SUDS REPORT FOR 253-255 LONDON ROAD, HEADINGTON, OXFORD, OX3 9EH

PRC2507-REV-B

Date: 01/04/2022

Suite L, The Kidlington Centre
Kidlington, OX5 2DL
www.erscltd.co.uk

CONTENTS

APPENDICES

1. SITE DETAILS

Site Name	253-255 London Road
Site Address	253-255 London Road, Headington, Oxford, OX3 9EH
Purpose of Development	Residential
Existing Land Use	Brownfield
OS NGR	455149E, 207395N
County	Oxford
Country	England
Local Planning Authority	Oxford City Council

1.1. Site Location

The location of the project site is shown in Figure 1 below.

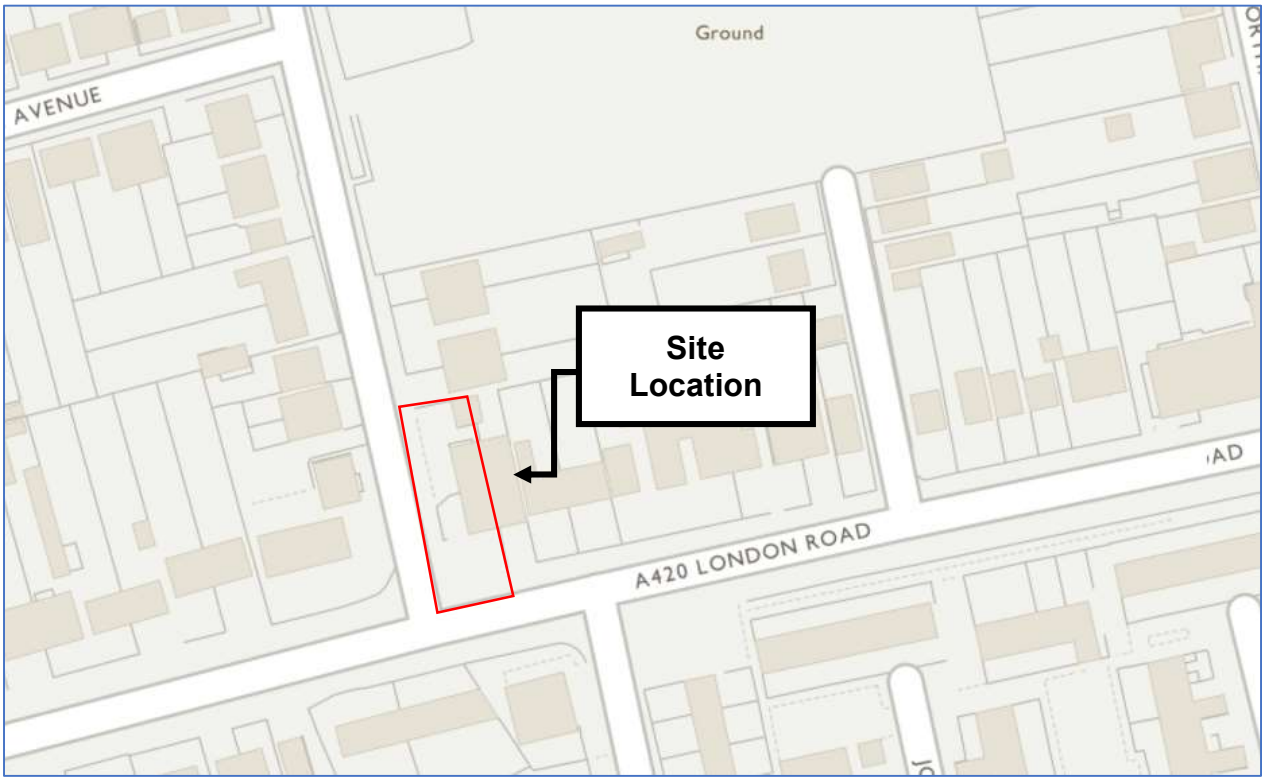


Figure 1- Location of Project Site (Source: UK Grid Reference Finder).

1.2. Existing Site Description

The existing site is brownfield, the ground levels fall gradually from the south to the north of the site.

1.3. Geology of The Area

According to the British geological survey, there was no superficial deposits information available at the time of writing this report, as shown in figure 2 below. The bedrock of the area is a Wheatley limestone member, consisting of limestone, as shown in Figure 3, overleaf.

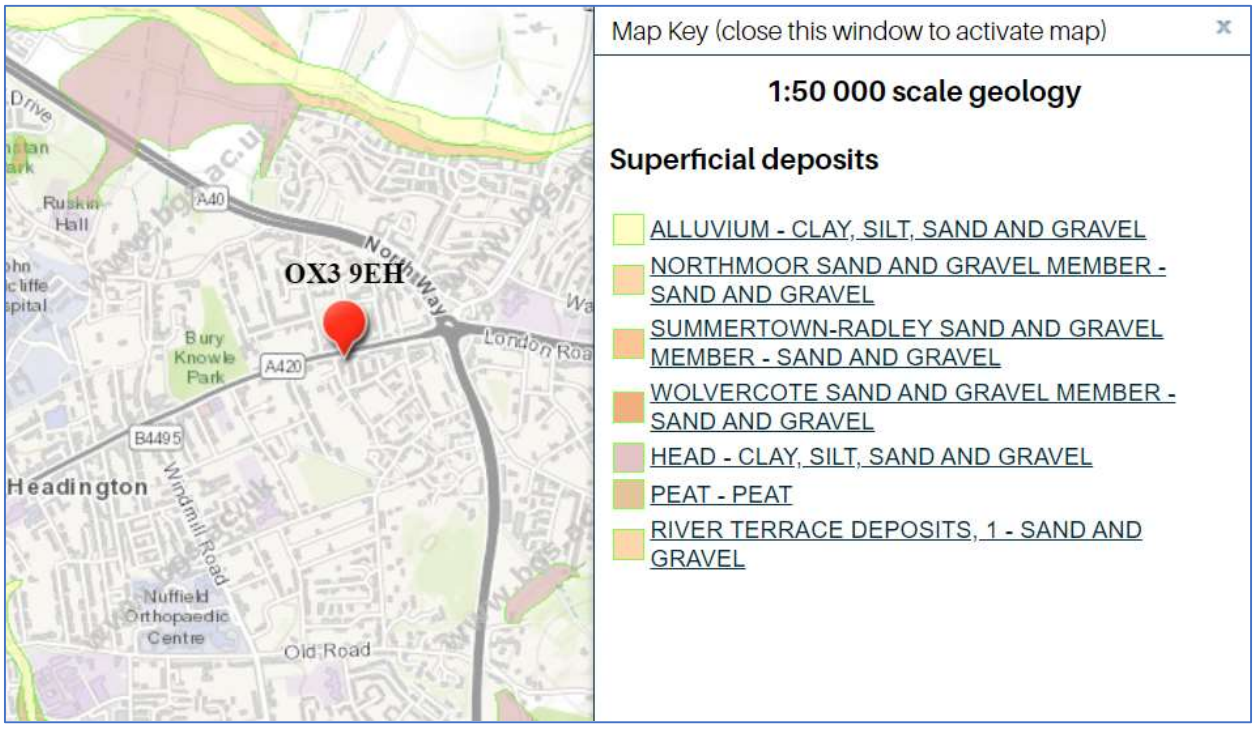


Figure 2- Superficial Deposits at the site. (Source: British Geological Society Website (contains British Geological Survey materials © NERC2022).

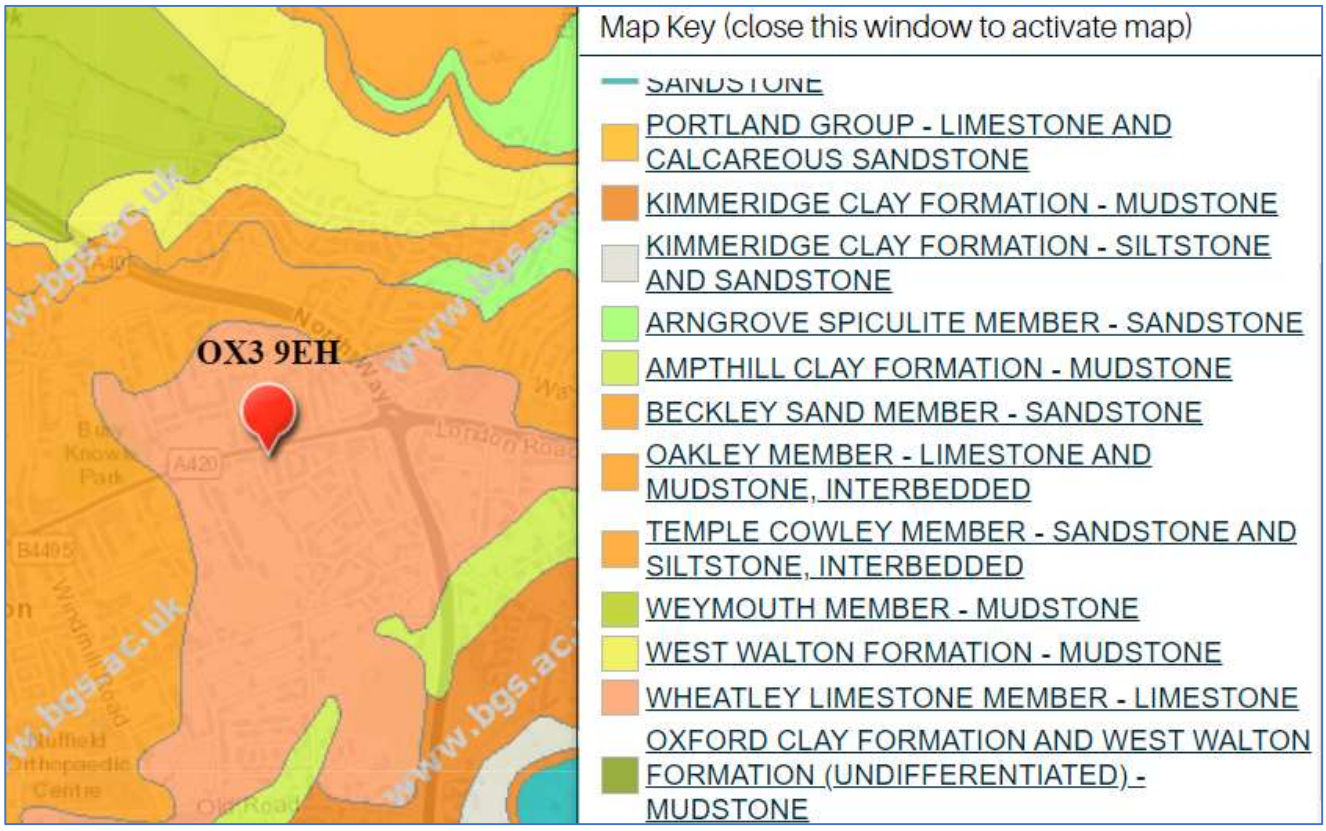


Figure 3- Bedrock at the site. (Source: British Geological Society Website (contains British Geological Survey materials © NERC2022).

1.4. Proposed Development

The proposals involve the construction of a HMO residence, with associated car parking and landscaping.

The proposed site plans from the client can be found in Appendix A.

2. PLANNING POLICIES

- NPPF states:

“The development should be made safe for its lifetime without increasing flood risk elsewhere. Strategic policies should be informed by a strategic flood risk assessment and should manage flood risk from all sources”

The Council will require all development to use sustainable urban drainage systems (SuDS) unless demonstrated that it is not viable. The Council will encourage SuDS to be linked to water efficiency methods. The Council may require developer contributions to guarantee the long-term maintenance and performance of SuDS is to an appropriate standard.

