DRAINAGE STRATEGY REPORT

FOR

50 REDINGTON ROAD
LONDON
NW3 7RS

CLIENT: MR MARCUS DONN
PROJECT NO: P3940

ISSUE 1.0
12 JANUARY 2018

Michael Alexander Consulting Engineers, Foundation House, 4 Percy Road, London, N12 8BU
E–mail mail@maengineers.com
Tel 020 8445 9115

1.00 INTRODUCTION

1.01 It is proposed to demolish the existing house at 50 Redington Road NW3 7RS and construct a replacement house. The proposed works are covered by Planning Application 2014/4531/P

1.02 Michael Alexander Consulting Engineers have been instructed by the Client, Mr Marcus Donn to prepare a Drainage Strategy for the project.

1.03 This report has been prepared by Isaac Hudson MA(Cantab.) MEng CEng MIStructE
Calculations in respect of allowable discharge rates and attenuation volumes have been prepared by Rupert Evans MSc CEnv C.WEM MCIWEM PIEMA

2.00 DRAINAGE STRATEGY REQUIREMENTS

2.01 Planning permission reference 2014/4531/P (Planning Condition 8) sets out the following requirements of the Sustainable Urban Drainage System: -
"*(the) system shall be based on a 1:100 year event with 30% provision for Climate Change and demonstrating greenfield levels of runoff*"

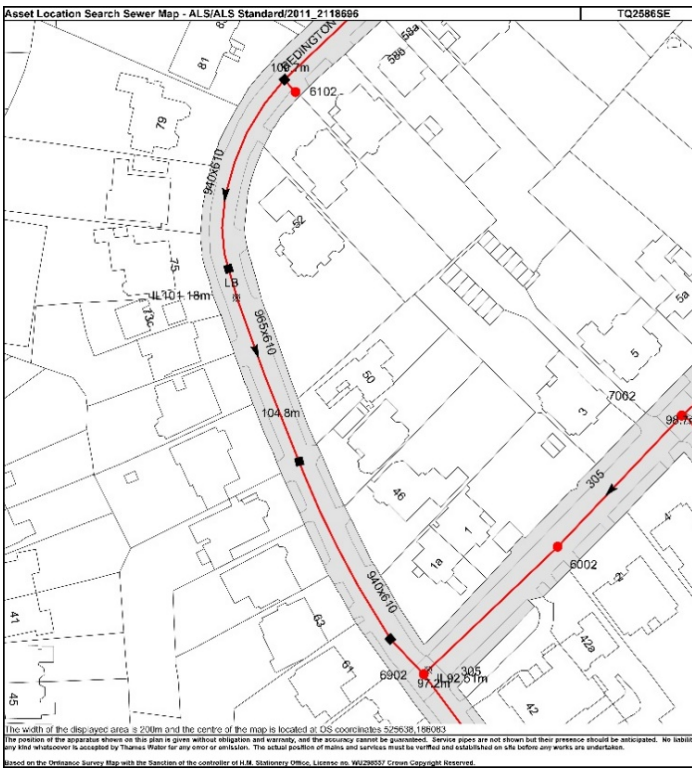
2.02 Furthermore, the scheme is required to be compliant with Code for Sustainable Homes level 4. Mandatory requirements are: -

- The peak runoff rate and annual runoff volume is not greater for development than for predevelopment.
- The system must also be designed to prevent flooding of property in the instance of local drainage failure.

3.00 DESK STUDY & INVESTIGATIONS

3.01 The Thames Water Asset Location Search Sewer Map was obtained.

It shows a combined sewer within Redington Road, at a depth of circa 4.8-5.2m below ground level.

