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16 August 2019

Greater London Authority
City Hall
The Queen's Walk
London
SE1 2AA

For the attention of: Reece Harris

Re: GLA 4558 - 9, 11 and 19 Osiers Road

Dear Reece,

1. Introduction

This report has been produced to supplement the Flood Risk Assessment document reference 4618-FRA-jk-180726-jk-Rev2-RDCD, to provide additional information and clarification on items raised by the GLA during the Stage 1 consultation for the proposed development at 9, 11 and 19 Osiers Road, Wandsworth.

Within this report risks are expressed as an annual exceedance probability (AEP). This is the percentage probability that a given event could occur in any given year.

2. GLA Comments

Following the Stage 1 consultation the GLA made the following comments in an email dated 13th August 2019:

Information requested	Location Addressed
2. The surface water drainage strategy for the proposed development does not comply with the London Plan policy 5.13 (and draft policy SI.13), as it does not give appropriate regard to the drainage hierarchy, greenfield runoff rate and climate change. Further details on how SuDS measures at the top of the drainage hierarchy will be included in the development, and how greenfield runoff rate will be achieved should be provided. Additional attenuation storage volumes calculations, attenuation tank dimensions, and SuDS maintenance information should also be provided.	Section 3.3

3. The proposed development does not comply with the requirements of London Plan policy 5.15 (and draft New London Plan policy SI.15) as no water consumption target has been identified for the residential component of the development.	Section 3.8
9. The calculations of Greenfield runoff rates adopts an urbanisation factor of 0.75, representing partially developed catchment. The Greenfield runoff rate is intended to represent a partially developed catchment (literally a 'green field') and the use of an urbanisation factor greater than zero is incorrect. The applicant should provide revised Greenfield runoff calculations using an urbanisation factor of zero.	Section 3.1
10. The surface water drainage strategy addresses the Drainage Hierarchy, and notes that rainwater harvesting and green roofs would be possible options, and that infiltration is not feasible due to the site geology. Attenuation tanks are proposed as the main SuDS measure, and these are the only measures that are shown on plans. *Permeable paving is mentioned but does not appear on landscaping plans. Opportunities for green infrastructure-based SuDS public realm areas have not been considered. This approach does not satisfy the requirements of London Plan policy 5.13 (and draft London Plan SI.13).The applicant should provide more detailed plans including rainwater harvesting, green/blue roofs, permeable paving and green infrastructure-based SuDS such as tree pits and raingardens.*	Section 3.4
11. The attenuation tank volume have been estimated using a simplified method, which gives an estimated attenuation requirement of 300m^3 for a design discharge rate of 2.3l/s in a 100 year event with 40% climate change allowance. Section 6.3 of the FRA suggests a range of potential design discharge rates, up to Q100. Where a design discharge rate greater than Q_{bar} is proposed, more detailed calculations should be provided to show resultant discharge rates in a range of design events up to the 100 year event with 40% climate change allowance.	Section 3.5
12. Section 6.2.1 and 6.3 of the FRA show a 30% climate change allowance for design. This is not consistent with the value adopted in section 6.2.4 or current government climate change allowance guidance for small catchment areas.	Section 3.2
13. No maintenance plan has been included in the drainage strategy. The applicant should include a maintenance plan showing the maintenance and inspection frequency, and maintenance activities for each SuDS measure proposed.	Section 3.6
14. No assessment of the exceedance flow paths has been provided. Additional information should be provided showing that exceedance flow paths, through the site are available in the case of attenuation system blockage or an extreme rainfall event.	Section 3.7
15. The surface water drainage strategy for the proposed development does not comply with London Plan policy 5.13 (a draft policy SI.13), as it does not give appropriate regard to the drainage hierarchy, Greenfield runoff rate and climate change. Further details on how SuDS measure at the top of the	Section 3.3

drainage hierarchy will be included in the development, and how Greenfield runoff rates will be achieved should be provided. Additional attenuation storage volumes calculation, attenuation tank dimensions, and SuDS maintenance information should also be provided.	

3. Proposed SuDS Drainage Details & Calculations

3. 1. Greenfield Runoff Rates

The FRA proposed a greenfield runoff rate of 2.3 l/s based on a site area of 0.41ha and applying an urbanisation factor of 0.75. Following the GLA's comments on the greenfield calculation this rate has been reviewed and revised to represent the greenfield runoff rate for the site excluding the urbanisation factor. The rates have been calculated using the WINDES MicroDrainage software SUDS function which is based on the FSR method. The calculations for the rates are presented in Attachment D of this report. The table below summarises the greenfield runoff rates for the 50%, 3.3% and 1% annual exceedance probabilities.

Greenfield Runoff Rates		
Annual Exceedance Probability (AEP)	**Greenfield Runoff Rate (l/s)**	
50% AEP	Q_{bar}	0.6
3.3% AEP	Q_{30}	1.4
1% AEP	Q_{100}	2.0

3. 2. Climate Change

The climate change allowance is now taken as 40% in line with upper estimate of the current government climate change allowances and the London Plan.

3. 3. Drainage Hierarchy

In accordance with policy SI.13 of the new Draft London plan which Is largely in keeping with policy 5.13 of the London plan, all new developments should utilise Sustainable Drainage Systems (SuDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

1) Rainwater use as a resource (for example rainwater harvesting and blue roofs for irrigation)

2) Rainwater infiltration to ground at or close to source

3) Rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)

4) Rainwater discharge direct to a watercourse (unless not appropriate)

5) Rainwater attenuation above ground (including blue roofs);

6) Rainwater attenuation below ground;

7) Controlled rainwater discharge to a surface water sewer or drain

8) Controlled rainwater discharge to a combined sewer

The summary below provides site specific comments on how the drainage hierarchy has been followed.

