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DRAINAGE REPORT

PROPOSED RESIDENTIAL DEVELOPMENT, 75 NEWBOLD ROAD, BARLESTONE

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Executive Summary

This Drainage Assessment reviews the existing drainage arrangement at the application site and proposes a surface water drainage strategy in line with Local Authority and Lead Local Flood Authority (LLFA) guidance.

The site is currently occupied by a garden and outbuildings and is located adjacent to 75 Newbold Road, Barlestone, Leicester.

The proposed development comprises the construction of a number of dwellings with associated hardstanding.

The site is less than 1 hectare in size and within flood zone 1, so no flood risk assessment is required.

Surface Water Drainage

The proposed strategy presented in detail in this report aims to reduce the surface water discharge to greenfield rates. All post development run-off from the site will be limited to 5 litres/second in accordance with best practice.

Attenuation and reduced discharge will be provided for all storm events up to and including the 1 in 100-year storm plus 40% allowance for climate change. Sustainable Drainage Systems (SuDS) shall be used, including an area of tanked permeable paving for surface water attenuation and silt traps.

New new sewer connections are proposed to Barlestone Rd (both surface and foul) connecting to the existing combined sewer.

An additional 10% allowance for urban creep has been included in the sizing of attenuation.

Maintenance/management of all onsite drainage infrastructure has been considered within a separate maintenance plan appended to this report. This will be updated through the development process.

The proposed drainage strategy is entirely based on-site and therefore the only off-site works will be the foul and surface water outlets to the Severn Trent Water sewer.

Overall, the proposals provide a high level of water treatment, runoff reduction and flooding protection for the proposed development and are in accordance with all requirements of the Lead Local Flood Authority (LLFA).

Foul Drainage

It is proposed to discharge the foul drainage from the site into the existing Severn Trent Water sewer in the street.



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1 INTRODUCTION

- 1.1.1 Wallace Engineering Consulting was commissioned to undertake a Drainage Assessment for the proposed development of land located at Barlestone Rd, Leicester.
- 1.1.2 This Drainage Assessment has been produced in support of a planning application and should be read in conjunction with the other planning documents.
- 1.1.3 The development proposal comprises the construction of a number of dwellings and associated hardstanding. Proposed development details are provided in Appendix A.
- 1.1.4 The site is less than 1 hectare in size and within flood zone 1, so no flood risk assessment is required.
- 1.1.5 The total site area is 4800 square metres. Pre-development, the site is approximately 5% impermeable. Post development, approx. 47% of the site will be impermeable (2250 square metres).
- 1.1.6 Since April 2015, Lead Local Flood Authorities (LLFA's) have become a statutory consultee on surface water drainage for many planning applications. For this site, the following is considered to be the required level of details for planning approval., and have requested the following for this particular proposal.
 - SuDS: Designs, Maintenance Plans & Calculations - for SuDS proposed, the LLFA require product specifications or design drawings, all supporting calculations and a maintenance plan. This needs to include details of any attenuation structures and green roofs in accordance with the CIRIA C753 SuDS Manual.



2 Site Description

2.1.1 The site is approximately 4800 square metres in size and located off Newbold Road, Barlestone

2.1.2 The site location information is as follows:

- Nearest Postcode: CV130DT

2.2 Topography

Site Topography

2.2.1 An onsite topographic survey has been carried out and is provided in Appendix B.

2.2.2 The site is rectangular in shape and falls gently from north to south.



3 Design principles and policy requirements

3.1 *General Principles for Proposed Site Run-Off*

3.1.1 The DEFRA Sustainable Drainage Systems Non-Statutory Technical Standards for Sustainable Drainage Systems (March, 2015) states that the following options must be considered for disposal of surface water runoff in order of preference:

- Discharge to ground
- Discharge to a surface water body
- Discharge to a surface water sewer
- Discharge to a combined sewer

Discharge to Ground

3.1.2 The potential for surface water to discharge to ground has been assessed through a review of the likely ground conditions and possible infiltration structures.

3.1.3 The area in which this site is located is generally underlain by impermeable clays. Based upon this information, it is unlikely that infiltration is possible on this site.

3.1.4 As well as the underlying ground conditions, the site and surrounds are urban in nature and have existing sewer connections. Hence it is considered that infiltration is not possible on this site.

Discharge to Surface Water Body

3.1.5 There are no suitable surface water bodies near to the site that can be used for surface water discharge.

Discharge to Surface Water Sewer/Combined Sewer

3.1.6 Discharge to the public sewer network should only be considered once all other options for draining surface water from the site have been exhausted.

3.1.7 It is proposed to construct a new connection to the combined sewer in Barlestone Rd. All impermeable areas will drain into an area of tanked permeable paving which will attenuate flows. Flow from the paved area will be restricted to 5 litres/second before discharge to the existing STW sewers. See appendix C for details of the permeable paving.

3.1.8 The proposed attenuation structure will discharge to the Severn Trent Water sewer, with a discharge rate of 5 litres/second in accordance with best practice. Severn Trent will be contacted for approval of the discharge to their sewer. See Appendix C for design drawings, calculations and Severn Trent Water sewer locations.



3.2 *Sustainable Drainage Systems (SuDS)*

- 3.2.1 To maximise the potential use of SuDS at the site, a review has been undertaken as shown in Table 1 in accordance with the SuDS Hierarchy. This review highlights the components referenced in the SuDS Hierarchy and provides recommendations on whether the components could be incorporated into the development.

Table 1: SuDS Selection Based on the SuDS Hierarchy

Component	Recommendation
Green (living) roofs	Whilst the use of green roofs provides additional environmental benefits such as enhanced aesthetics and ecology, its exposure to wind and orientation must be considered. Access to undertake the construction and maintenance easily and safely is also a high priority. If feasible, depending on the roof design, a green roof will provide water quality, biodiversity and aesthetic benefits to the site. Additionally, the green roof/s will offer some attenuation for run-off, reducing volumes of run-off and in higher frequency events (i.e. 1in2 year storms) will result in no run-off for the building. The proposed roofs are pitched and are not suitable for green roofs
Basins and Ponds	Ponds and attenuation basins can provide overland storage of surface water whilst also providing additional biodiversity and aesthetic/amenity value. There are no open areas on the site which are suitable for basins or ponds.
Filter Strips and Swales	Swales are linear vegetated drainage features, which provide overland conveyance and storage of surface water whilst trapping sediments and hydrocarbons within run-off. They also create biodiverse areas for planting and habitat. Swales are not considered suitable for this site due to the urban setting restricting the availability of space and suitability of swales.
Infiltration Devices	Infiltration devices are not considered suitable for the main drainage system due to the impermeable nature of the existing ground.
Permeable Paving	Whilst incorporating attenuation storage, permeable paving also provides treatment through filtration of silt (and attached pollutants), settlement and retention of solids, adsorption of pollutants and biodegradation of organic pollutants, including petrol and diesel. The external areas will be tanked permeable paving
Tanked Systems	This is the least sustainable option in terms of the SuDS Hierarchy. However, the use of tanked systems would still be of benefit compared to traditional drainage systems as it does allow run-off to be slowed down to an acceptable discharge rate. There are no tanks proposed for the site.



4 Surface Water Drainage Design

4.1 Existing Site Runoff

- 4.1.1 The development area currently comprises a number of buildings with extensive areas of parking and hardstanding. The existing and proposed areas are summarised below.

Table 2: Site Areas

Parameter	Existing (m2)	Existing (%)	Proposed (m2)	Proposed (%)
Impermeable area	200	5	2250	47
Permeable area	4600	95	2550	53
Total area	4800	100	460	100

- 4.1.2 The surface water runoff from the site currently infiltrate into the ground

4.2 Design Considerations

- 4.2.1 Consideration has been given to the following when calculating the proposed impermeable areas.