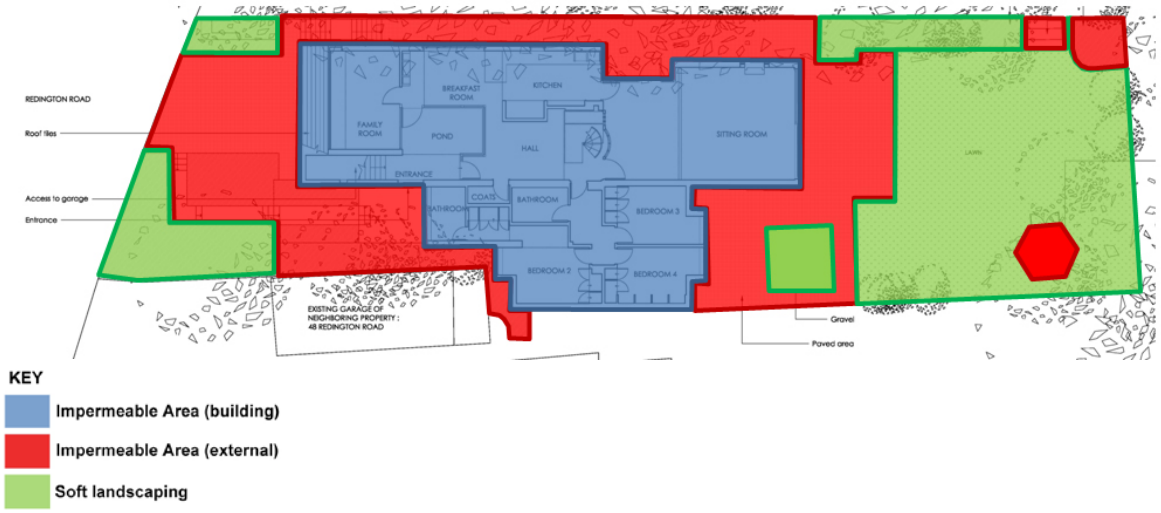


3.02 A CCTV survey has been commissioned, and its findings will be used to confirm the assumptions in the Drainage Strategy.

An assessment will also be made as to the condition of the drainage network where it is to be retained in the new scheme.

4.00 IMPERMEABLE AREA CALCULATIONS

4.01 In its current condition the site is predominantly covered by the house and its surrounding hard landscaping, with a lawn to the rear and small soft landscaped areas either side of the drive to the front garden



4.02 For the proposed replacement house, the increased footprint is offset by the reduction in hard landscaped areas. The areas of building and hard landscaping have been calculated and are summarised on the drawings included in Appendix A.

5.00 RAINWATER STORAGE CALCULATIONS

5.01 A specialist consultant, Evans River & Coastal, has been appointed to: -

- calculate the allowable discharge rates based on the criteria set out in the Planning Condition and described in clause 2.01 of this report
- generate a required attenuation volume to enable the discharge criteria to be met.

The calculations and findings are given in Appendix B

5.02 The results of the analysis are that between 43m^3 and 49m^3 of attenuation is required. For the purposes of the drainage strategy the worst case of 49m^3 has been adopted.

6.00 CONSTRAINTS ON DRAINAGE SOLUTION

6.01 The Drainage Strategy has been developed to meet the requirements described above. A number of alternative options have been considered but the adopted solution has been informed by the constraints described below.

6.02 The soil conditions have been determined by geotechnical investigations (boreholes and trial pits). The soils were found to be the strata known as the 'Claygate Member' which is a clay based soil with partings and bands of sand. Whilst there are parts of the soil which are locally permeable the areas are not well interlinked so overall the soil how as a low permeability. As such the use of soakaways, permeable paving or other approaches based on infiltration are not appropriate for this site.

6.03 The site is constrained by the boundaries so there is limited space for new drainage runs or shallow extensive attenuation features outside the footprint of the building. Furthermore there are areas where groundworks need to be minimised due to the presence of tree roots.

6.04 The level of the last manhole and the existing connection to the sewer within limits the depth of any attenuation, as the outfall cannot be lower than the connection.

7.00 DRAINAGE STRATEGY

7.01 The Drainage Strategy is described on the drawings included in Appendix C

7.02 The Foul drainage from the 1st floor, Upper Ground and Lower Ground floors will generally run externally or are distributed at high level within Basement Level 1. These will then fall under gravity to an external Foul manhole within the front drive.

Foul drainage for Basement Levels 1 and 2 will be collected in a sump beneath Basement Level 2. These will then be pumped up to the external Foul manhole within the front drive.

7.03 The waterproofing to the basement leves will include 'Cavity Drainage' to the floor of Basement Level 2 and the walls of both basement levels. Any collected water from this system will be collected in a separate Cavity Drainage sump within the basement and pumped to the Foul manhole within the front drive.

7.04 Surface water will be collected from external hard landscaped areas and the new building's roof, using existing drainage runs where it is possible to retain them. The Surface Water drainage system will be attenuated to limit discharge to the required levels.

7.05 Attenuation will be provided using a cellular modular storage system such as Hydro International 'Stormell'. This has been adopted due to the limited site area available for attenuation and the ability to stack the cells.

Each cell has a capacity of 1.5m^3 and hence the required number of cells = 49/1.5 = 32.7 cells. Due to the inherent storage in the drains etc, this is rounded down to 32 cells.

7.06 The existing drainage connection will be reused for foul drainage. In respect of the surface water drainage, it will be investigated as to whether the invert level of the last manhole facilitates reuse of the manhole to also connect to the outfall from the cellular attenuation. If this is not possible a new connection to the combined sewer in Redington Road will be made for the surface water.