1) Rainwater use as a resource (for example rainwater harvesting and blue roofs for irrigation)

Blue roofs are proposed at podium level as a source control SuDS feature, however, due to the high density nature of the development there is little permeable landscaped area that require irrigation. It is therefore not considered practical to harvest rainwater for the purposes of irrigation. Green and brown roofs provide a degree of storage within the substrate that will naturally be used to irrigate the roof.

2) Rainwater infiltration to ground at or close to source

The site investigation report indicates infiltration is not possible due to the underlying strata and groundwater level. Tanked permeable paving is proposed to the external ground level paved areas.

3) Rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens).

Green and Brown roofs are proposed at roof level and raised planters at ground level.

4) Rainwater discharge direct to a watercourse (unless not appropriate)

The route to the River Wandle crosses 3rd party land and is therefore not considered to be viable

7) Controlled rainwater discharge to a surface water sewer or drain

There are no known surface water sewers in the vicinity of the site.

8) Controlled rainwater discharge to a combined sewer

There are no known combined sewers in the vicinity of the site. Surface water will likely need to be discharged to the designated foul water sewer which is assumed to be combined as existing, subject to Thames Water approval.

3. 4. Proposed Sustainable drainage features

In line with the London Plan the SuDS selected for the proposed development should be appropriate for the development and for the location, on this basis the following SuDS features are proposed:

- Blue roofs
- Green/ Brown roofs
- Permeable paving
- Below ground attenuation tank

Blue roofs are proposed at podium level in areas that are not above residential units. It is proposed that blue roofs will be provided in the form attenuation crates between 85mm and 100mm deep and with 95% void ratio. Due to the depth of the attenuation feature the blue roof is assumed to only attenuate rainwater falling directly onto it and would not have the capacity to attenuate rainwater from roof level as well.

Green roofs are proposed at roof level as indicated on drawing T20P14 included in Attachment A. The drawing highlights roof areas that are to be used for photovoltaic modules and green roofs, roof areas that are to be used for photovoltaic modules are not considered viable for green roofs as well.

The use of permeable block paving is proposed on external hard landscaped areas. Due to the lack of infiltration potential the paving would have to be 'Type C – No infiltration' construction. As noted in the drainage strategy, storage in permeable paving is assumed to be provided in the form of a 300mm subbase at 30% void ratio.

At this stage of the design detailed plans of SuDS measures and landscaping features cannot be provided as the design of the building is not at detailed design. However approximate areas and depths of proposed SuDS features and the benefits provided by them have been summarised.

The strategy for implementing and providing detailed design of green infrastructure based SuDS features has been agreed with the Architect, Landscape Architect and Client. However, large scale rainwater harvesting is not practicable for implementation for the project.

3. 5. Discharge rates

In line with the FRA and CIRIA guidance the peak discharge rate off site is proposed to match the Q_{100} discharge rate for the 1% AEP rainfall with a 40% allowance for climate change. The 3.3% AEP discharge rate should target the Q_{30} Greenfield rate and the 50% AEP discharge rate should target the Q_{bar} greenfield rate for the site.

CIRIA guidance notes that the implementation of 'long term storage' features such as green roofs, brown roofs and permeable paving reduces the volume of discharge off-site. A greater percentage of runoff is prevented from discharging in more frequent storm events due to the process of evapotranspiration and wetting of soil and aggregate, as well as temporary storage provided by the green roof and permeable paving subbase. In addition the SuDS features are a form of 'source control' SuDS which provide treatment to surface water runoff in line with the SuDS management train.

With consideration given to the above the 50% AEP discharge rate will be lower than the Q_{30} discharge rate due to the use of long term storage features, however the Q_{bar} discharge rate is considered unreasonable to achieve without introducing a risk of blockage. This is because the size of the flow control orifice will be smaller which in turn increases maintenance issues associated with them.

The 3.3% AEP will be restricted to the Q_{30} discharge rate and the 1% AEP restricted to the Q_{100} discharge rate through the implementation of a series of flow control, for example at podium level to attenuation flows from the blue roof as well as a complex flow control prior to discharging off site.

Attachment D provides calculations on the discharge rates for Q_{bar}, Q_{30} and Q_{100} and the resultant volumes of storage required for each return period. The critical return period, resulting in the largest volume of storage required, estimated to be 336m^3 is the 1% AEP with an additional 40% allowance for climate change. The table below summarises how the storage will be provided.

Attenuation Feature	Storage Volume Provided
Below ground attenuation tank	228m^3
Permeable Paving subbase	100m^3
Blue Roof	8m^3

Section 6.2.4 of the FRA notes the required storage volumes based on 2.3l/s discharge rate for up to and including the 1% AEP with a 40% allowance for climate change. The updated calculations storage volumes noted in the table above are similar, albeit slightly higher, as they are based on a 2.0l/s discharge for the 1% AEP with a 40% allowance for climate change.

3. 6. Maintenance Plan

A maintenance plan for each of the proposed SuDS techniques has been included in Attachment C.

3. 7. Exceedance Flows

An assessment of the exceedance flow paths based on the existing site levels demonstrates that the exceedance flows will be from the north eastern corner of the site to the southwestern towards the public highway. The topographical survey is included in Attachment B.
In the event of a system blockage or an extreme rainfall event the site levels and surface waters system should be designed to convey runoff away from the building and its users. The diagram below demonstrates the overland flow routes.

