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Project:	**Phase 1 Flood Risk Assessment (FRA)**
Prepared for:	Metis Projects / St Pauls School
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Project: Phase 1 Flood Risk Assessment

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Reference: 4297

Site Location: St Paul's School, Lonsdale Road, London, SW13 9JT

Proposed Development: Construction of staff accommodation block

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Contents

1. Summary

1.1 Ambiental have been appointed by St Pauls School to produce a Flood Risk Assessment for the construction of a staff residential block – Block A. Ambiental have been previously appointed in supporting the school. Ambiental therefore have amended the previous provided National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) for a s73 application for the ongoing redevelopment of St Paul's School, Lonsdale Road, Barnes, London, SW13 9JT.

1.2 It is understood that the client is submitting an amended application for the construction of a staff residential block at Block A. Ambiental are required to amend the FRA in light of the amended plans.

1.3 It is understood that the EA had no objections to the previous application to vary conditions across the wider site, subject to conditions (LBRuT Ref 17/4358/VRC; EA Ref SL/2018/117999/01-L01). One of the conditions was focused to the proposed staff accommodation block:

"Flood resistance and resilient measures highlighted in section 1.9 (e) should be fully implemented into the proposed staff accommodation blocks".

1.4 This relates to the mitigation measures proposed in the previous FRA. The client has amended the plans for Block A and therefore this FRA will re-assess the proposed development in light of these plans, and update mitigation measures if required. The previously approved mitigation for Block A involved setting the perimeter retaining wall at a height of 5.47mAOD (2100 breach flood level for this location).

1.5 The previously approved scheme proposed an upper ground floor level of 6.22mAOD. The EA since these mitigation measures were proposed now accept that mitigation is only required to the 2100 breach flood level (5.47mAOD). This proposal therefore now seeks to lower the upper ground floor to 5.47mAOD. The lower ground floor is also being lowered to 2.245mAOD. However, the perimeter wall is to be retained at 5.47mAOD, thus keeping the mitigation in place to protect the basement accommodation.

1.6 The proposed perimeter wall should be enclosed around the entire Block A development. Any thresholds should be a step up/ step down mechanism with minimum thresholds of 5.47mAOD.

1.7 Aa part of a historic planning condition (U23171) FFLs for the staff accommodation blocks were required to be 5.735mAOD. It is unclear where this level originated from. However, correspondence with the EA in 2017 indicated that FFLs could be set at the breach level as a from of mitigation against this residual risk. As such, it is understood that as part of the s73 application the developer is seeking to amend the previous condition of setting FFLs at 5.735mAOD to a lower elevation of 5.47mAOD in line with the most recent guidance provided by the EA.

1.8 As such, and given that:

a) planning permission was previously granted for a similar scheme;

b) the site has been shown to be **defended to the 1:1000 year standard**, and will remain so until at least 2100;

c) the proposal seeks only to lower the proposed upper and lower ground floors compared to the approved scheme;

d) the proposed upper ground floor and retaining wall will be set at the 2100 breach flood level (5.47mAOD);

e) appropriate mitigation can be implemented at the proposed staff accommodation blocks at the south of the site to manage the residual risk of breach flooding;

f) betterment can be provided by the formalisation of a **flood warning and evacuation plan**

following the guidelines contained within the NPPF, the proposed development could be considered assuming appropriate mitigation (including adequate warning procedures) can be maintained for the temporary lifetime of the development.

Development Description	Existing	Proposed
Development Type:	School complex	Construction of staff accommodation block (Block A)
(Number of Bedrooms):	N/A[2]	N/A[2]
EA Vulnerability Classification:	More and Less Vulnerable	No Change
Ground Level:	Approximately between 3.53mAOD and 6.93mAOD across whole site	LGF to be set at 2.245mAOD, UGF to be set at 5.47mAOD.
Level of Sleeping Accommodation:	N/A[2]	LGF (2.245mAOD) and above
Impermeable Surface Area:	N/A[2]	N/A[2]
Surface Water Drainage:	Run-off from the site discharges directly into the River Thames via attenuation tanks beneath the Bowl Car Park	Attenuate to London Plan
Site Size:	N/A[2]	No change
Risk to Development	**Summary**	**Comment**
EA Flood Zone:	Flood Zone 3	
Flood Source:	Tidal	River Thames
Present day extreme water level	5.04mAOD; 5.03mAOD	Node Point 2.18 and 2.19 respectively, from Thames Estuary 2100 study completed by HR Wallingford in 2008.
2065 to 2100 Design water level	5.50mAOD; 5.49mAOD	
From 2100 Design water level	5.94mAOD; 5.93mAOD	
Recorded Flood Events in Area:	Yes	January 1928
Recorded Flood Events at Site:	No	Site outside January 1928 flood extent.
SFRA Available:	Yes	London Borough of Richmond Strategic Flood Risk Assessment Update (2016) and Surface Water Management Plan (June 2011)
Management Measures	**Summary**	**Comment**
Ground floor level above extreme flood levels:	Yes	UGF set to 5.47mAOD (2100 breach flood level). LGF to be set to 2.245mAOD, however retaining wall set to 5.47mAOD as previously approved by EA
Safe Access/Egress Route:	Yes	Safe access away from the source of flooding
Flood Resilient Design:	Yes	Section 8 of this FRA
Site Drainage Plan:	Run-off from the site discharges directly into the River Thames via attenuation tanks beneath the Bowl Car Park	It is recommended that the developer attenuate runoff and net volume in accordance with the London Plan drainage policy
Flood Warning & Evacuation Plan:	Yes	Formal evacuation plan should be reviewed in line with recent EA breach data.
Offsite Impacts	**Summary**	**Comment**
Displacement of floodwater:	N/A[1]	Site lies in area of tidal flood risk
Increase in surface run-off generation:	Yes	Attenuate to London Plan
Impact on hydraulic performance of channels:	None	Does not affect channel

Table 1: Summary of flood risks, impacts and proposed flood mitigation measures.

N/A[1] not required for this assessment; *N/A[2]* data not available.

2. Development Description and Site Area

Proposed Development and Location

2.1 The proposed development site is located at St Paul's School, 82 Lonsdale Road (Block A), Barnes, London, SW13 9JT (*Figure 1*). Block A is highlighted in Figure 1.

2.2 The wider site consists of several school buildings, educational facilities and associated sports fields/ facilities.

2.3 It is understood that the client is submitting an amended application for the construction of a staff residential block at Block A. Ambiental are required to amend the FRA in light of the amended plans.

2.4 The previously approved scheme proposed an upper ground floor level of 6.22mAOD. Given that the EA accepted that mitigation was only required to the 2100 breach flood level, the proposal now seeks to lower the upper ground floor to 5.47mAOD. The lower ground floor is also being lowered to 2.245mAOD. However, the perimeter wall is to be retained at 5.47mAOD, thus keeping the mitigation in place to protect the basement accommodation.

2.5 Aa part of a historic planning condition (U23171) FFLs for the staff accommodation blocks were required to be 5.735mAOD. It is unclear where this level originated from. However, correspondence with the EA in 2017 indicated that FFLs could be set at the breach level as a from of mitigation against this residual risk. As such, it is understood that as part of the s73 application the developer is seeking to amend the previous condition of setting FFLs at 5.735mAOD to a lower elevation of 5.47mAOD in line with the most recent guidance provided by the EA.

2.6 The nearest watercourse to the site is the River Thames, which abuts the curved northern boundary of the St Pauls School site. The River Thames is classified as an EA main river.

2.7 Topographic levels across the site vary approximately between 3.53mAOD and 6.93mAOD (*Source: 2m LiDAR*). The topographic levels at the centre of the site, where the new school buildings are to be located, are approximately between 4.88mAOD and 6.93mAOD.

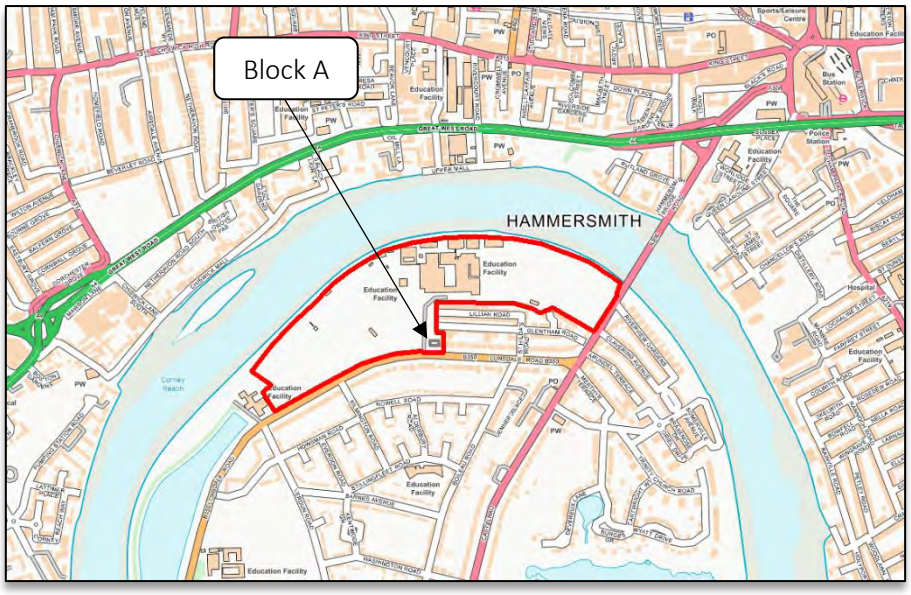

Figure 1: Site Location Map-Site outlined in red (Source: OS)

Vulnerability Classification

2.9 Block A is to be located in Flood Zone 3 according to the EA Flood Map for Planning, in an area benefitting from the presence of defences (Figure 2).

2.10 The proposed staff accommodation would be considered "More Vulnerable" under the NPPF.

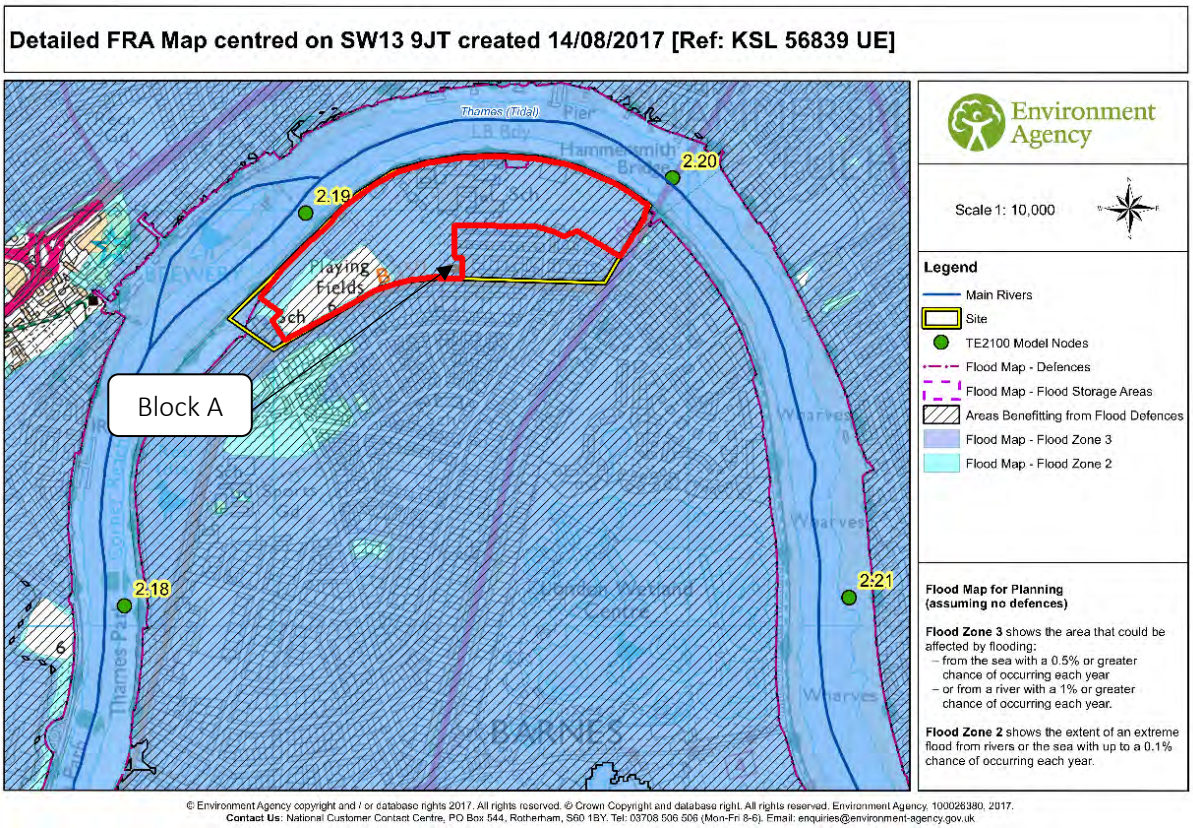

Figure 2: EA Flood Map for Planning (Source: EA)

Geology

2.11 According to the British Geological Survey (BGS) the bedrock of the site is of the London Clay Formation, comprising of clay and silt. The superficial geology has been identified as Alluvium formed of clay, silt, peat and sand.

3. Sequential Test/Exception Test

3.1 Under the NPPF, all new planning applications should undergo a *Sequential Test*. This test should be implemented by local planning authorities with a view to locating particularly vulnerable new developments (e.g. residential, hospitals, mobile homes etc.) outside of the floodplain. The test refers to the EA Flood Zones described in Table 2. For reference, the NPPF *Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table* is reproduced below.

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	×	Exception Test Required	✓
	Zone 3b *Functional Floodplain*	Exception Test Required	✓	×	×	×

Table 2: The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF. Shaded cells denote the proposed re-development. Please note: ✓ means development is appropriate; × means the development should not be permitted.

3.2 Using the principles of the Sequential Test outlined above, the proposed development is "More Vulnerable". The site is located within Flood Zone 3 (as defined by the EA) and as such, under the NPPF, this development requires the implementation of the Exception Test.

For the Exception Test to be passed, the proposed development must meet the following criteria:

- it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh the flood risk, as informed by a Strategic Flood Risk Assessment;
- a Flood Risk Assessment demonstrates that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

(*Source: the NPPF)*

3.3 As such, and in order to address these requirements, the planning application is required to be accompanied by a FRA which shows that the development can be achieved in a sustainable manner, with an overall reduction to flood risk to the site and surrounding area.

3.4 The EA have previously approved a similar scheme on site. The proposal now seeks to lower than upper and lower ground floors compared to the approved scheme. The crest level of the proposed perimeter retaining wall will remain at a height of 5.47mAOD (2100 breach flood level) which should provide protection to the basement level. Previous meetings with the EA for the

redevelopment of the wider site has indicated that as defence breach is a residual risk, mitigation is only required to the breach flood level. No freeboard is typically required.

3.5 Given that the proposed perimeter wall will be set to the 2100 defence breach flood level (5.47mAOD), it could be considered that the proposal would be safe for its lifetime.

4. Site Flood Hazards

Sources of Flooding

4.1 As outlined in Figure 2, the proposed development is located within Flood Zone 3 (High Risk of flooding) and is considered to be "More Vulnerable" under the NPPF. Communication with the Environment Agency (EA) has identified the following potential sources of flooding to the site:

Source	Description
Tidal	River Thames
Surface	On site
Groundwater	On site
Sewer	Local sewer network

Table 3: Summary of flood sources.

Mechanisms and History of Flooding

4.2 According to the low detail, national-scale flood mapping created on behalf of the EA the proposed development is located within Flood Zone 3 of the tidal flood plains of the River Thames.

4.3 Figure 2 outlines only the potential floodplain; and the mitigating effects of flood defences currently in place are not considered. The site benefits from flood defences (including the Thames Barrier) which act to protect to the 1:1000 year standard.

Tidal

4.4 The EA Flood Map for Planning (*Figure 2*) confirms that the site lies within Flood Zone 3 (High Risk), with a greater than 0.5% annual chance of tidal flooding from the River Thames.

4.5 The nearest watercourse to the site is the River Thames, which abuts the curved northern boundary of the wider St Paul's School site. The River Thames is located approximately 260m north of Block A at its closest proximity. The River Thames is classified as an EA main river.

4.6 The EA data has shown that the site is currently protected by defences to the 1:1000 year standard and would remain so, up to at least the year 2100.

4.7 The EA has provided extreme modelled flood levels from the Thames Estuary 2100 study (*Table 4*). Modelled flood levels upstream of the Thames Barrier are the highest levels permitted by the Thames Barrier.

4.8 The EA provided modelled flood data for several in-channel nodes along the River Thames as it passes the site (*Figure 2*).

4.9 The EA has identified node 2.19 to be closest, and therefore most representative of flood risk to the site. However, best practice for flood risk requires the assessment to analyse the closest **upstream** node to the site. As such, extreme modelled flood levels from both Node 2.18 and Node 2.19 have been used for this assessment.

Node 2.18	Present Day (2008) (Extreme)		2065 – 2100	From 2100
Water Design Level (mAOD)	5.04mAOD		5.50mAOD	5.94mAOD
Defence Level (mAOD)	Left Defence	Right Defence	6.25mAOD	6.70mAOD
	5.54mAOD	5.94mAOD		
Node 2.19	**Present Day (2008) (Extreme)**		**2065 – 2100**	**From 2100**
Water Design Level (mAOD)	5.03mAOD		5.49mAOD	5.93mAOD
Defence Level (mAOD)	Left Defence	Right Defence	5.95mAOD	6.40mAOD
	5.54mAOD	5.94mAOD		

Table 4: Modelled extreme water level data from Nodes 2.18 and 2.19 (Source: EA)

4.10 Detailed modelling available at Node 2.18 has revealed an extreme water level for the present day (as of 2008) of 5.04mAOD, a 2065 to 2100 design water level of 5.50mAOD and a 2100 design water level of 5.94mAOD, as demonstrated in Table 4.

