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Hydrotec & Engineering Consultants

Develop Design Deliver

Drainage Strategy and SuDS

59 St Mary's Road, Hayes, UB3 2JP

April 2025

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CLIENT:

Mr Faluck Patel

Reference: 25/FRP/drainage/SuDS/St Mary's Rd/Hayes

INSTRUCTION:

Hydrotec and Engineering Consultants was commissioned by Mr Faluck Patel to carry out a surface water drainage strategy for the proposed residential development at 59 St Mary's Road, Hayes, UB3 2JP.

SCHEME:

Erection of a two-bedroom dwelling to the side of the existing dwelling with associated landscape amenities.

REQUIREMENT:

Surface water drainage strategy for the proposed residential extension to assist the planning application's requirement.

DOCUMENT REVIEW & APPROVAL

Prepared by	Dr Mahmud Ahsan BSc MSc PhD MIAHR
Reviewed by	Dr Mahmud Ahsan BSc MSc PhD MIAHR
Approved by	Mr Faluck Patel

Executive Summary

A site-specific flood risk assessment (FRA) and surface water drainage strategy were conducted to assist the planning application's requirement for the proposed development on the land at 59 St Mary's Road, Hayes, UB3 2JP. The national grid reference number of the development site is TQ 09794 80841 ("the Site"). The proposed development is the erection of a two-bedroom dwelling to the side of the existing dwelling with associated landscape amenities.

The present FRA and surface water drainage strategy of the Site were made with the available information including the latest Environment Agency's (EA) flood maps data, FEH hydrological data, topographical elevation data (LiDAR), soil map data, borehole data of the British Geological Survey, recent photographs, and sewer maps data of Thames Water.

The present investigation suggests that the Site is in flood zone 1, and therefore, the Site is considered to be out of fluvial and coastal flood risk.

The Site is at a very low surface water flood risk - according to the EA's flood map; moreover, the hydrological and topographical elevation data suggest that the impact of the overland flow from the Site's surroundings would be minimal. In addition, the Site would not be a flood risk to the groundwater or reservoir flows. The Site would also not be considered a foul water flood risk.

The attenuation storage calculation was performed for the generated surface water runoff within the Site, and no external flow was taken into account from the surrounding areas. The investigation was made at 50% AEP, 10% AEP, 3.3% AEP and 1% AEP, including climate change allowance to assist the sustainable drainage systems (SuDS) design. The attenuation requirements for the whole site at 3.3% AEP and 1% AEP are $3m^3$ and $5m^3$, respectively, with climate change allowance $6m^3$ and $10m^3$.

The proposed development would have a small increase (e.g. approximately 7.73%) in impervious surface area compared to the existing condition. However, this increment of impervious surface area would not substantially deteriorate the excess surface water runoff to the Site itself or its surrounding areas.

The soil types beneath the Site would not have a good infiltration rate to attenuate excess surface water runoff. Thus, it would also not be suitable to attenuate excess surface water runoff through the underground soakaway on the Site. There is no watercourse in close proximity to the Site, and it would not be feasible to attenuate the excess runoff by a detention pond or underground storage tank on the Site due to the amenity space limitations.

There is an existing surface water sewer of the Thames Water underneath St Mary's Road. The existing dwelling discharges the outfalls into the Thames Water sewer. Therefore, in the proposed surface water drainage strategy, the excess runoff from the proposed side extension would be discharged to the Thames Water sewer in conjunction with the existing sewer drainage network.

It should be noted that the confirmation of consent agreement from Thames Water will be obtained to discharge the outfalls.

The proposed drainage network would be separate (e.g. separate surface and foul water sewers), the diameter of the surface water sewer would be 100mm, and the gradient of the pipes would be 1 in 80 or more to assist in gravity flow.

In addition, there would be grassland (lawn) in the rear gardens with permeable topsoils, assisting water quality improvement by reducing the suspended solid and silt materials. It is highly recommended for water butts to collect roof water to utilise for general washing and irrigation for gardening and plantation. Therefore, the proposed eco-friendly drainage strategy and landscape amenities would assist in creating a better drainage system.

The Site would not be a risk to fluvial flow and is not a risk to surface water drainage. Therefore, the finished ground floor level of the proposed side extension would be the same as the existing dwelling's ground floor level

The access and egress from the Site during any flooding incident would be at St Mary's Road, located in front of the Site.

The excess generated foul water flow by the proposed dwelling was estimated to be 0.005 litres/sec. It should, however, be mentioned that a confirmation of consent agreement from Thames Water will be obtained before utilising the proposed development.

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Abbreviations

AEP	Annual Exceedance Probability
CCA	Climate Change Allowance
DWF	Dry Weather Flow
DTM	Digital Terrain Model

EA	Environment Agency
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
mAOD	meter Above Ordnance Datum
NGR	National Grid Reference
OS Map	Ordnance Survey Map
SuDS	Sustainable Drainage Systems

1 Introduction

The flood risk and sustainable drainage are important aspects of any new and existing development sites. The flood, which is being enhanced in the recent time due to the global climate change effects, could make vulnerable the properties, communities, and many aspects of human life. Therefore, it is important nowadays to assess the flood risk of any new developments, and the National Planning Policy Framework[1] (NPPF) guidelines have given the authority to the Environment Agency[2] (EA) and local planning authority (LPA) to make sure that any developments should be considered the flood risk assessment from all potential sources for the planning authorisation. These are not only securing the minimum risk at the proposed development site but also reducing the risk to the other existing developments.

Generally, a new development would provide an improvement with better facilities to the users and the communities, but it should also make a satisfaction that the proposed development would not and should not deteriorate to on-site and/or off-site other existing developments in the surrounding areas during its design life. Therefore, it has been a policy of the NPPF, lead local flood authority (LLFA), LPA, water utility companies and other relevant authorities to assess and manage the sustainable surface water drainage systems of all possible sources for a proposed development before granting the planning permission.

Thus, the aim of the present site-specific flood risk assessment and drainage strategy is to assist planners and designers with blue-green sustainable drainage systems design for the proposed residential side extension and reduce the flood risk to other existing developments in the surrounding areas.

1.1 Background of the project site

The proposed development (hereafter "the Site") is the erection of a two-bedroom dwelling to the side of the existing dwelling with associated landscape amenities. According to the NPPF guidelines, the proposed development would therefore be classified as a more vulnerable

[1] National Planning Policy Framework - GOV.UK (www.gov.uk)
[2] Flood risk assessments if you're applying for planning permission - GOV.UK (www.gov.uk)

category in terms of flood risk vulnerability classification[3]. The Site is located on the land at 59 St Mary's Road, Hayes, UB3 2JP. The national grid reference number (NGR) of the Site is TQ 09794 80841. The geographical boundary of the project site lies within Hillingdon Council's remit, who is the lead local flood authority (LLFA), providing advice and guidance for sustainable drainage systems (SuDS) for this development site. The existing conditions of the Site comprise a two-storey dwelling at the end of the terrace. The front side of the Site is a concrete pavement, whereas the rear side is covered with grassland (lawn).

Figure no.	**1.1**
Title	The location of the Site
Project name	59 St Mary's Road, Hayes
Project no.	3082

Legend

The Site's extent

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Figure 1.1: The location and existing condition of the proposed development site.

Generally, the adjacent areas consist of predominantly built-up residential houses. Hayes Town Chapel is situated adjacent to the west side. St Mary's Road, which is the main access road from

[3] National Planning Policy Framework - Annex 3: Flood risk vulnerability classification - Guidance - GOV.UK (www.gov.uk)

the Site, is located in front of the Site, i.e. on the north side. There is no watercourse in close proximity to the Site.

