location, the industrial nature of the development and heavy external hardstanding usage the site is not able to accommodate large areas of open green space which would be required to accommodate such SUDS features.

ii) Discharge to Watercourse

On the basis that discharge of surface water direct to ground is unsuitable in consideration of the evidence noted above, discharge to watercourse or sewer is therefore to be explored.

As noted in section 3.3, the closest watercourse to the development site is Corn Brook. This however lies 120m beyond the application site boundary and therefore a new connection directly into the watercourse would be challenging.

Investigation has therefore been carried out to establish existing offsite connectivity to the watercourse which could be utilised. It is noted that the drainage which was installed as part of the adjacent site development 'The Outer Space Project' (application number 112014/VO/2016/N2) passes close to the north eastern edge of the site boundary. The surveys carried out indicate that invert levels are low enough to allow for a gravity connection into this sewer.

Accordingly it is proposed to connect post development site surface water drainage indirectly into Corn Brook via the into the existing surface water drain to the north east.

It is proposed to discharge via the above noted method via greenfield runoff rates for the development site. This is calculated at 9 l/s, based upon the development site area of 1.4Ha. This is derived from actual greenfield runoff rates calculated based on SPR soil type as stipulated in IH124 – refer to Appendix 5 for details.

The above restricted flow discharge results in a below ground attenuation volume of approximately **740m³** based on a 1 in 100 year event including 40% climate change (refer to Appendix 5 for details).

An indicative drainage strategy layout is provided within Appendix 7. These proposals ensure that all surface water passes through the flow control device prior to connection to the offsite drainage (and subsequently Cornbrook), with attenuation tanks provided to cater for the 1 in 100 year flows with an allowance for climate change as noted above. It is also proposed that a full retention oil separator is provided immediately after the Hydrobrake chamber and hence accordingly all surface water will pass through the interceptor including roof water. The benefit of locating the interceptor after the

hydrobrake is that surface water runoff will pass through at a controlled rate and hence accordingly there are no associated issues of washing through of oils during intense rainfall events and thus is considered the most robust method of surface water treatment.

The existing drainage network which we are proposing to connect into is noted to also contain a flow control device and attenuation storage tanks – the original drainage information notes that this adjacent site is also restricted to greenfield runoff rates, which in this instance is 20.4 l/s for the adjacent site development area. Accordingly, in order to avoid flooding the existing system the existing downstream flow control device shall need replacing with a new flow control device capable of accommodating the existing plus the restricted greenfield runoff rate from the proposed development. I.e. $20.4 \text{ l/s} + 9 \text{ l/s} = 29.4 \text{ l/s}$.

4.3 Construction

Where appropriate, all construction will be carried out in accordance with the DTLR document 'Interim Guidance for Improving the Flood Performance of New Buildings, Flood Resilient Construction 2007.'

The detailed design of the on site surface water drainage system will be in accordance with the Environment Agency stipulation that there are to be no off site surface water flood routes generated by the development during an enhanced 1 in 100 year storm.

Under a critical drainage failure, or extreme rainfall event over and above the 1 in 100 year + 40% climate change event site levels shall be designed so that overland flood routes avoid causing flooding to on site buildings or off site third party buildings. Refer to the overland flood route drawing contained in Appendix 7.

Proposed building footprints will lie outside Flood Zones 2 and 3 and there will therefore be no loss of floodplain volume requiring consideration during the 1 in 100 year enhanced flood event.

A safe emergency access can be maintained at all times during a 1 in 100 year enhanced flood event.

There will be a site management Health and Safety document prepared in respect of the site.

5 CONCLUSIONS

5.1 Flooding

Following review of the EA flood mapping, the site lies within Flood Zone 1 which relates to an annual probability of river flooding of less than 1 in 1000.

The risk from surface water flooding is classified as low / very low (refer to Appendix 2 for EA flood maps). This risk is deemed to be reduced to very low to all areas following post development levels and drainage works.

There are to be no off site surface water flood routes generated by the development during a 1 in 100 year storm, enhanced by 40% for climate change.

5.2 Site Surface Water Drainage

Discharge to SUDS:

Due to underlying impermeable and contaminated ground conditions infiltration methods are deemed unsuitable.

Given the densely populated and industrial nature of the development, spacial constraints therefore dictate that surface SUDS features such as ponds or swales are unable to be accommodated.

Discharge to Watercourse:

Beyond the northern boundary of the site, Corn Brook is culverted at a depth of circa 5m below ground level.

An indirect connection is deemed to be able to be achieved, utilising the existing adjacent site surface water system.

It is therefore proposed to discharge post-development surface water indirectly into the existing culverted watercourse.

Discharge into watercourse will be limited to greenfield runoff rates, which in this instance is 9 l/s. Due to connecting into existing drainage infrastructure, the existing off site flow control device shall require upgrading to accommodate the 9 l/s – this will require an upgrade from 20.4 l/s to 29.4 l/s.

5.3 Site Foul Water Drainage

It is anticipated that site foul water drainage will connect into the existing on-site foul water connections running into the private drainage system to the north. This in turn eventually connects into the 300mm diameter public combined water sewer in Bennett Street.

The above is subject to liaison / approval with United Utilities.

5.4 Flood Risk Management Measures

There will be a site management Health and Safety document prepared in respect of the site.

5.5 Off Site Impacts

All roofed and paved areas are to be formally drained into the on-site surface water drainage system. The design of the on-site surface water system would ensure that no off site flood flows are generated by the proposed development in the 1% plus climate change event.

In a critical drainage failure event, or extreme rainfall event over the 1 in 100 + 40% cc event overland flood routes will ensure that on or off-site buildings are not adversely affected.

5.6 Residual Risk

With careful design of the drainage elements as described above, there will be no residual flood related risks remaining after the development has been completed.

The proposed development will be located within Flood Zone 1 and can be constructed safely without putting the building or users at risk from flooding.

A safe emergency access can be maintained at all times during a 1 in 100 year enhanced flood event.

It is proposed to utilise a full retention interceptor immediately downstream of the hydrobrake through which all post-development surface water will pass – this is considered to be the most robust solution to minimising the possibility of contamination from post-development site drainage into the watercourse

The system will also act to ensure there are no off site overland flood flows generated by the proposed development. There is no evidence to indicate that there will be any impact on the flora and fauna dependant on the local watercourses for their survival.