4.11 Detailed modelling available at Node 2.19 has revealed an extreme water level for the present day (as of 2008) of 5.03mAOD, a 2065 to 2100 design water level of 5.49mAOD and a 2100 design water level of 5.93mAOD, as demonstrated in Table 4.

4.12 As such, Node 2.18 provides marginally greater flood levels (0.01m greater for each epoch) and will be used for the remainder of this assessment.

4.13 Data provided by the Environment Agency has shown defence levels of 5.54mAOD and 5.94mAOD (left and right defences, respectively) for the present day, and will provide defence levels of 5.95mAOD for 2065 to 2100 and 6.40mAOD from 2100 at Node 2.19.

4.14 At Node 2.18, the EA has provided defences levels of 5.54mAOD and 5.94mAOD (left and right defences, respectively) for the present day, 6.25mAOD for 2065 to 2100 and 6.70mAOD from 2100.

4.15 Therefore, when compared with the modelled flood levels, **it would appear that the site will be defended against tidal flooding to the 1:1000 year standard of protection until at least the year 2100.**

4.16 It is important to note that tidal flooding is generally caused by low pressure weather systems creating storm-surges (or storm tides), chiefly via high speed winds. These winds (and to a certain extent, the low pressure) create a 'bulge' of water which, if it coincides with high tide, can generate very high, stormy, water levels. However, because this mechanism is well understood, it is very likely that an early warning will be issued before such an event strikes. As such, it is very unlikely that the site would be subject to tidal flooding without several hours of early warning.

4.17 Given the site has been shown to benefit from flood defences which provide a 1:1000 year standard of protection and will remain as such up to at least 2100, the risk of flooding from tidal sources could be deemed **relatively low.**

Surface Water (Pluvial)

4.18 The EA online Risk from Surface Water Flooding Map indicates that Block A would be located within an area with a "Very Low" risk of flooding from surface water (*Figure 3*).

4.19 The EA Online Surface Water Flood Depth Map for a High risk scenario demonstrates that Block A would remain unaffected for this event.

4.20 The EA Online Surface Water Flood Depth Map for a Medium risk scenario (*Figure 4*) demonstrates that Block A would remain unaffected for this event (between 1% and 3% annual chance of occurring).

4.21 The EA Online Surface Water Flood Depth Map for a Low risk scenario (*Figure 5*) demonstrates that Block A would remain unaffected for this event (between 1% and 0.1% annual chance of occurring).

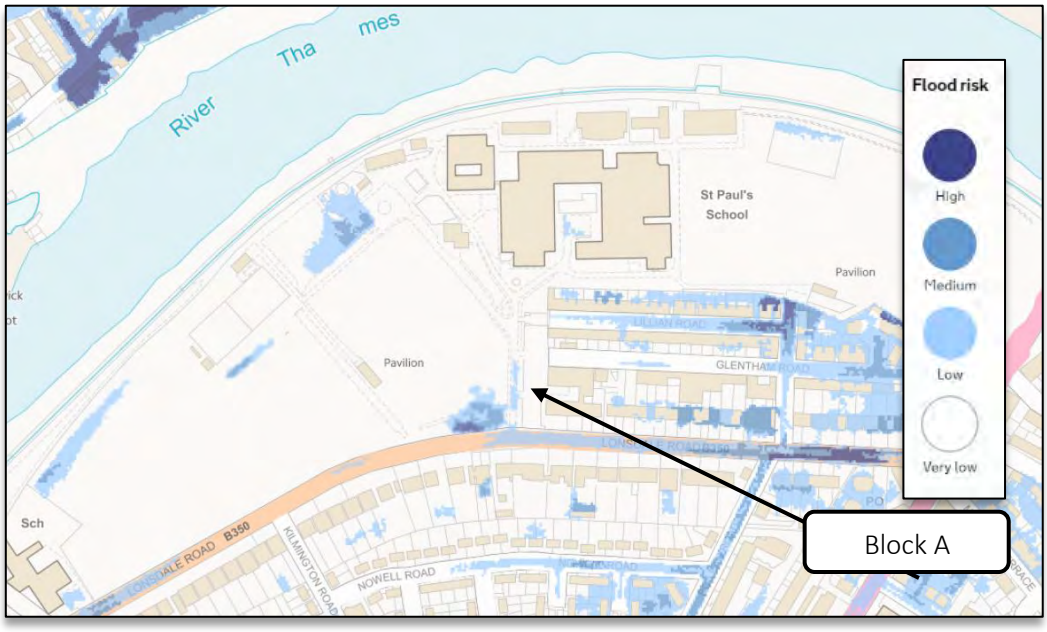

Figure 3: EA Online Surface Water Flood Risk Map (Source: EA Online)

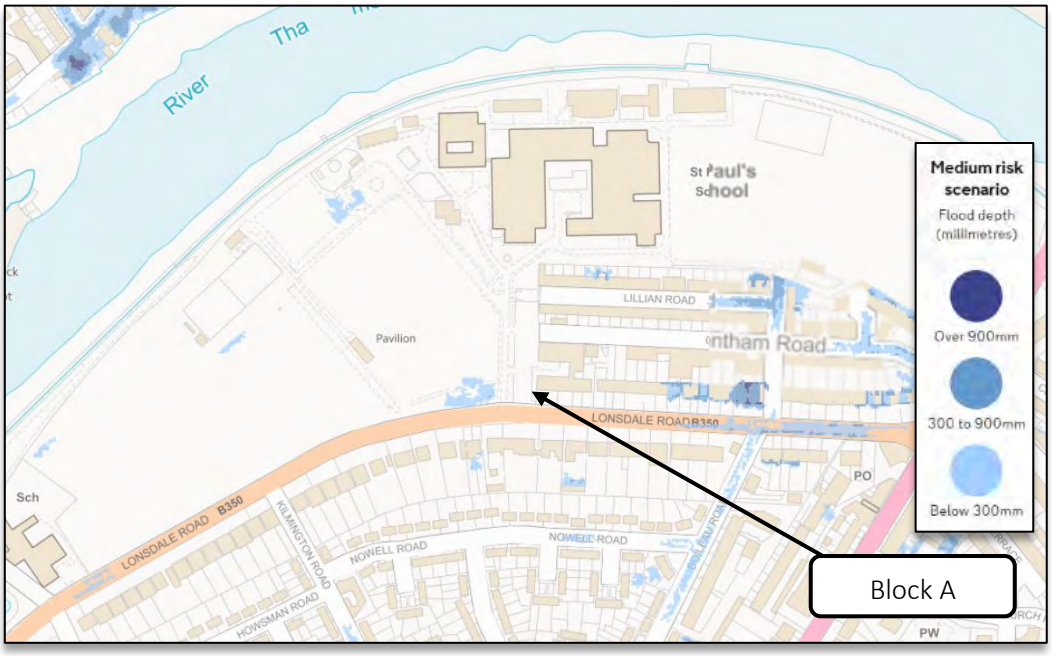

Figure 4: EA Online Surface Water Flood Depth Map; Medium risk scenario (Source: EA Online)

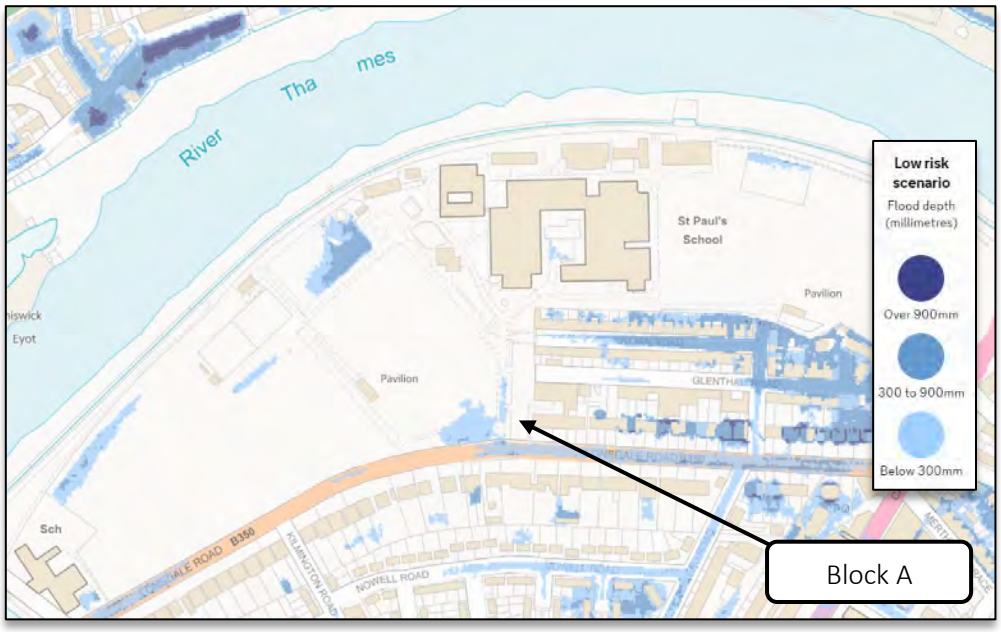

Figure 5: EA Online Surface Water Flood Depth Map; Low risk scenario (Source: EA Online)

4.22 The London Borough of Richmond Surface Water Management Plan 'Surface Water Flooding Incidents and Surface Water Depth (m) 1 in 100 Chance of Rainfall Event Occurring in Any Given Year' Map (*Figure 6*) has identified the site to be located in an area where there have been no recorded surface water flooding incidents.

4.23 As such, the risk of flooding from this source to Block A could be considered **relatively low**.

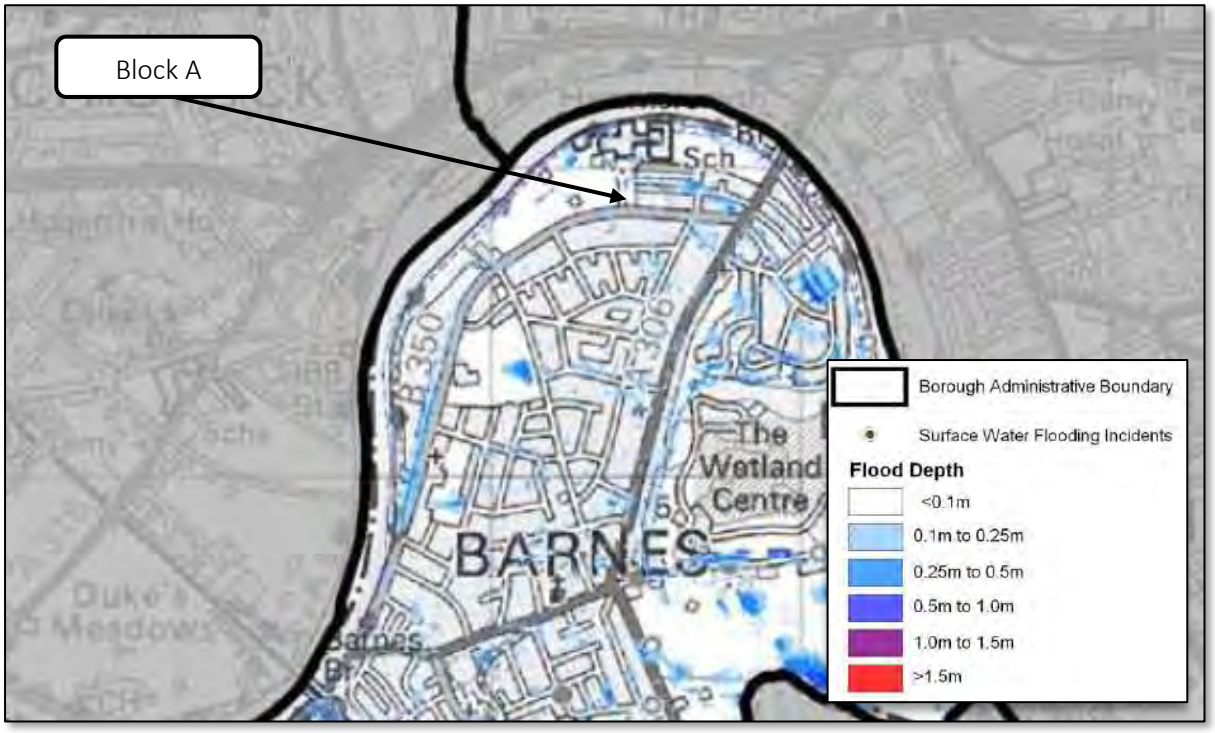

Figure 6: Richmond SWMP Surface Water Map (Source: Richmond SWMP)

Groundwater

4.24 The EA has not identified the site to be located in a Groundwater Source Protection Zone, however the site is underlain by a Minor Aquifer of High vulnerability.

4.25 The Richmond upon Thames Surface Water Management Plan (2011) states that superficial deposits (primarily River Terrace Deposits) in the borough are water bearing and have an increased potential for elevated groundwater. Whilst no groundwater level data are available for the superficial deposits, where groundwater tables exist, they are expected to be close to or at ground level, and may fluctuate with river stage.

4.26 Figure 3.5.1 of the Richmond BC SWMP (2011) demonstrates that the northern boundary of the wider St Paul's School site is underlain by permeable superficial deposits that have increased potential for elevated groundwater (IPEG). An extract of this is provided in *Figure 7.* It can be identified that Block A is not located within an area considered to have IPEG.

4.27 Figure E of the Richmond SFRA (2016) demonstrates that there is 'potential for groundwater flooding of property situated below ground level' and 'potential for groundwater flooding to occur at surface' across the School grounds. Block A itself appears to be located within an area with 'potential for groundwater flooding of property situated below ground level'. As such, given that Block A proposes a basement with sleeping accommodation, flood proofing measures should be considered.

4.28 Susceptibility to groundwater flooding in the Richmond BC area may change as a result of climate change, or changes to flood management. One of the climate change predictions includes an

increase of high rainfall events. This could lead to further groundwater flooding in the Richmond BC area due to increased perched groundwater levels and associated spring flows.

4.29 No Groundwater flood incidents have been recorded on site or in the area surrounding the site by the EA or Richmond SWMP/ SFRA, as such the risk of flooding from this source could be considered **moderate.**

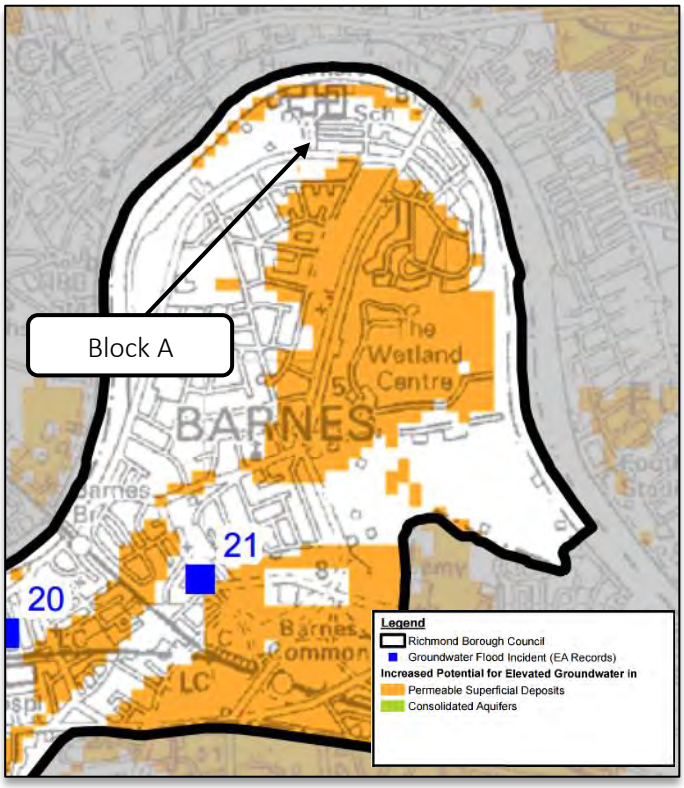

Figure 7: Richmond SWMP Increased Potential for Elevated Groundwater Map (Source: Richmond SWMP)

Sewer

4.30 The EA has provided no records to show that the site has flooded previously from this source.

4.31 The Richmond SWMP (2011) has identified the SW13 9 postcode area to have between 21-50 sewer flood records. No further information has been provided at this stage in regard to the severity, cause or exact location of these flood events.

4.32 The Richmond SFRA (2016) used DG5 data provided by Thames Water to identify postcode areas which are more susceptible to sewer flooding. It was identified that TW3 and SW15 were deemed most susceptible across the Borough.

4.33 Figure I of the SFRA further documents that the SW13 9 postcode area has experienced 21-25 incidents of sewer flooding based on DG5 data. This reiterates the figures provided in the SWMP, although limits the previous numbers to a maximum of 25, rather than 50.

4.34 As such, the risk to the site from this flood source could be considered **relatively low to moderate.**

4.35 Any new sewer connection from the proposed development should be agreed with the local sewer provider.

Surface Water Drainage Strategy

4.36 The London Plan states that Sustainable Urban Drainage Strategies (SuDS) should be utilised unless there are practical reasons for not doing so.

4.37 If a Surface Water Drainage Strategy has not yet been undertaken for the proposed staff accommodation at Block A, it is recommended that one is undertaken to demonstrate accordance with the adopted London Plan.

Records of Historical Flooding

4.38 The EA and Richmond SFRA (2008) have not provided any records of historic flood events from rivers or the sea affecting the site. However, this does not mean that flooding has not occurred in the past, as EA records are not comprehensive.

5. Probability of Flooding

5.1 According to the EA Flood Map for Planning, Block A would be located in Flood Zone 3 (High Risk), with a greater than 0.5% annual chance of tidal flooding from the River Thames.

5.2 Tidal flooding is generally caused by low pressure weather systems creating storm-surges (or storm tides), chiefly via high speed winds. These winds (and to a certain extent, the low pressure) create a 'bulge' of water which, if it coincides with high tide, can generate very high, stormy, water levels. However, because this mechanism is well understood, it is very likely that an early warning will be issued before such an event strikes. As such, it is very unlikely that the site would be subject to tidal flooding without several hours of early warning.

