

NORTHERN ARC, PHASE 1B
DRAINAGE TECHNICAL NOTE



Homes England & Bellway Homes Ltd

NORTHERN ARC, PHASE 1B

DRAINAGE TECHNICAL NOTE

**REPORT REF.
2006821-03A**

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2006821-006 Drainage Strategy – Parcel 1.5 & 1.6

2006821-007 Levels Strategy – Parcel 1.5 & 1.6

2006821-008 Drainage Strategy – Parcel 1.3

2006821-009 Levels Strategy – Parcel 1.3

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1. INTRODUCTION

- 1.1. This technical note is prepared in support of a Reserved Matters Application (RMA) to be submitted by Bellway Homes Ltd to Mid Sussex District Council (MSDC) for the development of Phase 1 East of the Northern Arc urban expansion to the north of Burgess Hill.
- 1.2. Outline planning permission (ref DM/18/5114) was granted on 4 October 2019 for a comprehensive, phased, mixed-use development including approximately 3040 dwellings at Burgess Hill Northern Arc. Phase 1 East is split into two physically distinct areas: East of Issacs Lane North forming sub-phases 1.5 and 1.6, which measure 5.3ha; and Lowlands forming sub-phase 1.3, which is 1.65ha in area. A total of 247 homes are proposed with 25 homes to be constructed within sub phase 1.3, 136 homes in sub-phase 1.5 and 86 homes in sub phase 1.6.
- 1.3. The parcel at Lowlands has development proposed at its southern most edge with the remaining area to the north being set aside for extensive open space and woodland, eventually forming an extension to Bedelands Nature Reserve once the development is complete. The proposals also include the formation of the Green Circle-Freeks Lane section of the strategic green link network within the wider development together with a pedestrian and cycle route along the northern boundary of the secondary school to be constructed to the north of plots 1.5 and 1.6.
- 1.4. The drainage principles set out below have been designed in line with the approved Regional Surface Water Masterplan produced by AECOM in February 2021 (Ref-60610807-ACM-XX-XX-RP-DR-10002). The parcels included in this report are covered by Drainage Areas 9 (P1.5 & P1.6) and 10 (P1.3) in section 12 and 13 of the AECOM Report. The regional Sustainable Drainage System (SuDS) layouts for these Drainage Areas are presented in the AECOM Regional SuDS Layout Ref 60610807-ACM-09-XX -DR-DR-200091 - 200094 and 60610807-ACM-10 XX -DR-DR-200100.
- 1.5. This note sets out the proposals to manage the foul and surface water drainage as part of the proposed development, in accordance with Condition 22, 24, 26, 27 and 29 set out below:

Condition 22

Prior to the commencement of development within each reserved matters area, the proposed method of surface water drainage and means of disposal for that reserved matters area shall be submitted to and agreed in writing by the LPA. The surface water drainage design for each reserved matters area should follow the principles agreed as part of the regional surface water drainage masterplan as approved by condition 21 and no dwelling or building in that reserved matters area shall be occupied until all drainage works have been carried out for that reserved matters area in accordance with the approved details. The details shall be based on sustainable drainage (SuDS) principles including source control and shall;

a) include a timetable for the implementation of the surface water drainage design and a management and maintenance plan for the lifetime of the development which shall include arrangements for adoption by any public authority or statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime.

b) demonstrate that the surface water drainage system will be able to cater for a 1 in 100 year storm event + 40% climate change and that the discharge rates from that phase or phases meets the principles set out in the Drainage Strategy Calculations Summary Tables document produced by AECOM as Appendix C of their Outline Planning Application Environmental Statement Addendum Chapter 7: Water Resources, Flood Risk & Drainage 7.1 Water Resources Consultation;

c) include flood flow routing plans for that phase showing the effect of the development on fluvial (river) and pluvial (surface water and ordinary watercourse) flows and how that phase will deal with exceedance flows either generated on site and/or arriving from adjacent phases of the development;

d) provide plans, design specifications and calculations for all surface water drainage systems. Reason: To ensure an acceptable impact on the existing public sewer network as well as to ensure the proposal is acceptable in relation to flood risk and to accord with Policy DP41 of the Mid Sussex District Plan.

Condition 24

Prior to the commencement of development within each reserved matters area, the proposed method of foul drainage and means of disposal for that reserved matters area shall be submitted to and agreed in writing by the LPA in conjunction with the relevant sewerage authority. The foul water drainage

design for each reserved matters area should follow the principles agreed as part of the foul water masterplan scheme. No dwelling or building in that reserved matters area shall be occupied until all drainage works have been carried out for that reserved matters area in accordance with the approved details. The details shall include a timetable for its implementation and a management plan for the lifetime of the development which shall include arrangements for adoption by any public authority or statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime. Reason: To ensure an acceptable impact on the existing public sewer network and to accord with Policy DP41 of the Mid Sussex District Plan.

Condition 26

For each relevant reserved matters application (relevance to be determined in accordance with confirmation sought from the local planning authority), detailed plans shall be submitted to and approved in writing by the LPA at the relevant reserved matters stage showing the approved modelled fluvial + climate change flood extent (with any buffers) and surface water flood extent (with any buffers) in relation to the proposed development layout for that reserved matters area, including amenity space and drainage infrastructure that will be utilised by that reserved matters area. Such plans should demonstrate that buildings within the reserved matters area will not be at risk of flooding and that surface water flood flow routes will be maintained or accommodated within the layout of that reserved matters area. Historic flood extents should also be included within these details. The development of each reserved matters area subject to the requirements of this condition shall then proceed in accordance with the information submitted to and approved by the local planning authority.

Condition 27

27. Prior to the development of each reserved matters area, details of watercourses, ponds and any other natural water bodies (existing and proposed) for that reserved matters area shall be submitted to and approved in writing by the LPA in conjunction with the Environment Agency.

The submitted details shall include:

- a minimum 8m buffer zone from top of the river bank for all Main Rivers and a minimum 5m buffer zone from top of the watercourse bank for Ordinary Watercourses;*
- information about any ponds that are to be removed from any reserved matters area and the consequences of removal of any pond in terms of flood risk;*
- evidence of how ordinary watercourses and natural ponds are to be preserved and details of any crossings that are necessary for the provision of infrastructure.*

Condition 29

No development shall take place within each reserved matters area where the River Adur is located until mitigation/enhancement plans for the River Adur within that reserved matters area have been submitted to, and agreed in writing by, the local planning authority and implemented as approved. Thereafter, the development within that reserved matters area shall be implemented in accordance with the approved scheme.

2. SURFACE WATER DRAINAGE AND SuDS METHODOLOGY

Drainage Hierarchy

2.1 In line with CIRIA guidance C753 (The SuDS manual), the drainage hierarchy needs to be considered and is listed below in order of preference:

- Store rainwater for later use;
- Use infiltration techniques, such as porous surfaces in non-clay areas;
- Attenuate rainwater by storing in tanks or sealed water features for gradual release to a watercourse;
- Discharge rainwater direct to a watercourse;
- Discharge rainwater to a surface water drain; and
- Discharge rainwater to the combined sewer.

Store rainwater for later use

2.2 For the purposes of the strategy, it has been determined the use of rainwater storage and source control will not be utilised for the hydraulic design given these will be privately conveyed and therefore not reliable to form part of strategy for the design life of the development. The potential to reuse a percentage of the rainwater from the site could be explored further during detailed design, in particular through the use of water butts. This assessment considers the worst-case runoff rates and assumes this option is not viable.

Use infiltration techniques, such as porous surfaces

2.3 The Regional Surface Water Masterplan report produced by AECOM determined infiltration was unlikely to be viable at the site and restricted discharge to local watercourses would be the preferred method for managing surface water runoff.

2.4 AECOM carried out further geotechnical investigation (ref: 60578790 Ground Investigation Report Rev 2) for the nearby Freek's Farm & Maple Drive development and through fieldwork the presence of clay strata throughout the subsurface conditions was encountered. This was a mixture of clay topsoil, re-engineered clay, natural made ground and cohesive made ground, with stiff natural clay encountered at the base of all boreholes. With this it has been deemed that infiltration is not suitable for this scheme.

Discharge to local watercourse

- 2.5 There are a number of existing watercourses in the vicinity of the site, from a review of the local topography, it can be seen that these watercourses currently serve the site. The development drainage strategy will be based upon discharge to the existing watercourses, limited to existing greenfield run-off rates. This follows the same principles set out within the approved AECOM report.
- 2.6 The River Adur is located to the East of Parcel 1.5. No development is located within the 8m buffer zone or within approved modelled fluvial extent. Drawing 2006821-06 illustrates the flood extent for the 1 in 1000 year event and the 1 in 100 year event plus 105% allowance for climate change fluvial flood extent.
- 2.7 The World's End Stream is located to the South of Parcel 1.3. No development is located within the 8m buffer zone or within approved modelled fluvial extent. Drawing 2006821-08 illustrates the flood extent for the 1 in 1000 year event and the 1 in 100 plus 105% allowance for climate change fluvial flood extent.

Proposed Sustainable Drainage Systems (SuDS)

- 2.8 **Table 2-1** below appraises the constraints and opportunities for the use of SuDS techniques within the site and it adopts the management train approach outlined in CIRIA C753 'The SuDS Manual'.

Table 2-1 - C753 SuDS Components -Management Train Approach

Type:	Infiltration Devices (Source Control)
Constraints:	Unsuitable ground conditions so unable to infiltrate into the ground.
Opportunities:	None.
Type:	Permeable Paving (Source Control)
Constraints:	Permeable paving potential has been discounted for the overall hydraulic strategy due to long term maintenance and control issues. The site is very steep in places and this would limit the effectiveness/efficiency of permeable paving.
Opportunities:	None.
Type:	Swales/Filter Drains (Permeable Conveyance)
Constraints:	None.
Opportunities:	Swales will be used for conveyance and to improve quality of surface water effluent. They will also be utilised within the attenuation basin as a low flow channel to further improve water quality.
Type:	Attenuation Basin / Wetland Ponds (end of pipe treatment)
Constraints:	None.
Opportunities:	Basins will be used to store water prior to discharging into the nearby watercourses and to provide additional treatment of the surface water runoff.
Type:	Buried Storage (end of pipe treatment)
Constraints:	None.
Opportunities:	Geocellular storage could be used within the network to provide additional storage if required.

Proposed SuDS Strategy

- 2.9 After consideration of the CIRIA C753 management train approach, the most viable SuDS options for the site are detention basins, attenuation ponds and low flow channels (swales) in order to provide appropriate water quality treatment prior to discharge to the nearby watercourses.

Storage Requirements – Parcel 1.5 & 1.6

- 2.10 AECOM drawing 60610807-ACM-09-XX-DR-DR-200092 shows a Hydrobrake restricting flows to 23.2l/s for DA 9.2. The approved drainage design utilises the regional attenuation pond (P22), providing attenuation storage just upstream of

the outfall to the River Adur. The remainder of the storage requirements is be provided via on-plot attenuation

Storage Requirements – Parcel 1.3

- 2.11 AECOM drawing 60610807-ACM-10 XX -DR-DR-200100 shows the surface water network for DA10.1 conveying runoff from the proposed impermeable area into regional pond 24 (P24). A Hydrobrake restricts flows and discharges into a conveyance swale prior to discharging into the World's End Stream.

Surface Water Strategy

- 2.12 A piped surface water network has been designed to convey run-off within the development parcels and will be offered to Southern Water for adoption up to the headwall of any detention basin or attenuation pond. The swales, basins ponds will be utilised for conveyance, storage and treatment of run-off and will either be adopted by MSDC or maintained by a Management Company.
- 2.13 Highway Swales constructed to WSCC adoptable standards are proposed along the southern boundary of phase 1.6 (Drainage Area 9.2) to treat surface water flows from the highway along the southern boundary of the site.
- 2.14 Sediment forebays at the inlet of the attenuation basin and ponds will be incorporated to ensure that the basin provides the necessary treatment prior to discharge into the stream.
- 2.15 The attenuation basins and ponds within the site have been designed to provide storage for events up to the critical 1 in 100 year storm event, plus a 40% allowance for climate change. A factor of 5% urban creep has been applied to the impermeable area for the residential development and 10% for the impermeable area within the school catchment, this approach was used within the approved AECOM report and is therefore considered suitable. For the impermeable areas for Parcels 1.3, 1.5 & 1.6 see **Table 2-2** below.

Table 2-2: Proposed Impermeable Area

Area	Impermeable Area (ha)	Impermeable Area (ha) + Urban Creep
Parcel 1.3	0.509	0.534
Parcels 1.5 & 1.6	2.569	2.697
+		
Allowance for Secondary School	0.520	0.580
Total	3.089	3.277

- 2.16 The regional ponds have been designed in line with AECOM drawings Ref 60610807-ACM-XX-XX-DR-DR-300220 & 300240. Pond P22 serving parcels 1.5 and 1.6 is located to the south of Parcel 1.5 and is East of parcel 1.6. The pond is 2.0m in depth and provides a storage volume of 1354m³. The pond has been designed to have a permanent water depth of 0.50m.
- 2.17 A detention basin is located to the North of P22 providing additional on plot storage to the Parcel 1.5b. The basin is 1.1m in depth (including freeboard) and provides a storage volume of approximately 501m³.
- 2.18 The detention basin has been designed with a low flow channel, raised landscaped plateau and gentle slopes to integrate the basin within development and landscaping proposals.
- 2.19 Pond P24 serving parcel 1.3 is located to the south of the development and is 1.3m in depth and provides a storage volume of 358m³. The pond has been designed to have a permanent water depth of 0.50m.
- 2.20 The Proposed Drainage Strategy is shown in **Appendix A** and indicates how the site is to be drained and the proposed locations of the SuDS features.

Urban Creep

- 2.21 In accordance with the AECOM report an additional 5% of impermeable area has been accounted for to mitigate against future urban creep for Parcels 1.5, 1.6 and 1.3. An additional 10% allowance has been accounted for to mitigate against future urban creep for the school catchment. This allowance is included within the total impermeable area for the site, used within the surface water drainage calculations.

Stages of Treatment

- 2.22 In terms of surface water treatment, the integration of the potential SuDS features outlined above allow for a SuDS management train approach to be applied to ensure that surface water runoff is of sufficient quality, so as not to cause pollutant-based detriment to the receiving watercourse or ditch.

CIRIA Simple Index Method

- 2.23 Shown below are three tables which form part of the CIRIA C753 Simple Index Treatment Method and highlight the improvement in water quality the designed SuDS methods deliver. The benchmark classification data for the development is shown in **Table 2-3** which is then compared to the SuDS mitigation indices displayed in **Table 2-4**.
- 2.24 As per the CIRIA C753 SuDS manual, where the mitigation index of an individual component is insufficient, two components (or more) in series will be required, where;

$$\text{Total SuDS mitigation index} = \text{mitigation index}_1 + 0.5 (\text{mitigation index}_2)$$

Where:

$$\text{mitigation Index}_n = \text{mitigation index for component n}$$

- 2.25 A factor of 0.5 is used to account for the reduced performance of secondary or tertiary components associated with already reduced inflow concentrations. These comparison results highlighted in **Table 2-5** and **Table 2-6** show the

quality of water discharging from the site has been improved by the use of SuDS methods within the design.

Table 2-3: Pollution hazard indices for different land use classifications

(land use in blue is applicable for the majority of the development, land use in orange is applicable for the secondary road connecting the EBLR and Issacs Lane).