APPENDIX 1

SITE LOCATION PLANS





APPENDIX 2

EA FLOOD MAPS

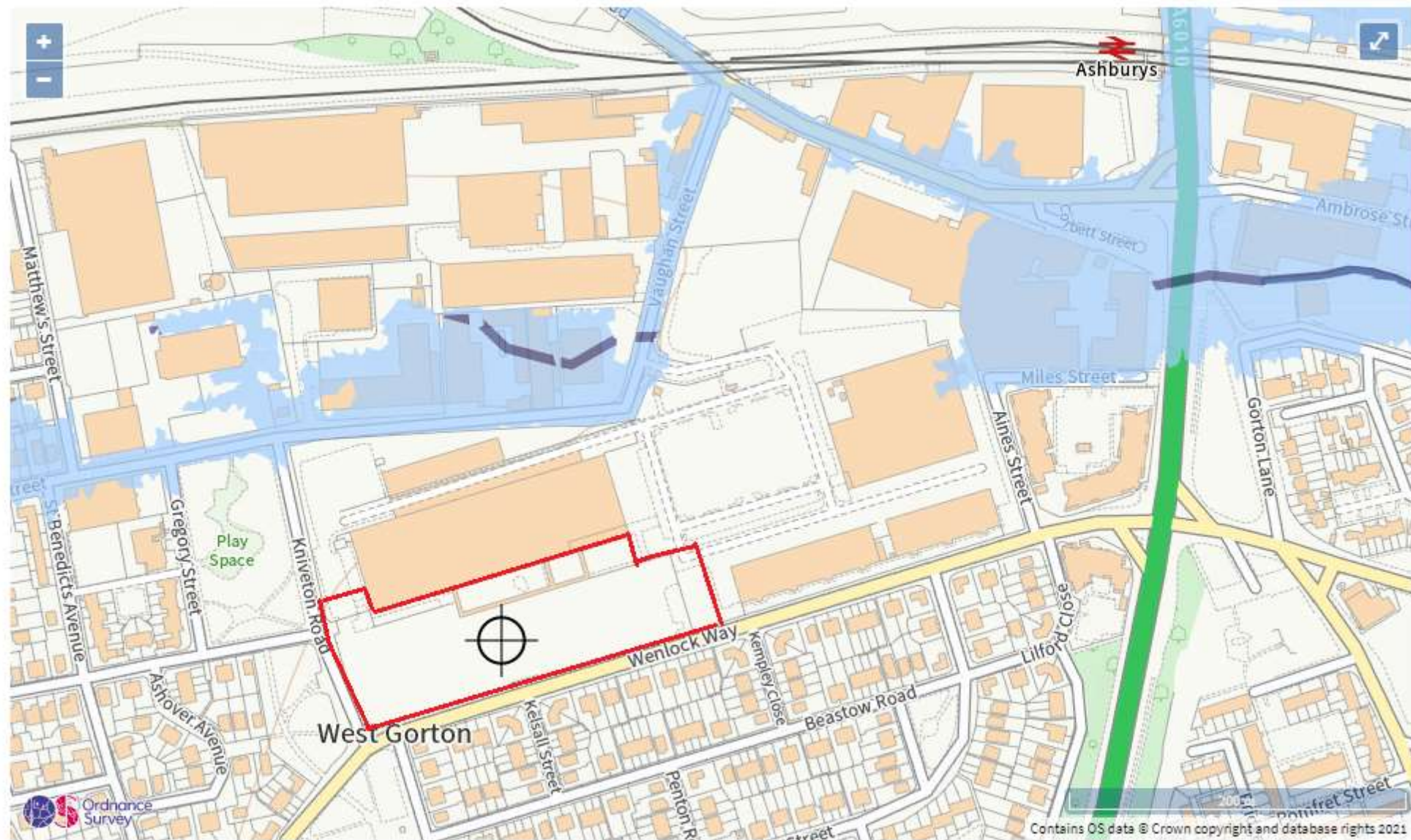
Flood risk

Extent of flooding



Location

Enter a place or postcode



Extent of flooding from rivers or the sea

High Medium Low Very low Location you selected

Flood risk

Extent of flooding

Location

Enter a place or postcode



Extent of flooding from surface water

● High ● Medium ● Low ○ Very low ⊕ Location you selected

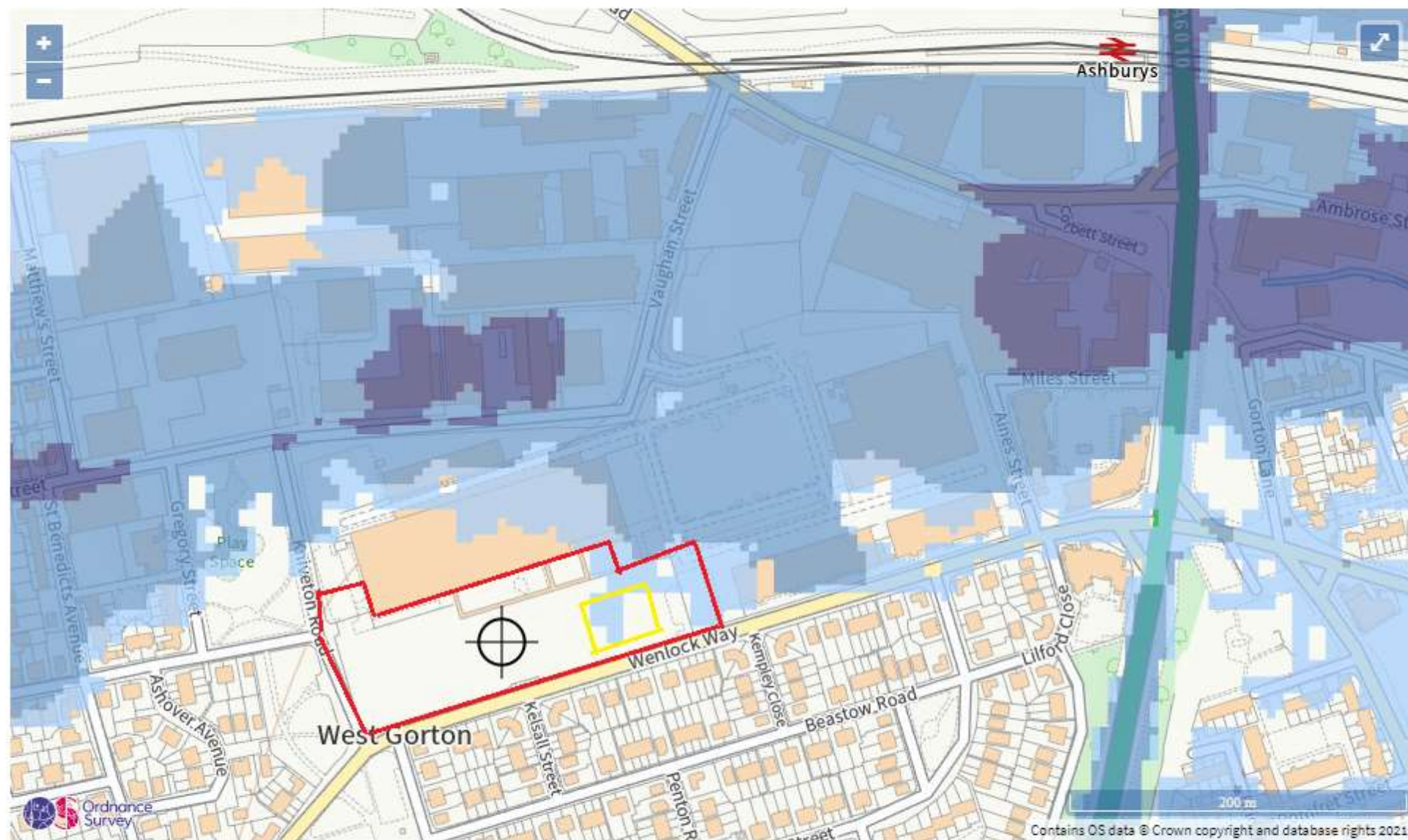
Flood risk

Flood depth



Location

Enter a place or postcode

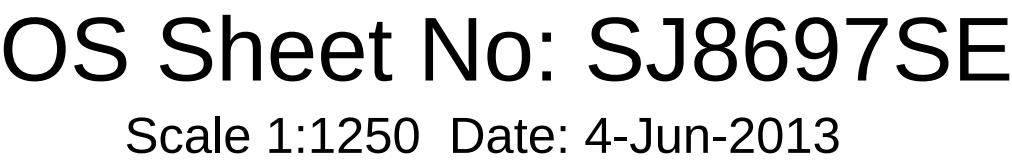


Reservoir flood risk: flood water depth

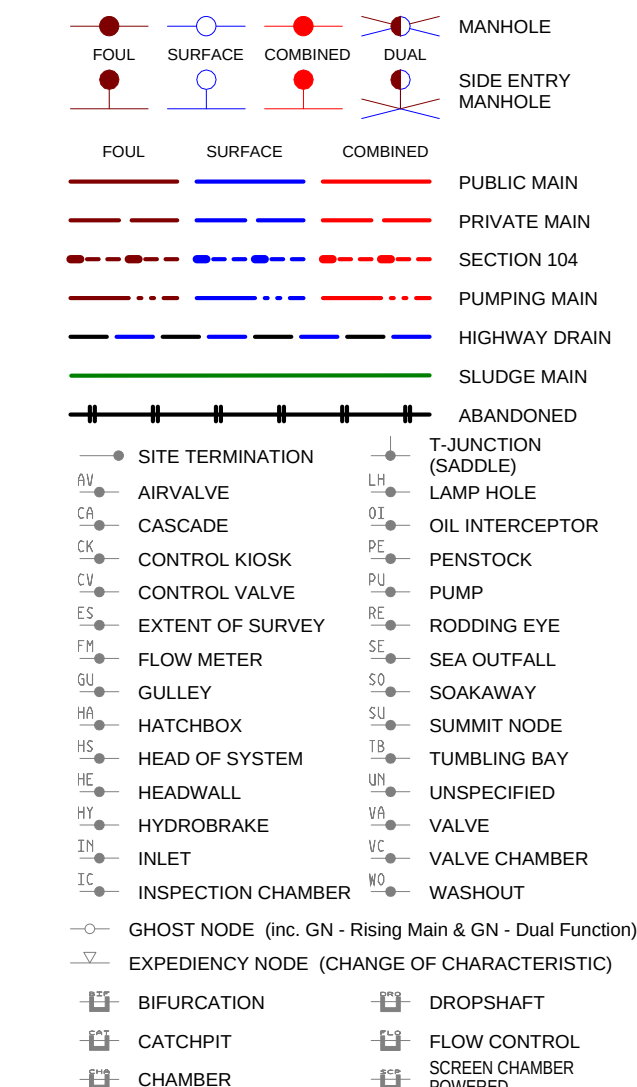
Over 2m Between 0.3 and 2m Below 0.3m Location you selected

APPENDIX 3

UNITED UTILITIES PUBLIC SEWER PLANS



WASTE WATER SYMBOLOGY



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

NODE TABLE ABBREVIATIONS

MANHOLE FUNCTION

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

MANHOLE / NODE TYPE

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

SEWER SHAPE

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

SEWER MATERIAL

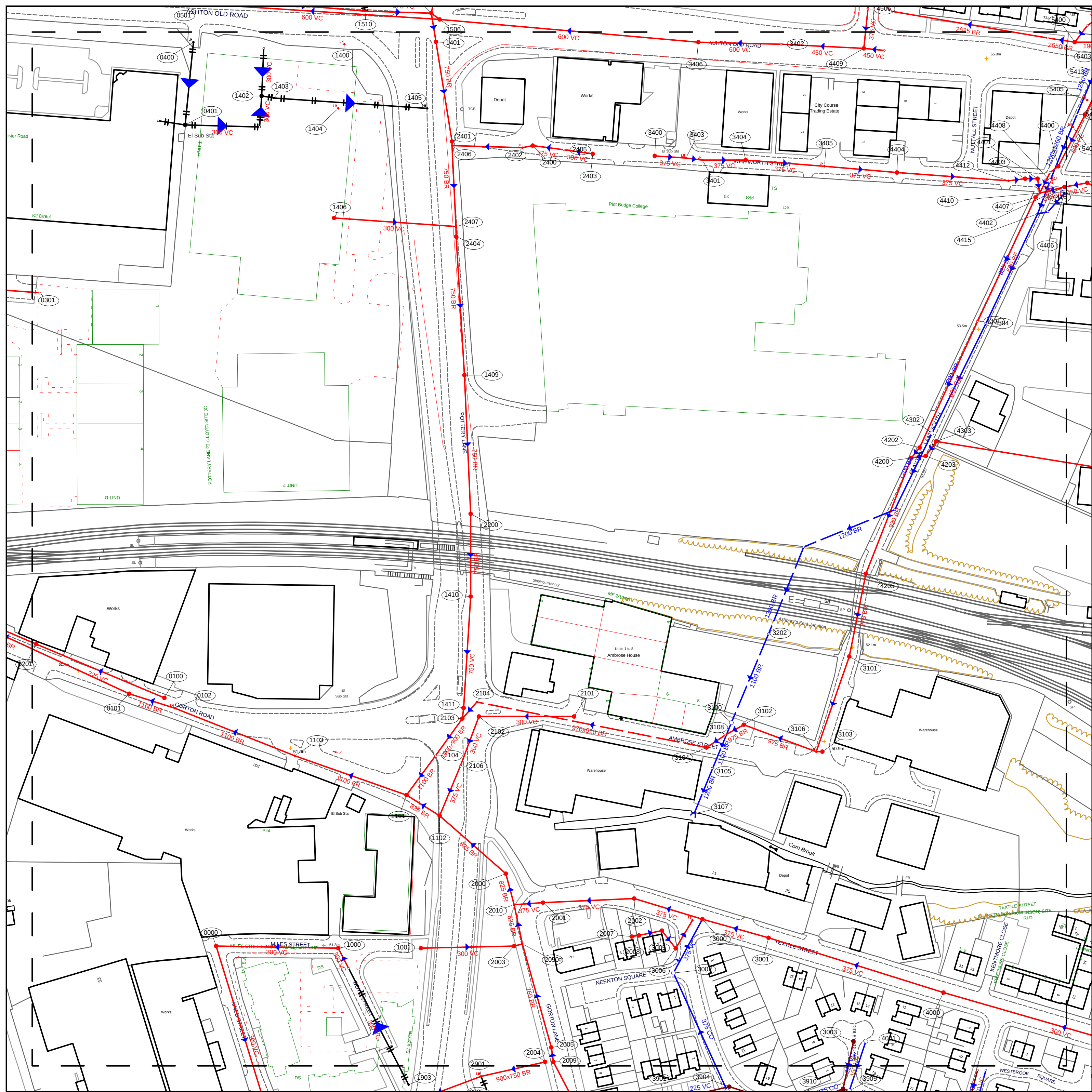
AC Asbestos Cement
BR Brick
CI Cast Iron
SI Spun (Grey) Iron
CO Concrete
CS Concrete Segments (Bolted)
CS Concrete Segments (Unbolted)
CC Concrete Box Culvert
DI Ductile Iron
GR Glass Reinforced Concrete
GR Glass Reinforced Plastic
PS Plastic / Steel Composite
PV Polyvinyl Chloride
PE Polyethylene
RP 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

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OS Sheet No: SJ8697SE
Scale 1:1250 Date: 4-Jun-2013
82 Nodes
Sheet 1 of 1



Item No.	Color	Material	Type	Size (LxWxH)	Weight (kg)	Volume (m³)	Lead Time (days)	Unit Price (€)
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5002	46.16	C	M	41.77 450	5003	C	VC	3
5003		C	L	42.36 450	5004	C	VC	10 6.08
5004		C	L		375			36.38
5005	46.55	C	M	42.19 375	5006	C	VC	8.45
5006		C	L	380	5007	C	VC	8.06
5007		C	J	375	5008			18.25
5008		S	G					
5009		C	Q	375	5010	C	VC	4.12
5101	48.29	C	M	44.19 225	5102	C	VC	57 18.25
5102		C	Q	43.87 300	5103	C	VC	59 18.25
5105	47.36	C	M	43.48 375	5106	C	VC	81 69.43
5401	50.51	C	M	48.14 225	5402	C	VC	185 73.82
6001	47.2	C	M	44.74 225	6002	C	VC	2.24
6002		C	L	43.31 375	6003	C	VC	10.44
6003	47.36	C	M	43.36 375	6004	C	VC	10.05
6004		C	Q	300	6005	C	VC	3.16
6006		C	J	375	6007	C	VC	63.95
6401		C	J	46.26 375	6402	C	VC	3.61
6402	50.43	C	M	740 460	6403			9
6403		C	M	1400	6404	C	BR	27.66
6404		C	G		6405	C	G	7.62
6405		C	G	740	6406			56.44
6406		C	G		6407	C	Q	800
6407		C	Q	800	6408	C	BR	132.31
6409		C	M	1200	6410	C	M	1400
6410		C	M	1400	6504	C	Q	22.45 670 620
6504		C	Q	22.45 670 620	7001	47.66	E	BR -1 34.37
7001	47.66	C	M	43.77 300	7002	48	C	VC 106 38.12
7002	48	C	M	45.01 300	7003	47.57	C	VC 115 53.08
7003	47.57	C	M	45.54 300	7004		C	VC 94 48.04
7004		S	G	1675 1980	7005		S	G 8.06
7005		S	G	1695 1980	7006		S	G 263.23
7006		S	Q	2700 1800	7301	51.27	C	VC 108 24.21
7301	51.27	C	M	49.68 225	7302	51.25	C	VC 78 79.88
7302	51.25	C	M	46.45 225	7303		C	VC -15 47.43
7303		C	M	46.45 225	7304		C	L 85.7
7304		C	L	40.73 1050	7401	50.28	C	VC 114 28.43
7401	50.28	C	M	48.23 225	7402	50.26	C	VC 151 21.21
7402	50.26	C	M	47.96 225	7403	50.35	C	BR 72.34
7403	50.35	C	M	47.25 1050	7404		C	L
7404		C	L		7405	50.73	C	M 47.17 760 790
7405	50.73	C	M	47.17 760 790	7406		C	BR 27.66
7406		C	Q	48.01 375	7407	50.9	C	VC 74 50.36
7407	50.9	C	M	47.91 300	7408	48.45	C	VC 86 27.66
7408	48.45	C	M	44.53 300	7409	48.96	C	VC 78 49.16
7409	48.96	C	M	43.9 300	8003		C	VC -109 22.8
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8003		C	V	43.72 225	8004	49.11	C	VC 5.04
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8006		C	V	600	8007		C	BR 54.36
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8009		S	G	1675 1980	8010		S	G 54.33
8010		S	J	1675 1980	8011		S	J 42.51
8011		S	J	2700 1800	8012		S	J 8.52
8012		S	Q	2700 1800	8103		S	Q 8.94
8103	49.96	C	M	42.94 600	8201	50.71	C	CO 257 110.37
8201	50.71	C	M	47.72 300	8202	50.9	C	VC 88 42.2
8202	50.9	C	M	48.84 225	8203		C	VC 141 36.62
8203		C	L	40.62 1050	8204		C	BR 21.26
8204		C	L	1050	8401	51.58	C	BR 69.18
8401	51.58	C	M	48.69 300	8402	51.62	C	VC 73 40.49
8402	51.62	C	M	48.85 1050	8403	51.82	C	VC 138 55.4
8403	51.82	C	M	46.9 1050	8404	51.97	C	VC 94 31.6
8404	51.97	C	M	49.09 1050	8405	51.37	C	BR 125 21.19
8405	51.37	C	M	48.1 1050	8406		C	BR 94 77.78
8406		C	J	1050	8407		C	BR 8.06
8407		C	G	300	9001		C	VC 12.04
9001		S	G	2700 1800	9101	50.2	C	VC 94.32
9101	50.2	C	M	47.83 300	9201		C	VC 137 12.27
9201		C	48.58 300	9202		C	VC 140 36.4	
9202	50.67	C	M	48.83 300	9203	50.59	C	VC 194 87.32
9203	50.59	C	M	41.62 1050	9204		C	BR 85.85
9204		C	Q	48.64 300	9301		C	VC 119 38.08
9301		C	M	225	9401	52.14	C	BR 80.41
9401	52.14	C	M	49.35 1050	9402		C	BR 31.93
9402		C	M	760 610	9403		C	BR 26.15
9403		C	M		9404		C	VC 15.4
9404		C	M	225				



