Appendix E: Flood Risk Assessment and Drainage Strategy

Flood Risk Assessment &
Drainage Strategy

Francis Gardner House,

Camden

Jubb

PREPARED BY:
Jubb Consulting Engineers Ltd.

FOR:
Empiric Student Property

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1 Project Information

1.1 Project Information

Client	Empiric Student Property

1.2 Project Details

Project Name	Francis Gardner House
Location	89-91 West End Lane, London
Jubb Project Number	19366

1.3 Report Details

Version	V2
Status	Planning Issue
Date	11/02/20

1.4 Project Authorisation

ISSUE HISTORY:

AUTHORISATION:

Version	Date	Detail	Prepared By	Approved By
V1	13/01/20	First Draft	MEB	MJB
V2	11/02/20	Planning Issue	MEB	MJB

2 Introduction

2.1 Commission

2.1.1 This Flood Risk Assessment and Drainage Strategy has been commissioned on behalf of Quantum Consulting to support a planning application for the proposed development within the existing Francis Gardner House student accommodation complex within Camden, London.

2.1.2 This report is for the private and confidential use of Quantum Consulting (to whom alone is owed a duty of care) and their professional advisors and consultants in connection with the current development proposals for the site.

2.1.3 This report may not be relied upon or reproduced by any third party for any use without the written agreement of Jubb Consulting Engineers Ltd.

2.2 Brief

2.2.1 This flood risk assessment is prepared in accordance with the requirements of the National Planning Policy Framework (NPPF) published by the Department of Communities and Local Government. Section 14 of the NPPF and the associated Planning Practice Guidance sets out the framework for planning decisions made by the local, regional and national government and the Environment Agency (EA). In order for planning authorities to make informed decisions on the development of sites in areas at risk of flooding, NPPF requires the developer to carry out an assessment of flood risk.

This report addresses the requirements set out in Section 14 of the NPPF and other issues, which are deemed relevant to flood risk. These requirements include the following:

- Assessment of the magnitude and severity of flood risk to the site
- Assess suitability of the site and development through the use of the Sequential Test & Exception Test (if required)
- Consider flood risk due to overtopping of existing flood defences
- Assess the impact of the proposed development on flood risk to adjacent developments
- Determine the ability of existing and proposed drainage to accommodate development flows with respect to surface flooding
- Demonstrate the appropriate mitigation measure have been taken to prevent flooding
- Demonstrate the appropriate emergency situations have been considered e.g. overland flow paths and evacuation routes

2.2.2 This report also considers the disposal of wastewater generated by the proposed development. Existing infrastructure will be reviewed to identify potential options for the disposal of foul and surface water run-off. A strategy will be presented for the preferred option.

3 Existing Site

3.1 Location

3.1.1 The proposed site is located at 89-91 West End Lane, West Hampstead within the London Borough of Camden. The site is approximately 940m^2 in area, with a National Grid Reference (NGR) of 525383E, 184131N.

3.1.2 The site boundaries are formed by West End Lane to the east and residential blocks to the north, west and south. King's Garden Mansions forms the southern boundary to the site.

3.1.3 Beyond the site boundaries the site is predominantly surrounded by relatively dense residential blocks, with other uses such as commercial also present that in combination form the London Borough of Camden.

A site location plan is included in Appendix A.

3.2 Current Land Use

3.2.1 The proposed site currently comprises of an existing 70 student capacity apartment complex.

3.3 Site Topography

3.3.1 A detailed topographical survey has been undertaken on the proposed site.

3.3.2 The survey shows that the existing site is predominantly comprised off impermeable material in which the building footprint dominates. Along the frontage of the building the site is relatively flat with a general slight gradient present that runs from the building edge down towards the adjacent footway.

3.3.3 The small open spaces within the western region of the site are also shown to be flat, with low regions present immediately adjacent to the basement entrances.

3.3.4 The high point within the site is located along the road side of the building and is at a level of 50.87mAOD, whilst the low point is located at the basement entrances and is at a level of 47.65mAOD.

A copy of the topographical survey is included in Appendix B.

3.4 Site Geology

Geology

3.4.1 The British Geological Survey (BGS) maps indicate that the site is underlain with London Clay Formation (Clay, silt and sand).

3.4.2 BGS data does not indicate any superficial deposits beneath the site.

Hydrogeology

3.4.3 The BGS hydrogeology maps indicate that the site is underlain with Thames Group rocks that essentially hold no groundwater.

3.4.4 The Environment Agency's (EA) online indicative aquifer mapping identifies London Clay Formation as an Unproductive aquifer.

3.4.5 Unproductive aquifers are defined as rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

3.4.6 The Environment Agency Source Protection Zone map indicates that the subject site is not located within a groundwater source protection zone.

Hydrology

3.4.7 There are no watercourses located within the proposed site.

3.4.8 The nearest EA designated 'main river' to the site is the River Brent that is, located approximately 5.5km to the west of the site at its closest point. This watercourse runs southwards before connecting into the River Thames.

3.5 Existing Drainage

3.5.1 The existing local public sewer networks currently serving the site and wider Camden area are owned and maintained by Thames Water.

3.5.2 Thames Water asset plans indicate that there is an existing 965x610mm public combined sewer that runs along West End Lane immediately adjacent to the site. It is assumed that both foul and surface water flows from the existing site are discharged into this sewer presently.

3.5.3 The existing site is served by a private network of foul and surface water sewers. Due to the presence of a basement pumps may be actively used. A CCTV survey will be required to identify existing drainage infrastructure within the site and existing connections into the adjacent Thames Water combined sewer.

A copy of the Thames Water asset plan is included in Appendix C.

4 Flood Risk to the Existing Site

This section explores the primary sources of flooding to the sites.

4.1 Tidal & Fluvial Flooding

4.1.1 The proposed site is identified as lying outside of the fluvial and tidal flood risk zone according to the Environment Agency's published floodplain map (refer to Figure 1). This estimate of the extent of flooding is based on the absence or failure of all existing flood defences currently protecting the site.

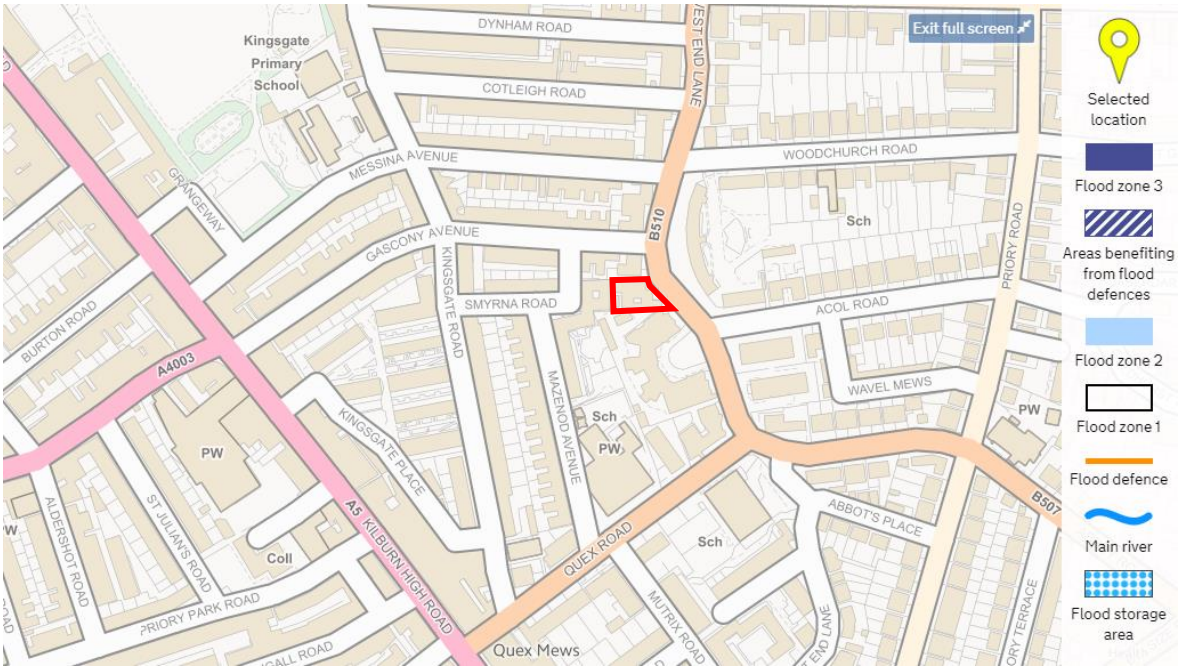


Figure 1 – Extract from Environment Agency Flood Map for Planning

4.1.2 The EA floodplain map indicates that the site lies within Flood Zone 1 – Low Probability in Table 1 of the NPPF Planning Practice Guidance.

4.1.3 This zone has less than a 1 in 1000-year annual probability of flooding.

4.1.4 The NPPF Planning Practice Guidance states that all types of development are suitable for this flood zone.

4.2 Overland / Surface Water Flooding

4.2.1 As shown on the EA risk of flooding from surface water map (refer to Figure 2), the site is identified as being in an area at very low risk of overland and surface water flooding.

