

Our Ref: 18039/CB

7th September 2018London Borough of Hillingdon
Civic Centre
High Street
Uxbridge
UB8 1UW

Dear Sir/Madam,

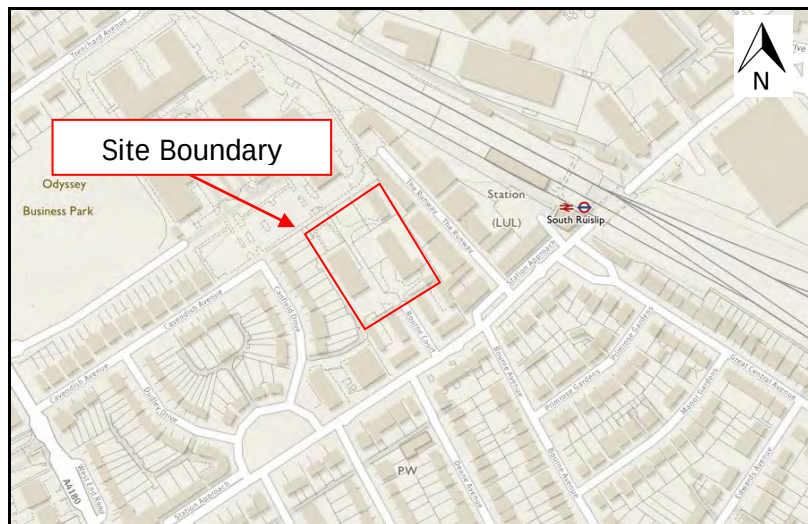
BOURNE COURT, RUISLIP, HILLINGDON, HA4 6SW
FLOOD RISK STATEMENT

This letter sets out the Flood Risk Statement (FRS) for the proposed development at Bourne Court in Hillingdon, London. The proposals are to redevelop the Bourne Court site to provide 109 self-contained residential units in two blocks, together with access, car and cycle parking, refuse storage, communal and private amenity space and new landscaping.

The property is located in Flood Zone 1 of the Yeading Brook and The Roxbourne, and is less than 1 hectare (ha). In accordance with the National Planning Policy Framework¹ (NPPF) and the latest Planning Practice Guidance for Flood Risk and Coastal Change² document, a detailed Flood Risk Assessment (FRA) would not be required for the site. However, the site is located near a Critical Drainage Area (CDA) and the client wishes to understand the risk of flooding to the site. Therefore, an FRA has been prepared with due consideration of the NPPF, the latest Planning Practice Guidance for Flood Risk and Coastal Change and Flood Risk Standing Advice (FRSA) for 'Vulnerable' developments in Flood Zone 1³.

ASSESSMENT OF EXISTING SITE

The site is less than 1 hectare and is located to the northwest of Station Approach in South Ruislip, London, within the jurisdiction of the London Borough of Hillingdon (LBH) as shown in Figure 1.

Figure 1⁴ - Site Location

Cont.../

¹ Communities and Local Government, National Planning Policy Framework, 2012

² Communities and Local Government, Planning Practice Guidance, 2014

<http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/> Accessed 20/07/2017

³ <https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities> Accessed 20/07/2017

⁴ © Ordnance Survey Crown copyright. All rights reserved. Accessed 27/04/2017

The site previously consisted of Bourne Lodge, the Phoenix Day Care Centre and the Wren Centre, with associated car parking facilities and playgrounds. The site previously had a number of uses; the Phoenix Day Care Centre and Wren Centre are being utilised as an adult day centres and Bourne Lodge is a residential care home. At present the site is a clear and vacant site.

A topographic survey was undertaken by LBH Residents Service in June 2016 which covered Bourne Court, the access road to the site and the levels within the site. The survey does not confirm if levels provided are set to Ordnance Datum however they do correlate with nearby Thames Water Asset Plan cover levels (all set to m AOD). The carriageway within Bourne Court is shown to have an average level of 37.56m AOD with onsite levels ranging from 37.69m AOD to 39.32m AOD. The survey shows the site rising in a north-westerly direction.

DESCRIPTION OF THE PROPOSED DEVELOPMENT

The proposals are to redevelopment the Bourne Court site to provide 109 self-contained residential units in two blocks, together with access, car and cycle parking, refuse storage, communal and private amenity space and new landscaping.

The proposals include ground floor sleeping accommodation however no basements or self-contained dwellings at lower ground levels are proposed.

ASSESSMENT OF FLOOD RISK

In assessing the risk of flooding to the site, data from the Environment Agency, LBH Preliminary Flood Risk Assessment⁵ (PFRA), Surface Water Management Plan⁶ (SWMP), and Strategic Flood Risk Assessment⁷ (SFRA) have been used. The SFRA has been updated in conjunction with other local boroughs and the information is found via the West London SFRA⁸ website.

Historic Flood Records

A number of sources of flood risk were investigated to determine if the site and surrounding area have been affected by flooding in the past. It was found that the Environment Agency does not hold any records of the site or surrounding area flooding. In addition, the PFRA, SWMP and SFRA do not hold any record of historical flood events on the site.

The LBH Flood Investigation Report July 2014⁹ notes that the road adjacent to the site was affected by surface water flooding on the 28th July 2014. The cause of the flooding was from overwhelmed surface water sewers. The Met Office notes that there were large rainfall totals in the south east of England from the 27th to the 29th July 2014¹⁰ which may have exacerbated the flooding situation within Station Approach. The site was not affected by this surface water flooding event.