3. SUSTAINABLE URBAN DRAINAGE SYSTEMS

Surface water arising from a developed site should, as far as practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account.

Reducing the rate of surface water discharge from Urban Sites is one of the most effective ways of reducing and managing flood risk.

Traditional piped surface water systems work by removing the surface water from our developments as quickly as possible, however this can cause various adverse impacts:

- Increased downstream flooding, and sudden rises in flow rates and water levels in local water courses.

- Reduction in groundwater levels dry weather flows in watercourses.

- Reduce amenity and adversely affect biodiversity due to the surface water run-off containing contaminants such as oil, organic matter and toxic materials.

SuDS are defined as a sequence of management principles and control structures designed to drain surface water in a more sustainable fashion than conventional piped drainage techniques. SuDS should utilise the environmental, ecological and social benefits.

These include:

- Protection and enhancement of water quality – As well as providing on-site attenuation, SuDS treat the water, resulting in an improved quality of water leaving the site. This is achieved when the water passes through the fine soils and the roots of specially selected plants, pollutants washed of the hard landscaping by rainfall will be safely removed before the water reaches the natural water course.

- A sympathetic approach to the environmental setting by providing the opportunities to create habitats for flora and fauna in urban watercourses and open spaces.

- Meeting the amenity and social needs of the local community and residents in the creation of attractive green spaces.

The various types of SuDS include:

Permeable paving	
Soakaways;	
Swales and basins;	
Bioretention/ rain gardens;	
Green roofs and rainwater re-use;	

Preferably a combination of these techniques should be used as part of the surface water management train, and it is important for all stakeholders, such as developers, architects, landscape architects and engineers to work together at the planning stage in order to determine a feasible solution.

4. PROPOSED SUDS SOLUTION

The total site area is 743m^2, and the impermeable areas of the existing site is 743m^2. Following the development at this site, the impermeable areas will have decreased to 485m^2.

Pre and post development surface water runoff calculations showing the peak flow rate leaving the site, prior to any SuDS mitigation can be found in Appendix B.

The ground conditions are not suitable for soakaways, and there is no available space for these, however we have consulted the water authority asset plans and these show that there are surface water sewers within London Road and Barton Road, these can be found in Appendix C.

In order to ensure that the SuDS management train has been considered fully:

- All hardstanding areas will be formed of permeable surfacing underlain by a hydrocarbon removing geotextile membrane at the car parking area to ensure there is no contamination of the receiving groundwater, in order to deal with as much of the surface water run off at source.

- Two wall mounted rainwater harvesting tanks will be provided in order to promote rainwater re-use, however sedum or green roofs can not be proposed due to the roofs being pitched.

- All remaining run off from the above will then be conveyed into an attenuation crate system, which has been sized for a 1 in 100 year plus 40% climate change storm event, with a flow restriction leaving the tank set to 0.760 l/s which is the existing site's greenfield rate. The volume of storage required has been calculated as 29.2m^3, and this restricted discharge will be conveyed by gravity to the existing surface water sewers at the site or within the vicinity of the site.

All surface water run off calculations can be found in Appendix B.

5. TIMESCALE AND MAINTENANCE OF DRAINAGE WORKS

All drainage works shall be completed prior to first occupation and there shall be no adoption of any of the drainage works within the site. The owners of the site will be responsible in overseeing the long term, maintenance of all communal drains. The following outline maintenance strategy sets out recommended timescales for maintenance of the proposed drainage works, in line with CIRIA SuDS Design Guide:

- Regular inspection will comprise the inspection and cleaning of catchment, gutters, filters and tanks to reduce the likelihood of contamination, this is recommended to be carried out every 3 to 6 months.

- Jet washing of permeable surfaces should be undertaken every 3 to 6 months in order to ensure that the system works properly

- The catch pit chamber and flow control to the attenuation tanks should be emptied every 3 months, and after every large storm event to ensure that there are no blockages.

- Inlets and outlets to rainwater harvesting tanks should be checked regularly to avoid blockages

The following table outlines the maintenance requirements for the new attenuation tanks:

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockages by sediment, algae or other matter: remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/ rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that the are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Table 1: Operation and maintenance requirements for attenuation tanks.

The following table outlines the maintenance requirements for the porous surfacing:

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations or clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto porous surfacing from adjacent impermeable areas as this is the most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48hr after large storms in six months
	Inspect slit accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 2: Operation and maintenance requirements for porous surfacing.

6. CONCLUSIONS

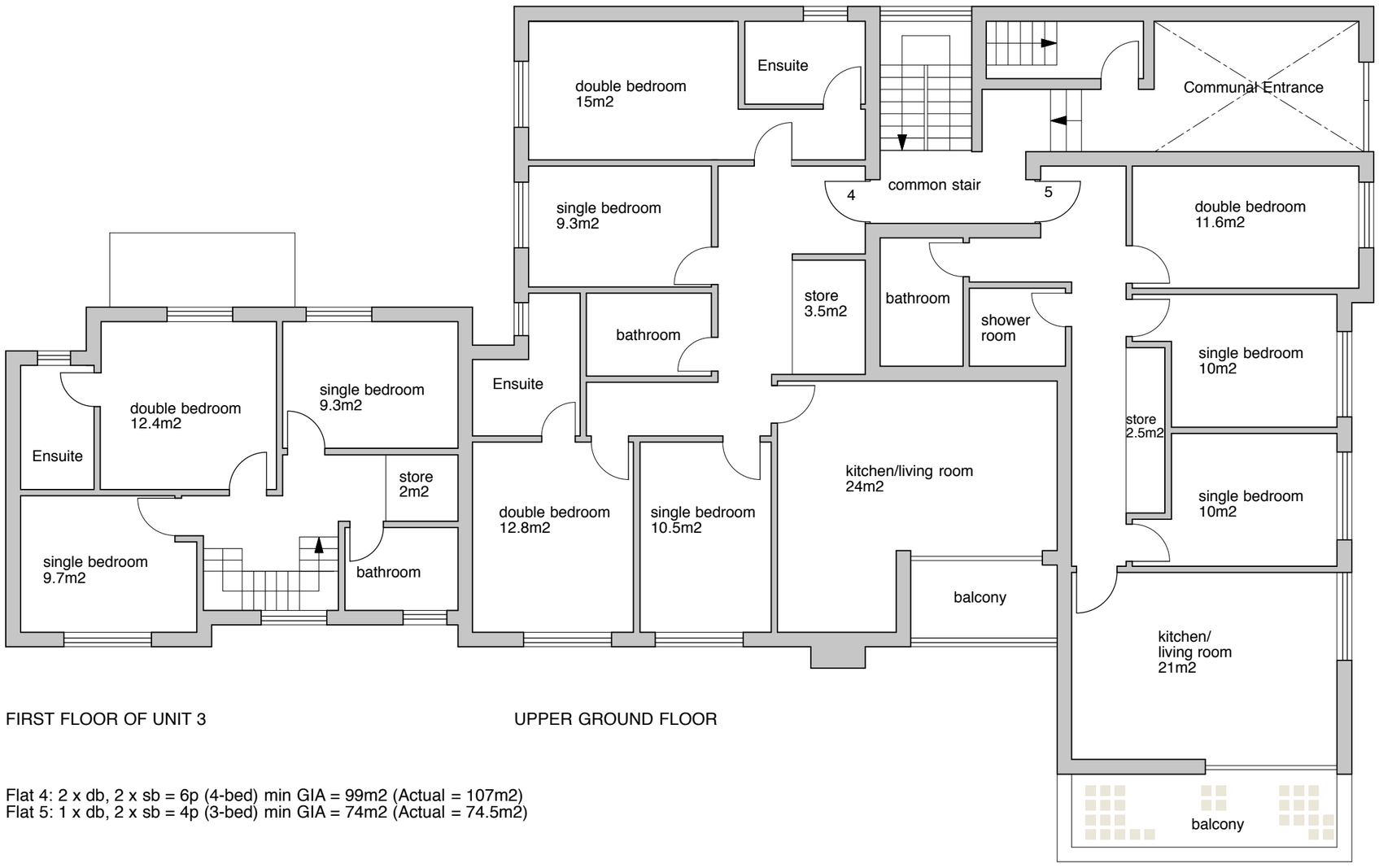
The purpose of this report and associated drawings, is to support the planning application and to satisfy the planners that we have considered the surface water flows arising due to the development at this site.

As requested, SuDS have been incorporated into the design, in the form of all hard-standing surfaces being formed of permeable paving. Two rainwater harvesting tanks will also be provided to encourage rainwater re-use.

All remaining surface water will then be conveyed into an attenuation tank, with restricted flow leaving the site set to the existing site's greenfield rate, therefore there will be a very large reduction in surface water leaving the site as a result of this proposed development.

The timetable of works is to complete all drainage prior to occupation of dwellings, and maintenance requirements are also included in this report.

APPENDIX A - DRAWINGS

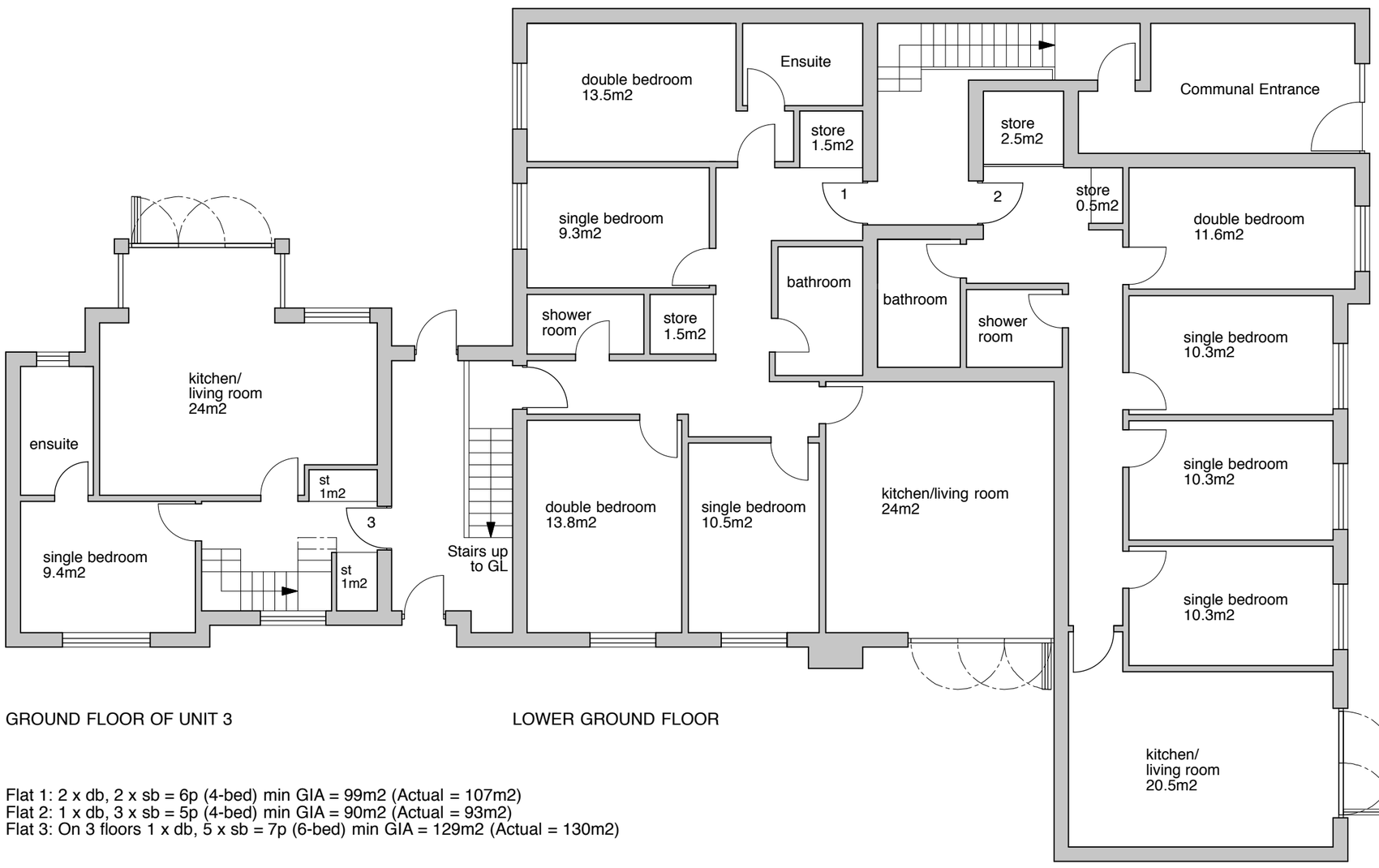


260 GIA

FIRST FLOOR OF UNIT 3

UPPER GROUND FLOOR

Flat 4: 2 x db, 2 x sb = 6p (4-bed) min GIA = 99m2 (Actual = 107m2)
Flat 5: 1 x db, 2 x sb = 4p (3-bed) min GIA = 74m2 (Actual = 74.5m2)