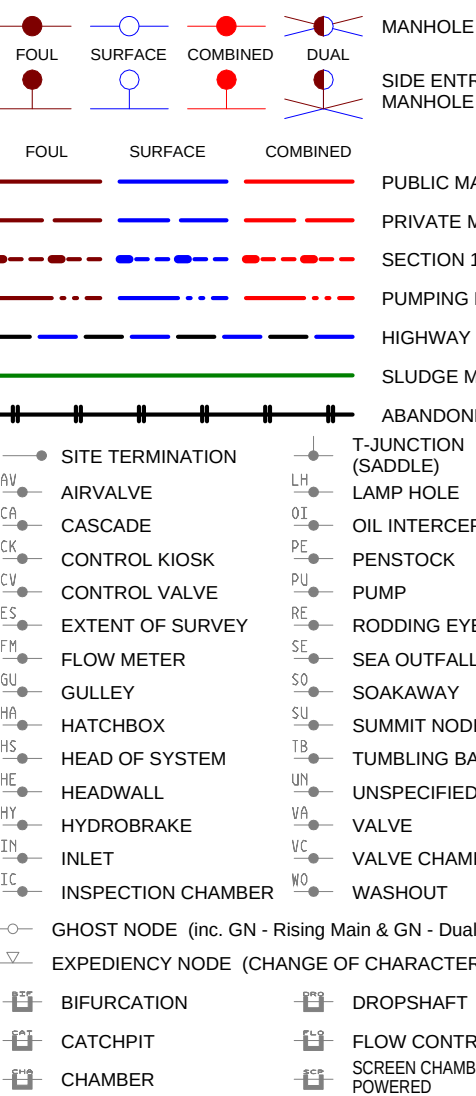
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0400		C	L						
0401		C	M						
0402		C	G						
1000	51.54	C	M	48.92	300	C	VC	70	59.01
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1102	50.57	C	M	44.65	825	C	BR	59	18.87
1103		C	J		1100	C	BR		62.39
1104		C	Q	44.18	1100	C	BR	-787	23.6
1400		C	L						
1401		C	M		750	E	BR		48.77
1402	54.17	C	M						
1403		C	L						
1404		C	L						
1405		C	L						
1406	54.49	C	M	51.49	300	C	VC		59.03
1407		C	G						
1408		C	G						
1409		C	M	50.12	750	E	BR	186	67.07
1410		C	M		750	E	VC		54
1411		C	M	46.65	750	C	VC	2	5.15
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2002	51.36	C	M	45.49	375	C	VC	294	44.05
2003	51.76	C	M	48.42	300	C	VC		4.12
2004	53.18	C	M	47.96	900	E	BR		31.78
2005	52.94	C	M	45.71	760	C	BR		51.92
2007		C	M						3.59
2008		C	M						11.23
2009	53.2	C	M		830	E	BR		7.07
2010		C	J		825	C	BR		15.52
2050		C	J		825	C	BR		19.42
2101	51.19	C	M		300	C	VC		46
2102	51.79	C	M	48.69	300	C	VC	171	25.63
2103	51.45	C	M	44.15	1000	E	BR	-740	22.2
2104		C	J		1000	E	BR		10.63
2106		C	Q	48.54	375	C	VC	173	26
2200	51.38	C	M	49.75	750	E	BR	125	40
2400	54.95	C	M	51.72	375	C	VC		5.1
2401	54.42	C	M	50.7	750	E	BR	2	
2402		C	L		375				34.01
2403	55.13	C	M	52.12	300	C	VC	74	14.14
2404	53.93	C	M	50.48	750	E	BR	186	67.12
2405		C	Q	51.93	375	C	VC	76	15.13
2406		C	J		750	E	BR		39.17
2407		C	J		750	E	BR		4.87
3000	51.89	C	M	45.74	375	C	VC	144	34.48
3001	52.66	C	M	45.9	375	C	VC	222	33.24
3002		S	M		375	C	VC		29.53
3003	55.17	F	M	53.16	150	C	VC		23.54
3005		C	M						10.89
3006		C	M						15.84
3007		C	3						
3008		S	Z			C			2.55
3009		S	J						
3100	50.79	S	M	49.39	1100	C	BR	38	23.77
3101	51.82	C	M		975	BR			48.7
3102	50.8	C	M	45.06	975	C	BR		10.3
3103	50.81	C	M	49.1	300	C	VC	7	3
3104	50.76	C	M	45.05	970	B	BR		113.16
3105		S	Q	48.76	1200	C	BR	38	23.77
3106		C	L	48.66	975	C	BR	10	37.34
3107		S	F						
3108		C	Q	45.06	970	B	BR	1082	10.82
3201		S	G		1200	C	BR		45.31
3202		S	Q		1100	C	BR		46.62
3400	55.39	C	M	52.47	375	C	VC	-167	15.03
3401		C	L		375	C	VC		21
3402		C	Q	47.85	600	C	VC	133	40.01
3403		C	L	52.56	375	C	VC		8.06
3404	55.5	C	M	52.49	375	C	VC	141	38.12
3405		C	L	52.22	375	C	VC	153	35.13
3406	55.32	C	M	47.53	600	C	VC		125.48
4000	54.2	C	M	46.56	375	C	VC	145	88.57
4001	55.14	S	M	53.43	225	C	VC	90	25.3
4200	52.68	C	M	46.53	930	C	BR		60.17
4201		S	G		1200	C	BR		47.54
4202	52.7	C	M	46.53	900	C	BR	-320	6.4
4203	52.84	C	M	46.64	1200	C	CO		7.07
4205		C	M		975	C	BR		40.79
4301		C	Q	48.3	600	C	CO	108	67.12
4302	52.8	S	M	49.21	1200	C	BR		41.15
4303	52.78	C	M	48.06	1200	C	CO	86	8.6
4304		S	Q		1200	C	BR		59.03
4400	54.58	C	M	49.16	600	C	PE		5
4401	54.56	C	M	51.5	225	C	CI		7.07
4402	54.6	C	M	51.08	225	C	VC		12.37
4403	54.47	C	M	51.52	375	C	VC	600	6
4404	55.05	C	M	51.95	375	C	VC		54.15
4405		C	G		2625	C	BR		77.1
4406		S	L						12.04
4407	54.47	C	M	48.93	600	C	PE	105	66.21
4408	54.6	S	M	50.71	1200	B	BR		8.54
4409	55.64	C	M	48.14	450	C	VC	138	40.05
4410		C	J		600	C	PE		2.83
4411		C	G		600	C	PE		11.18
4412		C	J		375	C	VC		8.06
4413		S	G		825	BR			5.1
4414		C	G		450	C	VC		10.05
4415		S	J		825	C	BR		58.6
4416		S	Q		825	C	BR		8.54

WASTE WATER SYMBOLOLOGY



Note - ALL flow direction arrows are to be read as 'SURFACE' unless otherwise stated.

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 Gully
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

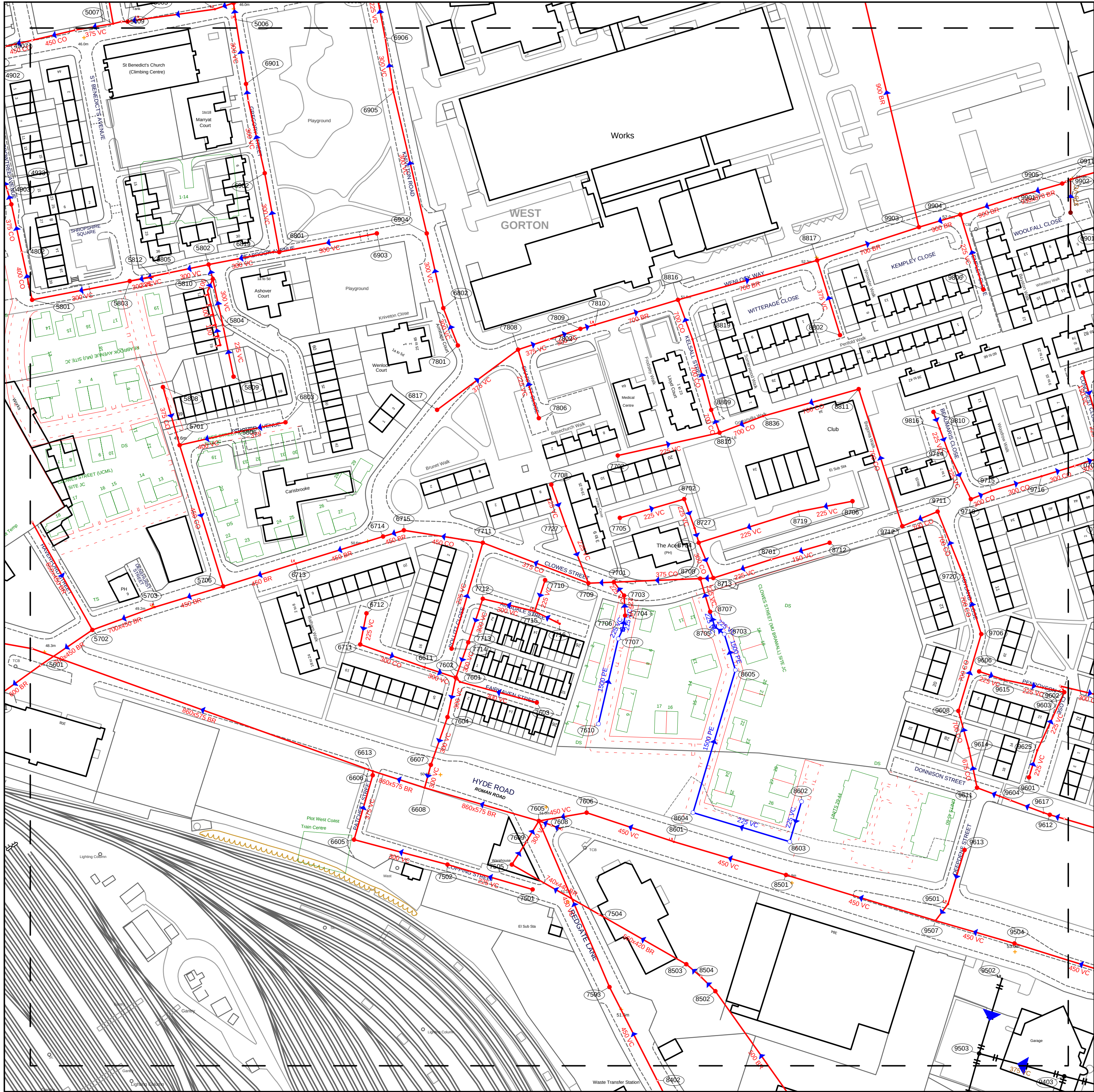
SEWER MATERIAL

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

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OS Sheet No: SJ8797SW
Scale 1:1250 Date: 4-Jun-2013
108 Nodes
Sheet 1 of 1