We are not currently aware of any other history of flooding at the site, or of any records of flooding from any source in close proximity to the site.

Risk of Flooding from Rivers or the Sea

The GOV.UK internet flood zone maps show that the site lies within 'Flood Zone 1' ('low risk', which for tidal or fluvial sources equates to a greater than 0.1% annual exceedance probability), as shown in Figure 2.

The risk of flooding from tidal or fluvial sources is therefore low for the site and proposed development.

Cont.../

⁵ Drain London, London Borough of Hillingdon Preliminary Flood Risk Assessment, 2011

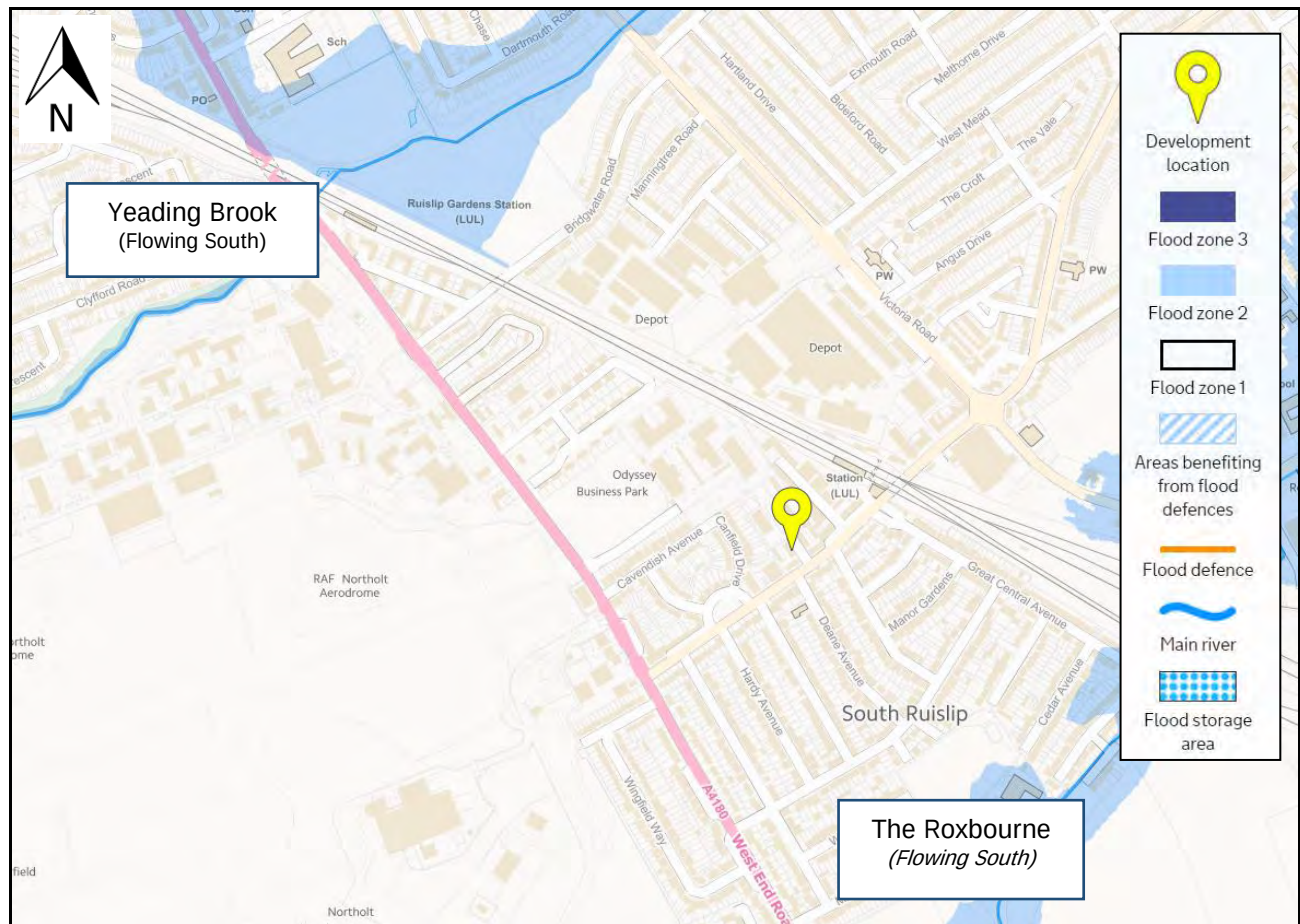
⁶ Drain London, London Borough of Hillingdon Surface Water Management Plan, 2013

⁷ Scott Wilson, London Borough of Hillingdon Strategic Flood Risk Assessment, March 2008

⁸ <http://westlondonsfra.london/> retrieved 27th July 2018

⁹ London Borough of Hillingdon Lead Local Flood Authority, Flood investigation Report July 28th 2014 published November 2014

¹⁰ <http://www.metoffice.gov.uk/climate/uk/summaries/2014/july> Retrieved 15th May 2017

Figure 2¹¹ –GOV.UK Flood Zone Map

Risk of Flooding from Land (Surface Water and Sewer Flooding)