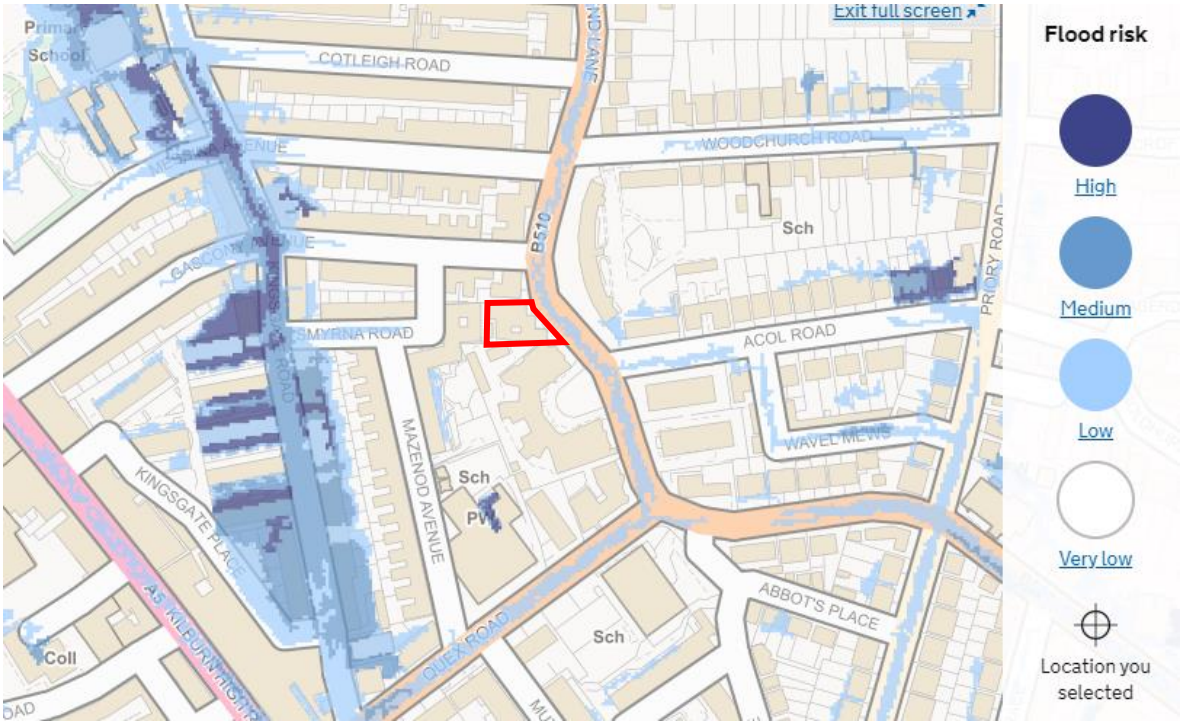


Figure 2 – Extract from Environment Agency Flood Risk from Surface Water Map

4.2.2 There is a low risk of onsite surface water flooding due to the existing nature of the site. The site is comprised predominantly of the building footprint, with only small areas of open space. These isolated pockets are such that localised heavy rainfall would pose only a small risk of flooding within the site, with the most at-risk region located adjacent to the basement along the western boundary.

4.2.3 The existing site is protected from overland flows due to the topography of the area surrounding the site. The site is situated within a localised crest with all regions along the site boundary sloping away from the site.

4.2.4 There are no records of overland or surface water flooding affecting the existing site. Based on this and the factors described above, the proposed site is not considered to be at risk from surface water or overland flooding.

4.3 Flooding from Sewers

4.3.1 There is a low risk of flooding from the existing public sewerage infrastructure located within close proximity to site due to the topography of the surrounding area as explained in Section 4.2. Any exceedance of flows along West End Lane would continue in a southerly direction down West End Lane and away from the site.

4.3.2 Due to the presence of the basement entrances and absence of flood exceedance routes along the western boundary of the site any failure/overtopping of the onsite foul and surface water drainage networks could lead to flooding within this region.

4.3.3 There are no records of historical flooding caused by the local sewer infrastructure, within the site or in the surrounding area, impacting the site.

4.3.4 Consequently, it is not considered that flooding from sewers poses a minimal risk of flooding to the existing site.

4.4 Flooding from Groundwater

4.4.1 The underlying bedrock beneath the proposed site has been identified as clay, silt and sand of the London Clay Formation. This geology is shown to essentially hold no groundwater and therefore does not function as an aquifer.

4.4.2 The local Camden Strategic Flood Risk Assessment (SFRA) completed by URS in 2014 indicates that it is not likely that the proposed site will be at risk of elevated groundwater levels and that there have been no historical cases of groundwater flooding within it. However, in the study it is noted that there is a potential for groundwater flooding outside the areas identified as having an increased potential for elevated groundwater within the SFRA. Groundwater flooding is often relatively small scale and site specific, whereas groundwater mapping produced is at a regional scale.

4.4.3 No detailed on-site geotechnical investigation works has been undertaken on the proposed site. No quantified assessment of groundwater flooding has therefore been made.

4.4.4 Given that there are no historic records of groundwater flooding events on the site and the existing topography tends to fall away from the site it is considered that flooding from groundwater does not pose a significant risk to the site.

4.5 Flooding from Artificial Sources

4.5.1 There are no artificial bodies of water located within or near the proposed site. As a result, it is not considered that flooding from artificial sources poses a risk of flooding to the site.

5 Proposed Development

5.1 Development Description

5.1.1 The current proposal for the site includes the demolition of the existing student accommodation block and redevelopment of the site to provide circa 86 student dwellings within a 7-story block that includes a basement. The proposals include a gym and cinema area within the basement and further communal spaces on the top floor.

5.1.2 Pedestrian and bicycle access to the site will be provided via West End Lane, whilst short-term car parking for delivery/maintenance vehicles will also be provided.

A plan of the proposed site plan is included in Appendix D.

5.2 Development Suitability

5.2.1 The NPPF aims to direct developments to suitable areas with low probability of flooding. The table below illustrates the acceptable classification of development within each flood zone.

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone 1 **(<1 in 1000)**	✓	✓	✓	✓	✓
Flood Zone 2 **(up to 1 in 1000)**	✓	✓	Exception Test	✓	✓
Flood Zone 3a **(1 in 100 fluvial)** **(1 in 200 tidal)**	Exception Test	✓	X	Exception Test	✓
Flood Zone 3b **(functional floodplain)**	Exception Test	✓	X	X	X

5.2.2 The proposed development type is considered to be classified as a ‘more vulnerable’ development under Table 2 of the NPPF.

5.2.3 As the site is in Flood Zone 1, all vulnerability classes are suitable and thus the proposed scheme is deemed acceptable.

5.2.4 The site will not require to be subjected to a sequential test by the Local Planning Authority (LPA) in respect of its allocation and appropriateness for the proposed development of this location, as the proposals are within flood zone 1.

6 Development Drainage

6.1 Foul Drainage

6.1.1 New foul water drainage networks will be required to service the proposed developments. The new network will collect and convey foul water discharge from the development to a new connection point on the adjacent public combined Thames Water sewer or if possible, an existing connection into the public sewer.

6.1.2 As stated in Section 3.5 a CCTV survey on the existing drainage connections into the adjacent existing Thames combined sewer will be required, which will influence the evolution of the foul drainage strategy for the development. It is recommended that an existing connection be reused if one is located and confirmed to be of suitable condition. This will limit excavation works required within the adjacent public highway.

6.1.3 The proposed development will result in an increase in foul flows discharged into the existing public foul network as the proposed development will increase student capacity within the site by 16 compared to existing.

6.1.4 The British Water Code of Practice states that for standard residential an expected flow of 150 l/day/person be utilised. Assuming 86 students the peak foul discharge from the site will be approximately 0.9l/s, which will be an approximate increase of 0.17l/s compared to existing.

6.1.5 The new foul sewerage network will be designed to accommodate the anticipated peak development flows without surcharging.

6.1.6 Thames Water have confirmed that the adjacent combined sewer will have sufficient capacity available to accommodate the additional flows from the proposed development without the need for reinforcement works.

A copy of the Thames Water Capacity Check is included in Appendix E.

6.1.7 The proposed connection point will need to be agreed with Thames Water via a section 106 connection agreement.

6.2 Surface Water Drainage

6.2.1 Current legislation and guidance requires management of surface water run-off from new developments to mitigate flood risk to the site and the surrounding area, and also provide a sustainable means of disposing of run-off from impermeable areas.

6.2.2 Off-site surface water discharge must be managed to ensure that it does not exceed the predevelopment flow rate. Sustainable drainage systems should be utilised to attenuate flows and ensure that run-off from the new hardstanding areas receives the appropriate level of treatment to improve water quality.

6.2.3 As required by the EA drainage guidance and local planning policy the site is required to retain the Q100 + 40% climate change storm onsite, whilst restricting offsite discharges to the greenfield rate or as close to this rate as possible due to the existing site being a brownfield site and current/future site constraints.

6.2.4 The proposals seek to provide a new sustainable surface water drainage system to dispose of surface water run-off in an effective manner. It is proposed to discharge flows via the use of attenuation techniques owing to the predicted poor infiltration rate on site. The geology underneath the site is London Clay Formation which has poor aquifer properties. Further ground investigations will be undertaken on the site that include soakaway testing in accordance with BRE365 guidance to confirm the suitability of utilising infiltration techniques within the site.

6.2.5 It is proposed to attenuate surface water discharge from the site using a Hydrobrake. A cellular tank will be used for attenuation storage. Attenuated flow will discharge into the existing Thames Water combined sewer.

6.2.6 The ICP SUDS greenfield rate method gives a greenfield Q_{bar} rate for the site of 0.3l/s and a Q100 greenfield rate of 1.1l/s, which are considered impractical due to flow control blockage risks. It is proposed to restrict flows to 5l/s for all design events to mitigate the risk of blockage. Greenfield runoff calculations are included in Appendix F.

6.2.7 Table 1 below demonstrates that restricting flow to 5l/s will provide betterment to the existing site for the expected 1 in 1 year rainfall event and greater up to the critical design event. Existing runoff rates were calculated utilising the modified rational method (CIRIA SuDS Manual 2015 - Equation 24.5), whilst rainfall intensities were derived from FEH 30min duration storm events.

Storm Event	Rainfall Intensity (mm/hr)	Existing Runoff (l/s)	Proposed Runoff (l/s)	Betterment %
1 in 1	20	5.2	5	4%
1 in 10	43.8	11.4	5	56%
1 in 30	65	17	5	71%
1 in 100	99.5	26	5	81%
1 in 100 + 40%CC	-	-	5	-

Table 1 – Proposed SW Runoff Betterment in Comparison to Existing

6.2.8 Reducing the discharge to the required rate and assuming an attenuation tank depth of 2m, an assessment of the 100 year plus 40% climate change scenario in MicroDrainage shows that the development will require 30m^3 of storage.

Microdrainage calculations are provided in Appendix F.

6.2.9 New surface water drainage infrastructure will be implemented on the site to adequately convey flows within the site to the proposed attenuation tank located within the south eastern corner of the site and then offsite into the adjacent existing public Thames Water combined water sewer.

