civils ltd - consulting engineers

FLOOD RISK ASSESSMENT

Kay Court, 368-372 Finchley Road
London NW3 7AJ

CLIENT
Jewish Care
Amelie House
221 Golders Green Road
London NW11 9DQ

Ref: 3992/2.3F
Date: September 2011

CONSULTING ENGINEERS
GTA Civils Ltd
66a Church Walk
Burgess Hill
West Sussex RH15 9AS

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Issue	Date	Compiled	Checked
Preliminary Issue	30 September 11	JP	MR

Report by: **John Pakenham BSc (Hons)**
Checked by: **Martin Roberts I Eng, ACIWEM, MIHT**

1.0 INTRODUCTION

1.1 This report has been prepared for Jewish Care in relation to the premises at Kay Court, 368-372 Finchley Road London NW3 7AJ and no responsibility is accepted to any third party for all or part of this study in connection with this or any other development.

1.2 The FRA has been developed to satisfy the requirements of Planning Policy Statement 25 (PPS25).

2.0 REQUIREMENTS OF THE FLOOD RISK ASSESSMENT

2.1 Annexes E-G of PPS25 Development and Flood Risk set out the requirements of a Flood Risk Assessment. The Environment Agency has also published its Practice Guide outlining minimum requirements for FRA documents.

2.2 This Practice Guide requires that FRAs contain the following:

- Location Plan.
- Development proposals.
- Existing information on extent and depth of flood events or on flood predictions.
- Sources of flooding.
- The impact of flooding on sites.
- An assessment of the run-off likely to be generated.
- The likely impact of displaced water on third parties.

3.0 EXISTING SITE & CURRENT FLOOD CONDITIONS

3.1 Kay Court lies within the London Borough of Camden. It lies 2.4km southeast of the River Brent, this being the nearest floodplain. Access is from Finchley Road to the west.

3.2 The site is a care home comprising 3 dwelling units with an annexe that has 57 bedrooms; there is also a single storey bungalow on the site. The total footprint area is approximately 953m^2. Additional areas of hardstanding, ie positively drained, total 728m^2, making the total impermeable area 1681m^2.

3.3 Existing site location maps and an aerial view of the site are shown in Appendix A. The site centres on national OS grid ref: E 525108m, N 186090m.

3.4 A topographical survey of the existing site has been conducted, with levels to Ordnance Datum (Newlyn), and is contained within Appendix B of this report. The survey shows that the site has external levels ranging between 85.86m and 82.20m AOD. The ground floors' FFLs are not stated but appear to be approximately 84.6m AOD.

3.5 Foul and storm water from the building drains via gravity to the existing public storm and foul sewers located in the street, this being typical in urban buildings.

3.6 The site's solid geology, according to the BGS map is 'Claygate Member', which is 'interbedded fine-grained sand, silt and clay' and related to the more ubiquitous London Clay. There are no drift deposits in this vicinity.

3.7 The Environment Agency Flood Map in Appendix D shows that the site lies within the Flood Zone 1 (FZ1.) This means that the annual probability of flooding from the Brent is less than 0.1% or '1 in 1000 years'. This relates to solely the fluvial – or river - risk for inland sites: other sources such as groundwater, pluvial and sewer failure flooding have to be considered separately.

3.8 Table D3 in PPS25 states that all development uses are appropriate in FZ1.

3.9 There is one historical record of flooding on this site from a Thames Water sewer failure, according to the North London Strategic Flood Risk Assessment (SFRA.) See the SFRA maps and records in Appendix D. This is an excerpt from section '5.5.5.3 Floods in Camden – Report of the Floods Scrutiny Panel' of the SFRA:

"The flood event on 7 August 2002 was caused by excessive rainfall causing the main sewer system to become completely inundated. The surcharge pressure forced the water to back onto the streets through manholes and gully gratings and into residents' homes at basement and ground floor level. It was stated that "any blocked or otherwise deficient Camden Council highway gullies could not have caused flooding on this scale" as the flood water could not drain to the trunk sewer.

This was supported by Thames Water's evidence confirming that the flooding was caused by its sewer system reaching maximum capacity very quickly so that surface water could not be drained at the rate as the rain fell."

3.10 Although there is every chance that Thames Water will improve the state of the sewers, which would help to keep such incidents recurring to a minimum, there is no guarantee that this will happen. Even if there are extensive works it is unclear as to how much this will improve the situation. The only fact that is certain is that Camden as a whole suffers from such inundations periodically and so until it is proven otherwise this has to be borne in mind and mitigated against in new developments.

4.0 PROPOSED DEVELOPMENT & MITIGATING MEASURES

4.1 The proposal is to demolish the existing buildings on the site and construct a new residential block with 36 self contained flats, together with basement car parking. See the proposed layout drawings in Appendix C.

4.2 The proposed building's 'footprint' area is to increase by 219m^2 to 1172m^2.

4.3 As the building footprint will be enlarged and so some external alterations are to take place, overland and groundwater flow routes may be affected. As this neighbourhood is not prone to pluvial (surface water) flooding this is not anticipated to be a significant factor.

4.4 The proposed basement's FFL shall be set at 80.28m AOD.

4.5 Vulnerability: both care homes and dwellings are classed in Table D2 of Annex D in PPS25 as 'More Vulnerable'.

4.6 The basement shall be tanked with a lined cavity drain system. The threat of groundwater flooding is not anticipated to be great as the site is not low lying. It is understood that a Site Investigation report, incorporating a 20m deep borehole, is due to be commissioned. This will show the current water table level, if within 20m of the ground's surface, and so should make this source more predictable. If this is found to be high there should be a pump installed to discharge any water collecting in the cavity.

4.7 Policy 4A.14 of the London Plan states: *"The use of sustainable urban drainage systems should be promoted for development unless there are practical reasons for not doing so..."* The proposal is to replace the existing units with a larger building. The runoff rate from all newly formed impermeable surfaces should be attenuated to approximately 50% of the current offsite flow rate in a 1 year storm. This flow rate is broadly: 1681m^2 x 50mm rain falling in one hour / 3600 seconds in 1 hour = 23.35 l/s. It is therefore proposed to limit the flow rate to 11.5 l/s in the critical 1 in 100 year plus 30% climate change storm event. See the drainage drawing in Appendix E.

4.8 There will be an attenuation tank capable of holding 42.5m^3, which is the 1 in 100 years plus 30% climate change event – see the calculation and drawing in Appendix E.

4.9 The invert level of the combined sewer in Finchley Road is 79.62m and so, as the IL of the basement's drainage is 78.42m AOD a pump will be needed to discharge this.

4.10 As outlined in section 3 above there is a clear risk of flooding in the event of high intensity rainfall causing the sewerage network to surcharge and ultimately flood. The floor and wall surfaces of this space should be formed of materials that will be easily cleaned after a flood event. Pumping stations are fitted with non-return valves: no water in the surcharged sewerage network will enter the site via the drainage network.

4.11 No additional surface water runoff over existing will be discharged from the new development. There will be no displaced water on to 3rd parties due to this development.

5.0 SUMMARY AND CONCLUSIONS

5.1 The proposal is to replace the existing buildings that comprise the care home at Kay Court with a single block of 36 residential flats.

5.2 There will be a small net decrease in impermeable area from 1681m^2 to 1596m^2.

5.3 The EA's Flood Map in Appendix D indicates that the site lies in fluvial Flood Zone 1 (Low Probability), but the SFRA indicates that this part of the borough is susceptible to sewer failure flooding. It suffered from such an event in 2002.

5.4 There is no change to the vulnerability as both the existing and proposed uses (Care Homes and Residential) are classed as 'More Vulnerable' in Table D2 of PPS25.

5.5 The offsite surface water flow rate will be reduced from 23.35l/s in a 1 in 1 year storm to 11.5l/s in the critical 1 in 100 year plus climate change event. The attenuation tank, sized at 42.5m^3, will be positioned immediately upstream of the pump chamber.

5.6 The pumped systems that discharge the foul and surface water into the public sewer in Finchley Road are fitted with non-return valves. Any surcharging of the public sewer will be stopped, meaning that only overland flow will cause the basement to flood.