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, home zones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g. hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

Table 2-4: Indicative SuDS mitigation indices

(bold text is applicable to this development).

Type of SuDS component	Mitigation indices		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bio retention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	Not applicable for the overall hydraulic analysis of this development.		

**Table 2-5: SuDS mitigation indices provided for Low Hazard Level
(Majority of the Development)**

Source	Required mitigation indices		
	TSS	Metals	Hydrocarbons
Medium	0.7	0.6	0.7
Type of SuDS component provided			
Swale	0.5	0.6	0.6
Detention Basin	0.5	0.5	0.6
Total	1.0	1.1	1.2
Check	+0.3	+0.5	+0.5

**Table 2-6: SuDS mitigation indices provided for Medium Hazard Level
(Secondary Road connecting Issacs Lane to EBLR)**

Source	Required mitigation indices		
	TSS	Metals	Hydrocarbons
Low	0.5	0.4	0.4
Type of SuDS component provided			
Attenuation Pond	0.7	0.5	0.6
Total	0.7	0.1	0.1
Check	+0.2	+0.1	+0.1

- 2.26 The drainage strategy for the site includes the use of swales, attenuation ponds and detention basins to provide suitable treatment based on the mitigation indices shown in **Table 2-4** to **table 2-6** above. Details of these features can be found on the Drainage Strategy drawing includes within **Appendix A**.

Proposed Outfalls

- 2.27 The surface water network for Parcels 1.5, 1.6 & the proposed secondary school conveys runoff into the regional Pond 22 prior to discharging into the River Adur (EA Main River) via a proposed headwall.
- 2.28 Parcel 1.3 conveys runoff into the attenuation pond (P24) located to the South of the development. The is restricted and discharges into a conveyance swale prior to discharging into the World Ends Stream (tributaroy of the River Adur).
- 2.29 Flow control devices downstream of P22 and P24 with Hydrobrakes are proposed to ensure that there is a gradual release of surface water runoff into the receiving watercourses. Table 2-7 shows the discharge rates for storm events up to the 1 in 100 year event plus an allowance of 40% for climate change.
- 2.30 Parcel 1.5 and 1.6 proposed discharge rates are in line with the approved AECOM report and allow for the 4.5 l/s from the secondary school's southern catchments as outlined in the approved AECOM report. Parcel 1.3 proposed discharge rates have been restricted to the existing greenfield runoff rate for the 1 in 1 year event. Refer to **Appendix B** for MicroDrainage calculations and **Table 2-7** below.

Table 2-7: Discharge Rates

Parcel Ref	Storm Events			
	Q2 (l/s)	Q30 (l/s)	Q100 +20%CC (l/s)	Q100 +40%CC (l/s)
Parcel 1.3 (Based on 1 in 1-year greenfield runoff rate in Appendix B)	3.6	3.6	3.6	3.6
Parcels 1.5 & 1.6 (In line with AECOM Report)	23.1*	23.1*	23.1*	23.1*
*Includes an allowance of 4.5l/s for school catchment				

Exceedance Routes

- 2.31 As a result of heavy or extreme storm events it is sometimes unavoidable for the capacities of sewers and other drainage systems to be exceeded. Drainage exceedance will occur when the rate of surface water runoff exceeds the inlet capacity of the drainage system, when the receiving water or pipe system becomes overloaded, blocked or when the outfall becomes restricted due to flood levels in the receiving water.
- 2.32 The routes will ultimately mimic the current flow routes associated with the existing site as a result of the topography. The natural low points of the site will be retained as open space incorporating the detention basins, which will intercept any exceedance flows from the development. The road network will convey run-off towards the low point within the site and will be designed to discharge flows into the open space. Beyond the developed area of this scheme, the site naturally falls to the River Adur and Worlds End Stream (EA Main Rivers) which will be the ultimate discharge of any exceedance flows. Exceedance routes are shown on the drainage strategy plan for the site. Refer to Drainage Strategy Plan in **Appendix A** for details.

3 FOUL WATER DRAINAGE

- 3.1 The foul effluent from Parcel 1.6 and the Western section of parcel 1.5 will drain to manhole MHF4 located with the EBLR via an adoptable gravity fed foul water network.
- 3.2 Due to the existing topography and the proposed levels of the EBLR an adoptable pumping station serving the Eastern section of Parcel 1.5 is proposed South of the development. The adoptable pumping station is accessed from the EBLR and the rising main will discharge into a breakout chamber prior to discharging into manhole MHF3 located within the EBLR.
- 3.3 Foul effluent from Parcel 1.3 will drain directly to the adoptable foul Water pumping station located within Phase 1A. The pumping station is located approx. 125m to the West of the site.
- 3.4 It is the intention that the piped elements of the foul water network will be adopted by Southern Water under a S104 agreement. The extent of the network proposed for adoption will be addressed at detailed design stage and agreed with Southern Water. Refer to the drainage plan in **Appendix A** which shows the extent of the adopted network.
- 3.5 Southern Water have previously identified capacity concerns within the foul sewer network. It is understood that Southern Water are undertaking further investigation and studies to assess the impact of the proposed development. Under the new charging arrangements introduced in April 2018, it is the responsibility of Southern Water to provide capacity within the sewer network to facilitate the proposed.

4 MANAGEMENT AND MAINTENANCE

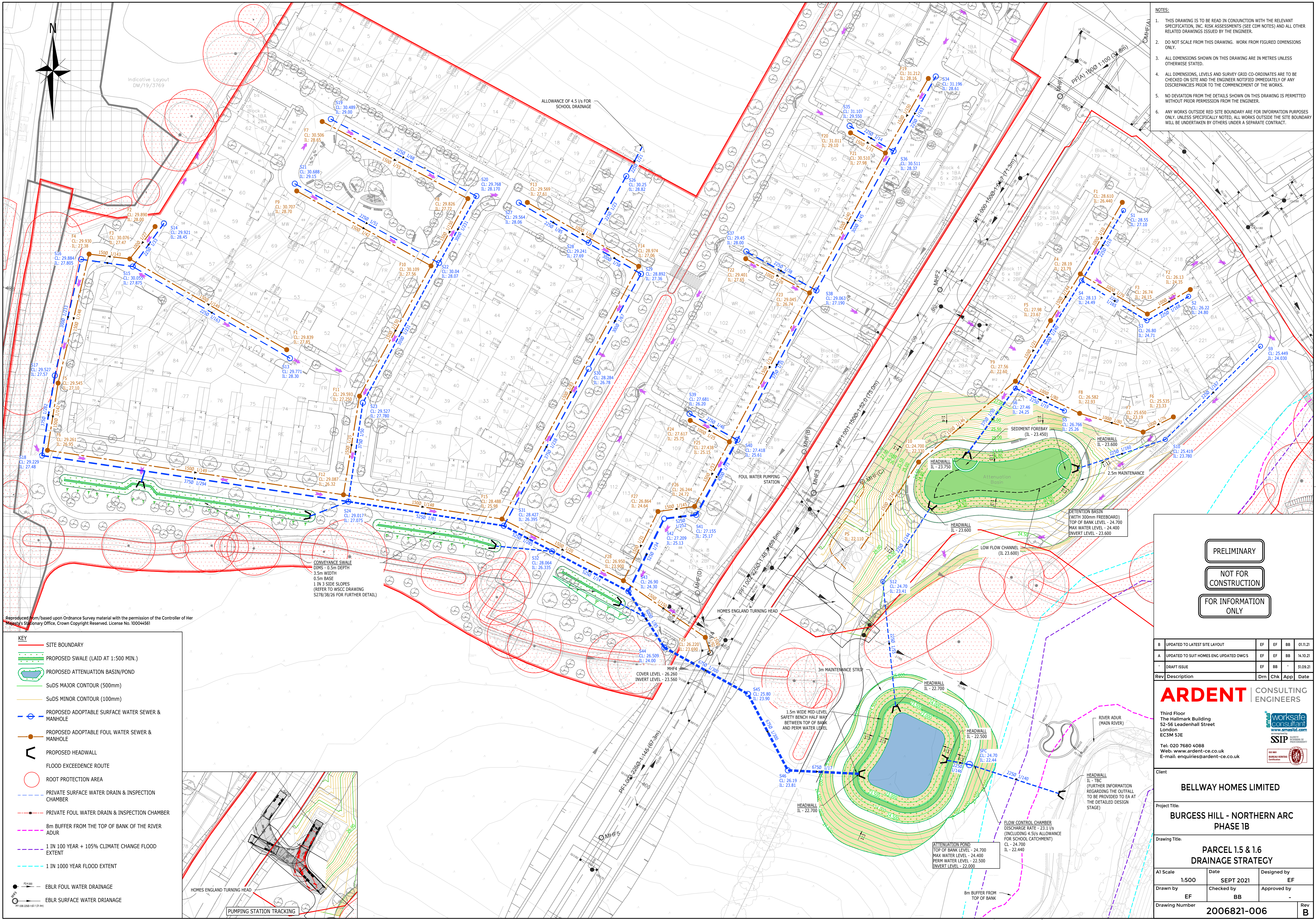
- 4.1 Estate roads within the development will be offered to WSCC for adoption, together with the associated highway swales. Refer to Ardent drawing 2006821-006 which show the adoptable highways drainage features.
- 4.2 It is the intention that the piped elements of the surface water network (up to the outfall into the proposed basins/swales) will be adopted by Southern Water under a S104 agreement. The extent of the network proposed for adoption will be addressed at detailed design stage and agreed with Southern Water. Refer to the drainage plan in **Appendix A** which shows the extent of the adopted network.
- 4.3 The SuDs will be adopted by MSDC or maintained by a Management Company. The management company will be appointed to maintain the SuDS elements of the surface water drainage strategy. Funding of the maintenance regime will be via the yearly maintenance fees from the development. All maintenance should be in accordance with the best practices and the CIRIA Manual C753.
- 4.4 A maintenance and management plan for the SuDS features is included in **Appendix C**.

5 CONCLUSION

5.1 Based on the findings of this technical note it can be concluded that;

- The Drainage Strategy for the site is in line with the approved outline strategy developed by AECOM.
- Treatment is provided via the use of detention basins and swales providing suitable mitigation for the type of development proposed in line with the CIRIA simple index approach.
- Exceedance routes will be contained within the site road network and open spaces with the eventual outfall for any overflow being the local watercourse network.
- SuDS features will be maintained by WSCC Highways, an appointed maintenance company or MSDC.
- Foul effluent will discharge into the wider development sewer network. An adoptable pumping station will serve the Eastern section of Parcel 1.5.

Appendix A
Ardent CE drawings

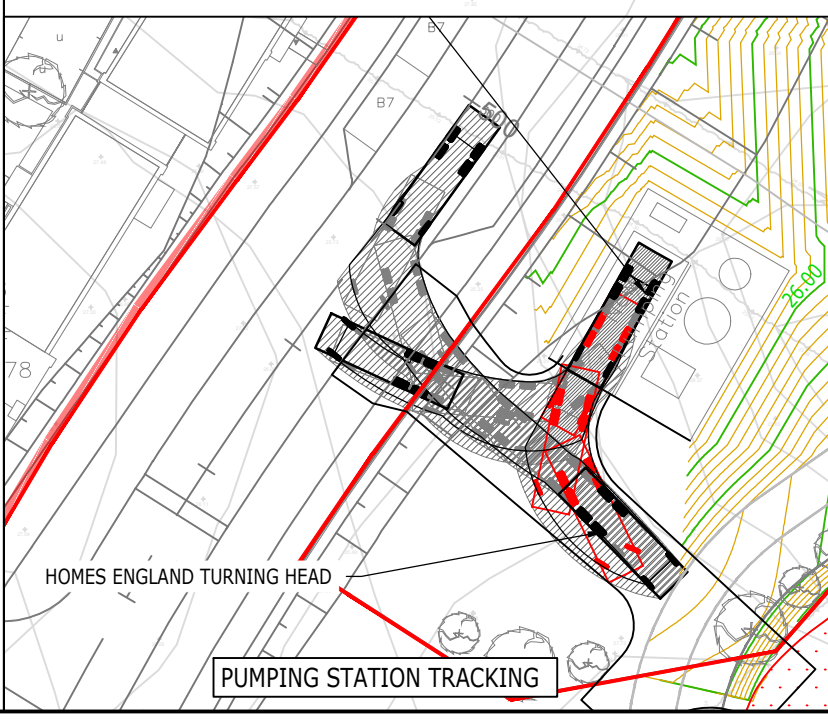


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- KEY
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 - PROPOSED SWALE (LAID AT 1:500 MIN.)
 - PROPOSED ATTENUATION BASIN/POND
 - SUDS MAJOR CONTOUR (500mm)
 - SUDS MINOR CONTOUR (100mm)
 - PROPOSED ADAPTABLE SURFACE WATER SEWER & MANHOLE
 - PROPOSED ADAPTABLE FOUL WATER SEWER & MANHOLE
 - PROPOSED HEADWALL
 - FLOOD EXCEEDENCE ROUTE
 - ROOT PROTECTION AREA
 - PRIVATE SURFACE WATER DRAIN & INSPECTION CHAMBER
 - PRIVATE FOUL WATER DRAIN & INSPECTION CHAMBER
 - 8m BUFFER FROM THE TOP OF BANK OF THE RIVER ADUR
 - 1 IN 100 YEAR + 105% CLIMATE CHANGE FLOOD EXTENT
 - 1 IN 1000 YEAR FLOOD EXTENT