- The 2013 EA 'Rainfall Run-off Management for Developments' Report (SC030219) states that urban creep, the process of gradually increasing impermeable area within an urban area (through paving soft landscaped surfaces and constructed outbuildings etc), is an acknowledged issue. To include an allowance for urban creep, the impermeable area used in the drainage calculations has been increased by 10% in accordance with the recommendation made in SC030219.

- 4.2.2 Site discharge should be as close to greenfield rates as possible. However, as the greenfield rates from this site are low (See Appendix C), in accordance with best practice, outflow controls will be set to discharge at a rate of 5 litres/second.

- 4.2.3 The climate change allowance used in the Drainage Strategy is in line with updated EA guidance values published in February 2016 for increased rainfall intensities by 2115.

4.3 Existing Greenfield Run-Off Rates

- 4.3.1 The existing run-off rates for a variety of return periods have been calculated using the Wallingford method.

- 4.3.2 The greenfield run-off rates are based on the parameters provided below in Table 3.



Table 3: Rural Run-off Calculator Parameters

Parameter	Value
Area (ha)	0.48
SAAR (mm)	654
Soil Type	4

- 4.3.3 The calculations are presented in Appendix C and summarised below in table 4.

Table 4: Existing Greenfield Run-off Rates

Parameter	Value for site (l/s)
QBAR	2.14
Q1	5
Q30	5
Q100	5

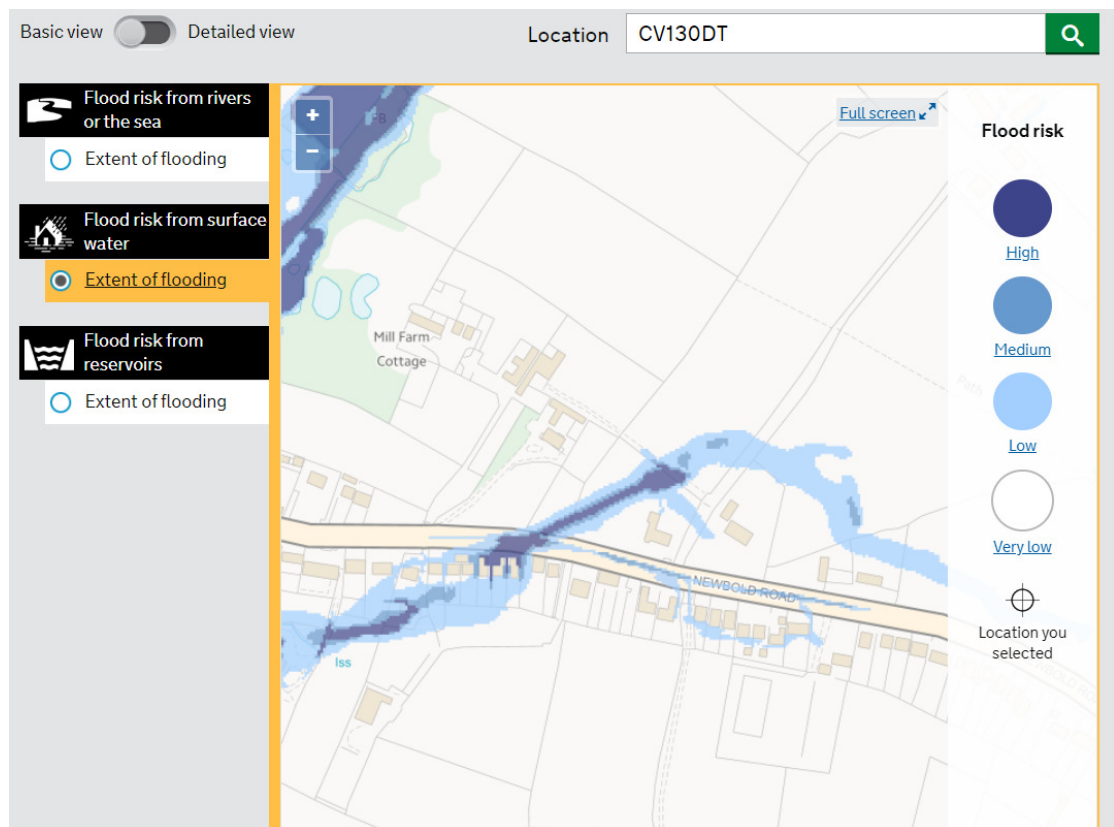
- 4.3.4 As the greenfield rates from this site are low, in accordance with best practice, outflow controls will be set to discharge at a rate of 5 litres/second.

4.4 Flood Risk Reduction

- 4.4.1 As infiltration is not possible on this site, reducing post development run-off volumes to pre-development volumes is achieved through attenuation.
- 4.4.2 By controlling run-off rates to 5 litres/second and providing attenuation for all storm events up to and including a 1 in 100-year storm plus 40% climate change allowance, the risk of downstream flooding will be minimised.
- 4.4.3 Details of the drainage system and attenuation structures are presented in the design drawings and calculations in Appendix C.
- 4.4.4 The calculations include an assessment of the attenuation for the 100-year storm +40% climate change.
- 4.4.5 A total attenuation volume of approximately 120 cubic metres is proposed to cater for the 100 year +40% storm event.

4.5 Exceedance Flooding and Overland Flow

- 4.5.1 The area is subject to existing overland flow routes and surface water flooding. See the surface water flood map below.



- 4.5.2 In order to minimise the risk from surface water flooding, it is proposed to maintain this flow route through the site using the proposed roadways. See appendix C for details
- 4.5.3 It should be noted that the drainage system has been designed to cater for the 1 in 100 year + 40% climate change storm. ie in this storm event all surface water will be collected on site and slowly released. Thus, the flow route will only be in use in the event of drainage network failure, storms in excess of the 1 in 100 year + 40% climate change storm or flows from offsite flowing through the site.

4.6 *Consents, Offsite Works and Diversions*

- 4.6.1 The proposed surface water drainage strategy is accommodated mostly on-site, with the only requirement for off-site works being the connection to the Severn Trent Water sewer.

4.7 *Maintenance*

- 4.7.1 A SuDS maintenance plan has been prepared to outline the management of the potential SuDS features. The maintenance plan is provided in Appendix D.



5 Water Quality

5.1 *Post-Development Water Quality Treatment*

5.1.1 In line with the 2015 SuDS Manual (CIRIA C753), certain criteria should be applied to manage the quality of run-off to support and protect the natural environment effectively. Treatment design, wherever practicable, should be based on good practice, comprising the following principles:

- Manage surface water run-off close to source
- Treat surface water run-off on the surface
- Treat surface water run-off to remove a range of contaminants
- Minimise risk of sediment remobilisation
- Minimise impacts from accidental spills

5.1.2 Managing pollution close to the source can help keep pollutant levels and accumulation rates low, essentially allowing natural treatment processes to be effective. This in turn can help maximise the amenity and biodiversity value of downstream surface SuDS components and keep maintenance activities straightforward and cost-effective.

5.1.3 The proposed development comprises two types of land use; residential roofs and a car parks/low traffic driveway. These land uses are classified as having very low and low hazard pollution levels, respectively. This table is provided below in Table 5.

Table 5: Pollution Hazard Indices from 2015 SuDS Manual (C753)

TABLE 26.2 Pollution hazard indices for different land use classifications				
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones 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 (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg 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 ¹	High	0.8 ²	0.8 ²	0.9 ²



- 5.1.4 The proposed drainage strategy utilises the following SuDS features:
- Tanked permeable paving
- 5.1.5 The indicative SuDS mitigation indices, provided in Table 26.3 of the 2015 SuDS Manual (C753) have been reviewed for the roof and paving. This table is provided below in Table 6.