299 GIA

GROUND FLOOR OF UNIT 3

LOWER GROUND FLOOR

Flat 1: 2 x db, 2 x sb = 6p (4-bed) min GIA = 99m2 (Actual = 107m2)
Flat 2: 1 x db, 3 x sb = 5p (4-bed) min GIA = 90m2 (Actual = 93m2)
Flat 3: On 3 floors 1 x db, 5 x sb = 7p (6-bed) min GIA = 129m2 (Actual = 130m2)

0.0 1.0 2.0 3.0 4.0 5.0

Scale = 1 : 100

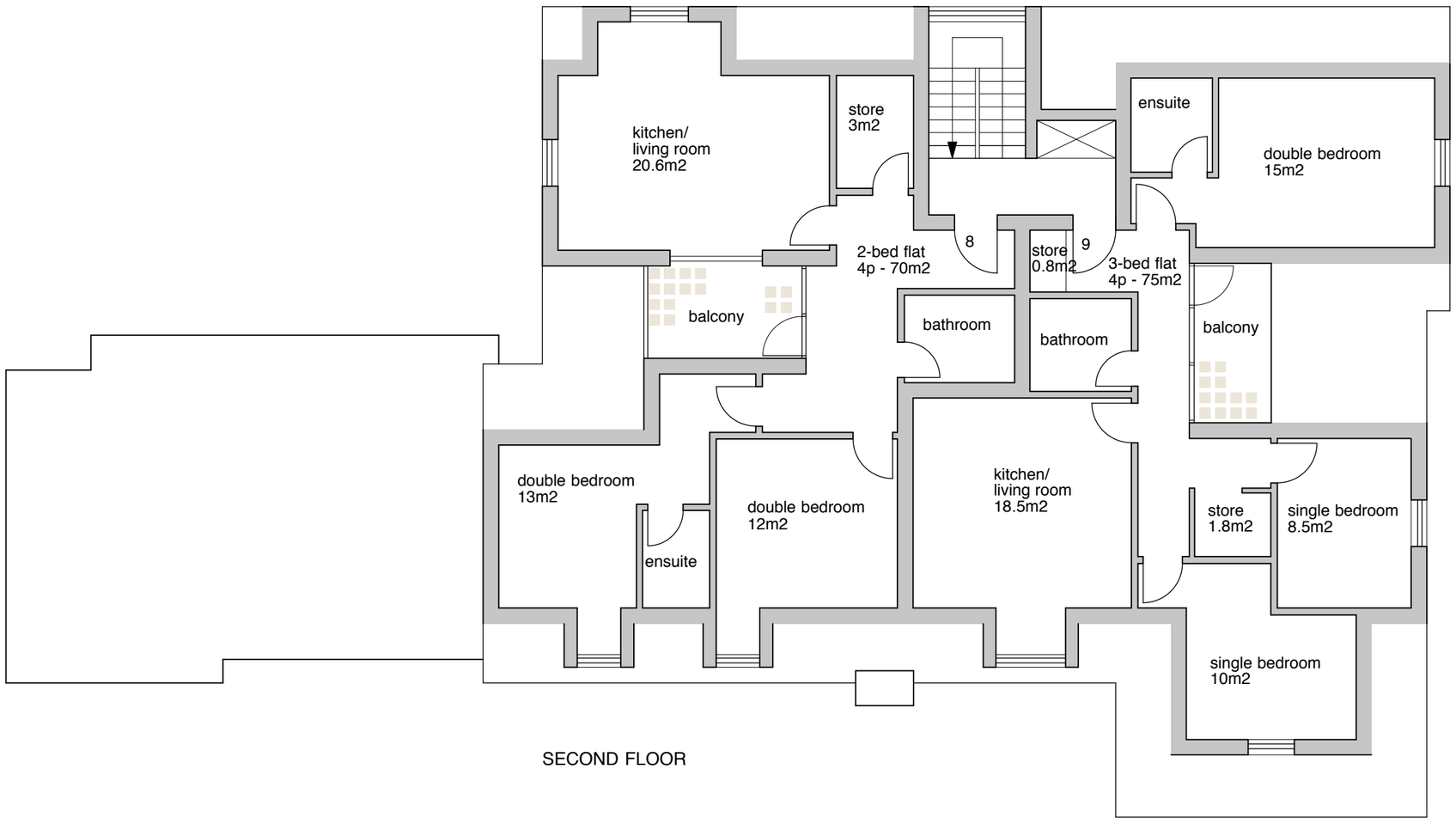
N

LesleyCotton
architect
Unit 12 Standingford House
26 Cave Street
Oxford OX4 1BA
01865 722550

253 London Road, OX3 9EH

Proposed Lower Floor Plans

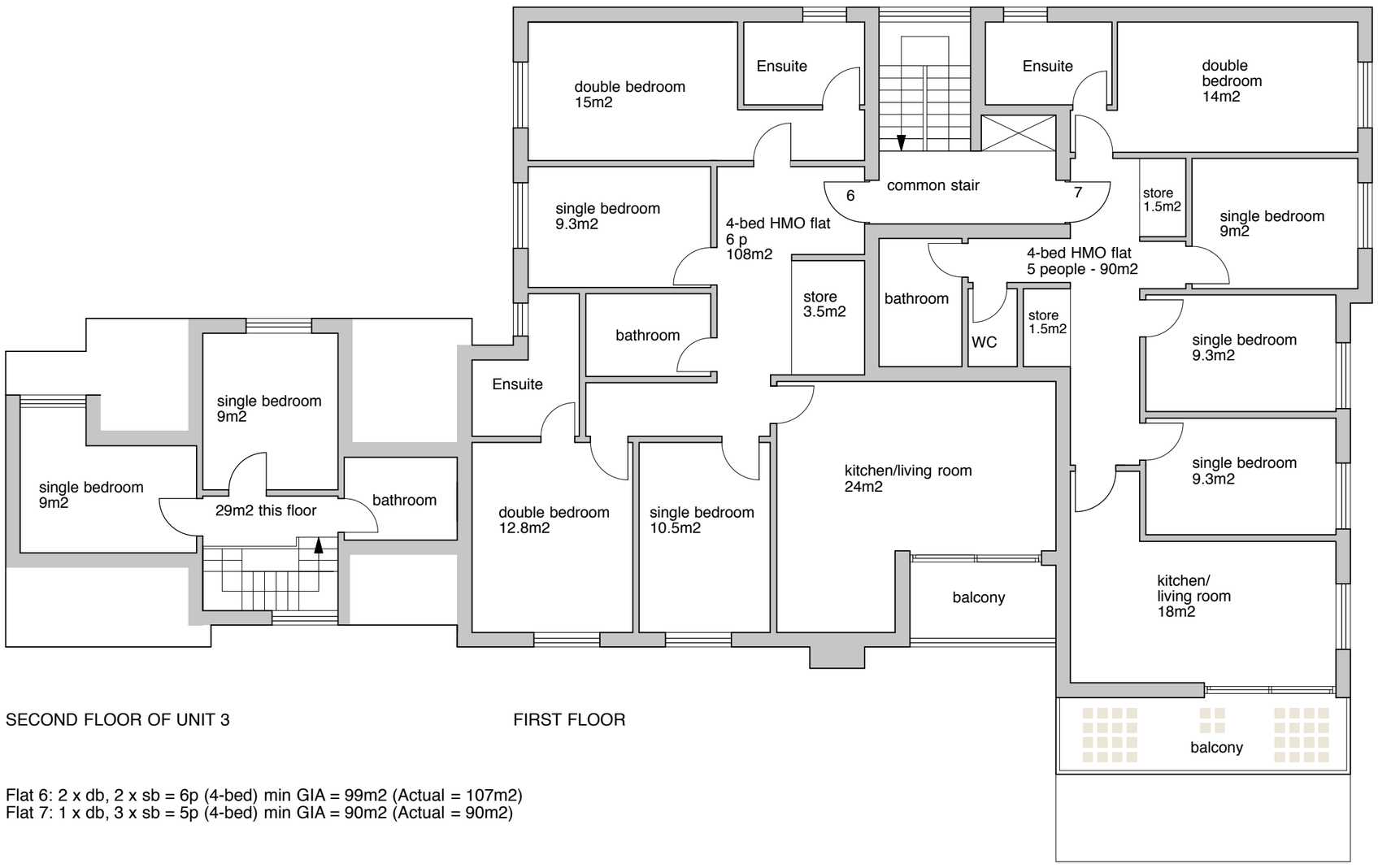
scale	drawing number
1:100 @ A2	245/PL 06



SECOND FLOOR

159 GIA

Flat 8: 2 x db = 4p (2-bed) min GIA = 70m2 (Actual = 70m2)
Flat 9: 1 x db, 2 x sb = 4p (3-bed) min GIA = 74m2 (Actual = 75m2)



SECOND FLOOR OF UNIT 3

FIRST FLOOR

246 GIA

Flat 6: 2 x db, 2 x sb = 6p (4-bed) min GIA = 99m2 (Actual = 107m2)
Flat 7: 1 x db, 3 x sb = 5p (4-bed) min GIA = 90m2 (Actual = 90m2)