5.7 The floor and wall surfaces of the basement should be of flood resilient, easily cleanable materials.

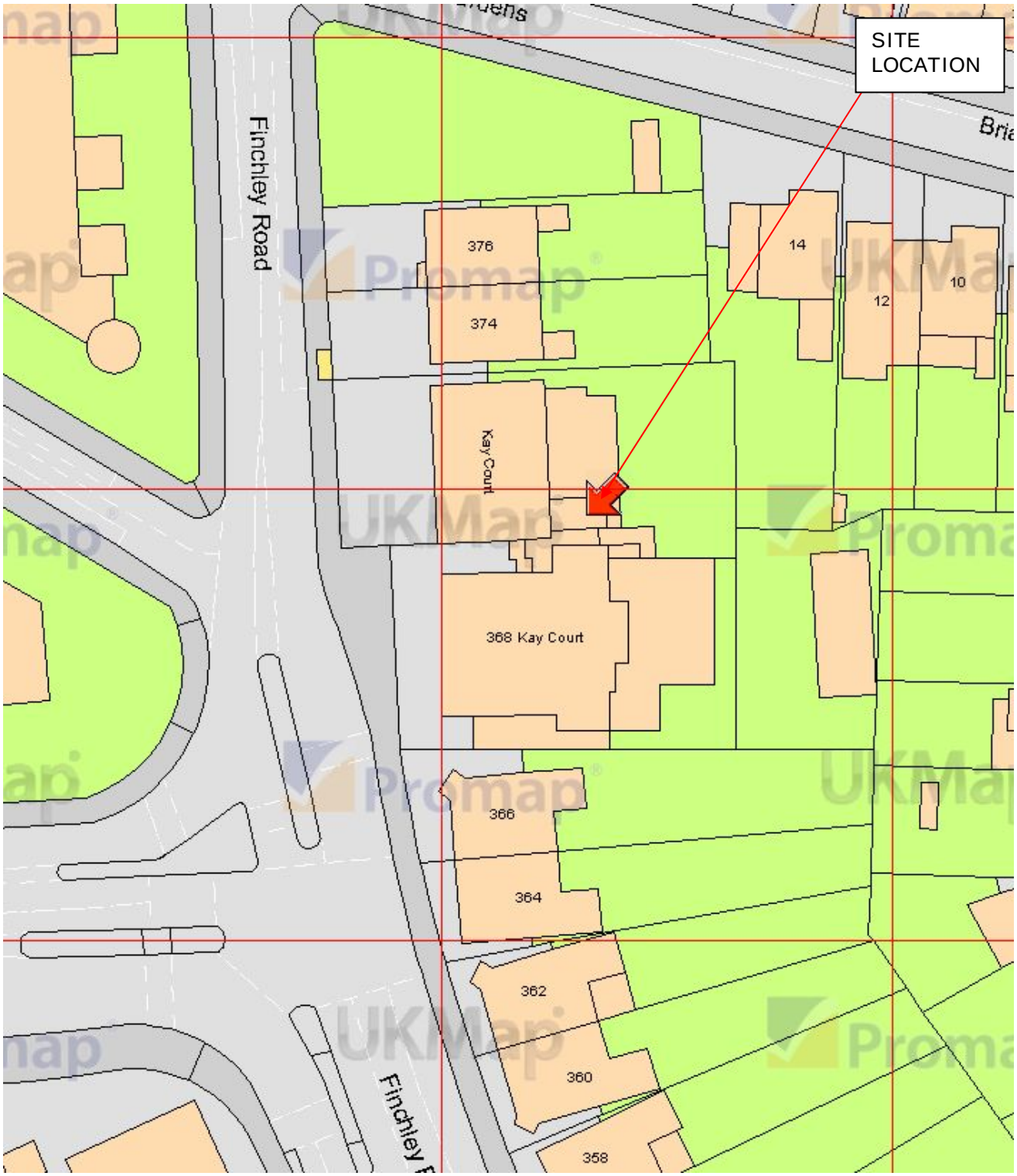
5.8 Only when the SI report is available will the actual threat of groundwater flooding be assessable. The water table level, if low, would indicate this risk is minimal. If it is high the basement's cavity lining should be fitted with a pump.

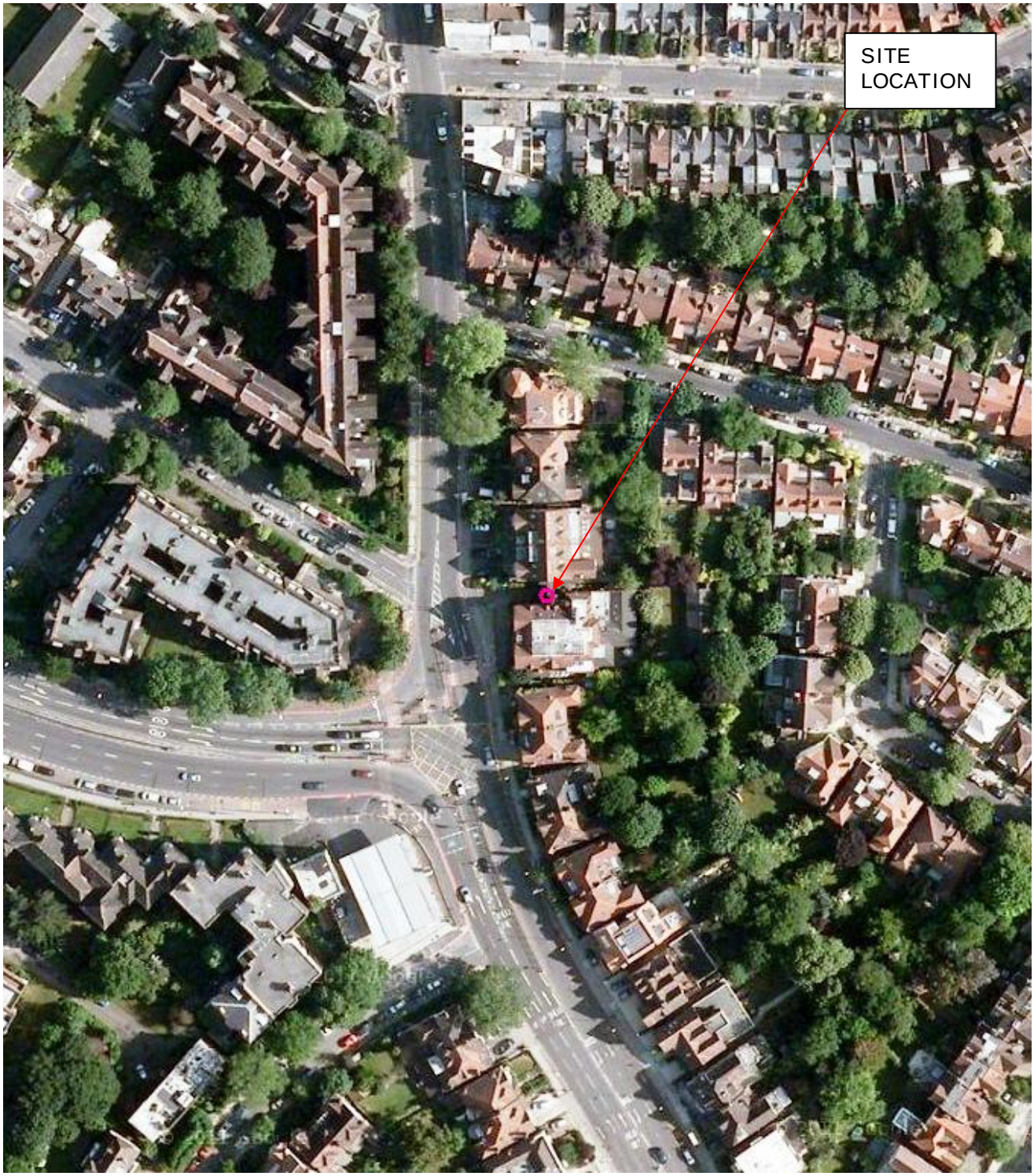
It is therefore considered that this development is PPS25 compliant.

- End of Report -

APPENDIX A

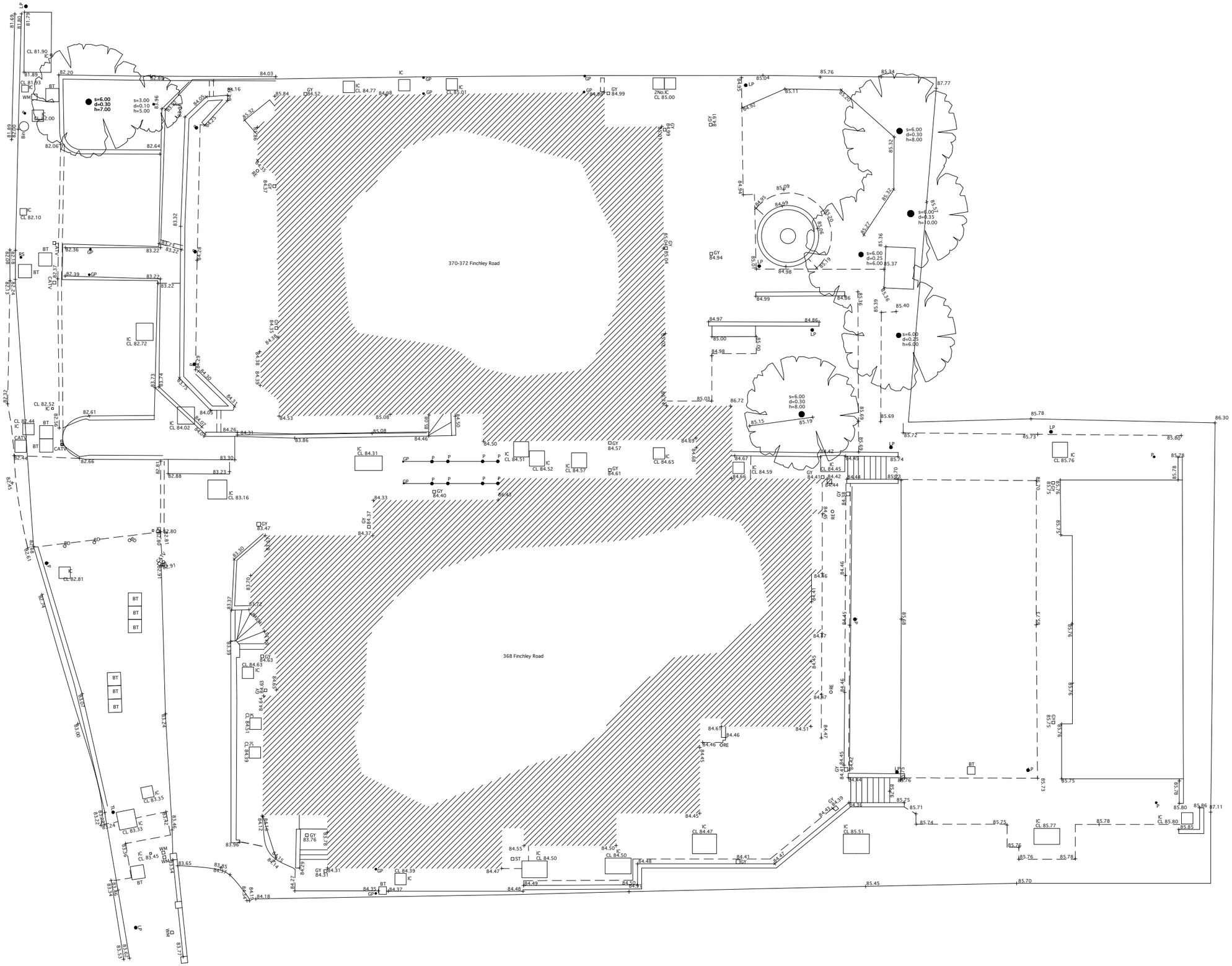
Site Location Map & Aerial Photo




SITE
LOCATION

APPENDIX B

Topographical Survey



Although every effort has been made to confirm type, run and size of drainage it is advisable to check these details against statutory authority records before proceeding with any design.