Table 6: Indicative SuDS Mitigation Indices from 2015 SuDS Manual (C753)

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters			
Type of SuDS component	Mitigation indices¹		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ⁴	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

- 5.1.6 To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type), as follows:

$$\text{Total SuDS mitigation index} \geq \text{pollution hazard index}$$

(for each contaminant type) (for each contaminant type)

- 5.1.7 For each type of land-use, the pollution hazard indices, mitigation indices and concluding hazard have been outlined in Table 7 below.

Table 7: Roof Space Water Quality Mitigation Summary

Residential Roofs				SuDS Manual Reference
	TSS	Metals	Hydrocarbons	
Pollution Hazard Index	0.2	0.2	0.05	Table 26.2
Mitigation Index (Permeable Paving)	0.7	0.6	0.7	Table 26.3
Total Mitigation index	0.7	0.6	0.7	Worst case only



Result	Total SuDS mitigation index $\geq$ pollution hazard index and therefore hazard is exceeded
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Table 8: External Pavement Space Water Quality Mitigation Summary

Residential Roofs				SuDS Manual Reference
	TSS	Metals	Hydrocarbons	
Pollution Hazard Index	0.5	0.4	0.4	Table 26.2
Mitigation Index (Permeable Paving)	0.7	0.6	0.7	Table 26.3
Total Mitigation index	0.7	0.6	0.7	Worst case only
Result	Total SuDS mitigation index $\geq$ pollution hazard index and therefore hazard is exceeded			

- 5.1.8 Therefore, it can be concluded that the provision of permeable exceeds the required pollution mitigation indices and provides sufficient treatment as part of the surface water management train, in accordance with the 2015 SuDS Manual (CIRIA C753).
- 5.1.9 Given that the site is not located in a Source Protection Zone, it is not considered necessary to apply a more cautionary approach.



6 Foul Run-off

6.1 *Discharge to Public Sewer Network*

- 6.1.1 Severn Trent Water are the foul sewerage suppliers for the area.
- 6.1.2 The identified point of connection from the site is into the public foul sewer network in the street. A Sewer connection application will be submitted to Severn Trent Water for approval.



7 Drainage during construction

7.1 Construction Run-off Management

7.1.1 Installing the surface water and foul drainage system, whilst managing temporary run-off, are key aspects of the construction works involved in any development. The information provided below is in accordance with the 'C698 Site handbook for the construction of SUDS' (CIRIA, 2007).

7.1.2 Please note that the measures recommended below are recommendations only and need to be confirmed at the construction stage by the client and the contractor.

7.2 Management of Construction (Including Drainage)

7.2.1 Drainage is typically an early activity in the construction stage of a development, taking form during the earthworks phase. However, final construction i.e. piped drainage system connections to the SuDS devices, should not take place until the end of site development work, unless a robust strategy for silt-removal is implemented prior to occupation of the site.

7.2.2 A plan for the management of construction (including phasing of works, details of any offsite works etc.) cannot be provided at this early stage, as construction work plans are not yet known. However, the following key points are general construction issues associated with SuDS which will be addressed when these plans are complete:

- Silt-laden waters from construction sites represent a common form of waterborne pollution;
- These silt-laden waters cannot enter SUDS drainage systems unless specifically designed to accept this as it can clog the systems and pollute receiving waters. Therefore, piped drainage systems should not be connected to the attenuation SuDS devices until the late stages of construction.
- Any gullies and piped systems should be capped off during construction and fully jetted and cleaned prior to connection to the attenuation SuDS devices.

7.3 Temporary Drainage During Construction

7.3.1 The three principal aspects of drainage control during construction are trapping sediment, conveying run-off, and controlling run-off.

7.3.2 Sediment traps and barriers can include basin traps and sediment fences (with any necessary boundary controls). The principal basins are to be installed after the construction site is accessed. Sediment fences and barriers will then be installed as needed during grading.

7.3.3 Conveyance of run-off can be achieved through small ditches/stream, storm drains, channels and sloped drains with sufficient inlet/outlet protection.

7.3.4 Slope stability needs to be considered when using any channels to convey run-off across the site into any basins etc.

7.3.5 Run-off control measures will need to be implemented in order not overwhelm the temporary system and cause flooding issues. Run-off rates from the site will be managed so they are no greater than pre-development



or in keeping with the best practice guidance to minimise risk of blockage. Any additional conveyance measures are to be installed as needed during grading.

- 7.3.6 Run-off control to include provision of perimeter ditches or appropriate levels grading to direct any water from the construction site to remain on site.
- 7.3.7 Any necessary surface stabilisation measures are to be applied immediately on all disturbed areas where construction work is either delayed or incomplete.
- 7.3.8 Maintenance inspections are to be performed weekly, and maintenance repairs to be made immediately after periods of rainfall.

7.4 *Protection of Drainage Infrastructure during Construction*

- 7.4.1 All drainage infrastructure should be protected from damage by construction traffic and heavy machinery through the implementation of measures such as protective barriers, and storing construction materials away from the drainage infrastructure.



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Appendix A: Proposed Development Details



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Appendix B: Topographic Survey

NOTES

GENERAL NOTES :-

ALL LEVELS ARE IN METRES DERIVED FROM GPS TRANSFORMATION.
GRID COORDINATES ARE ORDNANCE SURVEY NATIONAL GRID DERIVED FROM GPS TRANSFORMATION.
GPS COORDINATES AND LEVELS SET AT ST01 (NO SCALE FACTOR APPLIED)

THIS DRAWING HAS BEEN PRODUCED WITH A PLOT SCALE ACCURACY OF 1:200

SERVICE COVERS INDICATED WHERE VISIBLE. PIPE INVERTS / DETAILS SURVEYED FROM SURFACE.
INSPECTION ONLY. GENERALLY DAMAGED COVERS AND COVERS WITHIN HIGHWAYS WILL NOT BE LIFTED

TREE SPECIES SHOULD BE CONFIRMED BY TREE SPECIALIST IF CRITICAL.

OVERHEAD CABLES ARE INDICATED USING REMOTE SURVEY METHODS AND ARE SUBJECT TO SEASONAL VARIATION, AND SHOULD BE TREATED AS APPROXIMATE.

SERVICE COVERS LOCATED UNDER PARKED VEHICLES/MOBILE STRUCTURES MAYBE OMITTED.
BURIED SERVICE COVERS WILL NOT BE INDICATED.

TOPOGRAPHICAL SURVEY/UTILITY KEY :-

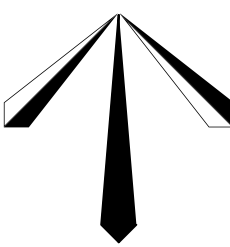
(ht) = height	ol = off let
a = aerometer	osa = off survey area
p/g = pea trap	OSBM = ordnance survey bench mark
a/f = assumed route	p & f = fence - post & rail fence
av = air valve	pd = pit depth
bb = bellina beacon	pr = pipe riser
bd = back drop	ptg = pipe to ground
bl = bed level	pta = pipe to surface
bol = bollard	re = rodding eye
bot = bottom of shaft	ret wall = retaining wall
bt = telecom	rs = road sign
c/f fence = closeboard fence	rwp = rain water pipe
c/box = control box	s/birch = silver birch
cstv = cable television	s/p = safety paving
cl = cover level	ssg = sagging
con = conifer	sec fence = security fence
cr = cable riser	sfc = soil filled chamber
cws = combined water sewer	sl = spot light
d/chun = drainage channel	sp = soil pipe
elb = electric junction box	st = stop top
elec = electric	sv = stop valve
eol = end of trace	sw = storm water sewer
ep = electric pole	TBM = temporary bench mark
er = earth rod	tfr = taken from records
f/bed = flower bed	tl = threshold level
fh = fire hydrant	top = top of cap
fl = floor level	top = top of pipe
fs = fire switch	tot = top of tank
fws = foul water sewer	tp = telecom pole
g = gully	ts = traffic signal
g/run = gully run	u/s = trench scar
gr = gas riser	u/s = underside
h/chestnut = horse chestnut	ut = unable to lift
h/thorn = hawthorn	utr = unable to rod
ic = inspection cover	uta = unable to survey
il = inert level	utl = unable to trace
ill = illuminated	vp = vent pipe
int = interceptor	w/c = water filled chamber
lp = lamp post	wl = water level
mh = manhole cover	wm = water meter
mkr = marker	wp = waste pipe
o/h = over head	wr = water riser