6.2.10 Due to the levels within the basement courtyard area, surface water runoff from this region will be required to be pumped via a suitably sized package pump station that will be located externally within the courtyard area. It is suggested that permeable pavement with an underdrain that connects into the package pump station be used within this region as it will ensure that the risk of sediment build-up and thus blockage issues are reduced. Additionally, the available storage within the permeable pavement will be able to provide emergency storage in the act of possible failure of the pumping system.

6.2.11 Pending the results of onsite CCTV survey a combined singular connection may be utilised to connect foul and surface water drainage from the proposed development into the adjacent Thames Water combine sewer. Separate proposed onsite surface water and foul sewer networks will be required only combining at the most downstream manhole within the site.

6.2.12 Thames Water have confirmed that their adjacent combined sewer will have sufficient capacity to accept 5l/s surface water runoff from the proposed development.

A plan of the proposed drainage strategy is included in Appendix G.

7 Sustainable Drainage Systems & Water Quality

7.1.1 The surface water management should incorporate sustainable drainage techniques to restrict surface water discharge from the site and improve water quality of the run-off. There are a wide range of techniques that can be applied including source control, online systems and outlet controls. Ciria have published a SuDS manual, which details a number of systems along with guidance on their application and design.

7.1.2 SuDS systems typically rely on either infiltration or attenuation to reduce peak flows and volume discharge and filtration systems to remove pollutants or solids from the effluent.

7.1.3 Following the results of onsite ground investigation works, additional sustainable drainage techniques such as permeable paving and filter drains will be considered, which will provide pollutant removal and flow restriction benefits.

7.1.4 As a means of analysing whether the SuDS measures utilised for the site will provide adequate water treatment to the surface water runoff the Ciria SuDS manual specifies a simple index approach. This approach gives different land uses certain pollution hazard indices (Table 26.2 Ciria Manual), while SuDS features are given mitigation indices (Table 26.3 Ciria Manual). If the SuDS indices are greater than the pollution hazard indices the water treatment within the system is deemed adequate.

7.1.5 The proposed development will have a very low pollution hazard indices as the site will mainly consist of a residential roof which has indices of 0.2, 0.2 and 0.05 for TSS, metals and hydrocarbons respectively. There will be short-term carparking provided within the front of the site for delivery/maintenance vehicles. It understood that this will be used infrequently. The remaining external areas will be for recreational use, pedestrian/bike access.

7.1.6 Most SuDS mitigation options have greater indices then the above and thus will be adequate in providing acceptable water quality to surface water runoff within the development. As the scheme progresses and more information is available it will be ensured that the Ciria simple index approach is appropriately followed with suitable SuDS features chosen.

8 SuDS Management & Maintenance

8.1.1 Drainage for within the proposed site boundaries will be managed and maintained privately.

8.1.2 SuDS features will remain private and will be maintained by a site management company. Details for the management and maintenance of any SuDS within the site will be agreed with the Local Authority prior to construction. The management company will be responsible for the regular inspection and maintenance of SuDS features, with a contractor on standby for emergency reactive maintenance.

8.1.3 As the scheme is progressed management and maintenance practices for taking care of the SuDS/drainage infrastructure will be constantly reviewed and updated with a final confirmed plan to be detailed at the completion of the construction.

8.1.4 SuDs features will be managed in accordance with the guidelines in Ciria C753, Chapter 32. As this is early in the application process the final details of the SuDS system and exact maintenance requirements are not yet fully known. However, a few fundamental actions can be specified now, these are noted below:

Attenuation Storage Tank

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Permeable Pavement

TABLE 20.15 Operation and maintenance requirements for pervious pavements

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

9 Development Flood Risk & Mitigation

9.1 Tidal & Fluvial Flooding

9.1.1 The proposed site is not at risk of tidal or fluvial flooding and lies within flood zone 1 on the EA flood maps. The development proposals do not increase the flood risk to either site or the surrounding area from tidal or fluvial sources.

9.1.2 The proposed use of the site remains 'more vulnerable' under the NPPF, however, this is still acceptable for a low risk flood site.

9.2 Overland / Surface Water Flooding

9.2.1 As discussed in section 4.2 the proposed site is not at risk of flooding from overland flows. A proposed drainage strategy will be designed to accommodate all surface water flows from the new hardstanding areas of the development. This network will be designed to accommodate flows for a range of storm events without flooding.

9.2.2 Consequently, the proposed development will not have a significant impact on flood risk to the site or the surrounding area.

9.3 Flooding from Sewers

9.3.1 There is a risk of flooding within the western boundary of the site within the existing site due to onsite sewer overtopping/failure due to the absence of flood exceedance routes. The proposed development will incorporate basement patios in this region and will similarly be at risk of flooding due to the absence of flood exceedance routes. However, this risk is mitigated somewhat as a new surface water drainage network will be constructed to service the proposed development for up to a 1 in 100- year storm event with an allowance for climate change.

9.3.2 A new foul drainage network will also be constructed to service the site. This network will be designed to accommodate the anticipated peak flows with no flooding.

9.4 Groundwater Flooding

9.4.1 There are no historic records of groundwater flooding on the site and the local SFRA indicates that there is a low risk of groundwater flooding associated with the underlaying geology. However, it should be noted that groundwater flooding is very site specific and there may be risk to the site. Further onsite testing will need to be carried out to confirm the risk.

9.4.2 The basement region will be wrapped in an impermeable membrane to ensure that any sudden surges in groundwater does not lead to flooding within the basement.

9.4.3 It is proposed to discharge surface water flows via attenuation solutions. The proposals are not expected to affect the groundwater table and consequently will not increase the risk of flooding from groundwater sources.

9.5 Flooding from Artificial Sources

9.5.1 As discussed in section 4.5 there is no flood risk to the site from artificial sources. The development proposals do not impact the risk posed to the site or the surrounding area.

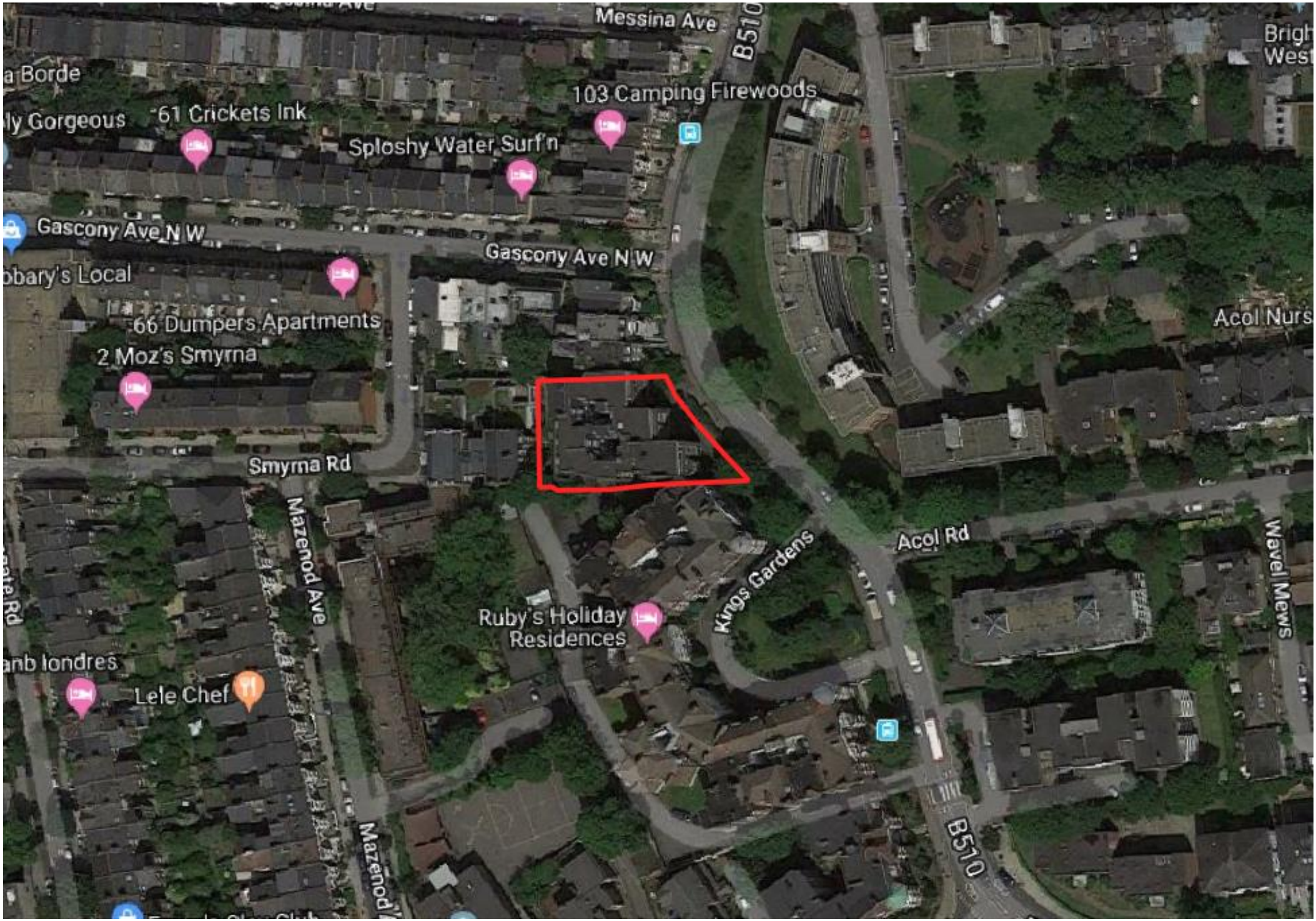
10 Conclusions & Recommendations

It is considered that this assessment represents a comprehensive and robust analysis of the flood impact of the development upon other adjacent properties and of existing flood mechanisms on the development itself. It demonstrates that the proposed development is sustainable in terms of flood risk and can be summarised as follows;