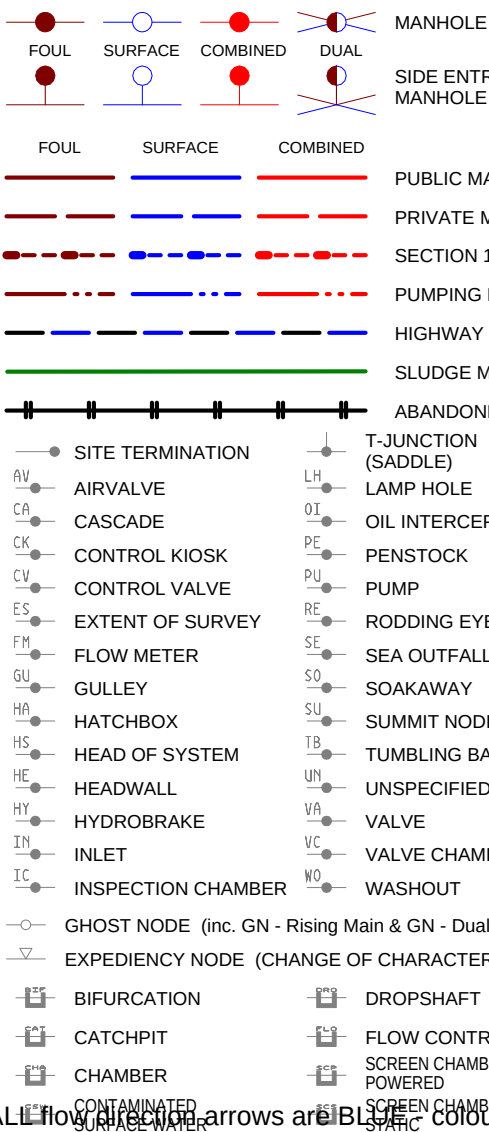
Refno Cover Func Type Invert Size.xSize.y Shape Matl Grad Length

5701	C	Q	45.67	600	C	BR	-66	30.81		
5701	49.39	C	M	47.01	450	C	CO	71.17		
5702	48.63	C	M	45.2	700	450	E	BR	-64	30.23
5703	C	L	45.39	700	450	E	BR	188	31.95	
5706	C	M			C	BR	34.48			
5709	C	G	860	575	E	BR	56.89			
5710	C	G	650	450	E	BR	59.54			
5801	47.05	C	M	44.36	400	C	CO	157	23.54	
5802	48.7	C	M	45.91	300	C	VC	81	19.42	
5803	48.11	C	M	45.39	300	C	VC	47	47.85	
5804	C	Q	47.37	300	C	VC	84	23.54		
5805	C	Q	45.67	225	C	VC	81	19.42		
5806	C	Q	400		C	VC	26.68			
5808	49.25	C	M	47.15	375	C	CO	243	29.12	
5809	49.72	C	M	47.64	225	C	VC	91	24.52	
5810	48.68	C	M	47.07	300	C	VC	-52	7.28	
5811	C	Q	100		C		0.99			
5812	C	J	300		C	VC	11.18			
5813	C	J	100		C		5.57			
5814	C	Q	100		C		1.96			
5815	C	J	100		C		5.08			
5816	C	Q	100		C		1.94			
5817	C	J	100		C		4.96			
5818	C	Q	100		C		1.85			
5819	C	J	100		C		4.94			
5820	C	Q	100		C		1.72			
5821	C	J	100		C		8.04			
5822	C	Q	100		C		1.79			
5823	C	Q	100		C		2.01			
5824	C	J	100		C		3.48			
5910	C	G	450		C	CO	21.59			
5911	C	G	450		C	CO	13.34			
6605	C	M	46.84	375	C	VC	104	32.28		
6606	C	M	46.51	800	C	CO	2			
6607	C	M	46.89	300	C	VC	11.4			
6608	C	J	860	575	E	BR	26.25			
6611	C	J	300		C	VC	15.81			
6613	C	J	860	575	E	BR	174.29			
6711	C	M	47.91	300	C	CO	32.89			
6712	50.81	C	M	48.16	225	C	VC	67	15.3	
6713	C	L	46.32	450	C	BR	36.69			
6714	50.67	C	M	46.93	450	C	BR	72	43.97	
6715	50.79	C	M	47.43	450	C	BR	22	10.44	
6801	49.07	C	M	46.29	300	C	VC	3		
6801	49.07	C	M	46.31	300	C	VC	64	38.64	
6802	50.63	C	M	48.58	300	C	VC	68	36.88	
6803	C	M	375		C		25.5			
6817	50.97	C	M	48	375	C	VC	119	48.6	
6819	C	J	300		C	VC	31.58			
6901	47.21	C	M	44.91	300	C	VC	31.4		
6902	48.16	C	M	45.71	300	C	VC	35.9		
6903	49.63	C	M	47.36	300	C	VC	46	47.85	
6904	50.04	C	M	48.02	300	C	VC	69.86		
6905	C	L	300		C	VC	26.31			
6906	C	Q	46.54	225	C	VC	15	26.48		
6907	C	Q	300		C	VC	8.06			
7501	50.86	C	M	49.51	225	C	VC	107	42.72	
7502	50.49	C	M	47.37	300	C	VC	91	46.57	
7503	51.62	C	M	48.01	450	C	VC	130	86.93	
7504	C	Q	47.63	740	440	E	BR	285	48.37	
7505	51.42	C	M	47.46	700	500	E	BR	-8	13.04
7601	C	L	48.04	300	C	VC	5	2.83		
7602	50.41	C	M	47.41	300	C	VC	84	19.42	
7603	50.61	C	M	48.14	300	C	VC	383	38.33	
7604	50.39	C	M	47.18	300	C	VC	90	24.35	
7605	50.89	C	M	46.94	860	575	E	BR	57.28	
7606	51.37	C	M	47.43	450	C	VC	50	23.35	
7607	C	G	900	1050			5.39			
7608	C	Q	920	600	E	BR	6.32			
7609	C	Q	49.17	300	C	VC	11.66			
7610	51.63	S	M	48.93	1500	C	PE	128	42.09	
7701	50.42	C	M	48.15	375	C	CO	246	12.29	
7702	51.72	C	M	48.94	225	C	VC	64	50.22	
7703	50.47	C	M	48.38	225	C	VC	102	8.13	
7704	50.81	C	M	48.46	225	C	VC	120	9.62	
7705	51.35	C	M	49.15	225	C	VC	98	32.28	
7706	51.05	S	F	48.55	225	C	VC	75	6.77	
7707	51.2	S	M	48.6	225	C	VC	100	4.98	
7708	51.4	C	M	49.51	225	C	VC	21.19		
7709	50.49	C	M	48.09	375	C	CO	130	54.46	

Refno Cover Func Type Invert Size.xSize.y Shape Matl Grad Length

7710	50.59	C	M	49.09	225	C	VC	15.81		
7711	50.75	C	M	47.65	450	C	CO	192	38.47	
7712	50.38	C	M	47.85	300	C	VC	96	22.14	
7713	50.36	C	M	47.62	300	C	VC	95	18.03	
7714	50.46	C	M	48.21	225	C	VC	130	53.16	
7715		C	L		300	C	VC	25.71		
7716		C	L		300	C	VC	13.42		
7727		C	J		225	C	VC	29.56		
7801	50.95	C	M	49.03	300	C	VC	45	19.31	
7802		C	Q	47.31	300	C	VC	72	15.81	
7806	51.47	C	M	49.5	225	C	VC	111	34.48	
7808	51.29	C	M	47.54	375	C	VC	69	15.81	
7809	51.54	C	M	47.04	700	C	BR	-9	7.28	
7810		C	L	47.89	700	C	BR	50	41.76	
8501		C	M		450	C	VC	56.32		
8502	51.58	C	M	48.25	700	480	F	BR	41	9.9
8503	51.42	C	M	47.79	560	420	F	BR	302	48.37
8504		C	Q	48.01	640	440	F	BR	38	9.22
8601		C	L		450	C	VC	44.27		
8602	52.09	S	M	50.75	225	C	VC	155	20.15	
8603	52.2	S	M	50.62	225	C	VC	152	48.61	
8604	52.2	S	M	49.55	1500	C	PE	126	71.63	
8605	51.68	S	M	48.98	1500	C	PE	121	18.11	
8701		C	Q		225	C	VC	29.41		
8702	51.33	C	M	48.79	225	C	VC	14.87		
8703	51.4	S	M	48.83	225	C	VC	74	5.93	
8704	51.13	C	M	48.45	300	C	CO	204	18.38	
8705	51.3	S	F	48.75	225	C	VC	74	7.43	
8706	51.80	C	M	48.99	225	C	VC	26.48		
8707	51.19	C	M	48.65	225	C	VC	76	16.67	
8708	51.05	C	M	48.28	375	C	CO	320	41.56	
8712		C	M		150	C	VC	29.12		
8713	51.12	C	M		375	C	CO	6.35		
8719		C	J		225	C	VC	50.29		
8727		C	J		225	C	VC	7.28		
8802	52.46	C	M	47.5	375	C	VC	65	37.64	
8809	51.92	C	M	47.65	700	C	CO	35.17		
8810	52.15	C	M	47.78	700	C	CO	106	11.7	
8811	52.49	C	M	48.49	700	C	CO	47.8		
8816	51.9	C	M	46.9	700	C	BR	696	69.64	
8817	52.32	C	M	46.78	700	C	BR	344	51.55	
8819		C	J		700	C	CO	20.25		
8826		C	J		700	C	CO	22.47		
9501		C	L	50.39	450		VC	10		
9502		C	L							
9503	53.35	C	M							
9504		C	M		450	C	VC	39.56		
9507		C	J		450	C	VC	75.29		
9601	52.91	C	M	50.16	225	C	VC	13.6		
9602		C	Q		300	C	CO	1.41		
9603	52.87	C	M	49.7	300	C	VC	2.24		
9604		C	Q		530	470	R	BR	17.09	
9606	52.3	C	M	50.21	225	C	VC	12.65		
9608	52.05	C	M	49.17	700	C	CO	241	38.6	
9611	52.51	C	M	49.35	675	C	CO	19.42		
9612	52.9	C	M	49.6	750	600	E	BR	3.16	
9613	52.54	C	M					27.2		
9614		C	J		700	C	CO	18.68		
9615		C	J		225	C	VC	29.61		
9616		C	G		300	C	CO	29.83		
9617		C	J		750	600	E	BR	17.09	
9621		C	G		750	600	E	BR	7.28	
9625		C	J		225	C	VC	30.87		
9706	52.28	C	M	48.99	700	C	CO	30.36		
9710	52.46	C	M	50.27	300	C	CO	10.77		
9711	52.39	C	M	48.72	700	C	CO	204	18.38	
9712	52.24	C	M	48.6	700	C	CO	6926	69.26	
9714		C	J		225	C	VC	25.5		
9715		C	J		300	C	CO	25		
9716		C	J		300	C	CO	16.76		
9720		C	J		700	C	CO	32.31		
9806	52.94	C	M	50.25	225	C	VC	45	37.64	
9810	52.7	C	M	51.06	225	C	VC	8.54	VC	
9816		C	J		225	C	VC	11.7		
9901		C	Q	46.73	900	C	BR	656	26.25	
9902		C	Q		870	930	E	BR	2.24	
9903	52.67	C	M	46.61	900	C	BR	133.6		
9904	52.81	C	M	46.67	900	C	BR	522	20.88	
9905	53.04	C	M	46.77	930	870	E	BR	625	25