Although every effort has been made to confirm species of trees shown on this drawing if it is critical to design we do not accept responsibility for any errors and advise consultation with an aboriculturalist.

Rev.	Notes:	Date

LEGEND

SURVEY STATION	5	CIRCULAR MANHOLE	MO
		BUS STOP	BS
		CONCRETE PAVING SLABS	CPS
		CABLE TELEVISION COVER	CATV
		ELECTRICITY CABLE PIT	EC
	TOP	ELECTRICITY CONTROL BOX	ECB
		ELECTRICITY POLE	EP
BANKING	BOTTOM	ELECTRICITY PYLON	EPYL
		FIRE HYDRANT	FH
		FLAG STAFF	FS
BUSHES AND HEDGES		FLOWER BED	FB
		FOOTPATH	FP
		GAS VALVE	GV
MARSH		GATE POST	GP
		GULLY	G
		INSPECTION COVER	IC
TREES	SPREAD SHOWN TO SCALE	KERB OUTLET	KO
		LAMP POST	LP
		LETTER BOX	LB
GATE	SINGLE DOUBLE	LITTER BIN	BIN
		MANHOLE	MH
		NAME PLATE	NP
		NOTICE BOARD	NB
RETAINING WALL	RTW	PARKING METER	PM
		POST	P
		PIPE	PE
		REFLECTOR POST	RP
SLOPING MASONARY		ROAD SIGN	RS
		RODDING EYE	RE
		SERVICE MARKER POST	MK
STILE		SIGN POST	SP
		SLUICE VALVE	SV
FENCE		STOP TAP	ST
		STOP COCK	SC
WALL	BKWL	TELEGRAPH POLE	TP
		TELEPHONE CALL BOX	TCB
		TRAFFIC LIGHT	TL
BUILDING		UNSURFACED	U/S
		VENT PIPE	VP
		WATER METER	WM
OPEN SIDED BUILDING		WATER TROUGH	WT
		BARBED WIRE FENCE	BWF
		CORRUGATED IRON FENCE	CIF
GLASS ROOFED		CLOSE BOARDED FENCE	CBF
		CHAIN LINK FENCE	CLF
		CHESTNUT PALING	CPF
CONTOUR	25.50	IRON RAILINGS	IRF
		INTERWOVEN FENCE	IWF
		LARCH LAP FENCE	LLP
ORDNANCE SURVEY BENCH MARK	OSBM Value 12.470	MISCELLANEOUS FENCE	Misc F
		PALING FENCE	PF
TEMPORARY BENCH MARK	TBM Value 87.55	PALISADE FENCE	Pal F
		POST AND CHAIN FENCE	PCF
		POST AND RAIL FENCE	PRF
ARCHWAY		POST AND WIRE FENCE	PWF
		TRELLIS	TLS
		BASEMENT LEVEL	BTL
		BED LEVEL	BL
		COVER LEVEL	CL
		FLOOR LEVEL	FL

STREET FURNITURE

AIR VALVE	AV	INVERT LEVEL	IL
BASEMENT LIGHT	BLT	THRESHOLD LEVEL	THL
BELISHA BEACON	BB	WATER LEVEL	WL
BOLLARD	BD	SPOT LEVEL	127.13
BOUNDARY POST/PEG	BP	SOFFIT LEVEL	SFL
BRITISH TELECOM BOX	BTB	EAVES LEVEL	EL
BT INSPECTION COVER	BT	RIDGE LEVEL	RL
BRITISH TELECOM PILLAR	BTP	ROOF LEVEL	RFL

RICS THE SURVEY ASSOCIATION

S U R V E Y S

16 LEYDEN ROAD □ STEVENAGE
HERTFORDSHIRE □ SG1 2BP
TEL 0143 872 8441 □ FAX 0143 874 2435
□ email mail@csl-surveys.co.uk □
□ http://www.csl-surveys.co.uk □

Project

KAY COURT, 368-372
FINCHLEY ROAD, NW3 7AJ

Title

TOPOGRAPHIC SURVEY

Client

JEWISH CARE

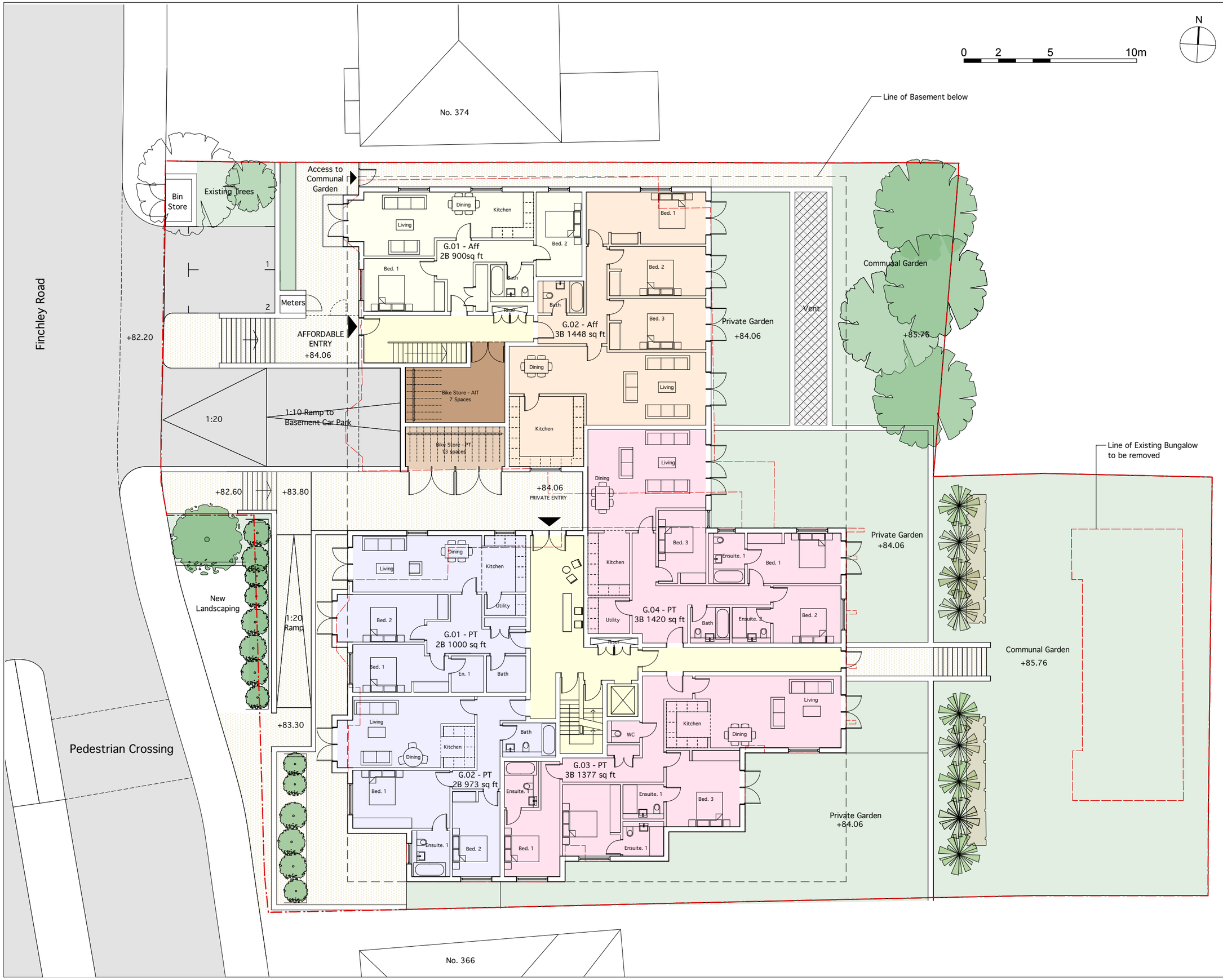
Drawing No	06508Q/T		
Scale	1:100	Date	FEBRUARY 2008
Sheet	1 of 1		

All levels related to OSBM 368 Finchley road, London

Value 84.86 m

APPENDIX C

Architect's Proposed Plans



Notes

08.08.11	Rev B - Bin store relocated. Vent position located within landscape.	ZA
04.08.11	Rev A -Pedestrian Crossing Island location added.	ZA
03.08.11	Issued for Information	ZA

Revisions

Twenty First Architecture Ltd,
30 Underwood Street,
London,
N17JQ
Tel: +44(0)20 7324 2662
www.21starchitecture.com