5.3 This information is supported by the EA Flood Map for Planning (Figure 2) which has been produced in part using JFLOW/HYDRO-F – a relatively coarse, national scale flood modelling strategy and in part using detailed flood models. These maps indicate the potential spatial extent of a tidal flood event which has a magnitude that is, on average, likely to occur once in every two hundred years (i.e. the 1:200 year tidal floodplain). It is important to note that only the *potential* floodplain is shown; ***the mitigating effects of any flood defences currently in place are not considered***. For reference, the definition of the NPPF flood risk zones is included in Table 5.

Zone	Description
1	Low Probability. This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
2	Medium Probability. This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.
3a	High Probability. This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
3b	The Functional Floodplain. This zone comprises land where water has to flow or be stored in times of flood. SFRA's should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the EA, including water conveyance routes).

Table 5: Definition of the NPPF Flood Zones. Shaded cells denote the proposed development. (Source: EA)

Climate Change on Site

5.4 Climate change is likely to increase the flow in rivers and raise sea levels and storm intensity.

5.5 The EA have recently updated the peak river flow allowances to use for different types of development. Communication with an EA, Flood and Coastal Risk Management Officer has confirmed that the changes are only focused to river flow and rainfall allowances. Tidal allowances are detailed in Table 3 of the new changes (https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances). As a result of this dialogue it has been confirmed that the EA detailed data sets provided are relevant for the purposes of this assessment given that the dominant source of flooding is tidal.

5.6 The EA provided modelled flood data for several in-channel nodes along the River Thames as it passes the site (*Figure 2*).

5.7 The EA has identified node 2.19 to be closest, and therefore most representative of flood risk to the site. However, best practice for flood risk requires the assessment to analyse the closest **upstream** node to the site. As such, extreme modelled flood levels from both Node 2.18 and Node 2.19 have been used for this assessment.

5.8 Detailed modelling available at Node 2.18 has revealed an extreme water level for the present day (as of 2008) of 5.04mAOD, a 2065 to 2100 design water level of 5.50mAOD and a 2100 design water level of 5.94mAOD, as demonstrated in Table 4.

5.9 Detailed modelling available at Node 2.19 has revealed an extreme water level for the present day (as of 2008) of 5.03mAOD, a 2065 to 2100 design water level of 5.49mAOD and a 2100 design water level of 5.93mAOD, as demonstrated in Table 4.

5.10 As such, Node 2.18 provides marginally greater flood levels (0.01m greater for each epoch) and will be used for the remainder of this assessment.

5.11 Data provided by the Environment Agency has provided defence levels of 5.54mAOD and 5.94mAOD (left and right defences, respectively) for the present day, and will provide defence levels of 5.95mAOD for 2065 to 2100 and 6.40mAOD from 2100 at Node 2.19.

5.12 Therefore, when compared with the modelled flood levels, **it would appear that the site will be defended against tidal flooding to the 1:1000 year standard of protection until at least the year 2100.**

6. Residual Risks

6.1 Residual risks are those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:

- the failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;
- failure of a reservoir, or;
- a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with.

6.2 The site benefits from flood defences which provide a protection level of up to 1:1000 years. As such there is a residual risk to the site of breach failure of the defences, from upstream inundation and overtopping of defences.

6.3 The controlling residual flood risk mechanism on site is tidal. Tidal flooding is generally caused by low pressure weather systems creating storm-surges (or storm tides), chiefly via high speed winds. These winds (and to a certain extent, the low pressure) create a 'bulge' of water which, if it coincides with high tide, can generate very high, stormy, water levels. However, because this mechanism is well understood, it is very likely that an early warning will be issued before a tidal flood event occurs. As such, it is very unlikely that the site would be subject to tidal flooding without several hours of early warning.

6.4 Given the nature of the tidal cycle flood waters on site will likely recede as in-channel water levels fall.

Reservoir Failure

6.5 The EA Risk from Reservoir Map has identified the site to be partially located in an area of reservoir flooding (*Figure 8*). The reservoir could potentially affect the site in the unlikely event of flooding from this source. According to the EA, there has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by reservoir panel engineers as detailed by the enforcement authority for the Reservoirs Act 1975 in England. The EA are responsible to ensure that reservoirs are inspected regularly and to ensure that essential safety work is carried out. As such the risk of flooding from this source is **relatively low**.

6.6 In the unlikely event that a reservoir dam fails, a large volume of water would escape at once and flooding could happen with little or no warning. The EA Risk from Reservoir map has identified the site to be located in an area of reservoir flooding.

6.7 The EA have identified the site to be affected by less than 0.3m and between 0.3m and 2m of flood depth for reservoir flooding. The flooding is shown in a worst case scenario, and therefore it is unlikely the maximum flood depth would occur at the site.

6.8 As reservoir flooding is unlikely and the modelled flood depths are based on the worst case scenario, flooding from this source is deemed to be **relatively low** risk. In addition, based on plans provided by the client, internal access will be maintained from the lower ground floor to the

upper floors of Block A via a communal stairwell. As such, in the unlikely event of reservoir failure, emergency safe refuge should be available on site.

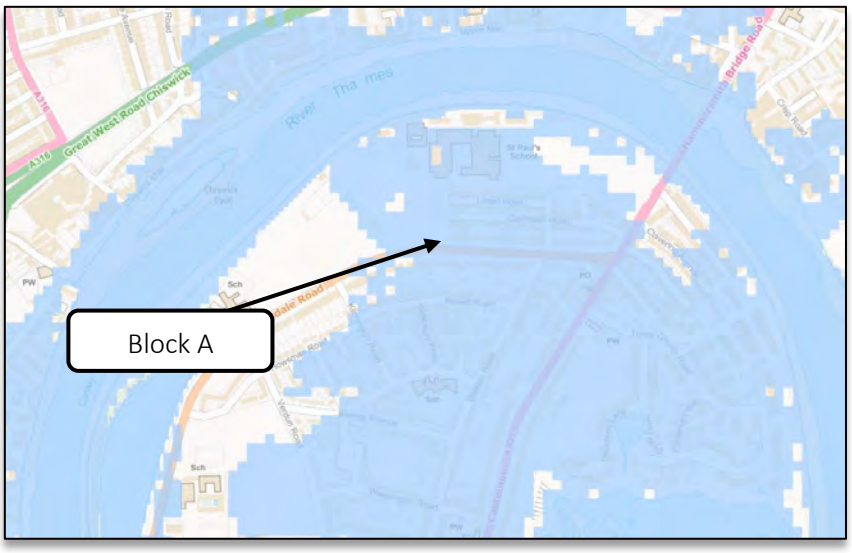

Figure 8: Maximum extent of flooding from reservoir failure (Source EA Online)

Defence Breach

6.9 The EA have provided Thames tidal breach data for the proposed development site, taken from their Thames Tidal Upriver Breach Inundation Modelling Study (June 2017). The extent of the breach model is provided in *Figure 9*.

6.10 Figure 9 demonstrates that the majority of the St Pauls School complex would be affected for a defence breach flood event in the 2100 epoch, including Block A.

6.11 To support the FRA for the redevelopment of the wider site, the EA provided 33 node points across the site and surrounding area (*Figure 10, Table 6*).

6.12 The EA attended a meeting on 7th December 2017 to provide guidance on the level of mitigation required in light of the updated breach data. Following from this meeting, the EA noted that FFLs are expected to be set at or above the breach flood level for residential accommodation.

6.13 The 2100 breach flood level for Blocks A, in light of the EAs June 2017 breach model, is 5.47mAOD.

6.14 The previously approved scheme proposed an upper ground floor level of 6.22mAOD. Given that the EA accepted that mitigation was only required to the 2100 breach flood level, the proposal now seeks to lower the upper ground floor to 5.47mAOD. The lower ground floor is also being lowered to 2.245mAOD With the upper ground floor level being at 5.47mAOD to further mitigate the risk of flooding to the lower ground floor units.

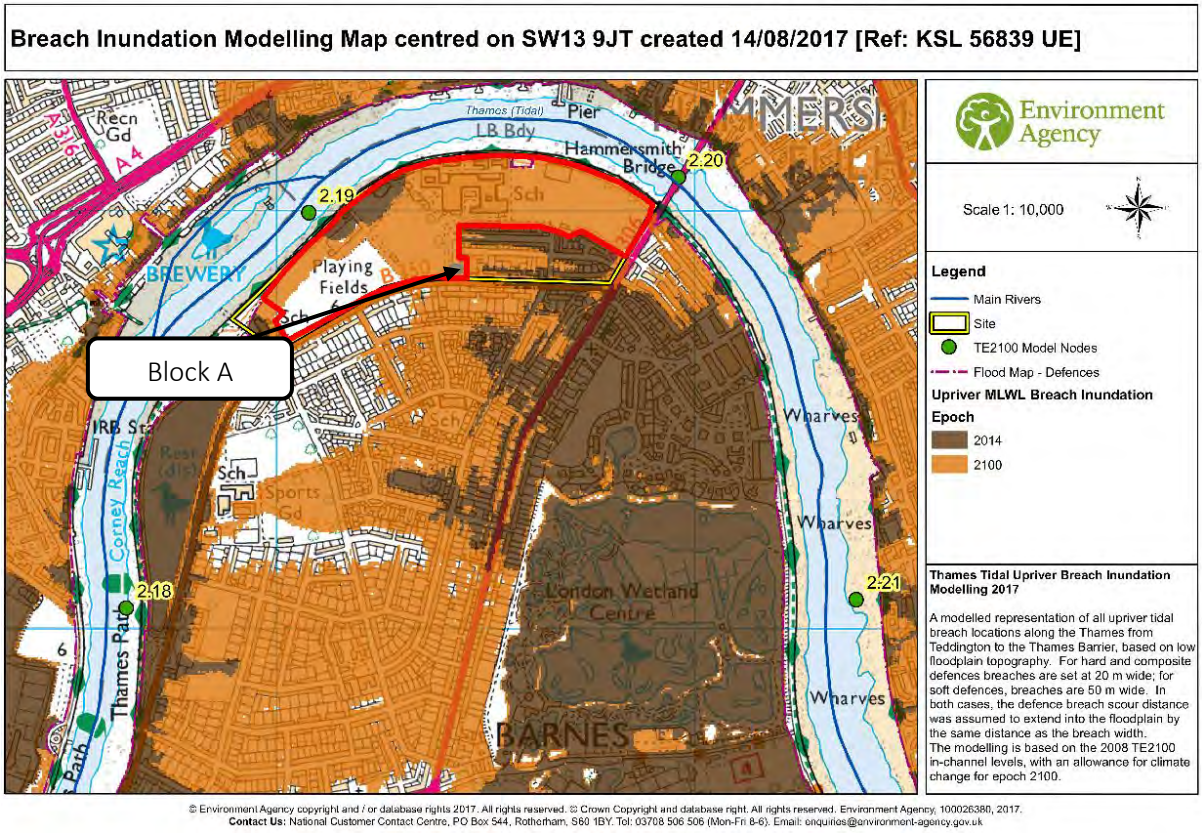

Figure 9: EA modelled breach extent map (Source: EA)

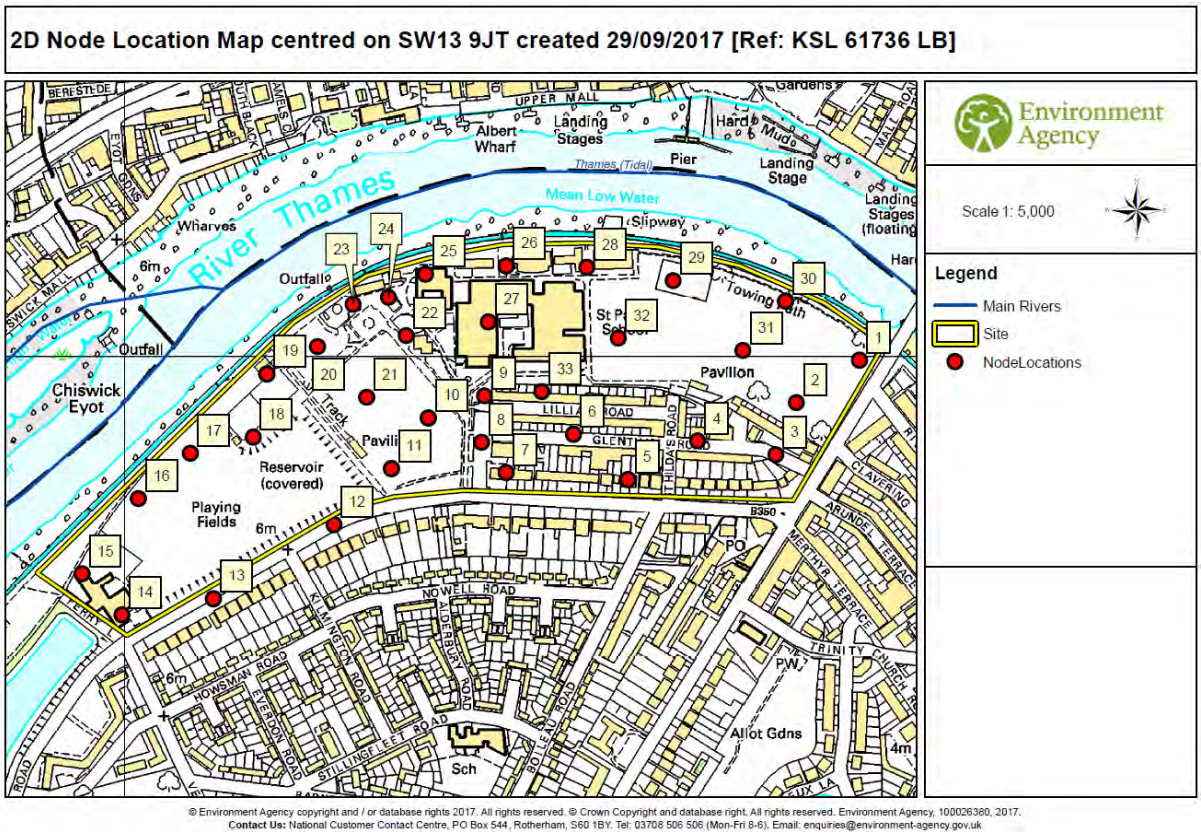

Figure 10: Node Location Map (Source: EA)

	National Grid Reference		Modelled levels in mAODN for Max Likely Water Level	
Node	Easting	Northing	2014	2100
1	522879	177994	Nil Return	5.82
2	522804	177943	Nil Return	5.42
3	522779	177881	3.95	5.34
4	522686	177897	3.94	5.34
5	522602	177851	4.20	5.34
6	522537	177905	Nil Return	5.33
7	522457	177859	Nil Return	5.35
8	522427	177895	Nil Return	5.47
9	522431	177951	Nil Return	5.51
10	522363	177925	Nil Return	5.49
11	522319	177864	Nil Return	5.50
12	522251	177797	Nil Return	5.59
13	522107	177709	Nil Return	5.77
14	521997	177689	Nil Return	5.85
15	521949	177738	4.98	5.89
16	522017	177828	Nil Return	5.89
17	522079	177882	Nil Return	5.89
18	522154	177902	Nil Return	5.89
19	522170	177977	5.03	5.86
20	522231	178010	5.03	5.88
21	522290	177949	Nil Return	5.88
22	522337	178023	Nil Return	5.87
23	522273	178061	5.03	5.84
24	522316	178069	Nil Return	5.86
25	522360	178097	Nil Return	5.81
26	522457	178107	Nil Return	5.88
27	522435	178039	Nil Return	5.71
28	522553	178105	Nil Return	5.88
29	522656	178089	Nil Return	5.84
30	522791	178064	Nil Return	5.82
31	522740	178005	Nil Return	5.69
32	522591	178020	Nil Return	5.49
33	522499	177956	3.94	5.34

Table 6: Thames Tidal Breach Modelled Flood Levels (Source: EA)

6.15 As such, the risk of flooding from breach to Block A could be considered **moderate to high**, although mitigation measures are recommended (*Section 8 of this report*) to protect the lower and upper ground floors of Block A.

Overtopping

6.16 No overtopping data has been provided by the EA with regards to this site.

6.17 As such, given height of the linear defences along the Thames relative to the modelled in-channel flood levels, the risk posed to the development from overtopping is deemed to be **relatively low.**

7. London Borough of Richmond SFRA Development Control Recommendations

7.1 The London Borough of Richmond upon Thames published a new Strategic Flood Risk Assessment (SFRA) in March 2016, which takes into account the new climate change data provided by the Environment Agency, and as such there are several new policies and development control recommendations that the proposed development must accommodate.

7.2 The proposed development site is located within Flood Zone 3 and is defended to the 1:1000 year standard by defences such as the Thames Barrier. As such, there is a residual risk of defence breach/ failure to the site.

7.3 Analysis of the EA data and the Breach map published in the Richmond SFRA (2016) has identified the site to have a "Moderate" and "Significant" breach hazard rating. This hazard rating was based on the previous EA defence breach modelling, pre-June 2017. Since this, the EA have released their new breach modelling, and based on the EAs hazard ratings, the rating for Block A is understood to be "Danger for Some" and "Danger for Most". As such, it is likely that Richmond would consider the site to have a "Moderate", "Significant" and in some cases "Extreme" hazard rating in line with the rating system. The policy constraints between "Significant" and "Extreme" hazard ratings are not dissimilar and therefore the impact of the new breach modelling on hazard rating in Richmond's view is not significant.