SURVEY CONTROL :-

STATION	EASTINGS	NORTHINGS	LEVEL
ST01	443373.856	305380.855	128.094
ST02	443436.571	305364.892	128.787
ST03	443388.311	305398.451	128.084
ST04	443412.770	305441.186	128.489
ST05	443434.913	305383.729	128.467
ST06	443460.784	305416.657	128.953

NORTH POINT :-

NORTH



UTILITY SURVEY KEY :-

HATCHED AREA	N	N	ELECTRIC CABLE
BOREHOLE	W	W	WATER PIPE
CPT	SS	SS	STORM SEWER
TRIAL PIT	CS	CS	COMBINED SEWER
HAND PIT	D	D	DUCTS
WINDOW SAMPLE	TV	TV	CABLE TELEVISION
	COM	COM	DATA CABLE
	TEL	TEL	TELECOM CABLE
	G	G	GAS PIPE
	U	U	UNIDENTIFIED SERVICE
	OTHER	OTHER	OTHER
	CCTV	CCTV	CCTV
	TL	TL	TRAFFIC LIGHT
	O	O	OFFSET FILL
	V	V	VENT
	F	F	FUEL PIPE
	GL	GL	GAUGE LINES
	P	P	PIPE
	AR	AR	ASSUMED ROUTE
	TR	TR	TAKEN FROM RECORDS

DISCLAIMER :-

Electromagnetic techniques have been used in the location of underground services. The results are not infallible and trial excavations should be carried out to confirm service identification, positions and particularly depths, where these are critical. The completeness of the underground services information cannot be guaranteed.

This method of survey does not differentiate between live and dead services, and as such all services should be treated as live. This drawing may not include the location of all public services that may cross the site, therefore the relevant service drawings should be obtained from the appropriate utility company and used in conjunction with this drawing.

Private service pipes and cables in highways are not shown, but their presence should be anticipated.

Additional below ground structures or obstructions not shown on this drawing may be present. Reference should be made to historical plans and as-built drawings. Locations in the vicinity of services should be carried out with due diligence ref: H5247 document avoiding dangers from underground services

Please note that factors such as ground conditions, proximity of other utilities, material and method of construction have an influence on the quality of the data collected on site.

BSA Standards - "Even an appropriate and professionally executed survey may not be able to achieve a 100% detection rate."

UTILITY NOTES



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Project 75A NEWBOLD ROAD, BARLESTONE, CV13 0DT

Title TOPOGRAPHICAL SURVEY

Date AUGUST 2018

Revisions

Scale 1:200@A1

Dwg No 32315 - 1

Surveyor G.B

Checked E.P

TOPOGRAPHICAL (LAND) SURVEYORS / UTILITY SURVEYORS
BUILDING MEASUREMENT SURVEYORS / 3D LASER SCANNING

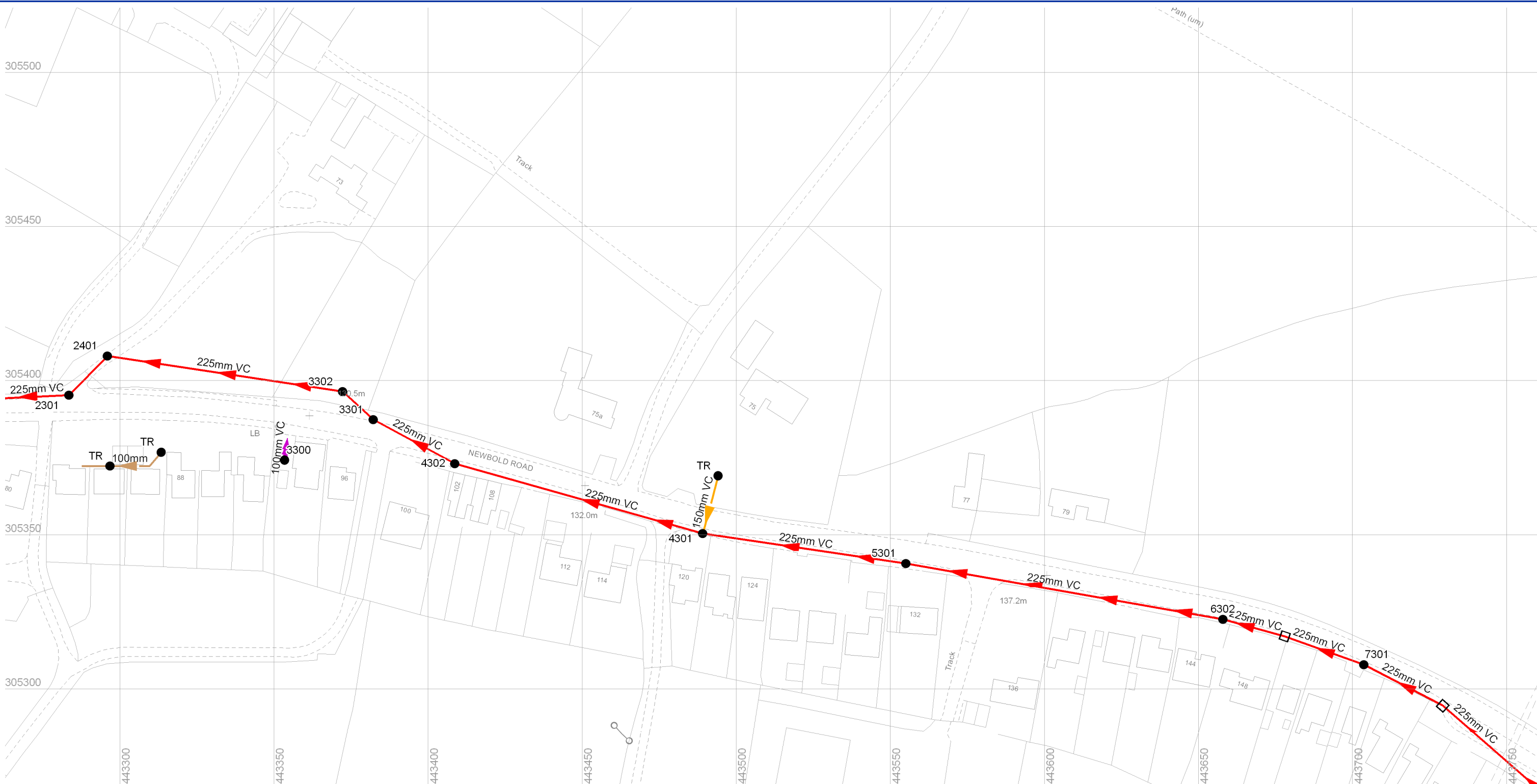


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Appendix C: Drainage Drawings and Calculations



Abandoned Gravity Sewer

Private Combined Gravity Sewer

Private Foul Gravity Sewer

Private Surface Water Gravity Sewer

Public Combined Gravity Sewer

Public Foul Gravity Sewer

Public Surface Water Gravity Sewer

Trunk Combined Gravity Sewer

Trunk Foul Use Gravity Sewer

Trunk Surface Water Gravity Sewer

Combined Use Pressurised Sewer

Foul Use Pressurised Sewer

Surface Water Pressurised Sewer

Highway Drain

Combined Lateral Drain (SS)

Foul Lateral Drain (SS)