Client: Jewish Care

Project: Kay Court
368-372 Finchley Road

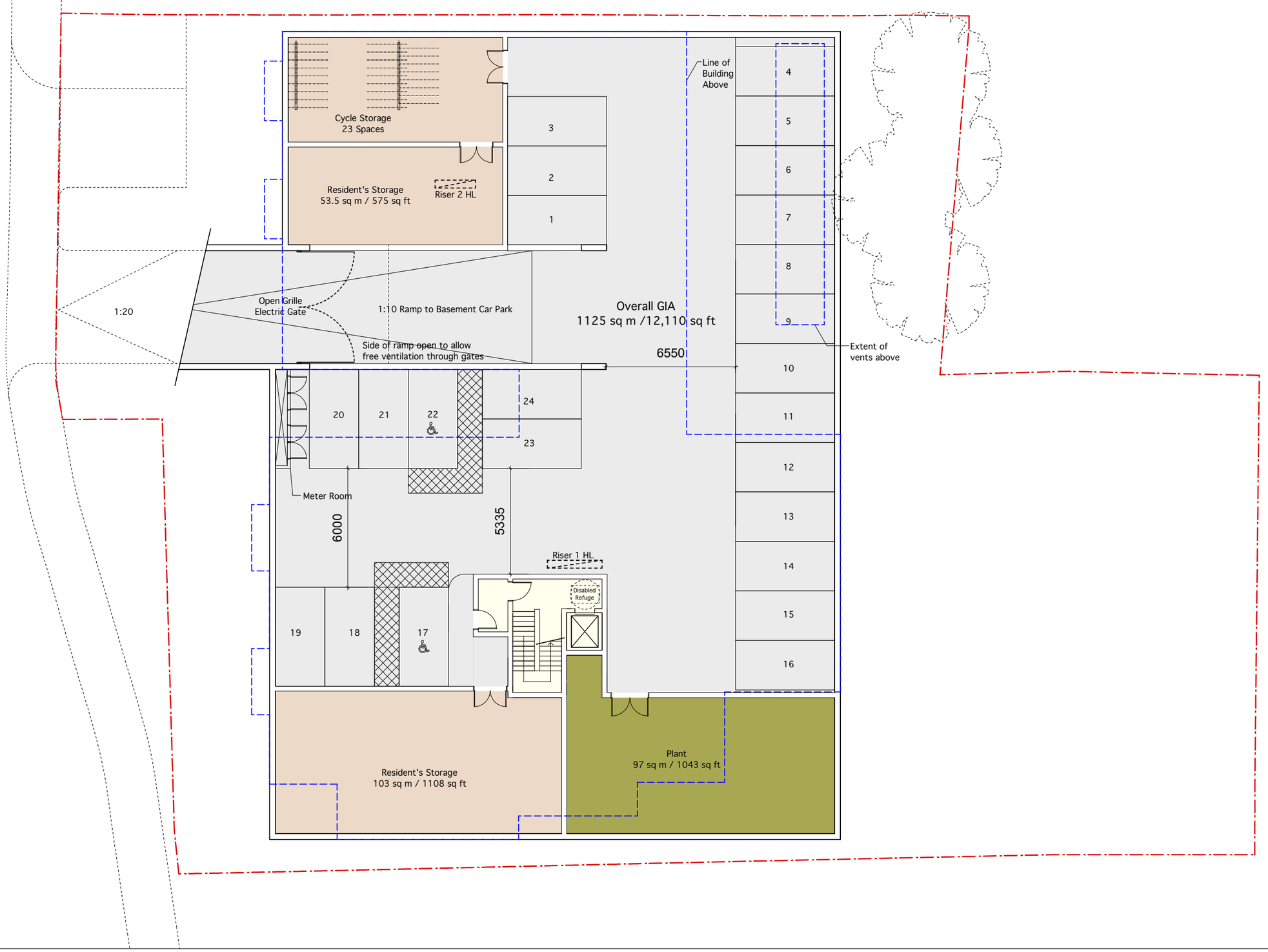
Drawing Title: Kay Court
General Arrangement
Ground Floor as Proposed

Status: Information
Drawn: ZA
Checked: PK
Scale: 1:100@A1 1:200@A3
Date: July 2011
Drwg. No.: 104_GA_00
Revision: B

Notes

N

0 2 5 10m



08.08.11	Rev C - Vent location added.	ZA
04.08.11	Rev B - Lobby added to Core.	ZA
03.08.11	Rev A - Parking Amended, Cycle Storage added, Riser locations added	ZA
02.08.11	Issued for Comment	ZA

Revisions

Twenty First Architecture Ltd,
30 Underwood Street,
London,
N17JQ
Tel: +44(0)20 7324 2662
www.21starchitecture.com

Client: Jewish Care

Project: Kay Court
368-372 Finchley Road

Drawing Title: Kay Court
General Arrangement
Basement Floor as Proposed

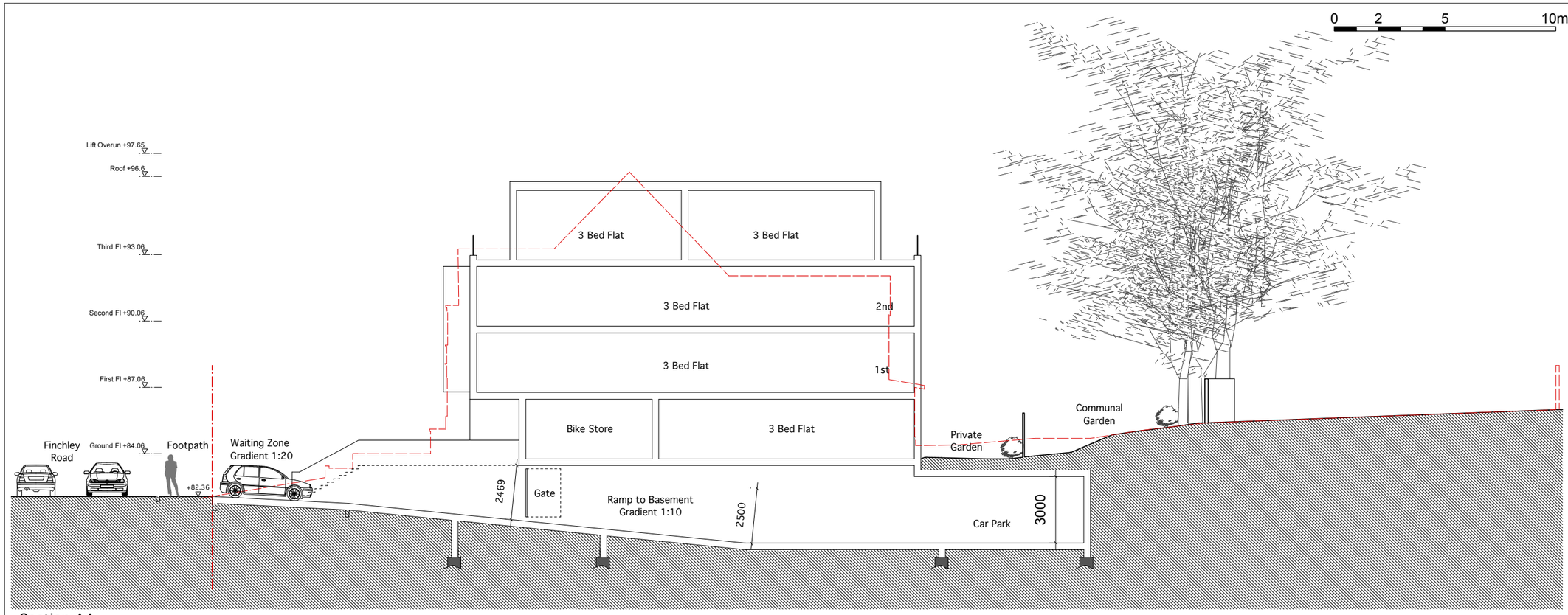
Status: Information | Drawn: ZA | Checked: PK