7.4 Therefore, there are requirements that the development must meet due to it being located within this hazard rating, set out in *7.4.6 Spatial Planning and Development Control Recommendations* of the Richmond SFRA, which is reproduced in *Appendix B* and are summarised below:

- Ground floor levels:
  - ground floor levels should be situated above the Thames 2100 Year 2100 tidal flood level;
- Site Access and Egress:
  - for residential property, dry access is to be provided above the year 2100 tidal flood level. For non-residential property, access must be 'safe';
  - a dedicated 'safe haven' should be provided above the year 2100 tidal flood level to enable rapid escape in the event of a defence breach;
- Basements:
  - new basements must be restricted to Less Vulnerable/ Water Compatible uses only;
  - more vulnerable uses will only be considered if a site-specific FRA can demonstrate the risk to life from breach events can be managed;
  - must have internal access that is above the 2100 tidal flood level, assuming a defence breach,
  - flood resilient designs to be adopted.

- Site runoff:
    - implement SuDS to ensure that runoff from the development is not increased as a minimum. Reduction should be sought to achieve greenfield runoff rates.
- Buffer Zone:
    - No development to take place within 16m of the tidal River Thames unless previously agreed with the Environment Agency.

8. Flood Risk Management Measures

8.1 The site is located in Flood Zone 3 (High Risk of flooding as defined in the NPPF) according to the EA Flood Map for Planning but is, however, defended to the 1:1000 year standard and shall remain so until at least 2100. As such, the site is at risk of flooding from a breach of the Thames defences. In line with the Richmond SFRA (2016) and the NPPF/ EA Guidance, the proposed development will require flood mitigation measures.

8.2 The EA previously approved a scheme at Block A with sleeping accommodation at the lower ground floor. This proposal does seek to lower the lower and upper ground floors. The upper ground floor is to be set at an elevation of 5.47mAOD (2100 breach flood level).

8.3 The EA previously agreed to sleeping accommodation at lower and upper ground floor due to the provision of a perimeter wall around Block A, with a crest level of 5.47mAOD (2100 breach flood level). This is to be retained in this amended scheme. With the upper ground floor level being at 5.47mAOD to further mitigate the risk of flooding to the lower ground floor units.

8.4 As such the following mitigation measures are recommended:

- It is recommended that the upper ground floor level of proposed residential accommodation block A be set no lower than 5.47mAOD (the 2100 breach flood level).
- It is understood that the client has previously submitted plans to include a perimeter wall around the proposed Block A to act as a mitigation measure to protect the lower ground floor residential usage, to which the Environment Agency did not object at the time (*see Appendix C)*. A meeting with the EA on 7th December 2017 confirmed that they would honour this previous stance as a method of mitigation to Block A. The crest level of this wall should be set no lower than 5.47mAOD (2100 breach flood level) to provide protection to the lower ground floor.
- It is recommended that the wall incorporate a stoop/ step up-step-down threshold to allow access and egress to and from the building.
- It is recommended that internal stair access to and from lower floors for all of the proposed residential blocks, are to be maintained for the lifetime of the development, to provide access and egress routes in the event of a breach;
- Bringing down electrical services from ceilings, where possible;
- Solid, impermeable (concrete) walls and floors at basement level, where possible;
- Installation of a pumped device to the basement level in case of any intrusion (where appropriate);
- Raised wiring and power outlets on lower ground and ground level;
- Ensure any basement level windows, and doors are of a flood proof design to ensure flood water cannot enter the properties;
- All plumbing insulation to be of closed-cell design;
- Non-return valves on any new sewer connections to prevent back-flow;
- Sign up to the EA Flood Warning Service.

8.5 In line with the LB of Richmond SFRA (2016), new basement developments must be restricted to less vulnerable/ water compatible uses unless it can be demonstrated that the risk to life from the breach can be managed (see Appendix B), which the perimeter wall should do and communal internal stairwell from this floor level to higher floor levels of the property should allow for emergency refuge at upper floors if required.

Access / Egress

8.6 The EA data has shown the site is currently protected by defences to the 1:1000 year standard and would remain so up to at least 2100.

8.7 It has been stipulated by the client that St Paul's School currently has a formal flood evacuation plan in place. The client has informed Ambiental that this Flood Warning and Evacuation plan was reapproved on 9th April 2017.

8.8 As the Environment Agency published new tidal defence breach modelling in June 2017, it is recommended that this Flood Warning and Evacuation Plan is amended in light of the new information.

8.9 Breach flooding can occur rapidly without warning and as such, prior evacuation from Block A may not be viable.

8.10 If flooding has already occurred prior to evacuation, it is advised to remain in the property and await instruction from the emergency services or until it is deemed safe to evacuate. Plans provided by the client indicate that the upper ground floor will be set to 5.47mAOD (2100 breach flood level) while the first floor will be set to 8.695mAOD (above the 2100 breach flood level). Plans further indicate that internal access will be maintained from the lower ground floor to the upper floors via a communal stairwell. Residents should move via internal stairwells to the upper floors of the buildings so as to be located within an area of safe refuge. No evacuation should be sought if flood depths exceed 25cm, evacuation should only be sought with the assistance of the emergency services in these circumstances.

8.11 As the site is located within a flood warning service area (*Figure 11*) it is recommended the site owner and occupants sign up to the EA flood warning service if they have not done so already in order to provide betterment to the site. It is recommended that all new site owners and occupants are made aware are of the potential flood risk to the site and that they sign up to the EA flood warning service.

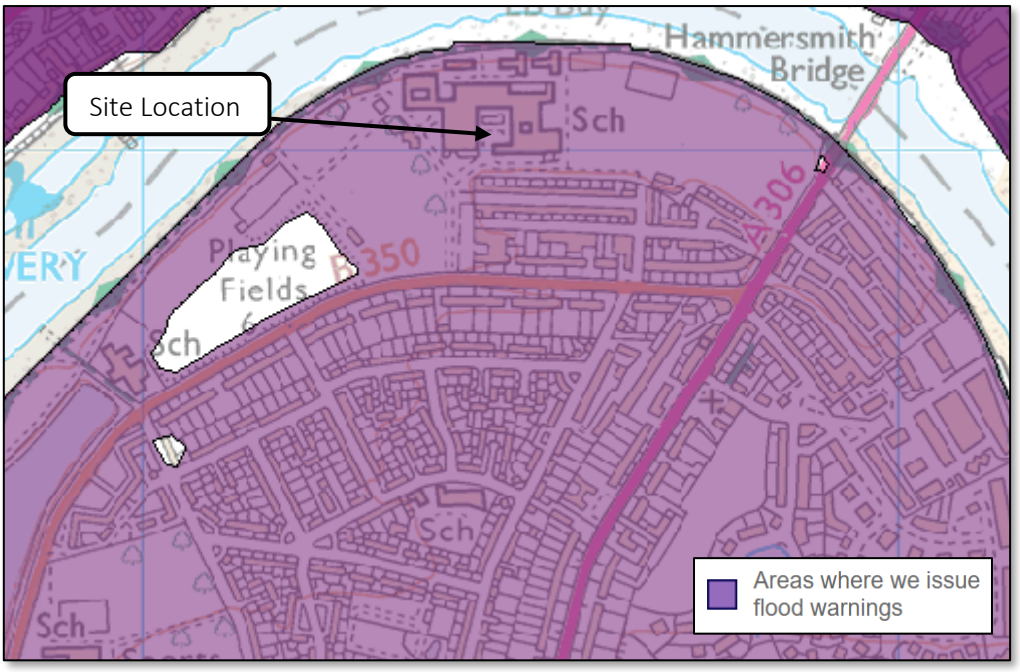

Figure 11: EA Flood Warning Area (Source: EA Online)

8.12 The EA operates a 24-hour telephone service on 0345 988 1188 that provides frequently updated flood warnings and associated floodplain information. Further information can be found on www.environment-agency.gov.uk/floodline. Floodline Warnings Direct is a free service operated by the EA that provides flood warnings direct to occupants by telephone, mobile phone, fax or pager.

9. Off Site Impacts

Impact to Flood Risk Elsewhere

9.1 The site is located in Flood Zone 3, (tidal flood risk) and under the NPPF:

> *"unless the development is located in an area which is subject to tidal flooding and which serves no conveyance function, land raising must be accompanied by compensatory provision of flood storage either on- or off-site"*

as such there is no requirement for compensatory flood storage.

Generation of Runoff

9.2 The London Plan states that Sustainable Urban Drainage Strategies (SuDS) should be utilised unless there are practical reasons for not doing so.

9.3 If a Surface Water Drainage Strategy has not yet been undertaken for the proposed staff accommodation at Block A, it is recommended that one is undertaken to demonstrate accordance with the adopted London Plan.

10. Conclusion

10.1 Ambiental Technical Solutions Limited were originally appointed by Michael Barclay Partnership LLP on behalf of St Paul's School. For this submission, Ambiental are now appointed by St Pauls School directly. Ambiental have now been appointed to amend the existing National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) for a s73 application for the ongoing redevelopment of St Paul's School, Lonsdale Road, Barnes, London, SW13 9JT.

10.2 It is understood that the client is submitting an amended application for the construction of a staff residential block at Block A. Ambiental are required to amend the FRA in light of the amended plans.

10.3 It is understood that the EA had no objections to the previous application to vary conditions across the wider site, subject to conditions (LBRuT Ref 17/4358/VRC; EA Ref SL/2018/117999/01-L01). One of the conditions was focused to the proposed staff accommodation block:

"Flood resistance and resilient measures highlighted in section 1.9 (e) should be fully implemented into the proposed staff accommodation blocks".

10.4 This relates to the mitigation measures proposed in the previous FRA. The client has amended the plans for Block A and therefore this FRA will re-assess the proposed development in light of these plans, and update mitigation measures if required. The previously approved mitigation for Block A involved setting the perimeter retaining wall at 5.47mAOD (2100 breach flood level for this location).

10.5 The previously approved scheme proposed an upper ground floor level of 6.22mAOD. Given that the EA accepted that mitigation was only required to the 2100 breach flood level, the proposal now seeks to lower the upper ground floor to 5.47mAOD. The lower ground floor is also being lowered to 2.245mAOD. However, the perimeter wall is to be retained at 5.47mAOD, thus keeping the mitigation in place to protect the basement accommodation.

10.6 The proposed perimeter wall should be enclosed around the entire Block A development. Any thresholds should be a step up/ step down mechanism with minimum thresholds of 5.47mAOD.

10.7 Aa part of a historic planning condition (U23171) FFLs for the staff accommodation blocks were required to be 5.735mAOD. It is unclear where this level originated from. However, correspondence with the EA in 2017 indicated that FFLs could be set at the breach level as a from of mitigation against this residual risk. As such, it is understood that as part of the s73 application the developer is seeking to amend the previous condition of setting FFLs at 5.735mAOD to a lower elevation of 5.47mAOD in line with the most recent guidance provided by the EA.

10.8 As such, and given that:

a) planning permission was previously granted for a similar scheme;

b) the site has been shown to be **defended to the 1:1000 year standard**, and will remain so until at least 2100;

c) the proposal seeks only to lower the proposed upper and lower ground floors compared to the approved scheme;

d) the proposed upper ground floor and retaining wall will be set at the 2100 breach flood level (5.47mAOD);

e) appropriate mitigation can be implemented at the proposed staff accommodation blocks at the south of the site to manage the residual risk of breach flooding;

f) betterment can be provided by the formalisation of a **flood warning and evacuation plan.**

Following the guidelines contained within the NPPF, the proposed development could be considered assuming appropriate mitigation (including adequate warning procedures) can be maintained for the temporary lifetime of the development.

Appendix A – Environment Agency Data

Product 4 (Detailed Flood Risk) for: St Paul's School, Lonsdale Road, London, SW13 9JT
Requested by: Thea Powell
Reference: KSL 56839 UE
Date: 14/08/2017

Contents

The information provided is based on the best data available as of the date of this letter.

You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements to the data for this location have been made. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

Please refer to the Open Government Licence which explains the permitted use of this information.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Customer services line: 01732 223 202
Email: kslenquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

Flood Map for Planning (Rivers and Sea)

The Flood Map:

Our Flood Map shows the natural floodplain for areas at risk from river and tidal flooding. The floodplain is specifically mapped ignoring the presence and effect of defences. Although flood defences reduce the risk of flooding they cannot completely remove that risk as they may be over topped or breached during a flood event.

The Flood Map indicates areas with a 1% (0.5% in tidal areas), Annual Exceedance Probability (AEP) - the probability of a flood of a particular magnitude, or greater, occurring in any given year, and a 0.1% AEP of flooding from rivers and/or the sea in any given year. In addition, the map also shows the location of some flood defences and the areas that benefit from them.

The Flood Map is intended to act as a guide to indicate the potential risk of flooding. When producing it we use the best data available to us at the time and also take into account historic flooding and local knowledge. The Flood Map is updated on a quarterly basis to account for any amendments required. These amendments are then displayed on the internet at https://www.gov.uk/check-flood-risk

At this Site:

The Flood Map shows that this site lies within the outline of Flood Zone 3. This zone comprises land assessed as having a 0.5% (1 in 200) or greater annual probability of tidal flooding.

Enclosed is an extract of our Flood Map which shows this information for your area.

Method of production

The Flood Map at this location has been derived using detailed modelling of the tidal River Thames through the Thames Tidal Defences Study completed in 2006 by Halcrow Ltd.

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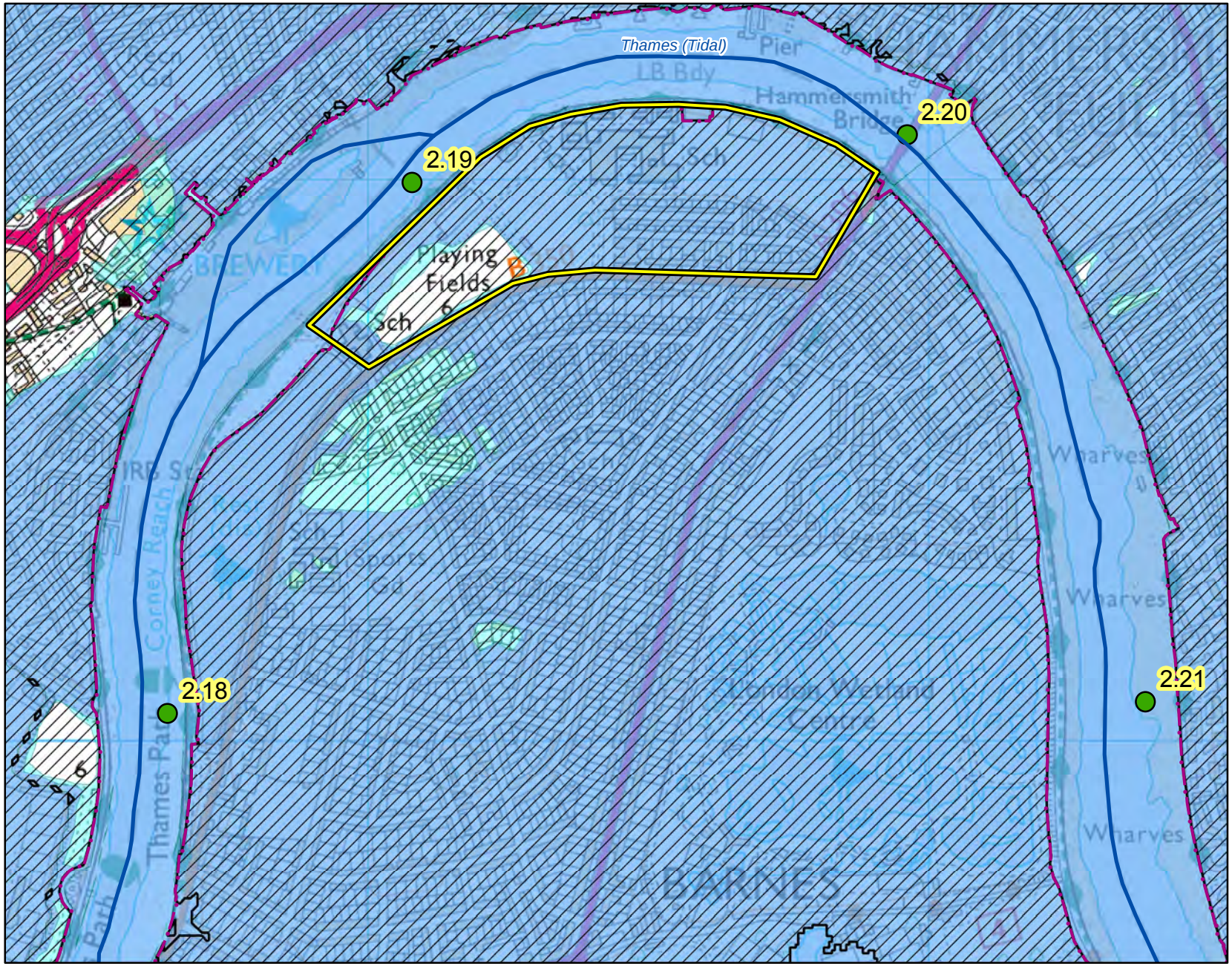
Detailed FRA Map centred on SW13 9JT created 14/08/2017 [Ref: KSL 56839 UE]



Environment Agency

Scale 1: 10,000

Legend

- Main Rivers
- Site
- TE2100 Model Nodes
- Flood Map - Defences
- Flood Map - Flood Storage Areas
- Areas Benefitting from Flood Defences
- Flood Map - Flood Zone 3
- Flood Map - Flood Zone 2

Flood Map for Planning (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:
- from the sea with a 0.5% or greater chance of occurring each year
- or from a river with a 1% or greater chance of occurring each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 0.1% chance of occurring each year.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Thames Estuary 2100 (TE2100)

You have requested in-channel flood levels for the tidal river Thames. These have been taken from the Thames Estuary 2100 study completed by HR Wallingford in 2008. The modelled node closest to your site is **2.19**; the locations of nearby nodes are also shown on the enclosed map.

Details about the TE2100 plan

The TE2100 plan is now live and within it are a set of levels on which the flood risk management strategy is based. The plan is the overarching flood management strategy for the Thames Estuary and therefore any development planning should be based on the same underlying data.