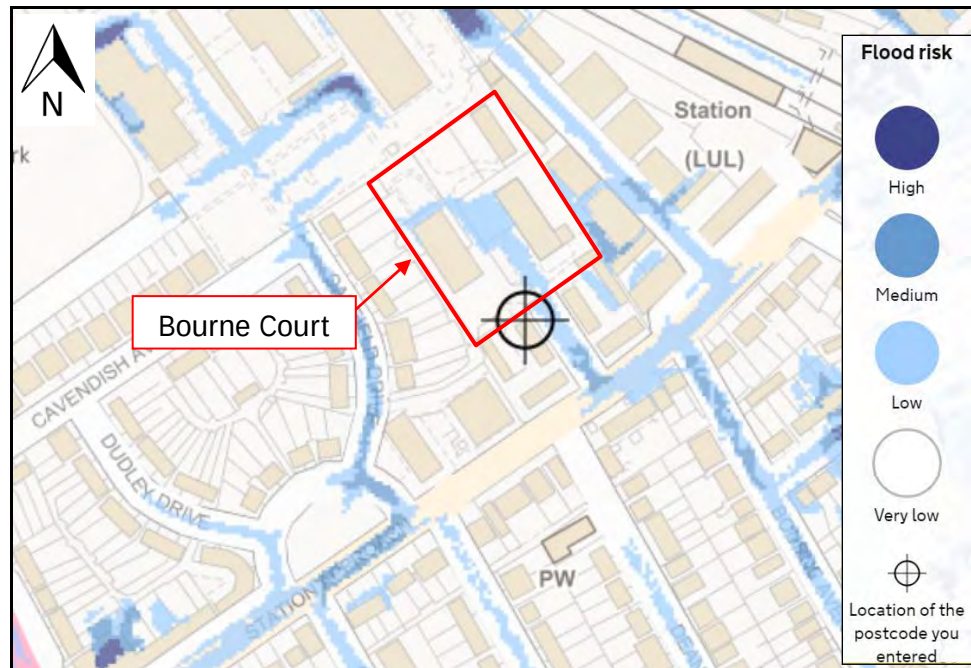
Flooding from surface water arises during intense rainfall events when flood waters are unable to infiltrate into the ground or discharge into local ditches or artificial drainage infrastructure. In an urban environment, the risk of flooding from surface water and from overloaded sewers is closely related, and both are included in the relevant surface water flooding datasets. Flooding events are typically of short duration (unless there is a drainage system blockage), but can be severe.

The site is located between three Critical Drainage Areas (CDA), in particular Group1_018, Group1_028 and Group1_019 as shown within Appendix A of the LBH SWMP. A CDA is classified by LBH as *"a discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure."*

The GOV.UK online mapping covering the risks of surface water flooding. These maps are a useful tool in assessing the extent and frequency of flooding in a general area but do come with a caveat that they should not be relied upon for site specific development or property level assessment. Engineering judgement is therefore required when considering the flood risk information presented. The GOV.UK long term risk of flooding from surface water map, applicable to the site, is shown in Figure 3.

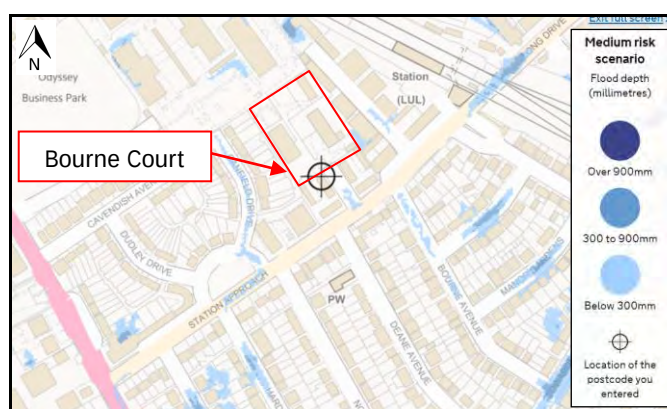
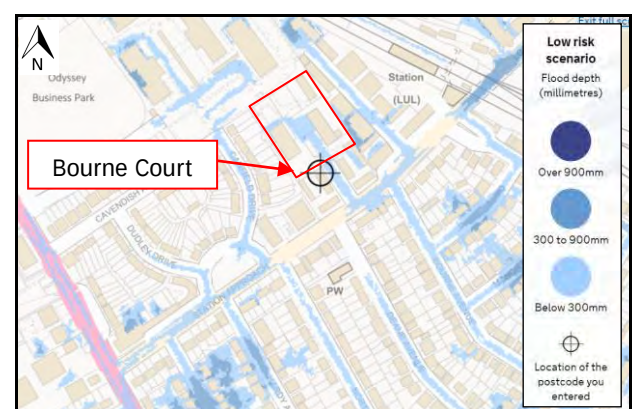
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¹¹ © Crown Copyright and database right 2017 OS 100024198. Retrieved 20/07/2018

Figure 3 ¹²- GOV.UK Surface Water Extents risk map

The dark blue shaded areas are areas of 'High' surface water flood risk which have a 3.3% AEP (1 in 30 year event) chance of flooding. While the lighter blue areas are of 'Medium' risk of surface water flooding which have a 1% AEP (1 in 100 year event) chance and the pale blue areas are of 'Low' risk of surface water flooding has a 0.1% AEP to 1% AEP (between a 1 in 1000 year and 1 in 100 year event) chance of occurring. Areas not highlighted in blue are classed at 'Very Low' risk of surface water flooding with less than 0.1% AEP (1 in 1000 year event) chance of occurring.

Figure 3 shows the site to lie within an area defined at 'Low' risk of surface water flooding, therefore between the 1% AEP and 0.1% AEP surface water flood extents. While surrounding areas to the north east and south east of the site have a higher risk if surface water flooding. Further investigation of the Environment Agency's detailed online maps was therefore undertaken to understand the risk of surface water flooding to the site and the proposed development.