- EBLR FOUL WATER DRAINAGE
- EBLR SURFACE WATER DRAINAGE



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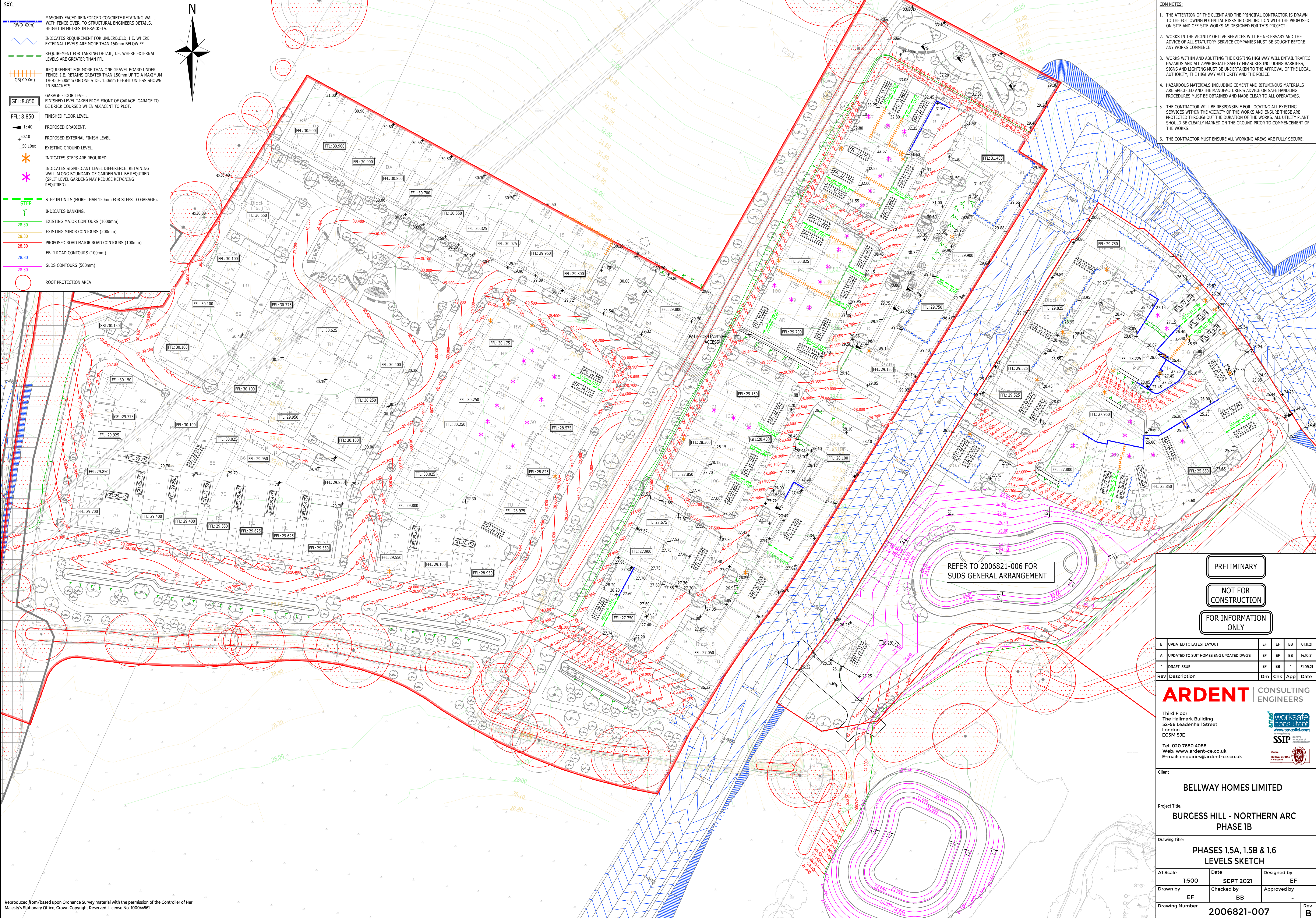
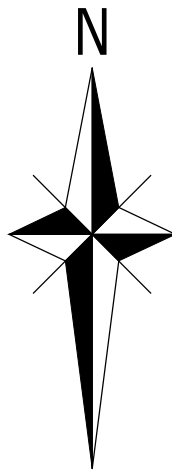
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Project Title:		BURGESS HILL - NORTHERN ARC PHASE 1B	
Drawing Title:		PARCEL 1.5 & 1.6 DRAINAGE STRATEGY	
A1 Scale	Date	Designed by	
1:500	SEPT 2021	EF	
Drawn by	Checked by	Approved by	
EF	BB	-	
Drawing Number		2006821-006	
		Rev B	

KEY:

- MASONRY FACED REINFORCED CONCRETE RETAINING WALL, WITH FENCE OVER, TO STRUCTURAL ENGINEERS DETAILS. HEIGHT IN METRES IN BRACKETS.
- INDICATES REQUIREMENT FOR UNDERBUILD, I.E. WHERE EXTERNAL LEVELS ARE MORE THAN 150mm BELOW FFL.
- REQUIREMENT FOR TANKING DETAIL, I.E. WHERE EXTERNAL LEVELS ARE GREATER THAN FFL.
- REQUIREMENT FOR MORE THAN ONE GRAVEL BOARD UNDER FENCE, I.E. RETAINS GREATER THAN 150mm UP TO A MAXIMUM OF 450-600mm ON ONE SIDE. 150mm HEIGHT UNLESS SHOWN IN BRACKETS.
- GARAGE FLOOR LEVEL.
FINISHED LEVEL TAKEN FROM FRONT OF GARAGE. GARAGE TO BE BRICK COURSED WHEN ADJACENT TO PLOT.
- FINISHED FLOOR LEVEL.
- PROPOSED GRADIENT.
- PROPOSED EXTERNAL FINISH LEVEL.
- EXISTING GROUND LEVEL.
- INDICATES STEPS ARE REQUIRED
- INDICATES SIGNIFICANT LEVEL DIFFERENCE. RETAINING WALL ALONG BOUNDARY OF GARDEN WILL BE REQUIRED (SPLIT LEVEL GARDENS MAY REDUCE RETAINING REQUIRED)
- STEP IN UNITS (MORE THAN 150mm FOR STEPS TO GARAGE).
- INDICATES BANKING.
- EXISTING MAJOR CONTOURS (1000mm)
- EXISTING MINOR CONTOURS (200mm)
- PROPOSED ROAD MAJOR ROAD CONTOURS (100mm)
- EBLR ROAD CONTOURS (100mm)
- SUDS CONTOURS (500mm)
- ROOT PROTECTION AREA



CDM NOTES:

1. THE ATTENTION OF THE CLIENT AND THE PRINCIPAL CONTRACTOR IS DRAWN TO THE FOLLOWING POTENTIAL RISKS IN CONJUNCTION WITH THE PROPOSED ON-SITE AND OFF-SITE WORKS AS DESIGNED FOR THIS PROJECT.
2. WORKS IN THE VICINITY OF LIVE SERVICES WILL BE NECESSARY AND THE ADVICE OF ALL STATUTORY SERVICE COMPANIES MUST BE SOUGHT BEFORE ANY WORKS COMMENCE.
3. WORKS WITHIN AND ABUTTING THE EXISTING HIGHWAY WILL ENTAIL TRAFFIC HAZARDS AND ALL APPROPRIATE SAFETY MEASURES INCLUDING BARRIERS, SIGNS AND LIGHTING MUST BE UNDERTAKEN TO THE APPROVAL OF THE LOCAL AUTHORITY, THE HIGHWAY AUTHORITY AND THE POLICE.
4. HAZARDOUS MATERIALS INCLUDING CEMENT AND BITUMINOUS MATERIALS ARE SPECIFIED AND THE MANUFACTURER'S ADVICE ON SAFE HANDLING PROCEDURES MUST BE OBTAINED AND MADE CLEAR TO ALL OPERATIVES.
5. THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN THE VICINITY OF THE WORKS AND ENSURE THESE ARE PROTECTED THROUGHOUT THE DURATION OF THE WORKS. ALL UTILITY PLANT SHOULD BE CLEARLY MARKED ON THE GROUND PRIOR TO COMMENCEMENT OF THE WORKS.
6. THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.

PRELIMINARY

NOT FOR CONSTRUCTION

FOR INFORMATION ONLY

B	UPDATED TO LATEST LAYOUT	EF	EF	BB	01.11.21
A	UPDATED TO SUIT HOMES ENG UPDATED DWG'S	EF	EF	BB	14.10.21
-	DRAFT ISSUE	EF	BB	-	31.09.21
Rev	Description	Dwn	Chk	App	Date

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Client

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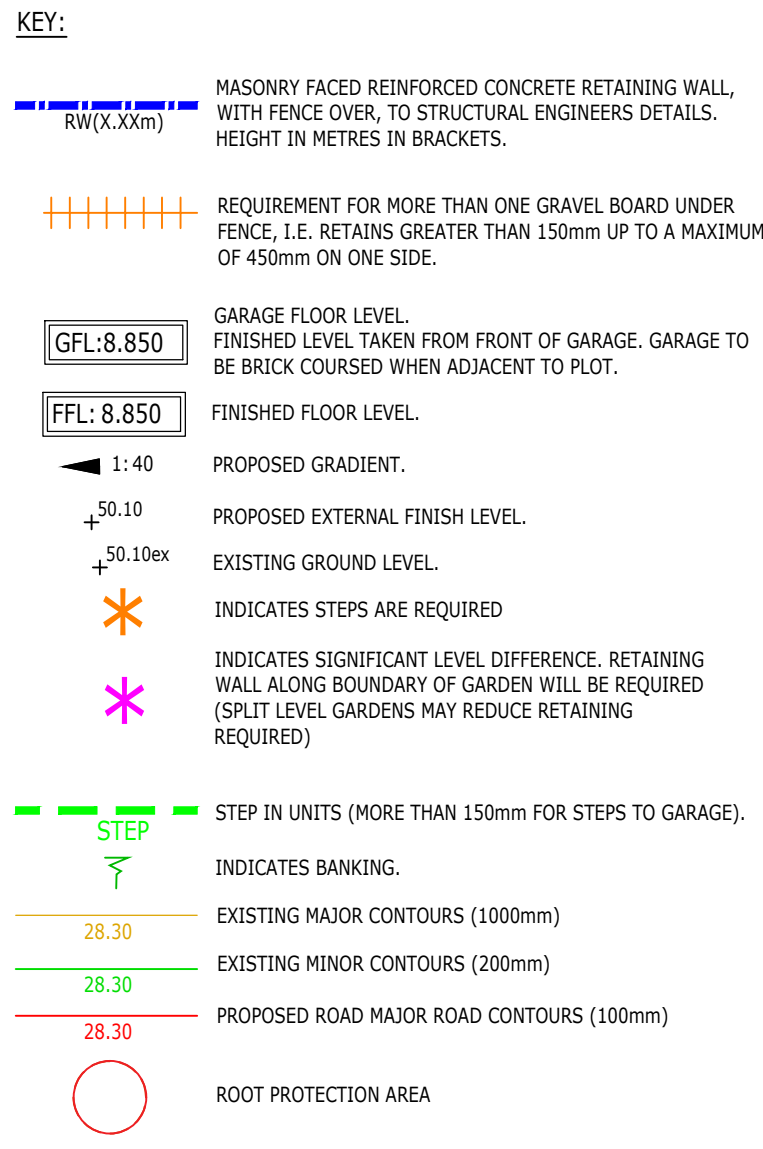
Project Title:
BURGESS HILL - NORTHERN ARC
PHASE 1B

Drawing Title:
PHASES 1.5A, 1.5B & 1.6
LEVELS SKETCH

A1 Scale	Date	Designed by
1:500	SEPT 2021	EF
Drawn by	Checked by	Approved by
EF	BB	-

Drawing Number
2006821-007

Rev
B



- NOTES:**
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION, I.E. RISK ASSESSMENTS (SEE CDM NOTES) AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
 2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
 3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES UNLESS OTHERWISE STATED.
 4. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
 5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
 6. ANY WORKS OUTSIDE RED SITE BOUNDARY ARE FOR INFORMATION PURPOSES ONLY. UNLESS SPECIFICALLY NOTED, ALL WORKS OUTSIDE THE SITE BOUNDARY WILL BE UNDERTAKEN BY OTHERS UNDER A SEPARATE CONTRACT.

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ONLY

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CONSTRUCTION

B	UPDATED TO LATEST SITE LAYOUT	EF	EF	BB	01.11.21
A	PRELIMINARY ISSUE	EF	EF	BB	14.10.21
-	DRAFT ISSUE	EF	BB	-	31.09.21
Rev	Description	Drn	Chk	App	Date

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Client

BELLWAY HOMES LIMITED

Project Title:

**BURGESS HILL - NORTHERN ARC
PHASE 1B**

Drawing Title:

PARCEL 1.3
LEVELS STRATEGY

A1 Scale 1:250	Date SEPT 2021	Designed by EF
Drawn by EF	Checked by BB	Approved by -
Drawing Number 2006821-009		Rev B

Appendix B
MicroDrainage Calculations

Ardent		Page 1
3rd Floor, The Hallmark Buil...		
52-56 LeadenHall Street		
London, EC3M 5JE		
Date 01/10/2021 14:35	Designed by efambely	
File	Checked by	
Innovyze	Source Control 2020.1	
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 Soil 0.450 Area (ha) 0.775 Urban 0.000 SAAR (mm) 851 Region Number Region 7 Results l/s QBAR Rural 4.3 QBAR Urban 4.3 Q100 years 13.6 Q1 year 3.6 Q30 years 9.7 Q100 years 13.6		
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Ardent		Page 0
3rd Floor, The Hallmark Building 52-56 LeadenHall Street London, EC3M 5JE	NOTHERN ARC 1B SW NETWORK 1 (PHASE 1.5 & 1.6) 2,30,100(20)	
Date 01/10/2021 File 2006821.MDX	Designed by EF Checked by BB	
Innovyze	Network 2020.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1

Pipe Sizes ACE-PIPE Manhole Sizes ACE-MH

FEH Rainfall Model	
Return Period (years)	50
FEH Rainfall Version	2013
Site Location GB 531349 121053 TQ 31349 21053	
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Surface Network 1

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	25.630	2.535	10.1	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	15.115	0.090	167.9	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	23.993	0.145	165.5	0.063	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	39.559	0.165	239.8	0.128	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	16.917	0.860	19.7	0.067	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	25.089	0.500	50.2	0.105	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.003	20.998	0.150	140.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.10	27.100	0.000	0.0	0.0	0.0	4.14	164.6	0.0
2.000	50.00	5.25	24.800	0.000	0.0	0.0	0.0	1.01	40.0	0.0
2.001	50.00	5.64	24.710	0.063	0.0	0.0	0.0	1.01	40.3	8.5
1.001	50.00	6.30	24.490	0.191	0.0	0.0	0.0	1.01	71.5	25.9
3.000	50.00	5.10	25.260	0.067	0.0	0.0	0.0	2.96	117.8	9.1
1.002	50.00	6.46	24.250	0.363	0.0	0.0	0.0	2.56	283.1	49.2
1.003	50.00	6.69	23.750	0.363	0.0	0.0	0.0	1.53	168.9	49.2

Ardent		Page 1
3rd Floor, The Hallmark Building 52-56 LeadenHall Street London, EC3M 5JE	NOTHERN ARC 1B SW NETWORK 1 (PHASE 1.5 & 1.6) 2,30,100(20)	
Date 01/10/2021 File 2006821.MDX	Designed by EF Checked by BB	
Innovyze	Network 2020.1	

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
4.000	41.706	0.250	166.8	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
4.001	28.872	0.180	160.4	0.082	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.002	47.911	0.100	479.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	27.323	0.190	143.8	0.050	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	39.341	0.710	55.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.006	23.280	0.670	34.7	0.056	0.00	0.0	0.600	o	225	Pipe/Conduit	
5.000	56.979	0.350	162.8	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
6.000	16.676	0.500	33.4	0.092	5.00	0.0	0.600	o	225	Pipe/Conduit	
5.001	16.363	0.070	233.8	0.128	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.002	37.344	0.160	233.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.003	25.356	0.090	281.7	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
5.004	97.021	0.330	294.0	0.086	0.00	0.0	0.600	o	375	Pipe/Conduit	
7.000	51.585	0.755	68.3	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
7.001	23.997	0.100	240.0	0.169	0.00	0.0	0.600	o	300	Pipe/Conduit	
8.000	51.582	1.005	51.3	0.079	5.00	0.0	0.600	o	225	Pipe/Conduit	
7.002	49.847	0.215	231.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
7.003	31.284	0.630	49.7	0.250	0.00	0.0	0.600	o	375	Pipe/Conduit	
5.005	49.290	0.605	81.5	0.214	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
4.000	50.00	5.69	24.130	0.000	0.0	0.0	0.0	1.01	40.1	0.0
4.001	50.00	6.16	23.880	0.082	0.0	0.0	0.0	1.03	40.9	11.1
4.002	50.00	7.51	23.700	0.082	0.0	0.0	0.0	0.59	23.5	11.1
1.004	50.00	7.93	23.600	0.495	0.0	0.0	0.0	1.09	43.3	67.0
1.005	50.00	8.30	23.410	0.495	0.0	0.0	0.0	1.76	70.0	67.0
1.006	50.00	8.47	23.170	0.551	0.0	0.0	0.0	2.23	88.5	74.6
5.000	50.00	5.93	28.300	0.000	0.0	0.0	0.0	1.02	40.6	0.0
6.000	50.00	5.12	28.450	0.092	0.0	0.0	0.0	2.27	90.4	12.5
5.001	50.00	6.20	27.875	0.220	0.0	0.0	0.0	1.02	72.4	29.8
5.002	50.00	6.80	27.805	0.220	0.0	0.0	0.0	1.02	72.4	29.8
5.003	50.00	7.20	27.570	0.220	0.0	0.0	0.0	1.07	118.7	29.8
5.004	50.00	8.73	27.480	0.306	0.0	0.0	0.0	1.05	116.1	41.4
7.000	50.00	5.54	29.000	0.000	0.0	0.0	0.0	1.58	63.0	0.0
7.001	50.00	5.94	28.170	0.169	0.0	0.0	0.0	1.01	71.4	22.9
8.000	50.00	5.47	29.150	0.079	0.0	0.0	0.0	1.83	72.8	10.7
7.002	50.00	6.75	28.070	0.248	0.0	0.0	0.0	1.03	72.7	33.6
7.003	50.00	6.95	27.780	0.498	0.0	0.0	0.0	2.58	284.6	67.4
5.005	50.00	9.10	27.075	1.018	0.0	0.0	0.0	2.25	358.5	137.8