Details about the TE2100 in-channel levels

The TE2100 in-channel levels take into account operation of the Thames Barrier when considering future levels. The Thames Barrier requires regular maintenance and with additional closures the opportunity for maintenance will be reduced. When this happens, river levels – for which the Barrier would normally shut for the 2008 epoch – will have to be allowed through to ensure that the barrier is not shut too often. For this reason, levels upriver of the barrier will increase and the tidal walls will need to be heightened to match.

Why is there no return period for levels upriver of the barrier?

The levels upriver of the barrier are the highest levels permitted by the operation of the Thames Barrier. If levels and flows are forecast to be any higher, the Thames Barrier would shut, ensuring that the tide is blocked and the river maintained to a low level. For this reason the probability of any given water level upriver of the Barrier is controlled and therefore any associated return period becomes irrelevant. The Thames Barrier and associated defence system has a 1 in 1000 year standard which means it ensures that flood risk is managed up to an event that has a 0.1% annual probability. The probability of water levels upriver is ultimately controlled by the staff at the Thames Barrier.

For further information about the Thames Barrier please visit our website at:

https://www.gov.uk/the-thames-barrier

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TE2100 2008 levels:

Levels downriver of the Thames Barrier are 0.1% AEP (1 in 1000) and levels upriver are the highest levels permitted by the Thames Barrier, described as the Maximum Likely Water Levels (MLWLs). The defence levels (left defence, right defence) are the minimum levels to which the defences should be built.

Location	Node	Easting	Northing	Extreme water level (m)	Left defence (m)	Right defence (m)	Allow for future defence raising to a level of...	
							Left Bank (m)	Right Bank (m)
Brentford	2.18	521644	177047	5.04	5.54	5.94	6.40	6.40
	2.18a	521776	177707	5.04	5.54	5.94	6.40	6.40
Barnes	2.19	522080	177994	5.03	5.54	5.94	6.40	6.40
	2.2	522963	178079	5.01	5.54	5.94	6.40	6.40
	2.21	523388	177068	4.96	5.54	5.94	6.40	6.40

TE2100 climate change levels:

				2065 to 2100		**2100**	
Location	Node	Easting	Northing	Design water level	Defence level (both banks)	Design water level	Defence level (both banks)
Brentford	2.18	521644	177047	5.50	6.25	5.94	6.70
	2.18a	521776	177707	5.50	5.95	5.94	6.40
Barnes	2.19	522080	177994	5.49	5.95	5.93	6.40
	2.2	522963	178079	5.48	5.95	5.92	6.40
	2.21	523388	177068	5.45	5.95	5.89	6.40

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Thames Tidal Upriver Breach Inundation Modelling - 2017

The table below displays site-specific modelled flood levels at your site. These have been taken from the Thames Tidal Upriver Breach Inundation Modelling Study 2017 completed by Atkins Ltd. in May 2017.

We have developed a modelling approach where all upriver breach locations along the Thames are equitably modelled, to ensure a consistent approach across London. This modelling simulates 5679 continuous tidal breaches along the entire extent of the Thames from Teddington to the Thames Barrier. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width.

For breaches upriver of the Thames Barrier, there is no return period for modelled levels as the levels are controlled by barrier closures. The levels used are referred to as Maximum Likely Water Levels (MLWLs). Therefore 2014 and 2100 epochs were modelled on that basis.

This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within London.

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Website: https://www.gov.uk/government/organisations/environment-agency

	National Grid Reference		Modelled levels in mAODN for Max Likely Water Level	
Node	Easting	Northing	2014	2100
1	522589	178073	Nil Return	5.56
2	522755	178041	Nil Return	5.84
3	522832	177953	Nil Return	5.63
4	522732	177892	3.95	5.34
5	522638	177819	4.58	5.34
6	522543	177935	3.94	5.33
7	522433	177829	Nil Return	5.40
8	522276	177807	Nil Return	5.57
9	522140	177737	Nil Return	5.75
10	521955	177683	4.98	5.89
11	522010	177807	Nil Return	5.89
12	522094	177886	Nil Return	5.88
13	522148	177970	5.03	5.86
14	522330	177941	Nil Return	5.88
15	522295	178065	5.03	5.84
16	522459	178052	Nil Return	5.58

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Breach Inundation Modelling Map centred on SW13 9JT created 14/08/2017 [Ref: KSL 56839 UE]

Environment Agency

Scale 1: 10,000

N W E S

Legend

- Main Rivers
- Site
- TE2100 Model Nodes
- Flood Map - Defences

Upriver MLWL Breach Inundation

Epoch

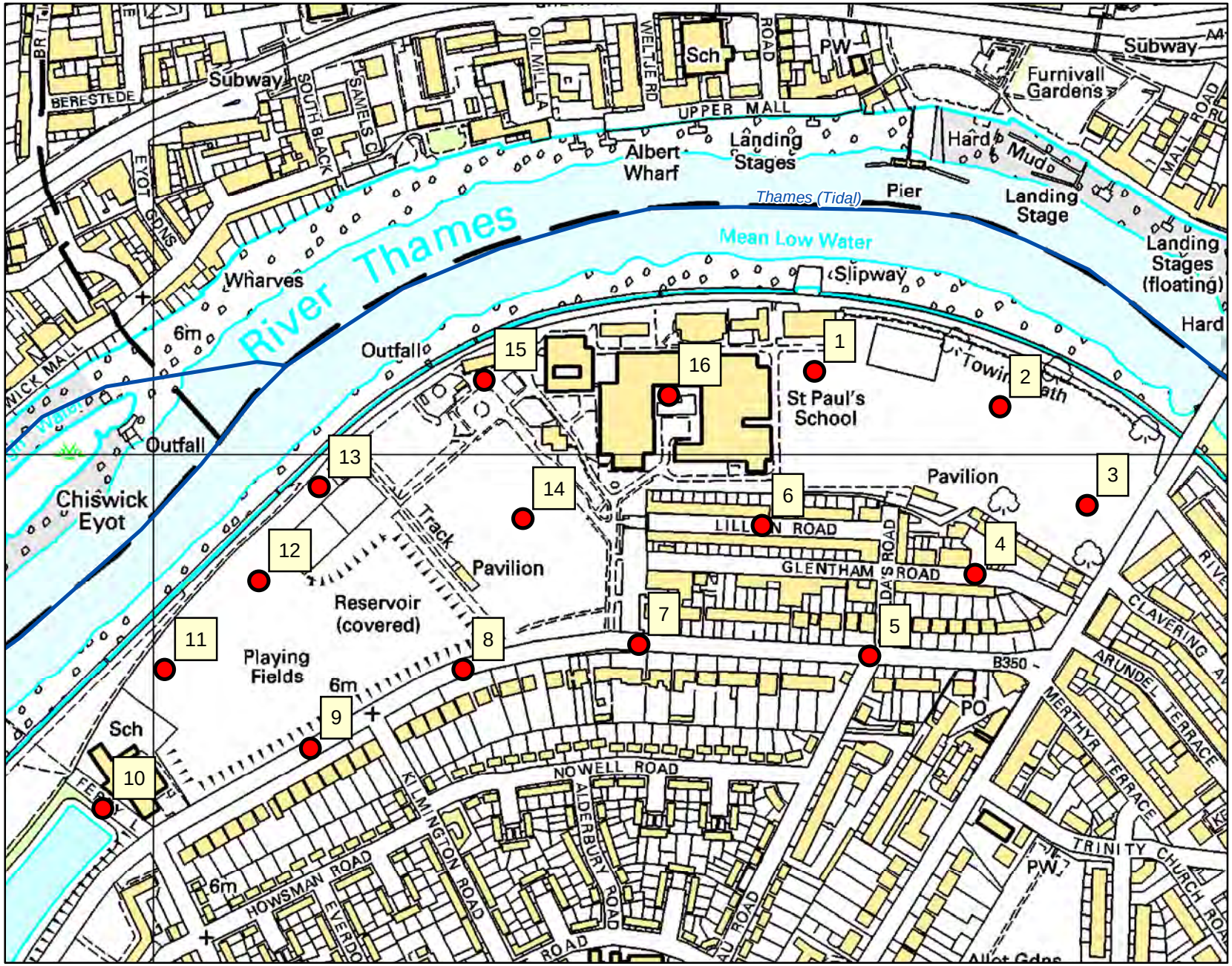
- 2014
- 2100

Thames Tidal Upriver Breach Inundation Modelling 2017

A modelled representation of all upriver tidal breach locations along the Thames from Teddington to the Thames Barrier, based on low floodplain topography. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width.
The modelling is based on the 2008 TE2100 in-channel levels, with an allowance for climate change for epoch 2100.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

2D Node Location Map centred on SW13 9JT created 14/08/2017 [Ref: KSL 56839 UE]



Environment Agency

Scale 1: 5,000

Legend

- Main Rivers
- NodeLocations

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Defence Details

The design standard of protection of the flood defences in this area of the Thames is 0.1% AEP; they are designed to defend London up to a 1 in 1000 year **tidal** flood event. The defences are all raised, man-made and privately owned. It is the riparian owners' responsibility to ensure that they are maintained to a crest level of 5.94 m AODN (the Statutory Flood Defence Level in this reach of the Thames). We inspect them twice a year to ensure that they remain fit for purpose. The current condition grade for defences in the area is 2 (good), on a scale of 1 (very good) to 5 (very poor). For more information on your rights and responsibilities as a riparian owner, please see our document 'Living on the edge' found on our website at:

https://www.gov.uk/government/publications/riverside-ownership-rights-and-responsibilities

There are no planned improvements in this area. Please see the 'Thames Estuary 2100' document on our website for the short, medium and long term Flood Risk Management strategy for London:

https://www.gov.uk/government/publications/thames-estuary-2100-te2100

Areas Benefiting from Flood Defences

This site is within an area benefiting from flood defences, as shown on the enclosed extract of our Flood Map. Areas benefiting from flood defences are defined as those areas which benefit from formal flood defences specifically in the event of flooding from rivers with a 1% (1 in 100) chance in any given year, or flooding from the sea with a 0.5% (1 in 200) chance in any given year.

If the defences were not there, these areas would be flooded. An area of land may benefit from the presence of a flood defence even if the defence has overtopped, if the presence of the defence means that the flood water does not extend as far as it would if the defence were not there.

Orchard House, Endeavour Park, London Road, Addington, West Malling, Kent, ME19 5SH.
Customer services line: 01732 223 202
Email: kslenquiries@environment-agency.gov.uk
Website: https://www.gov.uk/government/organisations/environment-agency

Recorded Flood Events Data

We hold records of historic flood events from rivers and the sea. Information on the floods that may have affected the area local to your site is provided below and in the enclosed map (if relevant).

Flood Event Data

We do not hold records of historic flood events from rivers and/or the sea affecting the area local to this site. However, please be aware that this does not necessarily mean that flooding has not occurred here in the past, as our records are not comprehensive.

Due to the fact that our records are not comprehensive, we would advise that you make further enquiries locally with specific reference to flooding at this location. You should consider contacting the relevant Local Planning Authority and/or water/sewerage undertaker for the area.

We map flooding to land, not individual properties. Our historic flood event record outlines are an indication of the geographical extent of an observed flood event. Our historic flood event outlines do not give any indication of flood levels for individual properties. They also do not imply that any property within the outline has flooded internally.

Please be aware that flooding can come from different sources. Examples of these are:

- from rivers or the sea;
- surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system);
- overflowing or backing up of sewer or drainage systems which have been overwhelmed,
- groundwater rising up from underground aquifers

Currently the Environment Agency can only supply flood risk data relating to the chance of flooding from rivers or the sea. However you should be aware that in recent years, there has been an increase in flood damage caused by surface water flooding and drainage systems that have been overwhelmed.

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Additional Information

Use of Environment Agency Information for Flood Risk / Flood Consequence Assessments

Important

If you have requested this information to help inform a development proposal, then we recommend that you undertake a formal pre-application enquiry using the form available from our website:-

http://www.environment-agency.gov.uk/research/planning/33580.aspx

Depending on the enquiry, we may also provide advice on other issues related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

In **England**, you should refer to the Environment Agency's Flood Risk Standing Advice, the technical guidance to the National Planning Policy Framework and the existing PPS25 Practice Guide for information about what flood risk assessment is needed for new development in the different Flood Zones. These documents can be accessed via:

https://www.gov.uk/government/publications/flood-risk-standing-advice-for-local-planning-authorities-frsa

http://planningguidance.planningportal.gov.uk/

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

You should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk / Consequence Assessment (FRA / FCA) where one is required, but does not constitute such an assessment on its own.
2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or overland runoff. The information produced by the local planning authority referred to above may assist here.
3. Where a planning application requires a FRA / FCA and this is not submitted or deficient, the Environment Agency may well raise an objection.
4. For more significant proposals in higher flood risk areas, we would be pleased to discuss details with you ahead of making any planning application, and you should also discuss the matter with your local planning authority.

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Surface Water

We have provided two national Surface Water maps, under our Strategic Overview for flooding, to your Lead Local Flood Authority who are responsible for local flood risk (i.e. surface runoff, ground water and ordinary watercourse), which alongside their existing local information will help them in determining what best represents surface water flood risk in your area.

Your Lead Local Flood Authority have reviewed these and determined what it believes best represents surface water flood risk. You should therefore contact this authority so they can provide you with the most up to date information about surface water flood risk in your area.

You may also wish to consider contacting the appropriate relevant Local Planning Authority and/or water/sewerage undertaker for the area. They may be able to provide some knowledge on the risk of flooding from other sources. We are working with these organisations to improve knowledge and understanding of surface water flooding.

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Product 4 (Detailed Flood Risk) for: St Paul's School, Lonsdale Road, London, SW13 9JT
Requested by: Thea Powell
Reference: KSL 61736 LB
Date: 29/09/2017

Contents

The information provided is based on the best data available as of the date of this letter.

You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements to the data for this location have been made. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

Please refer to the Open Government Licence which explains the permitted use of this information.

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Thames Tidal Upriver Breach Inundation Modelling - 2017

The table below displays site-specific modelled flood levels at your site. These have been taken from the Thames Tidal Upriver Breach Inundation Modelling Study 2017 completed by Atkins Ltd. in May 2017.

We have developed a modelling approach where all upriver breach locations along the Thames are equitably modelled, to ensure a consistent approach across London. This modelling simulates 5679 continuous tidal breaches along the entire extent of the Thames from Teddington to the Thames Barrier. For hard and composite defences breaches are set at 20 m wide; for soft defences, breaches are 50 m wide. In both cases, the defence breach scour distance was assumed to extend into the floodplain by the same distance as the breach width.

For breaches upriver of the Thames Barrier, there is no return period for modelled levels as the levels are controlled by barrier closures. The levels used are referred to as Maximum Likely Water Levels (MLWLs). Therefore 2014 and 2100 epochs were modelled on that basis.

This model has been designed for catchment wide flood risk mapping. It should be noted that it was not created to produce flood levels for specific development sites within London.

	National Grid Reference		Modelled levels in mAODN for Max Likely Water Level	
Node	**Easting**	**Northing**	**2014**	**2100**
1	522879	177994	Nil Return	5.82
2	522804	177943	Nil Return	5.42
3	522779	177881	3.95	5.34
4	522686	177897	3.94	5.34
5	522602	177851	4.20	5.34
6	522537	177905	Nil Return	5.33
7	522457	177859	Nil Return	5.35
8	522427	177895	Nil Return	5.47
9	522431	177951	Nil Return	5.51
10	522363	177925	Nil Return	5.49
11	522319	177864	Nil Return	5.50
12	522251	177797	Nil Return	5.59

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13	522107	177709	Nil Return	5.77
14	521997	177689	Nil Return	5.85
15	521949	177738	4.98	5.89
16	522017	177828	Nil Return	5.89
17	522079	177882	Nil Return	5.89
18	522154	177902	Nil Return	5.89
19	522170	177977	5.03	5.86
20	522231	178010	5.03	5.88
21	522290	177949	Nil Return	5.88
22	522337	178023	Nil Return	5.87
23	522273	178061	5.03	5.84
24	522316	178069	Nil Return	5.86
25	522360	178097	Nil Return	5.81
26	522457	178107	Nil Return	5.88
27	522435	178039	Nil Return	5.71
28	522553	178105	Nil Return	5.88
29	522656	178089	Nil Return	5.84
30	522791	178064	Nil Return	5.82
31	522740	178005	Nil Return	5.69
32	522591	178020	Nil Return	5.49
33	522499	177956	3.94	5.34