7.07 The existing surface water drainage system does not have attenuation, and the collected impermeable areas for existing and proposed conditions are similar. Hence the Code for Sustainable Homes requirement for not increasing the volume of run-off is easily met by the proposals.

7.08 There is a low risk of flooding to the property in the case of Drainage System failure.

If there is ponding to external areas, water will be prevented from entering the building by the landscaping levels design and appropriate threshold details. There will be upstands to all lightwells. For the foul drainage the sump will be fitted with a backup pump and there will be an alarm/SMS alert in case of failure.

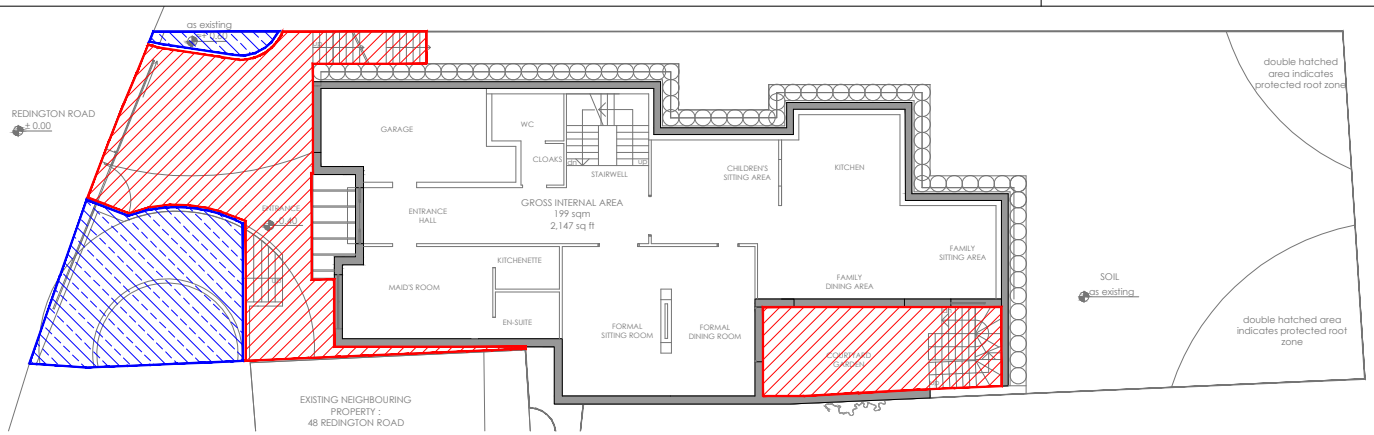
7.09 Any existing defects of the retained sections of the drainage system will be addressed prior to handover of the completed project. A CCTV survey of the full system will be carried out prior to practical completion to ensure no damage to the drainage has occurred during construction

7.10 The maintenance regime for the drainage systems will be documented in accordance with best practice. Maintenance of the system will be carried out by specialist contractors at the appropriate frequency.

In respect of the drainage attenuation, the detailed design and installation will minimise the maintenance requirements. A catchpit chamber immediately upstream of the cellular storage will help to reduce the risk of siltation, as will the laying of pipes to achieve self-cleansing velocities. The maintenance regime will involve checking the catchpit chamber and the hydrobrake after 3 months, and then further checks at 6 monthly intervals.

