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Drainage Impact Assessment
for
Proposed CRL Development
at
127A & 127B London Road
Waterlooville
Hampshire
PO7 7SH

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Drainage Impact Assessment

Contents	Page
1. Introduction	1
2. Existing Site Use	2
2.1. Site Setting	2
2.2. Site Topography	2
2.3. Watercourses	2
2.4. Hydrology & Geology	2
2.5. Existing Drainage	3
2.6. Indicative Flood Risk	3
3. Foul Drainage	4
3.1. Existing Foul Drainage	4
3.2. Proposed Foul Drainage	5
4. Storm Water Drainage	7
4.1. Existing Storm Water Drainage	7
4.2. Proposed Storm Water Drainage	7
4.3. Option 1: Soakaways (On site)	8
4.4. Option 2: Connection to SW Sewer	8
4.5. Option 3: Watercourses	9
4.6. Climate Change & Code for Sustainable Homes	10
5. Flood Risk	10
6. Summary	11
Appendices	
A	Location Plan 10072WV-RF01 Topographical Survey by D&H Surveys Ref SU01 dated Nov 2014 Extracts of Drainage Assessment by Robert West dated June 2012 Southern Water Sewer Records SVS Topographical survey
B	Proposed Site Layout 10072WV-RF03 Proposed Drainage ABMH F1987/01 Existing Impermeable Area ABMH F1987/10 Proposed Impermeable Area ABMH F1987/11 Windes Existing Site SW Runoff Calculations Windes Storage Calcs for Proposed SW Drainage Scheme

Drainage Impact Assessment

1. Introduction

- 1.1 We have been appointed by Planning Issues Ltd to provide a Drainage Impact Assessment (DIA) to accompany the proposed planning application at 127A & 127B London Road, Waterlooville, Hampshire, PO7 7SH.
- 1.2 The aim of the report is to review how the existing site is drained and how the proposed site can be drained in accordance with current design.
- 1.3 The report details the existing and proposed flows that are/will be generated and how these proposed storm water and foul water flows can be managed and discharged in a safe manner.
- 1.4 The DIA has been based upon the following documentation;
 - 1.4.1 Topographical Survey by D&H Surveys Ref SU01 dated Nov 2014
 - 1.4.2 Drainage Assessment by Robert West dated June 2012
 - 1.4.3 Proposed Site Layout 10072WV-RF03
 - 1.4.4 Location Plan 10072WV-RF01
 - 1.4.5 Geotechnical Desk Study Report – CCL05247.BU80 dated July 2014

2. Existing Site Use

2.1 Site Setting

2.1.1 The site is located at 127A & 127B London Road, Waterlooville, Hampshire, PO7 7SH.

2.1.2 A site location plan is shown in Appendix A, Location Plan 10072WV-RF01.

2.2 Site Topography

2.2.1 A topographical survey has been carried out by D&H Surveys Ref SU01 dated Nov 2014, as shown in Appendix A. In addition a previous developer undertook a topographical survey by SVS Ltd in June 2012, appendix A, which is also included within this report, as it clearly shows the existing drainage system within the site.

2.2.2 The site currently consists of a 2 detached houses with a few outbuildings, driveways and patios within a traditional garden/residential setting.

2.2.3 The existing site area is 2081m², with the impermeable areas restricted to the front drive, patio, dwellings and outbuildings.

2.2.4 The survey appears to have been undertaken to Above Ordinary Datum (mAOD). The site levels vary between 51.16 to 55.00m, with general levels around 54.70m AOD.

2.3 Watercourses

2.3.1 No watercourses or ditches are present within or adjacent to the site.

2.3.2 Hermitage Stream is located approximately 300m to the east of the site.

2.4 Hydrology & Geology

2.4.1 The geotechnical desk study appraisal has been undertaken by CCL for this site.

2.4.2 They noted the following:

The 1:50,000 Scale Solid and Drift Geology map of Fareham (Sheet 316), together with the digital map published by the British Geological Survey, indicates that there are no superficial deposits beneath the site.

The underlying solid geology comprises the London Clay Formation. This stratum is expected to comprise clay, silt and sand.

Hydrogeological information indicates that the underlying bedrock strata are classified as 'unproductive' (nonaquifer). The proposed development property is not within a Groundwater Source Protection Zone and there are no groundwater abstractions recorded within 1 km of the site.

The site does not lie within a designated flood plain and there are no listed discharge consents within 250 m of the site.

Ground conditions beneath the site generally comprise low permeability clays. In view of this, soakaway drainage is significantly constrained at the proposed development. It would, therefore, be prudent to identify alternative drainage methods for the proposed development prior to site purchase.

- 2.4.3 Based on the anticipated soil characteristics it is anticipated that soil infiltration within the site will not be viable, though this is to be determined within the on-site geotechnical investigation to be conducted following planning.

2.5 Existing Drainage

- 2.5.1 The topographical surveys as shown in Appendix A, shows manholes within the site indicating that a positive drainage system exists.
- 2.5.2 A CCTV drainage survey is yet to be undertaken to determine the existing drainage arrangements, though the survey information appears to strongly suggest that a combined system exists on site serving both properties that discharges to the foul sewer network within London Road.
- 2.5.3 The existing sewer connection is understood to be 100mm pipe.
- 2.5.4 It is therefore assumed that the existing properties have a direct combined water connection to the foul sewer within London Road.
- 2.5.5 The sewer network within the locality of the site is shown on Southern Waters Sewer Records, Appendix A (Extract Of RW report). Both foul and storm sewers are indicated being adjacent to the site.

2.6 Site Flood Risk

- 2.6.1 From inspection of the EA's website the site is understood to be situated within a Flood Zone 1, defined as an area where the chance of flooding from both rivers and the sea has been assessed as less than 0.1% in any year (less than 1 chance in 1,000 in any year), or 0.1% Annual Exceedance Probability (AEP).
- 2.6.2 A flood risk assessment was being undertaken by others at the time of writing this report.

3. Foul Drainage

3.1 Existing Foul Drainage

3.1.1 Based on the topographical survey information indicating the positive combined drainage system within the site it is assumed that this drainage connects to the designated 'foul sewer' within London Road, though this is to be confirmed via a CCTV survey in due course.