Figure 4 ¹³- GOV.UK 'Medium' Occurrence (1% AEP) Surface Water EventFigure 5 ¹⁴- GOV.UK 'Low' Occurrence (0.1% AEP) Surface Water Event

Cont.../

¹² © Crown Copyright and database right 2017 OS 100024198. Retrieved 20/07/2018

¹³ © Crown Copyright and database right 2017 OS 100024198. Retrieved 20/07/2018

¹⁴ © Crown Copyright and database right 2017 OS 100024198. Retrieved 20/07/2018

Figure 4 shows the 'Medium' occurrence; 1% AEP flood depths at the site and surrounding areas. The site is shown not to be affected by surface water flooding during this event. The site adjacent to the eastern boundary is shown to experience surface water ponding. Investigation of open source LiDAR data found that the cause of the surface water ponding along the boundary was due to site levels being higher than the adjacent site which prevents the flow of surface water onto the Bourne Court site.

Figure 5 shows that for the 'Low' occurrence, the 0.1% AEP event. This shows that the site is shown to experience surface water flooding along the access road through the centre of the site. The depth of surface water flooding on the site is shown to be below 300mm.

The required design flood event is the 1% AEP event plus an uplift for future climate change. Figure 4 only shows the present day 1% AEP event, with no uplift for climate change, whilst Figure 5 shows the 0.1% AEP event, which is greater than the design event. The LBH SWMP and PFRA undertook detailed surface water modelling which includes results for the design flood event (1% AEP plus climate change flood event) which can be seen in Figure 6.

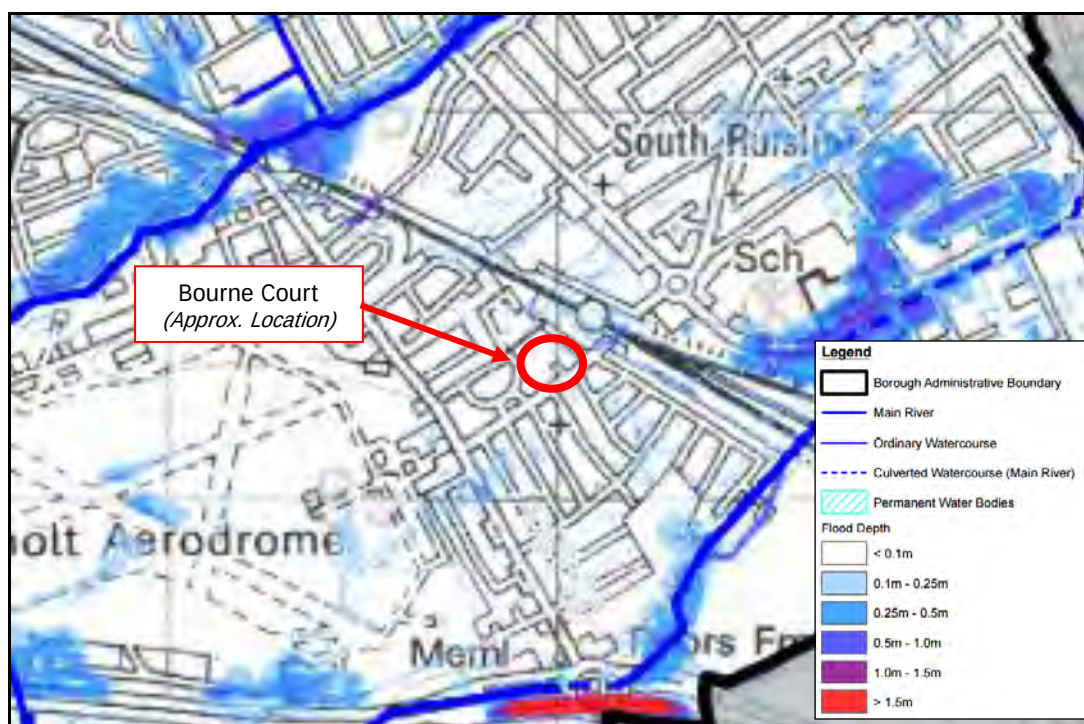


Figure 6¹⁵ – LBH SWMP Design Flood Event

Figure 6 shows that the site is not affected by surface water flooding during the design event. Surface water flooding is shown within low lying areas on Station Approach under the railway track. This flooding is reflective of the surface water flood event which occurred in 2014. No surface water flow paths are shown from the flooding on Station Road to the site during the design event.

Available data at the time of writing suggests that there could be some possible shallow surface water flooding at the site but this does not indicate any deep or internal flooding. Where possible, threshold levels of the development or along the access road should be raised to help prevent the ingress of any standing surface water. CIRIA Designing for Urban Exceedance recommends that threshold levels should be set 75-150mm above surrounding ground levels.

Risk of Flooding from Sewers

Sewer flooding generally results in localised short term flooding caused by intense rainfall events overloading the capacity of sewers.

Cont.../

¹⁵ Drain London, London Borough of Hillingdon Surface Water Management Plan, 2013

There are a number of sewers running close to the site. Thames Water asset data shows that there are two 150mm diameter foul sewers, running from the site in a south-easterly direction to Station Approach. In addition, there are two surface water sewers of 225mm and 150mm diameter running adjacent to the foul sewers. All sewers serving the site flow directly into the sewers within Station Approach and continue in a north-easterly direction.