A satellite photograph of the existing condition of the project site is shown in Figure 1.1, and the layout of the proposed development is given in Figure 1.2 in addition to the detailed layouts of the existing and proposed developments in Appendix I and II, respectively. The total land surface of the proposed development site is approximately 375m^2. However, the actual proposed side extension of the existing building is less than 250m^2, and therefore, it would be classified as a minor development - according to the Environment Agency's Standing Advice.[4]

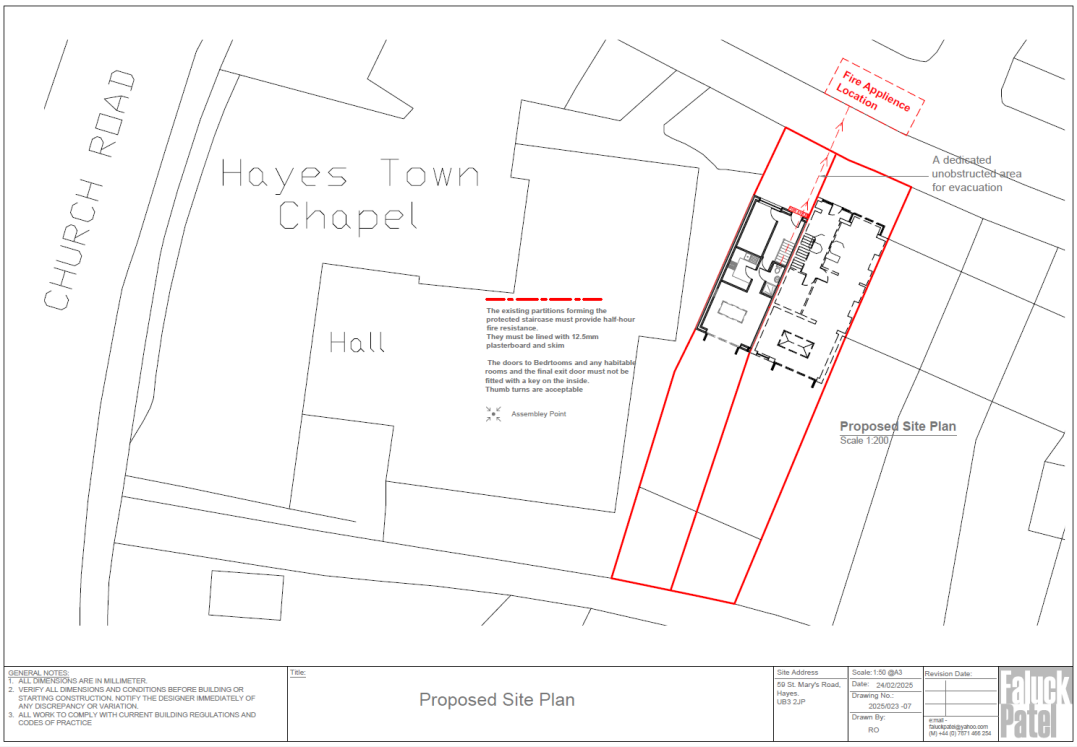

Figure no.	**1.2**	**Legend**	HEC Hydrotec & Engineering Consultants
Title	The layout of the proposed development		
Project name	59 St Mary's Road, Hayes		
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Figure 1.2: The layout of the proposed development.

[4] https://www.gov.uk/guidance/flood-risk-and-coastal-change#para51

2 Potential sources of the flood risk

The proposed development is the erection of a two-bedroom dwelling to the side of the existing dwelling with associated landscape amenities; thus, it is a requirement by LLFA to ensure the provision of appropriate flood risk assessment and sustainable drainage of the surface water within the development to promote safe and resilient communities, assisted by the Environment Agency[5] (EA) and LLFA.

2.1 Fluvial and coastal flood risk

The Environment Agency's flood map[6] indicates that the Site is located in flood zone 1, a risk of flooding less than 0.1% AEP (Annual Exceedance Probability), i.e. less than 1 in 1000-year flood event for the fluvial or coastal flows (Figure 2.1). Therefore, the proposed development site is considered to be out of either fluvial or coastal flows.

[5] Flood risk assessments if you're applying for planning permission - GOV.UK (www.gov.uk)
[6] Flood map for planning - GOV.UK (flood-map-for-planning.service.gov.uk)

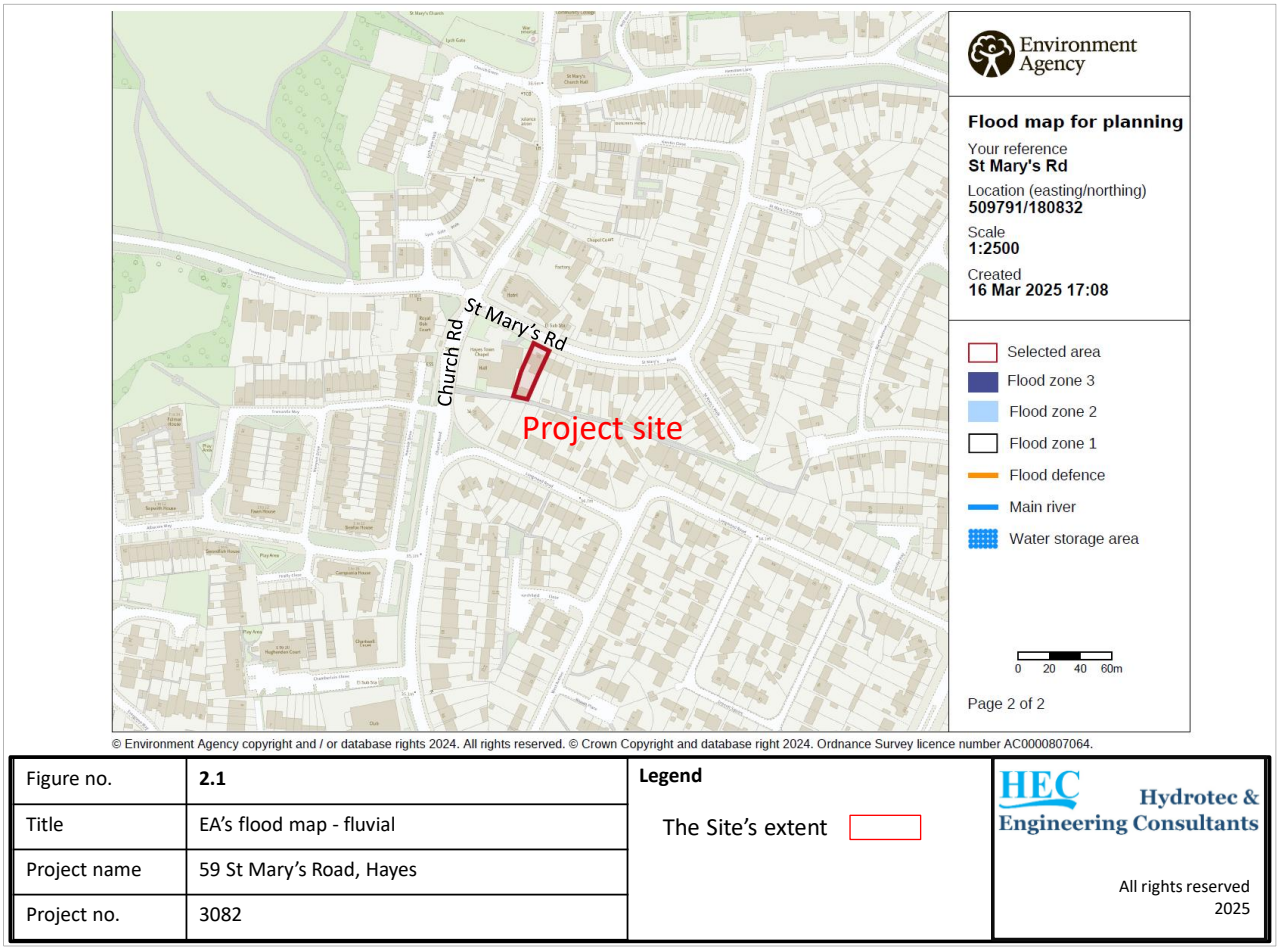

Figure 2.1: The fluvial and coastal flood risk at the Site - flood zone 1, the land having flood risk less than 0.1% AEP fluvial or coastal flows (reference – EA's flood map[7]).

2.2 Groundwater or reservoir flood risk

The EA's flood map[8] suggests that the Site is not at risk of flooding from the groundwater or reservoir flows (Figure 2.2).