WASTE WATER SYMBOLLOGY



Note - ALL flow direction arrows are in blue colour not significant

NODE TABLE ABBREVIATIONS

MANHOLE FUNCTION

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

MANHOLE / NODE TYPE

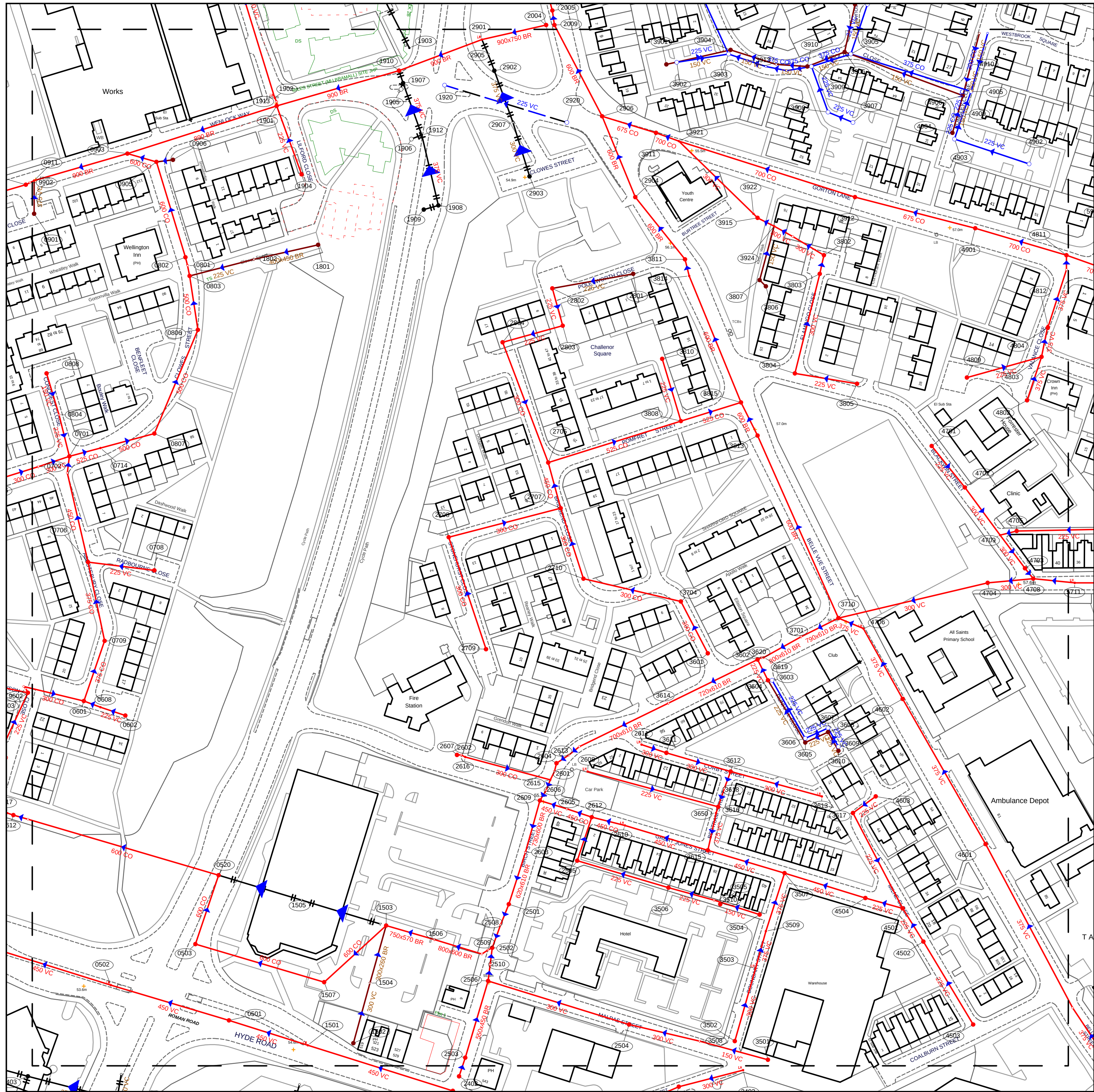
M	Manhole	Z	Ghost in Rising Main
J	Junction	C	Cascade
L	Lamphole	Y	Gully
H	Hatchbox	E	Ejector
R	Rodding Eye	O	Oil Injector
F	Outfall	I	Inlet
V	Combined Sewer Overflow	B	Hydrobrake
P	Pumping Station	T	Tent Column
S	Soakaway	X	Valve
D	Dual Function Manhole	U	Unspecified
W	Treatment Works	Q	Expediency Node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

SEWER SHAPE

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

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



Refno Cover Func Type Invert Size.xSize.y Shape Matl Grad Length

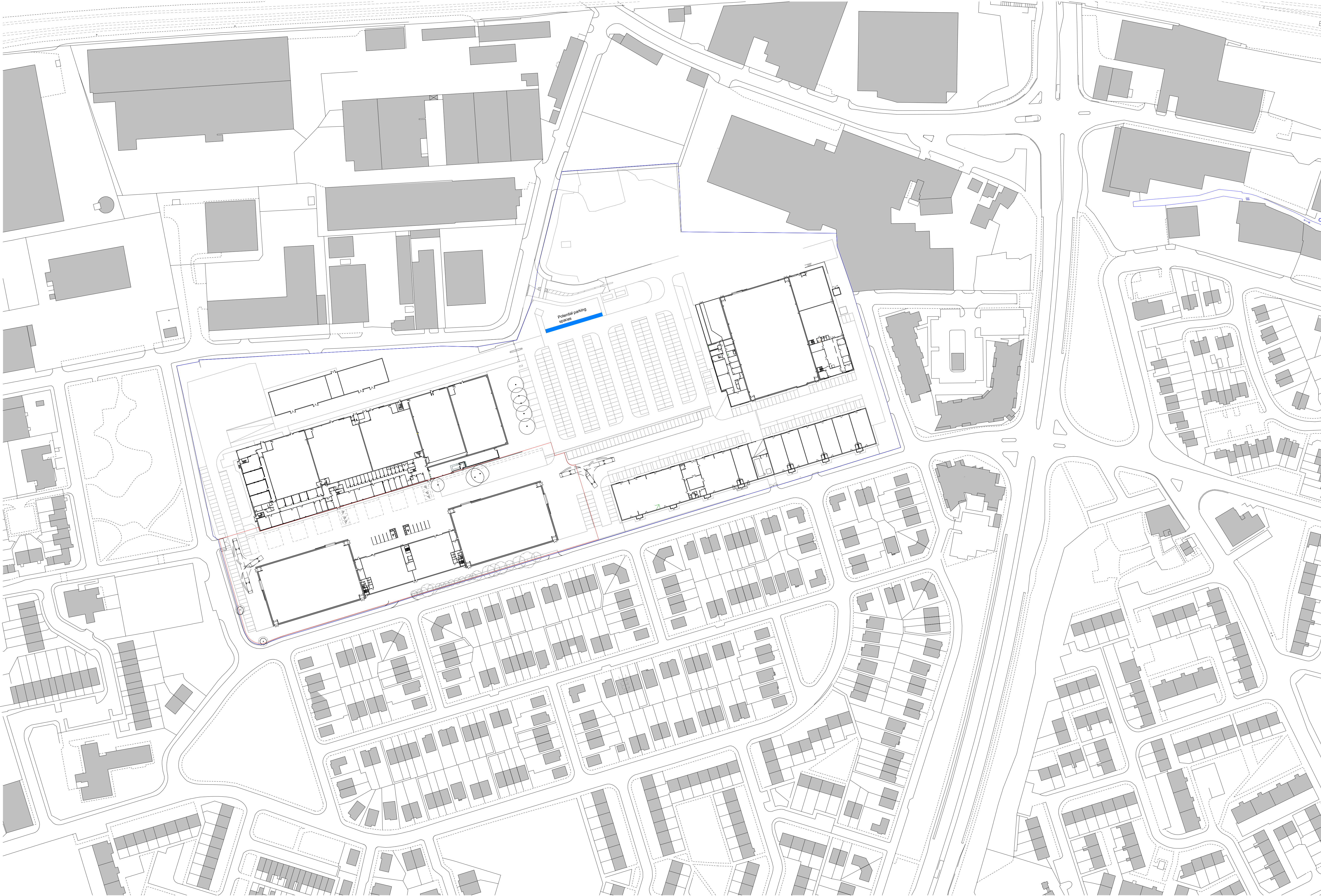
0501	54.29	C	M		49.81	450	C	VC	94	59.48
0502		C	L		49.18	450	C	VC		67.05
0503		C	M		50.55	600	C	CO	250	35.05
0520	53.92	C	M		50.16	600	C	CO		95.88
0601	53.09	C	M		49.48	375	C	CO	341	30.68
0602	53.12	C	M		51.32	225	C	VC		12.65
0608		C	J			225	C	VC		8.54
0701	53.18	C	M		48.61	525	C	CO		15.52
0702		C	Q			300	C	VC		15.81
0706	53.17	C	M		49.02	450	C	CO		44.15
0708	53.37	C	M		51.5	225	C	VC	79	32.25
0709	53.07	C	M		49.37	375	C	CO	129	38.83
0714		C	J			500	C	CO		26.93
0715		C	G			450	C	CO		8.06
0801		C	Q		47.75	600	C	CO	14	4.12
0802	53.82	C	M		47.44	600	C	CO	200	48.08
0803	53.91	C	M		48.06	500	C	CO	16	5.1
0804		C	Q		50.77	225	C	VC	71	20.62
0806	53.99	C	M		48.34	500	C	CO	101	26.31
0807	53.57	C	M		48.59	500	C	CO	236	54.23
0808	53	C	M		51.05	150	C	VC	75	20.88
0809	53.05	F	M		47.99	375	C	VC		16
0903	53.31	C	M		47	900	C	BR		46.84
0905	53.4	C	M		47.18	600	C	CO		14.56
0906	54	F	M		50.87	225	C	VC	3	8.06
0911		C	J			900	C	BR		2.24
1501		C	L		50.19	450	C	VC	105	39.85
1502	54.77	F	M		52.08	300	C	VC	81	30.08
1503	54.73	C	M		50.91	600	C	CO	270	40.49
1505		F	Q		51.71	300	S	BR	76	28.81
1505		C	Q							
1506		C	Q			750	F	BR		24.13
1507	54.32	C	M		50.76	600	C	CO	308	64.78
1508		C	Q							
1801	54.42	F	M		48.39	400	U	BR	-32	31.78
1802		F	Q		49.38	225	C	VC	-32	32.02
1901	53.74	C	M		47.35	890	C	BR	216	75.58
1902		C	L		47.55	400	C	CO	56	2.24
1903		C	L							
1904	54.2	C	M		51.85	225	C	VC	75	35.11
1905	54.06	S	M							
1906	54.45	S	M							
1907	54	C	M							
1908	54.67	C	M							
1909	54.64	C	M							
1910	54.36	C	M			900	C	BR		61.4
1911		C	G							
1912		C	J							
1913		C	Q		47.51	300	C	VC	67	2
1920	54.35	S	M							
2501	55.27	C	M		51.58	700	F	BR	269	10.77
2502	55.28	C	M		51.45	710	F	BR		2.24
2503	55.49	C	M		52.54	550	U	BR		38.6
2504	56.44	C	M		54.04	300	C	VC		71.17
2505	55.18	C	M			225	U	VC		22.14
2506		C	M		550	450	U	BR		8.06
2507		C	G		800	600	U	BR		24.04
2508		C	Q		51.54	650	F	BR	293	11.7
2509		C	Q		800	600	U	BR		3.61
2510		C	Q		550	460	F	BR		8.06
2601		C	Q		550	550	U	BR		4.47
2602		C	Q		300		C	CO		2.24
2603		C	Q		51.59	620	F	BR	-2625	26.25
2604	55.36	C	M		51.9	550	C	BR		4.12
2605		C	Q		450		C	VC		13.6
2606		C	Q		520	590	F	BR		5.83
2607	54.57	C	M		52.4	300	C	VC		2
2608		C	L			225	C	VC		65.25
2609	55.26	C	M		51.59	730	F	BR		25.96
2610		C	L		52.22	450	C	CO		16.49
2611		C	L		53.58	300	C	VC	27	12.65
2612		C	M		450		C	CO		12.65
2613		C	Q		570	520	F	BR		7.21
2614		C	G		550	550	U	BR		6.4
2615		C	J		600	600	U	BR		5.39
2616		C	J		300		C	CO		42.45
2705	55.32	C	M		52.92	525	C	CO	1117	67.05
2707	55.23	C	M		53.09	450	C	CO	207	22.8
2708	54.97	C	M		53.32	300	C	CO	697	55.79
2709	54.96	C	M		53.46	300	C	CO	474	56.92
2710	55.21	C	M		53.51	300	C	CO	128	35.74
2801	56.03	F	M		54.07	225	C	VC	147	39.62
2802	56.08	C	M		53.78	225	C	VC	267	18.68
2803	55.96	C	M		53.69	225	C	VC		30.08
2804	55.69	C	M		53	300	C	CO		62.03
2901		C	L		47.84	900	C	BR		42.72
2902	54.02	F	M							
2903	54.92	F	M							
2904	55.5	C	M		50.19	600	C	BR		42.15
2905		F	Q							
2906	54.99	C	M			600	C	BR		49.65
2907		F	Q							
2920	54.62	S	M		225		C	VC		61.68
3501		C	M		150		C	VC		34.21
3502		C	M		53.95	300	C	VC	51	36.4
3503		C	L		53.24	375	C	VC		18.68
3504	56.46	C	M		55.36	150	C	VC	68	23.09