3.1.2 The existing peak flows to the foul sewer have been determined as follows:

3.1.3 In accordance with Sewers for Adoption 7th Edition the peak foul flows is as follows:

$$\begin{array}{rcl} 2\text{No dwelling @ } 4000 \text{ l/day} & = & 4,000 \text{ l/day} \\ & & = 0.093 \text{ l/s} \\ \text{Total Foul Flow} & & = 0.093 \text{ l/s} \end{array}$$

The combined flows taking the dwellings roof, patios and driveway into account would be as follows:

$$\begin{array}{rcl} \text{Existing Impermeable Area} & & = 800\text{m}^2 \\ \text{@ } 50\text{mm/hr rainfall intensity} & & = 11.11 \text{ l/s} \\ \text{Total Combined flow} & & = 11.11 \text{ (SW)} + 0.093 \text{ (FW)} \\ & & = 11.20 \text{ l/s} \end{array}$$

3.1.4 In addition the existing drainage on site serves 2No residential dwellings. Legal changes that came into effect in October 2011 mean that any existing drainage within the site that served more than one property will be deemed to be adopted drainage maintained by the water authority, in this case Southern Water. This drainage will be required to be partly abandoned through the implementation of the development and will require the developer to enter into agreements with Southern Water to divest the existing redundant drainage.

3.1.5 Furthermore, it should also be noted that an existing 600mm diameter foul sewer is indicated within the proximity of the southern boundary of the site. The depth of this sewer is approximately 20m deep. The proposed building would appear to be set slightly further back than the existing property within the site which is to be removed. Discussions at an early stage are recommended to ascertain from Southern Water if there are any issues that need to be taken in to account that could affect the proposed development, and whether a build close too/over agreement with Southern Water is required to be entered into in this instance.

3.2 Proposed Foul Drainage

3.2.1 The proposed development is to consist of 27No residential dwellings, as shown on Proposed Site Layout 10072WV-RF03, appendix B.

3.2.2 In accordance with Sewers for Adoption 7th Edition the peak flows will be as follows:

$$27\text{No dwellings @ } 4000 \text{ l/day} = 108,000 \text{ l/day} = 1.25 \text{ l/s}$$

3.2.3 The proposed foul flow is anticipated to be greater than the previous foul flow from the site.

3.2.4 However, the existing connection to the designated foul sewer was a combined flow and therefore the proposed flows (1.25l/s) will be significantly lower than existing (11.20l/s) through the removal of the storm water flows through the implementation of the development.

3.2.5 A foul drainage scheme for the proposed development is indicated on drawing F1987/01 Appendix B, though this is subject to detailed design in due course. The design is based on the existing adopted sewer within the site having a diameter of 100mm and a gradient of 1 in 40, which has a maximum foul flow capacity of 9.2l/s (B Regs). The foul flow rate from 30 dwellings, according to B Regs (Table 5) is 5.8l/s, and thus it is viable to utilise the existing 100mm FWS connection from site to serve the development if gradients and levels permit. Discussions with Southern Water will be required to confirm this proposal, as the usual provision would be to provide a minimum 150mm pipe connection to the foul sewer.

3.2.6 If Southern Water are not content with the re-use of the existing 100mm foul sewer, then a new 150mm pipe on line connection to the foul sewer within London Road will have to be made via new manhole connection. The impact and disruption on the existing highway network whilst this work is being undertaken would be considerable.

3.2.7 The alternative option would be to potentially connect to the 600mm foul sewer situated along the southern boundary of the site, though the practicality of connecting to a sewer 20m deep is not the most desirable option.

3.2.8 A Section 106 sewer connection application is to be submitted to Southern Water for approval regarding the proposed new connection and foul flows from the development.

- 3.2.9 In addition the existing drainage on site serves 2No residential dwellings. Legal changes that came into effect in October 2011 mean that any existing drainage within the site that served more than one property will be deemed to be adopted drainage maintained by the water authority, in this case Southern Water. This drainage will be required to be partly abandoned through the implementation of the development and will require the developer to enter into agreements with Southern Water to divest the existing redundant drainage.
- 3.2.10 Furthermore, it should also be noted that an existing 600mm diameter foul sewer is indicated within the proximity of the southern boundary of the site. The depth of this sewer is approximately 20m deep. The proposed building would appear to be set slightly further back than the existing property within the site which is to be removed. Discussions at an early stage are recommended to ascertain from Southern Water if there are any issues that need to be taken in to account that could affect the proposed development, and whether a build close too/over agreement with Southern Water is required to be entered into in this instance
- 3.2.11 Although there are potentially some foul drainage issues within the site to overcome, we do not anticipate any issues in discharging the foul drainage flows from the proposed site to the foul sewer network within or adjacent to the site.

4. Storm Water Drainage

4.1 Existing Storm Water Drainage

- 4.1.1 The existing on site storm runoff from the driveways, roof and patio areas currently discharges into the onsite combined drainage system and enters the designated foul sewer system within London Road.
- 4.1.2 The existing impermeable area of the dwellings, driveways and patios and out building have been calculated to be 811m², as shown on ABMH drawing F1987/10, Appendix B, with 800m² discharging to the combined drainage system.
- 4.1.3 Based on a site area of 2081m² and an impermeable area of 811m² (39%) the existing storm water runoff rates from site are as follows:
- Q1 year = 1.1 l/s
 - Q30 years = 2.6 l/s
 - Q100 years = 3.3 l/s

4.2 Proposed Storm Water Drainage

- 4.2.1 The proposed impermeable area drained to the storm water drainage system has been calculated to be 1285m², as shown on ABMH drawing F1987/11, Appendix B
- 4.2.2 In line with Building Regulations and good drainage practice the surface water from any new development and hard paved areas would be required to have separate drainage systems, ie foul and storm systems.
- 4.2.3 Furthermore, the outlets for storm water drainage systems should be, in order of priority; to soakaways, watercourses and latterly to sewers.
- 4.2.4 In addition, in order to comply with normal design standards, BS EN 752, stipulates that the system should not surcharge for a storm return period of 1 in 2 years and not flood for a storm return period of 1 in 20 years.
- 4.2.5 However, the storm return period may be required to be increased to 1 in 100 years to accord with PPS 25, including an allowance of plus 20-30% to take account of climate change. The actual return period to be provided will depend on the planning conditions and Local Planning Authority (LPA) and Environment Agency (EA) requirements, which in turn will be governed by the potential flood risk to neighbouring properties downstream of the proposed site.