Scale: 1:100@A1 1:200@A3 | Date: July 2011

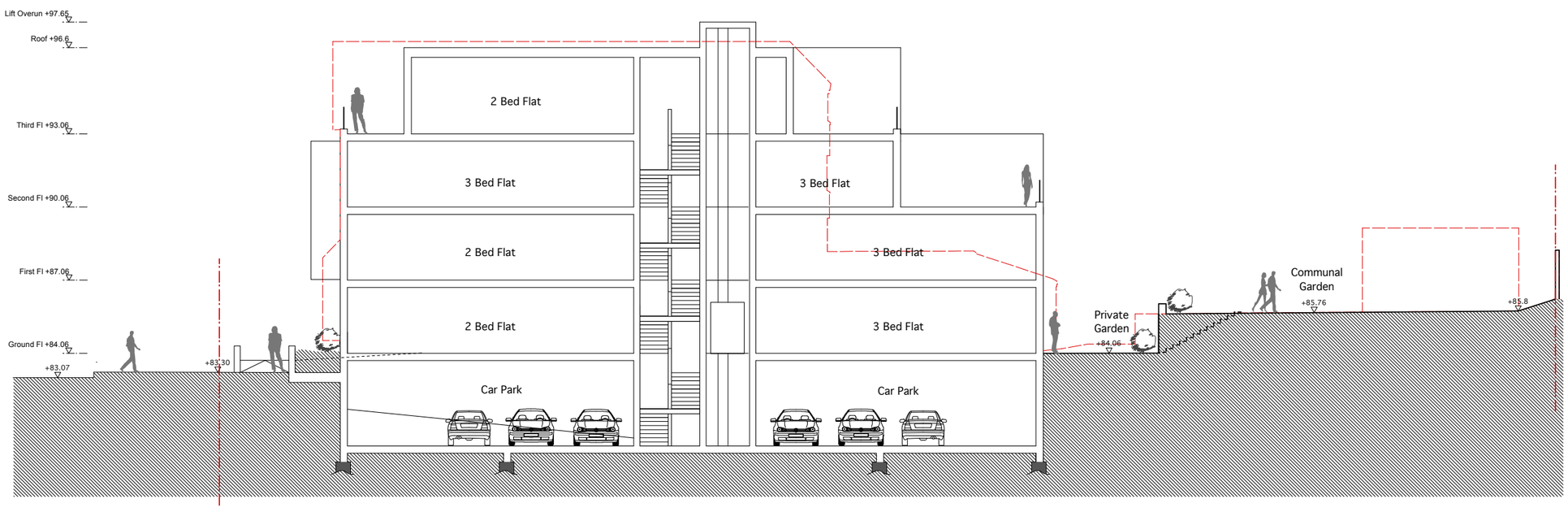
Drwg. No. 104_GA_-01 | Revision C

Notes

0 2 5 10m



Section AA

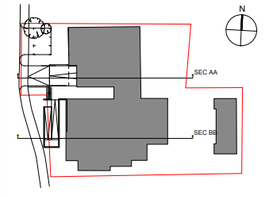


Section BB

03.08.11	Issued for Information ZA

Revisions

Twenty First Architecture Ltd,
30 Underwood Street,
London,
N17JQ
Tel: +44(0)20 7324 2662
www.21starchitecture.com



Client: Jewish Care

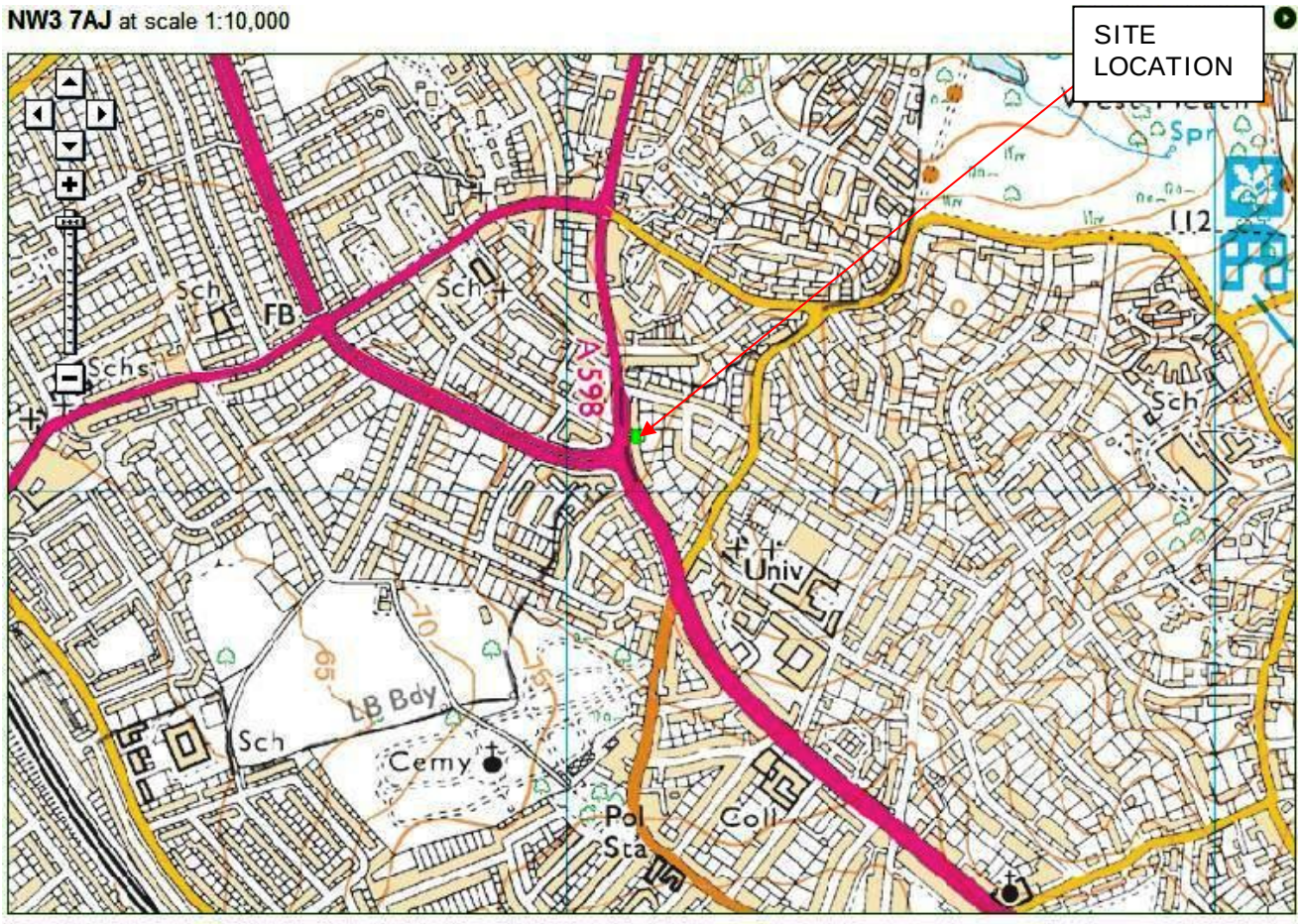
Project: Kay Court
368-372 Finchley Road

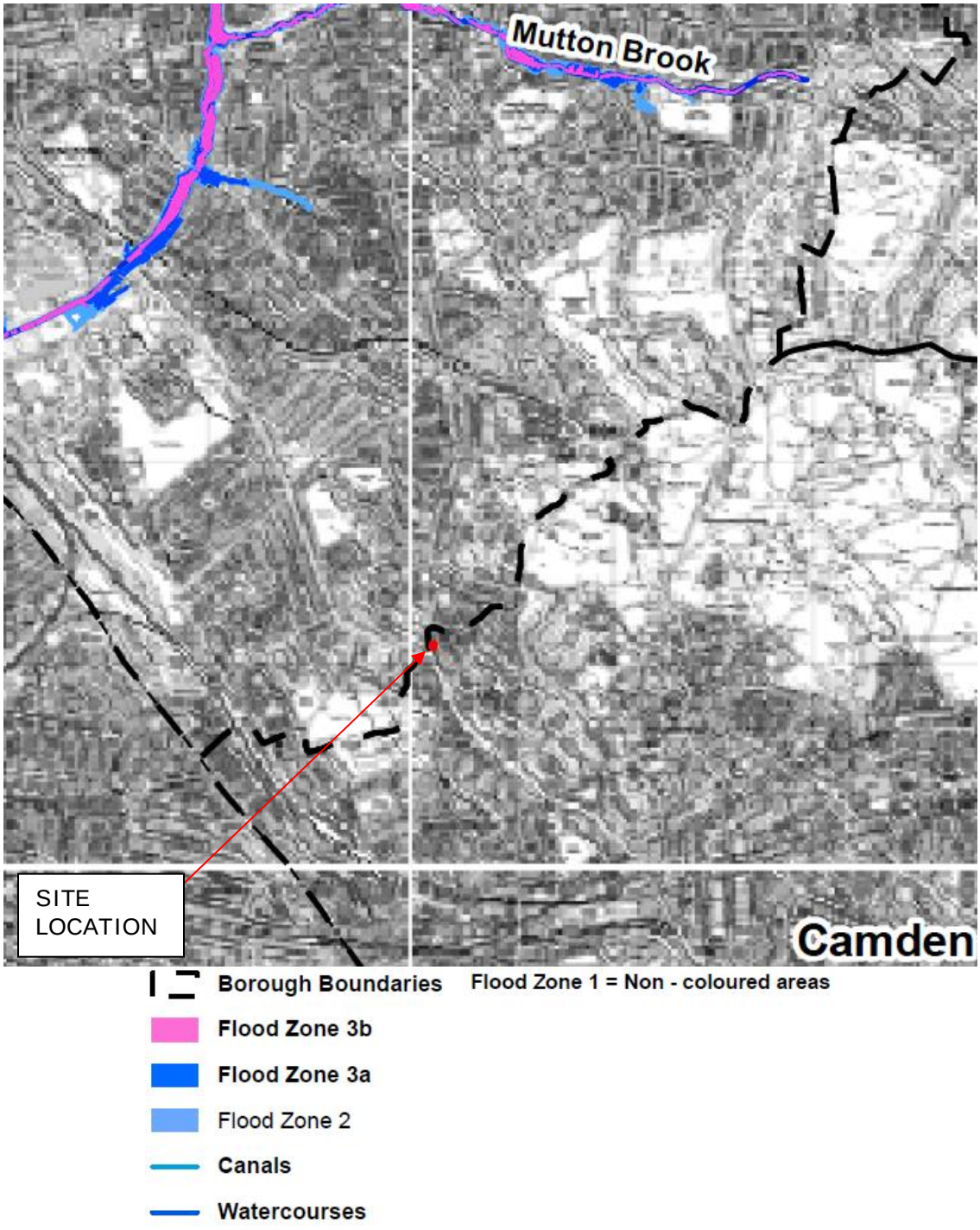
Drawing Title: Kay Court
General Sections
Section AA
Section BB

Status: Information
Drawn: ZA
Checked: PK
Scale: 1:100@A1 1:200@A3
Date: July 2011
Drwg. No. 104_GS_01
Revision