Surface Water Lateral Drain (SS)

Culverted Watercourse

Cable, Earthing

Cable Junction

Cable, Optical Fibre/Instrumentation

Cable, Low Voltage

Cable, High Voltage

Cable, Other

Housing, Building

Housing, Kiosk

Disposal Site

Sewage Treatment Works

Housing, Other

Pipe Support Structure

Sewage Pumping Facility

Sewer Facility Connection Inlet / Outlet

Blind Shaft

Combined Use Manhole

Flushing Chamber

Foul Use Manhole

Grease Trap

Head Node

Hydrobrake

Lamphole

Outfall

Overflow

Penstock

Petrol Interceptor

Sewer Chemical Injection Point

Sewer Junction

Sewerage Air Valve

Sewerage Hatch Box Point

Sewerage Isolation Valve

Soakaway

Surface Water Manhole

Vent Column

Waste Water Storage

Pre-1937 Properties

MATERIALS

- NONE

AC - ASBESTOS CEMENT

BR - BRICK

CC - CONCRETE BOX CULVERT

CI - CAST IRON

CO - CONCRETE

CSB - CONCRETE SEGMENTS (BOLTED)

CSU - CONCRETE SEGMENTS (UNBOLTED)

DI - DUCTILE IRON

GRC - GLASS REINFORCED CONCRETE

GRP - GLASS REINFORCED PLASTIC

MAC - MASONRY IN REGULAR COURSES

MAR - MASONRY RANDOMLY COURSED

PE - POLYETHYLENE

PF - PITCH

PP - POLYPROPYLENE

PSC - PLASTIC STEEL COMPOSITE

PVC - POLYVINYL CHLORIDE

RPM - REINFORCED PLASTIC MATRIX

SI - SPUN (GREY) IRON

ST - STEEL

U - UNKNOWN

VC - VITRIFIED CLAY

XXX - OTHER

SHAPE

C - CIRCULAR

E - EGG SHAPED

O - OTHER

R - RECTANGLE

S - SQUARE

T - TRAPEZOIDAL

U - UNKNOWN

CATEGORIES

W - WEIR

C - CASCADE

DB - DAMBOARD

SE - SIDE ENTRY

FV - FLAP VALVE

BD - BACK DROP

S - SIPHON

HD - HIGHWAY DRAIN

S104 - SECTION 104

PURPOSE

C - COMBINED

E - FINAL EFFLUENT

F - FOUL

L - SLUDGE

S - SURFACE WATER

SEVERN TRENT WATER

SEVERN TRENT WATER LIMITED
ASSET DATA MANAGEMENT
PO BOX 5344
COVENTRY
CV3 9FT
Telephone: 0845 601 6616

SEWER RECORD

O/S Map scale: 1:1250

Date of issue: 27.02.19

This map is centred upon:

O / S Grid reference:

x : 443512

y : 305395

Disclaimer Statement:

1. Do not scale off this Map.

2. This map and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its correctness is given or implied. In particular this Map and any information shown on it must not be relied upon in the event of any development or works (including but not limited to excavations) in the vicinity of Severn Trent Water's assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems.

3. On 1 October 2011 most private sewers and private lateral drains in Severn Trent Water's sewerage area, which were connected to a public sewer as at 1 July 2011, transferred to the ownership of Severn Trent Water and became public sewers and public lateral drains. A further transfer takes place on 1 October 2012 (date to be confirmed). Private pumping stations, which form part of these sewers or lateral drains, will transfer to the ownership of Severn Trent Water on or before 1 October 2016. Severn Trent Water does not possess complete records of these assets.

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Sewer Node

Sewer Pipe Data

REFERENCE	COVER LEVEL	INV LEVEL UPSTR	INV LEVEL DOWNSTR	PURP	MATL	SHAPE	MAX SIZE	MIN SIZE	GRADIENT	YEAR LAID
SK43053300	nil	nil	nil	F	VC	U	100	nil	0.00	nil
SK43053301	128.09	126.26	126.12	C	VC	C	225	nil	96.07	nil
SK43053302	127.23	126.06	125.69	C	VC	C	225	nil	207.95	nil
SK43054301	131.57	129.52	126.64	C	VC	C	225	nil	28.81	nil
SK43054302	128.16	126.61	126.37	C	VC	C	225	nil	123.04	nil
SK43055301	135.17	133.45	129.62	C	VC	C	225	nil	17.43	nil
SK43056302	137.14	135.34	133.51	C	VC	C	225	nil	57.14	nil
nil	nil	nil	nil	F	VC	nil	nil	nil	0.00	nil

MATERIALS

-	- NONE	PE	- POLYETHYLENE
AC	- ASBESTOS CEMENT	PF	- PITCH
BR	- BRICK	PP	- POLYPROPYLENE
CC	- CONCRETE BOX CULVERT	PSC	- PLASTIC STEEL COMPOSITE
CI	- CAST IRON	PVC	- POLYVINYL CHLORIDE
CO	- CONCRETE	RPM	- REINFORCED PLASTIC MATRIX
CSB	- CONCRETE SEGMENTS (BOLTED)	SI	- SPUN (GREY) IRON
CSU	- CONCRETE SEGMENTS (UNBOLTED)	ST	- STEEL
DI	- DUCTILE IRON	U	- UNKNOWN
GRC	- GLASS REINFORCED CONCRETE	VC	- VITRIFIED CLAY
RP	- GLASS REINFORCED PLASTIC	XXX	- OTHER
MAC	- MASONRY IN REGULAR COURSES		
MAR	- MASONRY RANDOMLY COURSED		

SHAPE

C	- CIRCULAR
E	- EGG SHAPED
O	- OTHER
R	- RECTANGLE
S	- SQUARE
T	- TRAPEZOIDAL
U	- UNKNOWN

PURPOSE

C	- COMBINED
E	- FINAL EFFLUENT
F	- FOUL
L	- SLUDGE
S	- SURFACE WATER

TABULAR KEY

- A. Sewer pipe data refers to downstream sewer pipe.
- B. Where the node bifurcates (splits) X and Y indicates downstream sewer pipe.
- C. Gradient is stated a 1 in...



Severn Trent Water Limited
Asset Data Management
PO Box 5344
Coventry
CV3 9FT
Telephone: 0845 601 6616

SEWER RECORD DATA TABLE

O/S Map scale:	1:1750	This map is centred upon: O / S Grid reference:
Date of issue:	27.02.19	x: 443512
Sheet No.	2 of 2	y: 305395

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Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:

Site name:

Site location:

Site Details

Latitude:

Longitude:

Reference:

Date:

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

Site characteristics

Total site area (ha):

Significant public open space (ha):

Area positively drained (ha):

Impermeable area (ha):

Percentage of drained area that is impermeable (%):

Impervious area drained via infiltration (ha):

Return period for infiltration system design (year):

Impervious area drained to rainwater harvesting (ha):

Return period for rainwater harvesting system (year):

Compliance factor for rainwater harvesting system (%):

Net site area for storage volume design (ha):

Net impermeable area for storage volume design (ha):

Pervious area contribution to runoff (%):

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

Design criteria

Climate change allowance factor:

Urban creep allowance factor:

Volume control approach:

Interception rainfall depth (mm):

Minimum flow rate (l/s):

Methodology

esti

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	4	4
SPR:	0.47	0.47

Hydrological characteristics

	Default	Edited
Rainfall 100 yrs 6 hrs:	--	63
Rainfall 100 yrs 12 hrs:	--	83.93
FEH / FSR conversion factor:	1.09	1.09
SAAR (mm):	654	654
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydrological region:	4	4
Growth curve factor 1 year:	0.83	0.83
Growth curve factor 10 year:	1.49	1.49
Growth curve factor 30 year:	2	2
Growth curve factor 100 years:	2.57	2.57
Q_{BAR} for total site area (l/s):	2.14	2.14
Q_{BAR} for net site area (l/s):	1	1