[7] https://flood-map-for-planning.service.gov.uk/
[8] https://check-long-term-flood-risk.service.gov.uk/ground-water

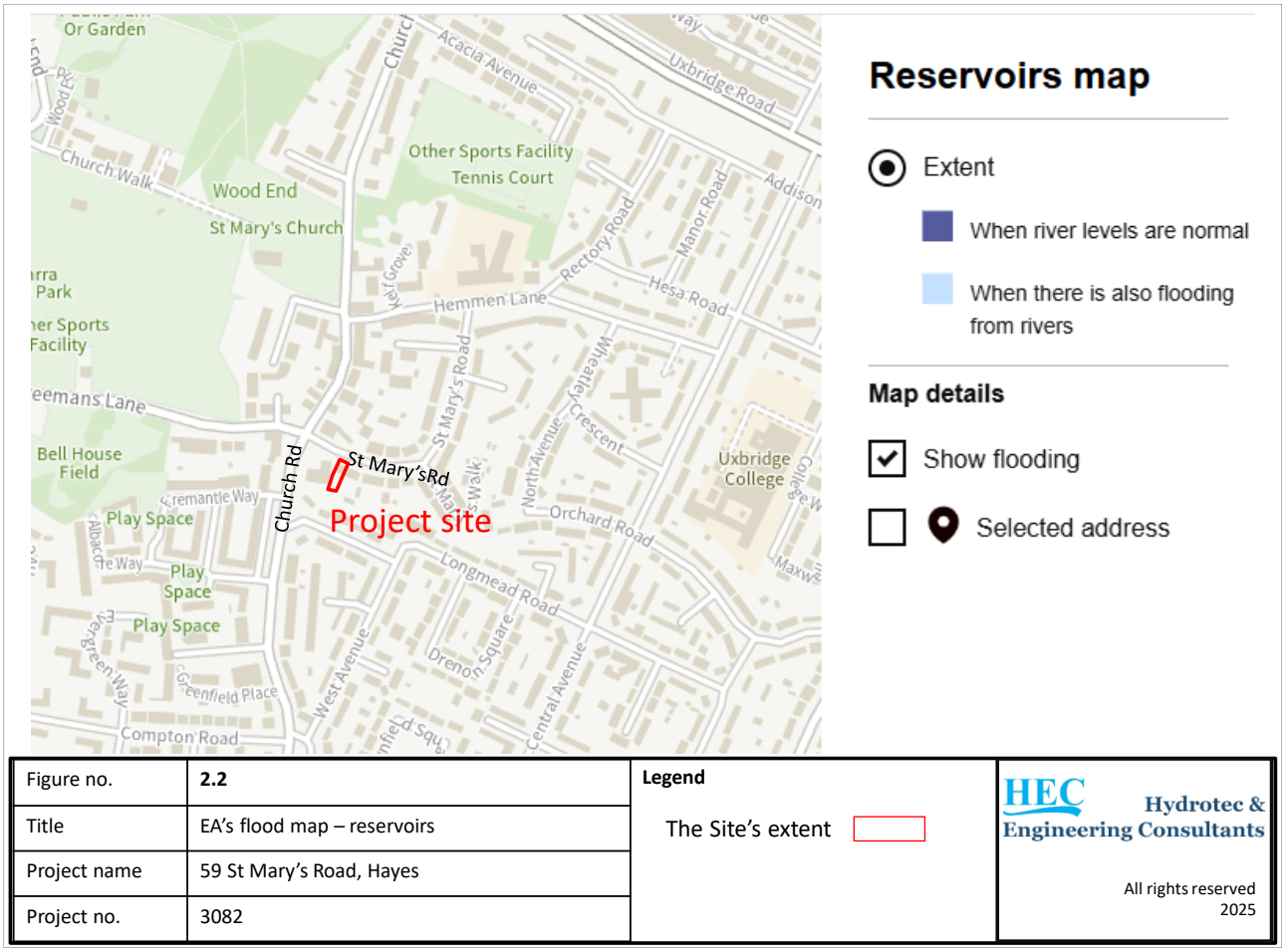

Figure no.	**2.2**	**Legend**	HEC Hydrotec & Engineering Consultants
Title	EA's flood map – reservoirs	The Site's extent	
Project name	59 St Mary's Road, Hayes		
Project no.	3082		

Figure 2.2: Groundwater/reservoir flow at the Site – not a flood risk against the reservoir or groundwater flows (reference – EA's flood map[9]).

There is no borehole data available on the Site; however, the nearest available borehole data from the British Geological Survey[10] is approximately 900m away to the northeast. The data were recorded in April 2003. The grid location of the test site is easting 510690 and northing 180860; see also Appendix III. The ground level of the test site is approximately 31.70mAOD, whereas the average ground level of the proposed extension is approximately 35.80mAOD, i.e. 4.1m above the test site. The borehole data indicate that the groundwater level was detected at 5.8m below the ground surface. This suggests that the proposed development would stay approximately 9.9 above the groundwater level. Thus, the Site would not be a groundwater flood hazard.

[9] https://www.gov.uk/check-long-term-flood-risk
[10] https://www.bgs.ac.uk/datasets/geophysical-borehole-logs/

2.3 Surface water drainage

The guidance of the Environment Agency and LLFA based on the national planning policy framework[11] (NPPF) recommends avoiding the increase in surface water flooding through requirements for sustainable drainage systems (SuDS) and minimising the impervious surface area. Moreover, the NPPF para 167 suggests that "when determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment." Therefore, the surface water drainage measures should have a neutral or better effect on the risk of flooding both on and off the site, taking into account rain falling on the site and runoff from adjacent areas.

The guidelines of the NPPF, LLFA and EA take a presumption against development in a 1 in 30-year hydrological event to the surface water drainage. Development should only be allowed in an area at risk from a 1 in 100-year (with climate change allowance (CCA)) if surface water drainage is manageable without any major risk to the development itself or other surrounding areas. It should be shown that in such cases, surface water flows can be contained within the development, and any flooding flood volumes do not affect third-party lands, flood the property, or obstruct the key access/egress routes.

Therefore, to achieve the guidance's requirements for the surface water drainage at the Site, the surface water flooding mechanism at the on-site and off-site was assessed with appropriate consideration.

The EA's surface water flood map[12] (Figure 2.3) indicates that the Site would stay at a very low flood risk to surface water drainage (i.e. a very low risk means that each year this area has a chance of flooding of less than 0.1% AEP). Therefore, the Site would be considered a very low hazard to surface water drainage.

Generally, the surface water overland flow is highly affected by the topographical features which define hydrological sub-catchments. For a better understanding of the surface water runoff

[11] Op. cit.
[12] https://check-long-term-flood-risk.service.gov.uk/surface-water

around the Site, the hydrological sub-catchments were obtained from the Flood Estimation Handbook[13] (FEH22) and the data are presented in Figure 2.4.

