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Householder Planning Application
77 Lawn Road
London NW3 2XB

Report to Demonstrate Compliance With Code for Sustainable Homes SUR1 Surface Water Run-off

On behalf of

Laura Bolohan & Xavier Menguy

March 2016

1 Background and Objectives

1.1 The following calculations and supporting information has been undertaken to ascertain if the mandatory requirements set out in the Code for Sustainable Homes – Category 4: Surface Water Run-off can be met. The appraisal has been carried out in accordance with the Technical Guidance Code Addendum (2014) England issued in May 2014.

1.2 This report examines the options available for surface water discharge and sets out the preferred strategy for doing so in a way that meets the mandatory requirements of Category 4 of the Code (SUR1). The objective of SUR1 is to design housing developments which avoid, reduce and delay the discharge of rainfall to public sewers and watercourses so as to protect watercourses and reduce the risk of localized flooding, pollution and other environmental damage.

1.3 This report makes recommendations as to the preferred method of discharging surface water from the development site based on the best available information. The recommended option has been numerically analyzed to ensure that the requirements of the Code can be met.

1.4 The requirements set out in the Code Addendum (2014) England of the Code for Sustainable Homes outline a number of assessment criteria. These are focused on the mandatory elements of SUR1. No credits are available for the Hydraulic Control Criteria. Two credits are available for the non-mandatory elements covered by Water Quality Criteria.

1.5 Climate change has been taken account of using the sensitivity ranges for peak rainfall intensity set out in Table B2 of Annex B of PPS25. For residential development a 100 year timeframe is used. From Table B2 it can be seen that for this development a 30% increase in peak rainfall intensity needs to be applied to current rainfall rates to give the correct climate change values.

2 Site Information

2.1 The site is located at 77 Lawn Road, London NW3 2XB. The OS Grid Reference is TQ275850.

2.2 The proposal is to extend and refurbish the interior and to provide a new basement flat to the existing property

2.3 The following information and data has been used in appraising the surface water management requirements for the proposed development.

Site Characteristic	Pre-developed site	Post developed site
Total area of site	485m^2	
Man-made impermeable area	125m^2	200m^2
Percentage of site that is impermeable	26%	41%
Infiltration rate	Not applicable. See Clause 3.11 below	
Greenfield run-off rate	0.7 l/sec (based on IoH Report 124 metrology)	
Standard Percentage Run-off (SPR)	47%	
SAAR	647mm	
Is the site within a Source Protection Zone	No	

3 Assessment Criteria

3.1 The Code for Sustainable Homes sets out mandatory requirements to meet the Hydraulic Control assessment criteria. These relate to the peak rate of run-off and the volume of run-off generated by the proposed development. These must be achieved in all instances and no credits are available.

3.2 The Code states that if there is no increase in the man-made impermeable area as a result of the new development then the peak rate run-off criteria does not apply. From the table above it can be seen that the proposed development does result in an increase in the man-made impermeable area. Where there is an increase in impermeable area the Code requires that it is demonstrated that the peak rate of run-off over the development lifetime, allowing for climate change, will be no greater for the developed site than it was for the pre-development site. This should comply at the 1 year and 100 year return period events.

3.3 The Code Addendum (2014) England Technical Guide states that the peak rate of run-off calculations should be carried out for a range of storm durations up to and including the 6 hour storm. The peak rate of run-off for the storm event will then be the 'worst case' run-off rate for the range of storm durations. The climate change allowance should be added only to the post development calculations.

3.4 Using the methodologies recommended by the Interim Code of Practice for Sustainable Drainage System (SUDS) (CIRIA 2004) the peak rates of runoff have been calculated for both the pre and post development site conditions. The analysis is shown in Appendix 2 and the results are summarized in the table below.

Return Period (years)	Peak Runoff (l/s)	
	Pre-developed Site	Post-developed Site
1	1.9	5.7
100	9.5	28.2

3.5 Based on the requirements of SUR1 if the post-development run-off rate exceeds the pre-developed rate then it is necessary to limit the discharge to the pre-development rate. This would give values of 1.9 l/s and 5.7 l/s for the 1 year and 100 year return periods respectfully.

3.6 In order to prevent blockage of the discharge system the Code recommends a minimum discharge rate of 5.0 l/sec for systems that incorporate flow control devices. The discharge of the 1 year return period is below this threshold, however in this location there are specific requirements from Thames Water that the peak discharge from the site must be limited to 5 l/sec and therefore this will be the limiting discharge for the 1 year and 100 year return period events

3.7 The Code states that the post-development volume of run-off, allowing for climate change over the development lifetime, must be no greater than it would have been before the development. The additional predicted volume of run-off for the 100 year 6 hour event must be prevented from leaving the site by using infiltration or other SUDS techniques. If this cannot be satisfied then the post-development peak rate of run-off must be reduced to the limiting discharge.

3.8 The total volume of water discharging from the site from the 100 year 6 hour event (including for a 30% increase for climate change for the post-developed site) is summarized below for both the existing and proposed site conditions. As recommended in the document 'Preliminary Rainfall Run-off Management for Developments (EA/DEFRA W5-074/A)' run-off from impermeable surfaces has been taken as 100% and 0% for all permeable surfaces.

Site Condition	**Total Volume Discharged**
Pre-developed site	$8.4m^3$
Post-developed site (including climate change)	$41.3m^3$
Difference	$32.9m^3$

3.9 In order to satisfy this condition it will be necessary to prevent the additional predicted volume of run-off from leaving the site by using infiltration or other SUDS techniques.

3.10 The primary methods of achieving this are outlined below along with a brief discussion of the appropriateness of each and the primary reasons why each method has been either included or discounted.

3.11 **Soakaways:** The preferred drainage solution for the surface water drainage would be to use soakaways but the Geological Survey of Great Britain shows that the site to be underlain by London Clay which is generally regarded as unsuitable for soakaways due to its impermeability.

Porous/pervious paving: Ground conditions and planning constraints preclude the use of porous or pervious paving.

Rainwater harvesting: The use of rainwater harvesting is proposed.

Green roofs: Green roofs are out of keeping with other properties in the area and the roof form and structure of the building is not suitable but the proposed garage and bin store are to be provided with a green roofs.