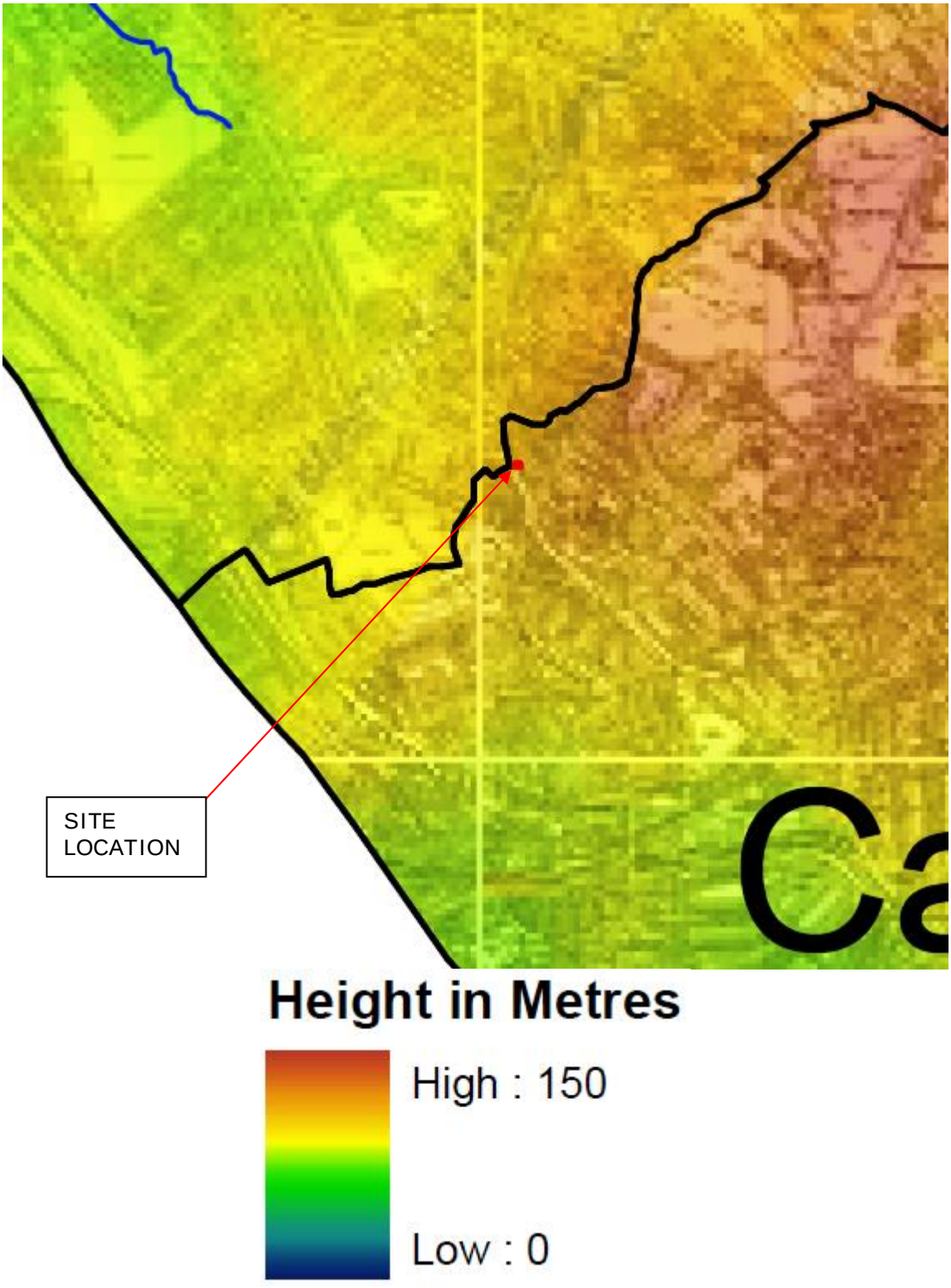
APPENDIX D

Environment Agency Flood Map & SFRA Flood Maps

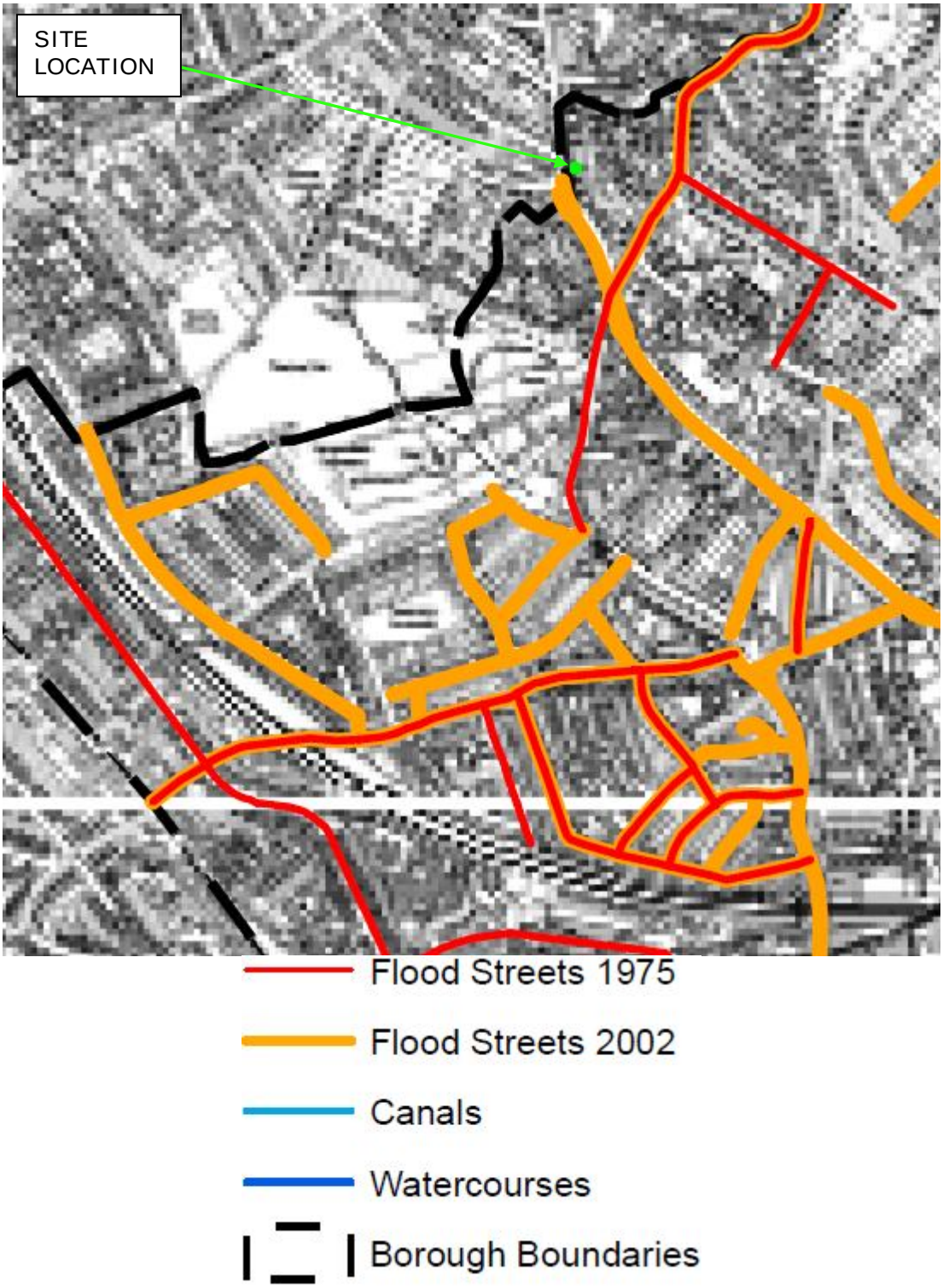




Enlarged Extract of SFRA Flood Zones Map



Enlarged Extract of SFRA Topography Map



Extract of SFRA 'Map 22: Camden Flooding Map'

(Although this shows the flood pattern stopping short of the site this is due to the borough boundary)

APPENDIX E

Drainage Drawings and Calculation

GENERAL NOTES

1. The location, size, depth and identification of existing services that may be shown or referred to on this drawing have been assessed from non intrusive observations , record drawings or the like. The contractor shall safely carry out intrusive investigations, trial holes or soundings prior to commencing work to satisfy himself that it is safe to proceed and that the assessments are accurate. any discrepancies shall be notified to gta prior to works commencing.