Due to the upper climate change limit being used for the drainage design exceedance flows are not expected to be significant. In addition most of the external landscaping will be permeable paving, so a flows generated by a blockage of the surface water system at a particular point in the system would likely drain back into the system at another point, without generating significant flows off site.

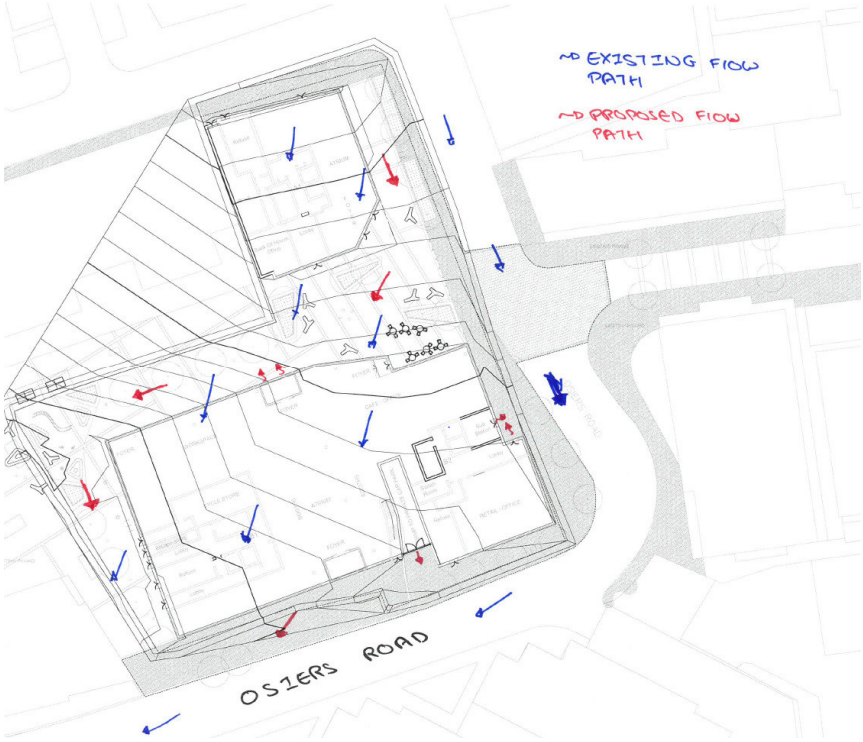


Figure 3.1 Exceedance flow paths

3. 8. Water Consumption Target

The residential component will be designed so that the mains water consumption would meet a target of 105 litres or less per person per day (excluding 5 litres per person per day for external water use). This target will be met by specifying fittings in accordance with the optional requirement' fitting approach as noted on table 2.2 in buildings regulations approved document G.

4. Conclusion

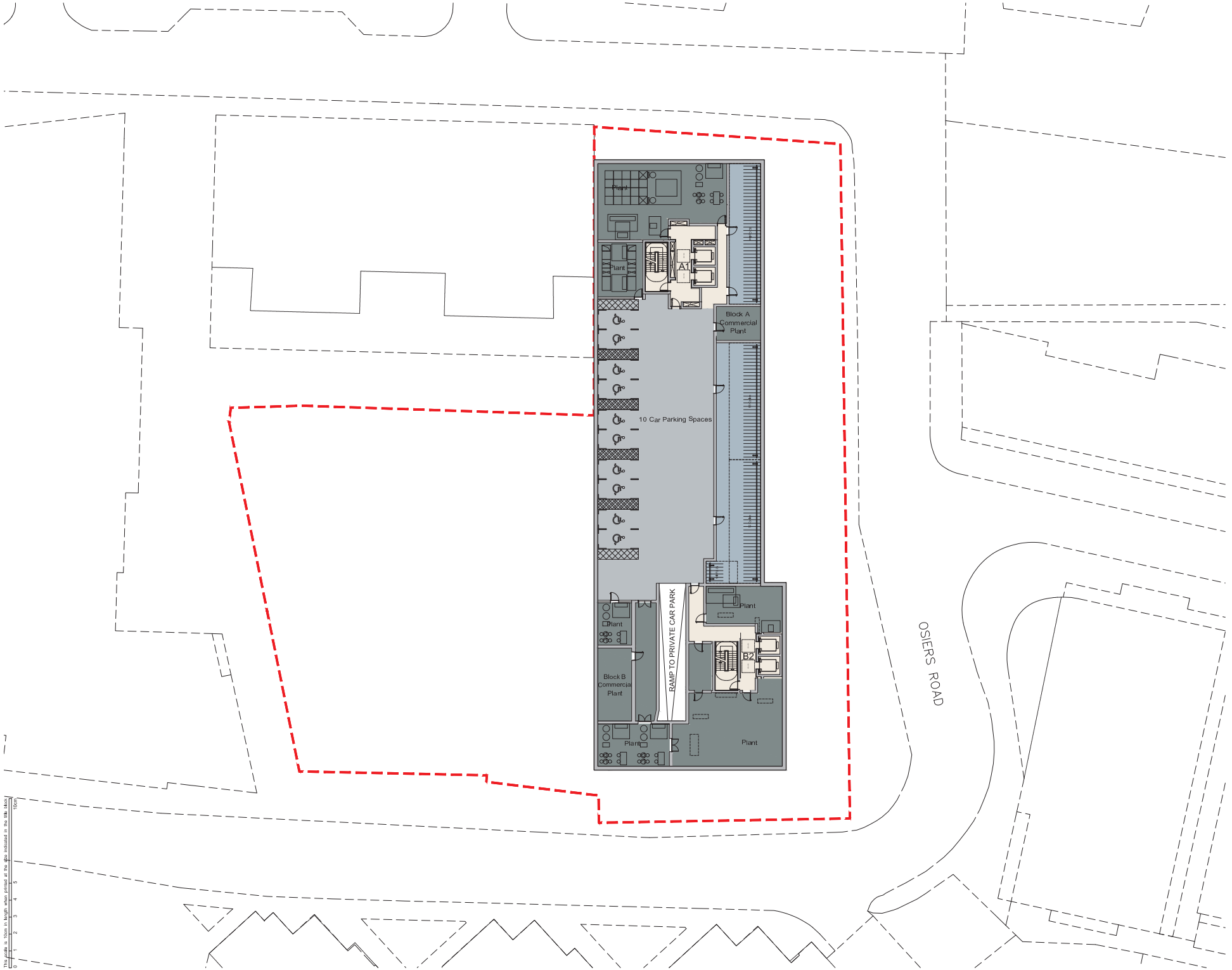
It is intended that this report demonstrates the sustainable drainage principles set out for the proposed development and addressed the GLA comments regarding the drainage proposals for the site.