The PFRA has collated data from the Thames Water DG Register, which indicates that there have been 21-50 properties affected by internal and external sewer flooding incidents within the HA4 6 postcode up to 2011. The SWMP notes 35 properties affected by sewer flooding in HA4 6 up to 2011. Thames Water confirmed that they have no historical records of internal sewer flooding at the site specifically.

Taking into consideration all sources of data, it is recommended that the development raises threshold level of the property in line with CIRIA guidelines. This would prevent the ingress of any unexpected flooding at the site in the event of a blockage in the local sewer network. CIRIA Designing for Urban Exceedance recommends that finished floor levels are set 75-150mm above surrounding ground levels. With this mitigation measure, it is considered that the risk of flooding to the development from surface water or sewers is low.

Risk of Flooding from Groundwater

The Environment Agency online groundwater mapping has no data for the site. The British Geologic Survey (BGS) 1:50,000 scale mapping bedrock geology as impermeable London Clay and there are no records for superficial deposits on the site.

An onsite ground investigation was conducted by Ground Exploration Limited for Hillingdon Engineering Consultancy in February 1997. Two boreholes were undertaken in this study; one borehole to 10m below ground level (BGL) and another to 15m BGL. In addition, four trial pits of approximately 0.7m in depth were also completed. The site investigation concluded that the site is located above clay, with a lens of clayey fine sand at 11m BGL. The site investigation report also noted that Borehole 1 encountered groundwater as seepage at 9.5m BGL. Whilst Borehole 2 did not encounter groundwater or seepage.

Groundwater emergence elsewhere in the area would follow localised flow paths and discharge to the local sewer system or drainage ditches. Groundwater flooding is unlikely to pose a significant risk to the development in comparison to the risk of surface water flooding already mitigated for. Any emergent groundwater would pond at the surface, and therefore raising of thresholds would provide protection to the proposed development. As such, the risk of flooding to the site from groundwater is low.

No basements are proposed and therefore the development will not increase the risk of groundwater flooding elsewhere.

Flooding from Artificial Sources

The GOV.UK online maps show that the area surrounding the site should not be affected by reservoir flooding. The Environment Agency are the enforcement authority for the Reservoirs Act 1975 in England. They ensure that reservoirs are inspected regularly, and essential safety work is carried out. All reservoirs must be inspected and supervised by reservoir panel engineers. There has been no loss of life in the UK from reservoir flooding since 1925.

The site is not at risk of reservoir flooding and there are no further artificial waterbodies in the area that would constitute a risk of flooding to the site.

Effect on the risk of flooding elsewhere

As the site is not at risk of flooding, the re-development of the site will have no impact on the flood storage capacity of the local area during the 1% AEP plus climate change design event.

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There will be changes to the built footprint on the site and this will result in a change in surface water runoff rates and volumes post-development. However, in line with the London Plan, the proposed development will be implementing a Sustainable Drainage System (SuDS) on site, which will reduce runoff rates to three times the Greenfield runoff rate. Details of the proposed SuDS strategy can be found within the Water Environment Ltd Drainage Strategy (September 2018) for the site. The inclusion of SuDS therefore reduces the risk of flooding to third party landowners or property.

SUMMARY

The Environment Agency Flood Map shows the site to be located within Flood Zone 1 of the Yeading Brook and The Roxbourne. Following assessment of all other sources of flooding, the site is considered to be at low 'actual' risk of flooding from all reasonable sources during the design flood event.

It is recommended that the site should implement raised threshold or finished floor levels in line with CIRIA Designing for Urban Exceedance to prevent internal ingress of any unexpected surface water or sewer flooding on the site.