4.2.6 The options for the proposed surface water drainage system outlets are as follows:

4.3 **Option 1: Soakaways (On site)**

4.3.1 No geotechnical investigations on site have been undertaken to date. Given the initial geotechnical view based on the likely geology beneath the site the viability of soakaways on site has been discounted at this stage. However, in line with the Building Regulation requirements soakaways tests will be undertaken to ascertain the viability of soakaways in due course.

4.3.2 However, the viability is subject to confirmation of the following:

- 4.3.2..1 Existing tree root protection zones
- 4.3.2..2 Actual soil infiltration rates
- 4.3.2..3 Geotechnical soil characteristics and horizons
- 4.3.2..4 Ground water table and likely seasonal variations
- 4.3.2..5 EA approval
- 4.3.2..6 Minimum 5m distance from existing and proposed structures

4.3.3 Based on the level of assumptions to be confirmed, this option is viewed at best as a potential fall-back position, with a connection to the storm water sewer being preferred, outlined later.

4.4 **Option 2: Watercourse**

4.4.1 There are no watercourses within or adjacent to the site and thus the option to discharge runoff from the proposed development into them is not present.

4.5 Option 3: Connection to Storm Water Sewer

- 4.5.1 The aim of any new drainage system would be to limit the discharge from the new development to no more than the existing discharge runoff rate, determined as 1.1/2.6/3.3 l/s for 1/30/100 year storm return periods.
- 4.5.2 However, as the existing discharge rate is lower than 5l/s, normal design practice permits the proposed discharge rate to be 5l/s to enable a flow control to be specified that is not prone to blocking.
- 4.5.3 A preliminary scheme as indicated on drawing F1987/01 Appendix B has been designed to restrict flows from site via a new connection to the existing storm water sewer within Arnside Road.
- 4.5.4 An attenuation tank is proposed to be constructed within the car park to provide sufficient storage to cater for a storm return period of upto 100 years plus 30% climate change allowance.
- 4.5.5 The discharge into the sewer will be controlled by a HRD Hydro brake flow control to 5l/s.
- 4.5.6 The proposed scheme will control the flows off site mitigating the flood risks to downstream properties through the increase of impermeable areas on site.
- 4.5.7 Pollution control in the form of trapped road gullies will suffice in this instance, in line with PPG3 as the trafficked areas of the drive and car parking are relatively low, ie less than 800m².
- 4.5.8 Furthermore, based on the increase in the impermeable areas from the existing scenario then the volume of water discharged off site will also increase. If required by the LPA the volume of water discharged off site can also be addressed in accordance with Code for Sustainable Homes (CfSH) by incorporating rain water harvesting.
- 4.5.9 In this instance it would be proposed to form the car park and access in a porous paving system such as Formpave, prior to discharging the runoff from these trafficked areas to the attenuation tank as shown on F1987/01. Furthermore, the rainwater harvesting tank would be provided by deepening the proposed tank by the required amount, but keeping the drain down invert level as currently proposed. In so doing the lower half of the tank, forming the rainwater harvesting tank, would fill up first, with storage for 100 year storm return period provided above the drain down pipe level.
- 4.5.10 Additional mechanical and electrical chambers would be required to filter and pump the water from the tank to the building for non-potable uses within the building.
- 4.5.11 It should be highlighted that the proposed storm water drainage route from site to the existing storm sewer within Arnside Road passes over third party land. The

developer will be required to obtain the consents from the land owner to install the proposed drainage across this land or enter into a Sewer Requisition notice with Southern Water.

- 4.5.12 In addition, as this drainage will be outside the Developer's site it is strongly recommended that this drainage is offered for adoption. It is recommended that discussions with Southern water and the land owners are held as soon as possible to agree routes and requirements to serve the development in due course.

4.6 Climate Change and Code for Sustainable Homes

- 4.6.1 The proposed storm water scheme as shown in Appendix B allows for a climate change of 30% in the storm water runoff rate.
- 4.6.2 In addition, if required rainwater harvesting tanks can be provided as described above, enabling the site to mitigate the volume of water leaving site into the storm sewer in line with the mandatory requirements of Code for Sustainable Homes. It should be noted that rainwater harvesting would not be required if infiltration techniques are viable on site.

5. Flood Risk

- 5.1 As highlighted previously site is understood to be situated within a Flood Zone 1, defined as an area where the chance of flooding from both rivers and the sea has been assessed as less than 0.1% in any year (less than 1 chance in 1,000 in any year), or 0.1% Annual Exceedance Probability (AEP).
- 5.2 Risks of flooding by other sources are deemed to be low given the sites topography. Please refer to separate Flood Risk Assessment (FRA) undertaken by others.
- 5.3 Given the anticipated proposed levels and the adjacent site level differences it should be viable to enable flood flows to pass through and around the site, without causing flooding to internal properties within the site.