Prepared by	Keval Joshi	
Checked by	Kate Mackay	
Approved by	Andy Stanford	

Yours Sincerely,

Keval Joshi
Infrastructure Engineer

Attachment A – Proposed Development Architectural Plans



NOTES

1 The Contractor must check and confirm all dimensions
2 All discrepancies must be reported and resolved by the Architect before works commence
3 This drawing is not to be scaled
4 All work and materials to be in accordance with current applicable Statutory Legislation and to comply with all relevant Codes of Practice and British Standards

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This guide is 10cm in length when printed at the size indicated in the title block

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Rev	Date
P1 Issued for Planning	12/07/18

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Architecture Planning Interiors
Old Church Court, Claylands Road, The Oval, London SW8 1NZ
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Client
Hollybrook Limited

Project
Osiers Road

Drawing
Basement Floor Plan

Scale	Date	Status
1:200 (A1)	Mar 18	Planning

Job Number	Drawing Number	Revision
5865	T20P-1	P1

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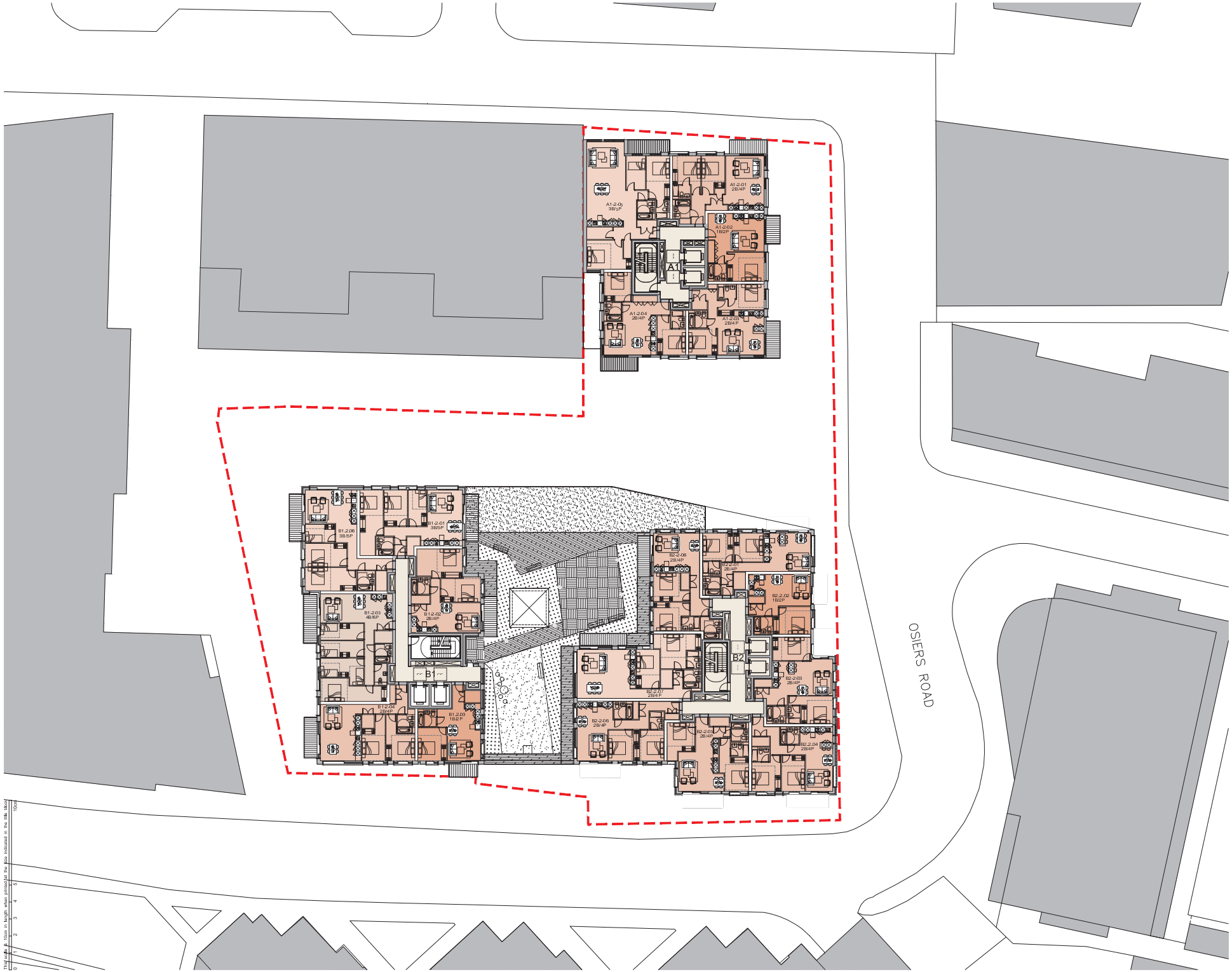