Please feel free to contact me if you have any queries

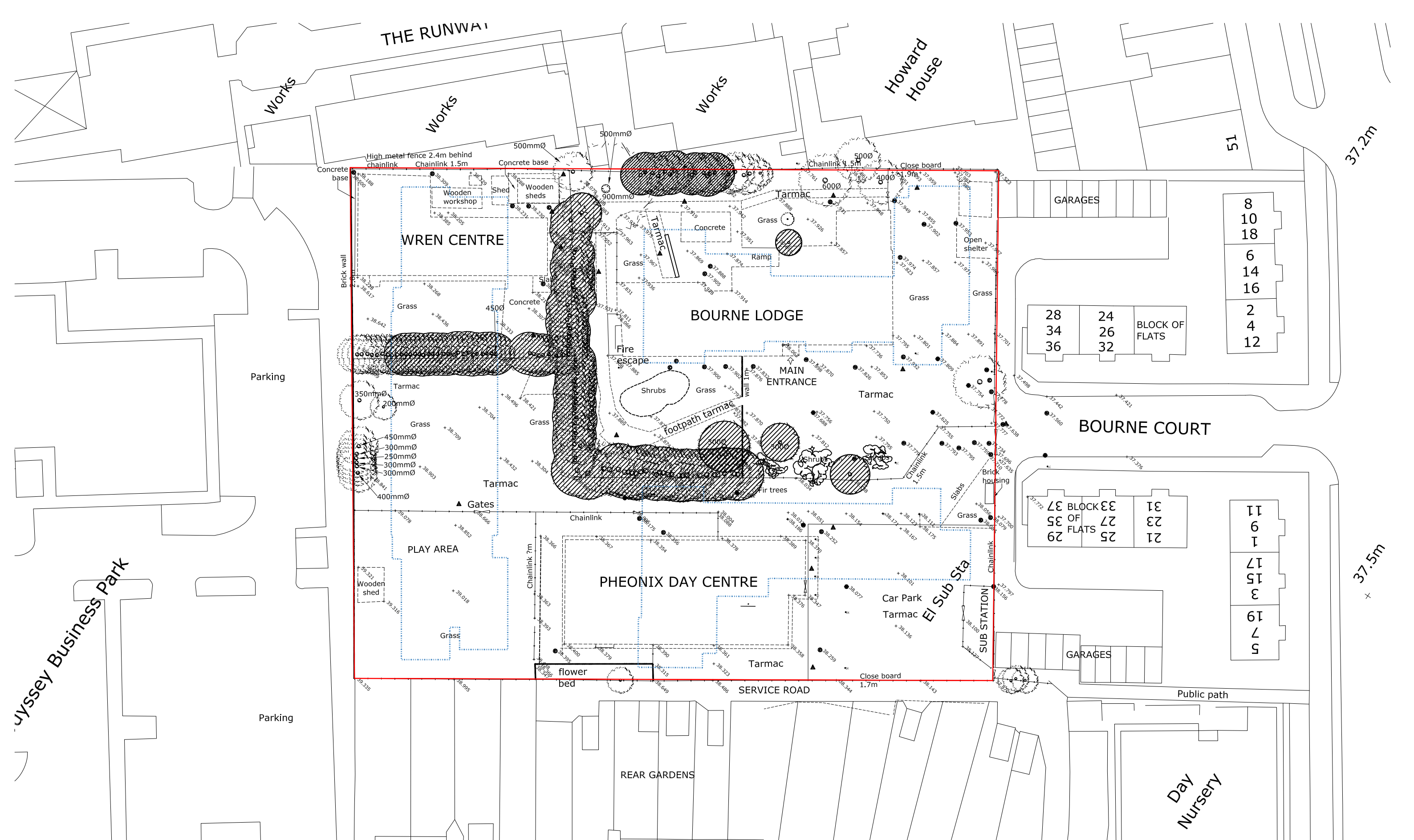
Yours sincerely,



Claire Burroughs
MSc DIC MEng (Hons)
MCIWEM
Senior Environmental Engineer

Enclosures:

- Topographic Survey
- Proposed Development
- Thames Water Sewer Plan
- Boreholes from Ground Investigation



Project
Bourne Court
Ruislip

Client

www.wamarchitecture.com

Project No 303	Drawing Title Existing Site Plan
DWG Type PL	DWG No 011
Date 06/07/18	Rev 00
	Checked BW
	Status For Approval

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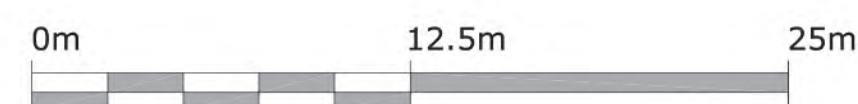
RIBA
Chartered Practice

DEMOLISHED BUILDINGS

PREVIOUS APPROVAL

0m 12.5m 25m

06/07/18



Project
**Bourne Court
Ruislip**

Client

www.wamarchitecture.com

Project No
303
DWG Type
PL
Date
05/07/18

Drawing Title
Proposed Site Plan
DWG No
100
Drawn
MR

Rev
00
Checked
BW

Scale
1:500
Status
For Approval

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Works

Works

Works

House

51

GARAGES

8
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18
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BOURNE COURT

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GARAGES

PUBLIC FOOTPATH

SERVICE ROAD

PARKING

PARKING



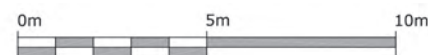
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Bourne Court
Ruislip
Client

Product No
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Date
05/07/18
Drawing Title
Proposed Ground Floor Plan
Rev
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Drawn
MR
Checked
BW
Scale
1:200 @ A1
Status
For Approval