Other Surface Infiltration Techniques: As with traditional soakaways, the use of surface infiltration techniques requires a reasonable degree of infiltration to be used effectively. In this situation the use of shallow infiltration techniques such as infiltration ponds, trenches etc. has been considered, however in view of the underlying London Clay and the space restrictions within the site, the effective use of such methods has been discounted

3.12 Based on the above, it is not possible to satisfy the requirements of Criterion A of the Code and consequently Criterion B must be achieved, which is to reduce the post-development peak rate of run-off to the limiting discharge. This is defined as the pre-development flow rate equivalent to the 1-year peak flow rate, the mean annual flood flow rate (Qbar) or 2 l/s/ha whichever is the highest flow rate.

3.13 These values are 1.9 l/s, 0.22 l/s and 0.1 l/s respectfully. All are less than the 5.0 l/s minimum value required to prevent blockage and the site specific requirements set out by Thames Water.

3.14 In order to demonstrate that the limiting discharge rate can be achieved, the proposed SUDS technique has been analysed using the 1 in 100 year storm with an increase of 30% in rainfall intensity to account for climate change. In this situation the preferred method of attenuating peak flow is to incorporate a flow control device and on-line storage within the system. The volume of required storage and other design criteria have been calculated and the results are tabulated in the table below. The detailed calculation is included in the appendix of this report.

Parameter	**Value**
Impermeable area discharging to system	200m^2
Critical storm duration	10 minutes
Maximum infiltration	Nil
Limiting discharge	5.0 l/s
Storage device used	Wavin AquaCell Lite Units
Required storage volume	2.1m^2
Peak discharge from site (1yr including climate change)	9.5l/s
Peak discharge from site (100yr including climate change)	28.2l/s

3.15 From the results summarised in the table it can be seen that the proposed mitigation option meets the requirements for Criterion B by limiting the peak run-off to a value that conforms to the 5 l/sec rule and the specified requirements of Thames Water.

3.16 The Code states that it must be demonstrated that the flooding of property would not occur in the event of a drainage system failure (caused either by extreme rainfall or a lack of maintenance).

3.16 In the event of the drainage system failing or becoming blocked, the run-off from the site would normally flow overland. The resulting surface water would issue from the lowest point of the site at the entrance to the garage. When the results of the flow route analysis and low associated flow volumes are taken into consideration it is considered that in the event of the drainage system failure flood risk to off-site properties will not be increased. Flood risk to the proposed garage would however be a probability.

3.14 The Code criteria states that one credit can be awarded by ensuring there is no discharge from the developed site for rainfall depths up to 5 mm. A further credit can be awarded by ensuring that the run-off from all hard surfaces receives an appropriate level of treatment in accordance with the SUDS Manual to minimise the risk of pollution.

3.17 A range of typical SUDS components that can be used to improve the environmental impact of a development is listed in the table below along with the relative benefits of each feature and the appropriateness to the subject site.

SUDS Feature	Environ-mental Benefits	Water quality improve-ment	Suitability for low permeability soils ($k<10^{-6}$)	Ground water recharge	Suitable for small confined sites	Site specific restrictions	Appropriate for subject site?
Wetlands	✓	✓	✓	✗	✗	Limited space	No
Retention ponds	✓	✓	✓	✗	✗	Limited space	No
Detention basins	✓	✓	✓	✗	✗	Limited space	No
Infiltration basins	✓	✓	✗	✓	✗	Limited space	No
Soakaways	✓	✓	✗	✓	✗	Unsuitable soils	No
Swales	✓	✓	✓	✓	✗	Limited space	No
Filter strips	✓	✓	✓	✓	✗	Limited space	No
Rainwater harvesting	✗	✓	✓	✓	✓	None	Yes
Permeable paving	✗	✓	✓	✓	✓	Unsuitable soils and planning restrictions	No
Green roofs	✓	✓	✓	✗	✓	Generally out of keeping with the area but to be provided for the proposed garage and bin store	Part
Underground storage	✗	✗	✓	✗	✓	None	Yes

3.18 Although soakaways are unsuitable for this site due to unsuitable soils infiltration of the soils on the site is possible preventing the discharge from hardstanding areas of the site for rainfall depth up to 5mm. Run-off from the drive and the entrance to the garage is to be drained by slot drains into the surface water drainage system. The slot drains and drainage system have been designed to easily cope with the flow resulting from a rainfall depth of 5mm.

4 Maintenance

4.1 The drainage system will be designed to be self-cleansing and of low maintenance.

4.2 The new surface water drainage system will not be accepted for adoption by Thames Water as it is on private land. It is unlikely that these facilities will be adopted in the future, even if the appropriate legislation changes are passed by Parliament.

4.3 It is recommended that all gullies and drainage channels be cleaned out at least annually.

4.4 Manholes and inspection chambers should be inspected every 5 years or whenever blockages occur.

4.5 Maintenance of the drainage system will be the responsibility of the householder.

5 Conclusions

5.1 Post development run off levels are greater than existing levels but a flow restriction within the demarcation manhole and on site storage will reduce the volume and rate of run-off to existing levels as required within the Code Addendum (2014) England Code for Sustainable Homes.

5.2 By restricting the flow the mandatory element of SUR 1 will be achieved.

5.3 The non-mandatory elements covered by Water Quality Criteria have been achieved and therefore two credits may be awarded.

APPENDIX 1

Sur 1 Summary Template Addendum (2014) England

Category 4: Surface Water Runoff

Sur 1 Summary Template – November 2010, Addendum (2014) England and Addendum (2014) Wales

Introduction

This template can be used to demonstrate compliance with the criteria specified in Sur 1 in the Code for Sustainable Homes November 10, Addendum (2014) England and Addendum (2014) Wales. **The template can be used by the Code Assessor to aid in assessing the Sur 1 issue and can be provided as supporting evidence in addition to the items listed in the schedule of evidence for Sur 1**. Completing this template is optional.

National policy documents have been used to set the standards for the mandatory element of Sur 1. Planning Practice Guidance (PPG)[1] for England/ Technical Advice Note 15 (TAN 15) for Wales and the SuDS manual are the key documents used. Further reading is listed in the References section of the Technical Guide.