Site discharge rates

	Default	Edited
1 in 1 year (l/s):	5	5
1 in 30 years (l/s):	5	5
1 in 100 year (l/s):	5	5

Estimated storage volumes

	Default	Edited
Attenuation storage 1/100 years (m³):	107	107
Long term storage 1/100 years (m³):	0	0
Total storage 1/100 years (m³):	107	107

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

ALL DIMENSIONS TO BE CHECKED BY CONTRACTOR

NOTES

1. THIS DRAWING IS FOR PLANNING PURPOSES ONLY AND IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT SERIES DESIGN DRAWINGS, SPECIFICATIONS AND DOCUMENTATION.
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4. ANY DISCREPANCIES IN THE DETAILS SHOWN ARE TO BE REPORTED TO THE EMPLOYERS REPRESENTATIVE/ENGINEER PRIOR TO CONSTRUCTION.
5. ALL EXISTING SERVICES ARE TO BE LOCATED PRIOR TO THE COMMENCEMENT OF ANY WORKS. THE CONTRACTOR MUST NOTIFY THE ENGINEER IMMEDIATELY OF ANY CONFLICT WITH THE PROPOSED WORKS.
6. THE GENERAL SPECIFICATION OF MATERIALS AND WORKMANSHIPS FOR THE CONSTRUCTION OF THE ACCESS ROAD, FOOTPATHS AND OTHER AREAS OF HANDSLANDING SHALL BE THE MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS, VOLUME 1, SPECIFICATION OF HIGHWAY WORKS (SHW) PUBLISHED BY THE STATIONARY OFFICE.
7. ALL RWP AND FO SHOWN ARE INDICATIVE ONLY AND SUBJECT TO APPROVAL AND SETTING OUT BY THE ARCHITECT.
8. ALL LEVELS AND DRAINAGE SHOWN ARE INDICATIVE ONLY AND SUBJECT TO DETAILED DESIGN
9. UNLESS NOTED OTHERWISE, PIPES TO BE:
FOUL PIPES EXTERNAL Ø100@1.80,
SURFACE WATER PIPES Ø100@1.100

DRAINAGE KEY

- Ø100@1:100> Stormwater Pipe - Diameter and fall
Ø100@1:100> Perforated Pipe - Diameter and fall
- SMH Ø1200 Diameter
CL 80.90 Cover Level
IL 80.00 Invert Level
- SIC Ø450 Surface Water Inspection Chamber (PPIC)
- RWP Rain Water Pipe
- Gully
- Channel drain with sump
- Ø150@1:100> Foul Pipe - Diameter and fall
- FMH Ø1200 Diameter
CL 80.90 Cover Level
IL 80.00 Invert Level
- FIC Ø450 Foul Inspection Chamber (PPIC)
- FO Foul Vent Pipe/Sub Stack/Foul Outlet

EXTERNAL WORKS KEY

- 18.30+ Proposed Level
- FFL 80.90 Finished floor level
- Tanked Permeable Paving - See detail

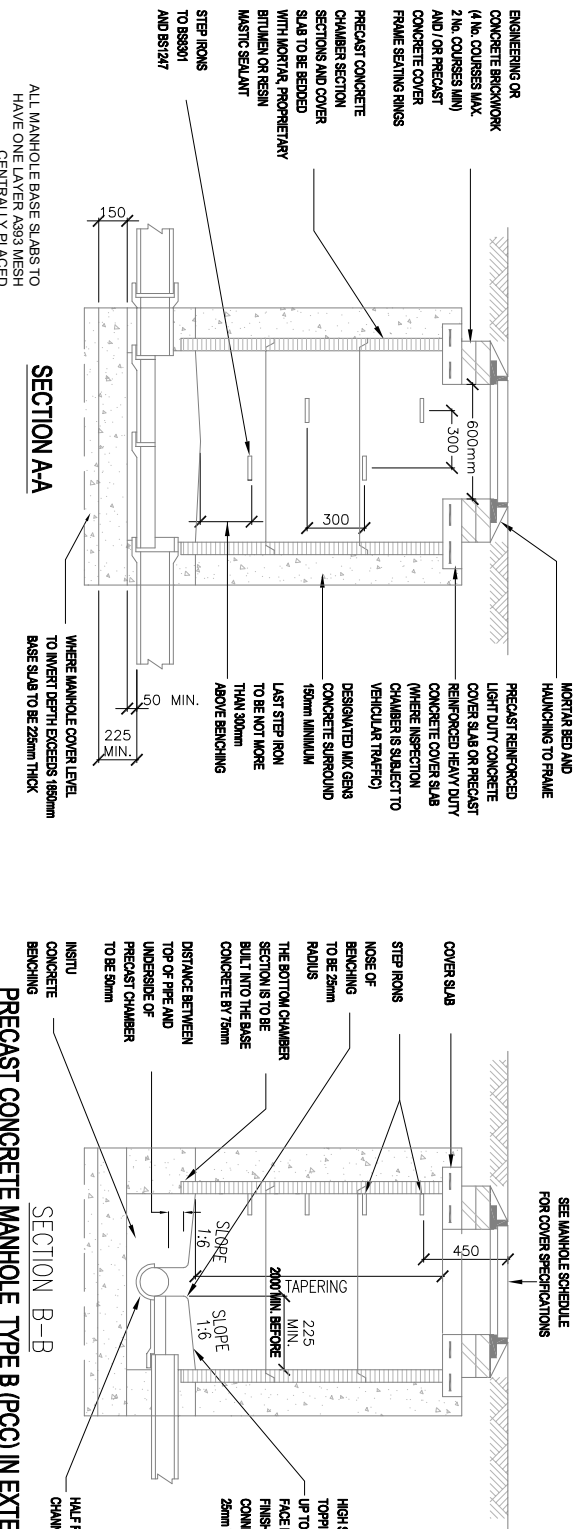
Project
PROPOSED DEVELOPMENT
NEWBOLD ROAD
BARLESTONE
Leicester

Title
PROPOSED DRAINAGE
SITWORKS PLAN

Scale: A1	Drawn	Authorised
1:200	AW	FC
Job No	Drawing No	Revision
1784	C01	-

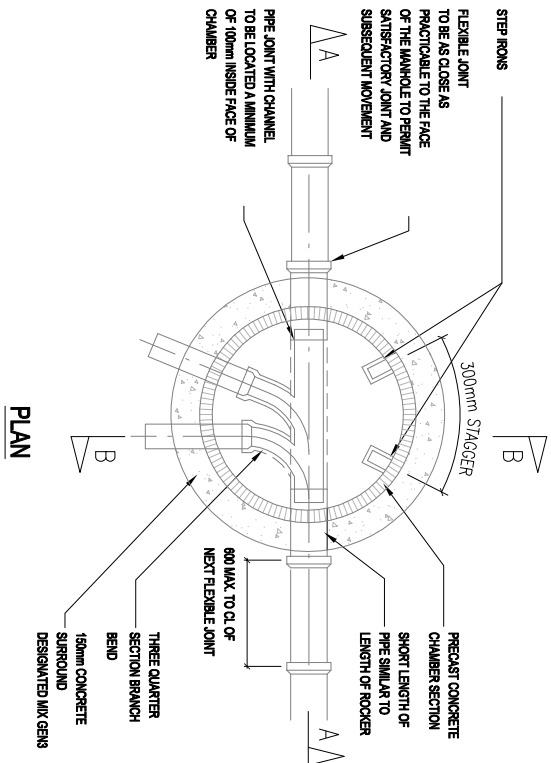
NOTES

- 14 MANHOLE COVERS AND FRAMES SHALL COMPLY WITH BS EN124 AND SHALL BE OF A NON-ROCKING DESIGN, WHICH DOES NOT RELY ON THE USE OF CLUSION INSERTS. CLASS D COVERS SHALL BE USED IN CARRIAGEWAYS, HARD SHOULDERS AND PARKING AREAS USED BY ALL TYPE OF ROAD VEHICLES. CLASS C SHALL BE USED IN FOOTWAYS, PEDESTRIAN AREAS AND ALL COMPARABLE LOCATIONS.