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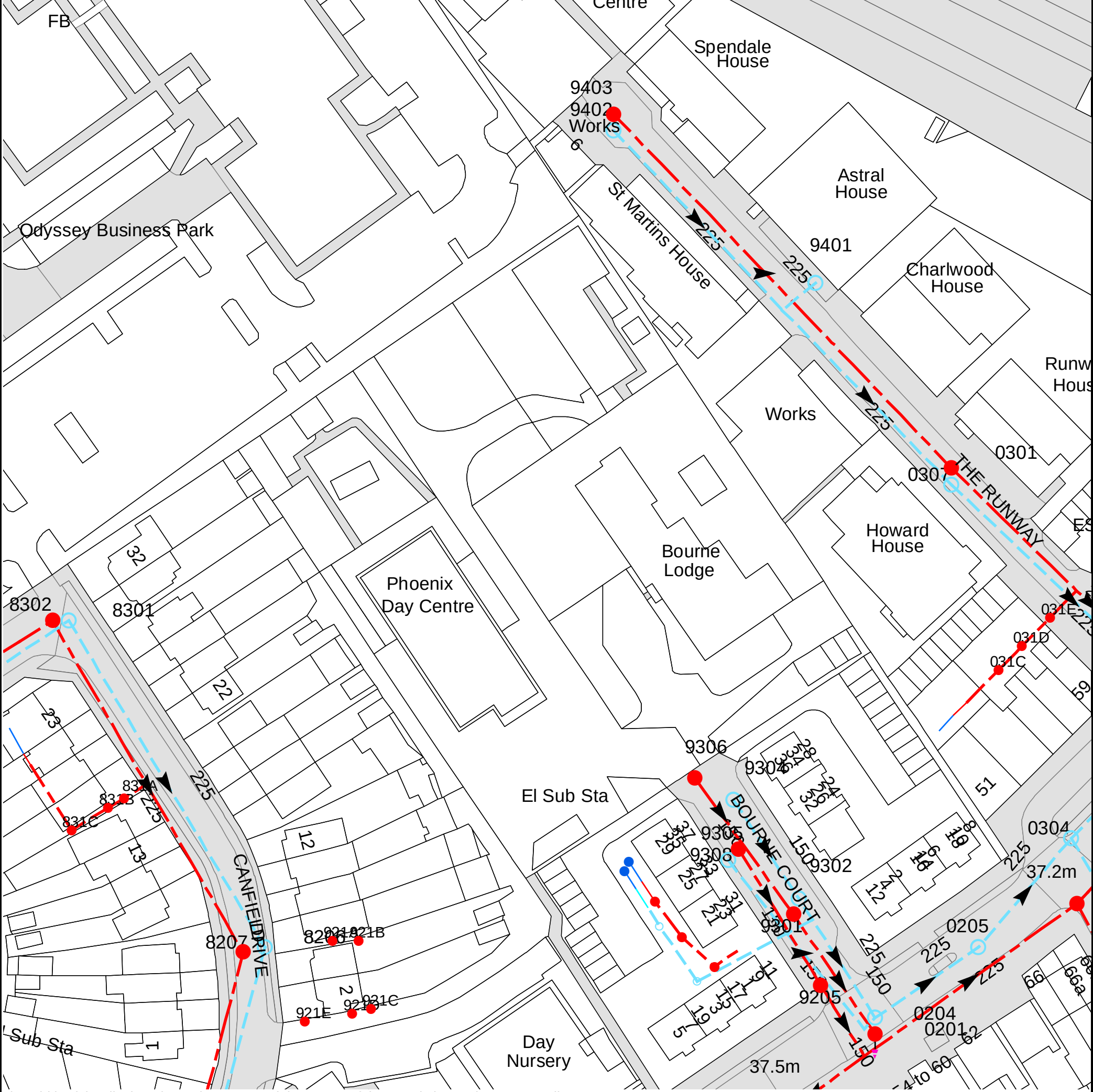
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**Bourne Court
Ruislip**
Client:

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Project No 303	Drawing Title Northeast Elevation	Rev 00	Scale 1:200 @ A2
DWG Type PL	DWG No 300	Status Checked	For Approval
Date 05/07/18	Drawn MR	Checked BW	

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The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 510948,185371
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
0303	37.19	35.18
0304	37.36	35.07
031D	n/a	n/a
031E	n/a	n/a
921H	n/a	n/a
931D	n/a	n/a
9301	37.38	36.02
931B	n/a	n/a
9302	37.39	35.69
931C	n/a	n/a
931A	n/a	n/a
9308	37.51	36.33
9305	37.52	36.18
9304	37.56	35.83
9306	37.66	36.47
031C	n/a	n/a
0307	37.62	36.27
0301	37.64	36.2
9401	38.26	37.13
9402	38.59	37.2
9403	38.59	37.18
0201	37.41	35.7
0204	37.44	35.55
921C	n/a	n/a
9205	37.47	36
921J	n/a	n/a
921I	n/a	n/a
0205	37.33	35.38
921E	n/a	n/a
921D	n/a	n/a
8207	38.27	36.14
8206	38.44	36.51
921A	n/a	n/a
921B	n/a	n/a
831C	n/a	n/a
831B	n/a	n/a
831A	n/a	n/a
8302	39.22	37.07
8301	39.22	37.55
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

	Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Trunk Surface Water
	Trunk Foul
	Storm Relief
	Trunk Combined
	Vent Pipe
	Bio-solids (Sludge)
	Proposed Thames Surface Water Sewer
	Proposed Thames Water Foul Sewer
	Gallery
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Sludge Rising Main
	Proposed Thames Water Rising Main
	Vacuum

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plans are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
- 5) 'na' or '0' on a manhole level indicates that data is unavailable.

Sewer Fittings

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

	Air Valve
	Dam Chase
	Fitting
	Meter
	Vent Column

Operational Controls

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

	Control Valve
	Drop Pipe
	Ancillary
	Weir

End Items

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

	Outfall
	Undefined End
	Inlet

Other Symbols

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

	Public/Private Pumping Station
	Change of characteristic indicator (C.O.C.I.)
	Invert Level
	Summit

Areas

Lines denoting areas of underground surveys, etc.

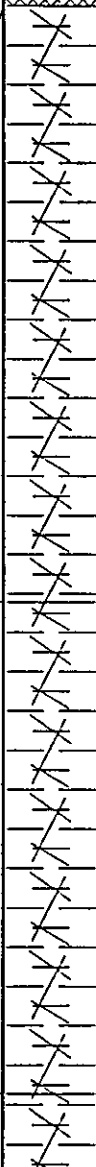
	Agreement
	Operational Site
	Chamber
	Tunnel
	Conduit Bridge

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

	Foul Sewer
	Surface Water Sewer
	Combined Sewer
	Gully
	Culverted Watercourse
	Proposed
	Abandoned Sewer

- 6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

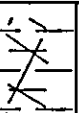
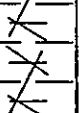
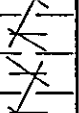
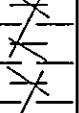
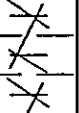
GROUND EXPLORATIONS LTD Tel:0895 231718 Fax:0895 239624		Project BOURNE COURT, RUISLIP	BOREHOLE 1 1/2
Co-ordinates E N		Client London Borough of Hillingdon	Project No. 97012
Scale 1:50		Agent HILLINGDON ENGINEERING CONSULTANCY	Ground Level