0.0 1.0 2.0 3.0 4.0 5.0

Scale = 1 : 100

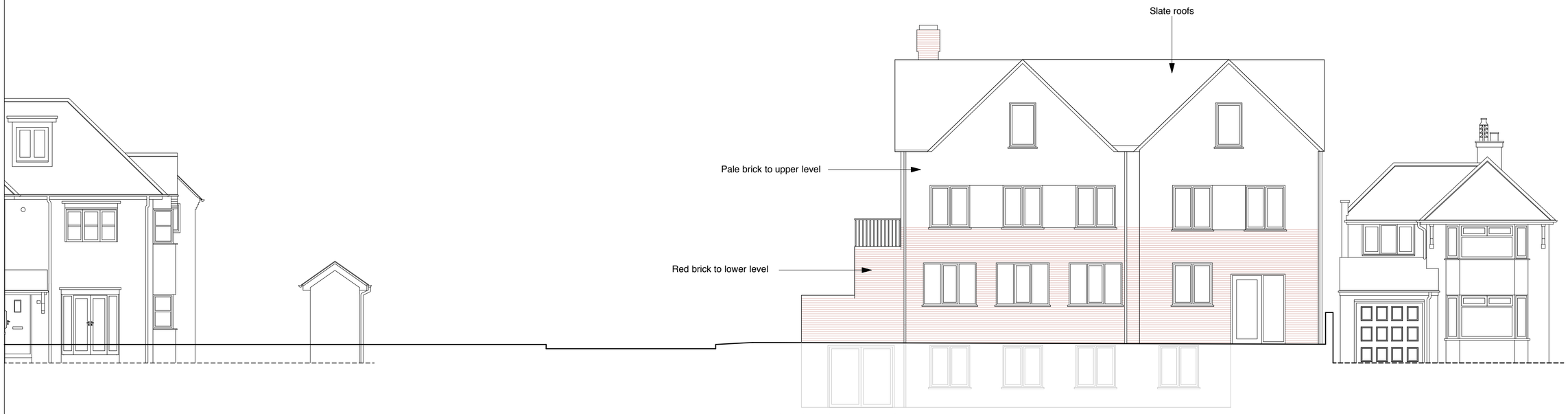
N

LesleyCotton
architect
Unit 12 Standingford House
26 Cave Street
Oxford OX4 1BA
01865 722550

253 London Road, OX3 9EH

Proposed Upper Floor Plans

scale	drawing number
1:100 @ A2	245/PL 07



LONDON ROAD ELEVATION

BARTON ROAD ELEVATION

0.0 1.0 2.0 3.0 4.0 5.0

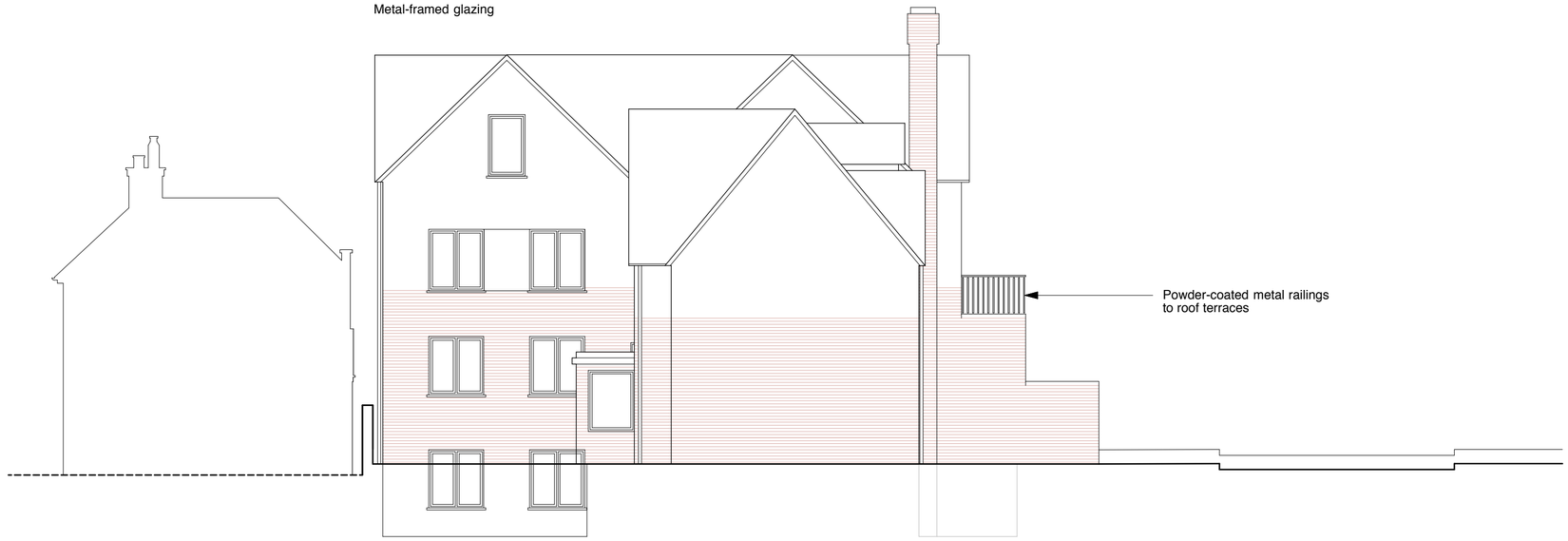
Scale = 1 : 100

LesleyCotton architect
Unit 12 Standingford House
26 Cave Street
Oxford OX4 1BA
01865 722550

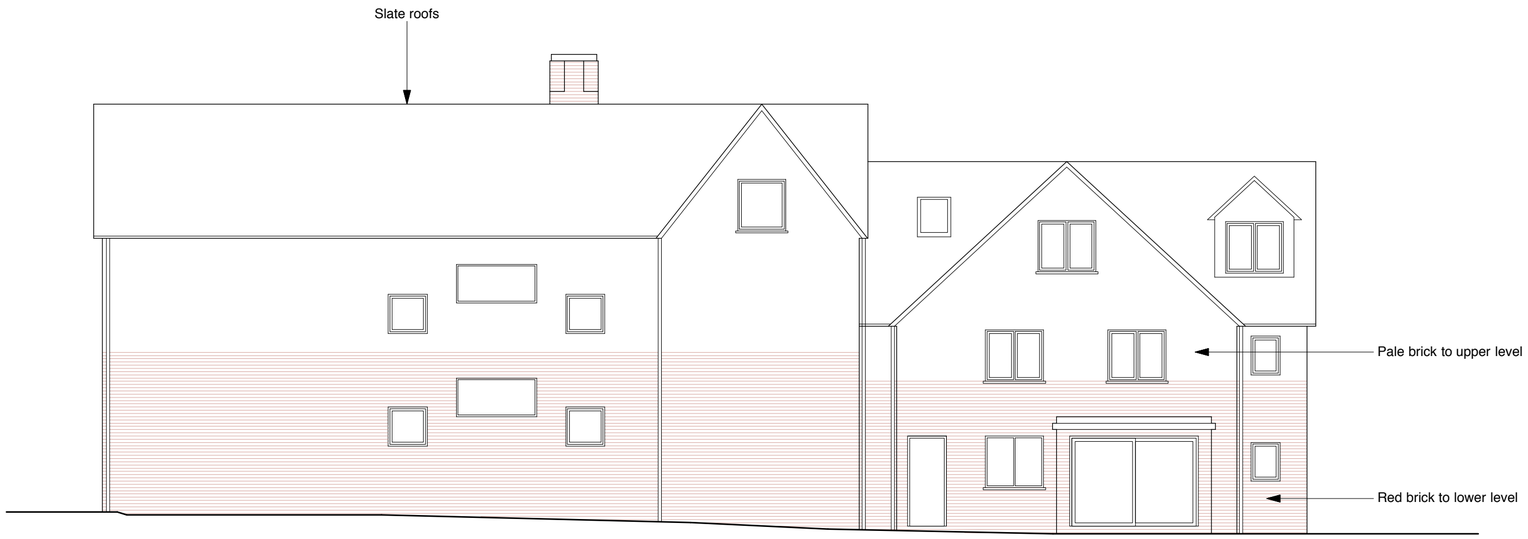
253 London Road, OX3 9EH

Proposed Front and Side Elevations

scale	drawing number
1:100 @ A2	245/PL 08



REAR ELEVATION



SIDE ELEVATION

0.0 1.0 2.0 3.0 4.0 5.0

Scale = 1 : 100

LesleyCotton
architect
Unit 12 Standingford House
26 Cave Street
Oxford OX4 1BA
01865 722550

253 London Road, OX3 9EH

Proposed Rear and Side Elevations

scale	drawing number
1:100 @ A2	245/PL 09

APPENDIX B – SURFACE WATER RUN OFF CALCULATIONS

Nimbus Engineering Consultants Ltd
www.nimbusengineering.co.uk

Kemp House,
152 City Road,
London, EC1V 2NX
Mob:0772 339 3155
email: info@nimbusengineering.co.uk

Job No.	C2507
Sheet no.	1
Date	25/03/21
By	S.L
Checked	
Reviewed	

MasterDrain
HY 10.01

Project 253-255 London Road

Title Pre and post development SW calcs

Data:-

Hydrology (FSR):-

Location	= Oxford	WRAP	= 4
Long reference	= 453205	Grid reference	= SP5305
M5-60 (mm)	= 20.1	SAAR (mm/yr)	= 650
r	= 0.42	Soil	=0.47
Hyd. area	= 6	Hyd. zone	= 8
Hydrograph	= Winter	Area	= England & Wales

Site values used in design:-

Total site area	= 0.0743 ha	Climate change factor	= 40%
Pre-dev area drained	= 0.0743 ha	Post-dev area drained	= 0.0486 ha
Imperm runoff factor	= 100%	Perm runoff factor	= 20%

Pre-development

Area to soakaways	= 0.0000 ha	Area to other SUDS	= 0.0000 ha
Perv. area to SUDS	= 0.0000 ha	Pre-dev flow to drain	= 0.00 l/s

Post-development

Area to soakaways	= 0.0000 ha	Area to other SUDS	= 0.0000 ha
Perv. area to SUDS	= 0.0000 ha	Post-dev flow to drain	= 0.00 l/s

Calculations:-

Revised Post-dev Imperm. area = 0.049 ha
Equiv. Post-dev Imperm. area = 0.049 ha
Equiv. Post-dev Perm. area = 0.005 ha
Total Pre-dev equiv. area ha = 0.074 ha
Total Post-dev equiv. area ha = 0.054 ha
100 yr 6 hour mean intensity = 10.26mm/hr

Results:-

Pre-dev peakflow runoff (l/s) (m^3/s)

R.P.	15	30	60	120	240	360	480	600	Max	CCF	Final	R.P.
1	16.5	10.8	6.8	4.1	2.5	1.9	1.5	1.3	16.5	N/A	16.5	1
30	40.1	25.9	16.0	9.6	5.6	4.1	3.3	2.7	40.1	N/A	40.1	30
100	52.1	33.9	21.0	12.6	7.3	5.3	4.2	3.5	52.1	N/A	52.1	100

Post-dev peakflow runoff (l/s)

R.P.	15	30	60	120	240	360	480	600	Max	CCF	Final	R.P.
1	11.9	7.8	4.9	3.0	1.8	1.4	1.1	0.9	11.9	40	16.6	1
30	29.0	18.7	11.5	6.9	4.1	2.9	2.4	2.0	29.0	40	40.6	30
100	37.6	24.5	15.2	9.1	5.3	3.8	3.0	2.5	37.6	40	52.7	100

100 year 6 hour (x Climate Change Factor) storm gives:-
Pre-dev runoff volume m^3 = 45.8m^3
Post-dev rainfall volume = 46.3m^3
Post-dev volume m^3 (excess above SUDS) = 46.3m^3
100 yr 6 hour mean intensity = 10.26mm/hr
Pre-dev volume to drain at 0 l/s = 0.0 m^3
Post-dev volume to drain at 0 l/s = 0.0 m^3
Post-dev storage volume = 46.3m^3
Post-dev 5mm imperm volume = 2.4 m^3
Post-dev 5mm perm volume = 1.3 m^3

$Q_{BAR(rural)}$ = 0.329 l/s or 4.427 l/s/ha or 0.000 cumecs - from IoH 124.