Ardent		Page 2
3rd Floor, The Hallmark Building 52-56 LeadenHall Street London, EC3M 5JE	NOTHERN ARC 1B SW NETWORK 1 (PHASE 1.5 & 1.6) 2,30,100(20)	
Date 01/10/2021 File 2006821.MDX	Designed by EF Checked by BB	
Innovyze	Network 2020.1	

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
9.000	8.242	0.180	45.8	0.580	5.00	0.0	0.600	o	225	Pipe/Conduit	
9.001	10.443	0.500	20.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
9.002	23.917	1.055	22.7	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
10.000	25.207	0.295	85.4	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
9.003	19.083	0.330	57.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
9.004	33.937	0.505	67.2	0.170	0.00	0.0	0.600	o	300	Pipe/Conduit	
9.005	55.893	0.235	237.8	0.055	0.00	0.0	0.600	o	375	Pipe/Conduit	
5.006	17.087	0.060	284.8	0.117	0.00	0.0	0.600	o	525	Pipe/Conduit	
5.007	27.003	1.960	13.8	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
11.000	26.850	0.165	162.7	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
12.000	15.868	1.105	14.4	0.049	5.00	0.0	0.600	o	225	Pipe/Conduit	
11.001	49.893	1.105	45.2	0.118	0.00	0.0	0.600	o	300	Pipe/Conduit	
13.000	25.168	0.660	38.1	0.032	5.00	0.0	0.600	o	225	Pipe/Conduit	
11.002	52.982	1.505	35.2	0.134	0.00	0.0	0.600	o	375	Pipe/Conduit	
14.000	16.610	0.365	45.5	0.041	5.00	0.0	0.600	o	225	Pipe/Conduit	
11.003	26.743	0.365	73.3	0.140	0.00	0.0	0.600	o	450	Pipe/Conduit	
11.004	10.103	0.040	252.6	0.066	0.00	0.0	0.600	o	525	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
9.000	50.00	5.07	29.500	0.580	0.0	0.0	0.0	1.94	77.1«	78.5
9.001	50.00	5.13	29.320	0.580	0.0	0.0	0.0	2.88	114.4	78.5
9.002	50.00	5.28	28.820	0.580	0.0	0.0	0.0	2.76	109.7	78.5
10.000	50.00	5.30	28.060	0.000	0.0	0.0	0.0	1.42	56.3	0.0
9.003	50.00	5.45	27.690	0.580	0.0	0.0	0.0	2.07	146.4	78.5
9.004	50.00	5.74	27.360	0.750	0.0	0.0	0.0	1.92	135.8	101.6
9.005	50.00	6.54	26.780	0.805	0.0	0.0	0.0	1.17	129.3	109.0
5.006	50.00	9.31	26.395	1.940	0.0	0.0	0.0	1.32	286.2	262.7
5.007	50.00	9.39	26.335	1.940	0.0	0.0	0.0	6.06	1311.2	262.7
11.000	50.00	5.44	28.610	0.000	0.0	0.0	0.0	1.02	40.6	0.0
12.000	50.00	5.08	29.550	0.049	0.0	0.0	0.0	3.47	138.0	6.6
11.001	50.00	5.79	28.370	0.167	0.0	0.0	0.0	2.35	165.8	22.6
13.000	50.00	5.20	28.000	0.032	0.0	0.0	0.0	2.13	84.5	4.3
11.002	50.00	6.08	27.190	0.333	0.0	0.0	0.0	3.06	338.3	45.1
14.000	50.00	5.14	26.200	0.041	0.0	0.0	0.0	1.94	77.3	5.6
11.003	50.00	6.27	25.610	0.514	0.0	0.0	0.0	2.38	378.1	69.6
11.004	50.00	6.39	25.170	0.580	0.0	0.0	0.0	1.40	304.1	78.5

Ardent		Page 3
3rd Floor, The Hallmark Building 52-56 LeadenHall Street London, EC3M 5JE	NOTHERN ARC 1B SW NETWORK 1 (PHASE 1.5 & 1.6) 2,30,100(20)	
Date 01/10/2021 File 2006821.MDX	Designed by EF Checked by BB	
Innovyze	Network 2020.1	

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
11.005	25.362	0.755	33.6	0.069	0.00	0.0	0.600	o	525	Pipe/Conduit	
5.008	20.863	0.225	92.7	0.137	0.00	0.0	0.600	o	600	Pipe/Conduit	
5.009	29.991	0.100	299.9	0.000	0.00	0.0	0.600	o	675	Pipe/Conduit	
5.010	26.976	0.090	299.7	0.000	0.00	0.0	0.600	o	675	Pipe/Conduit	
5.011	18.470	1.110	16.6	0.000	0.00	0.0	0.600	o	675	Pipe/Conduit	
5.012	31.604	0.200	158.0	0.000	0.00	0.0	0.600	o	675	Pipe/Conduit	
1.007	8.745	0.060	145.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.008	27.900	0.200	139.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
11.005	50.00	6.50	25.130	0.649	0.0	0.0	0.0	3.87	838.7	87.9
5.008	50.00	9.53	24.300	2.726	0.0	0.0	0.0	2.53	715.2	369.1
5.009	50.00	9.86	24.000	2.726	0.0	0.0	0.0	1.51	539.7	369.1
5.010	50.00	10.15	23.900	2.726	0.0	0.0	0.0	1.51	539.9	369.1
5.011	50.00	10.20	23.810	2.726	0.0	0.0	0.0	6.44	2306.2	369.1
5.012	50.00	10.46	22.700	2.726	0.0	0.0	0.0	2.08	745.2	369.1
1.007	50.00	10.59	22.500	3.277	0.0	0.0	0.0	1.08	43.0«	443.7
1.008	50.00	11.01	22.440	3.277	0.0	0.0	0.0	1.11	43.9«	443.7

Manhole Schedules for Surface Network 1											
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	Pipe Out PN	Invert Level (m)	Diameter (mm)	Pipes In PN	Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	28.550	1.450	Open Manhole	1200	1.000	27.100	225				
S2	26.220	1.420	Open Manhole	1200	2.000	24.800	225				
S3	26.800	2.090	Open Manhole	1200	2.001	24.710	225	2.000	24.710	225	
S4	28.130	3.640	Open Manhole	1200	1.001	24.490	300	1.000	24.565	225	
								2.001	24.565	225	
S5	26.766	1.506	Open Manhole	1200	3.000	25.260	225				
S6	27.460	3.210	Open Manhole	1500	1.002	24.250	375	1.001	24.325	300	
								3.000	24.400	225	
H1	25.939	2.189	Open Manhole	1500	1.003	23.750	375	1.002	23.750	375	
S9	25.449	1.319	Open Manhole	1200	4.000	24.130	225				
S10	25.419	1.539	Open Manhole	1200	4.001	23.880	225	4.000	23.880	225	
H2	25.610	1.910	Open Manhole	1200	4.002	23.700	225	4.001	23.700	225	
H3/P1	24.700	1.100	Open Manhole	1500	1.004	23.600	225	1.003	23.600	375	
								4.002	23.600	225	
S12	24.700	1.290	Open Manhole	1200	1.005	23.410	225	1.004	23.410	225	
H4	25.156	2.456	Open Manhole	1200	1.006	23.170	225	1.005	22.700	225	
S13	29.771	1.471	Open Manhole	1200	5.000	28.300	225				
S14	29.921	1.471	Open Manhole	1200	6.000	28.450	225				
S15	30.055	2.180	Open Manhole	1200	5.001	27.875	300	5.000	27.950	225	
								6.000	27.950	225	
S16	29.884	2.079	Open Manhole	1200	5.002	27.805	300	5.001	27.805	300	
S17	29.527	1.957	Open Manhole	1500	5.003	27.570	375	5.002	27.645	300	
S18	29.229	1.749	Open Manhole	1500	5.004	27.480	375	5.003	27.480	375	
S19	30.489	1.489	Open Manhole	1200	7.000	29.000	225				
S20	29.768	1.598	Open Manhole	1200	7.001	28.170	300	7.000	28.245	225	
S21	30.688	1.538	Open Manhole	1200	8.000	29.150	225				
S22	30.040	1.970	Open Manhole	1200	7.002	28.070	300	7.001	28.070	300	
								8.000	28.145	225	
S23	29.527	1.747	Open Manhole	1500	7.003	27.780	375	7.002	27.855	300	
S24	29.017	1.942	Open Manhole	1500	5.005	27.075	450	5.004	27.150	375	
								7.003	27.150	375	
D1	31.000	1.500	Open Manhole	1200	9.000	29.500	225				
S25	30.822	1.502	Open Manhole	1200	9.001	29.320	225	9.000	29.320	225	
S26	30.250	1.430	Open Manhole	1200	9.002	28.820	225	9.001	28.820	225	
S27	29.564	1.504	Open Manhole	1200	10.000	28.060	225				
S28	29.241	1.551	Open Manhole	1200	9.003	27.690	300	9.002	27.765	225	
								10.000	27.765	225	
S29	28.892	1.532	Open Manhole	1200	9.004	27.360	300	9.003	27.360	300	
S30	28.284	1.504	Open Manhole	1500	9.005	26.780	375	9.004	26.855	300	
S31	28.427	2.032	Open Manhole	1500	5.006	26.395	525	5.005	26.470	450	
								9.005	26.545	375	
S32	28.064	1.729	Open Manhole	1500	5.007	26.335	525	5.006	26.335	525	
S34	31.196	2.586	Open Manhole	1200	11.000	28.610	225				
S35	31.107	1.557	Open Manhole	1200	12.000	29.550	225				
S36	30.511	2.141	Open Manhole	1200	11.001	28.370	300	11.000	28.445	225	
								12.000	28.445	225	

Manhole Schedules for Surface Network 1

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S37	29.450	1.450	Open Manhole	1200	13.000	28.000	225				
S38	29.063	1.873	Open Manhole	1500	11.002	27.190	375	11.001	27.265	300	
								13.000	27.340	225	
S39	27.681	1.481	Open Manhole	1200	14.000	26.200	225				
S40	27.418	1.808	Open Manhole	1500	11.003	25.610	450	11.002	25.685	375	
								14.000	25.835	225	
S41	27.155	1.985	Open Manhole	1500	11.004	25.170	525	11.003	25.245	450	
S42	27.209	2.079	Open Manhole	1500	11.005	25.130	525	11.004	25.130	525	
S43	26.900	2.600	Open Manhole	1500	5.008	24.300	600	5.007	24.375	525	
								11.005	24.375	525	
S44	26.509	2.509	Open Manhole	1500	5.009	24.000	675	5.008	24.075	600	
S45	25.800	1.900	Open Manhole	1500	5.010	23.900	675	5.009	23.900	675	
S46	26.190	2.380	Open Manhole	1500	5.011	23.810	675	5.010	23.810	675	
SH3	24.700	2.000	Open Manhole	1500	5.012	22.700	675	5.011	22.700	675	
SH4/B1	24.700	2.200	Open Manhole	1500	1.007	22.500	225	1.006	22.500	225	
								5.012	22.500	675	
SFC	24.700	2.260	Open Manhole	1200	1.008	22.440	225	1.007	22.440	225	
S	23.000	0.760	Open Manhole	0		OUTFALL		1.008	22.240	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	531218.251	121091.922	531218.251	121091.922	Required	
S2	531238.649	121065.007	531238.649	121065.007	Required	
S3	531225.598	121057.381	531225.598	121057.381	Required	
S4	531205.133	121069.904	531205.133	121069.904	Required	
S5	531199.737	121029.129	531199.737	121029.129	Required	
S6	531184.381	121036.226	531184.381	121036.226	Required	
H1	531169.478	121016.043	531169.478	121016.043	Required	
S9	531261.142	121049.391	531261.142	121049.391	Required	
S10	531231.350	121020.206	531231.350	121020.206	Required	

Manhole Schedules for Surface Network 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
H2	531203.944	121011.122	531203.944	121011.122	Required	
H3/P1	531157.679	120998.674	531157.679	120998.674	Required	
S12	531142.868	120975.714	531142.868	120975.714	Required	
H4	531146.891	120936.579	531146.891	120936.579	Required	
S13	530957.189	121045.645	530957.189	121045.645	Required	
S14	530917.715	121087.886	530917.715	121087.886	Required	
S15	530907.971	121074.353	530907.971	121074.353	Required	
S16	530891.767	121076.634	530891.767	121076.634	Required	
S17	530883.551	121040.206	530883.551	121040.206	Required	
S18	530879.527	121015.171	530879.527	121015.171	Required	
S19	530969.995	121120.556	530969.995	121120.556	Required	
S20	531015.579	121096.419	531015.579	121096.419	Required	
S21	530958.687	121100.320	530958.687	121100.320	Required	
S22	531003.885	121075.464	531003.885	121075.464	Required	
S23	530980.035	121031.693	530980.035	121031.693	Required	
S24	530975.469	121000.744	530975.469	121000.744	Required	
D1	531072.308	121118.506	531072.308	121118.506	Required	
S25	531067.486	121111.821	531067.486	121111.821	Required	
S26	531062.504	121102.643	531062.504	121102.643	Required	

Manhole Schedules for Surface Network 1						
MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S27	531028.888	121094.376	531028.888	121094.376	Required	
S28	531050.744	121081.818	531050.744	121081.818	Required	
S29	531067.132	121072.043	531067.132	121072.043	Required	
S30	531050.735	121042.331	531050.735	121042.331	Required	
S31	531024.171	120993.154	531024.171	120993.154	Required	
S32	531039.263	120985.142	531039.263	120985.142	Required	
S34	531159.456	121133.887	531159.456	121133.887	Required	
S35	531132.451	121118.404	531132.451	121118.404	Required	
S36	531146.224	121110.524	531146.224	121110.524	Required	
S37	531100.072	121079.088	531100.072	121079.088	Required	
S38	531122.073	121066.866	531122.073	121066.866	Required	
S39	531082.691	121028.432	531082.691	121028.432	Required	
S40	531097.087	121020.145	531097.087	121020.145	Required	
S41	531084.424	120996.590	531084.424	120996.590	Required	
S42	531074.393	120995.386	531074.393	120995.386	Required	
S43	531063.193	120972.631	531063.193	120972.631	Required	
S44	531074.428	120955.052	531074.428	120955.052	Required	
S45	531100.641	120940.479	531100.641	120940.479	Required	
S46	531113.113	120916.560	531113.113	120916.560	Required	