Instructions

Where submitting this template as supporting evidence for a Code assessment please ensure that the **assessor completes the contact details (page 2)** and the **appropriately qualified professional completes the rest of the template**, **ensuring that it is signed using the Signature Line provided.**

If the template is incomplete and / or unsigned it will not be accepted as evidence supporting a Code assessment.

The Technical Guide states the calculation methodologies to be used to demonstrate compliance with some aspects of the criteria, for example the greenfield runoff rates. Although flexibility in choice of methodology is available for some of the criteria, best practice methodologies should always be used. If required, information regarding applicable calculation methodologies can be found in the SUDS Manual (CIRIA, 2007). Reputable software, such as Microdrainage, can be used for calculation purposes.

[1] Available at http://planningguidance.planningportal.gov.uk/

As of the 6th of March 2014, Planning Policy Statement 25 (PPS25) ceased to be a current document for planning purposes and was replaced by the new Planning Practice Guidance (PPG).

Guidance on when to use PPS25/PPG/TAN 15 for the purposes of your Code assessment

As of the 6th of March 2014, Planning Policy Statement 25 (PPS25) ceased to be a current document for planning purposes and was replaced by the new Planning Practice Guidance (PPG).

This change does not impact the technical requirements of Sur 1. The 'November 2010 Technical Guidance' and 'Code Addendum (2014) England' documents simply reference the planning guidance that was current at the time of publication.

In England, it is acceptable for the planning guidance (PPS25 or PPG) required for planning purposes to be used with the 'November 2010 Technical Guidance' and 'Code Addendum (2014) England'.

In Wales, TAN 15 must be used with the 'November 2010 Technical Guidance' and 'Code Addendum (2014) Wales'.

The below sections to be completed by the Assessor	
Contact Details	
Consultant/engineer details	
Company Name*	Michael Ward
Company Address	26 Sheddick Court, Dereham, Norfolk NR19 2DT
Contact Name	Michael Ward
Contact Telephone Number	01362 652935
Developer/client details	
Company Name*	Laura Bolohan & Xavier Menguy
Company Address	77 Lawn Road London NW3 2XB
Contact Name	Laura Bolohan & Xavier Menguy
Contact Telephone Number	07955883862
Development details	
Development Name*	Lawn Road
Development Address*	77 Lawn Road, London NW3 2XB
BRE Reference Number*	
Client Reference Number	
Number of dwellings on the site*:	One
Number of Code dwellings on the site*:	One
Fields marked with * must be completed.	

All of the following sections of the template to be completed by the Engineer / Consultant	
MANDATORY REQUIREMENTS	
Appropriately Qualified Professional	
1. ☒	I can confirm that I am an appropriately qualified professional in line with the Code definition.[2]

Assessment Information	
2.	For sites containing a mixture of non-Code and Code assessed dwellings there are several assessment options for Sur 1. The first would be to assess the whole site (including the non-Code dwellings) under the Code criteria. The second would be to demonstrate with several separate templates that each group of Code dwellings (and the associated sub catchments serving those dwellings) on the site have met the criteria individually. Please tick one of the following boxes;
☐	A. The site contains a mixture of Code and non-Code dwellings and the whole site has been assessed under the Sur 1 criteria including any associated sub catchments serving these dwellings.
	OR
☐	B. The site contains a mixture of Code and non-Code dwellings and there is more than one assessed area for Sur 1 within the site boundary. Please write the number of assessed areas within the site in the space provided below (you will need to complete this template for each assessed area)[3]. **Number of assessed areas:** **Dwellings included within this Sur 1 template:**
	OR
☒	C. The site only contains Code assessed dwellings and the associated sub catchment serving those dwellings.

Site Information		
3.	A. Please provide the site area[4](select units of measurement from drop down)	485m²
	B. Please provide the impermeable area of the site pre-development (select units of measurement from drop down)	125m²
	C. Please provide the impermeable area of the site post development (select units of measurement from drop down)	200m²

[2] Refer to the technical guide for details on the definition of an appropriately qualified professional.

[3] It would aid the QA process to provide a site plan highlighting each assessment area and highlighting which area is being assessed in this template.

[4] The site area must include all areas within the boundaries of the site, including both permeable and impermeable areas. The pre and post development site areas must always be the same. If box 2B has been ticked, the 'site area' will be only that for which this template demonstrates compliance. If 5A/B has been ticked, the 'site area' will exclude the area of the existing/adoptable highway.

How is the mandatory element of Sur 1 being assessed?	
4.	Please tick the relevant box below to identify where a special case applies for the site:
	Standard approach
☐	A. Criterion 1, 2 and 3 are being met in the standard way.
	Default case
☐	B. The mandatory criteria can be deemed to be met by default as the site discharges rainwater directly to a tidal estuary or the sea. *Note: where this applies, it is not necessary to complete points 5 – 16 of this template.*
	Special Cases[5]
☐	C. There is no increase in the man-made impermeable area as a result of the development and mandatory criteria section 1 and 2, have both been met by default. Note: where this applies criterion 3 (point 16 of this template) of the mandatory criteria must still be satisfied.
☒	D. A minimum flow rate or maximum storage requirement has been set by the sewerage undertaker (or other statutory body). Criteria 1 and/or 2 has been met by default. Note: all remaining mandatory criteria must be satisfied
☐	E. Planning approval has been granted for the detailed drainage strategy prior to the Code requirement being set for the development. Note: No credits for water quality can be awarded using this method. Please go to Point 18 .
☐	F. The assessed dwelling is directly connected to existing infra-structure which pre-dates the Code requirement. Note: No credits for water quality can be awarded using this method. Please go to Point 18

Adoptable/Existing Highways	
5.	Tick one or both of the following to confirm if some or all of the highways will be omitted from the site area in the calculations for one of the following reasons[6]:
☐	A. The highways are being adopted
☒	B. The Code dwellings are being built beside existing highways.

[5] Refer to the Technical Guide for details on the supporting evidence required to demonstrate compliance with these special cases. This evidence must be provided to demonstrate how the special case is being met.

[6] Refer to the technical guide for details on when an adoptable road can be omitted from the assessment.