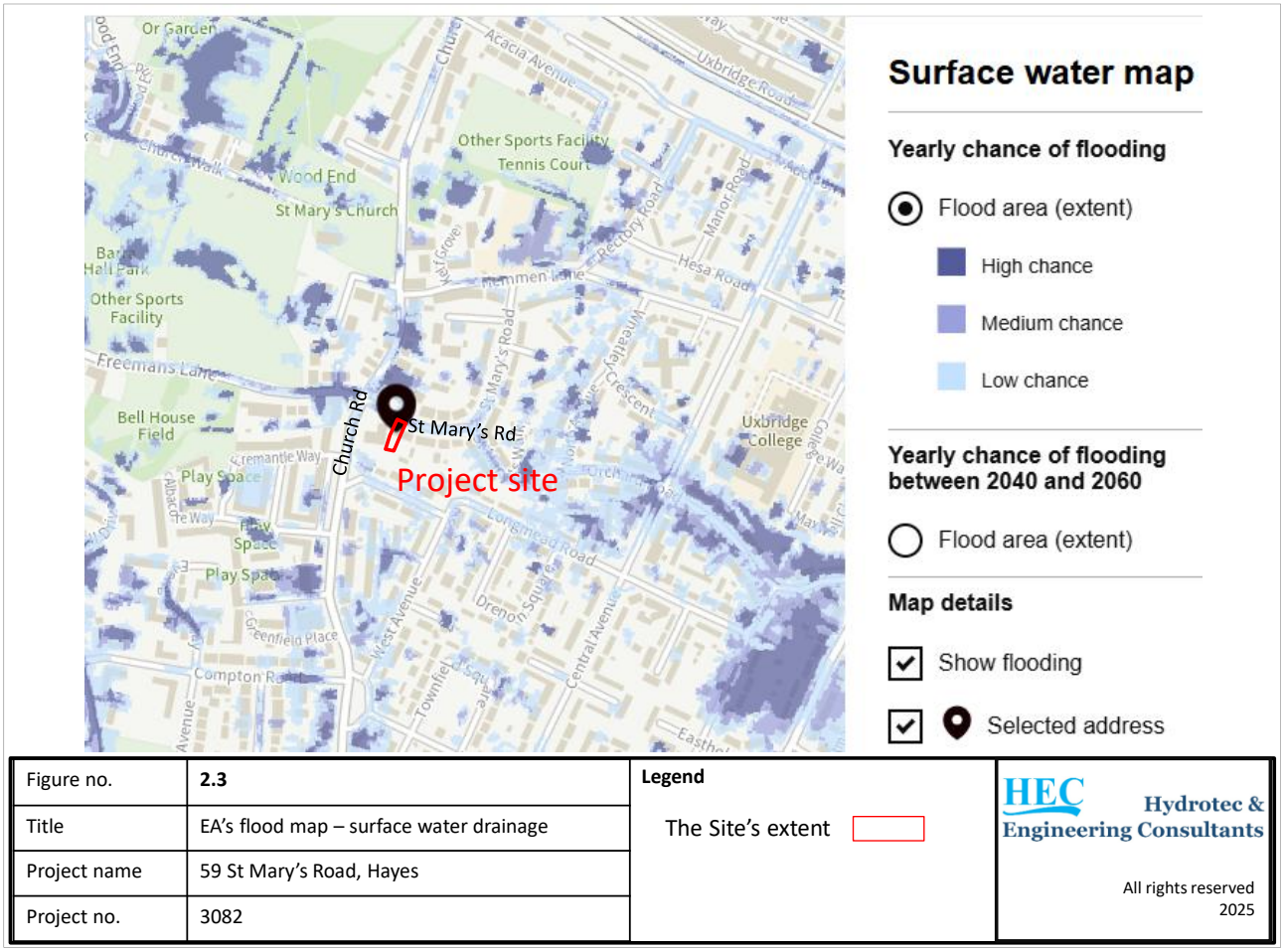

Figure 2.3: Surface water drainage at the Site – a very low flood risk against the surface water flow (reference – EA's flood map[14]).

The hydrological sub-catchments that could have a possible impact on the Site are presented in Figure 2.4, and the indicative flow paths of the surface water runoff are shown in the blue arrow lines.

The Site is located in a hydrological sub-catchment which conveys the overland flow southerly and then easterly. The surface area of this sub-catchment that could have a possible impact on the Site is relatively small, e.g. approximately 0.03 km^2. Moreover, most of the overland flow in

[13] Map - FEH Web Service (ceh.ac.uk)
[14] https://www.gov.uk/check-long-term-flood-risk

the upstream of this sub-catchment would be intercepted by the existing infrastructures and drainage networks. Thus, a very limited overland flow would reach the Site from the upstream; consequently, the Site would not be impacted by the off-site surface water runoff.

Two northern sub-catchments convey the surface water runoff easterly and would not have any contribution to the Site. The western sub-catchment would drain the surface water runoff southerly but would not contribute any overland flow to the Site.

Finally, the two southern sub-catchments convey the overland flow southerly and would stay out of the Site from any surface water runoff contribution.

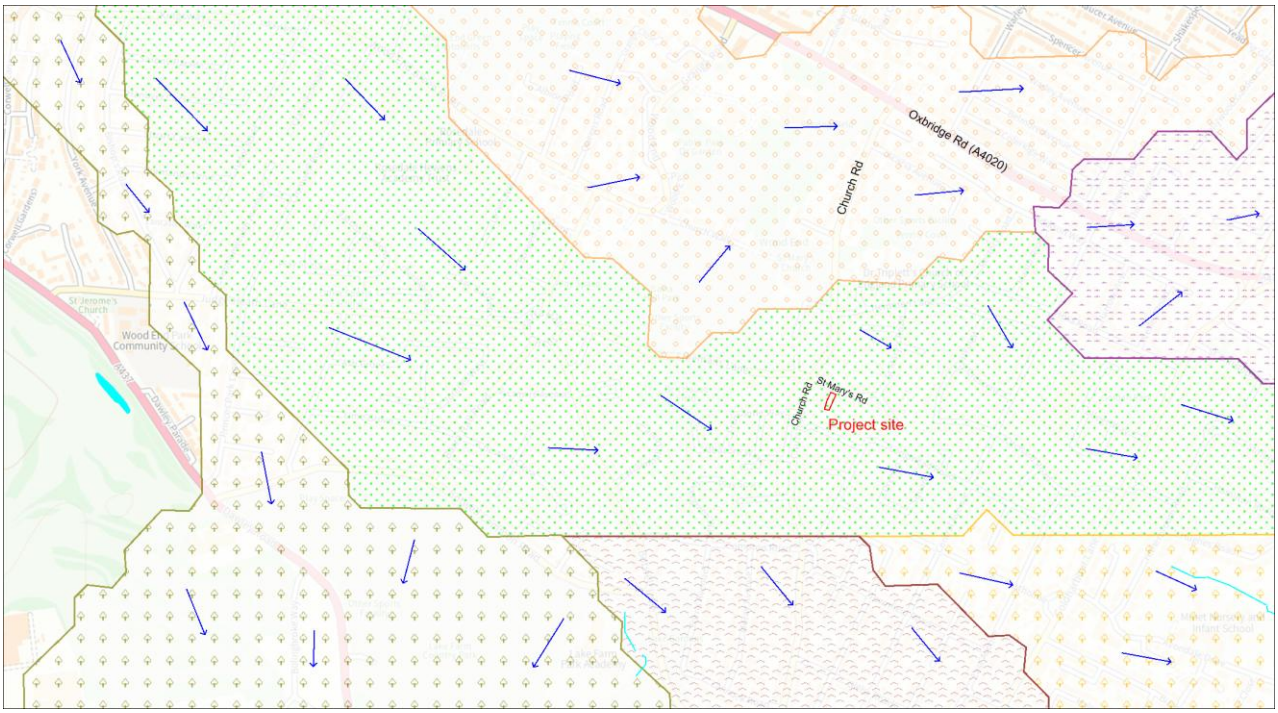

Figure no.	**2.4**
Title	FEH hydrological sub-catchments
Project name	59 St Mary's Road, Hayes
Project no.	3082

Legend

The Site's extent

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Figure 2.4: The hydrological sub-catchments around the Site (indicative overland flow paths in blue arrow lines); reference of the FEH22[15].

[15] op. cit.

Thus, the effective overland flow contribution to the Site from the adjacent areas would be minimal.