6. Summary

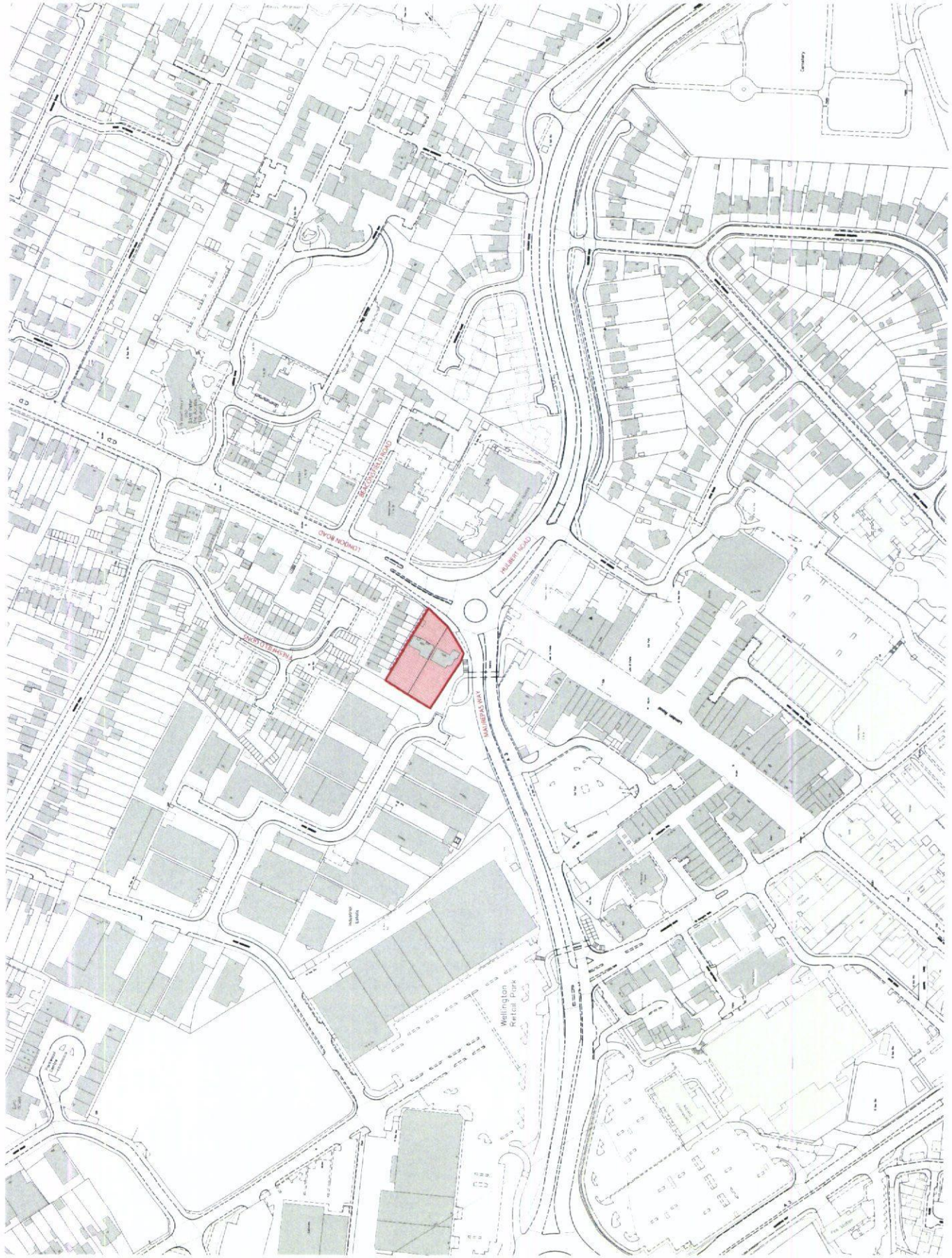
- 6.1 The foul drainage scheme from the proposed development will not result in greater flows to the foul water sewer as the existing storm water flows are to be removed and redirected to the storm water sewer.
- 6.2 The storm water runoff from the proposed development will be restricted to 5l/s in line with normal design criteria for small sites, thus enabling flow controls with low risk of blockage to be used.
- 6.3 Attenuation measures are proposed to the on-site storm water system which will comply with normal design standards, BS EN 752, ensuring that that the system will not surcharge for a storm return period of 1 in 2 years and not flood for a storm return period of 1 in 20 years.
- 6.4 In addition, in order to comply with PPS 25 and/or Code for Sustainable Homes if required, the storm return period will be increased to 1 in 100 years including an allowance of plus 20-30% to take account of climate change. The actual return period to be provided will depend on the planning conditions and Environment Agency (EA) requirements, which in turn will be governed by the potential flood risk to neighbouring properties downstream of the proposed site
- 6.5 On site storage will be provided using an attenuation tank with flows from this storage tank restricted to the sewer to 5l/s using a HRD Hydro brake flow control.
- 6.6 The attenuation tank is proposed to be deepened if required to provide a rainwater harvesting tank, to use water within the dwellings for non-potable uses, to mitigate the volume of water leaving the site.
- 6.7 The net effect of these proposed measures will be that the storm water runoff will be controlled thus providing flood protection within the site and to adjacent neighbours and properties in line with current requirements.
- 6.8 The alternative options for discharging the storm water to soakaways may be viable, subject to further geotechnical reports, but a discharge to a storm sewer is deemed the most viable option at present.
- 6.9 In line with Building Regulations the Local Building Control office/NHBC will be contacted to determine if any special drainage considerations are required to be adhered with, such as rodent control, sealed systems etc, though none are deemed likely.
- 6.10 The storm water scheme as shown on drawing F1987/01 complies with Code for Sustainable Homes with regard to restricted flows off site, and can easily be adjusted to comply with restricted volumes leaving site.

-
- 6.11 Discussions with Southern Water and adjacent land owners at the earliest opportunity are recommended regarding the following issues:
- 6.11.1 Proposed re-use of the 100mm foul water connection from site to the foul sewer within London Road.
 - 6.11.2 Part abandonment of existing foul sewers within the site
 - 6.11.3 Potential issues regarding the proximity of the proposed development to the existing 600mm foul sewer situated in close proximity to the site's southern boundary, and whether build close too/over agreements are required to be entered into with Southern Water.
 - 6.11.4 Proposed new storm sewer connection from site to the existing storm sewer within Arnside Road, and adoption of new route.
 - 6.11.5 Discussions with land owners regarding the right to install the storm water sewer within third party land.
- 6.12 On the basis of the findings within this report, and the proposed outline drainage designs, we are of the opinion that adequate drainage provision can be provided for the development without increasing flood risk to neighbours or their property. On this basis we trust that the above meets with your approval.

A

Location Plan 10072WV-RF01
Topographical Survey by D&H Surveys Ref SU01 dated Nov 2014

Extracts of Drainage Assessment by Robert West dated June 2012
Southern Water Sewer Records
SVS Topographical survey



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SEWER RECORDS PAGE 1 OF 2



109721

109433

		The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. WARNING: BNC plans are constructed of Bonded Adhesive Cement WARNING: Untrue (UT) materials may include Bonded Adhesive Cement Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.	
O.S. REF. SU6809NW	Drawn by: roysaya	Title: 137294_127A and 127B London Ro	
468076	Scale: 1:1250	Date: 07/06/2012	468546