SECTION B-B

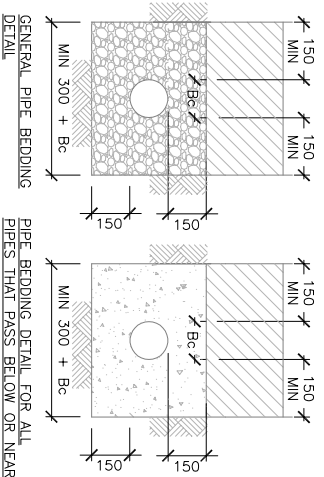
SCALE 1:20



PIPE DIAMETER	ROCKER PIPE * LENGTH
150mm-450mm	500mm-750mm
475mm-750mm	750mm-1000mm
OVER 750mm	1200mm

* OR LINTEL AND COMPRESSIBLE SEALANT IN ACCORDANCE WITH CLAUSE 689 OF THE SPECIFICATION

NOTES:
CHAMBERS WITH OUTGOING PIPES
GREATER THAN 500mm DIAMETER
SHALL BE FITTED WITH GUARD BARS
SAFETY CHAINS OR OTHER SAFETY
DEVICES. THE HOLES TO BE
PROVIDED IN BENCHING OR SEWERS
GREATER THAN 450mm DIAMETER
FOR ACCESS TO INVERT WHERE
INTERNAL HEIGHT EXCEEDS 1800mm
MAINTENANCE MAY BE PROVIDED WITH
REDUCING COVER AND SHAFT.
SHAFT DIAMETER TO BE 600mm
OR 900mm DIAMETER IF
LONGER THAN 500mm.



SELECTED FILL: FREE FROM STONES, LARGER THAN 40mm, LUMPS OF CLAY OVER 100mm, TWIG, FROZEN MATERIAL, VEGETABLE MATTER.

GRANULATED MATERIAL: TO CONFORM TO EN 12620, MAXIMUM GRADE B15, AND GRADUATED MATERIAL FROM 0mm UP TO MAXIMUM SIZE OF 10mm FOR 100mm PIPES, 14mm FOR 150mm PIPES, UP TO 600mm DIAMETER AND 40mm FOR PIPES MORE THAN 600mm DIAMETER.

GEN1 CONCRETE IN ACCORDANCE WITH BS 8500-1:2002.

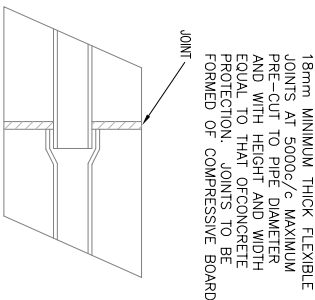
GRANULAR MATERIAL: TO CONFORM TO BS EN 1610 ANNEX B TABLE B.15 AND SHOULD BE SINGLE SIZE MATERIAL, OR GRADDED MATERIAL, FROM 5mm UP TO A MAXIMUM SIZE OF 10mm FOR 100mm PIPES, 16mm FOR 150mm PIPES, 20mm FOR PIPES FOR 150mm UP TO 600mm DIAMETER AND 40mm FOR PIPES MORE THAN 600mm DIAMETER.

GEN1 CONCRETE IN ACCORDANCE WITH
BS 8500-1:2002.

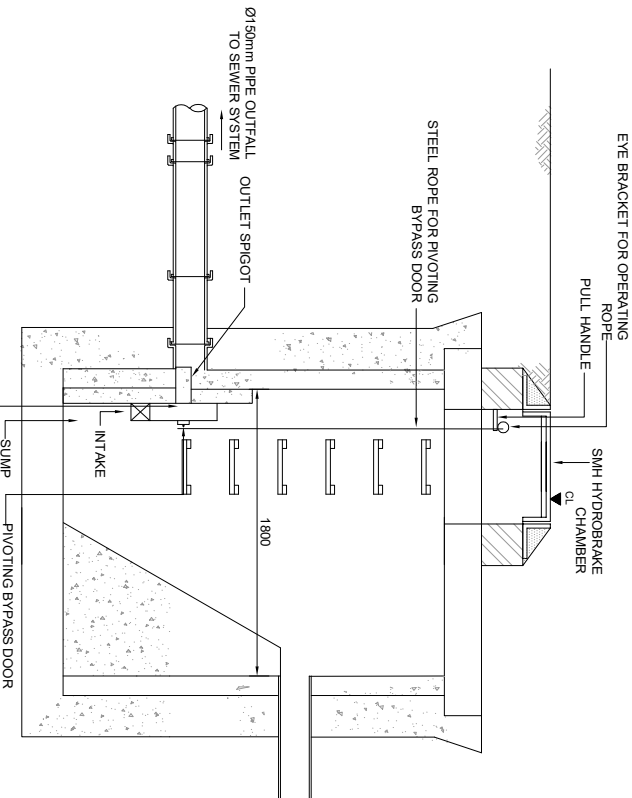
PIPE BEDDING: DETAIL FOR ALL PIPES THAT PASS BELOW OR NEAR FOUNDATIONS. PIPES WITH LESS THAN 600mm COVER IN ALL EXTERNAL AREAS AND PIPES WITH LESS THAN 1200mm COVER BELOW ROADS AND DRIVEWAYS	NOTE: PIPES LESS THAN 1200mm BELOW ROADS AND LESS THAN 600mm BELOW OTHER EXTERNAL AREAS SHALL HAVE A 150mm GENI CONCRETE SURROUND. OTHER THAN PIPES CAST WITH PILECAPS ALL PIPES BELOW SUSPENDED SLAB SHALL HAVE GRAVELLA SURROUND AS SHOWN.
--	--

PIPE BEDDING DETAIL

SCALE 1:10



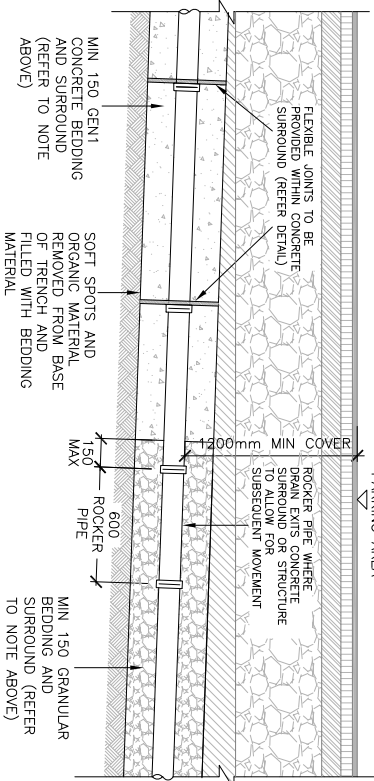
FLEXIBLE JOINTS IN CONCRETE PROTECTION
SCALE 1:10



HYDROBRAKE FLOW CONTROL DETAIL

SCALE 1:20

NOTE: A 150mm GENI CONCRETE SUPROUND SHALL BE USED ON ALL PIPE WORK PASSING BELOW GROUND BEARING FOUNDATIONS (IE STEP FOOTINGS FOR LANDSCAPING WALLS / PLANTERS). 150mm GENI CONCRETE SUPROUND SHALL BE USED ON ALL PIPE WORK (EXCEPT LAND DRAINS) WHICH ARE LESS THAN 1200mm BELOW TRAFFICABLE PAVED AREAS AND LESS THAN 600mm IN ALL OTHER EXTERNAL AREAS. ALL PIPEWORK WITHIN BUILDING FOOTPRINT TO BE BEDDED ON GENI CONCRETE TO A DEPTH OF 150mm. HALF THE PIPE DIAMETER TO BE BEDDED ON GENI CONCRETE TO A DEPTH OF 150mm. PARKING AREA.