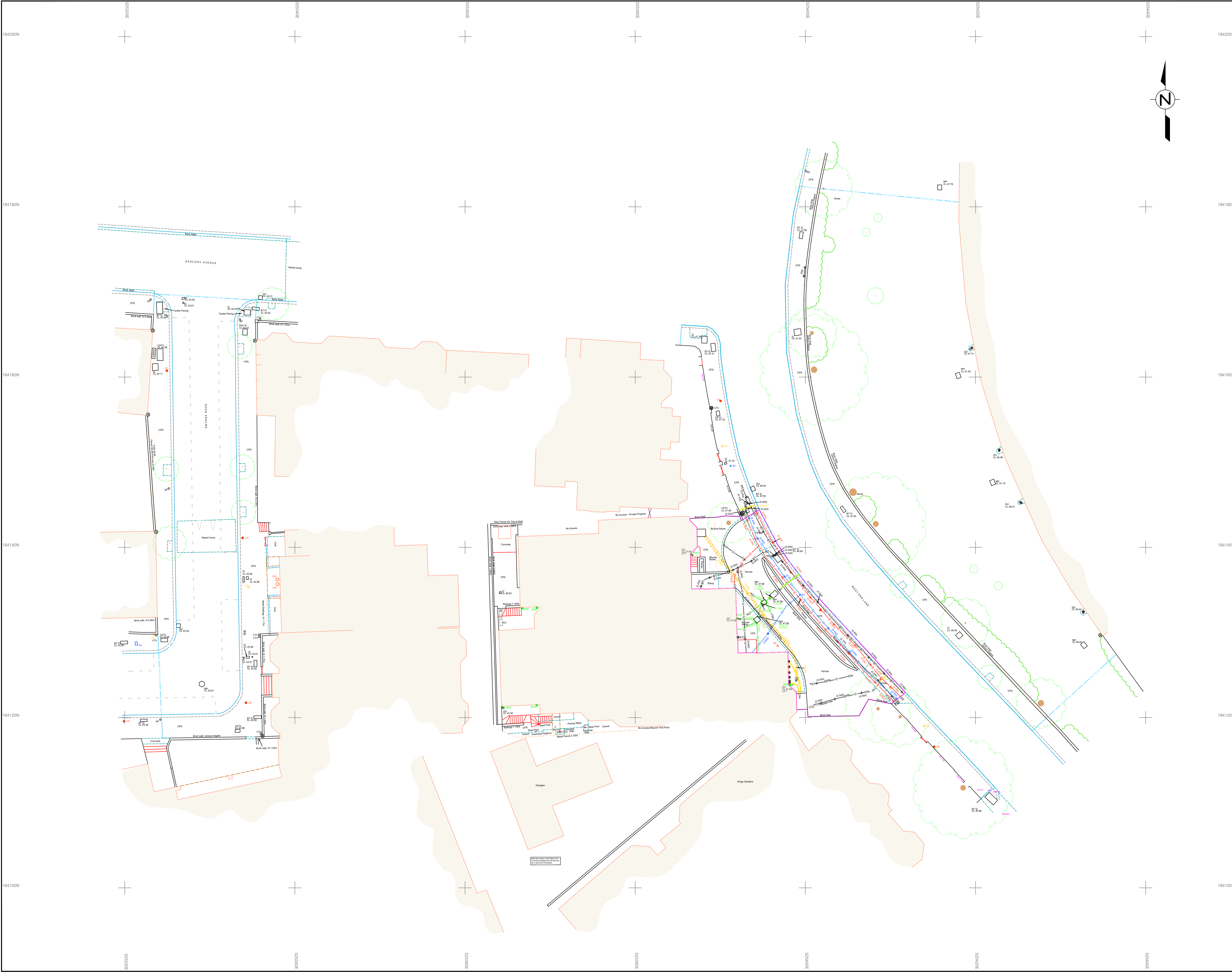
Subject	Conclusions
Tidal and Fluvial Flood Risk	The development is located in Flood Zone 1 – low probability for tidal and fluvial flooding on the Environment Agency flood maps.
Flood Risk from Other Sources	No flood risk to the site from overland flows, surface water, sewer, groundwater or artificial water bodies was identified. Due to the uncertain nature of groundwater flooding and the proposal of a basement further groundwater monitoring will be required.
Development Suitability	The development use is considered suitable for the site, which lies within Flood Zone 1 – low probability under Table 3 of the NPPF Planning Practice Guidance.
Existing Drainage	The existing local public sewer networks are owned and operated by Thames Water. There are no separate public Thames Water surface water or foul sewers in vicinity to the site, with their nearest infrastructure being a public combined sewer that is located immediately adjacent to the site within West End Lane. The site is currently positively drained. Presently surface water runoff and foul flows are discharged offsite into the adjacent public Thames Water combined sewer. Existing points of connection will need to be confirmed via onsite CCTV Survey.
Proposed Drainage	New surface and foul water sewer networks will be constructed to service the proposed development. Surface water flows will be discharged via a sustainable drainage solution. The preferred method is to discharge flows via infiltration methods, however, due to expected poor infiltration rates and available space within the site an attenuation solution is proposed. Foul flows will be discharged to the existing public combined sewer adjacent to the proposed site.
Surface Water Management	Due to the expected poor infiltration rate within the site it is proposed to discharge surface runoff from the site via an attenuation method. It is proposed to provide attenuation storage via an underground attenuation tank and flow restriction via an associated hydrobrake flow control device, with flows to be discharged offsite into the existing public Thames Water combined sewer via a new connection or possibly an existing connection pending CCTV survey results. The proposed attenuation tank has been sized to contain a 1 in 100 year plus 40% climate change event, whilst discharging offsite at a restricted rate 5l/s, which is considered the lowest practical discharge rate

	Thames Water have confirmed that there is sufficient capacity within the adjacent combined sewer to receive this restricted rate from the site. As the development is progressed further SUDS features may be incorporated such as permeable paving, which will provide further pollutant removal and flow restriction benefits. Onsite soakaway testing will be required to confirm the suitability of any infiltration techniques.
Foul Water Disposal	The development will increase foul loadings from the site, with the peak discharge rate being approximately 0.9l/s. Foul flows will be discharged to the existing adjacent public Thames Water combined sewer via a new connection or possibly an existing one pending CCTV Survey results. Thames Water have confirmed that there is sufficient capacity within their existing public combined sewer immediately adjacent to the site.

Appendix A: Site Location Plan


Messina Ave
B510
103 Camping Firewoods
61 Crickets Ink
Sploshy Water Surf'n
Gascony Ave N W
Gascony Ave N W
66 Dumpers Apartments
2 Moz's Smyrna
Smyrna Rd
Mazenod Ave
Kings Gardens
Acol Rd
Wavel Mews
Ruby's Holiday Residences
Lele Chef
B510
Acol Nurs

Appendix B: Topographical Survey



LEGEND

UTILITY LINETYPES

BT	British Telecom	G	Gas
CATV	Cable Television	HP	Heating Pipes
CCTV	Closed Circuit Television	HV	HV Cables
C	Communications	MSR	Multiple Services Route
DR	Drainage	OIL	Oil
CW	Drainage - Combined Water	OXY	Oxygen
FW	Drainage - Foul Water	SL	Street Lighting
SW	Drainage - Storm Water	TSL	Traffic Signal Loop
ED	Empty Duct	GPR— U	Unknown found by GPR
E	Electric	U	Unknown
FH	Fire Hydrant Main	UC	Unknown Cable
FO	Fibre Optic	UPL	Unknown Pipeline
FUEL	Fuel	W	Water

Assumed Service Route - See GENERAL NOTES (Using abbreviation of service and colour as above) ——ASR——XXX ——ASR——XXX ——

UTILITY SURVEY INFORMATION

AOC	Area of Concern	UTS	Unable to Survey
SVY AREA	Contracted Survey Area	UTL	Unable to Lift (cover)
PREVIOUS	Previous Survey Area	U	Unable to Trace
GPR Survey	Post processed GPR Area	B	Unable to Trace (due to blockage)
(O.60d)	Depth to Top of Service (m)	F	Unable to Trace Further
		E	End of Trace

ABREVIATIONS used on a PAS 128 Survey

(O.65d B2P) 0.65d = Depth in metres, B2 = Quality Level, P = Post processed GPR

TOPOGRAPHIC & UTILITY DETAILS

	Barrier (symbol - sized)		Pipe into Ground (symbol)
BB	Belisha Beacon (symbol)	PO	Post (symbol)
B	Bollard (symbol)	RWP	Rain Water Pipe (symbol)
	Borehole (symbol)	RS	Road Sign (symbol)
BTIC	British Telecoms IC (sized)	RE	Rodding Eye (symbol)
	Building (incomplete detail)	S	Sapling (symbol)
	Cable into Ground (symbol)	SP	Sign Post (symbol)
CTV	Cable TV Box (symbol)	SL	Spot Light (symbol)
	CCTV Camera (symbol)	50.00	Spot Height
CL 50.00	Cover Level in metres	SC	Stop Cock (symbol)
	Direction of Flow (Drainage)	SV	Stop Valve (symbol)
DB	Distribution Board (symbol)		Survey Station (symbol)
ER	Earth Rod (symbol)	TP	Telephone Pole (symbol)
EC	Electric Cabinet (sized)	B	Traffic Bollard (symbol)
EP	Electric Pole (symbol)	Dia: 0.3 Sp: 7.5 Ht: 10.2 Maple	Tree (dimensions in metres - e.g.) Diameter at 1mh: (bole) Spread: Height: Species:
ES	Electric Sign (symbol)		
Bottom / Top	Embankment Slope (symbol)		
FP	Feeder Pillar (sized)	TL	Traffic Light (symbol)
FH	Fire Hydrant (sized)	UV	Unknown Valve (symbol)
FP	Flag Pole (symbol)	VP	Vent Pipe (symbol)
FL	Flood Light (symbol)		Wall
GV	Gas Valve (symbol)	WP	Waste Pipe (symbol)
Single / Double	Gate	WM	Water Meter (symbol)
GL 50.00	Ground Level in metres	WV	Water Valve (symbol)
GU	Gulley (sized)		
IC	Inspection Cover (sized)		Building Canopy
IL 50.00	Invert Level in metres		Crash Barrier
JB BT	Junction Box - BT (sized)	Drainage Channel	Drainage Channel
JB COM	Junction Box - Comms (sized)	50.00	Drop Kerb (level in metres)
JB	Junction Box - Elec (sized)	50.00	Edge Detail (level in metres)
LP	Lamp Post (symbol)	50.00	Footpath (level in metres)
LB	Light Bollard (symbol)		Fence
LIG	Light in ground (symbol)	HERAS	Heras Fence
MH	Manhole (sized)	50.00	Kerb channel (m)
	Manhole Capped Port	50.00Tk	Kerb top (m)
PL 50.00	Parapet Level (m)	OHS	Overhead Service Line
Ø100	Pipe Diameter (mm)		Pedestrian Railing

GENERAL NOTES

Irrespective of the information provided by a utility survey and statutory plans, excavation work should be undertaken with extreme caution and in accordance with HSE Guidelines - HSG47 Avoiding Danger from Underground Services

Only sub-surface utility information is provided. Above ground utility information may be shown where it assists with positional referencing.