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape
5801X	48.36		150	VC	CRC	5801X	48.36		150	VC	CRC
0401X	44.63	225	225	VC	CRC	0401X	44.63	225	225	VC	CRC
0400X	44.62	43.76	225	VC	CRC	0400X	44.62	43.76	225	VC	CRC
0603X	37.59	34.08	225	VC	CRC	0603X	37.59	34.08	225	VC	CRC
0600X	37.89	33.87	225	VC	CRC	0600X	37.89	33.87	225	VC	CRC
0806X	37.83	29.97	600	CP	CRC	0806X	37.83	29.97	600	CP	CRC
0854X	37.59	36.52	375	VC	CRC	0854X	37.59	36.52	375	VC	CRC
0855X	37.53	37.75	375	VC	CRC	0855X	37.53	37.75	375	VC	CRC
0750X	36.76	37.93	225	VC	CRC	0750X	36.76	37.93	225	VC	CRC
1401X	46.72	45.81	150	VC	CRC	1401X	46.72	45.81	150	VC	CRC
1402X	47.66	46.44	150	VC	CRC	1402X	47.66	46.44	150	VC	CRC
1400X	46.13	45.18	225	VC	CRC	1400X	46.13	45.18	225	VC	CRC
1451X	46.59	45.64	150	VC	CRC	1451X	46.59	45.64	150	VC	CRC
1452X	47.91	46.65	150	VC	CRC	1452X	47.91	46.65	150	VC	CRC
1453X	48.21	47.37	150	CP	CRC	1453X	48.21	47.37	150	CP	CRC
1455X	48.44	48.37	150	VC	CRC	1455X	48.44	48.37	150	VC	CRC
1601X	38.83	38.33	225	VC	CRC	1601X	38.83	38.33	225	VC	CRC
1603X	40.41	36.27	225	VC	CRC	1603X	40.41	36.27	225	VC	CRC
1650X	41.76	40.05	225	VC	CRC	1650X	41.76	40.05	225	VC	CRC
1651X	40.34	38.48	225	VC	CRC	1651X	40.34	38.48	225	VC	CRC
1652X	40.56	39.96	175	VC	CRC	1652X	40.56	39.96	175	VC	CRC
1701X	40.98	39.84	150	VC	CRC	1701X	40.98	39.84	150	VC	CRC
1702X	40.57	39.11	150	VC	CRC	1702X	40.57	39.11	150	VC	CRC
1750X	39.48		375	VC	CRC	1750X	39.48		375	VC	CRC
1754X		38.65	150	VC	CRC	1754X		38.65	150	VC	CRC
1755X		38.55	150	VC	CRC	1755X		38.55	150	VC	CRC
2401X	52.98	50.63	225	VC	CRC	2401X	52.98	50.63	225	VC	CRC
2450X	53.24	51.17	225	CP	CRC	2450X	53.24	51.17	225	CP	CRC
2451X	52.81	52.15	225	CP	CRC	2451X	52.81	52.15	225	CP	CRC
2456X	52.51		225	CP	CRC	2456X	52.51		225	CP	CRC
2501X	50.77	49.16	150	VC	CRC	2501X	50.77	49.16	150	VC	CRC
2550X	51.07	48.6	150	VC	CRC	2550X	51.07	48.6	150	VC	CRC
2551X	47.42		150	VC	CRC	2551X	47.42		150	VC	CRC
2552X	49	47.36	150	VC	CRC	2552X	49	47.36	150	VC	CRC
2801X		44.48	150	VC	CRC	2801X		44.48	150	VC	CRC
2850X	43.90	43.57	225	VC	CRC	2850X	43.90	43.57	225	VC	CRC
2852X		42.04	225	VC	CRC	2852X		42.04	225	VC	CRC
2853X			225	VC	CRC	2853X			225	VC	CRC
2854X	41.1	39.01	375	VC	CRC	2854X	41.1	39.01	375	VC	CRC
2855X	41.1	41.79	150	VC	CRC	2855X	41.1	41.79	150	VC	C

LINE ITEM #S / COLUMNS		MATERIALS		LEGEND - SUPPLIERS		SHAPE(S)		NODE REFERENCE SYSTEM	
Beam	1-4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 82								