APPENDIX A

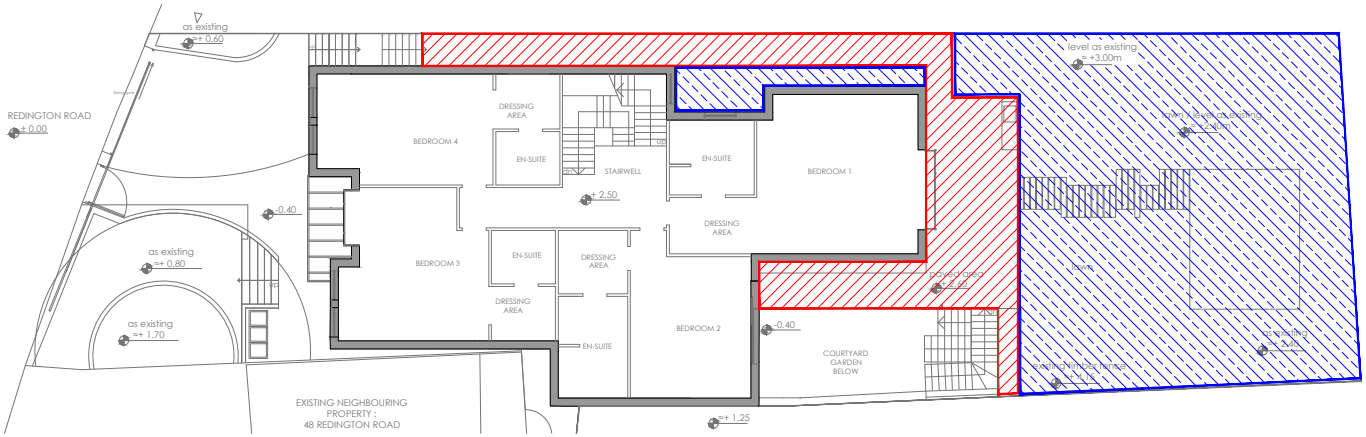
Impermeable Area Drawing



LOWER GROUND FLOOR PLAN

Scale 1:100

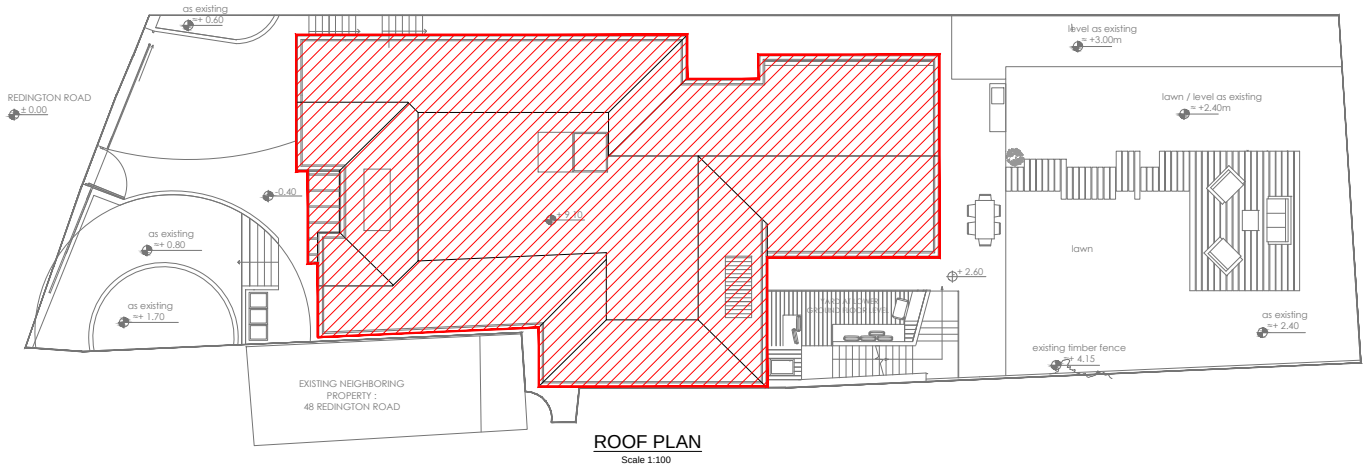
Lower Ground Floor
Impermeable Surface Area = 96.0 m²



UPPER GROUND FLOOR PLAN

Scale 1:100

Upper Ground Floor
Impermeable Surface Area = 65.6 m²



ROOF PLAN

Scale 1:100

Roof
Surface Area = 255.0 m²

NOTES

1. This drawing shall be read in conjunction with all relevant Architects & Engineers drawings and specifications.
2. Do not scale any dimensions. All dimensions to be checked on site.

LEGEND

- Proposed Building
- Soft Landscaping
- Impermeable Surfaces

TOTAL AREA OF SITE = 622.4 m²

IMPERMEABLE SURFACE AREA TABLE

Lower Ground Floor
Impermeable Surface Area = 96.0 m²

Upper Ground Floor
Impermeable Surface Area = 65.6 m²

Roof
Surface Area = 255.0 m²

TOTAL IMPERMEABLE SURFACE AREA = 416.6 m²

Rev.	Date	Description	By
P2	29.11.2017	ISSUED FOR COMMENT	SP
P1	20.11.2017	ISSUED FOR COMMENT	SP

PRELIMINARY

Architect
OSEL ARCHITECTURE

Project Title
50 REDINGTON RD
LONDON, NW3 7RS

Drawing Title
IMPERMEABLE AREA LAYOUTS

Michael Alexander
Foundation House
4 Percy Road
London N12 8BU
tel +44 (0)20 8445 9115
email mail@malexander.com
web www.malexander.com

Drawn	SP NOV 2017
Checked	IH NOV 2017
Scale	1:100 1:200
Size	A1 A3
Project No.	P3940
Drawing No.	155
Rev.	P2

0 100mm WHEN PLOTTED @ 1:1 FOR A1 100 50mm WHEN PLOTTED @ 1:2 FOR A3 200

APPENDIX B

Calculation of Storage Requirements

Email from Rupert Evans of Evans River & Coastal, dated 7th December 2017: -

Greenfield Runoff

The contributing impermeable area across the proposed site has been calculated as 416.6 sq m. Runoff from the contributing area is assumed to be 100% (i.e. 100% PIMP and no infiltration into the ground) and permeable parts of the site such as garden areas will be profiled so that they do not enter the drainage system. Therefore, in accordance with Section 24.2 of CIRIA 753 permeable areas will not contribute to the drainage system and have therefore not been included in the Greenfield runoff rate calculations.