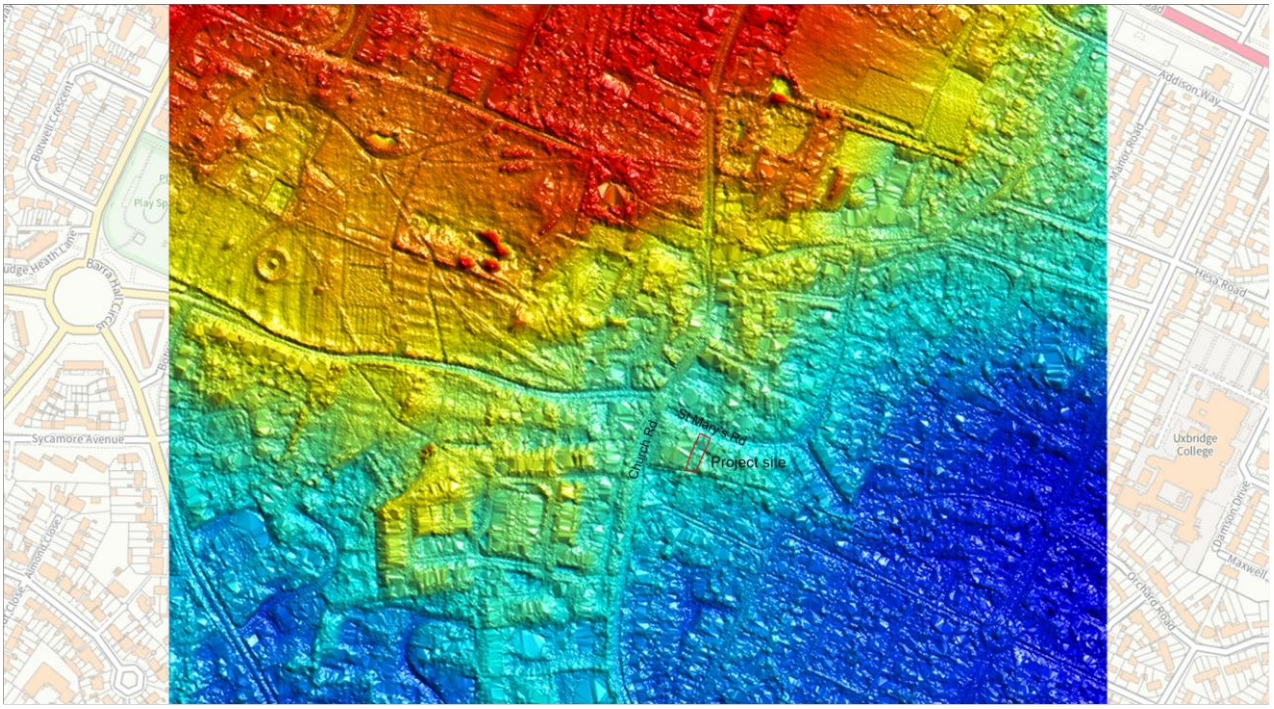

Figure no.	**2.5**
Title	The LiDAR data at the Site
Project name	59 St Mary's Road, Hayes
Project no.	3082

Legend LiDAR DTM elev., mAOD 38.98 32.43

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Figure 2.5: The LiDAR topographical elevation at the Site.

The intensity and magnitude of the overland flow and path on the ground surface would have a significant effect due to the ground elevation. Therefore, for an understanding of the complexity of the overland flow mechanisms, the topographical elevation around the Site was assessed based on the recent LiDAR[16] (Light Detection and Ranging) DTM (Digital Terrain Model) data (Figure 2.5).

[16] Defra Data Services Platform

The LiDAR elevation data suggest that the ground level in the far northern area is relatively higher. However, as mentioned earlier, surface water runoff from this area would be obstructed by local infrastructures and drainage networks and would not reach the Site.

In addition, the position of the Site is at a relatively higher ground level compared to the adjacent areas. Subsequently, there would be less surface water hazard to the Site.

Therefore, the contributing surface water runoff from the off-site to the Site would be relatively low. Subsequently, the Site would not be considered an off-site surface water flood risk. Thus, the surface water runoff generated at the proposed development would mainly be from the rainfall on the Site. Subsequently, a drainage strategy for this excess-generated surface water runoff is required and is to be managed by sustainable drainage systems (SuDS), according to the LLFA guidance.

2.4 Sewer flood risk

The proposed development is the erection of a two-bedroom dwelling to the side of the existing dwelling. Therefore, the proposed development would generate additional foul water flow by the occupants. The occupants of the existing dwelling have already been generating the foul water flow and discharge to the existing sewer drainage network of Thames Water.

The sewer drainage network data (see also Appendix IV) obtained from Thames Water indicate that the existing sewer drainage network systems around the Site are separate, i.e. conveying surface and foul water flow through the different pipes.

There is a 450mm in diameter surface water sewer under St Mary's Road, conveying flow easterly. There is a surface water manhole (reference number 8802) located in close proximity to the Site; however, there are no details of the cover and invert levels of the manhole in the Thames Water drainage network map. There is a 225mm in diameter foul water sewer beneath St Mary's Road, conveying flow westerly. There is a foul water manhole (reference number 8803) close to the Site; however, no details of the cover and invert levels are recorded in the Thames Water drainage network map.

There are no details of the existing private drainage network in the Thames Water drainage network. Therefore, a CCTV sewer drainage survey would be carried out in order to get the details of the existing on-site sewers' location, size, condition and connectivity before implementation of the proposed drainage network.

The proposed drainage networks would be separate, i.e. separate surface and foul water drainage pipes. Subsequently, there would be less wastewater flow to the Thames Water drainage networks, benefiting from less wastewater treatment by the sewage treatment works. Thus, it would be suitable to discharge the generated foul water flow from the proposed dwelling into the existing Thames Water sewer drainage network system in conjunction with the existing sewer drainage network.

For the estimation of the generated foul water by the proposed development, the standard guidelines of foul water design were followed. The foul water generation would be highly variable during the days or nights and throughout the year. Considering the standard guidelines from the Sewer for Adoption[17], the typical average dry weather flow (DWF) for this type of catchment is considered to be 150 litres per person per day. It is assumed that there would be a maximum of 3 occupants in a proposed two-bedroom dwelling. Therefore, the generated foul water flow by the proposed two-bedroom dwelling would become 0.005 litres/sec.

The general observation of the sewer drainage networks in the surrounding areas suggests that the proposed development would not significantly impact the existing sewer drainage network systems. However, a confirmation of consent agreement from Thames Water will be obtained before the utilisation of the proposed development.

[17] Sewerage Sector Guidance-approved documents | Water UK

3 Drainage strategy and flood attenuation storage requirements

The proposed development is the erection of a two-bedroom dwelling to the side of the existing dwelling with associated landscape amenities. The proposed development is therefore classified as a more vulnerable category - according to the NPPF flood risk vulnerability classification[18].

The existing ground surface on the front side of the Site is mostly concrete pavement, and therefore, it is impermeable land; see also a recent photograph in Figure 3.1. Most of the rear side is permeable land with grassland (e.g. lawn); see a recent photograph in Figure 3.2.

Figure no.	**3.1**	**Legend**	HEC Hydrotec & Engineering Consultants
Title	Existing ground surface at the front side		
Project name	59 St Mary's Road, Hayes		
Project no.	3082		

Figure 3.1: The photograph of the existing ground surface condition at the front side.

[18] National Planning Policy Framework - Annex 3: Flood risk vulnerability classification - Guidance - GOV.UK (www.gov.uk)

The total surface area of the proposed development site is approximately 375m^2. The permeable and impermeable surface areas of the pre-development and post-development are given in Table 3.1. The total impervious area of the existing development is approximately 156m^2, whereas the total impervious area of the proposed development is approximately 185m^2, containing the main house, proposed side extension, front side patios and access paths. Thus, the impervious area due to the proposed development would be increased by approximately 29m^2 or 7.73% with respect to the total area.

Figure no.	**3.2**	**Legend**	HEC Hydrotec & Engineering Consultants
Title	Existing ground surface at the rear side		
Project name	59 St Mary's Road, Hayes		
Project no.	3082		

Figure 3.2: The photograph of the existing ground surface condition at the rear side.

Table 3.1: The surface area of the pre-development and post-development at the Site.

Development	Permeable area, m^2	Impermeable area, m^2
Existing	219	156
Proposed	190	185

It should, however, be noted that the proposed side extension would be a separate dwelling, and the total land surface of the proposed dwelling is 168m^2 (e.g. 45% of the total Site) in which impermeable land is approximately 73m^2. Therefore, the proposed development would be classified as a minor development - according to the Environment Agency's Standing Advice[19].

The proposed development would slightly modify the existing land surface of the permeable area. Overall, the impervious area of the development site would be increased somewhat by the proposed development, however, it would provide better sustainable drainage systems with the proposed drainage strategy. Consequently, there would not be any deterioration of the excess surface water hazard due to the proposed development at the Site itself or its adjacent areas.

The proposed development would have a minor impact on the generated surface water runoff due to the impermeable land surface. However, to comply with the NPPF's local plan policy and LLFA guidelines, the development proposal should aim to achieve greenfield runoff rates and ensure that surface water runoff is managed as close to its source as possible. Subsequently, a proportionate reduction of the generated runoff would be managed on-site.