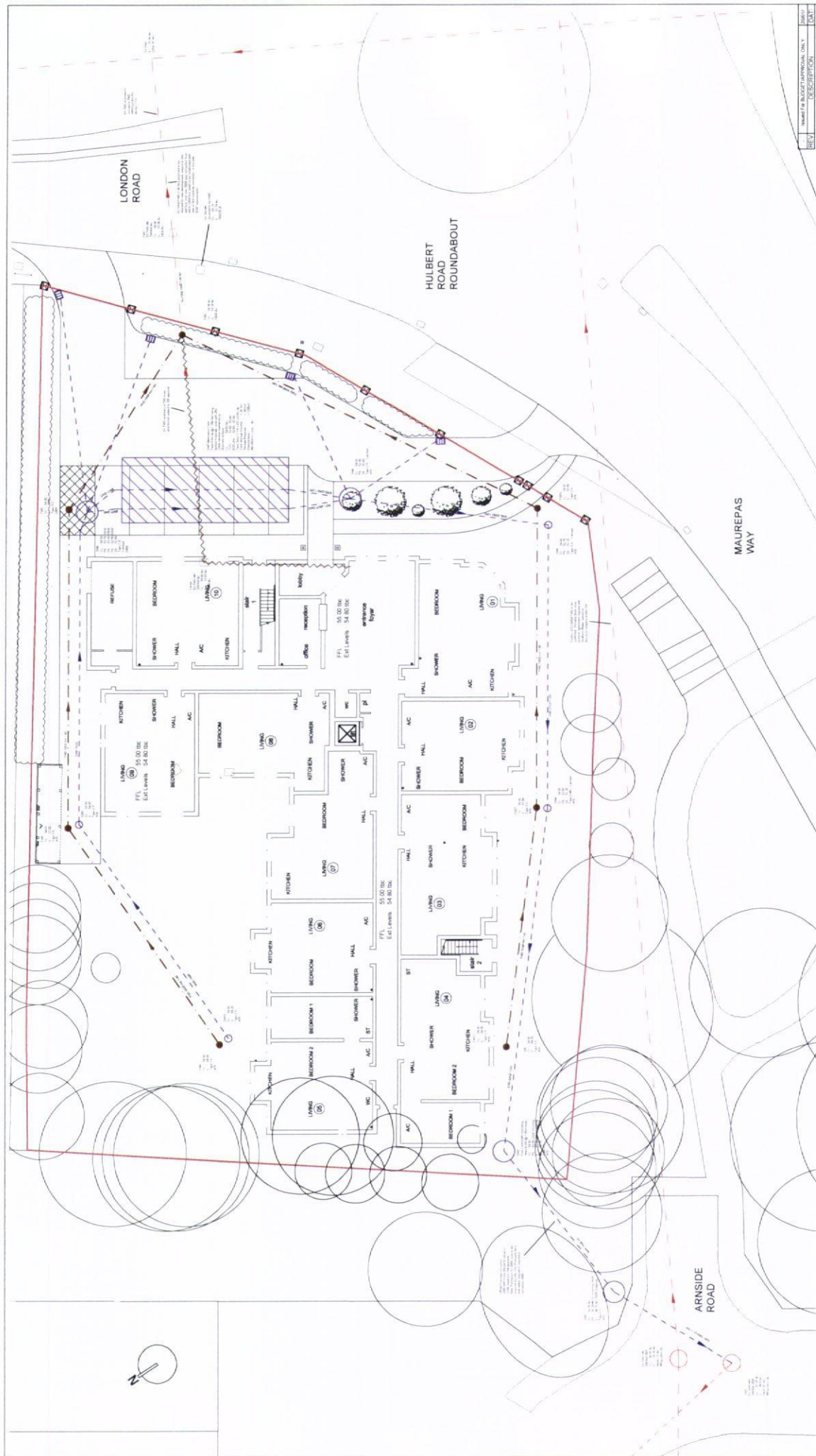
Drawn by: roysaya

Title: 137294 127A and 127B London Ro

Date: 07/06/2012

B

Proposed Site Layout	10072WV-RF03
Proposed Drainage	ABMH F1987/01
Existing Impermeable Area	ABMH F1987/10
Proposed Impermeable Area	ABMH F1987/11
Windes Existing Site SW Runoff Calculations	
Windes Storage Calcs for Proposed SW Drainage Scheme	



REV	DESCRIPTION	DATE
1	ISSUED FOR BUDGET APPROVAL ONLY	10/11/20



abmh
Consulting Civil & Structural Engineers
1 The Grange, London, England, SE18 3JH
Tel: 020 899 50000 / Fax: 020 899 50001
Email: info@abmh.co.uk / www.abmh.co.uk

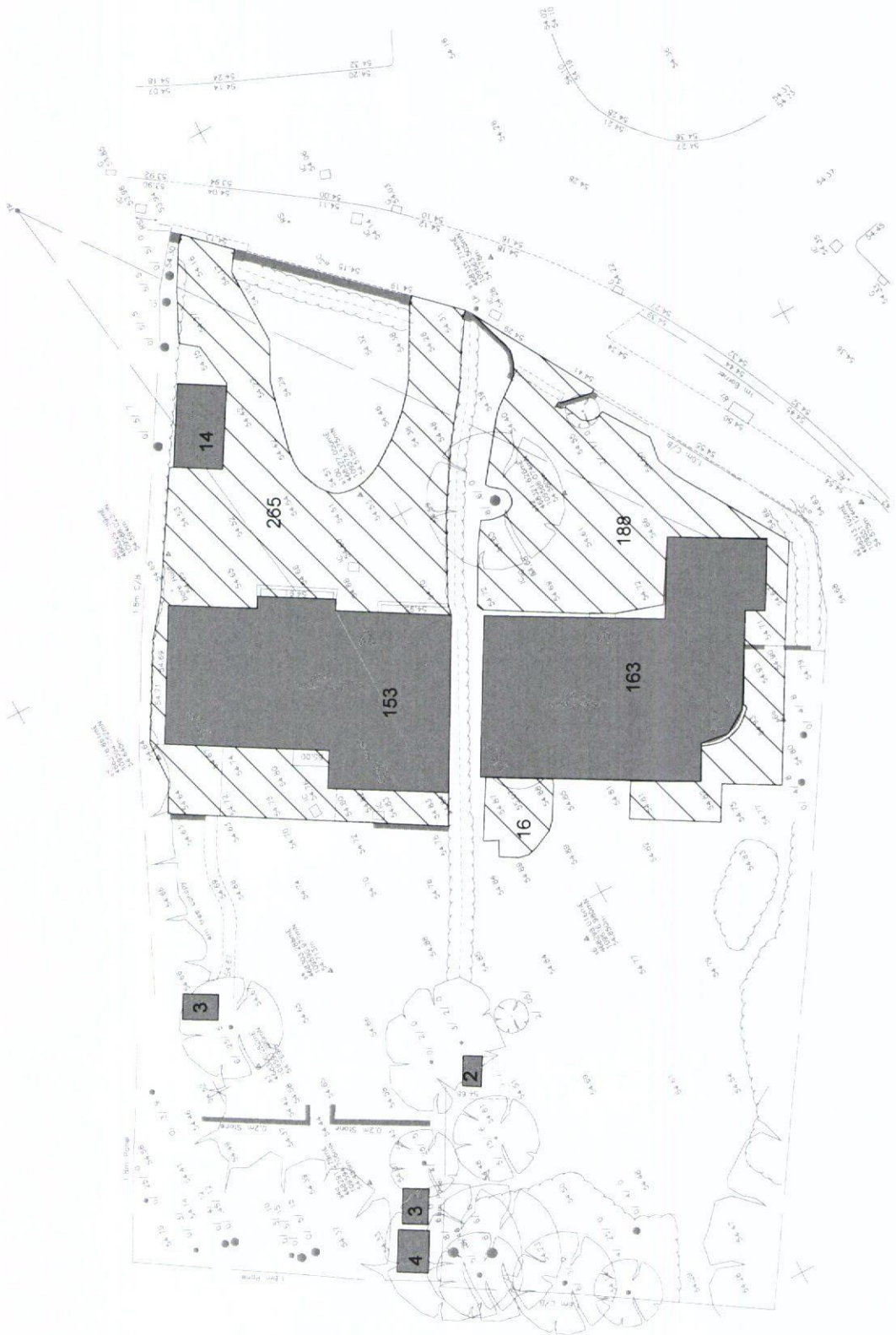
PROJECT	CRL WATERLOOVILLE 17 ARNSIDE ROAD WATERLOOVILLE HAMPSHIRE, PO7 7SH
DRAWING	PRELIMINARY DRAINAGE LAYOUT
SCALE	1:125
DATE	F1987/01
BY	ABM
CHECKED	ABM

SUBJECT TO THE APPROVAL OF:
LPA
BUILDING CONTROL/NHBC
SW S106 Connection
S185 Sewer Diversion/Requisition
Build Close to Agreement