In order to quantify the equivalent Greenfield runoff rate for the contributing area, the methodology outlined within the document entitled *The Revitalised Flood Hydrograph Model ReFH2 Technical Guidance* has been adopted. The document states that Table 24.1 of CIRIA 753 prefers FEH Methods over the IoH 124 Method, as they are more accurate when calculating peak flows within small catchments and plot scale Greenfield runoff calculations.

The ReFH2.2 software has been integrated within the Microdrainage software Version 2017.1.2 with rescaling abilities for sites below 50 ha. The method also uses the more up-to-date FEH13 Point rainfall data (which replaces the FEH99 data) which have been imported into the Microdrainage software Version 2017.1.2 from the FEH Web Service as well as the catchment descriptors.

In the Microdrainage software the AREA was modified to represent the contributing area area and a winter storm profile was used. Figure 1 shows that the equivalent 1 in 1 year runoff rate is 0 l/s (i.e. too low to be recorded by the software) and the 1 in 2 year runoff rate (i.e. similar to QBAR) is 0.1 l/s. When considering 2 l/s/ha, the runoff rate is 0.08 l/s.

Evans Rivers & Costal Ltd		Page 1
19 St Andrews Avenue Thorpe St Andrew Norwich NR7 0RG	Greenfield runoff rate	
Date 07/12/2017 20:03 File	Designed by rupertercl Checked by	
Micro Drainage	Source Control 2017.1.2	

ReFH2 Rural Runoff Peak Flows

Input

Return Period (Years)	2
FEH Rainfall Version	2013
Site Location	GB 525638 186082
Data Type	Point
Season	Winter
Country	England/Wales/Northern Ireland
Area (ha)	0.042
SAAR (mm)	664
BFIHOST	0.683
FARL	0.000
SPRHOST	0.000
URBEXT (2000)	0.0000

Results

Return Period (Years)	Rural (l/s)	Urban (l/s)
User	0.1	0.1
Q1	0.0	0.0
Q2	0.1	0.1
Q5	0.1	0.1
Q10	0.1	0.1
Q30	0.2	0.2
Q50	0.2	0.2
Q75	0.2	0.2
Q100	0.2	0.2
Q200	0.3	0.3
Q1000	0.4	0.4

Figure 1: Greenfield runoff rate equivalent (Source: Microdrainage Version 2017.1.2)

Allowable Discharge Rate

The DEFRA/EA document entitled *Rainfall runoff management for developments* dated 2013, and BS8582:2013 advise that the post-development site should aim to try and replicate the undeveloped state and that for Greenfield sites, the peak runoff rate from the developed site for the 1 in 1 year event and 1 in 100 year event should be constrained to the equivalent peak Greenfield runoff rate to minimise the impact on the receiving watercourse.

The guidance states that when considering volume control, the volume discharged from the site for the 1 in 100 year, 6 hour event is constrained to the equivalent volume associated with the Greenfield condition.

The aforementioned guidance and Section 24.10 of CIRIA 753 states that where the additional volume from the development cannot be used or disposed of on-site (e.g. through infiltration or rainwater harvesting) such as in this case, to avoid an increased runoff volume from developed areas into the sewer system, this volume should be discharged at a very low rate.

Therefore, the guidance recommends that:

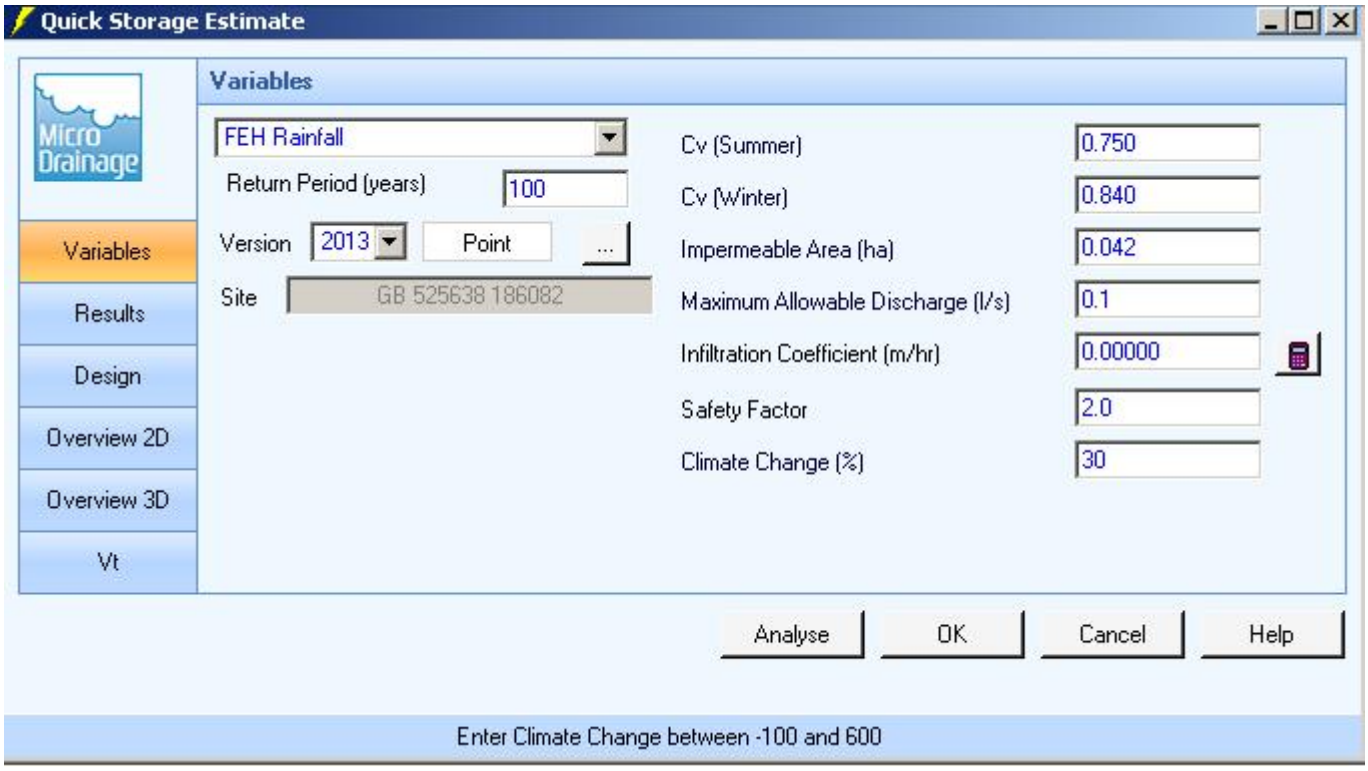
a) The additional volume resulting from the development (i.e. long term storage volume) should be discharged at a rate of 2 l/s/ha (or less); or

b) *ALL* the runoff for the 1 in 100 year event from the site should be discharged at a rate of 2 l/s/ha or QBAR (whichever is greater).

In order to provide effective attenuation from the site it is proposed that the runoff from the proposed site will be discharged in accordance with criterion b) above. Therefore, the allowable discharge from the site equates to 0.1 l/s.

Attenuation

The Microdrainage – *Quick Storage Estimate* function has been used in order to determine the volume of storage required based on the discharge rate of 0.1 l/s and contributing area of 416.6 sq m. The model was run for the climate change (30%) 1 in 100 year event as required by Planning Condition 8. The result can be seen on Figure 2.