2. Tender or billing drawings shall not be used for construction or the ordering of materials.

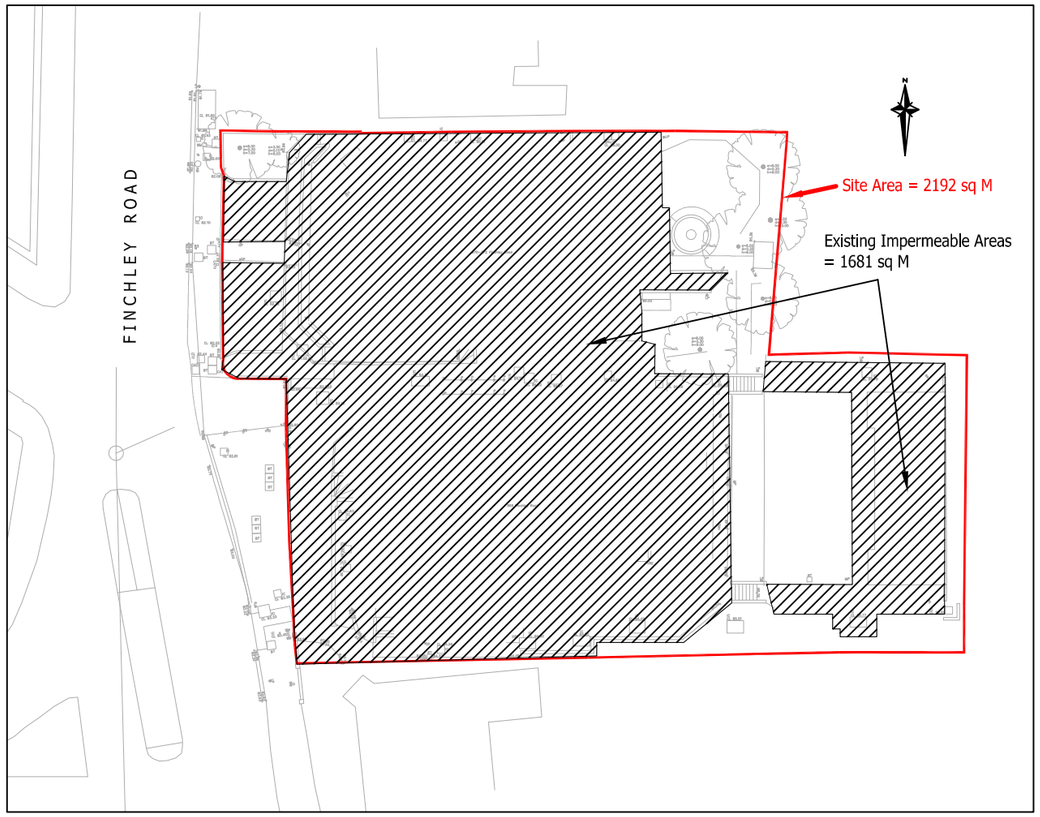
3. Do not scale. All dimensions and levels to be site confirmed.

4. This drawing shall be read in conjunction with all relevant architects, consultants drawings and specifications, together with H&S plan requirements

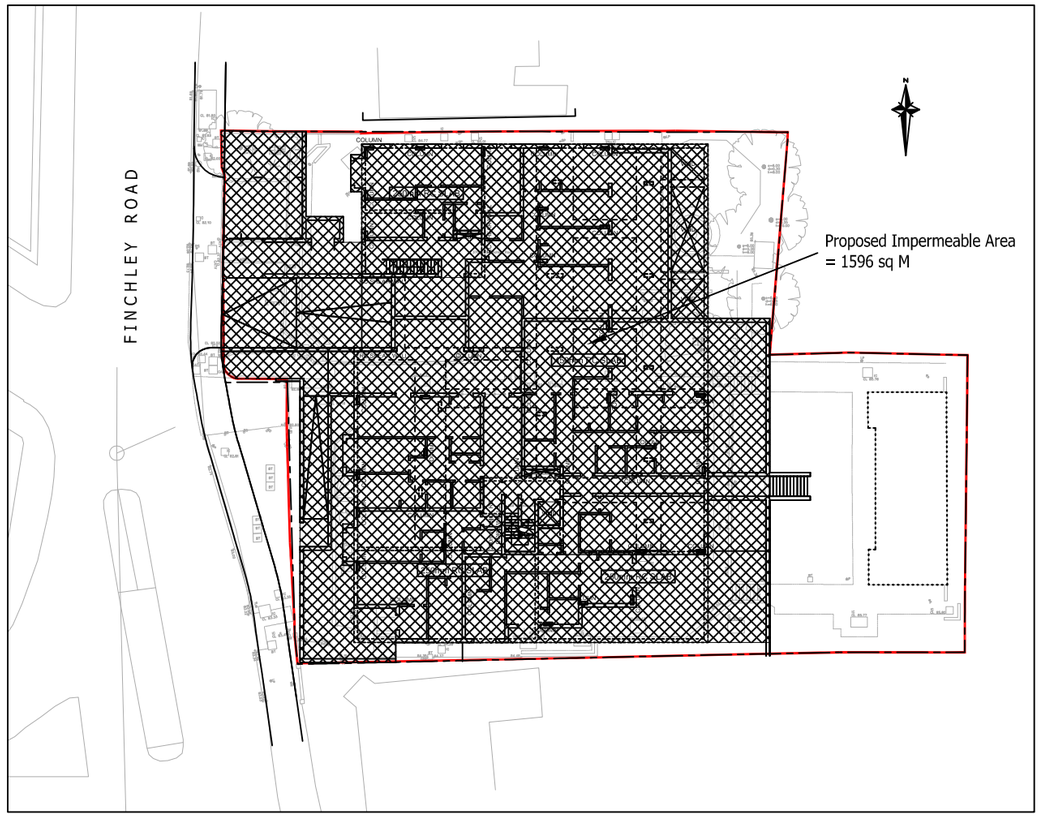
5. Copyright : This drawing must not be copied, amended nor reproduced without the prior written agreement of gta.

6. All drawings specifications and recommendations made by gta are subject to Local Authority and other relevant Statutory Authorities approval. Any works or services made abortive due to the client proceeding prior to these approvals is considered wholly at the Clients risk. gta hold no responsibility for resulting abortive works or costs.

Rev	Amendments	Date	Dsn	Chk
-	Report Issue	28.09.11	DMS	JP



EXISTING SITE



PROPOSED SITE

gta civils ltd
CONSULTING ENGINEERS
gloucester house, 66a church walk,
burgess Hill, west sussex, rh15 9as
tel.01444 871444 fax.01444 871401 web: www.gtacivils.co.uk

Client: FORM STRUCTURAL DESIGN

Architect: TWENTY FIRST ARCHITECTURE

Project: KAY COURT
368-372 FINCHLEY ROAD

Title: IMPERMEABLE AREAS
COMPARISON PLAN

Status: FRA

Date: SEPTEMBER 2011

Scale @ A3: 1:500

Drawing Number: 3992/101

Rev.: -

Notes

1. The location, size, depth and identification of existing services that may be shown or referred to on this drawing have been assessed from non intrusive observations , record drawings or the like. The contractor shall safely carry out intrusive investigations, trial holes or soundings prior to commencing work to satisfy himself that it is safe to proceed and that the assessments are accurate. Any discrepancies shall be notified to gta prior to works commencing.

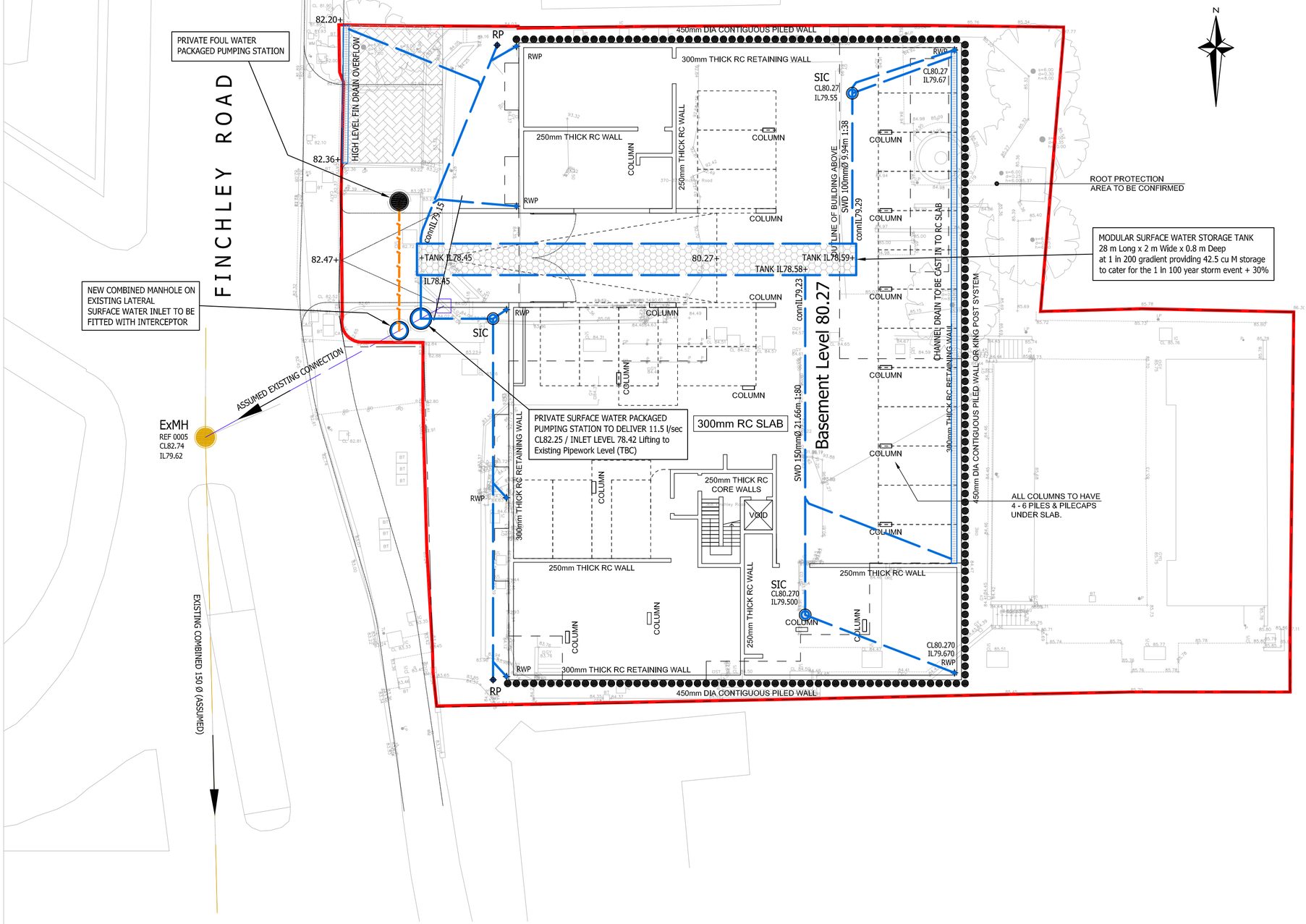
2. Prior to commencement of works the contractor shall provide co-ordinated and dimensioned installation drawings and calculations and allow 10 working days for gta`s checking procedure prior to proceeding with those works or the ordering of materials.