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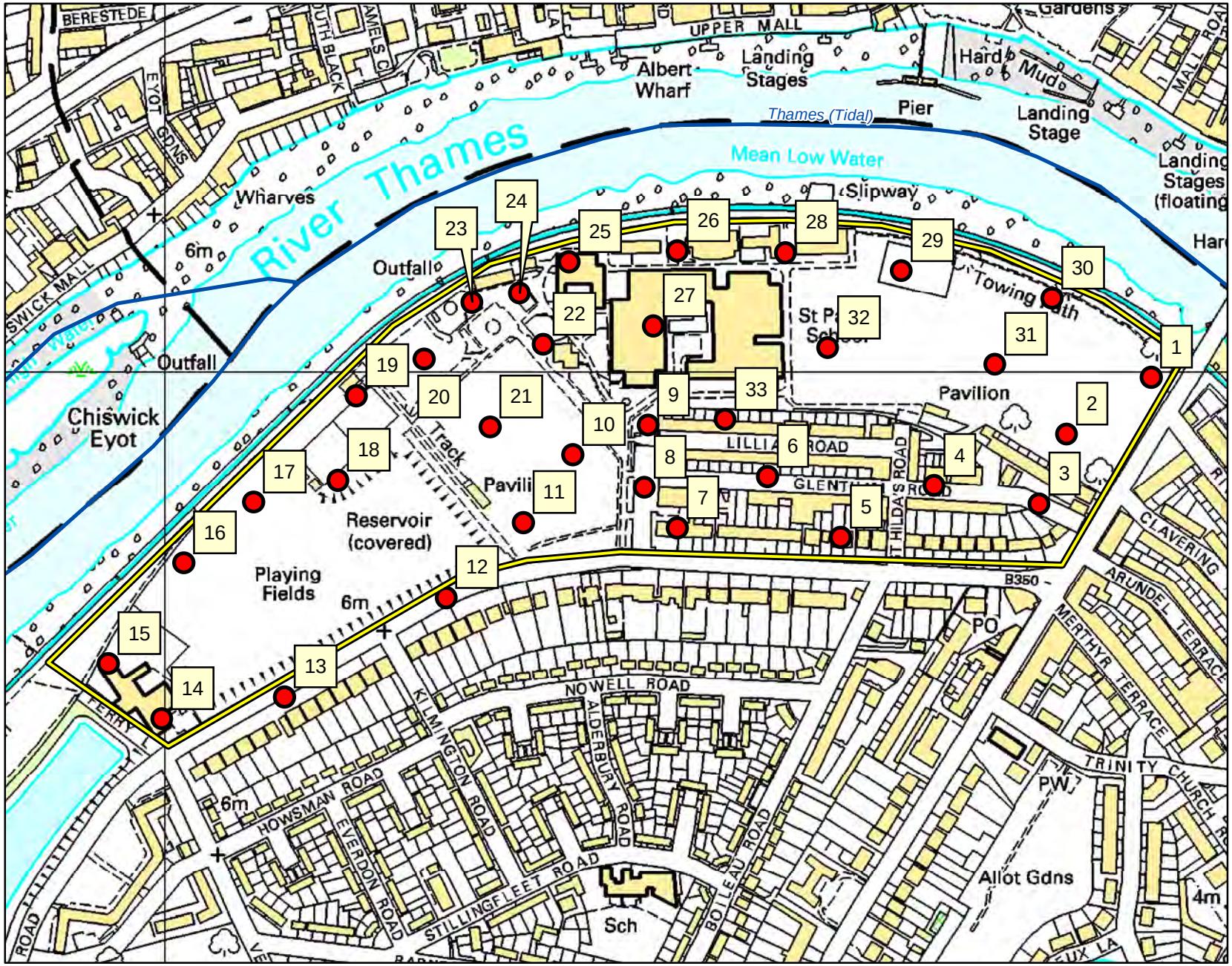

Environment Agency

Scale 1: 5,000

Legend

- Main Rivers
- Site
- NodeLocations

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Appendix B – Richmond SFRA (2016) Information

Policy Response	NPPF Flood Zone							
	Zone 3b Functional Floodplain (Tidal & Fluvial)		Zone 3a High Probability *(where combined fluvial / tidal hazard exists, the more conservative recommendations of the two sources should be applied)*					
			TIDAL BREACH FLOOD HAZARD - Defended Only *(Refer Figures C-1 to C-3)*			FLUVIAL FLOOD HAZARD *(Refer Figures C-4 to C-10)*		
	Developed	Undeveloped	Defence Breach 'Extreme & Significant Hazard'	Defence Breach 'Moderate Hazard'	Defence Breach 'Low Hazard' or 'No Hazard'	Undefended 'Extreme & Significant Hazard'	Undefended 'Moderate Hazard'	Defended + Undefended with 'Low Hazard' or 'No Hazard'
SPATIAL PLANNING RECOMMENDATIONS								
Important Considerations	Within Zone 3b Functional Floodplain, 'developed land' relates solely to existing buildings that are impermeable to flood water. The undeveloped land surrounding these buildings are important flow paths and/or flood storage areas. Property within Zone 3b Functional Floodplain will be subject to frequent flooding with a probability of more than 5% in any year. There are clear sustainability implications to be considered in this regard, and it is highly questionable whether insurance against flooding related damages will be available in the longer term	The undeveloped Functional Floodplain should be protected by not permitted any form of development unless it is for water-compatible development or essential utility infrastructure. Future development within Zone 3b Functional Floodplain can only be considered following application of the Sequential Test and the Exception Test	Future development within Zone 3a High Probability can only be considered following application of the Sequential Test			Future development within Zone 3a High Probability can only be considered following application of the Sequential Test		
Land Use (refer NPPG Table 2)	Redevelopment should only be supported if there is a net flood risk reduction. Change of use or conversion to a use with a higher vulnerability should not be permitted.	Water Compatible Development and Essential Infrastructure	Land use should be restricted to Water Compatible or Less Vulnerable development. More or Highly Vulnerable development may only be considered if Exception Test can be passed			Land use should be restricted to Water Compatible or Less Vulnerable development. More or Highly Vulnerable development may only be considered if Exception Test can be passed		
DEVELOPMENT CONTROL RECOMMENDATIONS								
Detailed Flood Risk Assessment (FRA)	Required	Required	Required			Required		
Ground Floor Level	Ground floor levels should be situated above the 1% chance in any one year plus climate change fluvial flood level plus an appropriate freeboard allowance defined in accordance Section 7.6.2. Ground floor levels should be situated above the Thames 2100 Year 2100 tidal flood level.	N/A	Ground floor levels should be situated above the Thames 2100 Year 2100 tidal flood level.	Flood resilient design techniques should be adopted to mitigate the potential damage to property in case of flooding. Further guidance is provided in the NPPG		Ground floor levels should be situated above the 1% chance in any one year plus climate change fluvial flood level plus an appropriate freeboard allowance defined in accordance Section 7.6.2.		
Site Access & Egress (Refer SFRA Appendix E)	For residential property, dry access is to be provided above the 1% chance in any one year fluvial flood level (including climate change) or year 2100 (from the TE2100 study) tidal flood level (whichever is greater). For non-residential property, access must be 'safe' in accordance with Defra "Flood Risk to People" (FD2320 & FD2321)	N/A	For residential property, dry access is to be provided above the year 2100 (from the TE2100 study) tidal flood level. For non-residential property, access must be 'safe' in accordance with Defra "Flood Risk to People" (FD2320 & FD2321). A dedicated 'safe haven' should be provided above the year 2100 (from the TE2100 study) flood level enable rapid escape should a failure of the defences occur. This may be provided in the form of a sheltered communal space within the building, accessed via internal stairs. It will be necessary to ensure that the safe haven is sufficient in size to safely accomodate all residents / site users.	It is essential to ensure that the nominated evacuation route does not divert evacuees onto a 'dry island' upon which essential supplies (i.e. food, shelter and medical treatment) will not be available for the duration of the flood event	For residential property, dry access must be provided above the 1% chance in any one year fluvial (including climate change) flood level. For non-residential property, access must be 'safe' in accordance with Defra "Flood Risk to People" (FD2320 & FD2321). A dedicated 'safe haven' should be provided with appropriate freeboard (Refer Section 7.6.2) above the 1% chance in any year (including climate change) flood level to enable rapid escape should a failure of the defences occur. This may be provided in the form of a sheltered communal space within the building, accessed via internal stairs. It will be necessary to ensure that the safe haven is sufficient in size to safely accomodate all residents / site users.	It is essential to ensure that the nominated evacuation route does not divert evacuees onto a 'dry island' upon which essential supplies (i.e. food, shelter and medical treatment) will not be available for the duration of the flood event
Basements	No basements are permitted within Zone 3b The Functional Floodplain	N/A	New basement development and extensions, conversions or additions to existing basements restricted to Less Vulnerable / Water Compatible uses only. More Vulnerable uses will only be considered if a site-specific Flood Risk Assessment and analysis of hazard/breach data specific to the development site can demonstrate that the risk to life as a result of a breach or overtopping of the defences can be managed. Highly vulnerable uses will not be permitted. Must have internal access that is above the year 2100 (from the TE2100 study) tidal flood level assuming a breach of the River Thames defences. Flood resilient design techniques must be adopted, as stated in the NPPG.	After passing the Exception Test - New basements and extensions, conversions or additions to existing basements may be permitted for residential use where they are not self-contained or used as bedrooms. Must have internal access that above the year 2100 (from the TE2100 study) tidal flood level assuming a breach of the River Thames defences. Flood resilient design techniques must be adopted, as stated in the NPPG.	New basement development and extensions, conversions or additions to existing basements restricted to Less Vulnerable / Water Compatible uses only. More Vulnerable uses will only be considered if a site-specific Flood Risk Assessment and analysis of hazard/breach data specific to the development site can demonstrate that the risk to life as a result of a breach or overtopping of the defences can be managed. Highly vulnerable uses will not be permitted. Must have internal access with an appropriate allowance for freeboard (refer Section 7.6.2) above the 1% chance in any one year (including climate change) fluvial flood level. Flood resilient design techniques must be adopted, as stated in the NPPG.	After passing the Exception Test - New basements and extensions, conversions or additions to existing basements may be permitted for residential use where they are not self-contained or used as bedrooms. Must have internal access with an appropriate allowance for freeboard (refer Section 7.6.2) above the 1% chance any one year (including climate change) fluvial flood level. Flood resilient design techniques must be adopted, as stated in the NPPG.

Site Runoff	Implement SuDS to ensure that runoff from the site (post redevelopment), as a minimum, is not increased. A reduction in site runoff should be sought, aiming to achieve greenfield run-off rates, or reduce run-off rates by at least 50% over current levels. Any SuDS design must take due account of groundwater and geological conditions. Infiltration techniques (including, for example, soakaways) are unlikely to be effective within areas overlying London Clay.
Buffer Zone	A minimum buffer zone must be provided to 'top of bank' within sites immediately adjoining the River Thames. A minimum of 16m for the Tidal River Thames and 8m for the Fluvial River Thames. Advice must be sought from the Environment Agency at an early stage.
Other	Ensure that the proposed development does not result in an increase in the risk of flooding (from all sources) within adjoining properties. This may be achieved by ensuring (for example) that the existing building footprint is not increased, that overland flow routes are not truncated by buildings and/or infrastructure, or hydraulically linked compensatory flood storage is provided within the site (or upstream)

7.6.3 Basements

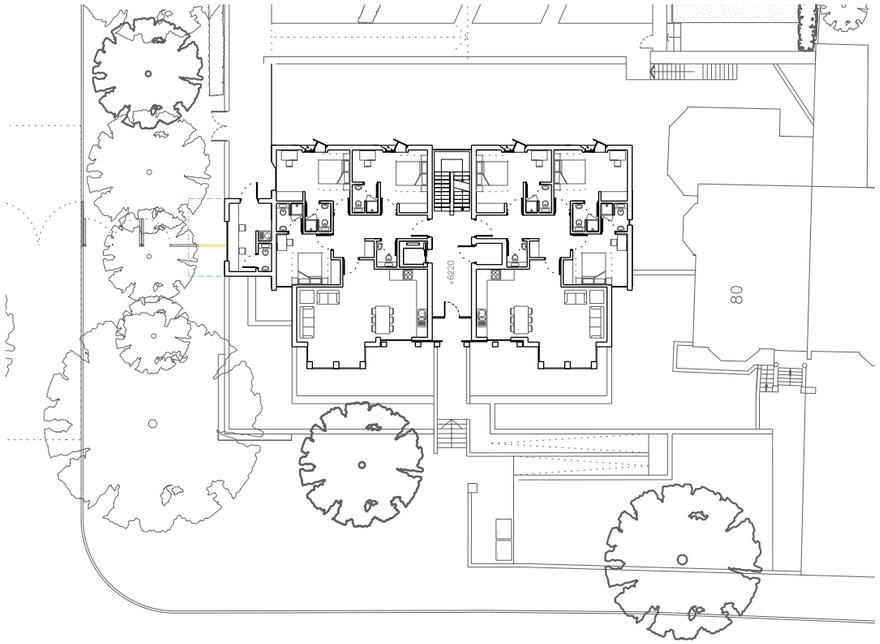
329. Basements represent a particularly high risk to life within flood affected areas of the Borough, and it is essential that careful consideration is given to their design and use. Basements may be subject to very rapid inundation as floodwater from all sources moves across the floodplain, and it is essential that the minimum design requirements set out in Section 7.4.6 (Page 47) are rigorously adhered to.

330. A summary of the main basement development requirements is provided below:

Flood Zone 3b (Functional Floodplain)	No basement permitted
Flood Zone 3a (Tidal / Fluvial)	**Area of Extreme, Significant and Moderate Breach Hazard**[38] **New Basements:** - Restricted to Less Vulnerable / Water Compatible use only. - More vulnerable uses will *only* be considered if a site-specific Flood Risk Assessment demonstrates that the risk to life can be managed. - Highly vulnerable uses will not be permitted. **Existing Basements:** - No basement extensions, conversions or additions for Highly Vulnerable uses. - More vulnerable uses will *only* be considered if a site-specific Flood Risk Assessment demonstrates that the risk to life can be managed. **Area of Low or No Breach Hazard** **New Basements:** - After passing the Exception Test, basements are permitted for residential use where they are not self-contained or used for bedrooms. **Existing Basements:** - Basement extensions, conversions or additions maybe permitted for existing developments where they are not self-contained or used for bedrooms. *(Refer Section 7.4.6 (Basements) for criteria)*
Flood Zone 2	**New Basements:** - After passing the Exception Test, basements are permitted for residential use where they are not self-contained or used for bedrooms. **Existing Basements:** - Basement extensions, conversions or additions maybe permitted for existing developments where they are not self-

[38] Refer to maps in Appendix C to determine tidal breach hazard rating

Appendix C – Site Plans/ Supporting Information



for pre application

Rev	Date	Amendment
-	13.02.18	Issued following the Pre-Application concept meeting (09.02.18)

WALTERS & COHEN ARCHITECTS

2 Wilkin Street
London
NW5 3NL

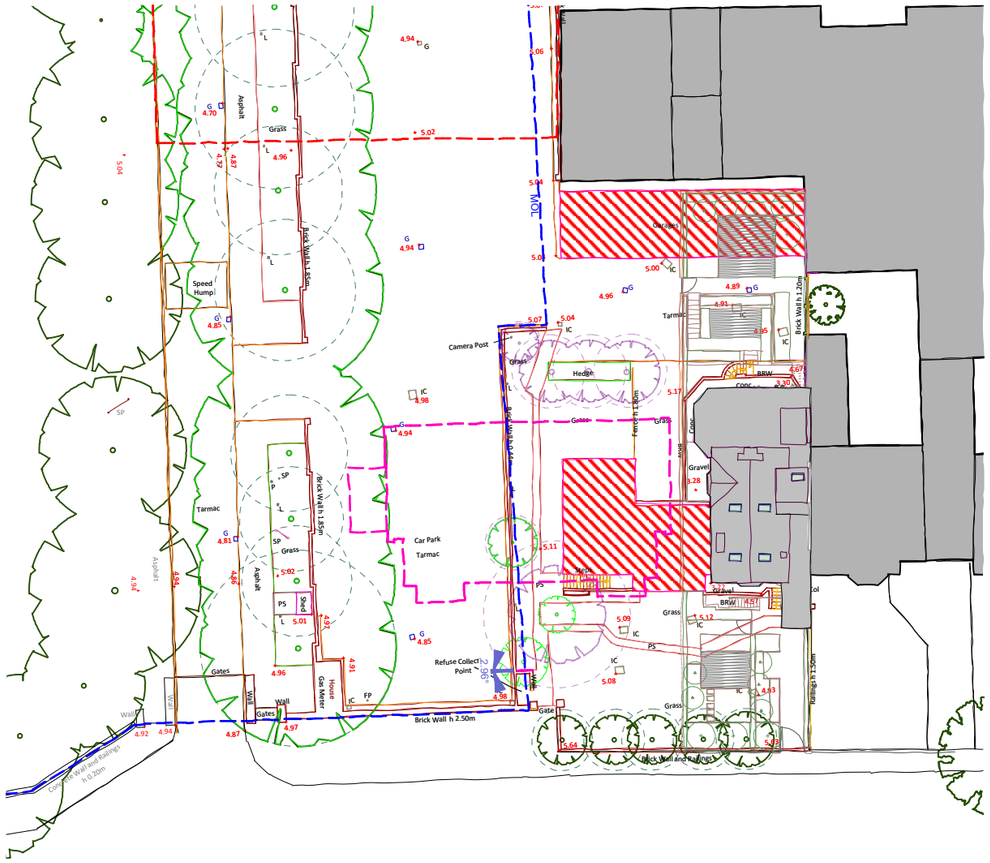
Telephone 020 7428 9751
Facsimile 020 7428 9752

mail@waltersandcohen.com

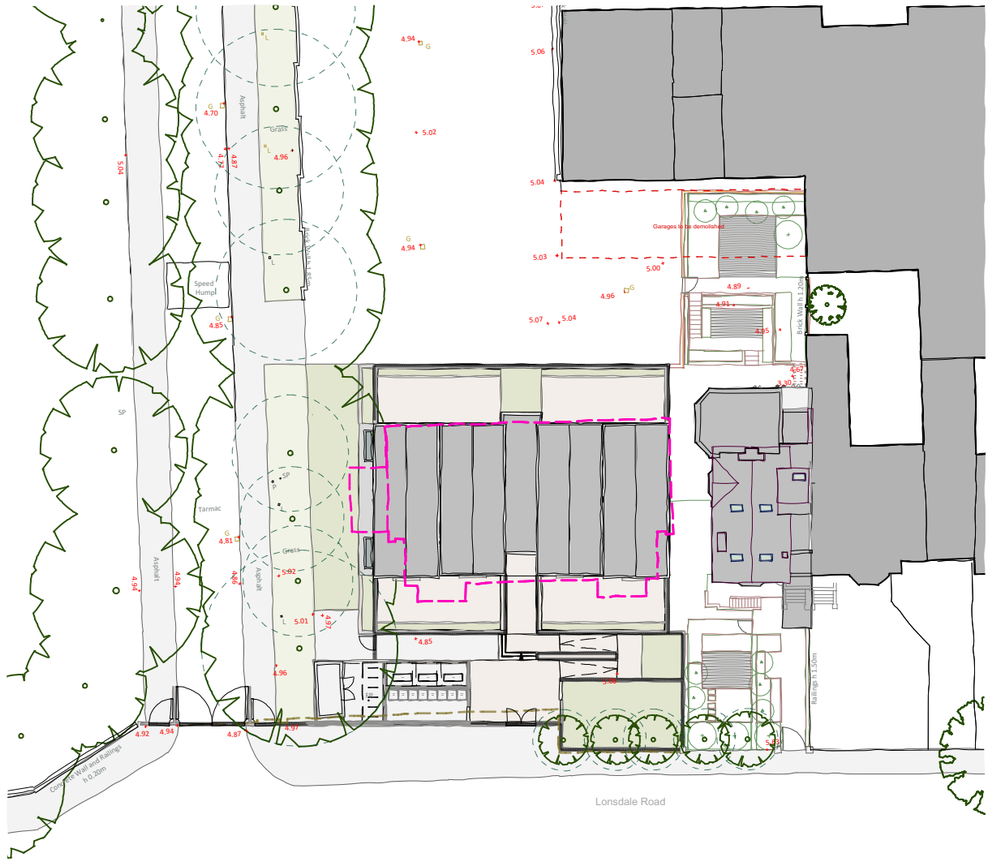
82 Lonsdale Road

Proposal approved by 08/17160/EXT

Checked by	Scale	Date Drawn	Job No.	**Drawing No.**	Revision
MZ	/	Jan 2018	1716	**1716-PD-0000**	-