Refno Cover Func Type Invert Size.xSize.y Shape Matl Grad Length

3505	56.31	C	M		54.66	225		C	VC		45.88
3506	55.84	C	M		52.69	450		C	VC	107	38.6
3507	56.48	C	Q		26.11	300		C	VC	-1	34.93
3508		C	J			375		C	VC		29.41
3509		C	Q		55.02	225		C	VC	65	22.8
3601	55.84	C	M		54.03	300		C	CO	188	28.8
3602	56.36	C	M		52.67	720	610	E	BR		47.85
3603	56.3	S	M								
3604	56.29	C	M		54.69	225		C	VC	30	11.18
3605	56.77	F	M		55.16	225		C	VC	76	34.99
3606	56.76	S	M		55.36	225		C	VC	77	32.25
3607	56.81	S	M		55.59	225		C	VC	55	12.08
3608	56.81	F	M		55.37	225		C	VC	81	12.08
3609	56.92	S	M		55.76	225		C	VC	69	10.3
3610	56.93	F	M		55.51	225		C	VC	79	10.3
3611	55.87	C	M		53.12	300		C	VC	231	32.29
3612	56.3	C	M		52.96	400		C	VC	107	8.54
3613		C	L		54.04	300		C	VC	43	45.61
3614		C	Q			700	610	U	BR		47.85
3615	56.04	C	M		52.33	450		C	VC	380	41.76
3616	56.05	C	M		52.76	300		C	VC		3.16
3617	57	C	M		55.37	225		C	VC	80	51.88
3618		C	Q		52.88	300		C	VC	119	9.49
3619		C	J			800	610	U	BR		1
3620		C	Q			720	520	E	BR		2.24
3650		C	J			375		C	VC		18.44
3701		C	Q			800	610	U	BR		20.59
3710	55.71	C	M		53.86	300		C	CO	146	48.27
3710	56.68	C	M		52.98	790	610	F	BR		20.12
3710	56.68	C	M		53.4	600		C	BR	83	96.25
3802	56.8	C	M		55.25	300		C	VC		17.49
3803	56.7	C	M		55.05	300		C	VC	-42	9.22
3804	57.02	C	M		55.31	300		C	VC	206	49.48
3805	57.17	C	M		55.62	225		C	VC	105	30.41
3806	56.67	F	M		55.74	150		C	VC	33	4.24
3807	56.69	F	M		55.59	150		C	VC		26.93
3808	56.41	C	M		52.83	525		C	CO		30.36
3810	56.36	C	M		54.31	225		C	VC	174	31.32
3811	56.3	C	M		51	600		C	BR	49	38.42
3813	56.44	C	M		52.07	600		C	BR		17.89
3814		C	J			600		C	BR		8.25
3815		C	M			600		C	BR		65.82
3901	54.6	F	M		52.9	150		C	VC	39	31.78
3902	54.56	S	M		52.98	225		C	VC	65	25.32
3903	54.44	S	M		52.39	375		C	CO		62.65
3904	54.46	F	M								
3905	55.31	S	M		52.98	375		C	CO	166	19.92
3906	55.35	F	M		52.47	150		C	VC	176	19.31
3907	55.78	S	M		54.34	225		C	VC	45	13
3908	55.53	S	M		54.03	225		C	VC	23	23.41
3909	55.14	S	M		52.84	375		C	CO		12.17
3910	55.14	F	M		52.34	150		C	VC		15.03
3911	54.91	C	M		49.89	675		C	CO		27.2
3912	56.5	C	M		51.17	700		C	CO		89.19
3913		S	Q			375		C	CO		9.49
3915	56.77	C	M		53.62	300		C	VC		2.83
3918		S	G			375		C	VC		9.49
3919		S	G			375		C	CO		10.2
3920		F	G		150			C	VC		23.09
3921		C	J			700		C	CO		11.7
3922		C	J			300		C	VC		50.21
3924		C	J			300		C	VC		8.94
3925		C	G			300		C	VC		10.3
4501	57.5	C	M		54.71	225		C	VC	12	18.68
4502	58.01	C	M		55.19	225		C	VC	47	18.87
4503	58.3	C	M		56.11	225		C	VC	52	46.65
4504	57.03	C	M		52.92	450		C	VC	194	40.8
4601	57.91	C	M		53.88	375		C	VC	158	80.62
4602	57.12	C	M		53.35	375		C	VC	122	38.95
4803	57.07	C	M		55.51	225		C	VC	113	13.6
4704	57.42	C	M		55.36	225		C	VC	-2561	25.61
4702	57.5	C	M		55.35	300		C	VC		28.8
4703	57.54	C	M		53.86	300		C	VC		6.4
4704	57.32	C	M		53.63	300		C	VC	114	73.98
4705	57.6	C	M		54.28	225		C	VC	8.25	
4706		C	L		53.03	375		C	VC	433	13
4708		C	M			300		C	VC		22.09
4709		C	J			300		C	VC		20
4802	57.8	C	M		54.7	375		C	VC	76	22.14
4803	57.72	C	M		54.39	375		C	VC	15.3	
4804	57.61	C	M		54.15	375		C	VC		29.41
4809	57.49	C	M		55.69	225		C	VC	32	37.36
4811		C	M			700		C	CO		45.88
4812		C	J			375		C	VC		1
4814		C	G			375		C	VC		7
4901	57.03	C	M		51.56	675		C	CO	162	59.91
4901	57.11	S	M		55.05	225		C	VC	42	37.86
4902	56.57	S	M		54.13	225		C	VC	32	12.65
4903	56.53	C	M		53.76	150		C	VC	23	18.68
4905	56.18	S	M		53.27	375		C	VC	234	60.75
4906	56.31	F	M		52.92	150		C	VC	141	60.73
4907		F	G		150			C	VC		15.52
4908		S	G			300		C	VC		29.12
4909		S	Q		53.74	225		C	VC	30	11.7
4910		F	Q			250		C	VC		15.52

APPENDIX 4

PROPOSED MASTERPLAN



The contractor is responsible for checking dimensions, tolerances and references. Any discrepancy to be verified with the Architect before proceeding with the works. Where an item is covered by drawings to different scales the larger scale drawing is to be worked to.

Do not scale drawing. Figured dimensions to be worked to in all cases.

Where products have been specified, PRP have reviewed applicable products available in the UK at the time of writing the specification, from which products named in the specification have been selected.

Where the contractor wishes to propose alternative products, representative samples and a full technical appraisal should be submitted by the contractor to the employer demonstrating that their proposed alternative has equal or better performance.

Any alternative products are subject to design team, building control, warranty provider and employer acceptance.

CDM REGULATIONS 2015. All current drawings and specifications for the project must be read in conjunction with the Designer's Hazard and Environment Assessment Record

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Rev Date Description

First Issue

WIP

Dwn Ckd
VP JH

Drawn VP
Checked JH

Date JUNE 2021

Scale @ A1 1 : 1000

SPACE STUDIOS, MANCHESTER

PROPOSED SITE PLAN - GROUND FLOOR LEVEL

Project	Origin	Volume	Level	Type	Role	Number
SPC -	PRP -	ZZ -	GF -	DR -	A -	002102
Revision	Status					
--	WORK IN PROGRESS -					

PRP

prp-co.uk
Manchester
0161 242 8950

APPENDIX 5

GREENFIELD RUNOFF & STORAGE CALCULATIONS

Calculated by:	Rory Harris
Site name:	Space Studios Phase 3
Site location:	Wenlock Way, Gorton

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

Site Details

Latitude:	53.46873° N
Longitude:	2.20021° W
Reference:	553981715
Date:	Jun 21 2021 17:41

Runoff estimation approach**Site characteristics**

Total site area (ha):	1.415
-----------------------	------------------------------------

Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	886	886
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

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

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

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

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

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

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

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	9	9
1 in 1 year (l/s):	7.83	7.83
1 in 30 years (l/s):	15.3	15.3
1 in 100 year (l/s):	18.72	18.72
1 in 200 years (l/s):	21.33	21.33

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



Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the design of the drainage scheme.

Site characteristics

Total site area (ha):	1.415
Significant public open space (ha):	0
Area positively drained (ha):	1.415
Impermeable area (ha):	1.156
Percentage of drained area that is impermeable (%):	82
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	1.42
Net impermeable area for storage volume design (ha):	1.16
Pervious area contribution to runoff (%):	0

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Methodology

esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
SPR:	0.47	0.47

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	55
Rainfall 100 yrs 12 hrs:	--	73.08
FEH / FSR conversion factor:	1.16	1.16
SAAR (mm):	886	886
M5-60 Rainfall Depth (mm):	17	17
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 10 year:	1.38	1.38
Growth curve factor 30 year:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Q_{BAR} for total site area (l/s):	9	9
Q_{BAR} for net site area (l/s):	9	9

Design criteria

Climate change allowance factor:	1.4
Urban creep allowance factor:	1.0
Volume control approach	Use long term storage
Interception rainfall depth (mm):	0
Minimum flow rate (l/s):	2

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	7.8	7.8
1 in 30 years (l/s):	15.3	15.3
1 in 100 year (l/s):	18.7	18.7

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m^3):	598	598
Long term storage 1/100 years (m^3):	143	143
Total storage 1/100 years (m^3):	740	740

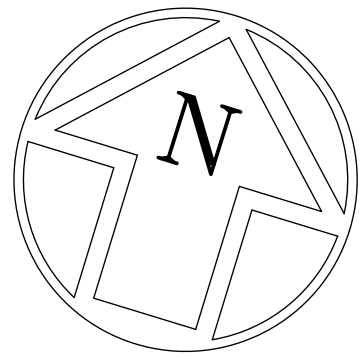
This report was produced using the storage estimation tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at <http://www.uksuds.com/terms-and-conditions.htm>. The outputs from this tool have been used to estimate storage volume requirements. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

APPENDIX 6

EXISTING DRAINAGE CONNECTIVITY

APPENDIX 7

PROPOSED DRAINAGE STRATEGY PLANS



Notes

- 1 All dimensions are in millimetres unless noted otherwise
- 2 All levels shown are in metres unless notified otherwise
- 3 This drawing is to be read in conjunction with all relevant Architectural and Service Engineer drawings
- 4 Do not scale from this drawing. Figured dimensions to be worked to in all cases. If in doubt contact the Engineer
- 5 COM (2015) - This drawing is to be read in conjunction with the Designers Risk Assessment produced for the project