Legend

- Existing drainage
- Proposed drainage
- Proposed drainage (100mm)
- Proposed drainage (150mm)
- Proposed drainage (225mm)
- Proposed drainage (300mm)
- Proposed drainage (450mm)
- Proposed drainage (600mm)
- Proposed drainage (900mm)
- Proposed drainage (1200mm)
- Proposed drainage (1500mm)
- Proposed drainage (1800mm)
- Proposed drainage (2100mm)
- Proposed drainage (2400mm)
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- Proposed drainage (3000mm)
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- Proposed drainage (6000mm)
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- Proposed drainage (7200mm)
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- Proposed drainage (8100mm)
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- Proposed drainage (11700mm)
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- Proposed drainage (12300mm)
- Proposed drainage (12600mm)
- Proposed drainage (12900mm)
- Proposed drainage (13200mm)
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- Proposed drainage (21300mm)
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- Proposed drainage (22200mm)
- Proposed drainage (22500mm)
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- Proposed drainage (25800mm)
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- Proposed drainage (26400mm)
- Proposed drainage (26700mm)
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- Proposed drainage (27300mm)
- Proposed drainage (27600mm)
- Proposed drainage (27900mm)
- Proposed drainage (28200mm)
- Proposed drainage (28500mm)
- Proposed drainage (28800mm)
- Proposed drainage (29100mm)
- Proposed drainage (29400mm)
- Proposed drainage (29700mm)
- Proposed drainage (30000mm)

10,000



	Existing Building Area	= 342 m ²
	Existing Impermeable Paved Area	= 469 m ²
	Total Impermeable Area	= 811 m ²
	Site Area	= 2081 m ²

REV	DESCRIPTION	DATE
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abmh
 Consulting Civil & Structural Engineers
 11 The Grove, Farnham, Basingstoke Regia, West Sussex PO22 7EY
 Aun Mob: 07939 55006 / Mark Mob: 07761 90000
 Email: info@abmh.co.uk / Web: www.abmh.co.uk

PROJECT	CRL WATERLOOVILLE 127A/B LONDON ROAD WATERLOOVILLE HAMPSHIRE PO7 7SH		
DRAWING	EXISTING IMPERMEABLE AREAS		
SCALE	1:250	DATE	JAN 2019
BY	F 1987/10	REV	
		CHKD	



Total Impermeable Area
= 1285 m²

REV	DESCRIPTION	DATE
		
Consulting Civil & Structural Engineers 1 The Atrium, 275 Broad Street, Suite 2002, New York, NY 10004 Tel: 212 691 1000 Fax: 212 691 1001 Email: info@abmbh.com		
CRL WATERLOOVILLE 127AB LONDON ROAD WATERLOOVILLE HAMPSHIRE PO7 7SH		
PROPOSED IMPERMEABLE AREAS		
SCALE 1:500	DATE JAN 2015	IN TITIAL
PROJECT	F 1987/11	CHNG REV

ABMH		Page 1
1 The Grove Felpham West Sussex PO22 7EY	CRL Waterloooville Ex SW Runoff Rates	
Date Jan 2015 File	Designed by MH Checked by	
Micro Drainage	Source Control 2014.1.1	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.400
Area (ha)	0.208	Urban	0.390
SAAR (mm)	731	Region Number	Region 7

Results 1/s

QBAR Rural 0.7
QBAR Urban 1.3

Q100 years 3.3

Q1 year 1.1
Q30 years 2.6
Q100 years 3.3

ABMH

1 The Grove
Felpham
West Sussex PO22 7EY

Date Jan 2015
File F1987 SW attenuation ta...

Micro Drainage

CRL Waterloooville
SW Attenuation Tank

Designed by MH
Checked by

Source Control 2014.1.1

Page 1



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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Overflow (l/s)	Max Volume (m³)	Status
15 min Summer	53.287	0.487	4.9	0.0	4.9	23.9	O K
30 min Summer	53.407	0.607	4.9	0.0	4.9	29.8	O K
60 min Summer	53.464	0.664	4.9	0.0	4.9	32.5	O K
120 min Summer	53.456	0.656	4.9	0.0	4.9	32.2	O K
180 min Summer	53.426	0.626	4.9	0.0	4.9	30.7	O K
240 min Summer	53.385	0.585	4.9	0.0	4.9	28.7	O K
360 min Summer	53.300	0.500	4.9	0.0	4.9	24.5	O K
480 min Summer	53.205	0.405	4.9	0.0	4.9	19.9	O K
600 min Summer	53.105	0.305	4.9	0.0	4.9	15.0	O K
720 min Summer	53.026	0.226	4.9	0.0	4.9	11.1	O K
960 min Summer	52.909	0.109	4.9	0.0	4.9	5.3	O K
1440 min Summer	52.805	0.005	4.9	0.0	4.9	0.2	O K
2160 min Summer	52.800	0.000	3.7	0.0	3.7	0.0	O K
2880 min Summer	52.800	0.000	2.9	0.0	2.9	0.0	O K
4320 min Summer	52.800	0.000	2.1	0.0	2.1	0.0	O K
5760 min Summer	52.800	0.000	1.7	0.0	1.7	0.0	O K
7200 min Summer	52.800	0.000	1.4	0.0	1.4	0.0	O K
8640 min Summer	52.800	0.000	1.2	0.0	1.2	0.0	O K
10080 min Summer	52.800	0.000	1.1	0.0	1.1	0.0	O K
15 min Winter	53.358	0.558	4.9	0.0	4.9	27.3	O K
30 min Winter	53.504	0.704	4.9	0.0	4.9	34.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	118.408	0.0	28.7	0.0	17
30 min Summer	79.579	0.0	38.6	0.0	32
60 min Summer	51.031	0.0	49.2	0.0	60
120 min Summer	31.581	0.0	61.3	0.0	92
180 min Summer	23.488	0.0	67.9	0.0	126
240 min Summer	18.897	0.0	73.1	0.0	160
360 min Summer	13.902	0.0	80.7	0.0	230
480 min Summer	11.169	0.0	86.6	0.0	298
600 min Summer	9.417	0.0	91.2	0.0	356
720 min Summer	8.187	0.0	95.2	0.0	412
960 min Summer	6.558	0.0	101.6	0.0	522
1440 min Summer	4.789	0.0	111.1	0.0	736
2160 min Summer	3.489	0.0	121.5	0.0	0
2880 min Summer	2.783	0.0	129.2	0.0	0
4320 min Summer	2.020	0.0	140.7	0.0	0
5760 min Summer	1.607	0.0	149.3	0.0	0
7200 min Summer	1.346	0.0	156.3	0.0	0
8640 min Summer	1.165	0.0	162.3	0.0	0
10080 min Summer	1.032	0.0	167.7	0.0	0
15 min Winter	118.408	0.0	32.0	0.0	17
30 min Winter	79.579	0.0	43.0	0.0	31