6.	Please confirm the following approach has been used and state the area of adoptable/existing/ highway:
☒	The impermeable area of the adoptable/existing highway has been excluded from the site area and all calculations and sections below. **Area of adoptable/existing highway**: m² Note: a site plan pre and post development must be provided to highlight the area of the land that has been excluded from the pre and post development site area

SECTION 1: Peak Rate of Runoff (Criterion 1)		
7.	A. Pre-development peak rate of runoff for the **1 year return period event**[7]	1.9**l/s**
	B. Post-development peak rate of runoff for the **1 year return period event** [7]**including mitigation**(this figure must be less than or equal to A, except where the 5l/s rule has been used)	9.5**l/s**
	C. Pre-development peak rate of runoff for the **100 year return period event** [7]	9.5**l/s**
	D. Post-development peak rate of runoff for the **100 year return period event** [7] **including mitigation**(this figure must be less than or equal to C, except where the 5l/s rule has been used)	5.0**l/s**
8. ☒	Please tick this box to confirm that the 5l/s rule has been applied where the peak rates of runoff have increased post development, but are still equal to or less than 5l/s.	

9.	If, post-development, mitigation methods were used to reduce the peak rate of runoff to meet the Code criteria, please provide a brief explanation below describing how the peak rate was reduced. For example, 'soakaways reduce the peak rate of runoff to pre-development levels'.[8]
	N/A ☒

10. ☒	Please tick this box to confirm that the post development peak rate of runoff calculations include an allowance for climate change in accordance with current best practice (PPS 25/PPG/TAN 15).

[7] Peak rate of runoff calculations should be carried out for the range of storm durations up to and including the 6 hour storm. The peak rate of runoff for the storm event will then be the 'worst case' runoff rate for the range of storm durations. The climate change allowance should be added only to the post development calculations.

[8] Note that detailed documentary evidence (as per the schedule of evidence table in the Technical guide) is required to demonstrate how the peak rate of runoff has been reduced.

11.	Please tick one of the following boxes as applicable to this site (where option F is selected, 2 ticks will be present):
☐	A. This is a greenfield site and is less than 50 ha therefore runoff rate calculations have been carried out in accordance with the IH Report 124 'Flood estimation for small catchments' (Marshall and Bayliss, 1994). The pro rata method on the size of catchment detailed in table 4.2 of the SuDS manual has been used.
☐	B. This is a greenfield site of 50 to 200 ha therefore runoff rate calculations have been carried out in accordance with the IH Report 124 'Flood estimation for small catchments' (Marshall and Bayliss, 1994).
☐	C. This is a greenfield site of more than 200 ha (or where there is a preference to do so and the catchment is considered suitable for its application) therefore runoff rate calculations have been carried out in accordance with the 'Flood estimation handbook' (Centre for Ecology and Hydrology, 1999).
☐	D. This is a greenfield site of more than 200ha where the Flood Estimation handbook is considered inappropriate for the development therefore the IH Report 124 has been used.
☒	E. This is a brownfield site and runoff rates have been calculated in accordance with current best practice simulation modelling.
☐	F. This is a brownfield site where the pre-development surface water drainage system is not known therefore the runoff rates have been calculated using the greenfield run-off model ticked above (please tick the relevant methodology), but using soil type 5.

SECTION 2: Volume of Runoff (Criterion 2)	
Section 2A	
12. ☒	Please tick this box to confirm that the following post development volume of runoff calculations include an allowance for climate change in accordance with current best practice (PPS 25/PPG/TAN 15).
☒	Please tick this box to confirm that the following volume of runoff calculations are for the 100 year event of 6 hour duration.

13.	A. Pre-development volume of runoff	8.4**m³**
	B. Volume of runoff caused by the new development **prior to mitigation**	41.3**m³**
	C. **Additional** predicted volume of rainwater caused by the new development **prior to mitigation** (= 13B – 13A)	32.9**m³**
	D. If the answer to 13C is greater than zero, please provide a brief explanation below describing the mitigation methods used toreduced the additional volume discharged from the developed site, for example, 'soakaways will infiltrate all of the additional volume'[9]:	
	N/A ☒ (criterion 2A cannot be satisfied, see point 13)	
	E. Has all of the additional volume of run off been reduced using the mitigation methods described in section 13D? If yes, go to point 16. If no, go to 13F.	No
	F. Please confirm the remaining additional volume of runoff discharged from the site when all (if any) mitigation measures described in 13D are in place.	32.9 **m³**

[9] Note that detailed documentary evidence (as per the schedule of evidence table in the Technical guide) is required to demonstrate how the volume of runoff has been reduced.

Justification for not meeting criteria 2A	
14.	A. Where there is an increase in the volume of runoff as a result of the development and criteria 2A cannot be satisfied via infiltration or other SuDS techniques (as listed below), please provide justification(s) for not installing SuDS : ***Note*: justifications given below must be supported by evidence (see TGN 001 for examples of acceptable evidence)**
	Soakaways: Ground conditions preclude the use of soakaways **Porous/Pervious paving:** Ground conditions and planning constraints preclude the use of porous paving **Rainwater re-use harvesting:** Rainwater harveting is to be used **Green Roof:** Generally green roofs are out of keeping with the proposed development but it is intended that the proposed garage and bin store will be provided with a green roofs. **Other surface infiltration techniques:** Physical restraints of site development preclude use of any surface infiltration techniques. N/A ☐ (all additional volumes of run-off have been dealt with)

Section 2B	
15.	Where it has not been possible to reduce all of the additional volume of run-off by infiltration or other SuDS techniques and full justifications have been given in point 14 above, the volume of runoff should be discharged at the 'limiting discharge' (i.e whichever of the following rates of runoff, is the higher). Please tick one of the boxes below to confirm the level of flow control that has been achieved:
☐	A. The peak discharge rate has been reduced to pre development 1 year peak flow rate
	Please state the pre development 1year peak flow rate l/s
	OR
☐	B. The peak discharge rate has been reduced to the site's estimated mean annual flood flow rate (Qbar).
	Please state Qbar: l/s
	OR
☐	C. The peak discharge rate has been reduced to 2l/s/ha.
	Please state the peak discharge rate at 2l/s/ha: l/s
	OR
☒	D. The limiting discharge rate requires a flow rate of less than 5l/s at a discharge point, therefore a flow rate of up to 5l/s has been used.