Existing site plan - 1:500@A3



Proposed site plan - 1:500@A3

Footprint approved by 08/1760/EXT

for pre application

Rev	Date	Amendment
-	14.12.17	Issued for Pre-Application concept meeting
A	13.02.18	Issued following the Pre-Application concept meeting (09.02.18)
B	02.11.18	Amended following feedback from February 2018 Pre-Appliciation and issued for further Pre-Application submission
C	26.11.18	Entrance and boundary treatment updated. Issued for Pre-Application concept meeting (12.12.18)

0 1 2 5 10 20m

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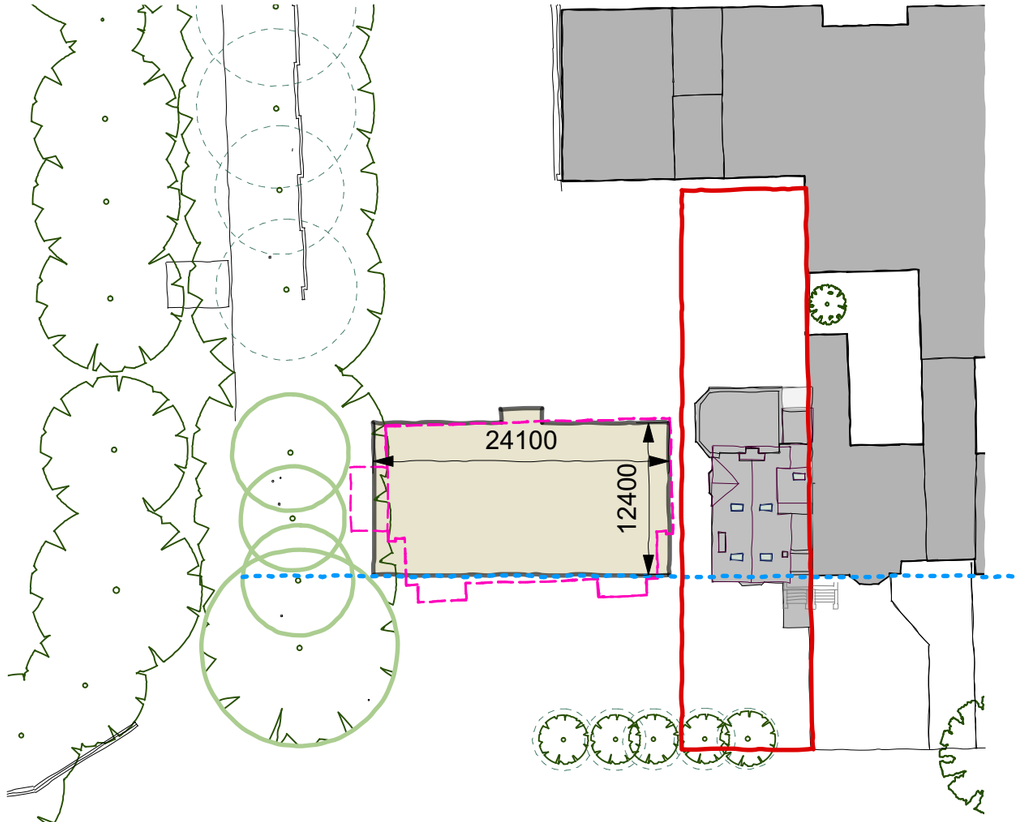
Existing and Proposed Site Plans

Checked by	Scale	Date Drawn	Job No.	**Drawing No.**	Revision
MZ	1:500 @A3	Dec 2017	1716	**1716-PD-1000**	C



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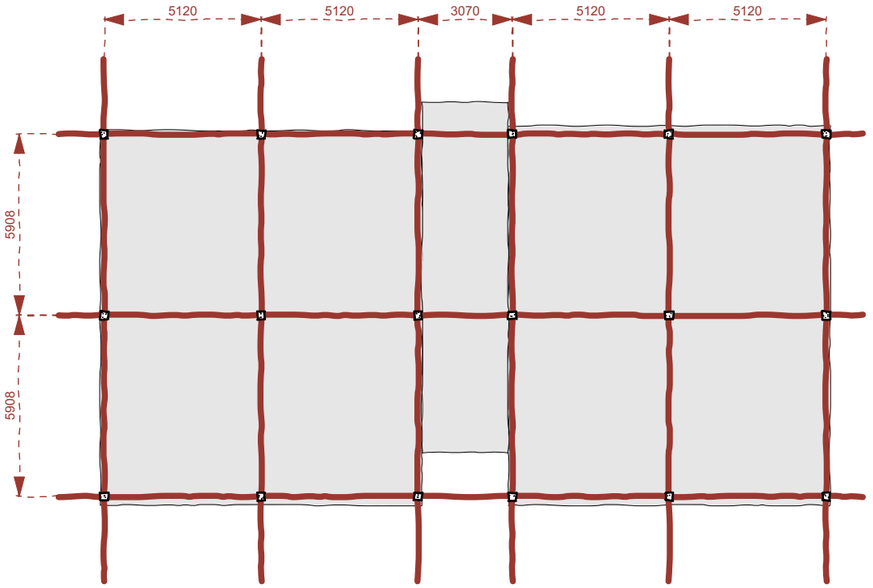
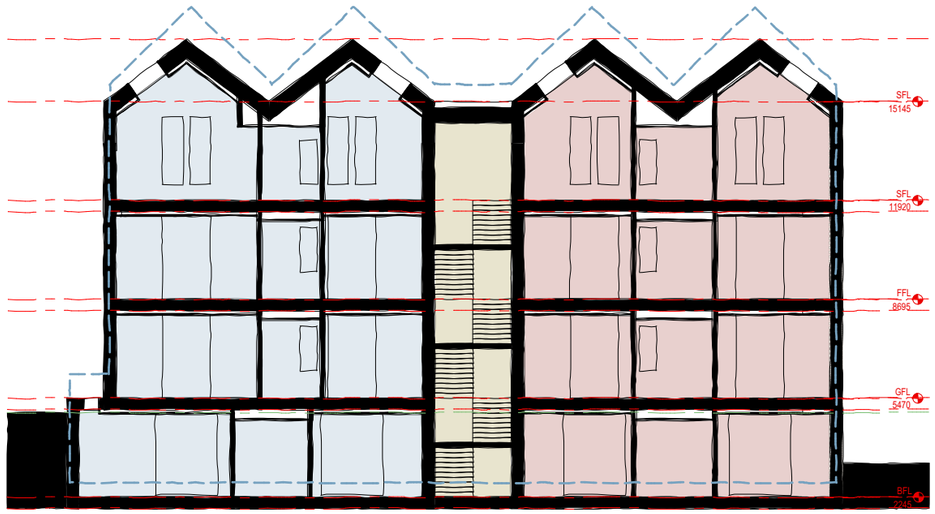


Grid - 1:200@A3



Section - 1:200@A3
Refer also to section on drawing 1716-PD-1014
with further notes on reduced height of proposal

Proposed footprint at ground floor level excluding lightwell and basment

Footprint approved by 08/1760/EXT

alignment with adjacent buildings

property boundaries of 80 lonsdale road

tree root protection area

Outline of proposal previously reviewed during Pre-Application in February 2018. Refer to drawing 1716-PD-1004 and 1005 rev A issued 13.02.18.

Use:

1 bedroom units for teachers

3 bedroom, 3 person units for graduate teachers

circulation

Gross external area: 1207 sqm

for pre application

Rev	Date	Amendment
-	14.12.17	Issued for Pre-Application concept meeting
A	13.02.18	Issued following the Pre-Application concept meeting (09.02.18)
B	02.11.18	Amended following feedback from February 2018 Pre-Appliciation and issued for further Pre-Application submission

0 1 2 5 10 20m

0 1 2 5 10m

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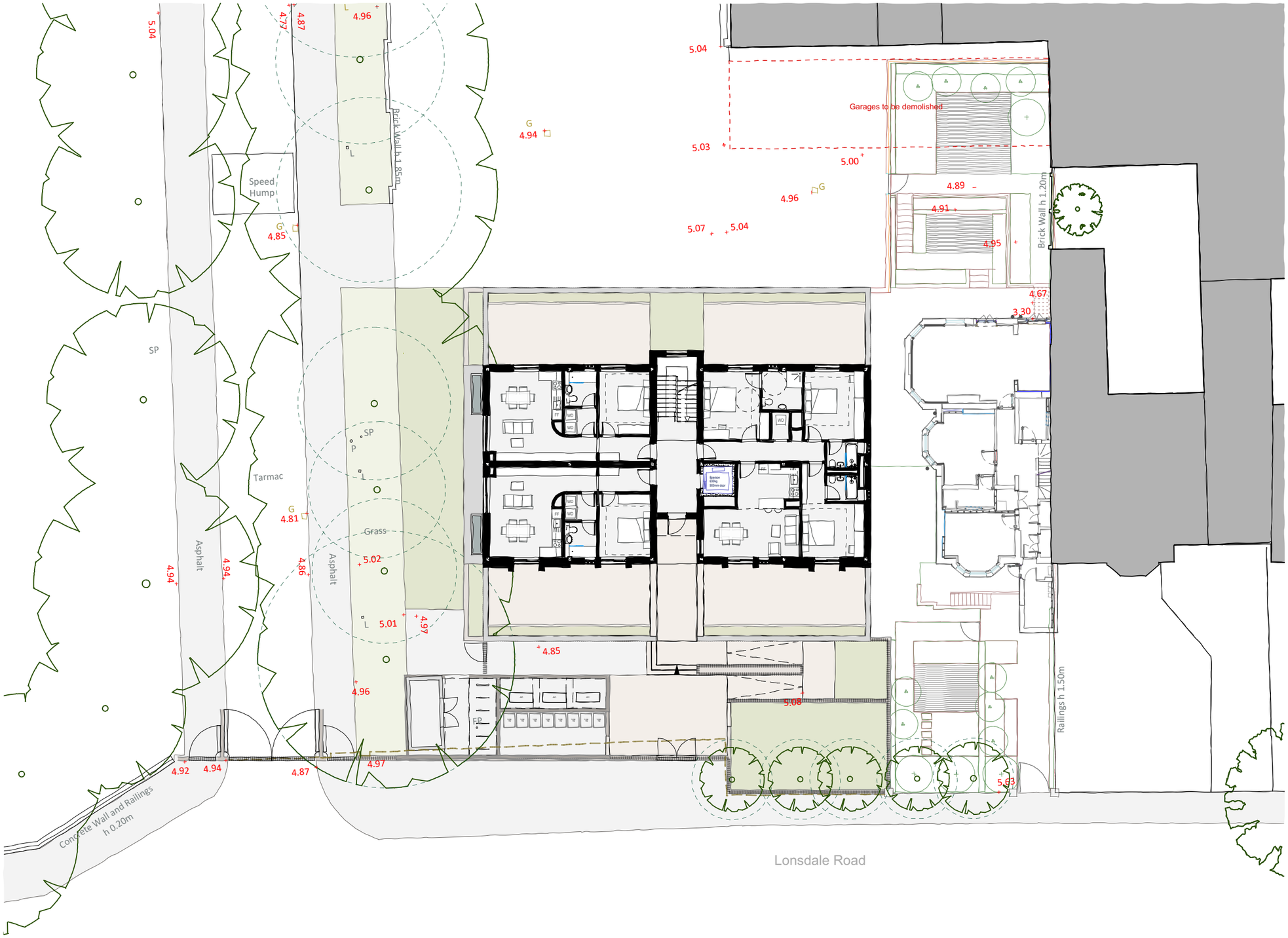
82 Lonsdale Road

Concept Diagrams

Checked by	Scale	Date Drawn	Job No.	**Drawing No.**	Revision
MZ	1:200; 1:500 @A3	Nov 2017	1716	**1716-PD-1001**	B



Ground floor site plan - 1:250@A3

for pre application

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C	26.11.18	Entrance and boundary treatment updated. Issued for Pre-Application concept meeting (12.12.18)

0 1 2 5 10m

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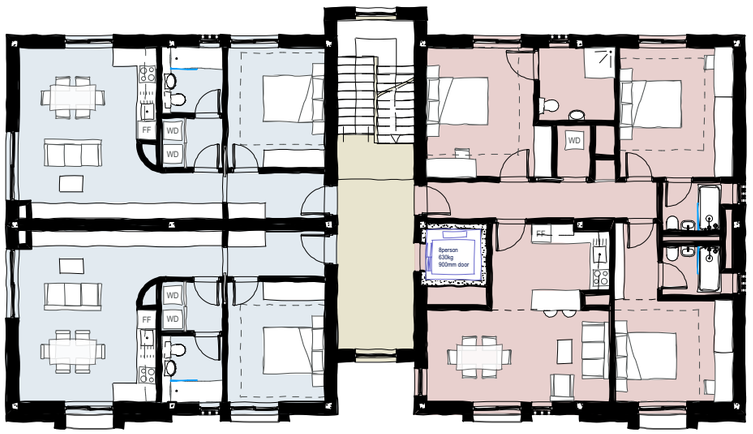
Ground floor site plan

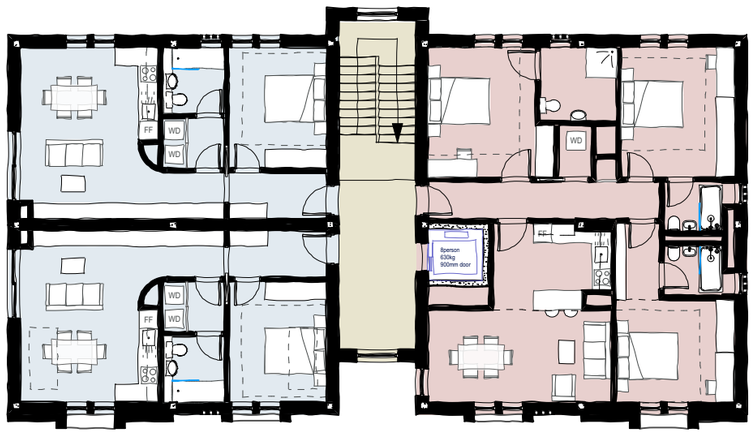
Checked by	Scale	Date Drawn	Job No.	**Drawing No.**	Revision
MZ	1:250 @A3	Dec 2017	1716	**1716-PD-1002**	C

Lower ground floor - 1:200@A3

Ground floor - 1:200@A3



First floor - 1:200@A3



Second floor - 1:200@A3

1 bedroom units for teachers
8 no; GIFA: 56 sqm / 62 sqm

3 bedrooms, 3 person units for graduate teachers
4 no; GIFA: 111 sqm

circulation

for pre application

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0 1 2 5 10m

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Plans

Checked by	Scale	Date Drawn	Job No.	**Drawing No.**	Revision
MZ	1:200 @A3	Dec 2017	1716	**1716-PD-1003**	B

South elevation - 1:400@A3

West elevation - 1:400@A3

Streetscape / Context Study - 1:250@A3

Outline approved by 08/1760/EXT

Outline of proposal previously reviewed during Pre-Application in February 2018. Refer to drawing 1716-PD-1004 and 1005 rev A issued 13.02.18.

for pre application

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0 1 2 5 10 20m

0 1 2 5 10m

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Elevations / Context Study

Checked by	Scale	Date Drawn	Job No.	Drawing No.	Revision
MZ	1:400@A3; 1:250@A3	Dec 2017	1716	1716-PD-1004	C

South elevation - 1:100 @A3

for pre application

Rev	Date	Amendment
-	13.02.18	Issued following the Pre-Application concept meeting (09.02.18)
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0 1 2 5m

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South Elevation

Checked by	Scale	Date Drawn	Job No.	Drawing No.	Revision
MZ	1:100 @A3	Jan 2018	1716	1716-PD-1005	B

Form and Mass Analysis

for pre application

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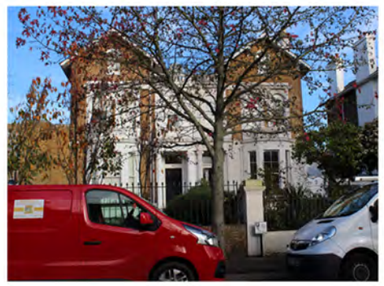
Streetscape / Form and Mass Analysis

Checked by	Scale	Date Drawn	Job No.	**Drawing No.**	Revision
MZ	/	Jan 2018	1716	**1716-PD-1006**	A