One of the main objectives of the surface water attenuation storage is that during the storm event, the generated surface water runoff within the Site would be retained on-site for some time. Therefore, the peak flow in the watercourses and/or drainage networks would not be increased substantially to ease the flood risk in the downstream. However, it is an acceptable policy of the LLFA with regard to the greenfield runoff rate to allow some discharge from the development site into the nearby watercourses and/or drainage network systems to reduce the cost and land space for the attenuation storage within the development site.

In the present calculation, the greenfield runoff rates were considered based on the HR Wallingford tools[20]. However, the total surface area of the Site is less than the minimum area requirement (i.e. 0.10 hectares) for these tools. Therefore, the minimum greenfield runoff rate of 5.0 litres/sec was adopted. HR Wallingford tools also recommend this value for SuDS design, and this would assist in reducing the sedimentation and blockage of the drainage pipes.

[19] https://www.gov.uk/guidance/flood-risk-and-coastal-change#para51
[20] Online tools for sustainable drainage systems (SuDS) (uksuds.com)

In order to calculate the generated surface water runoff at the Site, the hydrological data were obtained from the Flood Estimation Handbook[21] (FEH22). The cumulative rainfall depths were calculated, and the values at 1 in 2-year (50% AEP), 1in 10-year (10% AEP), 1 in 30-year (3.3% AEP) and 1 in 100-year (1% AEP) are provided in Table 3.2 up to 600mins (i.e. 10.0 hrs).

Table 3.2: The cumulative depth-duration rainfall at 50% AEP, 10% AEP, 3.3% AEP and 1% AEP at the Site.

Duration, mins	Rainfall depths, mm			
	50% AEP	10% AEP	3.3% AEP	1% AEP
15	7.38	16.14	21.67	28.11
30	9.42	20.62	27.96	36.55
45	10.63	23.40	31.75	41.62
60	11.53	25.34	34.49	45.27
90	14.26	29.48	39.55	51.55
120	16.90	32.87	43.43	56.32
180	19.98	37.10	48.38	62.78
240	22.06	39.88	51.64	67.11
300	23.58	41.82	53.95	70.18
360	24.76	43.33	55.74	72.55
420	25.69	44.54	57.17	74.47
480	26.47	45.56	58.38	76.07
540	27.15	46.45	59.41	77.44
600	27.75	47.23	60.32	78.63

The proposed development is for residential use, and therefore, the design life of the development would be 100 years. Thus, the NPPF's guidance suggests the upper-end allowance for peak rainfall when considering climate change. The upper-end peak rainfall allowances at the Site in the 2070s epochs are 35% and 40% at 3.3% AEP and 1% AEP, respectively - according to the Environment Agency's climate change allowance guidelines[22]. Subsequently, for the climate change allowance (CCA), the peak rainfall was increased by 10%, 20%, 35% and 40% at 50% AEP, 10% AEP, 3.3% AEP and 1% AEP, respectively.

[21] Map - FEH Web Service (ceh.ac.uk).
[22] Flood risk assessments: climate change allowances - GOV.UK (www.gov.uk)

Table 3.3: Surface water attenuation storage requirements at 50% AEP, 10% AEP 3.3% AEP and 1% AEP including climate change allowance at the Site.

Return periods	Storm duration, mins	Greenfield runoff rate, l/s	Volume of the surface water runoff, m^3		
			Total runoff	Attenuation req.	Attenuation req. with CCA
50% AEP	15	5.00	2	-2	-2
	30	5.00	2	-7	-7
	45	5.00	2	-12	-11
	60	5.00	1	-17	-16
	90	5.00	1	-26	-25
	120	5.00	1	-35	-35
	180	5.00	-1	-55	-54
	240	5.00	-3	-75	-74
	300	5.00	-5	-95	-95
	360	5.00	-8	-116	-115
10% AEP	15	5.00	5	1	2
	30	5.00	6	-3	-1
	45	5.00	7	-7	-5
	60	5.00	7	-11	-9
	90	5.00	7	-20	-18
	120	5.00	7	-29	-27
	180	5.00	5	-49	-46
	240	5.00	4	-68	-65
	300	5.00	1	-89	-85
	360	5.00	-1	-109	-106
3.3% AEP	15	5.00	7	3	6
	30	5.00	9	0	4
	45	5.00	10	-4	0
	60	5.00	10	-8	-3
	90	5.00	11	-16	-11
	120	5.00	11	-25	-20
	180	5.00	10	-44	-38
	240	5.00	8	-64	-57
	300	5.00	6	-84	-77
	360	5.00	4	-104	-97
1% AEP	15	5.00	10	5	10
	30	5.00	12	3	9
	45	5.00	13	0	6
	60	5.00	14	-4	3
	90	5.00	15	-12	-4
	120	5.00	15	-21	-12
	180	5.00	15	-39	-30
	240	5.00	14	-58	-48
	300	5.00	12	-78	-67
	360	5.00	10	-98	-87

The attenuation storage requirements for the proposed development were calculated at 50% AEP, 10% AEP, 3.3% AEP and 1% AEP, including climate change allowance[23] and the results are presented in Table 3.3. In Table 3.3, the 4th column is the total runoff volume (m^3) generated by the Site; the 5th column is the total runoff volume (m^3) required for attenuation, considering the 5.0 litres/sec greenfield runoff and the 6th column is the total runoff volume (m^3) required for attenuation with climate change allowance.

No external off-site runoff was taken into consideration in the present calculation, and the attenuation storage requirements for the whole Site (i.e. surface area $375m^2$) at 3.3% AEP and 1% AEP are $3m^3$ and $5m^3$, respectively, with climate change allowance $6m^3$ and $10m^3$.

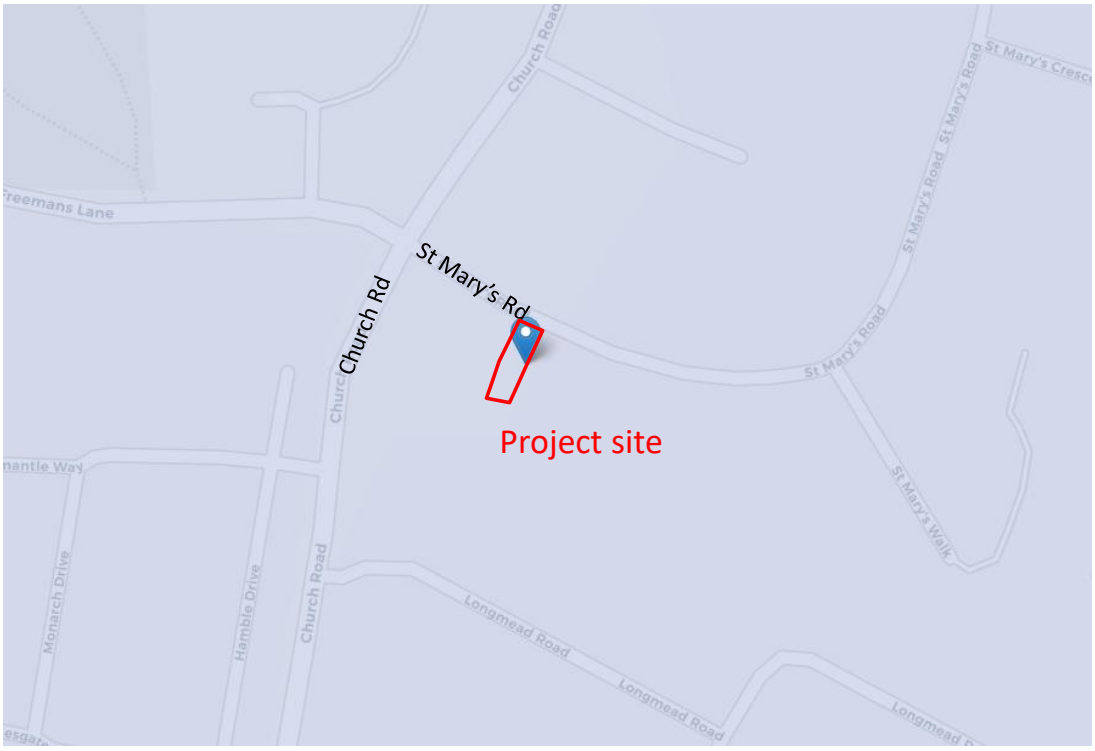


Figure no.	**3.3**	**Legend**	HEC Hydrotec & Engineering Consultants
Title	Soilscapes map data at the Site	The Site's extent	
Project name	59 St Mary's Road, Hayes		
Project no.	3082		

Figure 3.3: The soil types beneath the Site – loamy soils with naturally high groundwater (reference - Soilscapes map data of Cranfield University[24]).