SECTION 3: Designing for Local Drainage System failure (Criterion 3)	
16. ☒	Tick here to confirm that the consequences of system failure caused by extreme rainfall, lack of maintenance, blockage or other causes, have been considered and evaluated fully and there will be no increased risk to dwellings either on or off site.[10]

[10] Refer to the technical guide for details on the evidence that would be required to demonstrate that this has been considered fully.

SECTION 4: AWARDING OF CREDITS: WATER QUALITY CRITERIA (2 credits)[11]	
17. ☒	A. Tick here to confirm that there will be no discharge from the developed site for rainfall depths up to 5 mm. Please provide a brief explanation below describing how the runoff from rainfall depths up to 5 mm will be prevented from leaving the site (1 credit): Runoff will be via gullies and drains to a soakaways within the site boundary
☒	B. Tick here to confirm that the runoff from all hard surfaces shall receive an appropriate level of treatment in accordance with the SuDS Manual to minimise the risk of pollution to the receiving watercourse. Please provide a brief explanation below describing how the hard surfaces will receive an appropriate level of treatment (1 credit): Roof drainage will discharge via rainwater pipes and gullies in to the existing public sewer. Runoff from the drive will discharge via trapped gullies in to the existing public sewer.

[11] Note that where the mandatory element has been met using certain special cases no credits can be achieved. Please refer to the 'Special Cases' in the Sur 1 issue for further information.

18. Signature

The following declaration should be signed by the appropriately qualified professional or developer responsible for ensuring that the development meets the Sur 1 mandatory criteria and the necessary criteria to allow the awarding of credits, where applicable.

I confirm that the information provided in this document is truthful and accurate at the time of completion.

Name of Appropriately Qualified Professional:	Michael Ward
Signature of Appropriately Qualified Professional:	
Date:	30th March 2016
Name of developer:	
Signature of developer:	
Date:	

Please note: If the template is incomplete and / or unsigned it will not be accepted as evidence supporting a Code assessment.

The following section is only applicable where an associated design stage Code for Sustainable Homes assessment has been certified and the solutions designed have been implemented as specified in the design stage evidence. Where this is the case, all applicable sections of the Sur 1 template (above) must be completed with the design stage information, including point 17.

19. Post Construction Confirmation

The following declaration should be signed by the appropriately qualified professional or developer responsible for ensuring that the development meets the Sur 1 mandatory criteria and the necessary criteria to allow the awarding of credits, where applicable.

I confirm that the information provided in this document is truthful and accurate at the time of completion.

Name of Appropriately Qualified Professional:	
Signature of Appropriately Qualified Professional:	X SIGN HERE REPLACE IMAGE WITH SCANNED SIGNATURE
Date:	
Name of developer:	
Signature of developer:	X SIGN HERE REPLACE IMAGE WITH SCANNED SIGNATURE
Date:	

Please note: At post construction stage, where SuDS solutions have been installed, evidence must be provided to confirm that maintenance responsibilities have been defined.

APPENDIX 2

Drainage Calculations

Michael Ward
Highways and Drainage Consultant

77 LAWN ROAD, LONDON NW3 2XB

Greenfield Run Off Calculations
Using IOH Report 124

Global Variables

$Area_{SITE}$	0.050 Ha	$Area_{IOH}$	50 Ha	SAAR	647 mm	SOIL	0.47

Mean Annual Flood Estimation $QBAR_{RURAL} = 0.00108(AREA)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$

$QBAR_{RURAL}$ = 0.220 m^3/s

$QBAR_{SITE}$ = 0.000 m^3/s

Peak Flood Estimation $Q_{x(yrs)}$

Hydrometric Region	Growth Factors								
	1	2	5	10	25	30	50	100	500
6	0.850	0.880	1.280	1.620	2.140	2.236	2.620	3.190	4.490
$Q_x(m^3/s)$	0.0002	0.0002	0.0003	0.0004	0.0005	0.0005	0.0006	0.0007	0.0010
$Q_x(l/s)$	0.2	0.2	0.3	0.4	0.5	0.5	0.6	0.7	1.0

Allowable Greenfield Discharge Rates $Q_{x\text{-year}}$

$Q_{1\text{-year}}$	=	0.2 l/s
$Q_{30\text{-year}}$	=	0.5 l/s
$Q_{100\text{-year}}$	=	0.7 l/s

Estimation of Greenfield Discharge Rate for the $Q_{100\text{-year}}$ Climate Change Event

$Q_{100\text{-year}+30\%}$	=	0.9 l/s

Estimation of Greenfield Peak Runoff for the 100 Year Return Period Event for a 6 Hour Storm

$V_{100\text{-year 6 hour storm}}$	=	15.0 m^3

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Storage Calculations
Using Wallingford Procedure

Proposed Impermeable Area = 0.02 ha

Allowable Run Off = 5 l/s

Storm Frequency 1 in 100 Years + 30% M5-60 = 20mm r = 0.4 Z2 = 2.03

Duration Min	Z1	Rainfall Intensity mm/hr	Impermeable area ha	Inflow l/s	Outflow l/s	Difference l/s	Storage Cu m
5	0.36	206.70	0.02	11.5	5	6.5	1.9
10	0.51	152.75	0.02	8.5	5	3.5	2.1
15	0.62	125.71	0.02	7.0	5	2.0	1.8
30	0.79	81.77	0.02	4.5	5	-0.5	-0.8
60	1.00	52.78	0.02	2.9	5	-2.1	-7.4
120	1.22	31.85	0.02	1.8	5	-3.2	-23.2
240	1.53	19.63	0.02	1.1	5	-3.9	-56.3
360	1.67	14.04	0.02	0.8	5	-4.2	-91.1
600	1.90	9.10	0.02	0.5	5	-4.5	-161.8
1440	2.42	4.68	0.02	0.3	5	-4.7	-409.5

Total Storage Required = 2.1 Cu m

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Drainage Calculations
Using Wallingford Procedure