3. Tender or billing drawings shall not be used for construction or the ordering of materials.

4. Do not scale. All dimensions and levels to be site confirmed.

5. This drawing shall be read in conjunction with all relevant architects, consultants drawings and specifications, together with H&S plan requirements

6. Copyright : This drawing must not be copied, amended nor reproduced without the prior written agreement of gta.



KEY

- Existing Foul Drainage
- Existing Storm Drainage
- Private Storm Drainage
- Private Storm Rising Main
- Private Foul Rising Main
- Existing Public Sewer and Manhole
- Private Storm Manhole (SMH)
- Storm Plastic Inspection Chamber - D202.6 (SIC)
- Storm Water Rodding Point (RP)
- Rain Water Pipe (indicative) (RWP)
- Channel Drain
- Permeable Paving

Rev	Amendments	Date	Dsn	Chk
-	Report Issue	28.09.11	DMS	JP

Status: FRA

Client: FORM STRUCTURAL DESIGN

Architect: TWENTY FIRST ARCHITECTURE

Project: KAY COURT
368-372 FINCHLEY ROAD

Title: SURFACE WATER DRAINAGE STRATEGY PLAN

Date: SEPTEMBER 2011	Scale @ A2: 1:200
Base Layout Ref.	CAD File ref.
Clients Ref.	Project Ref.: 3992

gta civils ltd
CONSULTING ENGINEERS
gloucester house, 66a church walk,
burgess Hill, west sussex, rh15 9as
tel.01444 871444 fax.01444 871401 web: www.gtacivils.co.uk

Drawing Number: 3992/102

Rev.: -

Unity House 2 Albert Drive Burgess Hill RH15 9TN	FRA KAY COURT FINCHLEY ROAD NW3 7AJ
Date 29.09.11 File 3992-storage.SRC	Designed By DMS Checked By
Micro Drainage	Source Control W.11.4

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 35 minutes

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	11.5	0.0	11.5	79.2153	0.6003	31.9	O K
30 Summer	11.5	0.0	11.5	79.2923	0.6773	36.0	O K
60 Summer	11.5	0.0	11.5	79.2833	0.6683	35.5	O K
120 Summer	11.5	0.0	11.5	79.1873	0.5722	30.5	O K
180 Summer	11.5	0.0	11.5	79.0813	0.4662	24.8	O K
240 Summer	11.5	0.0	11.5	78.9807	0.3657	19.5	O K
360 Summer	11.5	0.0	11.5	78.8277	0.2127	11.3	O K
480 Summer	11.5	0.0	11.5	78.7323	0.1173	6.2	O K
600 Summer	11.4	0.0	11.4	78.6893	0.0743	4.0	O K
720 Summer	10.0	0.0	10.0	78.6768	0.0618	3.3	O K
960 Summer	8.0	0.0	8.0	78.6597	0.0447	2.4	O K
1440 Summer	5.8	0.0	5.8	78.6408	0.0257	1.4	O K
2160 Summer	4.2	0.0	4.2	78.6263	0.0113	0.6	O K
2880 Summer	3.3	0.0	3.3	78.6188	0.0038	0.2	O K
4320 Summer	2.4	0.0	2.4	78.6150	0.0000	0.0	O K
5760 Summer	1.9	0.0	1.9	78.6150	0.0000	0.0	O K
7200 Summer	1.5	0.0	1.5	78.6150	0.0000	0.0	O K
8640 Summer	1.3	0.0	1.3	78.6150	0.0000	0.0	O K
10080 Summer	1.2	0.0	1.2	78.6150	0.0000	0.0	O K
15 Winter	11.5	0.0	11.5	79.3058	0.6908	36.8	O K
30 Winter	11.5	0.0	11.5	79.4098	0.7948	42.3	O K
60 Winter	11.5	0.0	11.5	79.3933	0.7783	41.4	O K
120 Winter	11.5	0.0	11.5	79.2453	0.6303	33.5	O K
180 Winter	11.5	0.0	11.5	79.0797	0.4647	24.7	O K
240 Winter	11.5	0.0	11.5	78.9298	0.3147	16.7	O K
360 Winter	11.5	0.0	11.5	78.7258	0.1108	5.9	O K
480 Winter	10.1	0.0	10.1	78.6783	0.0633	3.4	O K
600 Winter	8.5	0.0	8.5	78.6643	0.0492	2.6	O K
720 Winter	7.4	0.0	7.4	78.6543	0.0392	2.1	O K
960 Winter	5.8	0.0	5.8	78.6408	0.0257	1.4	O K
1440 Winter	4.2	0.0	4.2	78.6268	0.0118	0.6	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	138.78	16
30 Summer	89.89	29
60 Summer	55.35	44
120 Summer	32.90	78
180 Summer	23.95	112
240 Summer	19.00	144
360 Summer	13.73	202
480 Summer	10.89	256
600 Summer	9.09	308
720 Summer	7.84	368
960 Summer	6.20	490
1440 Summer	4.46	734
2160 Summer	3.19	1100
2880 Summer	2.52	1464
4320 Summer	1.80	0
5760 Summer	1.42	0
7200 Summer	1.18	0
8640 Summer	1.01	0
10080 Summer	0.89	0
15 Winter	138.78	17
30 Winter	89.89	30
60 Winter	55.35	48
120 Winter	32.90	86
180 Winter	23.95	120
240 Winter	19.00	150
360 Winter	13.73	202
480 Winter	10.89	248
600 Winter	9.09	308
720 Winter	7.84	368
960 Winter	6.20	490
1440 Winter	4.46	728

Summary of Results for 100 year Return Period (+30%)

Storm Duration (mins)	Maximum Control (l/s)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
2160 Winter	3.0	0.0	3.0	78.6163	0.0013	0.1	O K
2880 Winter	2.4	0.0	2.4	78.6150	0.0000	0.0	O K
4320 Winter	1.7	0.0	1.7	78.6150	0.0000	0.0	O K
5760 Winter	1.3	0.0	1.3	78.6150	0.0000	0.0	O K
7200 Winter	1.1	0.0	1.1	78.6150	0.0000	0.0	O K
8640 Winter	1.0	0.0	1.0	78.6150	0.0000	0.0	O K
10080 Winter	0.8	0.0	0.8	78.6150	0.0000	0.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
2160 Winter	3.19	1084
2880 Winter	2.52	0
4320 Winter	1.80	0
5760 Winter	1.42	0
7200 Winter	1.18	0
8640 Winter	1.01	0
10080 Winter	0.89	0

Rainfall Details

Region	ENG+WAL	Cv (Summer)	0.750	Summer Storms	Yes
Return Period (years)	100	Cv (Winter)	0.840	Winter Storms	Yes
M5-60 (mm)	21.000	Shortest Storm (mins)	15	Climate Change %	+30
Ratio-R	0.430	Longest Storm (mins)	10080		

Time / Area Diagram

Total Area (ha) = 0.160

Time from:	(mins) to:	Area (ha)
0	4	0.160

Cellular Storage Details

Infil Coef - Base (m/hr)	0.000000	Porosity	0.95
Infil Coef - Sides (m/hr)	0.000000	Invert Level (m)	78.615
Safety Factor	2.0	Ground Level (m)	82.200

Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)	Depth (m)	Area (m²)	Infil. Area (m²)
0.00	56.0	56.0	2.80	0.0	104.0	5.60	0.0	104.0	8.40	0.0	104.0
0.40	56.0	80.0	3.20	0.0	104.0	6.00	0.0	104.0	8.80	0.0	104.0
0.80	56.0	104.0	3.60	0.0	104.0	6.40	0.0	104.0	9.20	0.0	104.0
1.20	0.0	104.0	4.00	0.0	104.0	6.80	0.0	104.0	9.60	0.0	104.0
1.60	0.0	104.0	4.40	0.0	104.0	7.20	0.0	104.0	10.00	0.0	104.0
2.00	0.0	104.0	4.80	0.0	104.0	7.60	0.0	104.0			
2.40	0.0	104.0	5.20	0.0	104.0	8.00	0.0	104.0			

Pump Outflow Control

Invert Level of Control 78.590

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	11.5	0.60	11.5	1.60	11.5	2.60	11.5	5.00	11.5	7.50	11.5
0.20	11.5	0.80	11.5	1.80	11.5	3.00	11.5	5.50	11.5	8.00	11.5
0.30	11.5	1.00	11.5	2.00	11.5	3.50	11.5	6.00	11.5	8.50	11.5
0.40	11.5	1.20	11.5	2.20	11.5	4.00	11.5	6.50	11.5	9.00	11.5
0.50	11.5	1.40	11.5	2.40	11.5	4.50	11.5	7.00	11.5	9.50	11.5