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ABMH		Page 2
1 The Grove Felpham West Sussex PO22 7EY	CRL Waterloooville SW Attenuation Tank	
Date Jan 2015 File F1987 SW attenuation ta...	Designed by MH Checked by	
Micro Drainage	Source Control 2014.1.1	

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	53.588	0.788	4.9	0.0	4.9	38.6	O K
120 min Winter	53.571	0.771	4.9	0.0	4.9	37.8	O K
180 min Winter	53.525	0.725	4.9	0.0	4.9	35.5	O K
240 min Winter	53.461	0.661	4.9	0.0	4.9	32.4	O K
360 min Winter	53.327	0.527	4.9	0.0	4.9	25.8	O K
480 min Winter	53.169	0.369	4.9	0.0	4.9	18.1	O K
600 min Winter	53.024	0.224	4.9	0.0	4.9	11.0	O K
720 min Winter	52.918	0.118	4.9	0.0	4.9	5.8	O K
960 min Winter	52.803	0.003	4.9	0.0	4.9	0.2	O K
1440 min Winter	52.800	0.000	3.6	0.0	3.6	0.0	O K
2160 min Winter	52.800	0.000	2.7	0.0	2.7	0.0	O K
2880 min Winter	52.800	0.000	2.1	0.0	2.1	0.0	O K
4320 min Winter	52.800	0.000	1.5	0.0	1.5	0.0	O K
5760 min Winter	52.800	0.000	1.2	0.0	1.2	0.0	O K
7200 min Winter	52.800	0.000	1.0	0.0	1.0	0.0	O K
8640 min Winter	52.800	0.000	0.9	0.0	0.9	0.0	O K
10080 min Winter	52.800	0.000	0.8	0.0	0.8	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
60 min Winter	51.031	0.0	54.9	0.0	58
120 min Winter	31.581	0.0	68.2	0.0	96
180 min Winter	23.488	0.0	76.4	0.0	136
240 min Winter	18.897	0.0	81.8	0.0	174
360 min Winter	13.902	0.0	90.1	0.0	248
480 min Winter	11.169	0.0	96.8	0.0	316
600 min Winter	9.417	0.0	102.1	0.0	370
720 min Winter	8.187	0.0	106.6	0.0	422
960 min Winter	6.558	0.0	113.7	0.0	500
1440 min Winter	4.789	0.0	124.5	0.0	0
2160 min Winter	3.489	0.0	136.1	0.0	0
2880 min Winter	2.783	0.0	144.8	0.0	0
4320 min Winter	2.020	0.0	157.6	0.0	0
5760 min Winter	1.607	0.0	167.2	0.0	0
7200 min Winter	1.346	0.0	175.0	0.0	0
8640 min Winter	1.165	0.0	181.8	0.0	0
10080 min Winter	1.032	0.0	187.8	0.0	0

ABMH		Page 3																																	
1 The Grove Felpham West Sussex PO22 7EY	CRL Waterloooville SW Attenuation Tank																																		
Date Jan 2015	Designed by MH																																		
File F1987 SW attenuation ta...	Checked by																																		
Micro Drainage		Source Control 2014.1.1																																	
<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.400</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.350</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+30</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 0.129 <table> <tr> <th colspan="2">Time (mins)</th> <th>Area</th> </tr> <tr> <th>From:</th> <th>To:</th> <th>(ha)</th> </tr> <tr> <td>0</td> <td>4</td> <td>0.129</td> </tr> </table>			Rainfall Model	FSR	Winter Storms	Yes	Return Period (years)	100	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	19.400	Shortest Storm (mins)	15	Ratio R	0.350	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+30	Time (mins)		Area	From:	To:	(ha)	0	4	0.129
Rainfall Model	FSR	Winter Storms	Yes																																
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From:	To:	(ha)																																	
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ABMH		Page 4
1 The Grove Felpham West Sussex PO22 7EY	CRL Waterloooville SW Attenuation Tank	
Date Jan 2015	Designed by MH	
File F1987 SW attenuation ta...	Checked by	
Micro Drainage		Source Control 2014.1.1

Model Details

Storage is Online Cover Level (m) 54.500

Tank or Pond Structure

Invert Level (m) 52.800

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	49.0	0.700	49.0	1.400	0.0	2.100	0.0
0.100	49.0	0.800	49.0	1.500	0.0	2.200	0.0
0.200	49.0	0.801	0.0	1.600	0.0	2.300	0.0
0.300	49.0	1.000	0.0	1.700	0.0	2.400	0.0
0.400	49.0	1.100	0.0	1.800	0.0	2.500	0.0
0.500	49.0	1.200	0.0	1.900	0.0		
0.600	49.0	1.300	0.0	2.000	0.0		

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0104-5000-1050-5000
Design Head (m)	1.050
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	104
Invert Level (m)	52.550
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.050	4.9
Flush-Flo™	0.309	4.9
Kick-Flo®	0.663	4.0
Mean Flow over Head Range	-	4.3

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)
0.100	3.5	1.200	5.2	3.000	8.1	7.000	12.1
0.200	4.8	1.400	5.6	3.500	8.7	7.500	12.5
0.300	4.9	1.600	6.0	4.000	9.2	8.000	12.8
0.400	4.9	1.800	6.3	4.500	9.8	8.500	13.2
0.500	4.7	2.000	6.7	5.000	10.3	9.000	13.6
0.600	4.4	2.200	7.0	5.500	10.7	9.500	13.9
0.800	4.4	2.400	7.3	6.000	11.2		
1.000	4.8	2.600	7.5	6.500	11.6		

ABMH		Page 5
1 The Grove Felpham West Sussex PO22 7EY	CRL Waterloooville SW Attenuation Tank	
Date Jan 2015 File F1987 SW attenuation ta...	Designed by MH Checked by	
Micro Drainage Source Control 2014.1.1		
<u>Pipe Overflow Control</u> Diameter (m) 0.150 Entry Loss Coefficient 0.500 Slope (1:X) 100.0 Coefficient of Contraction 0.600 Length (m) 5.000 Upstream Invert Level (m) 53.650 Roughness k (mm) 0.600		
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