NOTES

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Rev	Date
P1 Issued for Planning	17/07/18

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Client
Hollybrook Limited

Project
Osiers Road

Drawing
Second Floor Plan

Scale	Date	Status
1:200 (A1)	May 18	Planning

Job Number	Drawing Number	Revision
5865	T20P02	P1

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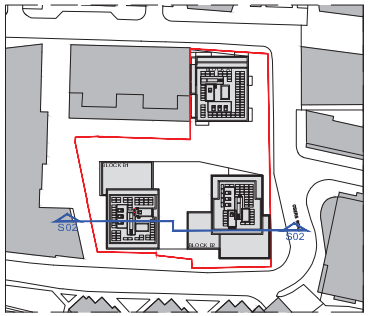

KEY PLAN

NOTES

1 The Contractor must check and confirm all dimensions
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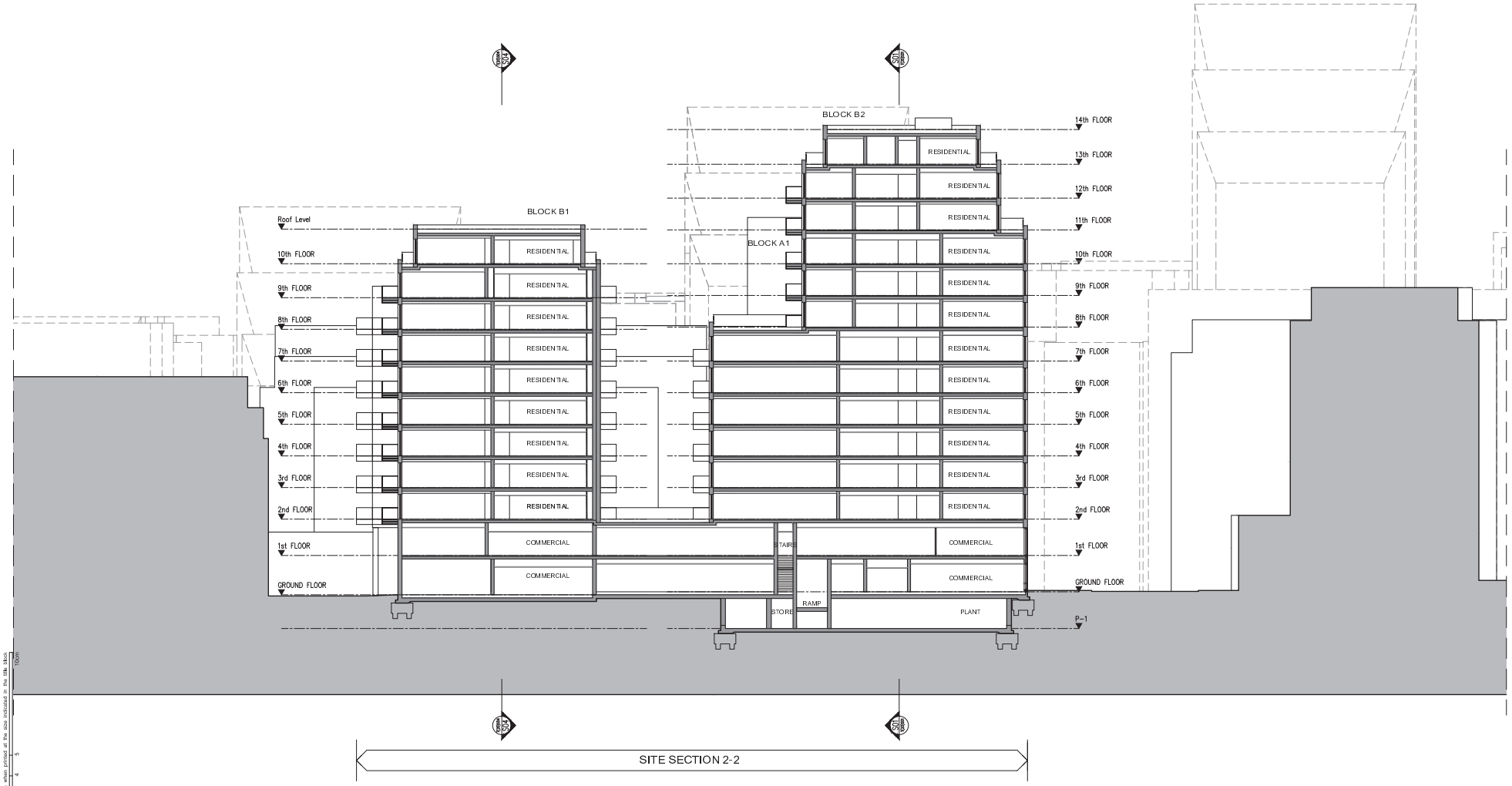

SITE SECTION 2-2

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Rev	Issued for Planning	Date
P1		12/07/18