The rainfall rates are calculated using the location specific values above in accordance with the Wallingford procedure.

Nimbus Engineering Consultants Ltd
www.nimbusengineering.co.uk

Kemp House,
152 City Road,
London, EC1V 2NX
Mob:0772 339 3155
email: info@nimbusengineering.co.uk

Job No.	C2507
Sheet no.	2
Date	25/03/21

MasterDrain
HY 10.01

Project	253-255 London Road	By	S.L
Title	Pre and post development SW calcs	Checked	
		Reviewed	

Data summary.

Use the data below for the SUR1 form

Site areas:-

Total site area	=	0.0743 ha ;743.1 m² [3A]
Pre-development impermeable area	=	0.0743 ha [3B]
Pre-development permeable area	=	0.0000 ha
Post-development impermeable area	=	0.0486 ha [3C]
Post-development permeable area	=	0.0258 ha

Peak runoff:-

Pre-development 1 year storm (15min)	=	16.5 l/s [6A]
Pre-development 100 year storm (15min)	=	52.1 l/s [6C]
Post-development 1 year storm (15min)	=	11.9 l/s [6B]
Post-development 100 year storm (15min)	=	37.64 l/s [6D]

Greenfield runoff:-

$Q_{BAR(rural)}$ = 0.329 l/s or 4.427 l/s/ha or 0.000 cumecs - from IoH 124.

Climate change factor:-

CCF = 40%

Volumes:-

Pre-development 100 yr/6hr storm [12A]= 64.1m³
Post-development 100 yr/6hr storm (add. volume with no SUDS) [12B]= 46.3m³
Post-development 100 yr/6hr storm (add. volume with SUDS) = 46.3m³
Post-development add. predicted volume (No SUDS) [12C] = -17.8m³

You may also require

Data relating to the infiltration test calculations (if applicable)
Evidence to show runoff reduction (if applicable)
Information on calculation methods (if applicable see next sheet)

Note

Numbers in square brackets relate to the
Nov. 2010 v1.1 / issued 11/02/10 copy of SUR1

Nimbus Engineering Consultants Ltd
www.nimbusengineering.co.uk

Kemp House,
152 City Road,
London, EC1V 2NX
Mob:0772 339 3155
email: info@nimbusengineering.co.uk

Job No.	C2507
Sheet no.	3
Date	25/03/21

MasterDrain
HY 10.01

Project	253-255 London Road	By	S.L
Title	Pre and post development SW calcs	Checked	
		Reviewed	

Definitions and methods

Hydrology

The hydrological constants are derived from the Wallingford maps. They are used to calculate location specific rainfall figures.

Site values and factors

Areas of the site should be entered in hectares (10000 m²). If the Pre-development site is a green field, this box is blank.
Climate Change Factor is initially set at 20% - this may be changed as required.
Greenfield runoff is calculated using the method described in IoH 124.
Runoff factors

The impermeable runoff factor is initially set at 98%
The permeable runoff factor is initially set at 20%

Note: the CCF and the runoff factors may be changed by the user to suit the development
The areas draining to soakaways and other SUDS are entered in the appropriate box (in hectares)

Calculations

The post-development area is reduced by subtracting the areas that drain to soakaways or other SUDS, to give a revised figure.
All areas are then multiplied by the appropriate runoff factor to give an equivalent area with 100% runoff.
These are then summated.
This gives a total pre-development equivalent area, and a similar figure for the post-development area.
The 'Post-dev volume to drain (no SUDS)' gives the total runoff to drain if no SUDS were used.

Results

The pre- and post-development areas are subjected to 1,30 and 100 year return period storms with a duration of 15 to 600 minutes.
The Revised Post-dev Imperm. area is the area (in ha) that is not going to SUDS x impervious runoff factor.
The runoff rates are calculated for the chosen hydrograph (Summer or Winter) as l/s. Figures in red indicate m³/s
The peak value is measured, multiplied by the CCF and the total maximum rate is shown.
The pre- and post-development volumes for a 100 year / 6 hour storm are calculated from the area under the hydrograph curve.
Post-dev volume (i.e. excess above SUDS) is that volume produced by the drained area that does not go to SUDS.
Qbar(rural) is calculated in accordance with the procedure laid down in IoH 124

Nimbus Engineering Consultants Ltd
www.nimbusengineering.co.uk

Kemp House,
152 City Road,
London, EC1V 2NX
Mob:0772 339 3155
email: info@nimbusengineering.co.uk

Job No.	C2507		
Sheet no.	1		
Date	24/03/21		
Project	253-255 London Road	By	S.L
Title	Hydrograph storage calcs with Qbar discharge	Checked	Reviewed

MasterDrain SW

Data:-

Location = Oxford
M5-60 (mm) = 20.1
Soil index = 0.45
Return period = 100
UCWI = 0.0

Grid reference = SP5305
r = 0.42
SAAR (mm/yr) = 650
WRAP = 4
Climate change = 40%

Clayey, or loamy over clayey soils with an impermeable layer at shallow depth.

Pipeline storage = 0.0 m³
Offline storage = 0.0 m³

Available MH storage = 0.0 m³

Percentage runoff = 100.0% (manual setting)

Imperv. area = 486 m²
Total area = 486 m²
Total runoff = 36.4 m³

Pervious area = 0 m²
Equiv area = 486 m² (Tot. area x % runoff).
Discharge rate = 0.760 l/s

Storage (m³) = 29.2 m³ (Sum of all balance quantities)

Total rainfall depth = 74.9 mm

Calculations :-

Time (hrs)	%Mean intens	Rain mm/hr	Inflow (m3)	Outflow (m3)	Balance (m3)	Cumulative (m3)
0.030	20.0	5.0	0.073	0.082	0.000	0.000
0.060	20.0	5.0	0.073	0.082	0.000	0.000
0.090	21.0	5.2	0.076	0.082	0.000	0.000
0.120	21.0	5.2	0.076	0.082	0.000	0.000
0.150	22.0	5.5	0.080	0.082	0.000	0.000
0.180	23.0	5.7	0.084	0.082	0.002	0.002
0.210	24.0	6.0	0.087	0.082	0.005	0.007
0.240	26.0	6.5	0.095	0.082	0.013	0.019
0.270	27.0	6.7	0.098	0.082	0.016	0.036
0.300	29.0	7.2	0.106	0.082	0.023	0.059
0.330	31.0	7.7	0.113	0.082	0.031	0.090
0.360	32.0	8.0	0.116	0.082	0.034	0.124
0.390	33.0	8.2	0.120	0.082	0.038	0.162
0.420	34.0	8.5	0.124	0.082	0.042	0.204
0.450	36.0	9.0	0.131	0.082	0.049	0.253
0.480	38.0	9.5	0.138	0.082	0.056	0.309
0.510	39.0	9.7	0.142	0.082	0.060	0.369
0.540	40.0	10.0	0.146	0.082	0.063	0.432
0.570	42.0	10.5	0.153	0.082	0.071	0.503
0.600	45.0	11.2	0.164	0.082	0.082	0.585
0.630	49.0	12.2	0.178	0.082	0.096	0.681
0.660	53.0	13.2	0.193	0.082	0.111	0.792
0.690	57.0	14.2	0.207	0.082	0.125	0.917
0.720	62.0	15.5	0.226	0.082	0.144	1.061
0.750	66.0	16.5	0.240	0.082	0.158	1.219
0.780	71.0	17.7	0.258	0.082	0.176	1.395
0.810	77.0	19.2	0.280	0.082	0.198	1.593
0.840	84.0	21.0	0.306	0.082	0.224	1.817
0.870	91.0	22.7	0.331	0.082	0.249	2.066
0.900	98.0	24.5	0.357	0.082	0.275	2.340
0.930	105.0	26.2	0.382	0.082	0.300	2.640
0.960	114.0	28.5	0.415	0.082	0.333	2.973
0.990	125.0	31.2	0.455	0.082	0.373	3.346
1.020	135.0	33.7	0.491	0.082	0.409	3.755
1.050	143.0	35.7	0.520	0.082	0.438	4.193
1.080	154.0	38.4	0.560	0.082	0.478	4.672
1.110	164.0	40.9	0.597	0.082	0.515	5.186
1.140	173.0	43.2	0.630	0.082	0.547	5.734
1.170	183.0	45.7	0.666	0.082	0.584	6.318
1.200	194.0	48.4	0.706	0.082	0.624	6.942

Nimbus Engineering Consultants Ltd
www.nimbusengineering.co.uk

Kemp House,
152 City Road,
London, EC1V 2NX
Mob:0772 339 3155
email: info@nimbusengineering.co.uk

Job No.		
C2507		
Sheet no.	2	
Date	24/03/21	
By	Checked	Reviewed
S.L		

MasterDrain SW

Project 253-255 London Road

Title Hydrograph storage calcs with Qbar discharge

Calculations (cont.) :-

Time (hrs)	%Mean intens	Rain mm/hr	Inflow (m3)	Outflow (m3)	Balance (m3)	Cumulative (m3)
1.230	204.0	50.9	0.742	0.082	0.660	7.602
1.260	212.0	52.9	0.771	0.082	0.689	8.291
1.290	219.0	54.7	0.797	0.082	0.715	9.006
1.320	226.0	56.4	0.822	0.082	0.740	9.747
1.350	233.0	58.2	0.848	0.082	0.766	10.512
1.380	239.0	59.7	0.870	0.082	0.788	11.300
1.410	244.0	60.9	0.888	0.082	0.806	12.106
1.440	248.0	61.9	0.902	0.082	0.820	12.926
1.470	249.0	62.1	0.906	0.082	0.824	13.750
1.500	250.0	62.4	0.910	0.082	0.828	14.578
1.530	250.0	62.4	0.910	0.082	0.828	15.406
1.560	249.0	62.1	0.906	0.082	0.824	16.230
1.590	248.0	61.9	0.902	0.082	0.820	17.050
1.620	244.0	60.9	0.888	0.082	0.806	17.856
1.650	239.0	59.7	0.870	0.082	0.788	18.644
1.680	233.0	58.2	0.848	0.082	0.766	19.409
1.710	226.0	56.4	0.822	0.082	0.740	20.150
1.740	219.0	54.7	0.797	0.082	0.715	20.865
1.770	212.0	52.9	0.771	0.082	0.689	21.554
1.800	204.0	50.9	0.742	0.082	0.660	22.214
1.830	194.0	48.4	0.706	0.082	0.624	22.838
1.860	183.0	45.7	0.666	0.082	0.584	23.422
1.890	173.0	43.2	0.630	0.082	0.547	23.969
1.920	164.0	40.9	0.597	0.082	0.515	24.484
1.950	154.0	38.4	0.560	0.082	0.478	24.962
1.980	143.0	35.7	0.520	0.082	0.438	25.401
2.010	135.0	33.7	0.491	0.082	0.409	25.810
2.040	125.0	31.2	0.455	0.082	0.373	26.183
2.070	114.0	28.5	0.415	0.082	0.333	26.516
2.100	105.0	26.2	0.382	0.082	0.300	26.816
2.130	98.0	24.5	0.357	0.082	0.275	27.090
2.160	91.0	22.7	0.331	0.082	0.249	27.339
2.190	84.0	21.0	0.306	0.082	0.224	27.563
2.220	77.0	19.2	0.280	0.082	0.198	27.761
2.250	71.0	17.7	0.258	0.082	0.176	27.937
2.280	66.0	16.5	0.240	0.082	0.158	28.095
2.310	62.0	15.5	0.226	0.082	0.144	28.239
2.340	57.0	14.2	0.207	0.082	0.125	28.364
2.370	53.0	13.2	0.193	0.082	0.111	28.475
2.400	49.0	12.2	0.178	0.082	0.096	28.571
2.430	45.0	11.2	0.164	0.082	0.082	28.653
2.460	42.0	10.5	0.153	0.082	0.071	28.724
2.490	40.0	10.0	0.146	0.082	0.063	28.787
2.520	39.0	9.7	0.142	0.082	0.060	28.847
2.550	38.0	9.5	0.138	0.082	0.056	28.903
2.580	36.0	9.0	0.131	0.082	0.049	28.952
2.610	34.0	8.5	0.124	0.082	0.042	28.994
2.640	33.0	8.2	0.120	0.082	0.038	29.032
2.670	32.0	8.0	0.116	0.082	0.034	29.066
2.700	31.0	7.7	0.113	0.082	0.031	29.097
2.730	29.0	7.2	0.106	0.082	0.023	29.120
2.760	27.0	6.7	0.098	0.082	0.016	29.136
2.790	26.0	6.5	0.095	0.082	0.013	29.149
2.820	24.0	6.0	0.087	0.082	0.005	29.154
2.850	23.0	5.7	0.084	0.082	0.002	29.156
2.880	22.0	5.5	0.080	0.082	0.000	29.154
2.910	21.0	5.2	0.076	0.082	0.000	29.148
2.940	21.0	5.2	0.076	0.082	0.000	29.143
2.970	20.0	5.0	0.073	0.082	0.000	29.133
3.000	20.0	5.0	0.073	0.082	0.000	29.124