Manhole Schedules for Surface Network 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SH3	531131.565	120915.758	531131.565	120915.758	Required	
SH4/B1	531162.923	120919.699	531162.923	120919.699	Required	
SFC	531171.518	120918.089	531171.518	120918.089	Required	
S	531197.993	120909.287			No Entry	

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PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	S1	28.550	27.100	1.225	Open Manhole	1200
2.000	o	225	S2	26.220	24.800	1.195	Open Manhole	1200
2.001	o	225	S3	26.800	24.710	1.865	Open Manhole	1200
1.001	o	300	S4	28.130	24.490	3.340	Open Manhole	1200
3.000	o	225	S5	26.766	25.260	1.281	Open Manhole	1200
1.002	o	375	S6	27.460	24.250	2.835	Open Manhole	1500
1.003	o	375	H1	25.939	23.750	1.814	Open Manhole	1500
4.000	o	225	S9	25.449	24.130	1.094	Open Manhole	1200
4.001	o	225	S10	25.419	23.880	1.314	Open Manhole	1200
4.002	o	225	H2	25.610	23.700	1.685	Open Manhole	1200
1.004	o	225	H3/P1	24.700	23.600	0.875	Open Manhole	1500
1.005	o	225	S12	24.700	23.410	1.065	Open Manhole	1200
1.006	o	225	H4	25.156	23.170	1.761	Open Manhole	1200
5.000	o	225	S13	29.771	28.300	1.246	Open Manhole	1200
6.000	o	225	S14	29.921	28.450	1.246	Open Manhole	1200
5.001	o	300	S15	30.055	27.875	1.880	Open Manhole	1200
5.002	o	300	S16	29.884	27.805	1.779	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	25.630	10.1	S4	28.130	24.565	3.340	Open Manhole	1200
2.000	15.115	167.9	S3	26.800	24.710	1.865	Open Manhole	1200
2.001	23.993	165.5	S4	28.130	24.565	3.340	Open Manhole	1200
1.001	39.559	239.8	S6	27.460	24.325	2.835	Open Manhole	1500
3.000	16.917	19.7	S6	27.460	24.400	2.835	Open Manhole	1500
1.002	25.089	50.2	H1	25.939	23.750	1.814	Open Manhole	1500
1.003	20.998	140.0	H3/P1	24.700	23.600	0.725	Open Manhole	1500
4.000	41.706	166.8	S10	25.419	23.880	1.314	Open Manhole	1200
4.001	28.872	160.4	H2	25.610	23.700	1.685	Open Manhole	1200
4.002	47.911	479.1	H3/P1	24.700	23.600	0.875	Open Manhole	1500
1.004	27.323	143.8	S12	24.700	23.410	1.065	Open Manhole	1200
1.005	39.341	55.4	H4	25.156	22.700	2.231	Open Manhole	1200
1.006	23.280	34.7	SH4/B1	24.700	22.500	1.975	Open Manhole	1500
5.000	56.979	162.8	S15	30.055	27.950	1.880	Open Manhole	1200
6.000	16.676	33.4	S15	30.055	27.950	1.880	Open Manhole	1200
5.001	16.363	233.8	S16	29.884	27.805	1.779	Open Manhole	1200
5.002	37.344	233.4	S17	29.527	27.645	1.582	Open Manhole	1500

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PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.003	o	375	S17	29.527	27.570	1.582	Open Manhole	1500
5.004	o	375	S18	29.229	27.480	1.374	Open Manhole	1500
7.000	o	225	S19	30.489	29.000	1.264	Open Manhole	1200
7.001	o	300	S20	29.768	28.170	1.298	Open Manhole	1200
8.000	o	225	S21	30.688	29.150	1.313	Open Manhole	1200
7.002	o	300	S22	30.040	28.070	1.670	Open Manhole	1200
7.003	o	375	S23	29.527	27.780	1.372	Open Manhole	1500
5.005	o	450	S24	29.017	27.075	1.492	Open Manhole	1500
9.000	o	225	D1	31.000	29.500	1.275	Open Manhole	1200
9.001	o	225	S25	30.822	29.320	1.277	Open Manhole	1200
9.002	o	225	S26	30.250	28.820	1.205	Open Manhole	1200
10.000	o	225	S27	29.564	28.060	1.279	Open Manhole	1200
9.003	o	300	S28	29.241	27.690	1.251	Open Manhole	1200
9.004	o	300	S29	28.892	27.360	1.232	Open Manhole	1200
9.005	o	375	S30	28.284	26.780	1.129	Open Manhole	1500
5.006	o	525	S31	28.427	26.395	1.507	Open Manhole	1500
5.007	o	525	S32	28.064	26.335	1.204	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
5.003	25.356	281.7	S18	29.229	27.480	1.374	Open Manhole	1500
5.004	97.021	294.0	S24	29.017	27.150	1.492	Open Manhole	1500
7.000	51.585	68.3	S20	29.768	28.245	1.298	Open Manhole	1200
7.001	23.997	240.0	S22	30.040	28.070	1.670	Open Manhole	1200
8.000	51.582	51.3	S22	30.040	28.145	1.670	Open Manhole	1200
7.002	49.847	231.8	S23	29.527	27.855	1.372	Open Manhole	1500
7.003	31.284	49.7	S24	29.017	27.150	1.492	Open Manhole	1500
5.005	49.290	81.5	S31	28.427	26.470	1.507	Open Manhole	1500
9.000	8.242	45.8	S25	30.822	29.320	1.277	Open Manhole	1200
9.001	10.443	20.9	S26	30.250	28.820	1.205	Open Manhole	1200
9.002	23.917	22.7	S28	29.241	27.765	1.251	Open Manhole	1200
10.000	25.207	85.4	S28	29.241	27.765	1.251	Open Manhole	1200
9.003	19.083	57.8	S29	28.892	27.360	1.232	Open Manhole	1200
9.004	33.937	67.2	S30	28.284	26.855	1.129	Open Manhole	1500
9.005	55.893	237.8	S31	28.427	26.545	1.507	Open Manhole	1500
5.006	17.087	284.8	S32	28.064	26.335	1.204	Open Manhole	1500
5.007	27.003	13.8	S43	26.900	24.375	2.000	Open Manhole	1500

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PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
11.000	o	225	S34	31.196	28.610	2.361	Open Manhole	1200
12.000	o	225	S35	31.107	29.550	1.332	Open Manhole	1200
11.001	o	300	S36	30.511	28.370	1.841	Open Manhole	1200
13.000	o	225	S37	29.450	28.000	1.225	Open Manhole	1200
11.002	o	375	S38	29.063	27.190	1.498	Open Manhole	1500
14.000	o	225	S39	27.681	26.200	1.256	Open Manhole	1200
11.003	o	450	S40	27.418	25.610	1.358	Open Manhole	1500
11.004	o	525	S41	27.155	25.170	1.460	Open Manhole	1500
11.005	o	525	S42	27.209	25.130	1.554	Open Manhole	1500
5.008	o	600	S43	26.900	24.300	2.000	Open Manhole	1500
5.009	o	675	S44	26.509	24.000	1.834	Open Manhole	1500
5.010	o	675	S45	25.800	23.900	1.225	Open Manhole	1500
5.011	o	675	S46	26.190	23.810	1.705	Open Manhole	1500
5.012	o	675	SH3	24.700	22.700	1.325	Open Manhole	1500
1.007	o	225	SH4/B1	24.700	22.500	1.975	Open Manhole	1500
1.008	o	225	SFC	24.700	22.440	2.035	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
11.000	26.850	162.7	S36	30.511	28.445	1.841	Open Manhole	1200
12.000	15.868	14.4	S36	30.511	28.445	1.841	Open Manhole	1200
11.001	49.893	45.2	S38	29.063	27.265	1.498	Open Manhole	1500
13.000	25.168	38.1	S38	29.063	27.340	1.498	Open Manhole	1500
11.002	52.982	35.2	S40	27.418	25.685	1.358	Open Manhole	1500
14.000	16.610	45.5	S40	27.418	25.835	1.358	Open Manhole	1500
11.003	26.743	73.3	S41	27.155	25.245	1.460	Open Manhole	1500
11.004	10.103	252.6	S42	27.209	25.130	1.554	Open Manhole	1500
11.005	25.362	33.6	S43	26.900	24.375	2.000	Open Manhole	1500
5.008	20.863	92.7	S44	26.509	24.075	1.834	Open Manhole	1500
5.009	29.991	299.9	S45	25.800	23.900	1.225	Open Manhole	1500
5.010	26.976	299.7	S46	26.190	23.810	1.705	Open Manhole	1500
5.011	18.470	16.6	SH3	24.700	22.700	1.325	Open Manhole	1500
5.012	31.604	158.0	SH4/B1	24.700	22.500	1.525	Open Manhole	1500
1.007	8.745	145.8	SFC	24.700	22.440	2.035	Open Manhole	1200
1.008	27.900	139.5	S	23.000	22.240	0.535	Open Manhole	0

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Area Summary for Surface Network 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.000	0.000	0.000
2.001	-	-	100	0.063	0.063	0.063
1.001	-	-	100	0.128	0.128	0.128
3.000	-	-	100	0.067	0.067	0.067
1.002	-	-	100	0.105	0.105	0.105
1.003	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.000	0.000	0.000
4.001	-	-	100	0.082	0.082	0.082
4.002	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.050	0.050	0.050
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.056	0.056	0.056
5.000	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.092	0.092	0.092
5.001	-	-	100	0.128	0.128	0.128
5.002	-	-	100	0.000	0.000	0.000
5.003	-	-	100	0.000	0.000	0.000
5.004	-	-	100	0.086	0.086	0.086
7.000	-	-	100	0.000	0.000	0.000
7.001	-	-	100	0.169	0.169	0.169
8.000	-	-	100	0.079	0.079	0.079
7.002	-	-	100	0.000	0.000	0.000
7.003	-	-	100	0.250	0.250	0.250
5.005	-	-	100	0.214	0.214	0.214
9.000	-	-	100	0.580	0.580	0.580
9.001	-	-	100	0.000	0.000	0.000
9.002	-	-	100	0.000	0.000	0.000
10.000	-	-	100	0.000	0.000	0.000
9.003	-	-	100	0.000	0.000	0.000
9.004	-	-	100	0.170	0.170	0.170
9.005	-	-	100	0.055	0.055	0.055
5.006	-	-	100	0.117	0.117	0.117
5.007	-	-	100	0.000	0.000	0.000
11.000	-	-	100	0.000	0.000	0.000
12.000	-	-	100	0.049	0.049	0.049
11.001	-	-	100	0.118	0.118	0.118
13.000	-	-	100	0.032	0.032	0.032
11.002	-	-	100	0.134	0.134	0.134
14.000	-	-	100	0.041	0.041	0.041
11.003	-	-	100	0.140	0.140	0.140
11.004	-	-	100	0.066	0.066	0.066
11.005	-	-	100	0.069	0.069	0.069
5.008	-	-	100	0.137	0.137	0.137
5.009	-	-	100	0.000	0.000	0.000
5.010	-	-	100	0.000	0.000	0.000
5.011	-	-	100	0.000	0.000	0.000
5.012	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				3.277	3.277	3.277

Free Flowing Outfall Details for Surface Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.008	S	23.000	22.240	0.000	0	0
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3rd Floor, The Hallmark Building 52-56 LeadenHall Street London, EC3M 5JE	NOTHERN ARC 1B SW NETWORK 1 (PHASE 1.5 & 1.6) 2,30,100(20)	
Date 01/10/2021 File 2006821.MDX	Designed by EF Checked by BB	
Innovyze	Network 2020.1	

Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 2 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	Yes
Return Period (years)	50	Winter Storms	Yes
FEH Rainfall Version	2013	Cv (Summer)	0.750
Site Location	GB 531349 121053 TQ 31349 21053	Cv (Winter)	0.840
Data Type		Point Storm Duration (mins)	30

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Innovyze	Network 2020.1	

Online Controls for Surface Network 1

Hydro-Brake® Optimum Manhole: S25, DS/PN: 9.001, Volume (m³): 2.0

Unit Reference	MD-SHE-0097-4500-1200-4500
Design Head (m)	1.200
Design Flow (l/s)	4.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	97
Invert Level (m)	29.320
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	4.5	Kick-Flo®	0.744	3.6
Flush-Flo™	0.359	4.5	Mean Flow over Head Range	-	3.9

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	3.2	0.800	3.7	2.000	5.7	4.000	7.9	7.000	10.3
0.200	4.2	1.000	4.1	2.200	5.9	4.500	8.3	7.500	10.6
0.300	4.5	1.200	4.5	2.400	6.2	5.000	8.8	8.000	11.0
0.400	4.5	1.400	4.8	2.600	6.4	5.500	9.2	8.500	11.3
0.500	4.4	1.600	5.1	3.000	6.9	6.000	9.6	9.000	11.6
0.600	4.2	1.800	5.4	3.500	7.4	6.500	9.9	9.500	11.9

Hydro-Brake® Optimum Manhole: SFC, DS/PN: 1.008, Volume (m³): 2.9

Unit Reference	MD-SHE-0197-2320-2000-2320
Design Head (m)	2.000
Design Flow (l/s)	23.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	197
Invert Level (m)	22.440
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.000	23.2	Kick-Flo®	1.240	18.5
Flush-Flo™	0.579	23.2	Mean Flow over Head Range	-	20.2

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	6.8	0.600	23.2	1.600	20.8	2.600	26.3	5.000	36.0
0.200	18.5	0.800	22.7	1.800	22.0	3.000	28.2	5.500	37.7
0.300	21.6	1.000	21.7	2.000	23.2	3.500	30.3	6.000	39.3
0.400	22.6	1.200	19.3	2.200	24.3	4.000	32.3	6.500	40.9
0.500	23.1	1.400	19.6	2.400	25.3	4.500	34.2	7.000	42.3

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Date 01/10/2021 File 2006821.MDX	Designed by EF Checked by BB	
Innovyze	Network 2020.1	

Hydro-Brake® Optimum Manhole: SFC, DS/PN: 1.008, Volume (m³): 2.9

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)
7.500	43.8	8.000	45.2	8.500	46.5	9.000	47.8	9.500	49.1

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3rd Floor, The Hallmark Building 52-56 LeadenHall Street London, EC3M 5JE	NOTHERN ARC 1B SW NETWORK 1 (PHASE 1.5 & 1.6) 2,30,100 (20)	
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Innovyze	Network 2020.1	

Storage Structures for Surface Network 1

Tank or Pond Manhole: H3/P1, DS/PN: 1.004

Invert Level (m) 23.600

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	549.0	1.100	938.0

Cellular Storage Manhole: D1, DS/PN: 9.000

Invert Level (m) 29.500 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	600.0	600.0	1.000	600.0	812.0	1.050	0.0	812.0

Tank or Pond Manhole: SH4/B1, DS/PN: 1.007

Invert Level (m) 22.500

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	409.0	1.100	701.0	1.175	856.0	2.200	1248.8