Existing Impermeable Area 0.013 ha

Storm Frequency 1 in 1 Year M5-60 = 20mm r = 0.36

Climate Change Allowance 0 %

Duration Min	Z1	Rainfall Intensity mm/hr	Impermeable Area ha	Peak Discharge l/s	Volume Run Off cu m
5	0.36	53.6	0.013	1.9	0.6
10	0.51	37.3	0.013	1.3	0.8
15	0.62	30.8	0.013	1.1	1.0
30	0.79	19.6	0.013	0.7	1.3
60	1.00	12.8	0.013	0.5	1.7
120	1.22	8.1	0.013	0.3	2.1
240	1.53	5.2	0.013	0.2	2.7
360	1.67	3.8	0.013	0.1	3.0

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Drainage Calculations
Using Wallingford Procedure

Proposed Impermeable Area 0.049 ha

Storm Frequency 1 in 1 Year M5-60 = 20mm r = 0.36

Climate Change Allowance 30 %

Duration Min	Z1	Rainfall Intensity mm/hr	Impermeable Area ha	Peak * Discharge l/s	Volume * Run Off cu m
5	0.36	53.6	0.049	9.5	2.8
10	0.51	37.3	0.049	6.6	4.0
15	0.62	30.8	0.049	5.4	4.9
30	0.79	19.6	0.049	3.5	6.2
60	1.00	12.8	0.049	2.3	8.2
120	1.22	8.1	0.049	1.4	10.3
240	1.53	5.2	0.049	0.9	13.3
360	1.67	3.8	0.049	0.7	14.7

* Includes Climate Change Allowance

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Drainage Calculations
Using Wallingford Procedure

Existing Impermeable Area 0.013 ha

Storm Frequency 1 in 100 Year M5-60 = 20mm r = 0.36

Climate Change Allowance 0 %

Duration Min	Z1	Rainfall Intensity mm/hr	Impermeable Area ha	Peak Discharge l/s	Volume Run Off cu m
5	0.36	159.0	0.013	5.7	1.7
10	0.51	117.5	0.013	4.2	2.5
15	0.62	96.7	0.013	3.5	3.1
30	0.79	62.9	0.013	2.3	4.1
60	1.00	40.6	0.013	1.5	5.3
120	1.22	24.5	0.013	0.9	6.4
240	1.53	15.1	0.013	0.5	7.8
360	1.67	10.8	0.013	0.4	8.4

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Drainage Calculations
Using Wallingford Procedure

Proposed Impermeable Area 0.049 ha

Storm Frequency 1 in 100 Year M5-60 = 20mm r = 0.36

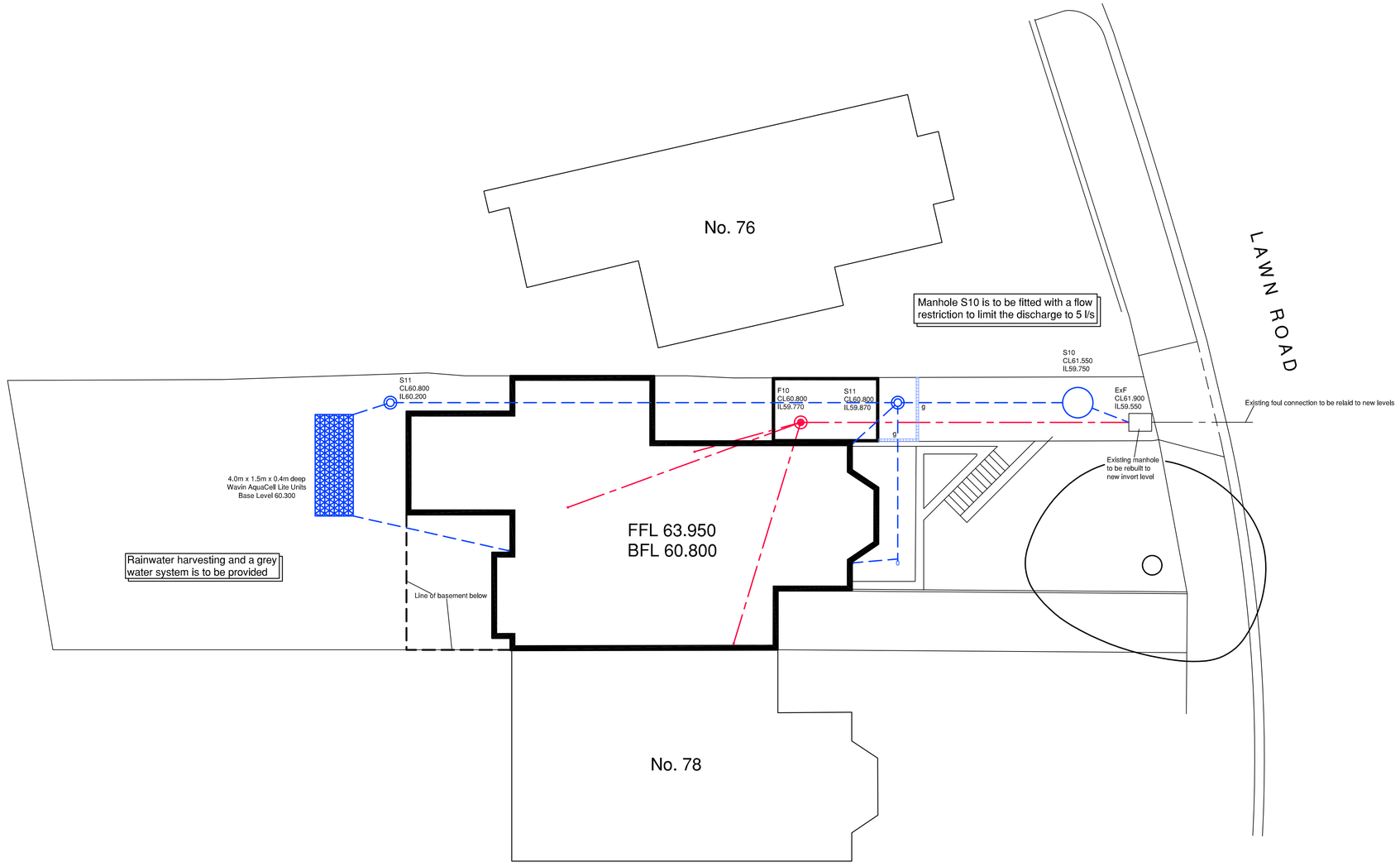
Climate Change Allowance 30 %

Duration Min	Z1	Rainfall Intensity mm/hr	Impermeable Area ha	Peak * Discharge l/s	Volume * Run Off cu m
5	0.36	159.0	0.049	28.2	8.4
10	0.51	117.5	0.049	20.8	12.5
15	0.62	96.7	0.049	17.1	15.4
30	0.79	62.9	0.049	11.1	20.0
60	1.00	40.6	0.049	7.2	25.9
120	1.22	24.5	0.049	4.3	31.3
240	1.53	15.1	0.049	2.7	38.4
360	1.67	10.8	0.049	1.9	41.3