Storage volume (m^3) = 29.2 m^3 (Sum of all balance quantities)

Nimbus Engineering Consultants Ltd
www.nimbusengineering.co.uk

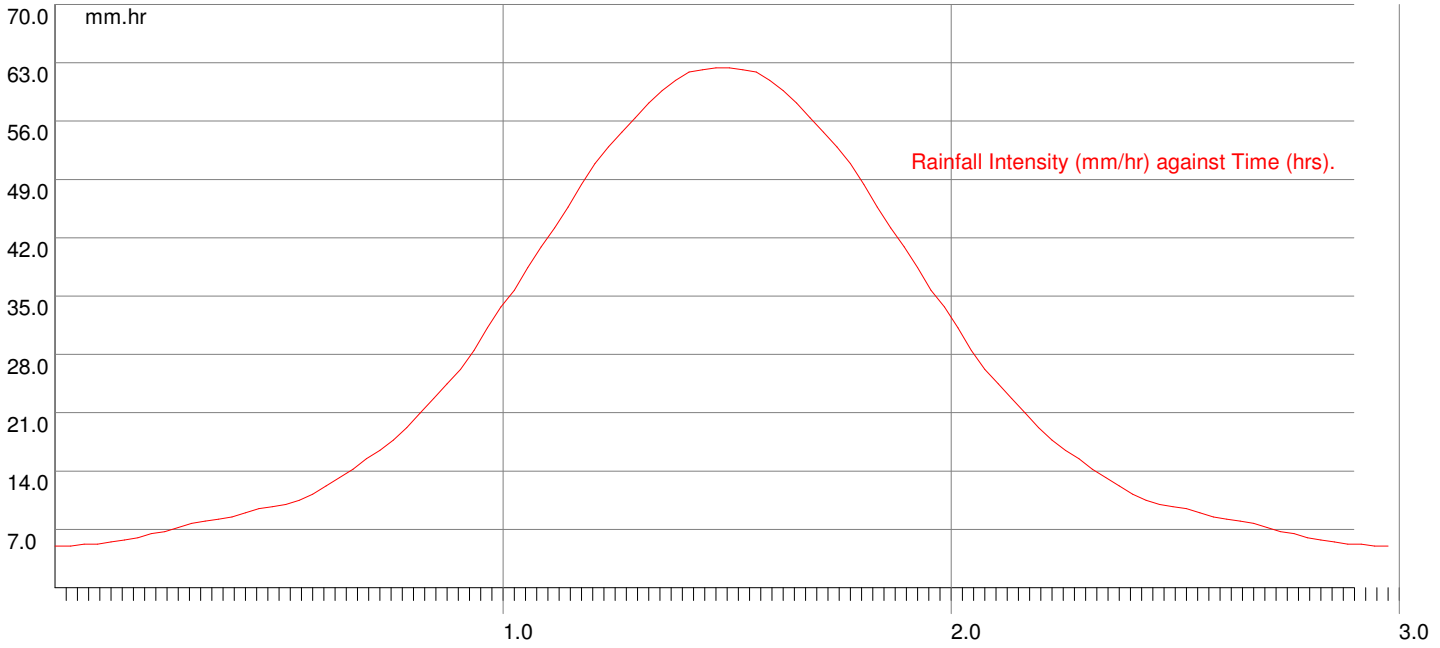
Kemp House,
152 City Road,
London, EC1V 2NX
Mob:0772 339 3155
email: info@nimbusengineering.co.uk

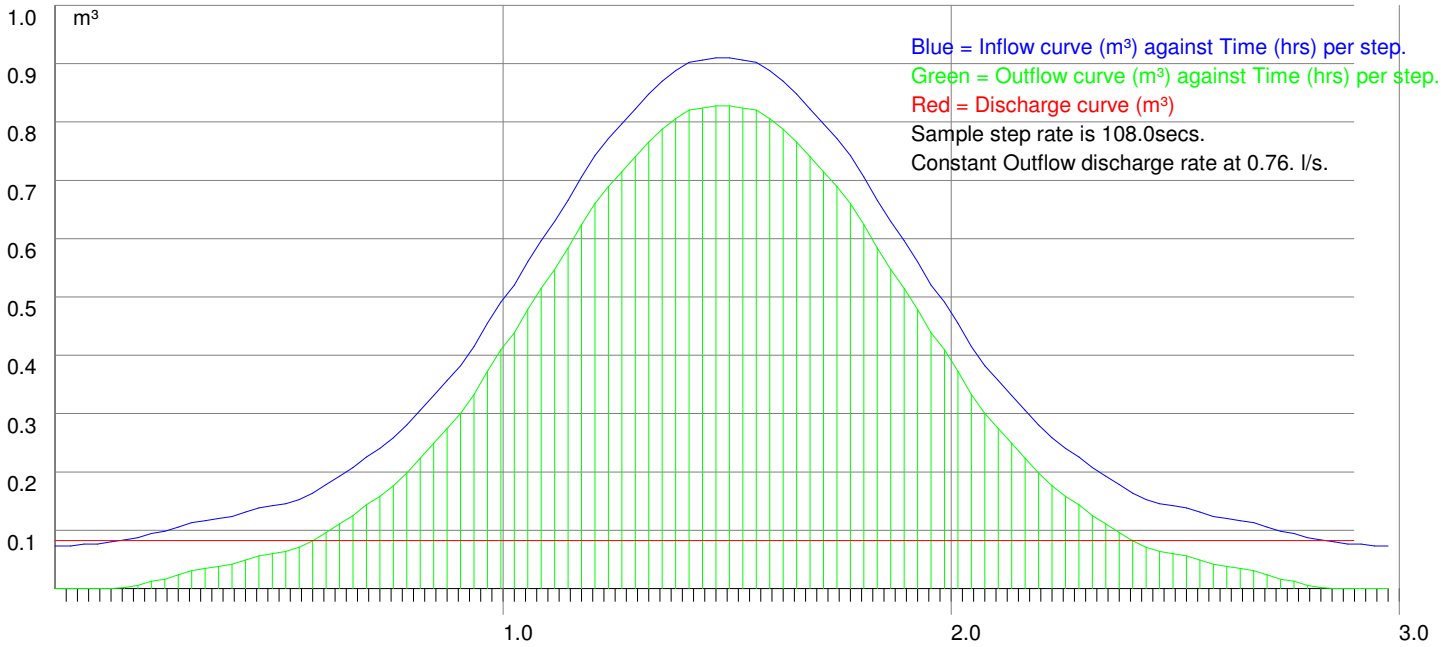
Job No.	C2507
Sheet no.	3
Date	24/03/21
By	S.L
Checked	
Reviewed	

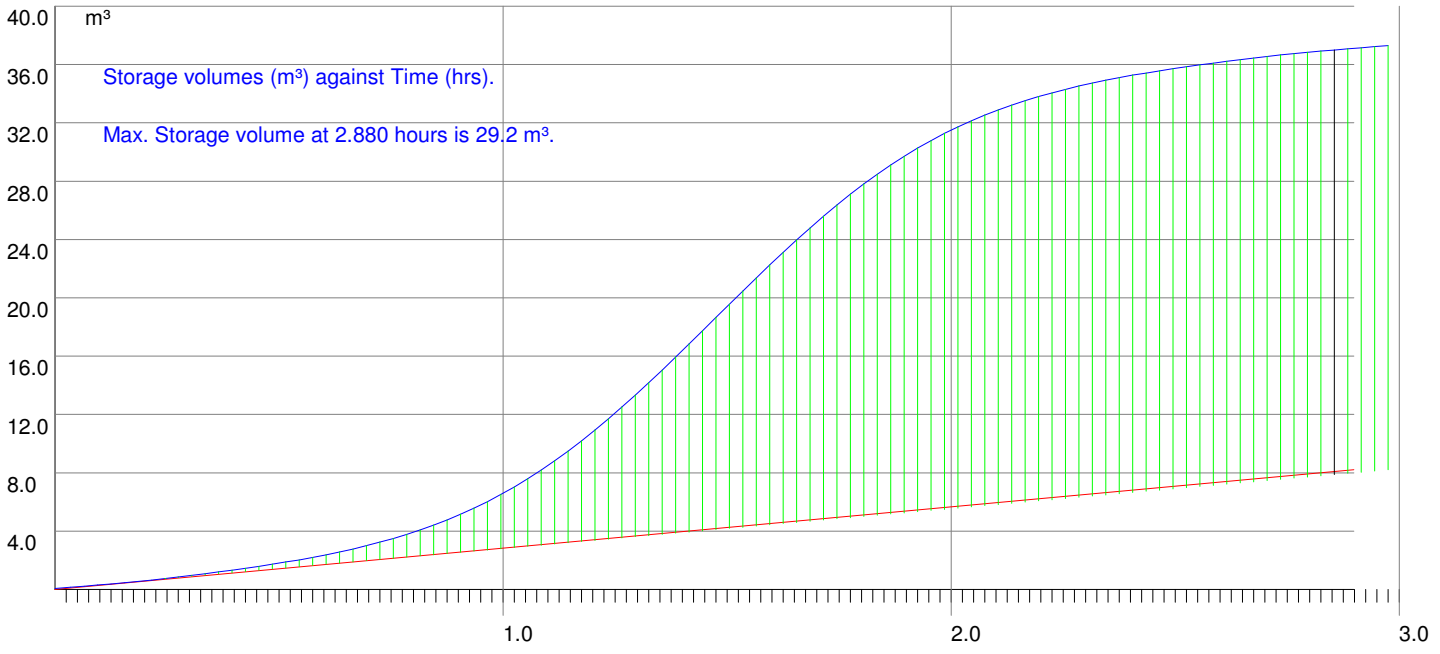
MasterDrain SW

Project 253-255 London Road

Title Hydrograph storage calcs with Qbar discharge







MasterDrain SW

Nimbus Engineering Consultants Ltd
www.nimbusengineering.co.uk

Kemp House,
152 City Road,
London, EC1V 2NX
Mob:0772 339 3155
email: info@nimbusengineering.co.uk