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
FEH Rainfall Version 2013 Cv (Summer) 0.750
Site Location GB 531349 121053 TQ 31349 21053 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 100
Climate Change (%) 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

									Water	Surcharged	Flooded		
	US/MH			Return	Climate	First (X)		First (Y)	First (Z)	Overflow	Level	Depth	Volume
PN	Name	Storm	Period	Change		Surcharge		Flood	Overflow	Act.	(m)	(m)	(m³)
1.000	S1	15 Summer	100	+40%							27.100	-0.225	0.000
2.000	S2	15 Winter	100	+40%	100/15	Summer					25.412	0.387	0.000
2.001	S3	15 Winter	100	+40%	100/15	Summer					25.422	0.487	0.000
1.001	S4	15 Winter	100	+40%	100/15	Summer					25.278	0.488	0.000
3.000	S5	15 Winter	100	+40%							25.362	-0.123	0.000
1.002	S6	15 Winter	100	+40%	100/15	Summer					24.738	0.113	0.000
1.003	H1	960 Winter	100	+40%	100/15	Summer					24.342	0.217	0.000
4.000	S9	15 Winter	100	+40%	100/15	Summer					24.509	0.154	0.000
4.001	S10	15 Winter	100	+40%	100/15	Summer					24.512	0.407	0.000
4.002	H2	960 Winter	100	+40%	100/15	Summer					24.342	0.417	0.000
1.004	H3/P1	960 Winter	100	+40%	100/30	Summer					24.340	0.515	0.000
1.005	S12	960 Winter	100	+40%	100/15	Summer					24.335	0.700	0.000
1.006	H4	480 Winter	100	+40%	100/15	Summer					24.345	0.950	0.000
5.000	S13	15 Winter	100	+40%	100/15	Summer					29.709	1.184	0.000
6.000	S14	15 Winter	100	+40%	100/15	Summer					29.880	1.205	0.000
5.001	S15	15 Winter	100	+40%	100/15	Summer					29.718	1.543	0.000
5.002	S16	15 Winter	100	+40%	100/15	Summer					29.553	1.448	0.000
5.003	S17	15 Winter	100	+40%	100/15	Summer					29.244	1.299	0.000
5.004	S18	15 Winter	100	+40%	100/15	Summer					29.152	1.297	0.000
7.000	S19	15 Winter	100	+40%	100/15	Summer					29.770	0.545	0.000
7.001	S20	15 Winter	100	+40%	100/15	Summer	100/15 Winter				29.770	1.300	1.919
8.000	S21	15 Winter	100	+40%	100/15	Summer					30.057	0.682	0.000
7.002	S22	15 Winter	100	+40%	100/15	Summer					29.706	1.336	0.000
7.003	S23	15 Winter	100	+40%	100/15	Summer					29.262	1.107	0.000
5.005	S24	15 Winter	100	+40%	100/15	Summer					28.800	1.275	0.000
9.000	D1	480 Winter	100	+40%	100/15	Summer					30.186	0.461	0.000
9.001	S25	480 Winter	100	+40%	100/15	Summer					30.201	0.656	0.000
9.002	S26	240 Winter	100	+40%							28.850	-0.195	0.000

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3rd Floor, The Hallmark Building 52-56 LeadenHall Street London, EC3M 5JE	NOTHERN ARC 1B SW NETWORK 1 (PHASE 1.5 & 1.6) 100(40)	
Date 01/10/2021 File 2006821.MDX	Designed by EF Checked by BB	
Innovyze	Network 2020.1	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1	0.00			0.0	OK	
2.000	S2	0.12			4.3	SURCHARGED	
2.001	S3	1.06			39.3	SURCHARGED	
1.001	S4	1.78			117.8	SURCHARGED	
3.000	S5	0.42			43.9	OK	
1.002	S6	0.91			221.8	SURCHARGED	
1.003	H1	0.11			16.2	SURCHARGED	
4.000	S9	0.06			2.2	SURCHARGED	
4.001	S10	1.22			46.5	SURCHARGED	
4.002	H2	0.16			3.6	SURCHARGED	
1.004	H3/P1	0.42			16.9	SURCHARGED	
1.005	S12	0.24			16.2	SURCHARGED	
1.006	H4	0.31			25.3	SURCHARGED	
5.000	S13	0.16			6.1	FLOOD RISK	
6.000	S14	0.56			45.2	FLOOD RISK	
5.001	S15	1.72			105.5	SURCHARGED	
5.002	S16	1.43			95.9	SURCHARGED	
5.003	S17	1.00			103.2	FLOOD RISK	
5.004	S18	1.15			128.7	FLOOD RISK	
7.000	S19	0.11			6.9	SURCHARGED	
7.001	S20	1.26			80.2	FLOOD	1
8.000	S21	0.64			44.4	SURCHARGED	
7.002	S22	1.74			118.8	SURCHARGED	
7.003	S23	0.93			233.6	FLOOD RISK	
5.005	S24	1.31			424.6	FLOOD RISK	
9.000	D1	0.08			4.6	SURCHARGED	
9.001	S25	0.05			4.3	SURCHARGED	
9.002	S26	0.04			4.3	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

									Water	Surcharged	Flooded
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)
10.000	S27	15 Winter	100	+40%					28.097	-0.188	0.000
9.003	S28	15 Winter	100	+40%	100/15 Winter				28.105	0.115	0.000
9.004	S29	15 Winter	100	+40%	100/15 Summer				28.118	0.458	0.000
9.005	S30	15 Winter	100	+40%	100/15 Summer				27.948	0.793	0.000
5.006	S31	15 Winter	100	+40%	100/15 Summer				27.756	0.836	0.000
5.007	S32	15 Winter	100	+40%	100/15 Summer				27.127	0.267	0.000
11.000	S34	15 Summer	100	+40%					28.610	-0.225	0.000
12.000	S35	15 Winter	100	+40%					29.629	-0.146	0.000
11.001	S36	15 Winter	100	+40%					28.562	-0.108	0.000
13.000	S37	15 Winter	100	+40%					28.080	-0.145	0.000
11.002	S38	15 Winter	100	+40%	100/15 Winter				27.691	0.126	0.000
14.000	S39	15 Winter	100	+40%	100/15 Summer				27.251	0.826	0.000
11.003	S40	15 Winter	100	+40%	100/15 Summer				27.207	1.147	0.000
11.004	S41	15 Winter	100	+40%	100/15 Summer				26.980	1.285	0.000
11.005	S42	15 Winter	100	+40%	100/15 Summer				26.843	1.188	0.000
5.008	S43	15 Winter	100	+40%	100/15 Summer				26.546	1.646	0.000
5.009	S44	15 Winter	100	+40%	100/15 Summer				25.618	0.943	0.000
5.010	S45	15 Winter	100	+40%	100/15 Summer				25.034	0.459	0.000
5.011	S46	360 Winter	100	+40%	100/60 Winter				24.766	0.281	0.000
5.012	SH3	480 Winter	100	+40%	100/15 Summer				24.498	1.123	0.000
1.007	SH4/B1	480 Winter	100	+40%	100/15 Summer				24.366	1.641	0.000
1.008	SFC	480 Winter	100	+40%	100/15 Summer				24.314	1.649	0.000

		Half Drain		Pipe				Level	
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)	Status	Level Exceeded		
10.000	S27	0.01			0.3	OK			
9.003	S28	0.12			15.6	SURCHARGED			
9.004	S29	0.80			99.4	SURCHARGED			
9.005	S30	1.01			121.8	SURCHARGED			
5.006	S31	2.74			592.8	SURCHARGED			
5.007	S32	0.55			592.3	SURCHARGED			
11.000	S34	0.00			0.0	OK			
12.000	S35	0.26			32.1	OK			
11.001	S36	0.73			113.7	OK			
13.000	S37	0.27			21.0	OK			
11.002	S38	0.70			219.0	SURCHARGED			
14.000	S39	0.32			22.3	SURCHARGED			
11.003	S40	0.86			275.1	FLOOD RISK			
11.004	S41	1.51			304.6	FLOOD RISK			
11.005	S42	0.50			334.6	SURCHARGED			
5.008	S43	2.04			971.5	SURCHARGED			
5.009	S44	2.24			961.5	SURCHARGED			
5.010	S45	2.29			962.8	SURCHARGED			
5.011	S46	0.15			204.8	SURCHARGED			
5.012	SH3	0.29			163.3	FLOOD RISK			
1.007	SH4/B1	0.68			23.5	SURCHARGED			
1.008	SFC	0.57			23.1	SURCHARGED			

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for SW NETWORK 2

Pipe Sizes ACE-PIPE Manhole Sizes ACE-MH

FEH Rainfall Model	
Return Period (years)	5
FEH Rainfall Version	2013
Site Location	GB 531349 121053 TQ 31349 21053
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for SW NETWORK 2

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	11.001	0.080	137.5	0.036	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	29.402	0.180	163.3	0.036	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	31.835	0.140	227.4	0.036	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	12.853	0.050	257.1	0.036	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.004	16.617	0.060	277.0	0.036	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.005	12.811	0.045	284.7	0.036	0.00	0.0	0.600	o	375	Pipe/Conduit	
S2.000	49.187	0.300	164.0	0.033	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	9.543	0.065	146.8	0.038	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.002	49.914	0.210	237.7	0.038	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.003	8.375	0.035	239.3	0.038	0.00	0.0	0.600	o	225	Pipe/Conduit	
S2.004	23.557	1.695	13.9	0.038	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.16	25.800	0.036	0.0	0.0	0.0	1.11	44.3	4.9
S1.001	50.00	5.65	25.720	0.072	0.0	0.0	0.0	1.02	40.6	9.7
S1.002	50.00	6.16	25.465	0.108	0.0	0.0	0.0	1.04	73.4	14.6
S1.003	50.00	6.35	25.250	0.144	0.0	0.0	0.0	1.13	124.3	19.5
S1.004	50.00	6.60	25.200	0.180	0.0	0.0	0.0	1.08	119.7	24.4
S1.005	50.00	6.80	25.140	0.216	0.0	0.0	0.0	1.07	118.0	29.2
S2.000	50.00	5.81	27.550	0.033	0.0	0.0	0.0	1.02	40.5	4.5
S2.001	50.00	5.95	27.250	0.071	0.0	0.0	0.0	1.08	42.8	9.6
S2.002	50.00	6.94	27.185	0.109	0.0	0.0	0.0	0.84	33.5	14.8
S2.003	50.00	7.10	26.975	0.147	0.0	0.0	0.0	0.84	33.4	19.9
S2.004	50.00	7.19	26.790	0.185	0.0	0.0	0.0	4.88	539.2	25.1

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Network Design Table for SW NETWORK 2

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.006	18.965	0.245	77.4	0.038	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.007	23.673	0.200	118.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S3.000	21.616	0.130	166.3	0.019	5.00	0.0	0.600	o	225	Pipe/Conduit	
S3.001	9.320	0.055	169.5	0.019	0.00	0.0	0.600	o	225	Pipe/Conduit	
S4.000	17.432	1.790	9.7	0.019	5.00	0.0	0.600	o	225	Pipe/Conduit	
S3.002	7.426	0.035	212.2	0.019	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.003	37.975	0.300	126.6	0.019	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.004	11.881	0.200	59.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.008	3.904	0.050	78.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.009	9.451	0.162	58.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.006	50.00	7.34	25.095	0.439	0.0	0.0	0.0	2.06	227.6	59.4
S1.007	50.00	7.58	24.600	0.439	0.0	0.0	0.0	1.66	183.8	59.4
S3.000	50.00	5.36	25.195	0.019	0.0	0.0	0.0	1.01	40.2	2.6
S3.001	50.00	5.51	25.065	0.038	0.0	0.0	0.0	1.00	39.8	5.1
S4.000	50.00	5.07	26.800	0.019	0.0	0.0	0.0	4.22	167.7	2.6
S3.002	50.00	5.63	24.935	0.076	0.0	0.0	0.0	1.08	76.0	10.3
S3.003	50.00	6.08	24.900	0.095	0.0	0.0	0.0	1.40	98.7	12.9
S3.004	50.00	6.18	24.600	0.095	0.0	0.0	0.0	2.04	144.5	12.9
S1.008	50.00	7.63	24.400	0.534	0.0	0.0	0.0	1.14	20.1«	72.3
S1.009	50.00	7.75	24.350	0.534	0.0	0.0	0.0	1.32	23.3«	72.3

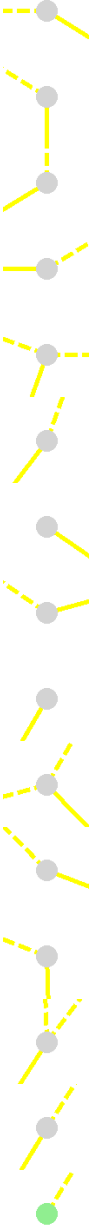


Manhole Schedules for SW NETWORK 2

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SS1	27.700	1.900	Open Manhole	1200	S1.000	25.800	225				
SS2	27.700	1.980	Open Manhole	1200	S1.001	25.720	225	S1.000	25.720	225	
SS3	28.410	2.945	Open Manhole	1200	S1.002	25.465	300	S1.001	25.540	225	
SS4	28.625	3.375	Open Manhole	1500	S1.003	25.250	375	S1.002	25.325	300	
SS5	28.558	3.358	Open Manhole	1500	S1.004	25.200	375	S1.003	25.200	375	
SS6	28.448	3.308	Open Manhole	1500	S1.005	25.140	375	S1.004	25.140	375	
SS7	29.010	1.460	Open Manhole	1200	S2.000	27.550	225				
SS8	29.710	2.460	Open Manhole	1200	S2.001	27.250	225	S2.000	27.250	225	
SS9	29.548	2.363	Open Manhole	1200	S2.002	27.185	225	S2.001	27.185	225	
SS10	28.907	1.932	Open Manhole	1200	S2.003	26.975	225	S2.002	26.975	225	
SS11	28.842	2.052	Open Manhole	1500	S2.004	26.790	375	S2.003	26.940	225	
SS12	28.567	3.472	Open Manhole	1500	S1.006	25.095	375	S1.005	25.095	375	
								S2.004	25.095	375	
SH1	26.912	2.312	Open Manhole	1500	S1.007	24.600	375	S1.006	24.850	375	250
SS13	26.474	1.279	Open Manhole	1200	S3.000	25.195	225				
SS14	27.436	2.371	Open Manhole	1200	S3.001	25.065	225	S3.000	25.065	225	
SS15	28.241	1.441	Open Manhole	1200	S4.000	26.800	225				
SS16	27.794	2.859	Open Manhole	1200	S3.002	24.935	300	S3.001	25.010	225	
								S4.000	25.010	225	
SS17	26.377	1.477	Open Manhole	1200	S3.003	24.900	300	S3.002	24.900	300	
SH2	26.132	1.532	Open Manhole	1200	S3.004	24.600	300	S3.003	24.600	300	
SB1/H3	25.700	1.300	Open Manhole	1500	S1.008	24.400	150	S1.007	24.400	375	
								S3.004	24.400	300	
SS-18 FC	25.700	1.350	Open Manhole	1200	S1.009	24.350	150	S1.008	24.350	150	
SS	25.000	0.812	Open Manhole	0		OUTFALL		S1.009	24.188	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SS1	531443.105	120623.084	531443.105	120623.084	Required	
SS2	531453.157	120618.612	531453.157	120618.612	Required	
SS3	531482.559	120618.535	531482.559	120618.535	Required	
SS4	531482.682	120586.701	531482.682	120586.701	Required	
SS5	531495.079	120583.307	531495.079	120583.307	Required	
SS6	531507.987	120572.843	531507.987	120572.843	Required	
SS7	531493.513	120627.839	531493.513	120627.839	Required	