Utilities may continue outside of the survey area. Any paint marks outside of the area are for investigative purposes only and may not represent the full extent of the sub-surface utilities.

Where logic indicates a utility exists but which cannot be positively confirmed with the technology, an assumed route (ASR) is recorded. All assumed service routes (ASR) have been highlighted with a background yellow colour for visual enhancement.

Sewer and manhole details shown on this drawing have been obtained by observation and measurement from the surface and as such cannot be guaranteed

Vertical & Horizontal Position - Vertical position (depth) is indicative to the top of the utility/feature and is recorded as (x.xxd) i.e. (1.25d) - (depth to top of service) and should not be taken as exact, as this could be the surround to the service rather than the service itself. Where depth information from the technology is unclear, depth is not shown. Drains and pipes/ducts may have been detected using threading and the depth indicated could be between the top (soffit) and the bottom (invert). Horizontal position is indicative to the centre of the utility/feature and should not be taken as exact.

Warranty - Biodegradable paints are used to mark-out the position of the utilities. Markings may become illegible quickly depending on ground, weather and traffic conditions. No warranty is given in respect of the durability of the paint markings and that they are a complete representation of the sub-surface utilities, therefore, this drawing should be used as the primary reference for the survey results.

This drawing does not provide an absolute representation of the sub-surface. Utilities have been detected using non-invasive technologies only and the performance can be adversely affected by ground, weather and site conditions outside of SUMO's control, therefore, some utilities may be undetectable. While SUMO uses reasonable endeavours to detect all utilities, it does not warrant that 100% detection will be achieved and that approximate depth penetration of the technologies SUMO uses will not be greater than two metres.

SHEET LAYOUT

Rev	Notes	Drawn	Date

Notes:

Grid Origin and Level Datum are arbitrary.

Survey is referenced to OS Grid and Level Datum.

Grid Origin and Level Datum are referenced to Clients drawing "-------------" which has been inserted into this model for background reference.

Previous Sumo Survey "-------------" has been inserted into this model for reference.

SUMO Survey Services

SUMO SERVICES Ltd
8 HAYWARD BUSINESS CENTRE
NEW LANE
HAVANT
HAMPSHIRE
PO9 2NL
TEL: 0845 456 1104
www.sumoservices.com

Title: Utilities & Topographical Details

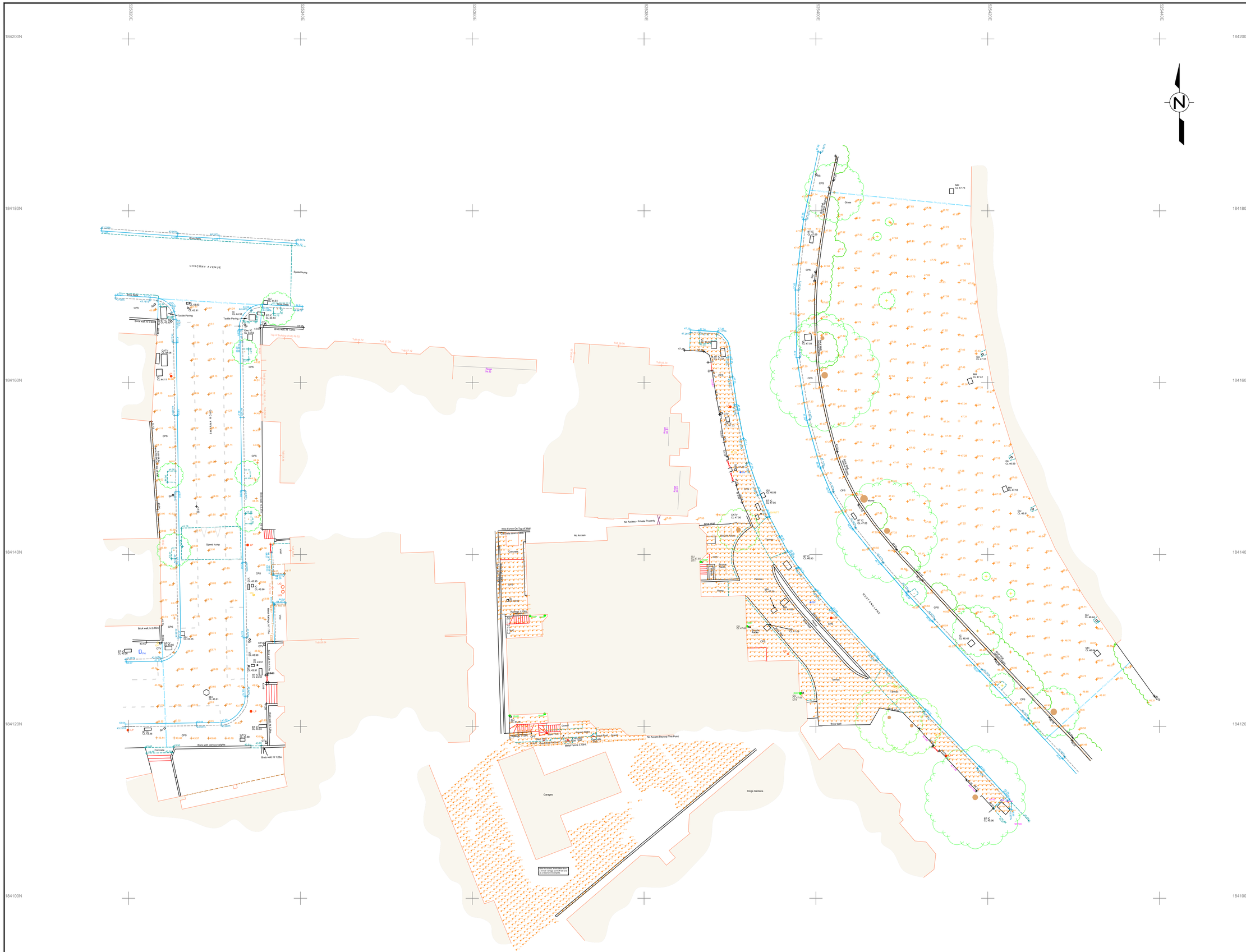
Client:

Project:

Date Completed:		Post Code:	

Surveyed:		Scale: 1/200 (A1 Sheet)
Drawn:		
Checked:		

Dwg No: Sheet 01	Job No:	Rev:



LEGEND

UTILITY LINETYPES

BT	British Telecom	Q	Gas
CATV	Cable Television	HP	Heating Pipes
CCTV	Closed Circuit Television	HV	HV Cables
C	Communications	MSR	Multiple Services Route
DR	Drainage	OIL	Oil
CW	Drainage - Combined Water	OXY	Oxygen
FW	Drainage - Foul Water	SL	Street Lighting
SW	Drainage - Storm Water	TSL	Traffic Signal Loop
ED	Empty Duct	GPR U	Unknown found by GPR
E	Electric	U	Unknown
FH	Fire Hydrant Main	UC	Unknown Cable
FO	Fibre Optic	UPL	Unknown Pipeline
FUEL	Fuel	W	Water

Assumed Service Route - See GENERAL NOTES (Using abbreviation of service and colour as above): ASR XXX ASR XXX

UTILITY SURVEY INFORMATION

AOC	Area of Concern	UTS	Unable to Survey
BWP AREA	Contracted Survey Area	UTL	Unable to Lift (cover)
PREVIOUS	Previous Survey Area		Unable to Trace
PPR Survey	Post processed GPR Area		Unable to Trace (due to blockage)
(O.60d)	Depth to Top of Service (m)		Unable to Trace Further
			End of Trace

ABREVIATIONS used on a PAS 128 Survey

(O.65d B2P) 0.65d = Depth in metres, B2 = Quality Level, P = Post processed GPR

TOPOGRAPHIC & UTILITY DETAILS

	Barrier (symbol - sized)		Pipe into Ground (symbol)
BB	Belisha Beacon (symbol)	CPO	Post (symbol)
B	Bollard (symbol)	RWP	Rain Water Pipe (symbol)
	Borehole (symbol)	RS	Road Sign (symbol)
BTIC	British Telecoms IC (sized)	RE	Rodding Eye (symbol)
	Building (incomplete detail)		Sapling (symbol)
	Cable into Ground (symbol)	SP	Sign Post (symbol)
CTV	Cable TV Box (symbol)	SL	Spot Light (symbol)
	CCTV Camera (symbol)	50.00 +	Spot Height
CL 50.00	Cover Level in metres	SC	Stop Cock (symbol)
	Direction of Flow (Drainage)	SV	Stop Valve (symbol)
DB	Distribution Board (symbol)		Survey Station (symbol)
ER	Earth Rod (symbol)	TP	Telephone Pole (symbol)
EC	Electric Cabinet (sized)	B	Traffic Bollard (symbol)
EP	Electric Pole (symbol)		Tree (dimensions in metres - e.g.)
ES	Electric Sign (symbol)		Diameter at 1mtr. (bole) Spread: Height: Species:
	Embankment Slope (symbol)	Sp: 3.5 Sp: 7.5 Ht: 10.2 Maple	
	Feeder Pillar (sized)	TL	Traffic Light (symbol)
FH	Fire Hydrant (sized)	UV	Unknown Valve (symbol)
FP	Flag Pole (symbol)	VP	Vent Pipe (symbol)
FL	Flood Light (symbol)		Wall
GV	Gas Valve (symbol)	WP	Waste Pipe (symbol)
	Gate	WM	Water Meter (symbol)
GL 50.00	Ground Level in metres	WV	Water Valve (symbol)
GU	Gulley (sized)		Building Canopy
IC	Inspection Cover (sized)		Crash Barrier
IL 50.00	Invert Level in metres		Drainage Channel
JB BT	Junction Box - BT (sized)		Drop Kerb (level in metres)
JB COM	Junction Box - Comms (sized)		Edge Detail (level in metres)
JB	Junction Box - Elec (sized)		Footpath (level in metres)
LP	Lamp Post (symbol)		Fence
LG	Light Bollard (symbol)		Heras Fence
	Light in ground (symbol)		Kerb channel (m)
MH	Manhole (sized)		Kerb top (m)
	Manhole Capped Port		Overhead Service Line
PL 50.00	Parapet Level (m)		Pedestrian Railing
100	Pipe Diameter (mm)		

GENERAL NOTES

Irrespective of the information provided by a utility survey and statutory plans, excavation work should be undertaken with extreme caution and in accordance with HSE Guidelines - HSG47 Avoiding Danger from Underground Services.