Legend

- Site Boundary (TBC by Architect)
- Proposed Level
- Existing Site Boundary Levels
- Denotes direction of fall and gradient
- Slope / Embankment
- RW - denotes retaining wall position



Rev	Drawn	Date	Description



Civil & Structural Engineers

First Floor
Suite 4
14-32 Hewitt Street
Manchester
M15 4GB

Tel: 0161 237 3400
Web: www.integraconsulting.co.uk

Drawing status:
STAGE 2

Contract:
**SPACE STUDIOS
MANCHESTER**

Drawing title:
EXTERNAL LEVELS GA

Scales
1:250 @ A0

Date
06/2021

Drawn
N1

Checked
PC

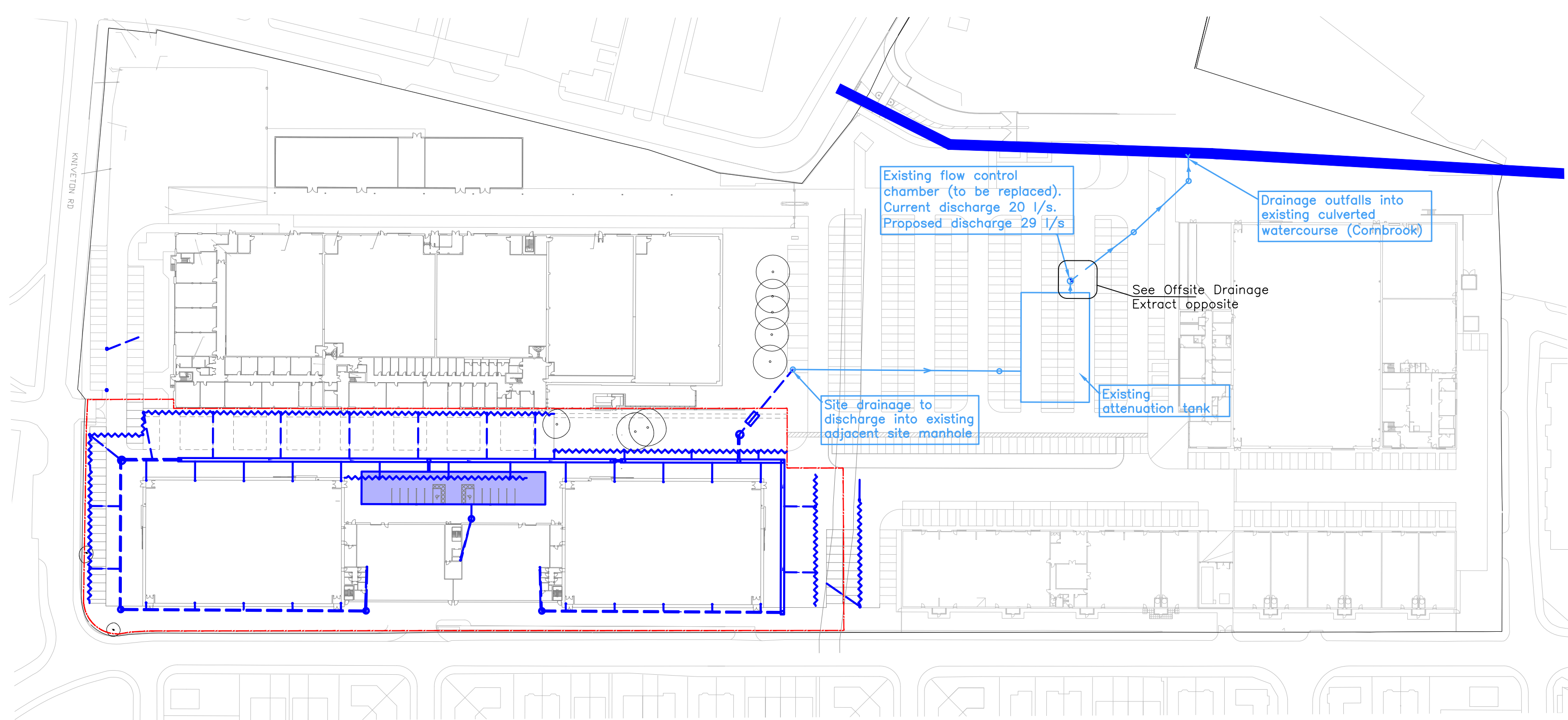
Project No.
320

Draw No.
0601

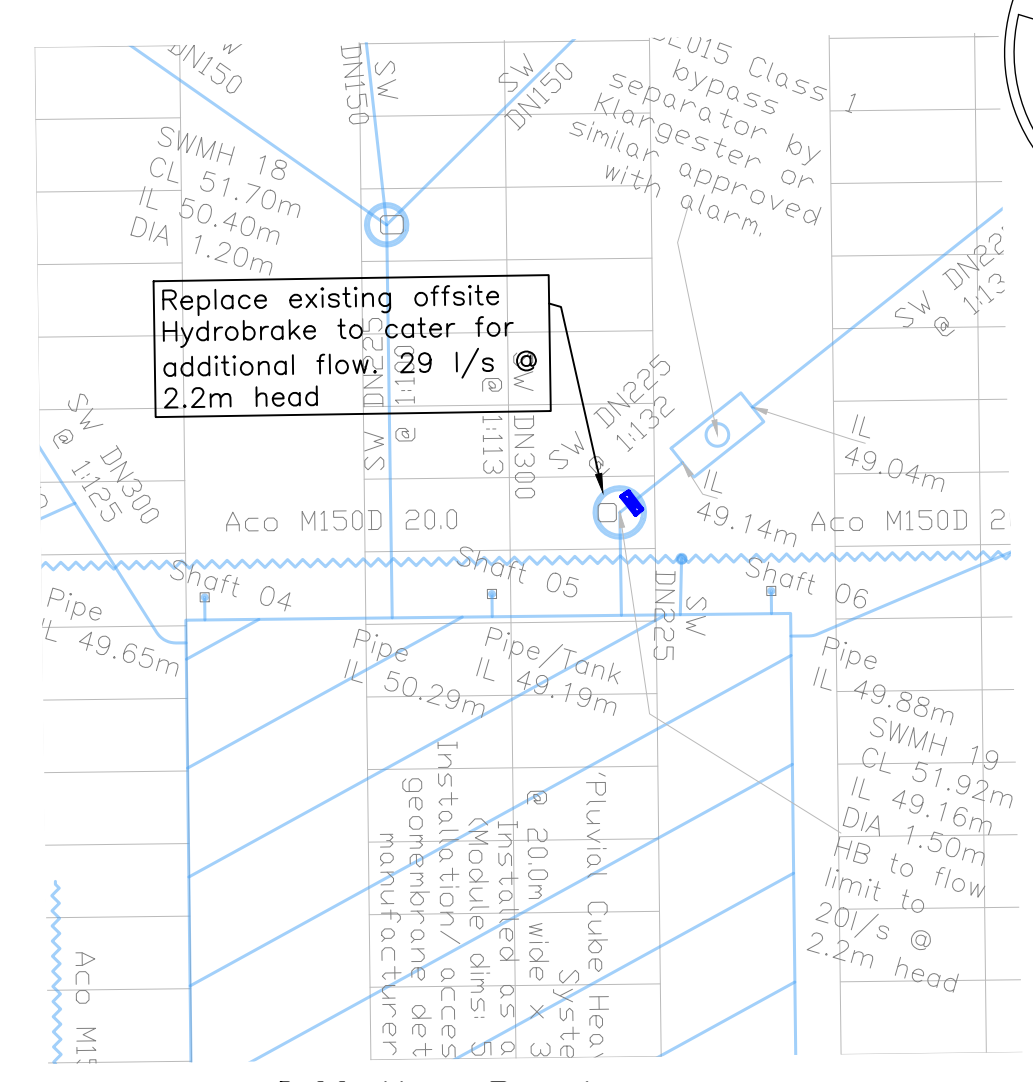
Rev
PC1

Project Origin Vol Lvl Type Role No
SPC - INT - ZZ - 00 - DR - C - 0601

DRAFT



Key Plan - Offsite
Drainage Connection
Scale 1:1000



Offsite Drainage
Extract

Key Plan:

- Existing FW drainage
- Existing SW drainage
- Existing CW drainage
- Existing FW Manhole
- Existing SW Manhole
- Existing CW Manhole
- Existing FW drainage to be grubbed up
- Existing SW drainage to be grubbed up
- New FW drainage
- New SW drainage
- New Drainage Channel / Kerbdrain
- New FW Manhole
- New SW Manhole
- New Surface Water Gully
- New Sump unit to drainage channels
- New rainwater pipe connection (Indicative, assumed positions)
- FP, FG, SP - new foul connection to Feeder Pillar (FP), Foul Gully (FG), Soil pipe (SP)
- Site boundary (tbc by Architect)

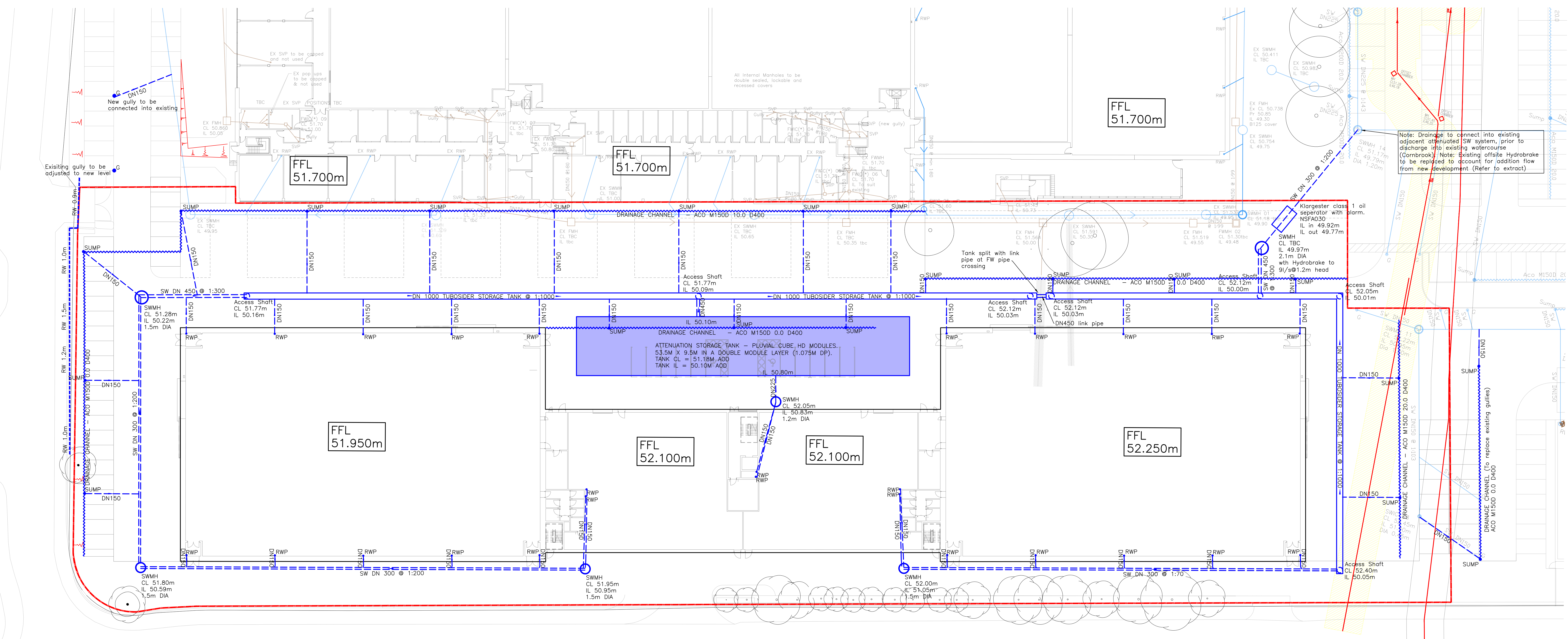
Note: Proposed drainage indicated opposite is indicative at this stage. Final drainage scheme is subject to agreement / approval with the LLFA / UU.

Note: Proposed drainage strategy consists of connection into Watercourse, via existing adjacent site drainage infrastructure. It is proposed to limit the site discharge to greenfield runoff rates (9 l/s). Attenuation storage will be provided in below ground attenuation storage tanks up to the 1 in 100 year + 40% climate change event.