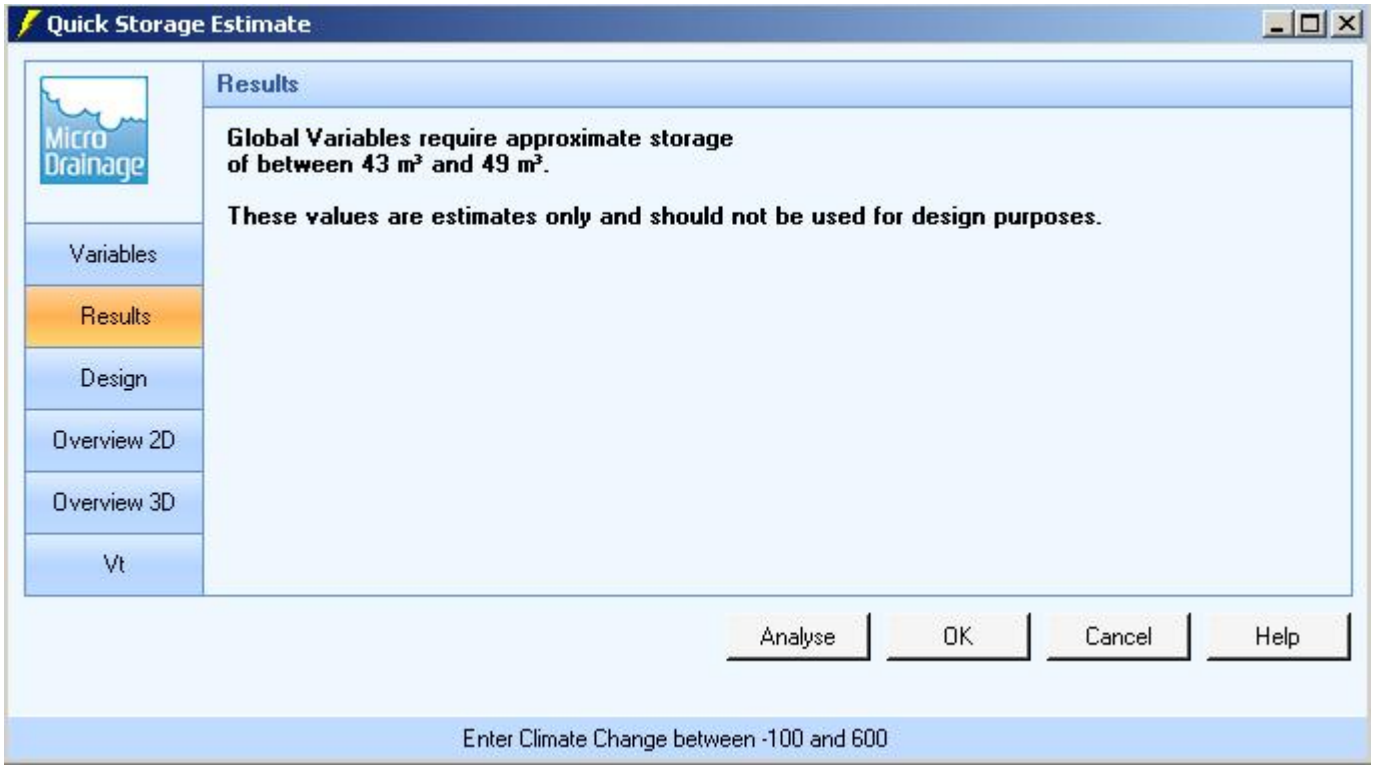


Figure 2: Storage Volume (Source: Microdrainage Version 2017.1.2)

Regards

Rupert Evans MSc CEnv C.WEM MCIWEM PIEMA
Director

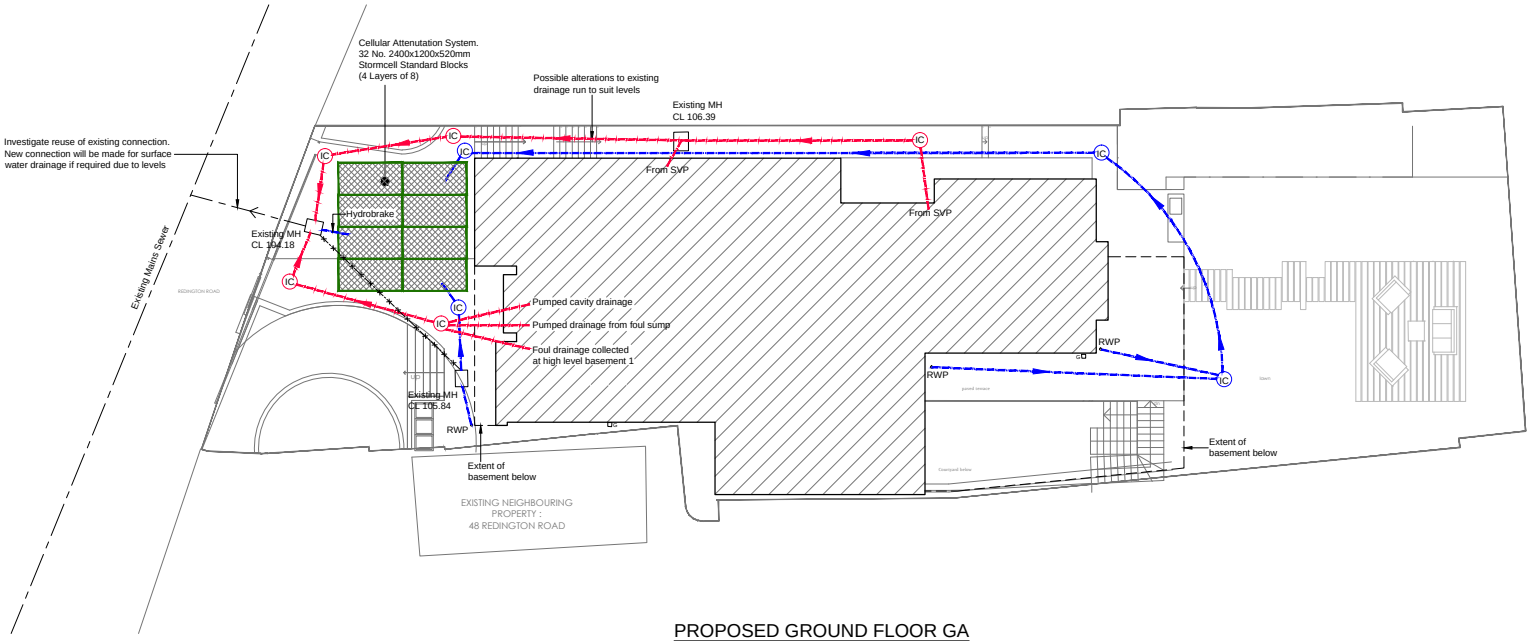
Flood Risk Assessments / SUDS Strategies /
River and Coastal Flood Modelling / Flood Response Plans