* Includes Climate Change Allowance

APPENDIX 3

Proposed Drainage Layout



GENERAL NOTES

1. All building work to comply with NHBC requirements.
2. Landscaping to be as shown on landscaping drawing.
3. Use only figured dimensions, refer to setting out drawing.
4. All proposed and relevant existing levels are to be checked prior to construction start and any discrepancies referred back to the Engineer.
5. Cover levels of manholes and inspection chambers and gradients of sewers are for information purposes only and must not be used for setting out purposes.
6. All private footpaths and patios to be in precast concrete slabs.
7. Where foundations are likely to surcharge drain trenches (i.e. where the drain is adjacent to foundations) the foundation is to be excavated to a level compatible with the trench excavated for the drain. Alternatively the drain trench is to be backfilled with concrete to the underside of the foundation.
8. All existing drainage on site is to be checked for live connections. The inspection chambers are to be broken out and the drains either broken out or filled with PFA grout.

DRAINAGE NOTES

1. Underground drainage is to be either clay pipework to BS EN295, external rib-reinforced UPVC pipework or UPVC pipework to BS4660. Inspection chambers are to be compatible with the system used. Manholes to be constructed of either precast concrete components to BS5911 or Class B engineering bricks to BS EN772
2. Foul drainage to be at 1 in 60 unless otherwise shown.
3. Surface water drainage to be at 1 in 60 unless otherwise shown.
4. Invert level of rodding eye to be 600mm below finished floor level unless otherwise shown.
5. All drainage to be 100mm diameter unless otherwise shown.
6. AcoDrains to be type N100K with trapped outlet fitted with Class C slotted galvanised grating fixed in accordance with the manufacturers recommendations. Channels to have built in fall where cover gradient is less than 1 in 100.

KEY TO SYMBOLS

	FOUL	SW
Precast concrete manhole		
Polypropylene shallow inspection chamber		
Rodding eye		
100mm drains (unless otherwise shown)		
AcoDrain		

Rev	Date	Revision Details

Issue

For Planning

Client

Enric Torner

Site

77 Lawn Road
London NW3 2XB

Drawing Title

Drainage Layout

Job No. 973

Drawing Number	Revision
982/01	
Scale	**Date**
1:100 @ A1	March 2016

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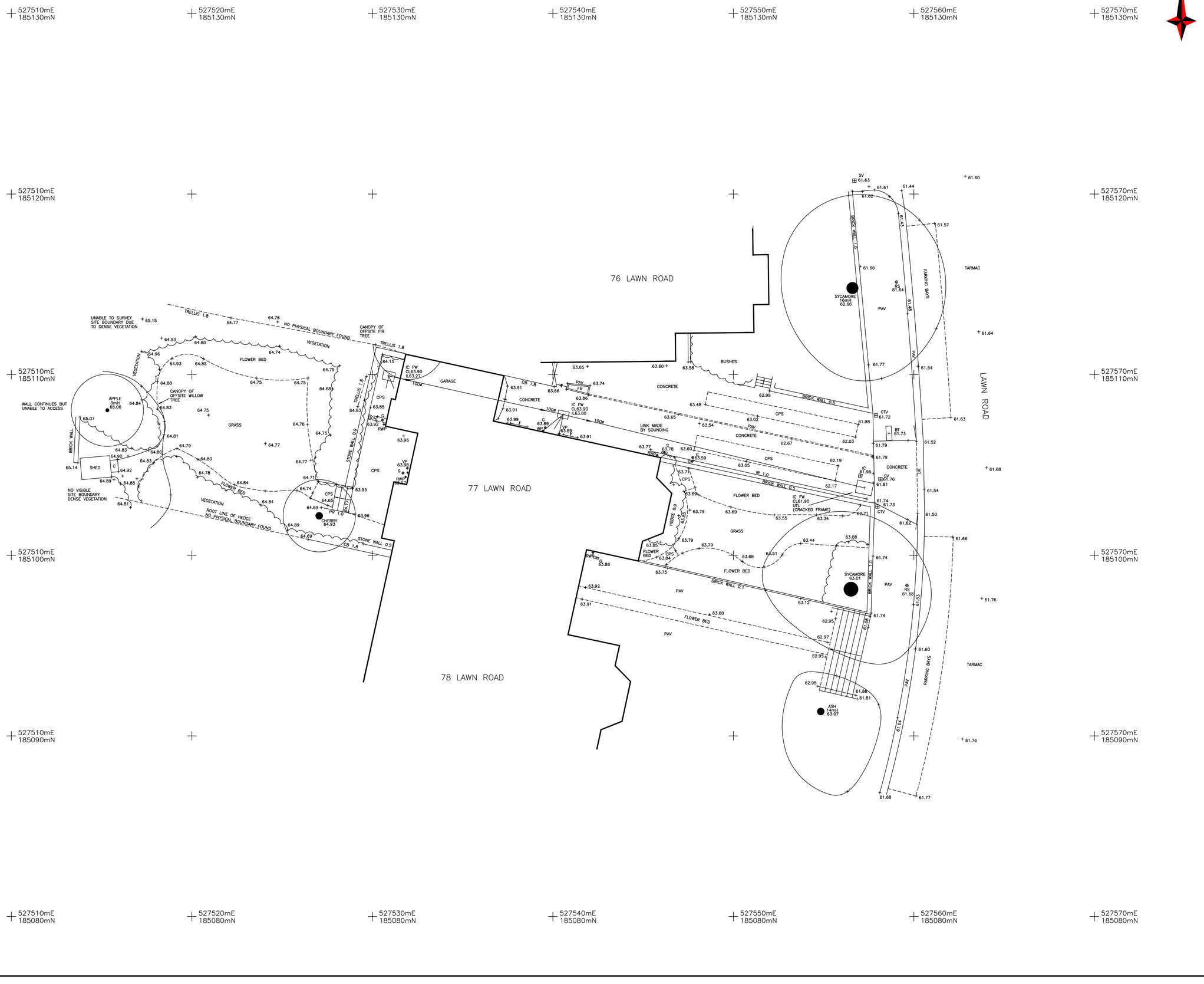
APPENDIX 4