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Client
Hollybrook Limited

Project
Osiers Road

Drawing
Proposed Site Section S02

Scale	Date	Status
1:200 (A1)	June 18	Planning

Job Number	Drawing Number	Revision
5865	T20S02	P1

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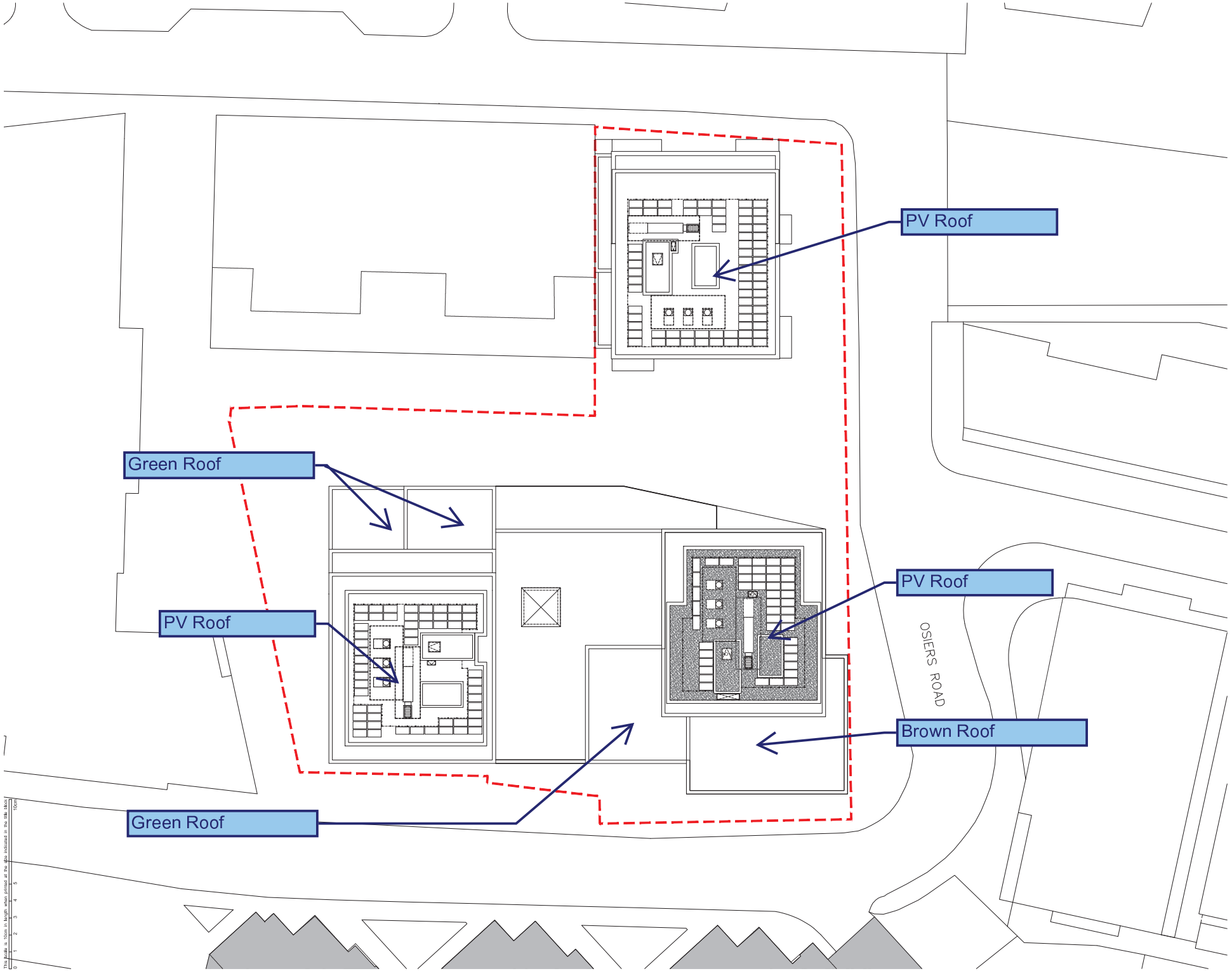

NOTES

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3. This drawing is not to be scaled
4. All work and materials to be in accordance with current applicable Statutory Legislation and to comply with all relevant Codes of Practice and British Standards

Rev	Date
P4	Issued for Planning 30/01/19
P3	Issued for Planning 28/01/19
P2	Issued for Planning 19/07/18
P1	Issued for Planning 17/07/18

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Client
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Project
Osiers Road

Drawing
Roof Floor Plan

Scale	Date	Status
1:200 (A1)	May 18	Planning

Job Number	Drawing Number	Revision
5865	T20P14	P4

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Attachment B – Topographical Survey

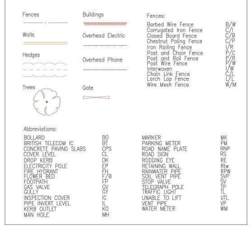
Notes:

Whilst every effort has been made to correctly identify species of trees on the site, we advise that an arboricologist be consulted before any final decisions are made.

All information contained in this drawing (including digital data) should be checked and verified prior to any fabrication or construction.

Grid coordinates are based on an OS GNSS system.