Samples / Tests		(Date)	Inst.	Depth	Description of Strata (thickness)	Legend	Level	
Type	Depth	Casing						
D1	0.10	(30/01/97)		0.05	MADE GROUND Tarmac (0.05) (0.05)			
B1	0.10 - 0.40			0.10	MADEGROUND Intermixed brown silty clay, sand, gravel and cobble size fragments of brick and sandstone (0.05) (0.05)			
D2	0.40			0.40	MADEGROUND Black sand and gravel size fragments of ash (0.30)			
D3	1.00	1.50		4.30	Stiff becoming closely fissured, brown, silty CLAY, with occasional claystone layers and selenite crystals. (3.90)			
U1 (30)	1.30 - 1.75							
D4	1.80							
D5	2.20							
U2 (45)	2.50 - 2.95							
D6	3.00				Roots seen to 3.00m			
D7	3.30							
U3 (50)	3.50 - 3.95							
D8	4.00							
D9	4.30							
U4 (80)	4.50 - 4.95	1.50		7.50	Stiff closely fissured, dark grey slightly silty to silty CLAY (3.20)			
D10	5.00							
D11	5.50							
S1 (16)	6.00 - 6.45							
D12	6.00							
D13	7.00	1.50						
U5 (60)	7.50 - 7.95				Very stiff closely fissured dark grey slightly silty to silty CLAY (4.50)			
D14	8.00							

Groundwater Strikes					Groundwater Observations					Chiselling		Percussive Boring	
Depth					Date	Time	Depth			Depth	Hours	Dia	Cased to
Struck	Rose to	Rate	Cased	Sealed			Bore	Casing	Water				
9.50		seepage	1.50		30/01/97		15.00	1.50	dry			0.00	1.50

Remarks Excavating from 0.0m to 1.2m for 1 hour.

GROUND EXPLORATIONS LTD Tel:0895 231718 Fax:0895 239624		Project BOURNE COURT, RUISLIP	BOREHOLE 1
Co-ordinates E N		Client London Borough of Hillingdon	Project No. 97012
Scale 1:50		Agent HILLINGDON ENGINEERING CONSULTANCY	Ground Level

Samples / Tests		(Date)	Inst.	Depth	Description of Strata (thickness)	Legend	Level
Type	Depth	Casing					
D15	8.50				Very stiff closely fissured dark grey slightly silty to silty CLAY		
S2 (21) D16	9.00 - 9.45 9.00	1.50					
D17	10.00						
U6 (56)	10.50 - 10.95	1.50			From 11.00m, grading to clayey silty fine SAND		
D18	11.00						
D19	11.50						
D20 U7 (100)	12.00 - 12.45	1.50		12.00	Very stiff, closely fissured, lightgrey, light green and red mottled silty CLAY. Semi polished undulating surfaces noted at 12.50m (3.00)		
D21	12.50						
D22	13.00						
S3 (35) D23	13.50 - 13.95 13.50	1.50					
S4 (40) D24	14.50 - 14.95 14.50	1.50					
				15.00			

Groundwater Strikes					Groundwater Observations					Chiselling		Percussive Boring	
Depth					Date	Time	Depth			Depth	Hours	Dia	Cased to
Struck	Rose to	Rate	Cased	Sealed			Bore	Casing	Water				
					30/01/97		15.00	1.50	dry				

Remarks

GROUND EXPLORATIONS LTD. Tel:0895 231718 Fax:0895 239624 		Project BOURNE COURT, RUISLIP	BOREHOLE 2 1/2
Co-ordinates E N		Client London Borough of Hillingdon	Project No. 97012
Scale 1:50		Agent HILLINGDON ENGINEERING CONSULTANCY	Ground Level

Samples / Tests		(Date)	Inst.	Depth	Description of Strata (thickness)	Legend	Level
Type	Depth	Casing					
B1	0.10 - 0.40	(30/01/97)		0.05	MADE GROUND Tarmac (0.05)		
D1	0.40			0.40	MADE GROUND Intermixed clay, sand, gravel and cobble size fragments of brick (0.35)		
D2	1.00			1.50	Stiff reddish brown becoming brown silty CLAY with occasional gravel (1.10)	* — *	
U1 (25)	1.00 - 1.45					* — *	
D3	1.50					* — *	
D4	1.70					* — *	
U2 (29)	2.00 - 2.45					* — *	
D5	2.50					* — *	
D6	2.80					* — *	
U3 (32)	3.00 - 3.45					* — *	
D7	3.50					* — *	
D8	3.80					* — *	
U4 (45)	4.00 - 4.45					* — *	
D9	4.50					* — *	
D10	4.80					* — *	
U5 (49)	5.00 - 5.45					* — *	
D11	5.50	1.50		5.30	From 3.00m, stiff	* — *	
D12	6.00					* — *	
S1 [15]	6.50 - 6.95					* — *	
D13	6.50					* — *	
D14	7.50					* — *	
U6 (60)	8.00 - 8.45					* — *	

Groundwater Strikes					Groundwater Observations					Chiselling		Percussive Boring	
Depth					Date	Time	Depth			Depth	Hours	Dia	Cased to
Struck	Rose to	Rate	Cased	Sealed			Bore	Casing	Water				
												0.00	1.50

Remarks No groundwater encountered
Excavating from 0.0m to 0.3m for 0.5 hours.