80-78

2 bay
pitch-flat-pitch

76-74

2 bay
pitch-flat-pitch

72-70-68

3 bay
tower-flat-tower

66-64-62

3 bay
pitch-pitch-pitch

60-58

2 bay
flat-pitch-flat

56-54

2 bay
pitch-flat

52

1 bay
pitch

50-48

2 bay
pitch-tower-pitch

46-46a

2 bay
pitch-flat

44-42a-42

3 bay
flat-flat-tower

Streetscape / Existing Typologies

for pre application

Rev	Date	Amendment
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Streetscape / Existing typologies

Checked by	Scale	Date Drawn	Job No.	**Drawing No.**	Revision
MZ	/	Jan 2018	1716	**1716-PD-1007**	-

for pre application

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-	02.11.18	Issued for Pre-Application submission
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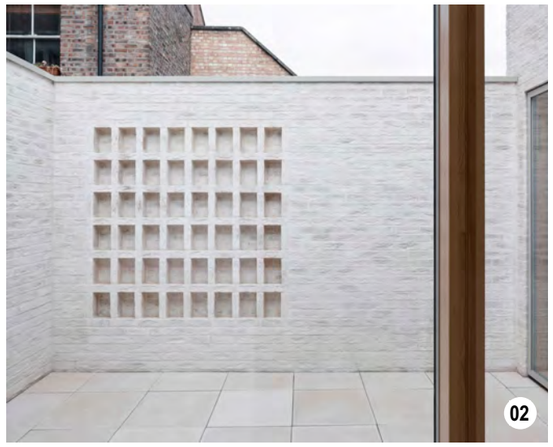
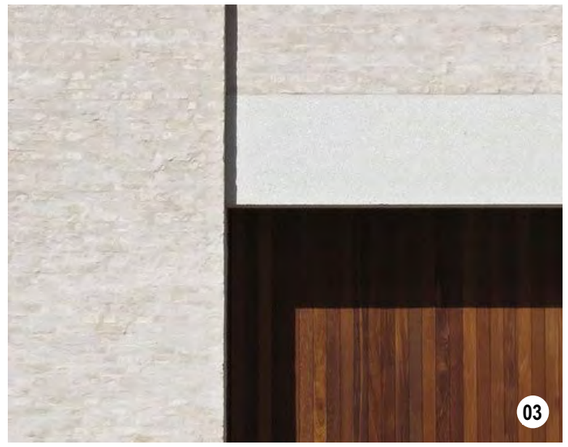
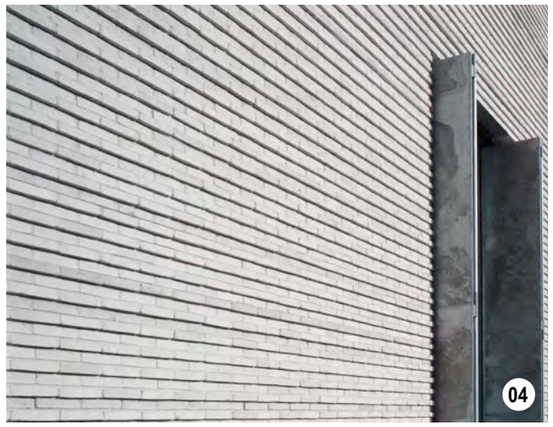
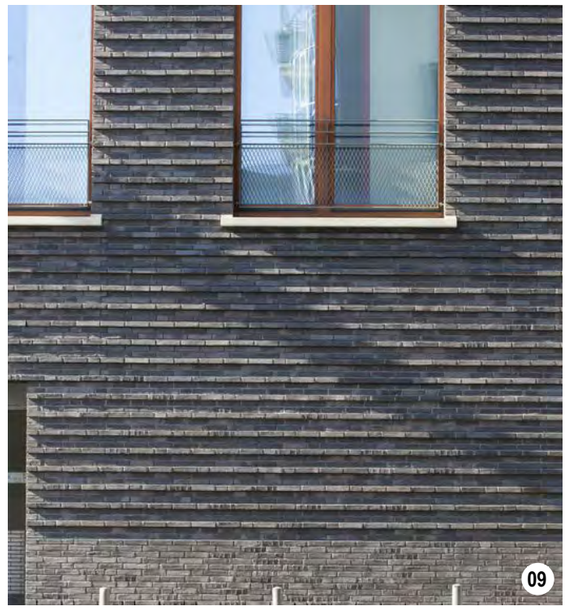
3D View

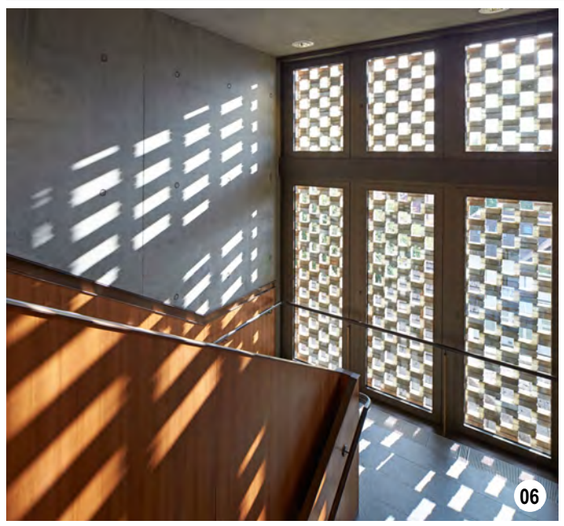
Checked by	Scale	Date Drawn	Job No.	**Drawing No.**	Revision
MZ	/	Dec 2018	1716	**1716-PD-1008**	A

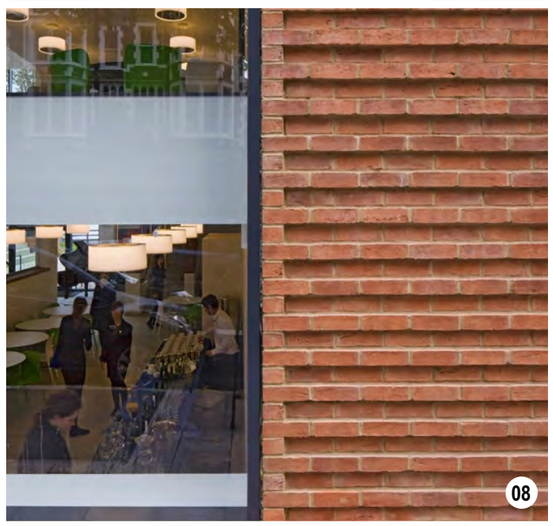












Key

Fig 01: Light brick extension on Lonsdale road opposite SPS main entrance

Fig 02,02,03,05: example of light brick

Fig 06,07: "hit and miss" perforated brickwork

Fig 04,08, 09: recessed brick banding

for pre application

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Precedent and materials

Checked by	Scale	Date Drawn	Job No.	**Drawing No.**	Revision
MZ	/	Jan 2018	1716	**1716-PD-1009**	-

West elevation - 1:100 @A3

for pre application

Rev	Date	Amendment
-	02.11.18	Issued for Pre-Application submission
A	26.11.18	Entrance and boundary treatment updated. Issued for Pre-Application concept meeting (12.12.18)

0 1 2 5m

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West Elevation

Checked by	Scale	Date Drawn	Job No.	**Drawing No.**	Revision
MZ	1:100 @A3	Nov 2018	1716	**1716-PD-1010**	A

North elevation - 1:100 @A3

for pre application

Rev	Date	Amendment
-	02.11.18	Issued for Pre-Application submission
A	26.11.18	Entrance and boundary treatment updated. Issued for Pre-Application concept meeting (12.12.18)

0 1 2 5m

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North Elevation

Checked by	Scale	Date Drawn	Job No.	**Drawing No.**	Revision
MZ	1:100 @A3	Nov 2018	1716	**1716-PD-1011**	A

East elevation - 1:100 @A3

for pre application

Rev	Date	Amendment
-	02.11.18	Issued for Pre-Application submission
A	26.11.18	Entrance and boundary treatment updated. Issued for Pre-Application concept meeting (12.12.18)

0 1 2 5m

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East Elevation

Checked by	Scale	Date Drawn	Job No.	**Drawing No.**	Revision
MZ	1:100 @A3	Nov 2018	1716	**1716-PD-1012**	A

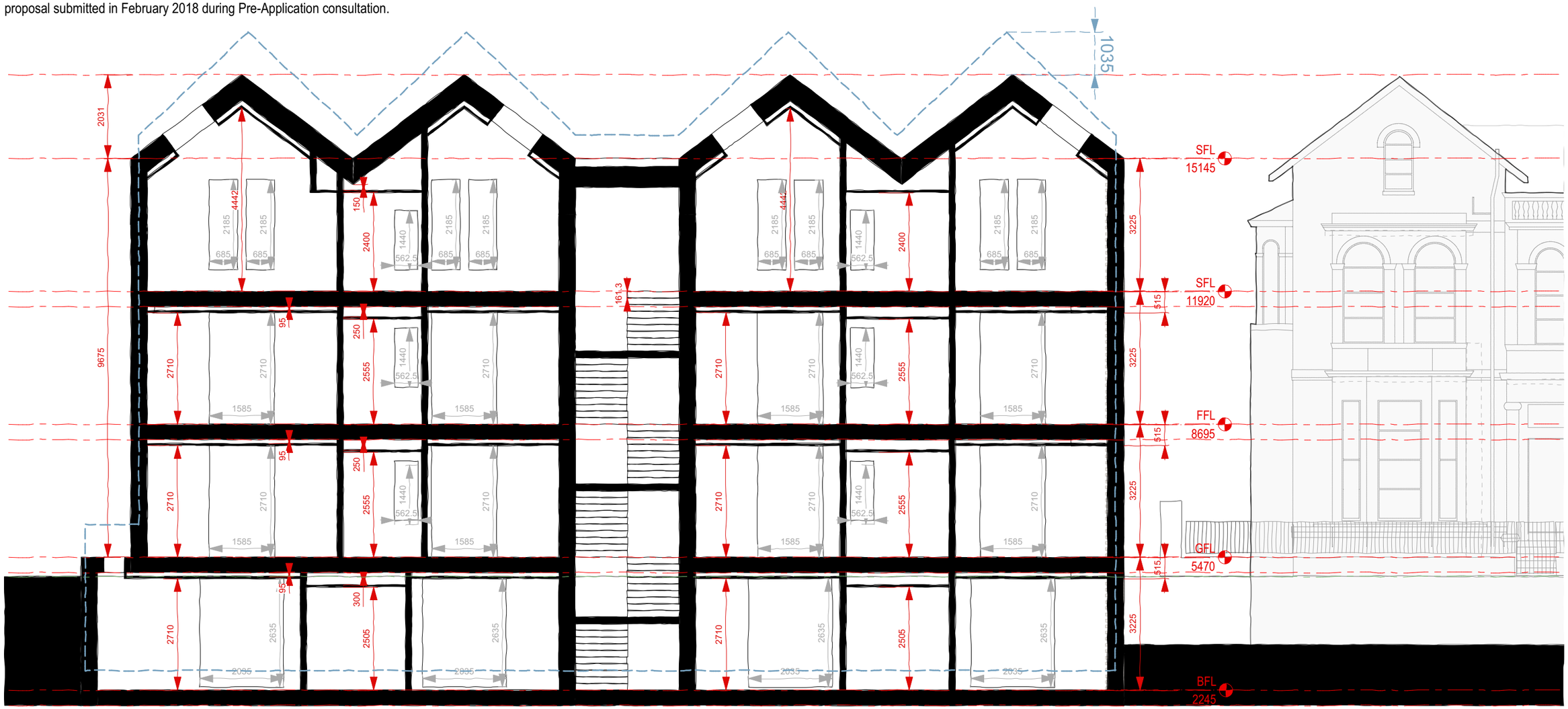
Reduction in building height explained

The crest of the retaining wall and the upper ground floor level have been set to 5.47m AOD, level with the breach flood level. This is expected to be acceptable to the Environment Agency based on current EA data and guidance received to date. As a result the building can be lowered by 750mm. A flood risk assessment will be provided with a full plans application.

In addition the floor to ceiling heights have been reviewed and the pitch of the roofs has been reduced.

In total the height of the building has been reduced by 1035mm compared with the proposal submitted in February 2018 during Pre-Application consultation.

Outline of proposal previously reviewed during Pre-Application in February 2018. Refer to drawing 1716-PD-1004 and 1005 rev A issued 13.02.18.



Section - 1:100 @A3

for pre application

Rev	Date	Amendment
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0 1 2 5m

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Section

Checked by	Scale	Date Drawn	Job No.	**Drawing No.**	Revision
MZ	1:100 @A3	Nov 2018	1716	**1716-PD-1013**	-

Existing St Paul's School entrance and boundary treatment to 82 Lonsdale Road

Proposed St Paul's School entrance and boundary treatment to 82 Lonsdale Road - 1:200@A3

for pre application

Rev	Date	Amendment
-	26.11.18	Issued for Pre-Application concept meeting (12.12.18)

0 1 2 5 10m

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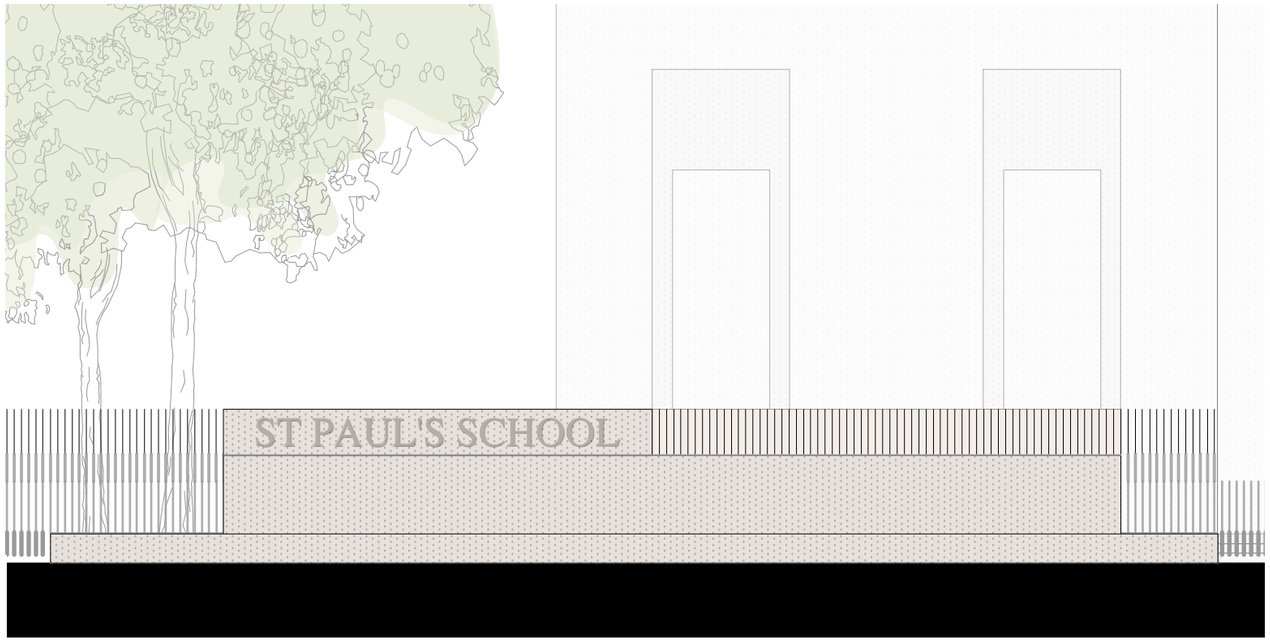
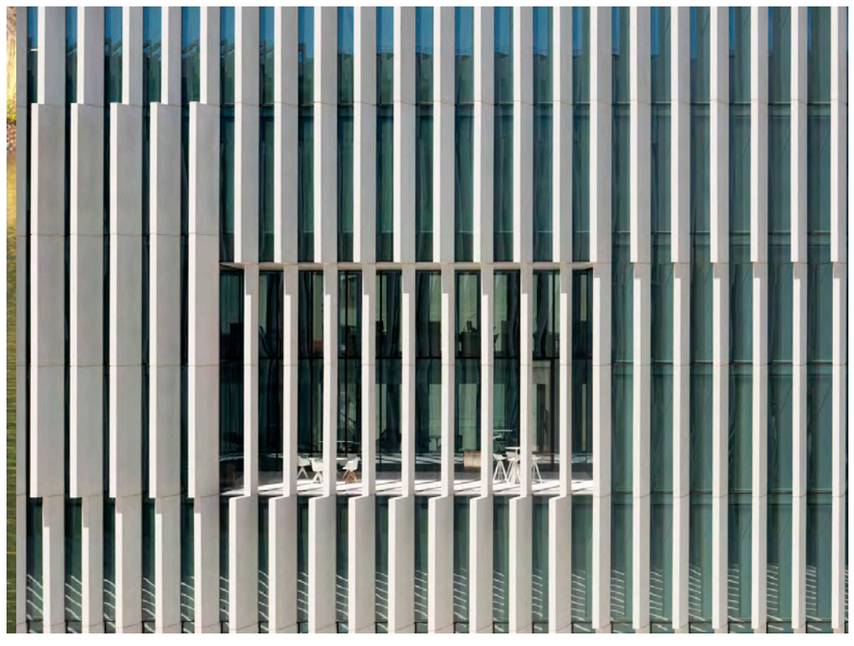
SPS entrance and boundary treatment

Checked by	Scale	Date Drawn	Job No.	**Drawing No.**	Revision
MZ	1:200@A3	Nov 2018	1716	**1716-PD-1014**	-



St Paul's School entrance and boundary treatment to 82 Lonsdale Road - 1:100@A3

St Paul's School signage potentially carved stone to match signage at reception



Metal veritcal fins to provide security above masonry wall
depth and spacing of fins will provide varying degrees of visibility into the school site which will change as viewers pass by responding to their angle of view

for pre application

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0 1 2 5 10m

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SPS entrance and materials

Checked by	Scale	Date Drawn	Job No.	**Drawing No.**	Revision
MZ	1:200@A3	Nov 2018	1716	**1716-PD-1015**	-