Legend:



Coordinate Table

Stn	Easting	Northing	Level
BRC1	525391.465	175139.776	32.665
BRC2	525319.696	175152.524	29.724
CD1	525386.099	175143.453	50.006
CD1X	525364.892	175133.830	6.187
D2	525313.588	175182.160	6.985
D3	525342.693	175191.084	6.859
D4	525329.647	175187.156	6.922
D5	525350.548	175136.288	6.088
D6	525361.173	175142.479	6.170
D7	525319.584	175075.664	5.206
D8	525293.111	175125.232	6.285
G4	525386.642	175100.687	6.096
R1	525355.381	175121.018	7.713

Rev. Suffix	Date	Initial	Revision Details

Surveyor	DH	Verified By	DH	CAD Operator	TJH	Approved By	ARL	Date	07.09.15

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

JJL Residential

Location

Osiers Road
Wandsworth

Drawing Title

Topographical Survey

Job No. 1506030	Old Job No.
Drawing Number JR/1506030	Revision Suffix
Scale 1:200m (A1)	Date September 2015

CD SURVEYS LTD
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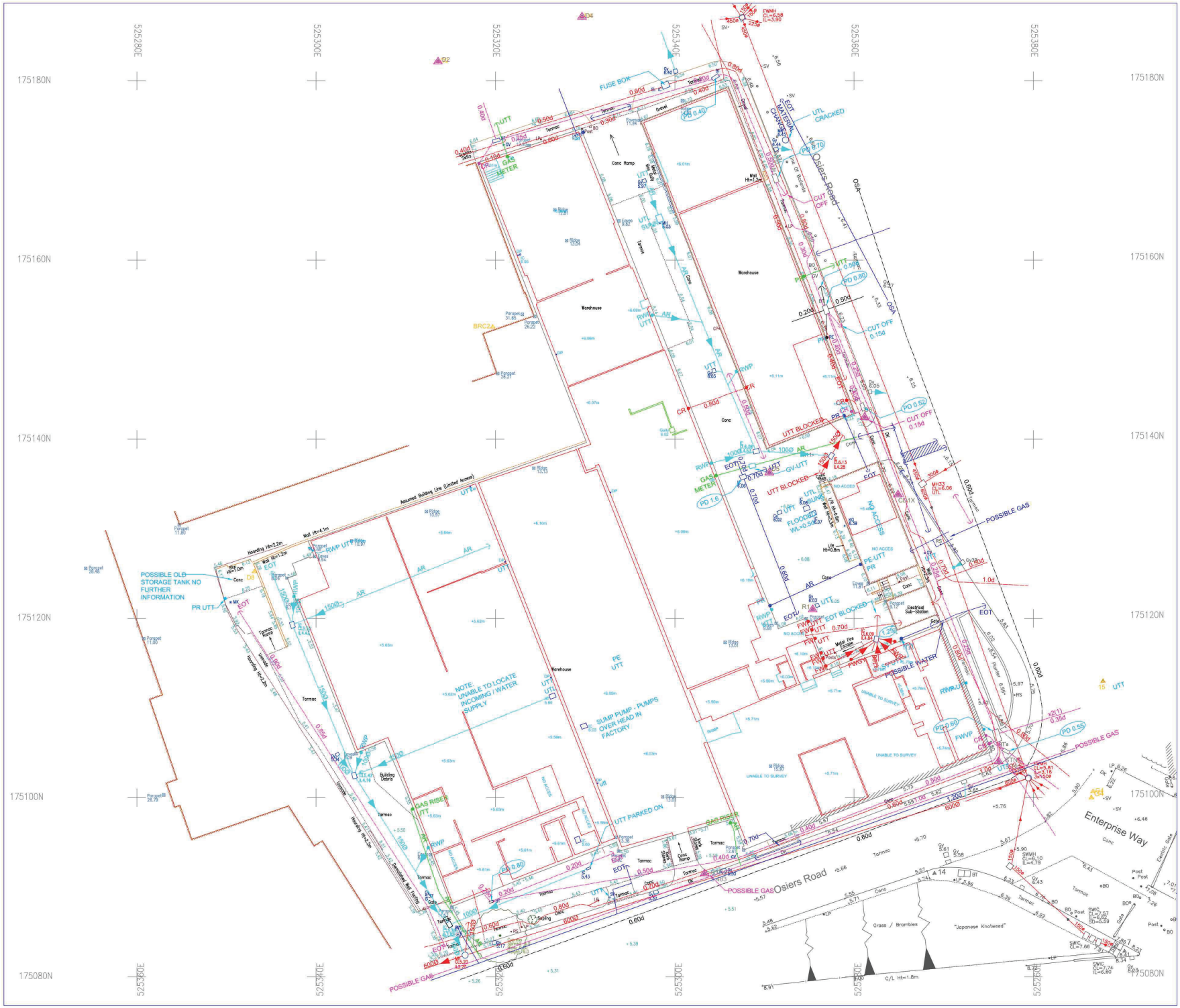

PROJECT NAME:	OSIERS ROAD
PROJECT ADDRESS:	9, 11 & 19 OSIERS ROAD LONDON WANDSWORTH SW18
DRAWING TITLE:	UNDERGROUND UTILITY SURVEY
CLIENT:	HOLLYBROOK HOMES
SCALE: 1:200	PAPER SIZE: A1
DATE: 20/06/2017	
PROJECT NO:	CS-3026
DRAWING NO:	01

SURVEYED	DRAWN	QA
LK	AS	PC

METERS
0 20

REV NO	DATE	DESCRIPTION	DRAWN	QA
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NOTES:
- SURVEY ORIENTATION IS IN RELATION TO EXISTING SITE NETWORK.
- SURVEY HEIGHTS ARE IN RELATION TO EXISTING SITE CONTROL NETWORK.
- ALL HEIGHTS SHOWN ARE IN METERS.