Job No.	C2507
Sheet no.	4
Date	24/03/21

Project	By	Checked	Reviewed
253-255 London Road	S.L		

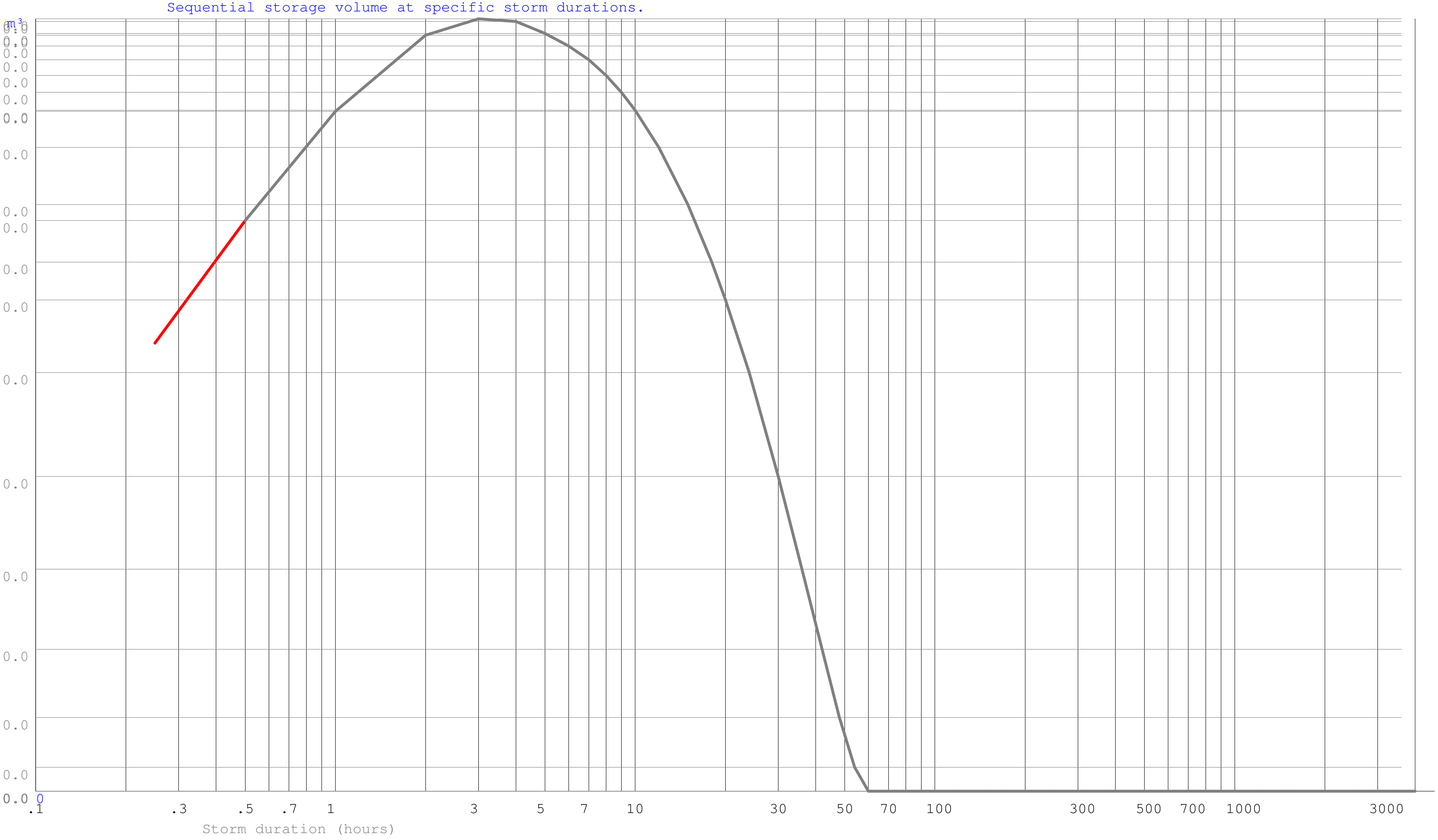
Title: **Hydrograph storage calcs with Qbar discharge**

Maximum storage volumes for varying duration storms.

Storm length (hrs)	Max. Vol (m^3)	Max. Vol time	Mean intens (mm/hr)	Step time. (mins)	Peak found
0.25	16.91	0.25	141.30	0.2	
0.5	21.54	0.50	91.99	0.3	
1	25.66	1.00	57.00	0.6	
2	28.53	2.00	34.13	1.2	
3	29.16	3.00	24.96	1.8	Peak found
4	29.06	---	19.88	2.4	
5	28.60	---	16.62	3.0	
6	28.13	---	14.37	3.6	
7	27.61	---	12.71	4.2	
8	27.02	---	11.42	4.8	
9	26.38	---	10.39	5.4	
10	25.70	---	9.54	6.0	
12	24.30	---	8.24	7.2	
15	22.14	---	6.88	9.0	
18	19.97	---	5.94	10.8	
20	18.54	---	5.45	12.0	
24	15.80	---	4.70	14.4	
30	11.88	---	3.92	18.0	
36	8.38	---	3.38	21.6	
42	5.35	---	2.98	25.2	
48	2.78	---	2.67	28.8	
54	0.90	---	2.43	32.4	
60	0.00	---	2.22	36.0	
66	0.00	---	2.06	39.6	
72	0.00	---	1.92	43.2	
84	0.00	---	1.69	50.4	
96	0.00	---	1.51	57.6	
120	0.00	---	1.26	72.0	
150	0.00	---	1.04	90.0	
175	0.00	---	0.92	105.0	
200	0.00	---	0.82	120.0	
250	0.00	---	0.68	150.0	
300	0.00	---	0.59	180.0	
375	0.00	---	0.49	225.0	
500	0.00	---	0.38	300.0	
750	0.00	---	0.28	450.0	
1000	0.00	---	0.22	600.0	
1250	0.00	---	0.18	750.0	
1500	0.00	---	0.16	900.0	
1570	0.00	---	0.15	942.0	
2000	0.00	---	0.12	1200.0	
2500	0.00	---	0.10	1500.0	
3000	0.00	---	0.09	1800.0	
3500	0.00	---	0.08	2100.0	
4000	0.00	---	0.07	2400.0	

Nimbus Engineering Consultants Ltd www.nimbusengineering.co.uk	Kemp House, 152 City Road, London, EC1V 2NX Mob:0772 339 3155 email: info@nimbusengineering.co.uk	Job No. C2507 Sheet no. 5 Date 24/03/21		
Project 253-255 London Road		By S.L	Checked	Reviewed
Title Hydrograph storage calcs with Qbar discharge				

MasterDrain SW



MasterDrain SW

Nimbus Engineering Consultants Ltd
www.nimbusengineering.co.uk

Kemp House,
152 City Road,
London, EC1V 2NX
Mob:0772 339 3155
email: info@nimbusengineering.co.uk

Job No. C2507			
Sheet no. 6			
Date 24/03/21			
Project 253-255 London Road	By S.L	Checked	Reviewed
Title Hydrograph storage calcs with Qbar discharge			

Explanatory notes for Peak Flow Storage

1) This system uses the rainfall intensity/ duration curve calculated using either the Wallingford or FEH method as selected.
2) The balance is calculated from the inflow minus the outflow.
3) The storage volume is the maximum value of the balance curve.
4) This method was described by Davis (1963) - see Butler & Davies, 2nd edition, p294
5) References to 'storm duration' relate only to the hydrograph method (qv).
6) There are always 600 steps in the calculation process, thus a 'run' time of 10 hours will be sampled every minute,

Explanatory notes for Hydrograph Storage

1) The user has the choice of Summer or Winter curves
2) The mean intensity varies with the duration of the storm curve
3) There are always 120 steps in the calculation process, irrespective of storm duration.
4) The balance is calculated from the inflow minus the outflow.
5) The storage volume is the sum of the balance values for each step.
6) Varying durations should be tried to find the maximum storage value - this can be narrowed down very closely.

*Modelling using the flow characteristics of the restrictor is available using Vortex Control modelling function. Please be aware that this function needs the full design data file to function.

Why do the two methods give different results?

The rainfall characteristics for each method are very different.

The Peak flow (using the Intensity/Duration/Frequency curve) does not model the actual rainfall. This curve is joined points which represent the mean intensity of a storm at a given duration i.e. a value of 19.5 mm/hr for a 60 minute storm indicates that over the sixty minute period, the mean intensity was 19.5 mm/hr. The calculation method samples the IDF curve for a given location and frequency (Return Period) and calculates the storage for that rate and duration less the outflow volume. The maximum value is displayed as the 'worst case' storage.

The hydrograph method uses a standard curve for either Winter or Summer storms. Traditionally these are symmetrical about the central peak. UK rainfall does not fit into this convenient curve, so the calculations are dealing with a stylised set of data. The mean intensity for the storm is calculated from the IDF curve and applied to the curve data, calculating the storage for that step less the outflow volume. The final storage volume is the sum of the storage for all the steps.

It can be seen that these two methods are very different, and the user may have the choice of which result to use. This is not an exact science, though is often treated as such by those that do not understand the principles of the calculations.

Nimbus Engineering Consultants Ltd
www.nimbusengineering.co.uk

Kemp House,
152 City Road,
London, EC1V 2NX
Mob:0772 339 3155
email: info@nimbusengineering.co.uk

MasterDrain
HY 10.01

Job No. C2507			
Sheet no. 1			
Date 24/03/21			
Project 253-255 London Road	By S.L	Checked	Reviewed
Title IoH 124 (Qbar(urban))Runoff calcs			

Hydrological Data:-

FSR Hydrology:-

Location	= Oxford	Grid reference	= SP5305
M5-60 (mm)	= 20.1	r	= 0.42
Soil runoff	= 0.45	SAAR (mm/yr)	= 650
WRAP	= 4	Area = England & Wales	
Hydrological area = 6		Hydrological zone = 8	

Soil classification for WRAP type 4
Clayey, or loamy over clayey soils with an impermeable layer at shallow depth.

Design data:-

Area = 0.000743 Km² - 0.074 Ha - 743 m² % Urbanisation = 60.00%

Calculation method:-

Runoff is calculated from:-

$$Q_{BAR(urban);} = Q_{BAR(rural)} (1 + URBAN)^{2NC}[1 + URBAN\{(21/CIND) - 0.3\}]$$

where:-

NC varies with the value of SAAR:-
for 500<SAAR<1100 mm then NC = 0.92 - 0.00024SAAR
for 1100<SAAR<3000 mm then NC = 0.74 - 0.000082SAAR

CIND = 102.4SOIL + 0.28(CWI - 125) CWI = Catchment Wetness Index

so

CIND =30.117 CWI =67.989 NC =0.764

For areas less than 50Ha, a modified calculation which multiplies the 50Ha runoff value by the ratio of the site area to 50Ha is used
Reducing factor used for these calculations is 0.001

$Q_{BAR(rural)}$ = 0.299 (l/s)

$Q_{BAR(urban)}$ = 0.760 (l/s)

$Q_{BAR(urban)}$ is then multiplied by a growth factor - GC(T) - for different storm return periods derived from EA publication W5-074/A.