PIPE BEDDING

SCALE 1:20

Scale : A1	Drawn	Authorised	
NTS	AW	FC	
Job No	Drawing No	Revision	
1784	C02	-	

CONSTRUCTION DETAILS

PROPOSED DEVELOPMENT
NEWOLD ROAD
BARLESTONE

MARBLE HOMES LEICESTER
27-35 Sussex Street
Leicester

NOTES

- METRES ABOVE LOCAL DATUM.

- TO THE COMMENCEMENT OF ANY WORKS. THE

6. FOR GRAVITY SEWERS, ALL DRAINAGE AND FITTINGS ARE TO BE FLEXIBLY JOINTED UPVC TO BS EN 1401-1 OR CLAYWARE TO BS EN295 OR CONCRETE TO BS5911 PART 100

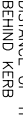
8. CHAMBER WALLS AND COVER SLAB TO BE CONSTRUCTED IN PRECAST CONCRETE TO BS EN 1917 AND BS 5911-3.

- 10 BACKFILL TO ALL TRENCHES UNDER CARRIAGEWAYS TO BE TYPE 1 SUB-BASE MATERIAL, ELSEWHERE BACKFILL TO BE IN ACCORDANCE WITH THE SPECIFICATION, FREE DRAINING READILY COMPACTIBLE MATERIAL, FREE FROM RUBBISH AND ORGANIC MATTER, FROZEN SOIL, CLAY LUMPS AND LARGE STONES. TO BE COMPACTED IN LAYERS NOT EXCEEDING 150mm THICK.

12. THE GENERAL SPECIFICATION OF MATERIALS AND WORKMANSHIPS FOR THE CONSTRUCTION OF THE ACCESS ROAD, FOOTPATHS AND OTHER AREAS OF HARDSTANDING SHALL BE THE MANUAL OF

13. ALL PIPES TO BE LAID SOFFIT TO SOFFIT UNLESS NOTED OTHERWISE.

- 14 MANHOLE COVERS AND FRAMES SHALL COMPLY WITH BS EN124 AND SHALL BE OF A NON-ROCKING DESIGN WHICH DOES NOT RELY ON THE USE OF CLUSION INSERTS. CLASS D COVERS SHALL BE USED IN CARRIAGEWAYS, HARD SHOULDERS AND PARKING AREAS USED BY ALL TYPE OF ROAD VEHICLES. CLASS C SHALL BE USED IN FOOTWAYS, PEDESTRIAN AREAS AND ALL COMPARABLE LOCATIONS.



MARBLE HOMES LEICESTER
27-35 Sussex Street
Leicester

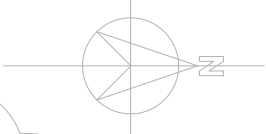
CONSTRUCTION DETAILS 2

1784

ALL DIMENSIONS TO BE CHECKED BY CONTRACTOR

NOTES

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Key



- PRELIMINARY		AW	AW	22.10.19
Rev	Description	Eng	Draft	Date
Developer				
MARBLE HOMES LEICESTER				
27-35 Sussex Street				
Leicester				
Project				
PROPOSED DEVELOPMENT				
NEWBOLD ROAD				
BARLESTONE				
Title				
PROPOSED OVERLAND				
FLOW PATHS				
Scale: A1	Drawn	Authorised		
1:200	AW	FC		
Job No	Drawing No	Revision		
1784	C01	-		

Appendix D: SuDS Maintenance Report



Wallace Engineering
Consulting Engineers

MAINTENANCE REPORT

PROPOSED RESIDENTIAL DEVELOPMENT, 75 NEWBOLD ROAD, BARLESTONE

Prepared For: **Marble Homes Leicester Ltd**

Prepared By: **Wallace Engineering Ltd**
Consulting Engineers
22 Park Rise
Harpenden
AL5 3AL
Tel: 07854 199 245
E: andrew@wallaceengineering.co.uk

Report number 1784/02

Revision: **A** 22/10/19

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1.0 General

- 1.1 Sustainable Drainage Systems (SuDS) are an environmentally friendly approach to managing rainfall. SuDS techniques use landscape features and tanks to deal with surface water with the aim to:
- 1.1.1 Control the flow, volume and frequency of water leaving a development.
 - 1.1.2 Prevent pollution by intercepting silt and cleaning runoff from hard surfaces.
 - 1.1.3 Provide attractive surroundings for the community.
- 1.2 The surface water drainage strategy for this development utilises a green roof and permeable paving as the main SUDS features as well as a number of minor features (silt traps, trapped gullies). The following sections provides a brief description of these features and outlines the maintenance programme that should be adopted.

2.0 Timetable and Responsibility

- 2.1 The works proposed at this site are to begin as soon as approval is obtained from the local authority, and the drainage system should be in place by approximately December 2020. The drainage maintenance regime should begin as soon as installation is complete
- 2.2 Responsibility for the inspection and maintenance will be with the site occupier. They may choose to appoint a management company to complete the works, but ultimate responsibility will be with the occupier of the site.

3.0 Cleaning of the Drainage System

- 3.1 Drainage systems should be inspected at regular intervals and where necessary, thoroughly cleaned out at the same time. Any defects discovered should be made good.
- 3.2 The following operations should be carried out during the periodic cleaning of a drainage system:-

Product Type	Period	Responsibility	Maintenance Methods
Silt Trap	As necessary and before wet season	Owner/ Maintenance Company	• Sediment and debris that accumulated during summer needs to be removed before the wet season. • Inspect and clean out routinely prior to inlet pipework to minimise debris reaching the tank. • Conduct inspections more frequently during the wet season for the area where sediment or trash accumulates



Product Type	Period	Responsibility	Maintenance Methods
			more often. Clean and repair as needed.
Standard Manholes/ Inspection Chambers	As necessary	Owner/ Maintenance Company	- Remove and clean any soil and vegetation that covers the manhole cover to prevent blockage of the drainage system at the manhole. - Renew/replace any damaged/missing bolts and damaged/missing manhole covers.
Drainage Pipes	Six monthly interval	Owner/ Maintenance Company	Inspect underground drainage pipes to ensure that the distribution pipework arrangement is operational and free from blockages. If required, take remedial action.
Permeable Paving	As required	Owner/ Maintenance Company	Inspect the paving after any precipitation to ensure no displacement of any organic matter onto the surface of the pavement.
	Six monthly (Ideally, this activity to be carried out in spring and autumn seasons)	Owner/ Maintenance Company	Agitate (e.g. brush, vacuum, etc.) the block paving to ensure no vegetation of any sort is allowed to grow and develop in the joints (where may affect performance).
	Winter season	Owner/ Maintenance Company	De-icing may be used without causing significant detrimental effects towards the permeable pavement's performance. When used carefully, the use of these chlorides will not result in an increase in the chloride levels in the local ground.
Hydrobrake	Monthly for 3 months	Owner/ Maintenance Company	Inspect and identify any areas that are not operating correctly. If required, take remedial action.
	Monthly	Owner/ Maintenance Company	Debris removal from catchment surface (where may cause risks to



Product Type	Period	Responsibility	Maintenance Methods
			performance).
	Annually	Owner/ Maintenance Company	• Remove sediment from pre-treatment structures.
	Annually and after large storms	Owner/ Maintenance Company	• Inspection/check all inlets and outlets to ensure that they are in good condition and operating as designed.

4.0 Sketches and Plans

- 4.1 The locations of the above features can be found by examining Drawing 1784/C01