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This drawing does not provide an absolute representation of the sub-surface. Utilities have been detected using non-invasive technologies only and the performance can be adversely affected by ground, weather and site conditions outside of SUMO's control, therefore, some utilities may be undetectable. While SUMO uses reasonable endeavours to detect all utilities, it does not warrant that 100% detection will be achieved and that approximate depth penetration of the technologies SUMO uses will not be greater than two metres.

SHEET LAYOUT

Rev	Notes	Drawn	Date

Notes:

Survey is referenced to OS Grid and Level Datum.

SUMO SERVICES Ltd
8 HAYWARD BUSINESS CENTRE
NEW LANE
HAVANT
HAMPSHIRE
PO9 2NL
TEL: 0845 456 1104
www.sumoservices.com

Title: Utilities & Topographical Details

Client: Empiric Ltd

Project: Francis Gardner House

Date Completed:	13/12/2019	Post Code:	NW6 4SY
Surveyed:	MW, CE, MA	Scale:	1/200 (A1 Sheet)
Drawn:	PC, MA		
Checked:	MW		
Dwg No:	Sheet 01	Job No:	SOR16587
		Rev:	

Appendix C: Thames Water Asset Plans

Asset location search

Thames Water Property Searches

Jubb Consulting Engineers Limited
St James Court
St James Parade
BRISTOL
BS1 3LH

Search address supplied Springboard Urban 89-91
West End Lane
London
NW6 4SY

Your reference Francis Gardner House

Our reference ALS/ALS Standard/2019_4119864

Search date 2 December 2019

Keeping you up-to-date

Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0845 070 9148

searchcode

Asset location search

Property Searches

Search address supplied: Springboard Urban 89-91, West End Lane, London, NW6 4SY

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This searchprovides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an ‘as constructed’ record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

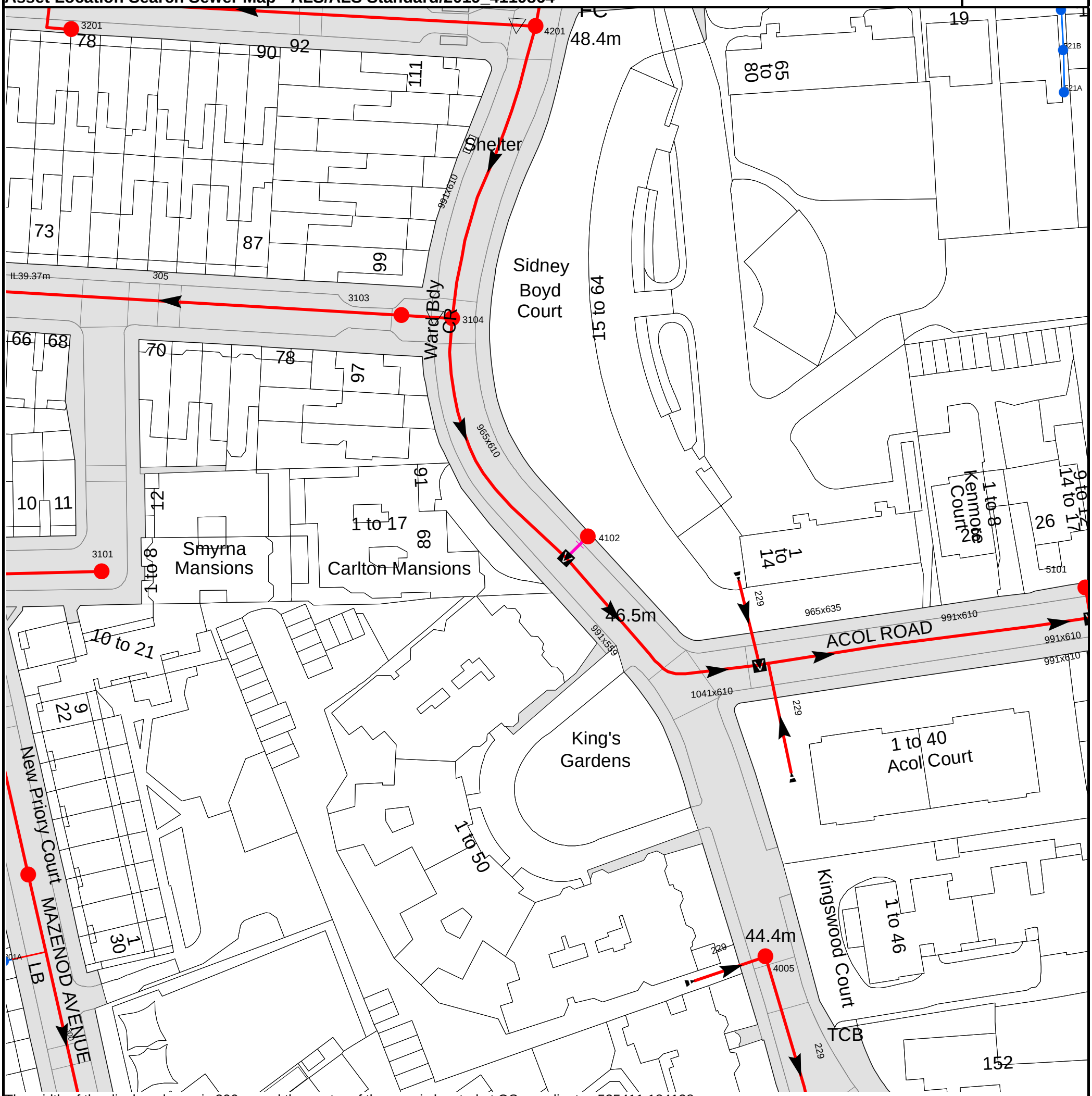
Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2019_4119864



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 525411,184128

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.

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
4102	n/a	n/a
4005	44.05	41.61
521C	n/a	n/a
521B	n/a	n/a
521A	n/a	n/a
5101	n/a	n/a
3002	43.07	38.56
3201	n/a	n/a
3101	43.6	40.02
3103	47.3	43.09
3104	47.46	42.55
4201	48.44	43.63

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

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

Gulley

Culverted Watercourse

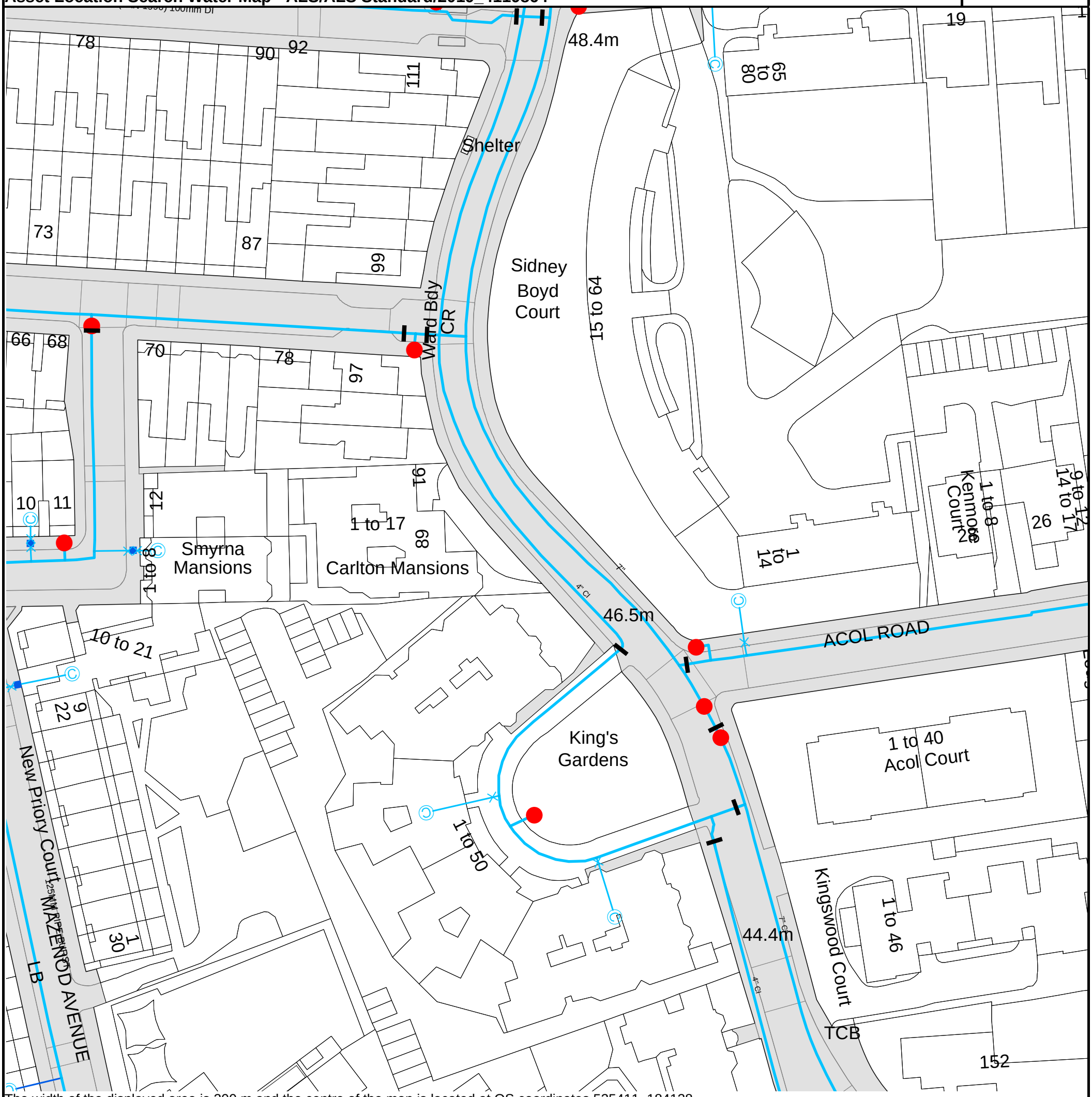
Proposed

Abandoned Sewer

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.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. 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.