[23] Peak rainfall climate change allowances by management catchment - GOV.UK (www.gov.uk)
[24] Soilscapes soil types viewer - National Soil Resources Institute. Cranfield University (landis.org.uk)

To assess the feasibility of the attenuation for the generated surface water runoff through underground infiltration, the soil types beneath the Site were assessed based on the Soilscapes map data of Cranfield University[25]. Generally, soil types beneath the Site are loamy soils with naturally high groundwater (Figure 3.3). However, the Site would not be a groundwater flood risk as explained in Section 2.2 above. Moreover, the infiltration rate of the soils beneath the Site would not be good.

It should be mentioned that an infiltration rate of 15mm/hr was applied to permeable surfaces in the attenuation storage requirements calculation. It should, however, be noted that there is no in-situ soil percolation data available at the project site during the publication of the report.

Furthermore, due to space limitations, it would not be suitable to attenuate excess surface water runoff through soakaway. The proposed two-bedroom dwelling would be an independent house, and the width of the land surface is just under 5m; therefore, it would not be feasible to attenuate surface water runoff by an underground storage tank.

There is no watercourse in close proximity to the Site, and it would not be feasible to attenuate excess surface water in a detention pond on the Site due to the space limitations.

There is an existing surface water sewer drainage network in close proximity to the Site, e.g., the surface water sewer of Thames Water beneath St Mary's Road. In addition, there is a surface water manhole located in close proximity to the Site.

At present, all the on-site surface water runoff is discharged to nearby overground and/or existing sewer drainage networks. The proposed development would have a relatively small increase of the impervious surface area; therefore, it would not substantially deteriorate the excess surface water runoff to the Site compared to the existing condition.

Thus, in the proposed surface water drainage strategy, the excess surface water runoff would be discharged to the existing surface water sewer at St Mary's Road in conjunction with the existing sewer drainage network.

[25] https://www.landis.org.uk/

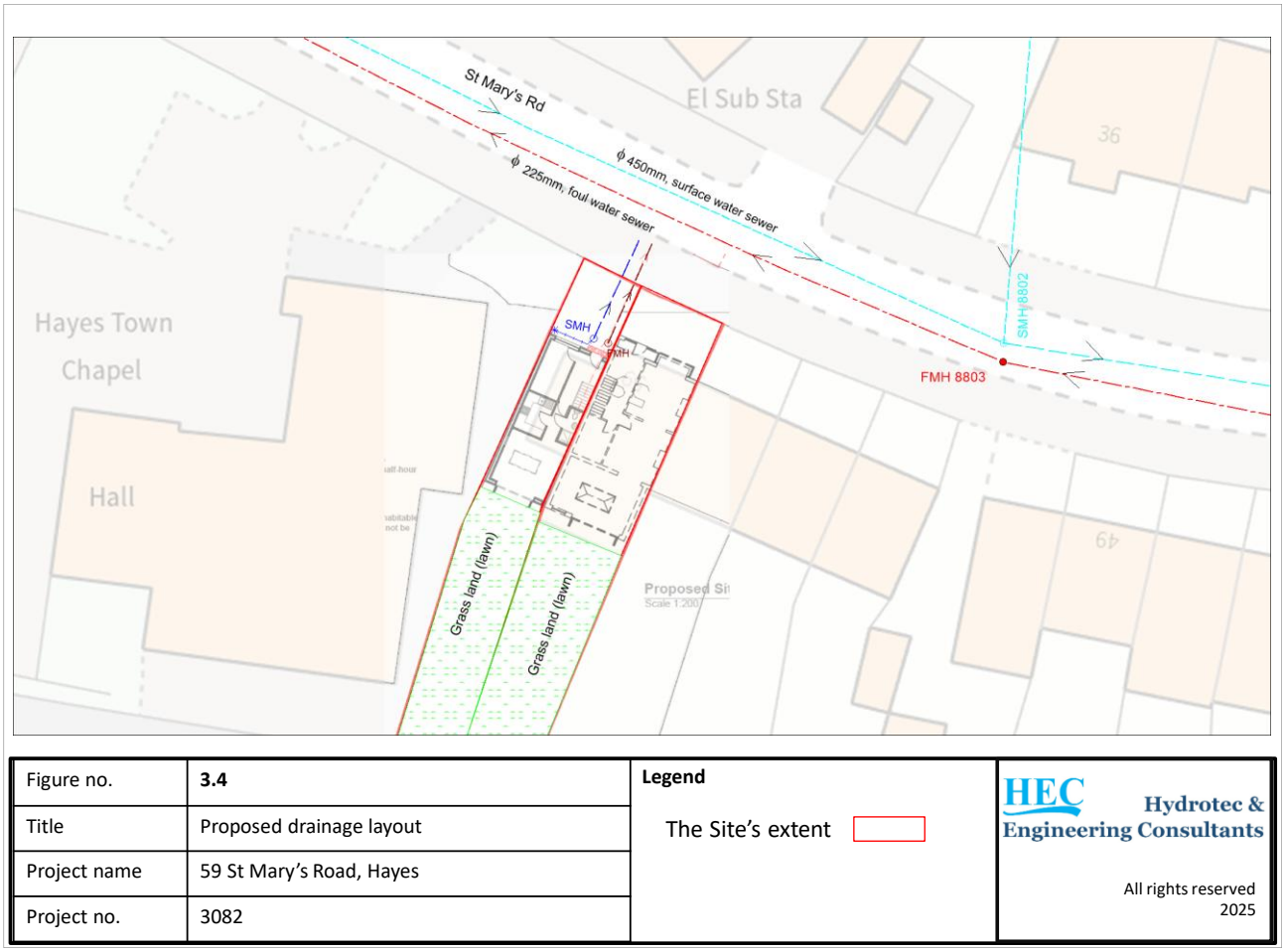


Figure no.	**3.4**
Title	Proposed drainage layout
Project name	59 St Mary's Road, Hayes
Project no.	3082

Legend

The Site's extent

HEC Hydrotec & Engineering Consultants

Figure 3.4: The proposed drainage layout at the Site.

Moreover, to comply with the NPPF's local plan policy and LLFA guidelines and to improve the sustainability of the wider drainage systems, environmental impact and local biodiversity in the surrounding areas – runoff from the roof surface would be stored in water butts for each dwelling (see an example of water butt in Appendix VI), and it would be utilised for general washing and irrigation, e.g. gardening. There would be grassland (lawn) in the rear gardens with permeable topsoils, assisting water quality improvement by reducing the suspended solid and silt materials.

The proposed drainage network would be separate, e.g. the surface and foul water drainage would be through different pipes; see also drainage layout in Figure 3.4 and Appendix V. The diameter of the pipes would be 100mm, and the pipes would be connected with manholes, ACO drains and gullies. The gradient of the drainage pipes would be 1 in 80 or more to assist in gravity flow. The cover level of the manholes would be the ground level, whereas the invert level would be set to provide the required gradient to assist in the gravity flow.

The proposed drainage pipes, in conjunction with the existing drainage network, collect the excess runoff by gravity flow in addition to ACO drains to intercept the runoff on the Site (see an example of an ACO drain in Appendix VII). Therefore, the proposed surface water drainage strategy would be sustainable during the design life of the development without deteriorating the Site itself or other existing developments in surrounding areas.

It should, however, be noted that the confirmation of consent agreement will be obtained to discharge the excess outfalls into the Thames Water surface water sewer drainage network located beneath St Mary's Road.