T: 01603 304077
M: 07896 328220
E: rupert.evans@evansriversandcoastal.co.uk
W: www.evansriversandcoastal.co.uk

Lavender House | 19 St Andrews Avenue | Thorpe St Andrew | Norwich | NR7 0RG

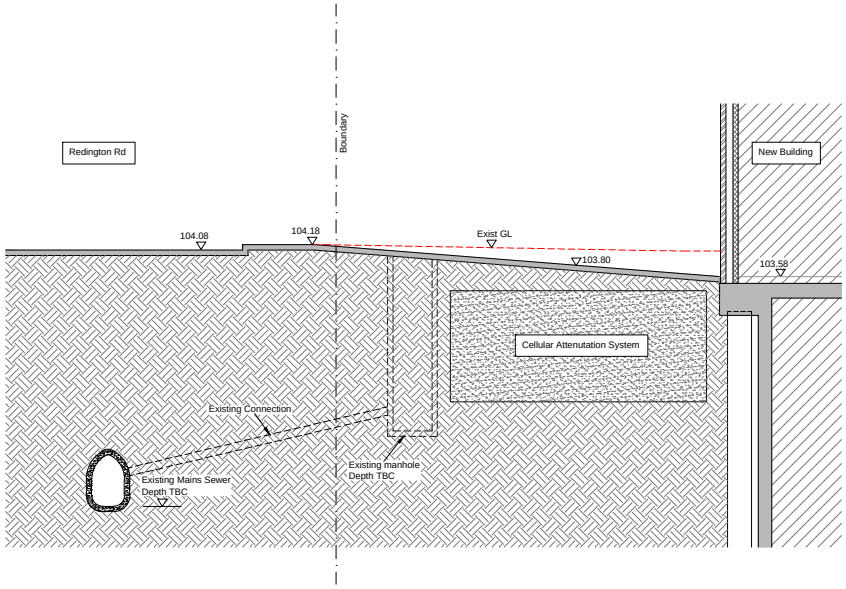
APPENDIXC

Drainage Strategy Drawing



PROPOSED GROUND FLOOR GA SHOWING DRAINAGE

Scale 1:100



PROPOSED SECTION

Scale 1:50

NOTES

1. This drawing shall be read in conjunction with all relevant Architects & Engineers drawings and specifications.
2. Do not scale any dimensions. All dimensions to be checked on site.
3. All works to be carried out in accordance with the current Building Regulations and Code of Practice and to be approved by the Building Inspector.

LEGEND

- Existing Drainage
- Existing Drainage run removed
- Proposed Surface Water drainage (150Ø @ 1:100 Fall)
- Proposed Foul Water drainage (150Ø @ 1:80 Fall)
- IC — Surface Water PPIC ((Hepworth)SPIC1/1)
- IC — Foul Water PPIC ((Hepworth)SPIC1/1)
- RWP — Rain Water Down Pipe with rodding access
- SVP — Soil Vent Down Pipe with rodding access

Rev.	Date	Description	By
P1	12.01.2018	ISSUED FOR COMMENT	SP

PRELIMINARY

Architect
OSEL ARCHITECTURE

Project Title
50 REDINGTON RD
LONDON, NW3 7RS

Drawing Title
DRAINAGE STRATEGY

Michael Alexander
Foundation House
4 Percy Road
London N12 8BU
tel +44 (0)20 8445 9115
email mail@malexander.com
web www.malexander.com

Drawn	SP	JAN 2018
Checked	IH	JAN 2018
Scale	1:100 1:200	Size A1 A3
Project No.	Drawing No.	Rev.
P3940	150	P1

0 — 100mm WHEN PLOTTED @ 1:1 FOR A1 — 100 — 50mm WHEN PLOTTED @ 1:2 FOR A3 — 200

Foundation House
4 Percy Road
London
N12 8BU

Tel +44 (20) 8445 9115
Email mail@maengineers.com
Web www.maengineers.com