Asset Location Search Water Map - ALS/ALS Standard/2019_4119864



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 525411, 184128.

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ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0845 070 9148** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if the Ombudsman finds that you have suffered actual loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

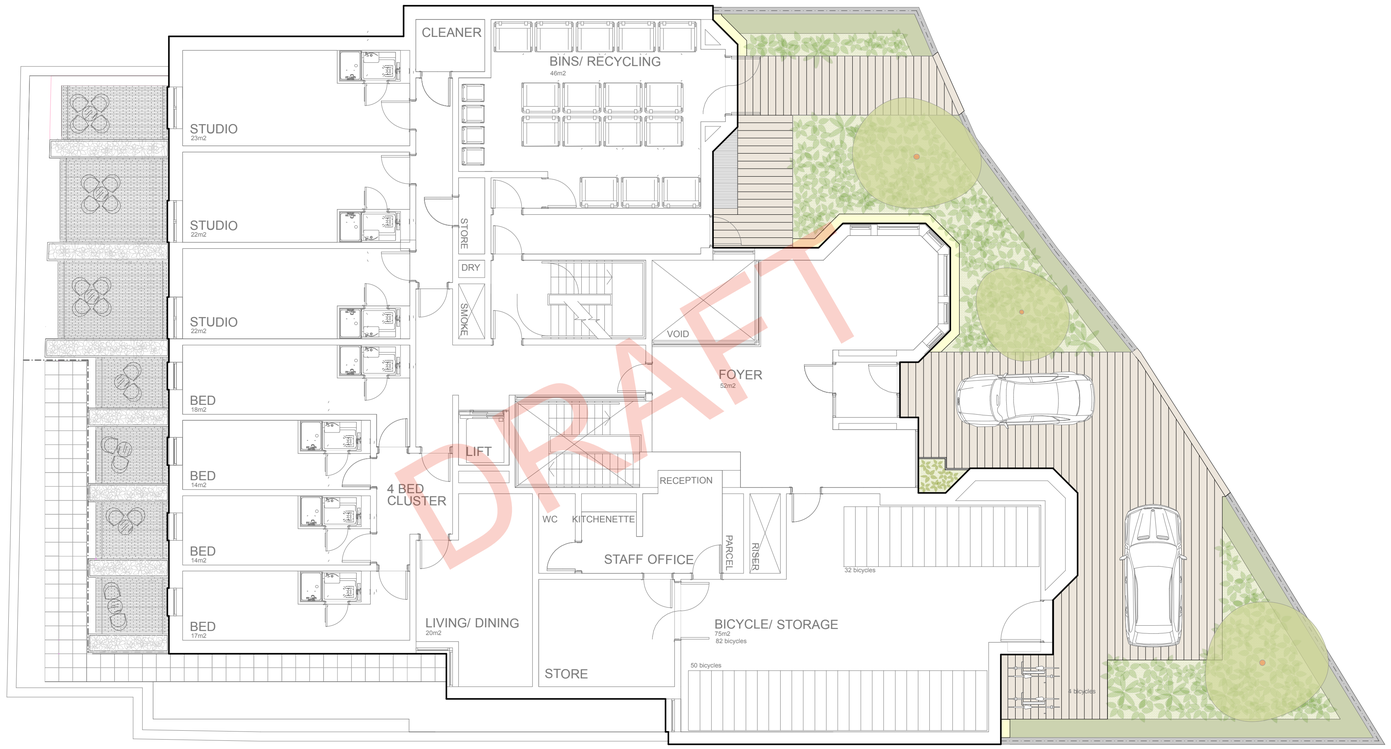
TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Web site: www.tpos.co.uk
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

Appendix D: Proposed Site Plan



NOTES

1. All dimensions in millimetres unless otherwise shown.
2. All levels in metres above Ordinance Datum (mAOD) unless otherwise shown.
3. All dimensions to be checked on site and any discrepancies reported to Employer before pricing / work starts.
4. Any ambiguities or discrepancies within this drawing and any other information given elsewhere must be reported to Camlins and the Employer for clarification before pricing work proceeds.
5. All drawings to be read in conjunction with other Camlins drawings and specification information as appropriate.
6. Refer to relevant Engineer's and Architect's information as appropriate for confirmation of all engineering and architectural details.
7. All works to be carried out in accordance with the latest British Standards and appropriate codes of practice as a minimum.

KEY

- Proposed Natural Stone Setts With Drainjoint
- Natural Stone Edge
- Proposed Railing
- Proposed Boundary Wall
- Proposed Trees
- Proposed Loose Gravel To Building Edge
- Proposed Clipped Evergreen Hedge
- Proposed Mixed Shrub Planting
- Cycle Stands

Rev.	Date	Description	Revised by	Checked by

Camlins
New Zealand House, Abbey Foregate,
Shrewsbury, Shropshire, SY2 6FD
01743 290 779
www.camlins.com

Francis Gardner House, London
Empiric Properties Limited

General Arrangement - Ground Floor Landscape Plan

Status	Drawn by	Checked by
Planning	AS	AN

Drawing Number	Revision	Scale	Date
SY617-100-0001	-	1:100@A1	03.02.2020

Appendix E: Thames Water Capacity Check

Miss Maddie Eaves

Jubb Consulting
Suite B, St James Court,
St Hames Parade,
Bristol,
BS1 3LH

Wastewater pre-planning
Our ref **DS6068325**

20 December 2019

Pre-planning enquiry: Capacity Confirmation

Dear Maddie,

Thank you for providing information on your development.

Site: Francis Gardner House, West End Lane, London - NW6 4SY

Existing site: Student Accommodation (Capacity-70 people).
Existing surface water flows at 5.2 l/s for 1:1yr, 11.4 l/s for 1:10yr, 17.0 l/s for 1:30 & 26.0 l/s for 1:100yr into combined sewer of 965x610mm.
Proposed site: Student Accommodation (Capacity-86 people).
Proposed foul water discharge by gravity into combined sewer of 965x610mm.
Proposed surface water discharge at 5.0 l/s for all storm events up to and including 1:100yr+40%CC into combined sewer of 965x610mm.
Proposed Impermeable area - 0.094ha.

We're pleased to confirm that there will be sufficient foul and surface water capacity in our sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you've any further questions, please contact me on 020 3577 7608.

Yours sincerely

Zaid Kazi

Adoptions Engineer
Developer Services – Sewer Adoptions Team

Appendix F: Microdrainage Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.094	Urban	0.000
SAAR (mm)	600	Region Number	Region 6

Results l/s

QBAR Rural	0.3
QBAR Urban	0.3
Q100 years	1.1
Q1 year	0.3
Q30 years	0.8
Q100 years	1.1

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.699	0.699	5.0	0.0	5.0	21.0	O K
30 min Summer	0.830	0.830	5.0	0.0	5.0	24.9	O K
60 min Summer	0.862	0.862	5.0	0.0	5.0	25.9	O K
120 min Summer	0.807	0.807	5.0	0.0	5.0	24.2	O K
180 min Summer	0.727	0.727	5.0	0.0	5.0	21.8	O K
240 min Summer	0.636	0.636	5.0	0.0	5.0	19.1	O K
360 min Summer	0.461	0.461	5.0	0.0	5.0	13.8	O K
480 min Summer	0.335	0.335	5.0	0.0	5.0	10.1	O K
600 min Summer	0.248	0.248	4.9	0.0	4.9	7.4	O K
720 min Summer	0.189	0.189	4.8	0.0	4.8	5.7	O K
960 min Summer	0.128	0.128	4.4	0.0	4.4	3.8	O K
1440 min Summer	0.094	0.094	3.3	0.0	3.3	2.8	O K
2160 min Summer	0.075	0.075	2.4	0.0	2.4	2.2	O K
2880 min Summer	0.064	0.064	1.9	0.0	1.9	1.9	O K
4320 min Summer	0.053	0.053	1.4	0.0	1.4	1.6	O K
5760 min Summer	0.046	0.046	1.1	0.0	1.1	1.4	O K
7200 min Summer	0.042	0.042	0.9	0.0	0.9	1.2	O K
8640 min Summer	0.038	0.038	0.8	0.0	0.8	1.1	O K
10080 min Summer	0.036	0.036	0.7	0.0	0.7	1.1	O K
15 min Winter	0.793	0.793	5.0	0.0	5.0	23.8	O K
30 min Winter	0.948	0.948	5.0	0.0	5.0	28.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	149.695	0.0	24.4	0.0	17
30 min Summer	96.881	0.0	31.6	0.0	31
60 min Summer	59.609	0.0	38.9	0.0	52
120 min Summer	35.406	0.0	46.2	0.0	84
180 min Summer	25.760	0.0	50.4	0.0	120
240 min Summer	20.438	0.0	53.3	0.0	154
360 min Summer	14.757	0.0	57.8	0.0	214
480 min Summer	11.701	0.0	61.1	0.0	272
600 min Summer	9.767	0.0	63.7	0.0	328
720 min Summer	8.423	0.0	65.9	0.0	384
960 min Summer	6.664	0.0	69.6	0.0	492
1440 min Summer	4.783	0.0	74.9	0.0	734
2160 min Summer	3.429	0.0	80.5	0.0	1100
2880 min Summer	2.705	0.0	84.7	0.0	1448
4320 min Summer	1.934	0.0	90.8	0.0	2152
5760 min Summer	1.523	0.0	95.4	0.0	2896
7200 min Summer	1.265	0.0	99.0	0.0	3648
8640 min Summer	1.087	0.0	102.1	0.0	4296
10080 min Summer	0.955	0.0	104.7	0.0	5032
15 min Winter	149.695	0.0	27.3	0.0	17
30 min Winter	96.881	0.0	35.4	0.0	31