Manhole Schedules for SW NETWORK 2

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SS8	531542.699	120627.604	531542.699	120627.604	Required	
SS9	531550.795	120622.551	531550.795	120622.551	Required	
SS10	531550.722	120572.638	531550.722	120572.638	Required	
SS11	531543.574	120568.274	531543.574	120568.274	Required	
SS12	531520.017	120568.438	531520.017	120568.438	Required	
SH1	531513.574	120550.600	531513.574	120550.600	Required	
SS13	531431.491	120572.415	531431.491	120572.415	Required	
SS14	531449.294	120560.155	531449.294	120560.155	Required	
SS15	531467.078	120577.648	531467.078	120577.648	Required	
SS16	531458.289	120562.594	531458.289	120562.594	Required	
SS17	531463.468	120557.271	531463.468	120557.271	Required	
SH2	531498.892	120543.589	531498.892	120543.589	Required	
SB1/H3	531499.301	120531.714	531499.301	120531.714	Required	
SS-18 FC	531497.208	120528.420	531497.208	120528.420	Required	
SS	531492.305	120520.340			No Entry	

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PIPELINE SCHEDULES for SW NETWORK 2

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	SS1	27.700	25.800	1.675	Open Manhole	1200
S1.001	o	225	SS2	27.700	25.720	1.755	Open Manhole	1200
S1.002	o	300	SS3	28.410	25.465	2.645	Open Manhole	1200
S1.003	o	375	SS4	28.625	25.250	3.000	Open Manhole	1500
S1.004	o	375	SS5	28.558	25.200	2.983	Open Manhole	1500
S1.005	o	375	SS6	28.448	25.140	2.933	Open Manhole	1500
S2.000	o	225	SS7	29.010	27.550	1.235	Open Manhole	1200
S2.001	o	225	SS8	29.710	27.250	2.235	Open Manhole	1200
S2.002	o	225	SS9	29.548	27.185	2.138	Open Manhole	1200
S2.003	o	225	SS10	28.907	26.975	1.707	Open Manhole	1200
S2.004	o	375	SS11	28.842	26.790	1.677	Open Manhole	1500
S1.006	o	375	SS12	28.567	25.095	3.097	Open Manhole	1500
S1.007	o	375	SH1	26.912	24.600	1.937	Open Manhole	1500
S3.000	o	225	SS13	26.474	25.195	1.054	Open Manhole	1200
S3.001	o	225	SS14	27.436	25.065	2.146	Open Manhole	1200
S4.000	o	225	SS15	28.241	26.800	1.216	Open Manhole	1200
S3.002	o	300	SS16	27.794	24.935	2.559	Open Manhole	1200
S3.003	o	300	SS17	26.377	24.900	1.177	Open Manhole	1200
S3.004	o	300	SH2	26.132	24.600	1.232	Open Manhole	1200
S1.008	o	150	SB1/H3	25.700	24.400	1.150	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	11.001	137.5	SS2	27.700	25.720	1.755	Open Manhole	1200
S1.001	29.402	163.3	SS3	28.410	25.540	2.645	Open Manhole	1200
S1.002	31.835	227.4	SS4	28.625	25.325	3.000	Open Manhole	1500
S1.003	12.853	257.1	SS5	28.558	25.200	2.983	Open Manhole	1500
S1.004	16.617	277.0	SS6	28.448	25.140	2.933	Open Manhole	1500
S1.005	12.811	284.7	SS12	28.567	25.095	3.097	Open Manhole	1500
S2.000	49.187	164.0	SS8	29.710	27.250	2.235	Open Manhole	1200
S2.001	9.543	146.8	SS9	29.548	27.185	2.138	Open Manhole	1200
S2.002	49.914	237.7	SS10	28.907	26.975	1.707	Open Manhole	1200
S2.003	8.375	239.3	SS11	28.842	26.940	1.677	Open Manhole	1500
S2.004	23.557	13.9	SS12	28.567	25.095	3.097	Open Manhole	1500
S1.006	18.965	77.4	SH1	26.912	24.850	1.687	Open Manhole	1500
S1.007	23.673	118.4	SB1/H3	25.700	24.400	0.925	Open Manhole	1500
S3.000	21.616	166.3	SS14	27.436	25.065	2.146	Open Manhole	1200
S3.001	9.320	169.5	SS16	27.794	25.010	2.559	Open Manhole	1200
S4.000	17.432	9.7	SS16	27.794	25.010	2.559	Open Manhole	1200
S3.002	7.426	212.2	SS17	26.377	24.900	1.177	Open Manhole	1200
S3.003	37.975	126.6	SH2	26.132	24.600	1.232	Open Manhole	1200
S3.004	11.881	59.4	SB1/H3	25.700	24.400	1.000	Open Manhole	1500
S1.008	3.904	78.1	SS-18 FC	25.700	24.350	1.200	Open Manhole	1200

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PIPELINE SCHEDULES for SW NETWORK 2

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.009	o	150	SS-18 FC	25.700	24.350	1.200	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.009	9.451	58.3	SS	25.000	24.188	0.662	Open Manhole	0

Free Flowing Outfall Details for SW NETWORK 2

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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S1.009	SS	25.000	24.188	0.000	0	0
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Simulation Criteria for SW NETWORK 2

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1
Number of Input Hydrographs	0	Number of Offline Controls	0
Number of Online Controls	1	Number of Storage Structures	1
		Number of Time/Area Diagrams	0
		Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	Summer Storms	Yes
Return Period (years)	50	Winter Storms	Yes
FEH Rainfall Version	2013	Cv (Summer)	0.750
Site Location GB 531349 121053 TQ 31349 21053		Cv (Winter)	0.840
Data Type	Point Storm Duration (mins)		30

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Online Controls for SW NETWORK 2

Hydro-Brake® Optimum Manhole: SS-18 FC, DS/PN: S1.009, Volume (m³): 1.6

Unit Reference MD-SHE-0089-3600-1050-3600	
Design Head (m)	1.050
Design Flow (l/s)	3.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	89
Invert Level (m)	24.350
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.050	3.6	Kick-Flo®	0.656	2.9
Flush-Flo™	0.311	3.6	Mean Flow over Head Range	-	3.1

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	2.8	0.800	3.2	2.000	4.9	4.000	6.7	7.000	8.8
0.200	3.5	1.000	3.5	2.200	5.1	4.500	7.1	7.500	9.0
0.300	3.6	1.200	3.8	2.400	5.3	5.000	7.5	8.000	9.3
0.400	3.6	1.400	4.1	2.600	5.5	5.500	7.8	8.500	9.6
0.500	3.4	1.600	4.4	3.000	5.9	6.000	8.1	9.000	9.9
0.600	3.2	1.800	4.6	3.500	6.3	6.500	8.4	9.500	10.1

Storage Structures for SW NETWORK 2

Tank or Pond Manhole: SB1/H3, DS/PN: S1.008

Invert Level (m) 24.400

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	257.0	1.300	611.0

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NETWORK 2											
Simulation Criteria											
Areal Reduction Factor 1.000				Additional Flow - % of Total Flow 0.000							
Hot Start (mins) 0				MADD Factor * 10m³/ha Storage 2.000							
Hot Start Level (mm) 0				Inlet Coeffiecient 0.800							
Manhole Headloss Coeff (Global) 0.500				Flow per Person per Day (l/per/day) 0.000							
Foul Sewage per hectare (l/s) 0.000											
Number of Input Hydrographs 0				Number of Offline Controls 0				Number of Time/Area Diagrams 0			
Number of Online Controls 1				Number of Storage Structures 1				Number of Real Time Controls 0			
Synthetic Rainfall Details											
Rainfall Model				FEH				Data Type Point			
FEH Rainfall Version				2013 Cv (Summer)				0.750			
Site Location GB 531349 121053 TQ 31349 21053 Cv (Winter)				0.840							
Margin for Flood Risk Warning (mm)				300.0							
Analysis Timestep 2.5 Second Increment (Extended)											
DTS Status				ON							
DVD Status				OFF							
Inertia Status				ON							
Profile(s)				Summer and Winter							
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440											
Return Period(s) (years)				2, 30, 100							
Climate Change (%)				0, 0, 20							
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	SS1	15 Winter	2	+0%					25.860	-0.165	0.000
S1.001	SS2	15 Winter	2	+0%	100/15 Summer				25.802	-0.143	0.000
S1.002	SS3	15 Winter	2	+0%					25.563	-0.202	0.000
S1.003	SS4	15 Winter	2	+0%	100/15 Winter				25.371	-0.254	0.000
S1.004	SS5	15 Winter	2	+0%	100/15 Summer				25.333	-0.242	0.000
S1.005	SS6	15 Winter	2	+0%	100/15 Summer				25.285	-0.230	0.000
S2.000	SS7	15 Winter	2	+0%	100/15 Summer				27.606	-0.169	0.000
S2.001	SS8	15 Winter	2	+0%	30/15 Summer				27.333	-0.142	0.000
S2.002	SS9	15 Winter	2	+0%	30/15 Summer				27.295	-0.115	0.000
S2.003	SS10	15 Winter	2	+0%	30/15 Summer				27.117	-0.083	0.000
S2.004	SS11	15 Winter	2	+0%					26.845	-0.320	0.000
S1.006	SS12	15 Winter	2	+0%	100/15 Summer				25.237	-0.233	0.000
S1.007	SH1	15 Winter	2	+0%	100/15 Summer				24.757	-0.218	0.000
S3.000	SS13	15 Winter	2	+0%					25.239	-0.181	0.000
S3.001	SS14	15 Winter	2	+0%					25.128	-0.162	0.000
S4.000	SS15	15 Winter	2	+0%					26.822	-0.203	0.000
S3.002	SS16	15 Winter	2	+0%					25.027	-0.208	0.000
S3.003	SS17	15 Winter	2	+0%	100/360 Winter				24.978	-0.222	0.000
S3.004	SH2	360 Winter	2	+0%	30/120 Winter				24.676	-0.224	0.000
S1.008	SB1/H3	360 Winter	2	+0%	2/30 Summer				24.676	0.126	0.000
S1.009	SS-18 FC	360 Winter	2	+0%	2/15 Summer				24.670	0.170	0.000
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded				
S1.000	SS1	0.16			5.8	OK					
S1.001	SS2	0.29			10.8	OK					
S1.002	SS3	0.23			15.5	OK					
S1.003	SS4	0.21			20.1	OK					
S1.004	SS5	0.25			24.7	OK					

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3rd Floor, The Hallmark Building 52-56 LeadenHall Street London, EC3M 5JE	NORTHERN ARC 1B SW NETWORK 2 (PHASE 1.3) 2,30,100(20)	
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Innovyze	Network 2020.1	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NETWORK 2

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain	Pipe	Status	Level Exceeded
				Time (mins)	Flow (l/s)		
S1.005	SS6	0.32			29.2	OK	
S2.000	SS7	0.13			5.2	OK	
S2.001	SS8	0.29			10.4	OK	
S2.002	SS9	0.47			15.0	OK	
S2.003	SS10	0.72			19.5	OK	
S2.004	SS11	0.05			24.1	OK	
S1.006	SS12	0.31			57.9	OK	
S1.007	SH1	0.37			57.7	OK	
S3.000	SS13	0.08			3.0	OK	
S3.001	SS14	0.17			5.7	OK	
S4.000	SS15	0.02			3.1	OK	
S3.002	SS16	0.20			11.4	OK	
S3.003	SS17	0.15			13.8	OK	
S3.004	SH2	0.03			2.8	OK	
S1.008	SB1/H3	0.30			4.3	SURCHARGED	
S1.009	SS-18 FC	0.17			3.6	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NETWORK 2

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
 Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Data Type Point
 FEH Rainfall Version 2013 Cv (Summer) 0.750
 Site Location GB 531349 121053 TQ 31349 21053 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status OFF
 Inertia Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 2, 30, 100
 Climate Change (%) 0, 0, 20

									Water	Surcharged	Flooded
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)
S1.000	SS1	15 Winter	30	+0%					25.896	-0.129	0.000
S1.001	SS2	15 Winter	30	+0%	100/15 Summer				25.863	-0.082	0.000
S1.002	SS3	15 Winter	30	+0%					25.635	-0.130	0.000
S1.003	SS4	15 Winter	30	+0%	100/15 Winter				25.472	-0.153	0.000
S1.004	SS5	15 Winter	30	+0%	100/15 Summer				25.444	-0.131	0.000
S1.005	SS6	15 Winter	30	+0%	100/15 Summer				25.402	-0.113	0.000
S2.000	SS7	15 Winter	30	+0%	100/15 Summer				27.637	-0.138	0.000
S2.001	SS8	15 Winter	30	+0%	30/15 Summer				27.529	0.054	0.000
S2.002	SS9	15 Winter	30	+0%	30/15 Summer				27.499	0.089	0.000
S2.003	SS10	15 Winter	30	+0%	30/15 Summer				27.256	0.056	0.000
S2.004	SS11	15 Winter	30	+0%					26.878	-0.287	0.000
S1.006	SS12	15 Winter	30	+0%	100/15 Summer				25.344	-0.126	0.000
S1.007	SH1	360 Winter	30	+0%	100/15 Summer				24.959	-0.016	0.000
S3.000	SS13	15 Winter	30	+0%					25.262	-0.158	0.000
S3.001	SS14	15 Winter	30	+0%					25.169	-0.121	0.000
S4.000	SS15	15 Winter	30	+0%					26.831	-0.194	0.000
S3.002	SS16	15 Winter	30	+0%					25.088	-0.147	0.000
S3.003	SS17	15 Winter	30	+0%	100/360 Winter				25.031	-0.169	0.000
S3.004	SH2	360 Winter	30	+0%	30/120 Winter				24.957	0.057	0.000
S1.008	SB1/H3	360 Winter	30	+0%	2/30 Summer				24.957	0.407	0.000
S1.009	SS-18 FC	360 Winter	30	+0%	2/15 Summer				24.952	0.452	0.000

		Half Drain		Pipe			
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS1	0.35			13.2	OK	
S1.001	SS2	0.70			26.5	OK	
S1.002	SS3	0.59			39.7	OK	
S1.003	SS4	0.54			52.0	OK	
S1.004	SS5	0.65			63.7	OK	

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52-56 LeadenHall Street	SW NETWORK 2 (PHASE 1.3)	
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Innovyze	Network 2020.1	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NETWORK 2