LEGEND:

KEY

CHANTON SURVEY
PHONE: 0208 900 9022 FAX: 0208 900 9055
EMAIL: SURVEY@CHANTON.CO.UK
WEBSITE: WWW.CHANTON.CO.UK

Attachment C – SuDS Maintenance Schedule

Project No. 4618
Ref: P:\Projects\4618\Documents\Reports\FRA\GLA Response\Attachment C - Maintenance Schedule\Maintenance Schedule.docx

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Osiers Road,

Sustainable Drainage Operation and Maintenance Schedule

Component	Task	Frequency	Responsibility
Green Roofs	Inspect Vegetation-Free Zones	Annual once established	Site Maintenance Contractor/Specialist Maintenance Contractor
	Remove Debris	Annual once established	
	Deadhead	As needed	
	Check Irrigation/Moisture Levels	To Manufacturer's guidance	
	Fertilising	As needed only	
Blue roofs and associated ancillaries. (This is TBC following appointment of manufacturer)	Inspections of flow control outlets	1 Month	Site Maintenance Contractor/ Specialist Maintenance Contractor
	Inspections of rainwater inlet chambers	1 Month	
	Inspection of hard standing surfaces	8-10 Weeks	
	Removal of silt from chambers	As required	
	Record of inspections/maintenance undertaken to be kept	As required	
Inspection and Control Chambers	Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage.	3 Months	Site Maintenance Contractor
	Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt.	1 Year	Site Maintenance Contractor
Inlets and Outlets to SUDS features	Inspect, remove silt and debris	3 months	Site Maintenance Contractor
Geocellular Attenuation Tank	Maintenance to be carried out as necessary	As needed	Specialist Maintenance Contractor

Attachment D – MicroDrainage Calculations

Project No. 4618

Ref: P:\Projects\4618\Documents\Reports\FRA\GLA Response\Attachment D - Micro Drainage Calculations\Quick Storage Estimate.docx

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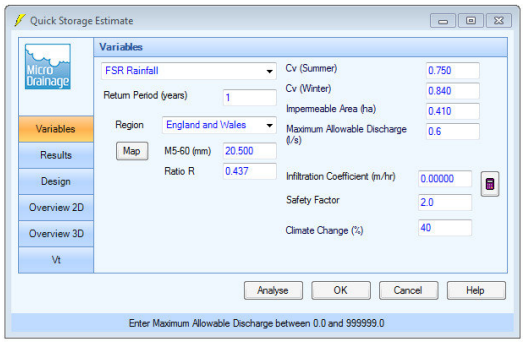
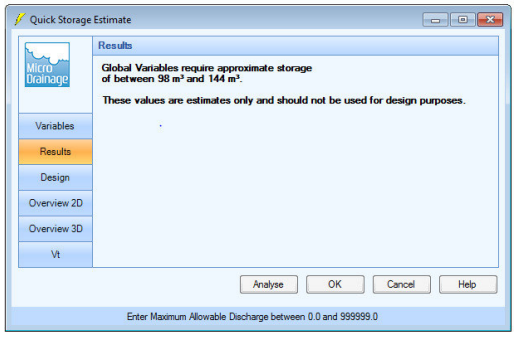
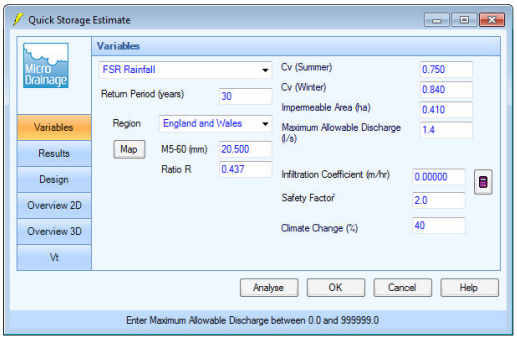
Osiers Road,

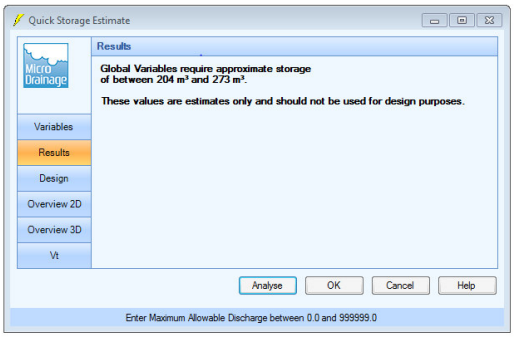
MicroDrainage Quick Storage Estimates



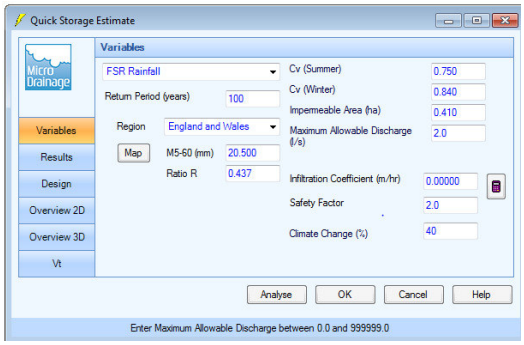


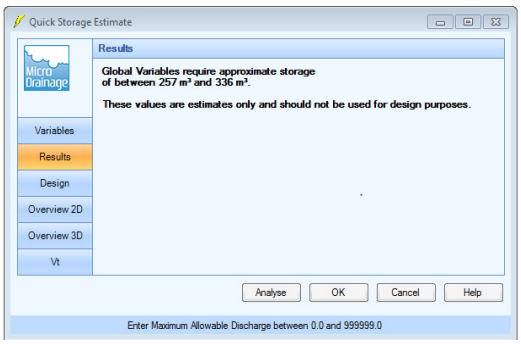
100% AEP
Qbar discharge rate





3% AEP
Q30 discharge rate





1% AEP
Q100 Discharge rate

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	0.410	Urban	0.000
SAAR (mm)	600	Region Number	Region 6

Results l/s

QBAR Rural	0.6
QBAR Urban	0.6
Q100 years	2.0
Q1 year	0.5
Q30 years	1.4
Q100 years	2.0