Nimbus Engineering Consultants Ltd
www.nimbusengineering.co.uk

Kemp House,
152 City Road,
London, EC1V 2NX
Mob:0772 339 3155
email: info@nimbusengineering.co.uk

Job No.	C2507
Sheet no.	2
Date	24/03/21
Project	253-255 London Road
Title	IoH 124 (Qbar(urban))Runoff calcs
By	S.L
Checked	
Reviewed	

MasterDrain
HY 10.01
Calculated data:-

Mean Annual Peak Flow $Q_{BAR(urban)}$ = 0.76 l/s

Values for $Q_{BAR(urban)}$

Ret. per.	m³/hr	l/s	l/s/ha	Ret. per.	m³/hr	l/s	l/s/ha
1yr	0.001	0.646	8.695	100yr	0.002	2.395	32.224
2yr	0.001	0.669	9.002	100yr+20%	0.003	2.873	38.668
5yr	0.001	0.973	13.094	100yr+30%	0.003	3.113	41.891
10yr	0.001	1.231	16.572	200yr	0.003	2.813	37.850
30yr	0.002	1.695	22.812	200yr + 30%	0.004	3.656	49.205
50yr	0.002	1.992	26.802	500yr	0.003	3.413	45.931
				1000yr	0.004	3.922	52.785

Growth factors -

1yr	2yr	5yr	10yr	30yr	50yr	100yr	200yr	500yr	1000yr
0.85	0.88	1.28	1.62	2.23	2.62	3.15	3.70	4.49	5.16

The above is based on the Institute of Hydrology Report 124 to which you are referred for further details (see Sect 7). Note that the 200 year growth curve was taken from W5-074/A.

For WRAP type 1 soils, CIND can become negative for lower values of SAAR. In this case the CIND value is multiplied by -1 to return a positive value (CIND is very small at this point).

APPENDIX C – WATER AUTHORITY ASSET PLANS

Asset location search

Property Searches

Nimbus Engineering Consultants LTD
Kemp House
152City road
LONDON
EC1V 2NX

Search address supplied 255
London Road
Headington
Oxford
OX3 9EH

Your reference C2507

Our reference ALS/ALS Standard/2021_4386655

Search date 23 March 2021

Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

Asset location search

Property Searches

Search address supplied: 255, London Road, Headington, Oxford, OX3 9EH

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This searchprovides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0800 009 4540, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Asset location search

Thames Water Property Searches

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an ‘as constructed’ record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2021_4386655

The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 455142,207374

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
8601	102.69	100.61
1601	103.7	102.87
0603	n/a	n/a
041B	n/a	n/a
0403	106.2	102.87
041A	n/a	n/a
9402	105.56	103.97
041F	n/a	n/a
041G	n/a	n/a
1514	104.47	103.29
1512	104.46	103.7
1509	104.45	103.64
1508	104.47	103.19
1511	104.43	103.81
1510	104.43	103.48
151B	n/a	n/a
151A	n/a	n/a
9501	105.11	103.72
9500	105.13	104.15
1505	104.39	101.6
1504	104.35	101.2
0501	106.32	103.3
0502	106.31	104.66
1503	104.17	102.08
1502	104.19	101.77
1513	103.9	102.17
1501	103.9	102.45
1602	103.76	102.68
1603	103.84	102.39
0604	n/a	n/a
3406	104.45	102.51
351A	n/a	n/a
2501	104.41	103.03
2502	104.46	103.09
2503	104.46	102.81
3503	103.99	102.34
3502	103.98	102.78
351B	n/a	n/a
351F	n/a	n/a
8301	n/a	n/a
031D	n/a	n/a
931B	n/a	n/a
1301	104.88	102.01
0309	n/a	n/a
031C	n/a	n/a
031B	n/a	n/a
031A	n/a	n/a
1302	105.5	103.14
1305	n/a	n/a
2306	105.04	102.2
0308	n/a	n/a
2305	104.8	102.67
0307	n/a	n/a
0306	n/a	n/a
1306	n/a	n/a
1401	105.73	102.45
0407	n/a	n/a
0406	n/a	n/a
9403	n/a	n/a
041H	n/a	n/a
9401	105.43	103.76
041I	n/a	n/a
041C	n/a	n/a
0402	105.84	103.32
0405	n/a	n/a
041D	n/a	n/a
0404	n/a	n/a
231A	n/a	n/a
2303	n/a	102.42
2304	104.35	103.15
3405	104.39	102.85
3301	n/a	102.43
3302	103.97	102.17
341D	n/a	n/a
3310	104.98	102.19
3313	105.3	102.49
3314	105.25	102.1
341G	n/a	n/a
341F	n/a	n/a
341C	n/a	n/a
341B	n/a	n/a
3304	103.21	101.31
3305	n/a	101.58
3407	105.1	102.9
3312	105.08	102.63
3306	102.34	100.8
3401	104.76	103.19
3402	104.73	103.63
3311	104.96	101.35
3403	104.89	103.7
3404	104.93	103.29

Manhole Reference	Manhole Cover Level	Manhole Invert Level
3315	n/a	n/a
3307	n/a	99.87
0201	104.84	103.43
2203	103.58	102.08
2204	103.6	101.46
2205	103.62	102.2
2206	103.56	101.6
2207	103.86	102.36
2208	103.86	101.93
1201	103.75	102.75
2210	104.05	102.46
221C	n/a	n/a
221D	n/a	n/a
221B	n/a	n/a
1203	n/a	102.98
221A	n/a	n/a
1202	104.06	102.4
2209	104.07	102.63
2302	n/a	103.2
0301	105.45	101.64
0304	105.25	100.85
2301	104.37	103.17
1304	n/a	n/a
231E	n/a	n/a
231D	n/a	n/a
031E	n/a	n/a
231C	n/a	n/a
231B	n/a	n/a
1303	105.39	101.06
3212	102.9	100.92
3205	n/a	101.77
321A	n/a	n/a
3206	n/a	101.8
3209	n/a	n/a
3202	n/a	101.97
3210	103.48	101.68
3208	102.6	101.44
3211	103.25	101.6
2211	n/a	102.6
2212	103.9	103.05
3201	n/a	101.91
3207	n/a	101.56
2213	103.89	103.21
3203	103.6	101.73
3303	n/a	102.24
3108	103.41	101.37
3107	103.45	101.53
3106	103.28	101.14
3105	103.25	99.93
3101	103.17	101.67
3104	n/a	100.95
3102	103.1	99.23
311C	n/a	n/a
3103	103	99.3
211C	n/a	n/a
3109	n/a	n/a
931E	n/a	n/a
921A	n/a	n/a
9201	104.75	100.09
9302	104.95	n/a
9202	104.97	101.05
9301	104.99	102.29
9101	102.97	101.22
9102	102.94	100.72
931G	n/a	n/a
931C	n/a	n/a
931D	n/a	n/a
931A	n/a	n/a
0302	105.05	101.43
0303	105.08	100.7
031G	n/a	n/a
0202	104.77	102.25
031F	n/a	n/a
8202	103.97	99.9
931F	n/a	n/a
0103	104.54	102.73
2101	102.99	100.69
0102	104.6	102.65
0101	104.48	102.58
211E	n/a	n/a
211D	n/a	n/a
1101	102.74	100.37
211A	n/a	n/a
011B	n/a	n/a
211B	n/a	n/a
011A	n/a	n/a
2218	103.36	102.59
2217	103.29	101.71
2202	103.43	101.14
2201	103.39	101.25
2216	103.56	101.97
2215	103.54	101.28
2214	103.7	102.03

Manhole Reference	Manhole Cover Level	Manhole Invert Level

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.

2) All measurements on the plans are metric.

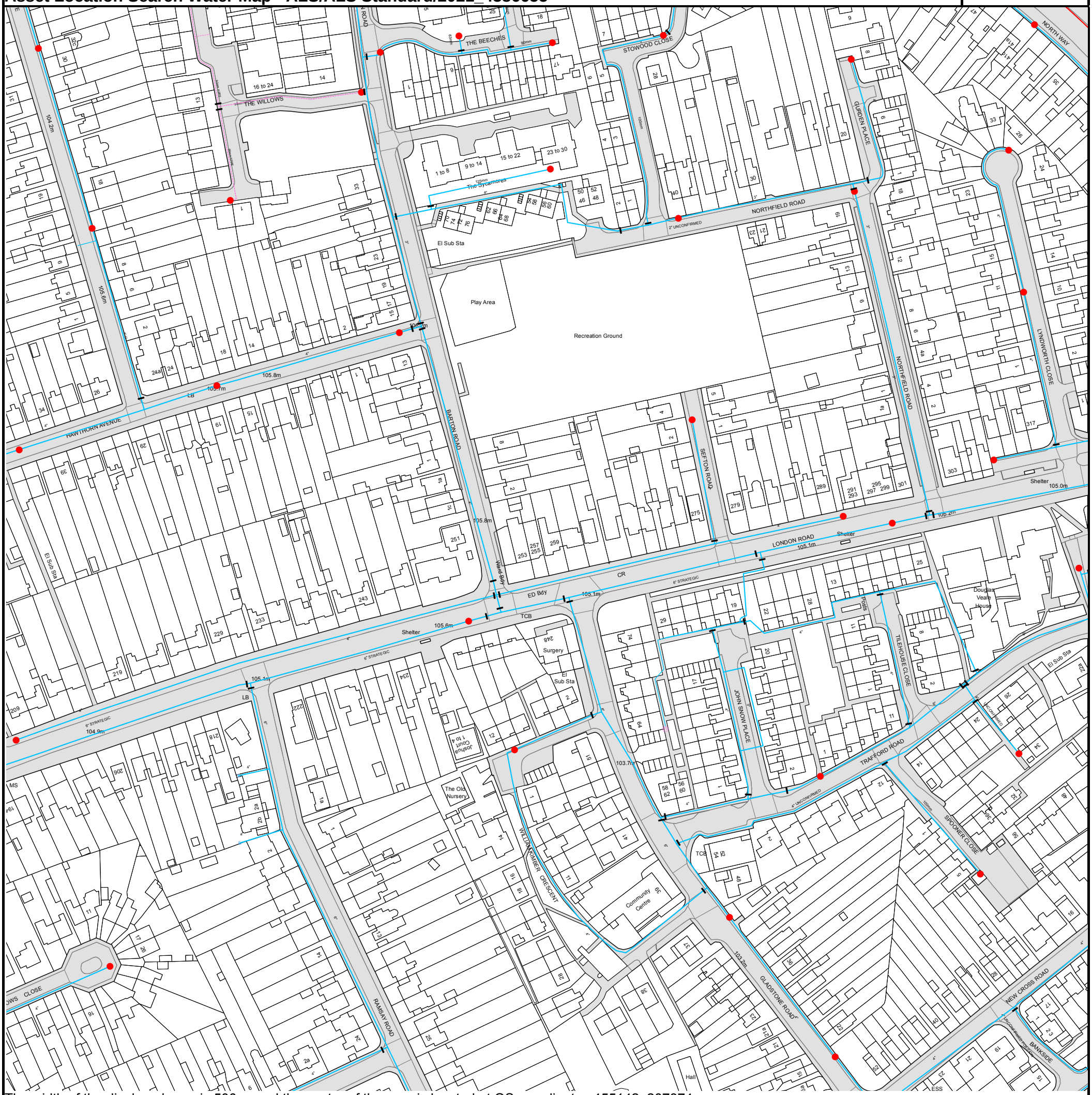
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

5) 'na' or '0' on a manhole level indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Searches on 0800 009 4540.

Asset Location Search Water Map - ALS/ALS Standard/2021_4386655



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 455142, 207374.

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0800 009 4540** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.