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.005	SS6	0.82			75.3	OK	
S2.000	SS7	0.30			11.8	OK	
S2.001	SS8	0.67			23.7	SURCHARGED	
S2.002	SS9	1.04			33.4	SURCHARGED	
S2.003	SS10	1.64			44.3	SURCHARGED	
S2.004	SS11	0.12			57.2	OK	
S1.006	SS12	0.77			145.1	OK	
S1.007	SH1	0.15			23.6	OK	
S3.000	SS13	0.19			6.9	OK	
S3.001	SS14	0.43			14.1	OK	
S4.000	SS15	0.05			7.0	OK	
S3.002	SS16	0.51			28.2	OK	
S3.003	SS17	0.38			35.2	OK	
S3.004	SH2	0.04			4.9	SURCHARGED	
S1.008	SB1/H3	0.26			3.7	SURCHARGED	
S1.009	SS-18 FC	0.17			3.6	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NETWORK 2											
Simulation Criteria											
Areal Reduction Factor 1.000				Additional Flow - % of Total Flow 0.000							
Hot Start (mins) 0				MADD Factor * 10m³/ha Storage 2.000							
Hot Start Level (mm) 0				Inlet Coefficient 0.800							
Manhole Headloss Coeff (Global) 0.500				Flow per Person per Day (l/per/day) 0.000							
Foul Sewage per hectare (l/s) 0.000											
Number of Input Hydrographs 0				Number of Offline Controls 0				Number of Time/Area Diagrams 0			
Number of Online Controls 1				Number of Storage Structures 1				Number of Real Time Controls 0			
Synthetic Rainfall Details											
Rainfall Model				FEH				Data Type Point			
FEH Rainfall Version				2013 Cv (Summer)				0.750			
Site Location GB 531349 121053 TQ 31349 21053 Cv (Winter)				0.840							
Margin for Flood Risk Warning (mm)				300.0							
Analysis Timestep 2.5 Second Increment (Extended)											
DTS Status				ON							
DVD Status				OFF							
Inertia Status				ON							
Profile(s)				Summer and Winter							
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440											
Return Period(s) (years)				2, 30, 100							
Climate Change (%)				0, 0, 20							
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	SS1	15 Winter	100	+20%					25.993	-0.032	0.000
S1.001	SS2	15 Winter	100	+20%	100/15 Summer				25.963	0.018	0.000
S1.002	SS3	15 Winter	100	+20%					25.732	-0.033	0.000
S1.003	SS4	15 Winter	100	+20%	100/15 Winter				25.643	0.018	0.000
S1.004	SS5	15 Winter	100	+20%	100/15 Summer				25.605	0.030	0.000
S1.005	SS6	15 Winter	100	+20%	100/15 Summer				25.557	0.042	0.000
S2.000	SS7	15 Winter	100	+20%	100/15 Summer				28.014	0.239	0.000
S2.001	SS8	15 Winter	100	+20%	30/15 Summer				27.963	0.488	0.000
S2.002	SS9	15 Winter	100	+20%	30/15 Summer				27.904	0.494	0.000
S2.003	SS10	15 Winter	100	+20%	30/15 Summer				27.371	0.171	0.000
S2.004	SS11	15 Winter	100	+20%					26.897	-0.268	0.000
S1.006	SS12	15 Winter	100	+20%	100/15 Summer				25.501	0.031	0.000
S1.007	SH1	480 Winter	100	+20%	100/15 Summer				25.232	0.257	0.000
S3.000	SS13	15 Winter	100	+20%					25.278	-0.142	0.000
S3.001	SS14	480 Winter	100	+20%					25.232	-0.058	0.000
S4.000	SS15	15 Winter	100	+20%					26.840	-0.185	0.000
S3.002	SS16	480 Winter	100	+20%					25.232	-0.003	0.000
S3.003	SS17	480 Winter	100	+20%	100/360 Winter				25.231	0.031	0.000
S3.004	SH2	480 Winter	100	+20%	30/120 Winter				25.231	0.331	0.000
S1.008	SB1/H3	480 Winter	100	+20%	2/30 Summer				25.230	0.680	0.000
S1.009	SS-18 FC	480 Winter	100	+20%	2/15 Summer				25.225	0.725	0.000
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded				
S1.000	SS1	0.53			19.9	OK					
S1.001	SS2	1.05			39.6	SURCHARGED					
S1.002	SS3	0.83			56.0	OK					
S1.003	SS4	0.76			73.6	SURCHARGED					
S1.004	SS5	0.90			88.0	SURCHARGED					

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NETWORK 2

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.005	SS6	1.13			103.3	SURCHARGED	
S2.000	SS7	0.42			16.4	SURCHARGED	
S2.001	SS8	0.93			32.9	SURCHARGED	
S2.002	SS9	1.51			48.6	SURCHARGED	
S2.003	SS10	2.38			64.4	SURCHARGED	
S2.004	SS11	0.18			82.0	OK	
S1.006	SS12	1.06			200.9	SURCHARGED	
S1.007	SH1	0.18			28.3	SURCHARGED	
S3.000	SS13	0.29			10.5	OK	
S3.001	SS14	0.07			2.5	OK	
S4.000	SS15	0.07			10.7	OK	
S3.002	SS16	0.09			4.9	OK	
S3.003	SS17	0.07			6.2	SURCHARGED	
S3.004	SH2	0.05			5.4	SURCHARGED	
S1.008	SB1/H3	0.26			3.7	SURCHARGED	
S1.009	SS-18 FC	0.17			3.6	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NETWORK 2											
Simulation Criteria											
Areal Reduction Factor		1.000		Additional Flow - % of Total Flow		0.000					
Hot Start (mins)		0		MADD Factor * 10m³/ha Storage		2.000					
Hot Start Level (mm)		0		Inlet Coeffiecient		0.800					
Manhole Headloss Coeff (Global)		0.500		Flow per Person per Day (l/per/day)		0.000					
Foul Sewage per hectare (l/s)		0.000									
Number of Input Hydrographs		0		Number of Offline Controls		0		Number of Time/Area Diagrams		0	
Number of Online Controls		1		Number of Storage Structures		1		Number of Real Time Controls		0	
Synthetic Rainfall Details											
Rainfall Model		FEH		Data Type		Point					
FEH Rainfall Version		2013		Cv (Summer)		0.750					
Site Location		GB 531349 121053		TQ 31349 21053		Cv (Winter)		0.840			
Margin for Flood Risk Warning (mm)						300.0					
Analysis Timestep		2.5		Second Increment (Extended)							
DTS Status						ON					
DVD Status						OFF					
Inertia Status						ON					
Profile(s)				Summer and Winter							
Duration(s) (mins)		15, 30, 60, 120, 240, 360, 480, 960, 1440									
Return Period(s) (years)				100							
Climate Change (%)				40							
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	SS1	15 Winter	100	+40%	100/15 Summer				26.165	0.140	0.000
S1.001	SS2	15 Winter	100	+40%	100/15 Summer				26.134	0.189	0.000
S1.002	SS3	15 Winter	100	+40%	100/15 Summer				25.915	0.150	0.000
S1.003	SS4	15 Winter	100	+40%	100/15 Summer				25.797	0.172	0.000
S1.004	SS5	15 Winter	100	+40%	100/15 Summer				25.758	0.183	0.000
S1.005	SS6	15 Winter	100	+40%	100/15 Summer				25.694	0.179	0.000
S2.000	SS7	15 Winter	100	+40%	100/15 Summer				28.302	0.527	0.000
S2.001	SS8	15 Winter	100	+40%	100/15 Summer				28.233	0.758	0.000
S2.002	SS9	15 Winter	100	+40%	100/15 Summer				28.156	0.746	0.000
S2.003	SS10	15 Winter	100	+40%	100/15 Summer				27.455	0.255	0.000
S2.004	SS11	15 Winter	100	+40%					26.908	-0.257	0.000
S1.006	SS12	15 Winter	100	+40%	100/15 Summer				25.599	0.129	0.000
S1.007	SH1	480 Winter	100	+40%	100/15 Summer				25.352	0.377	0.000
S3.000	SS13	480 Winter	100	+40%					25.352	-0.068	0.000
S3.001	SS14	480 Winter	100	+40%	100/240 Winter				25.352	0.062	0.000
S4.000	SS15	15 Winter	100	+40%					26.844	-0.181	0.000
S3.002	SS16	480 Winter	100	+40%	100/240 Winter				25.351	0.116	0.000
S3.003	SS17	480 Winter	100	+40%	100/120 Winter				25.351	0.151	0.000
S3.004	SH2	480 Winter	100	+40%	100/30 Summer				25.350	0.450	0.000
S1.008	SB1/H3	480 Winter	100	+40%	100/15 Summer				25.350	0.800	0.000
S1.009	SS-18 FC	480 Winter	100	+40%	100/15 Summer				25.344	0.844	0.000
Half Drain Pipe											
PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded				
S1.000	SS1	0.58			21.8	SURCHARGED					
S1.001	SS2	1.15			43.4	SURCHARGED					
S1.002	SS3	0.91			61.1	SURCHARGED					
S1.003	SS4	0.84			80.7	SURCHARGED					
S1.004	SS5	1.02			99.0	SURCHARGED					

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Innovyze	Network 2020.1	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for SW NETWORK 2

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.005	SS6	1.28			117.5	SURCHARGED	
S2.000	SS7	0.50			19.4	SURCHARGED	
S2.001	SS8	1.08			38.1	SURCHARGED	
S2.002	SS9	1.75			56.2	SURCHARGED	
S2.003	SS10	2.75			74.4	SURCHARGED	
S2.004	SS11	0.21			97.1	OK	
S1.006	SS12	1.22			231.6	SURCHARGED	
S1.007	SH1	0.21			32.8	SURCHARGED	
S3.000	SS13	0.04			1.4	OK	
S3.001	SS14	0.09			2.9	SURCHARGED	
S4.000	SS15	0.08			12.5	OK	
S3.002	SS16	0.10			5.7	SURCHARGED	
S3.003	SS17	0.08			7.1	SURCHARGED	
S3.004	SH2	0.06			6.3	SURCHARGED	
S1.008	SB1/H3	0.37			5.2	SURCHARGED	
S1.009	SS-18 FC	0.17			3.6	SURCHARGED	

Appendix C
SuDS Management and Maintenance Plan

**SUDS MANAGEMENT & MAINTENANCE
PLAN****SEPTEMBER 2021**

Introduction

This Surface Water Management System describes the measures to manage flood risk, and risks to the sustainable drainage system and the environment. This Management System should be implemented at **Phase 1B Northern Arc** to ensure that the drainage network functions as designed and flood risk is not increased to the Site and the surrounding environs. The Site Management Team should oversee and implement the Management System and designate a qualified person who will be responsible for the proper operation and maintenance of the foul and surface water structures.

Stormwater Runoff Quality

The stormwater management system protects and enhances the stormwater runoff water quality through the removal of sediment and pollutants, catchpit manholes and silt trapped gullies will reduce the amount of pollutants entering the system. Preventive maintenance of the system will include a comprehensive source reduction program of regular sweeping and litter removal, prohibitions on the use of pesticides, and maintenance of bin areas.

Drainage System

Maintenance and cleaning of gullies, stormwater manholes, culverts, and SuDS components will assure adequate performance. This maintenance program is outlined below;

Maintenance Program

The Site Management Team will conduct the operation and maintenance plan set forth in this document. The Site Management will ensure that inspections and record keeping are timely and accurate. Inspection & Maintenance Log Forms (attached) should include the date and physical conditions of the structures, depth of sediment in structures, evidence of overtopping or debris blockage and maintenance required of each structure. Records of maintenance will be kept on file at the property and copies of Inspection & Maintenance Log sheets indicating all work and inspections will be available to the Council upon request.

Concurrent with inspection and cleaning, all litter shall be picked up and removed from the parking areas, external bin store, wetland areas, and soft landscaping.

Regular maintenance should include:

1. Inspect channel and gully inlet grates and remove any debris every 6 months or as determined to be reasonable based on experience with the installed systems to ensure that the gullies are working in their intended fashion and that they are free of debris; quarterly, inspect gully sumps and bottom of drain manholes; if depth of sediment in sumps exceeds 50% capacity, sediment must be removed. Excessive sediment shall be removed and properly disposed by a licensed drainage cleaning company.
2. Inspect all wetland and vegetated areas, and remove litter and debris as necessary. Replant bare areas or areas with sparse growth.
3. Inspection of external bin stores for spillage and scattered litter must be performed on a regular basis to prevent the spread of pollutants into the stormwater management system.
4. Basin/Pond inlets, outlet/headwalls should be checked annually and after large storms to ensure that they are in good condition and operating as designed. Regular maintenance includes monthly inspections to identify any areas that are not operating correctly for the first 3 months and then every 6 months after.

Winter Maintenance Program

Ensure that drainage structures are not blocked by ice, snow, debris or rubbish during winter months.

Fertiliser Use

Only slow-release organic low-phosphorous fertilisers will be used in any landscaped areas in order to limit the amount of nutrients that could enter the stormwater system.

SuDS Operation and Maintenance Requirements based on C753 the SuDS Manual 2015

Inlets, Outlets, Controls and Inspection Chambers	
Regular Maintenance	Frequency
Inlets, outlets and surface control structures Inspect surface structures, removing obstructions and silt as necessary. Check there is no physical damage. Strim vegetation 1m min. Surround to structures and keep hard aprons free from silt and debris.	Monthly Monthly
Inspection chambers and below-ground control chambers Remove cover and inspect, ensuring that water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn.	Annually
Occasional Maintenance	
Check topsoil levels are 20mm above edges of drainage/ SuDS engineering features to avoid mower damage.	As necessary
Remedial Work	Frequency
Repair physical damage if necessary.	As required

Attenuation ponds and Swales	
Regular Maintenance	Frequency
Grass Mow grass access paths and verges surrounding ponds and swales areas at 35-50mm minimum and 75mm maximum, or as specifies; to provide a cared-for appearance and allow pedestrian access.	Monthly or as required
Mow rough grass areas for occasional access or habitat reasons at 100mm and maximum 150mm with cutting removed to wildlife piles.	As required, 4-6 times annually
Grass areas not required for access may be managed for wildlife interest and to reduce costs. Two cuts in July and September or one cut annually in September or October as specified, and cuttings removed to wildlife piles.	Annually or as required
Wet woodland management Manage annually, with cuttings left in-situ or removed to wildlife piles.	Annually or as required
Wetland vegetation Cut (strim) at 100mm with cuttings removed to wildlife piles September-October. Or Maintain as a mosaic to be cut 25-30% in any one year at 100mm in September or October with cuttings removed to wildlife piles.	Annually or as required
Occasional tasks	Frequency
Where silt accumulates on apron or area in front of inlet or outlet, remove and land apply within design profile of SuDS. Where silt accumulates more than 150mm in base of ponds/swales, undertake a phased removal of silt subject to client approval. Inspect geotextile liner to ensure it remains covered and sealed to prevent pollution of groundwater and identify any remedial works if necessary. Remove silt as instructed, but not more than 30% of the pond area at any one time and to an agreed depth but not the subsoil layer. Retain as much representative existing vegetation as possible to ensure rapid recolonisation of open areas. Stack excavated material adjacent to wetland to allow de-watering of silt. Undertake silt removal during September-October to minimise damaged to protected wildlife and ensure regrowth of aquatic vegetation before winter. Spread excavated material on site above SuDS design profile, e.g. top of banks, in accordance with EA (2010).	Annually or every 3 years, as required

Drainage Operation and Maintenance Log

Site Maintenance Supervisor: _____

Date: _____

☐ Routine☐ Response to rainfall event in _____Other ☐ _____

BMP	Frequency	Date Performed	Comments
Gullies and Manholes	Monthly Inspections		
	Maintenance Quarterly and as necessary		
Culverts and Headwalls	Inspect and identify areas not operating properly every 3 months (for the first 3 months) and every 6 months after.		
	Monthly trash screens inspection and remove debris		
Landscaped & Vegetated Areas	Maintenance as necessary		