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
60 min Winter	0.994	0.994	5.0	0.0	5.0	29.8	O K
120 min Winter	0.916	0.916	5.0	0.0	5.0	27.5	O K
180 min Winter	0.799	0.799	5.0	0.0	5.0	24.0	O K
240 min Winter	0.669	0.669	5.0	0.0	5.0	20.1	O K
360 min Winter	0.401	0.401	5.0	0.0	5.0	12.0	O K
480 min Winter	0.239	0.239	4.9	0.0	4.9	7.2	O K
600 min Winter	0.154	0.154	4.6	0.0	4.6	4.6	O K
720 min Winter	0.119	0.119	4.2	0.0	4.2	3.6	O K
960 min Winter	0.096	0.096	3.4	0.0	3.4	2.9	O K
1440 min Winter	0.075	0.075	2.4	0.0	2.4	2.2	O K
2160 min Winter	0.061	0.061	1.8	0.0	1.8	1.8	O K
2880 min Winter	0.053	0.053	1.4	0.0	1.4	1.6	O K
4320 min Winter	0.044	0.044	1.0	0.0	1.0	1.3	O K
5760 min Winter	0.039	0.039	0.8	0.0	0.8	1.2	O K
7200 min Winter	0.035	0.035	0.7	0.0	0.7	1.1	O K
8640 min Winter	0.032	0.032	0.6	0.0	0.6	1.0	O K
10080 min Winter	0.030	0.030	0.5	0.0	0.5	0.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
60 min Winter	59.609	0.0	43.5	0.0	56
120 min Winter	35.406	0.0	51.7	0.0	92
180 min Winter	25.760	0.0	56.5	0.0	130
240 min Winter	20.438	0.0	59.7	0.0	168
360 min Winter	14.757	0.0	64.7	0.0	224
480 min Winter	11.701	0.0	68.4	0.0	278
600 min Winter	9.767	0.0	71.4	0.0	326
720 min Winter	8.423	0.0	73.8	0.0	376
960 min Winter	6.664	0.0	77.9	0.0	490
1440 min Winter	4.783	0.0	83.9	0.0	736
2160 min Winter	3.429	0.0	90.2	0.0	1100
2880 min Winter	2.705	0.0	94.9	0.0	1464
4320 min Winter	1.934	0.0	101.8	0.0	2168
5760 min Winter	1.523	0.0	106.9	0.0	2912
7200 min Winter	1.265	0.0	110.9	0.0	3656
8640 min Winter	1.087	0.0	114.3	0.0	4296
10080 min Winter	0.955	0.0	117.3	0.0	5008

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	21.000	Shortest Storm (mins)	15
Ratio R	0.432	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.087

Time (mins) From:	To:	Area (ha)
0	4	0.087

Model Details

Storage is Online Cover Level (m) 3.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	30.0	1.400	0.0	2.800	0.0	4.200	0.0
0.200	30.0	1.600	0.0	3.000	0.0	4.400	0.0
0.400	30.0	1.800	0.0	3.200	0.0	4.600	0.0
0.600	30.0	2.000	0.0	3.400	0.0	4.800	0.0
0.800	30.0	2.200	0.0	3.600	0.0	5.000	0.0
1.000	30.0	2.400	0.0	3.800	0.0		
1.200	0.0	2.600	0.0	4.000	0.0		

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	105
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0
Flush-Flo™	0.296	5.0
Kick-Flo®	0.637	4.1
Mean Flow over Head Range	-	4.3

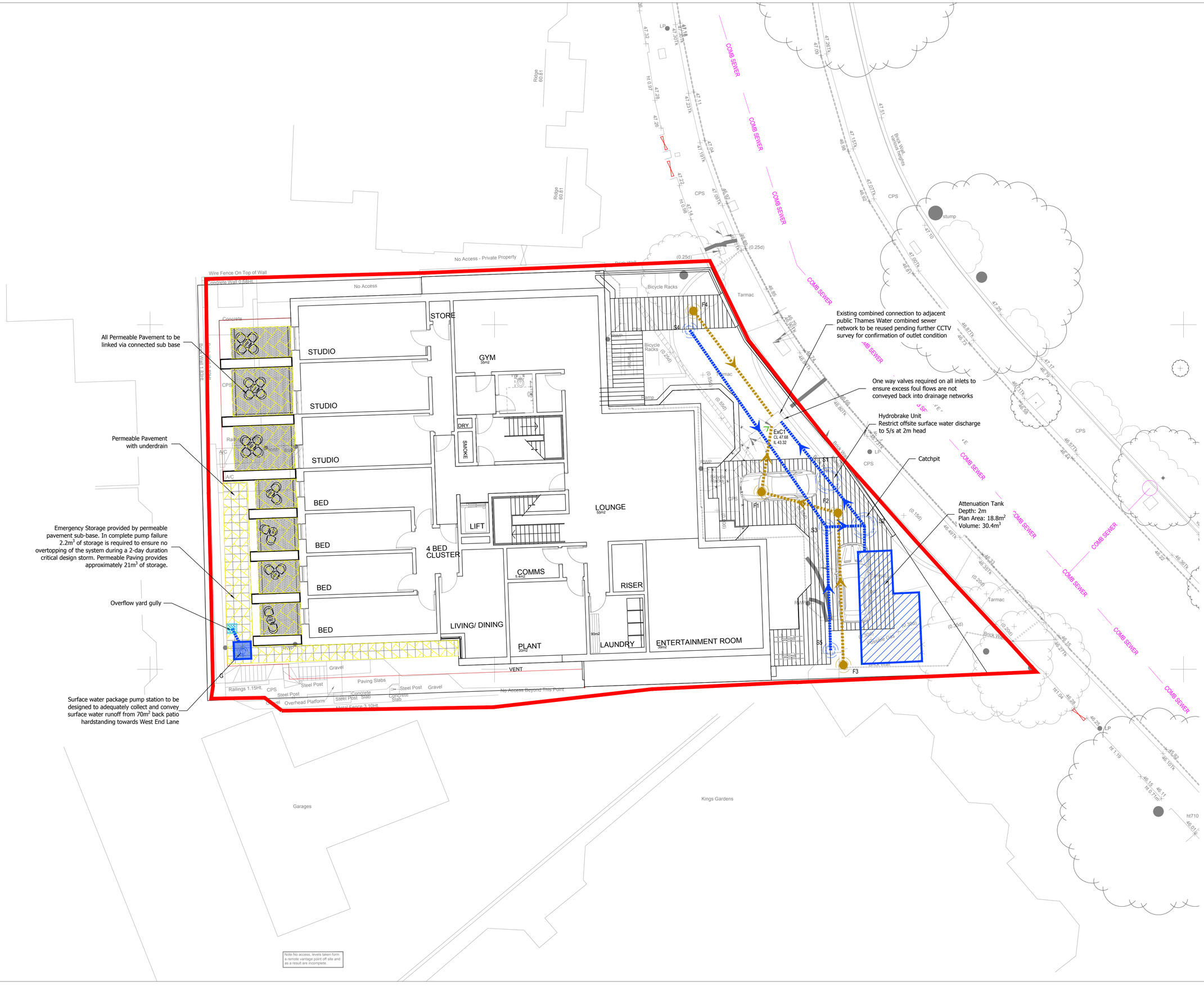
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.4	3.000	8.4	7.000	12.5
0.200	4.8	1.400	5.8	3.500	9.0	7.500	12.9
0.300	5.0	1.600	6.2	4.000	9.6	8.000	13.3
0.400	4.9	1.800	6.6	4.500	10.1	8.500	13.7
0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.1
0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.5
0.800	4.5	2.400	7.5	6.000	11.6		
1.000	5.0	2.600	7.8	6.500	12.1		

Weir Overflow Control

Discharge Coef 0.544 Width (m) 5.000 Invert Level (m) 3.000

Appendix G Proposed Drainage Strategy



Notes:

1. Existing public Thames Water drainage positions taken from a combination of topographical survey information and Thames Water asset plans and are therefore indicatively placed. Contractor to confirm downstream connection positions and levels prior to commencement.
2. All existing on site drainage to be identified and either abandoned or removed from site.
3. Drainage to be constructed in accordance with Sewers for Adoption 7th Edition and Building Regulations Part H.
4. RWP and SVP locations to be provided and confirmed by Architect.
5. Contractor to submit a Section 106 application to connect proposed on site drainage infrastructure to the public Thames Water network.
6. Surface water runoff to be attenuated to 5l/s as agreed by Thames Water (refer to pre planning enquiry reference DS6068325). Allowable discharge rate will also be required to be confirmed by the LLFA.
7. Hydrobrake proposed as flow control, to be installed in accordance with manufacturer's guidance. Using an alternative flow control may result in additional attenuation storage being required.
8. Attenuation Tank associated with flow control devices to be cellular structures, Polystorm or similar approved.
9. Chambers to be 450mm PPIC Type 3 or Type 4 chambers with the exception of the catch pit which shall be 1200mm diameter concrete rings, Type 2 chambers.
10. Sewers to be PVC Class SN8 with Class S Granular Bed and Surround where depth to cover is greater than 1.2m in vehicular areas or 0.9m in pedestrian areas. Bed and surround to be Class Z concrete elsewhere.

Rev	Date	Description	By	Apvd
P4	07.02.20	Updated Layout	MB	DG
P3	13.01.19	Existing Outlet Utilised	MB	DG
P2	10.12.19	Received TW asset plan	MB	DG
P1	30.11.19	Preliminary issue	MB	DG

PROJECT:
FRANCIS GARDNER HOUSE

TITLE:
PROPOSED DRAINAGE STRATEGY

CLIENT:
QUANTEM CONSULTING

SCALE@A1:
1:100

PROJECT REF:
19366

DRAWING No: 500

REV: P4

Revision Referencing
P = Preliminary A = Approval T = Tender C = Construction

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