Existing Survey



Original Drawing Size: A1

NOTES:–

The accuracy and content of this drawing are dependent on the original specification and EDI should be consulted before use at other scales.

Where underground services are shown, all reasonable care has been taken within the spirit of the original specification and requirement. Before use of this information the user should consult EDI and satisfy themselves of the completeness and accuracy of such detail before undertaking any works. Due to the nature of this work and limitations imposed by ground conditions and the detection equipment no guarantee can be given that all services have been recorded. Trial holes should be dug at critical locations.

All reasonable care has been taken in the survey detail represented on this drawing but any discrepancies must be reported to EDI immediately.

Our aim is to produce the best possible results within the specification and cost constraints of our clients. Any comments are most welcome.

Levels shown at kerbs are channel level unless stated.

LEGEND

Features:

AV	Air Valve
AB	Air Brick
BD	Bollard
BH	Borehole
BM	Benchmark
BP	Boundary Post
BS	Bus Stop
BT	British Telecom
CL	Cover Level
COL	Column
CTV	Cable TV Cover
DCH	Drainage Channel
DF	Drinking Fountain
DIS	Disused
DK	Drop Kerb
DPC	Damp proof Course
EIC	Electricity IC
EJ	Expansion Joint
ER	Earth Rod
FH	Fire Hydrant
FHR	Fire Hose Reel
FS	Flagstaff
G	Gully
GV	Gas Valve
IC	Inspection Cover
IL	Invert Level
JBX	Junction Box
KO	Kerb Outlet
LB	Letter Box
LBN	Litter Bin
LLP	Low Level LP
LP	Lamp Post
MP	Marker Post
MS	Mile Stone
MT	Mercury Telecom
OHL	Overhead Line
OP	Overflow Pipe
PM	Parking Meter
PP	Power Pole
RAD	Radiator
RE	Rodding Eye
RNP	Road Name Plate
RS	Road Sign
RSD	Roller Shutter Door
RWP	Rain Water Pipe
SD	Service Duct
SV	Stop Valve
TCB	Telephone Call Box
TP	Telegraph Pole
TS	Traffic Signal
UB	Universal Beam
UNK	Unknown
UR	Urinal
UTL	Unable to lift
V	Vent
VP	Vent Pipe
WM	Water Meter
WO	Wash Out
WP	Waste Pipe

Building Level Details:

D	Door
EL	Eave Level
FFL	Floor Level
FRL	Flat Roof Level
HL	Head Level
PPL	Parapet Level
RL	Ridge Level
SL	Sill Level
SP	Springer of Arch
TA	Top of Arch
W	Window
62.56	Ceiling/Beam Soffit

Boundary Types:

BW	Barbed Wire
CB	Close Boarded
CH	Chainlink
CI	Corrugated Iron
CP	Chestnut Paling
IR	Iron Railing
IW	Interwoven
LL	Larch Lap
PAL	Palisade
PR	Post & Rail
PW	Post & Wire
TNR	Timber Knee Rail
RTW	Retaining Wall
VSF	Vehicle Safety Fence
WMF	Wire Mesh Fence

Surfaces & Finishes:

B	Brickwork
BB	Breeze Block
C	Concrete
CLT	Ceiling Tiles
CP	Carpet
CPS	Concrete Paving Slabs
CPT	Carpet Tiles
CR	Concrete Render
CT	Ceramic Tiles
FT	Floor Tiles
HBD	Hardboard
L	Linoleum
P	Plaster
PAV	Brick Paviors
S	Steel work
T	Tarmac
TSP	Textured Safety Paving
VT	Vinyl Tiles

Services:

–c–	CATV cables
	CCTV cables
–D–	Data cables
–E–	Electric cables
	Foul water
–G–	Gas pipes
	Heating duct
–SD–	Service ducts
	Storm water
	Telecom cab.
	Unidentified
–W–	Water pipes
150ø	Pipe Diameter/Flow
	Overhead Lines

Survey Station
Fence
Gate
Painted Road Markings
Edge of Vegetation
Kerb/Drop Kerb
Tree
Banks
Building
Overhead Building Detail
Wall

Control: All levels and co–ordinates are related to the datums described.

The horizontal control of this survey is based on Ordnance Survey grid as translated from GPS coordinates using Leica's SmartNet service. We have applied a reverse scale factor to maintain true ground distances, based on station ST6. The vertical control of this survey is based on OS datum as translated from GPS coordinates using the OSGM02 transformation as supplied by the OS. This may differ from the existing OS benchmarks in the area which should be disregarded; all levels should be taken from EDI survey stations.

Station Schedule

Station	Easting	Northing	Level	Type
1	527565.848	185081.714	61.743	Hilti Nail
2	527568.750	185104.282	61.674	Hilti Nail
4	527542.202	185108.890	63.844	Hilti Nail
6	527524.250	185107.829	64.758	Peg
8	527550.852	185096.546	63.418	Hilti Nail

Rev.	Job No.	Date	Revision Detail	Surveyor	Chkd

CLIENT

Charlton Brown Architects
The Belvedere
2 Back Lane
Hampstead
NW3 1HL

PROJECT

Topographic Survey
77 Lawn Road
London
NW3 2XB

Job No.	Surveyor	Checked	Date	Scale
15112	GG	GMP	July 2015	1:100

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DRAWING No. 15112/T/01–01

REV. –