Note: All SW & FW pop up positions indicated are assumed at this stage - subject to receipt of final positions

- 25 All foul gullies to incorporate a dry (odour) trap
26 All pipe runs below buildings to be concrete encased

- Notes**
- All dimensions are in millimetres unless noted otherwise
 - All levels shown are in metres unless notified otherwise
 - This drawing is to be read in conjunction with all relevant Architectural and Service Engineer drawings
 - Do not scale from this drawing. Figured dimensions to be worked to in all cases. If in doubt contact the Engineer
 - COM (2015) - This drawing is to be read in conjunction with the Designers Risk Assessment produced for the project
 - All SW drainage pipes to be Polypropylene adoptable drainage system, or similar approved up to 375mmØ and concrete from 450mmØ
 - All road gullies to have Grade D400 gratings to B.S.E.N. 124 with 4500 x800 deep Pre-Cast concrete or polyethylene pots
 - Manholes to be precast concrete rings to BS 5911 dia as indicated
 - All Manhole covers to be Grade B125 in footpaths/ soft landscaping or D400 in trafficked areas to B.S.E.N. 124. Areas within landscaping, footpaths or block paved areas to have recessed covers (TBC by Landscape Architect)
 - Manhole minimum clear opening sizes as below:
 - CL to pipe soffit <1.5m
 - pipes not larger than 150mm 750x750
 - pipes 225 and larger 1200x750
 - CL to pipe soffit >1.5m
 - All pipe sizes 600/600
 - Inspection chambers to be 450mm Ø 'non-man entry' PPIC's
 - Invert levels quoted are exit inverts. All pipes to run soffit level, except into tanks, storage crates or flow control chambers
 - All RWP's & SVP's / Soil connections to have roddable access covers above ground
 - Installation of manholes, road gullies, pipes, channels etc to be as per the manufacturer's instructions and recommendations
 - Drainage channels to be ACO, or similar approved. Design/ spec/ installation to be in accordance with manufacturer's details
 - Pipes with cover of less than 900mm under road/paved and 600mm under landscaped areas to be encased in concrete bedding class S
 - All work to be carried out in accordance with the following documents:
 - (a) - Civil Engineering Specification for the Water Industry 7th Edition, 2011.
 - A minimum pipe velocity of 1.0 m/s to be achieved
 - FW Sewers are to provide 0.75 m/s velocity at one third design flow
 - All drainage is to comply with the requirements of BS EN 1252
 - Note: All SWP's and RWP's which connect to the main drainage run via a branch, must be fitted with above ground rodding access
 - All SW sewers to be 150mm dia UNO
 - All FW sewers to be 100mm dia @ 1:40 UNO
 - All inspection chambers within vehicle hardstanding areas are to be encased in 250mm concrete surround with a 600x600 D400 manhole cover
 - All internal manholes to have lockable double sealed lids



Note: Drainage to connect into existing adjacent attenuated SW system, prior to discharge into existing watercourse (Combrook). Note: Existing offsite Hydrobrake to be replaced to account for addition flow from new development (Refer to extract)

Rev	Drawn	Date	Description

integra consulting
Civil & Structural Engineers
First Floor
Suite 4
14-32 Hewitt Street
Manchester
M15 4GB
Tel: 0161 237 3400
Web: www.integraconsulting.co.uk

Drawing status:
STAGE 2

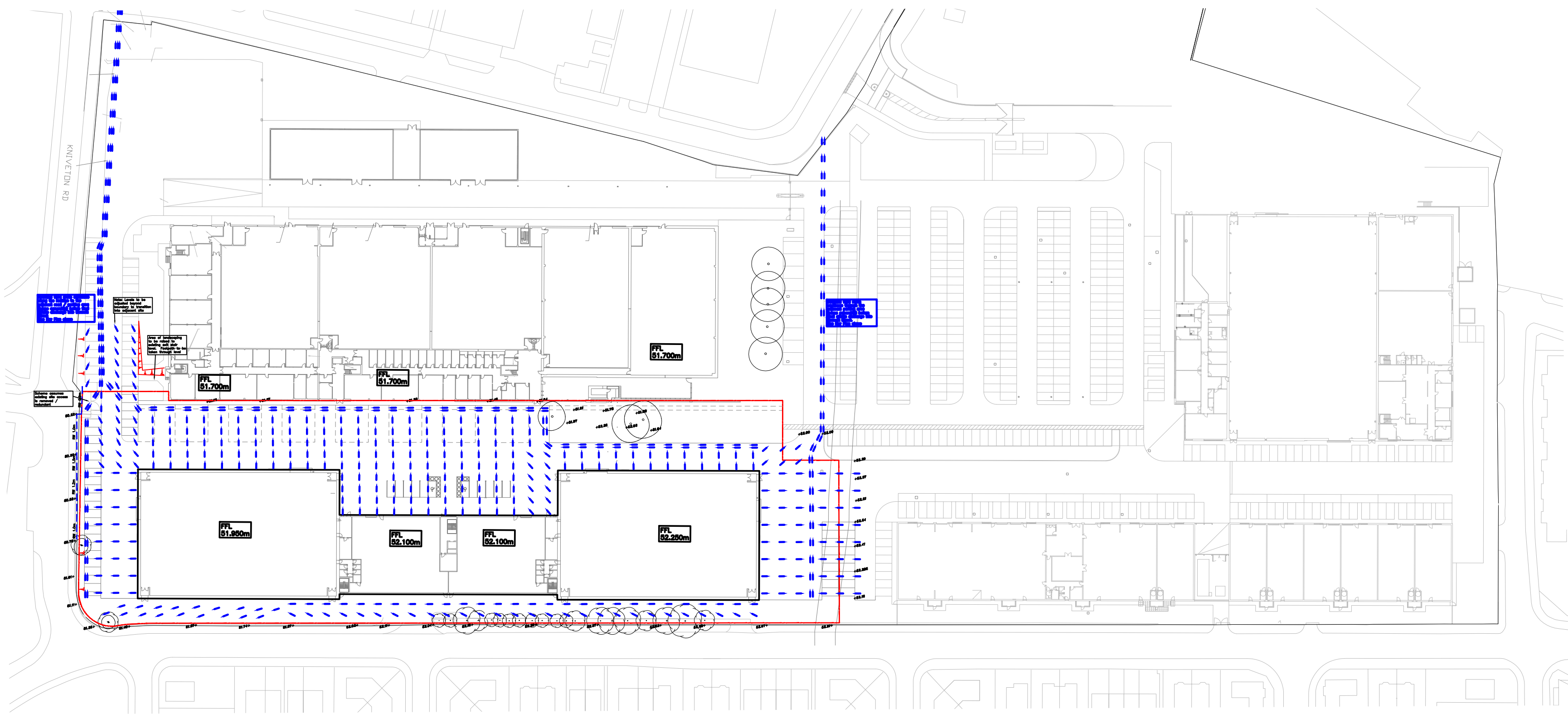
Contract:
SPACE STUDIOS MANCHESTER

Drawing title:
EXTERNAL DRAINAGE GA

Scales 1:250 @ A0		Date 06/2021				
Drawn NH		Checked CE				
Drawing No. 320		Drawn No. 0501	Rev PC0			
Project	Origin	Vol	Lvl	Type	Role	No.
SPC - INT - ZZ	- 00	- DR	- C	- 0501		

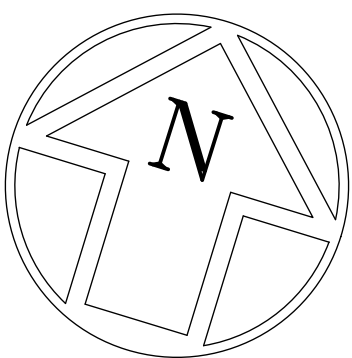
DRAFT





Key Plan - Overland Flood Routes
Scale 1:1000

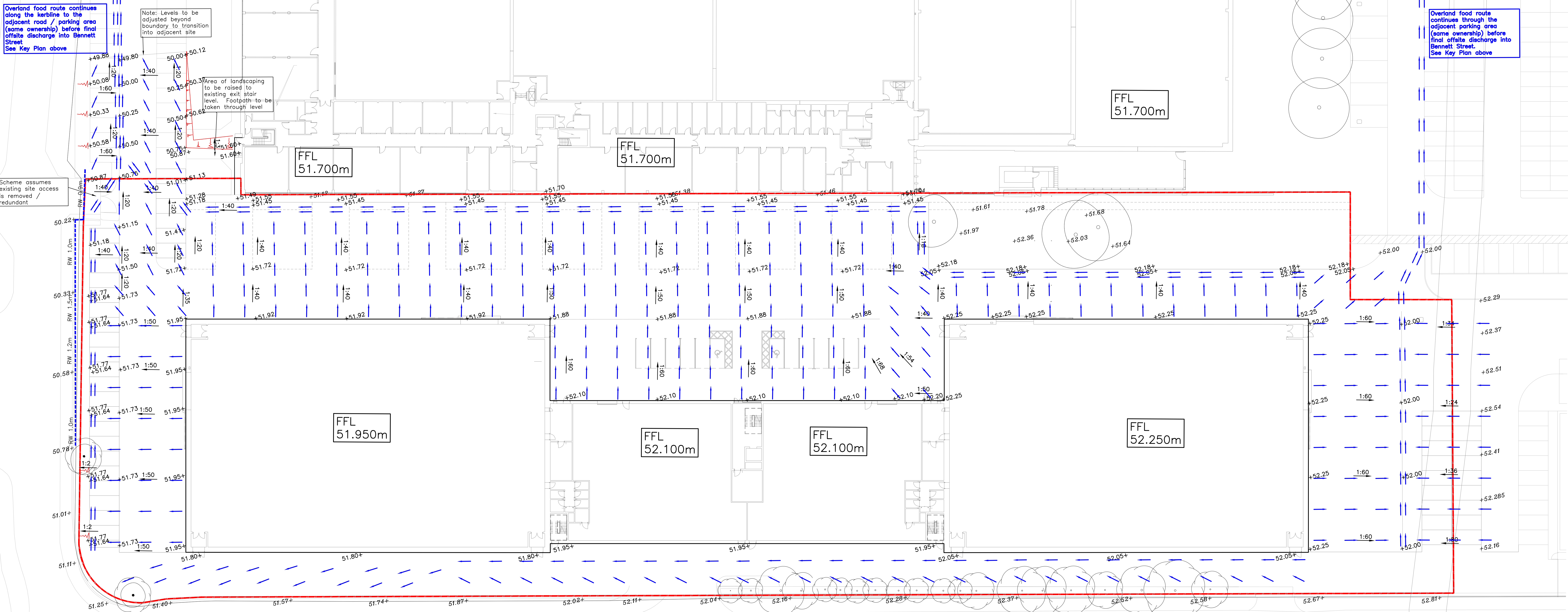
Note: The drawing below indicates the direction of overland flood routes in the event of critical drainage failure, or in extreme rainfall events (> 1 in 100 + 40% cc)



Legend

- Site Boundary (TBC by Architect)
- Proposed Level
- Existing Site Boundary Levels
- Denotes direction of fall and gradient
- Slope / Embankment
- RW - denotes retaining wall position
- Direction of flow

- Notes**
- All dimensions are in millimetres unless noted otherwise
 - All levels shown are in metres unless notified otherwise
 - This drawing is to be read in conjunction with all relevant Architectural and Service Engineer drawings
 - Do not scale from this drawing. Figure dimensions to be worked to in all cases. If in doubt contact the Engineer
 - COM (2015) - This drawing is to be read in conjunction with the Designers Risk Assessment produced for the project



Rev	Drawn	Date	Description

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Civil & Structural Engineers
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Suite 4
14-32 Hewitt Street
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M15 4GB
Tel: 0161 237 3400
Web: www.integraconsulting.co.uk

Drawing status:
STAGE 2

Contract:
SPACE STUDIOS MANCHESTER

Drawing title:
OVERLAND FLOOD ROUTES

Scales	Date
1:250 @ A0	06/2021

Drawn	Checked

Project	Origin	Vol	Lvl	Type	Role	No
SPC - INT	ZZ	- 00	- DR	- C	- 0502	

DRAFT