4 Finished floor level and access/egress from the Site

The proposed development, which is the erection of a two-bedroom dwelling to the side of the existing dwelling with associated landscape amenities, is classified as a less vulnerable category, according to the NPPF flood risk vulnerability classification[26]. In addition, the proposed extension of the existing building is less than 250m^2, and therefore, it would be classified as a minor development - according to the Environment Agency's Standing Advice[27].

The Site would not have a flood risk from fluvial flow. Moreover, the surface water drainage would have a very low risk and would have a minimal impact on the Site, taking into account the proposed drainage strategy.

Therefore, the finished ground floor level of the proposed side extension would be the same as the existing dwelling's ground floor level.

There would not be any issues with access and egress from the proposed development site during evacuation and emergency vehicles' movement. St Mary's Road, which is located in front of the Site, would be used as an access and egress during any unexpected flooding incident.

[26] Op.cit.
[27] Op.cit.

5 Conclusions

A site-specific flood risk assessment and surface water drainage strategy were conducted to assist the sustainable drainage systems (SuDS) design for the proposed development at 59 St Mary's Road, Hayes, UB3 2JP. The proposed development is the erection of a two-bedroom dwelling to the side of the existing dwelling with associated landscape amenities. The Site lies within Hillingdon Council's remit, who is the LLFA, providing advice and guidance for sustainable drainage systems for this development site.

The present flood risk assessment and drainage strategy for SuDS, which are the requirement for the planning application, were made with available information including the latest EA's flood maps data, FEH hydrological data, topographical elevation data (LiDAR), soil map data, borehole data of the British Geological Survey, recent photographs and sewer network data of Thames Water.

The present investigation suggests that the Site is in flood zone 1, and therefore, the Site is considered to be out of fluvial and coastal flood risk.

The proposed development site is a very low risk from the surface water flow - according to the EA's flood map[28]. Moreover, the hydrological and topographical elevation data around the Site indicate that the impact of the surface water runoff from the Site's surrounding areas would be minimal. Thus, the surface water attenuation storage requirements for the Site would only be the generated overland flow by the surface area of the proposed development, and the overland flow from the surrounding areas was not considered. In addition, the Site is not at risk to the groundwater or reservoir flows.

The soil types beneath the Site are loamy soils with naturally high groundwater, with reference to the Soilscapes map data[29]. Therefore, the infiltration rate beneath the soil would not be good. Thus, it would not be suitable to attenuate the excess surface water runoff through underground soakaways. Furthermore, due to space limitations, it would not be feasible to attenuate by underground storage tank.

[28] Op.cit.
[29] Op.cit.

There is no watercourse in close proximity to the Site, and due to space limitations, it would not be suitable for attenuating excess runoff by a detention pond on the Site. There is an existing surface water sewer drainage network of Thames Water located underneath St Mary's Road.

There would be a small increase in impervious surface area (e.g. approximately 29m^2 or 7.73% of the total area) due to the proposed side extension. However, there would not be any significant deterioration of the excess surface water runoff by the proposed development compared to the existing condition.

The proposed development is a side extension of the existing dwelling. Therefore, in the proposed drainage network, the excess runoff would be discharged to the existing Thame Water sewer in conjunction with the existing sewer drainage network.

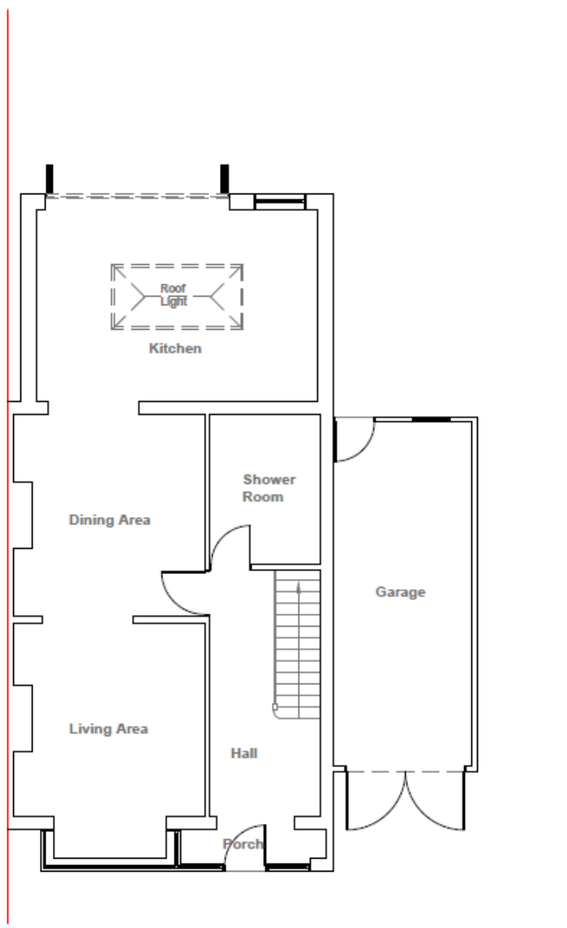
In addition, there would be grassland (lawn) in the rear gardens with permeable topsoils, assisting water quality improvement by reducing the suspended solid and silt materials. It is highly recommended to adopt water butts for collecting roof water and would be utilised for general washing and irrigation, e.g. gardening. Furthermore, the ACO drains and surface water drainage pipes would assist in conveying the excess runoff to the outfalls.

The Site is not considered to be a surface water flood risk, taking into account the proposed surface water drainage strategy. Therefore, the finished ground floor level of the proposed side extension would be the same as the existing dwelling's ground floor level.

The access and egress from the Site during any flooding incident would be at St Mary's Road, located in front of the Site.

The excess generated wastewater flow by the proposed side extension was estimated to be 0.005 litres/sec. The general observation of the Thames Water sewer drainage networks in the surrounding area suggests that the proposed side extension would not make any significant impact on the existing sewer drainage network systems. However, a confirmation of consent agreement from Thames Water will be obtained before utilising the proposed side extension.

Appendix I: The layout of the existing development.

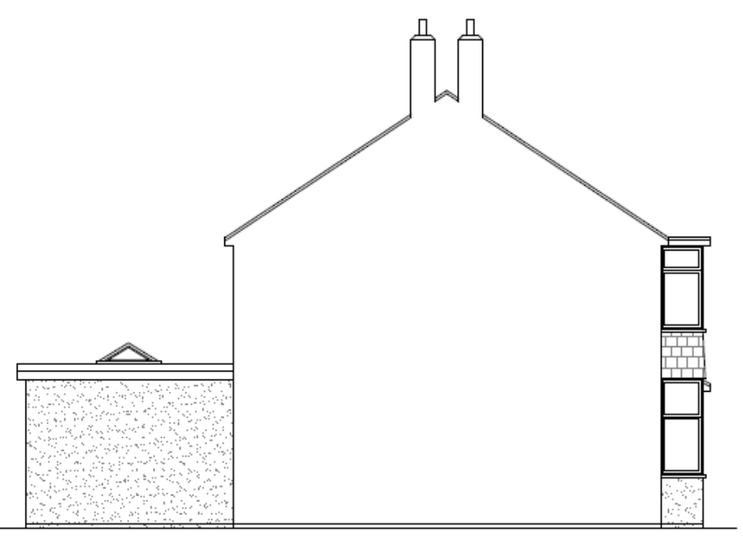


Existing Ground Floor Plan
Scale 1:100

Existing Front Elevation
Scale 1:100

Existing Side Elevation
Scale 1:100

Existing Rear Elevation
Scale 1:100



Existing Side Elevation
Scale 1:100

1:100
0 1 2 5 10 Meter

GENERAL NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETER.
2. VERIFY ALL DIMENSIONS AND CONDITIONS BEFORE BUILDING OR STARTING CONSTRUCTION. NOTIFY THE DESIGNER IMMEDIATELY OF ANY DISCREPANCY OR VARIATION.
3. ALL WORK TO COMPLY WITH CURRENT BUILDING REGULATIONS AND CODES OF PRACTICE

Title: Existing Ground Floor Plan & Elevations

Site Address: 59 St. Mary's Road, Hayes. UB3 2JP

Scale: 1:100 @A3
Date: 24/02/2025
Drawing No.: 2025/023 -01
Drawn By: RO

Revision Date:

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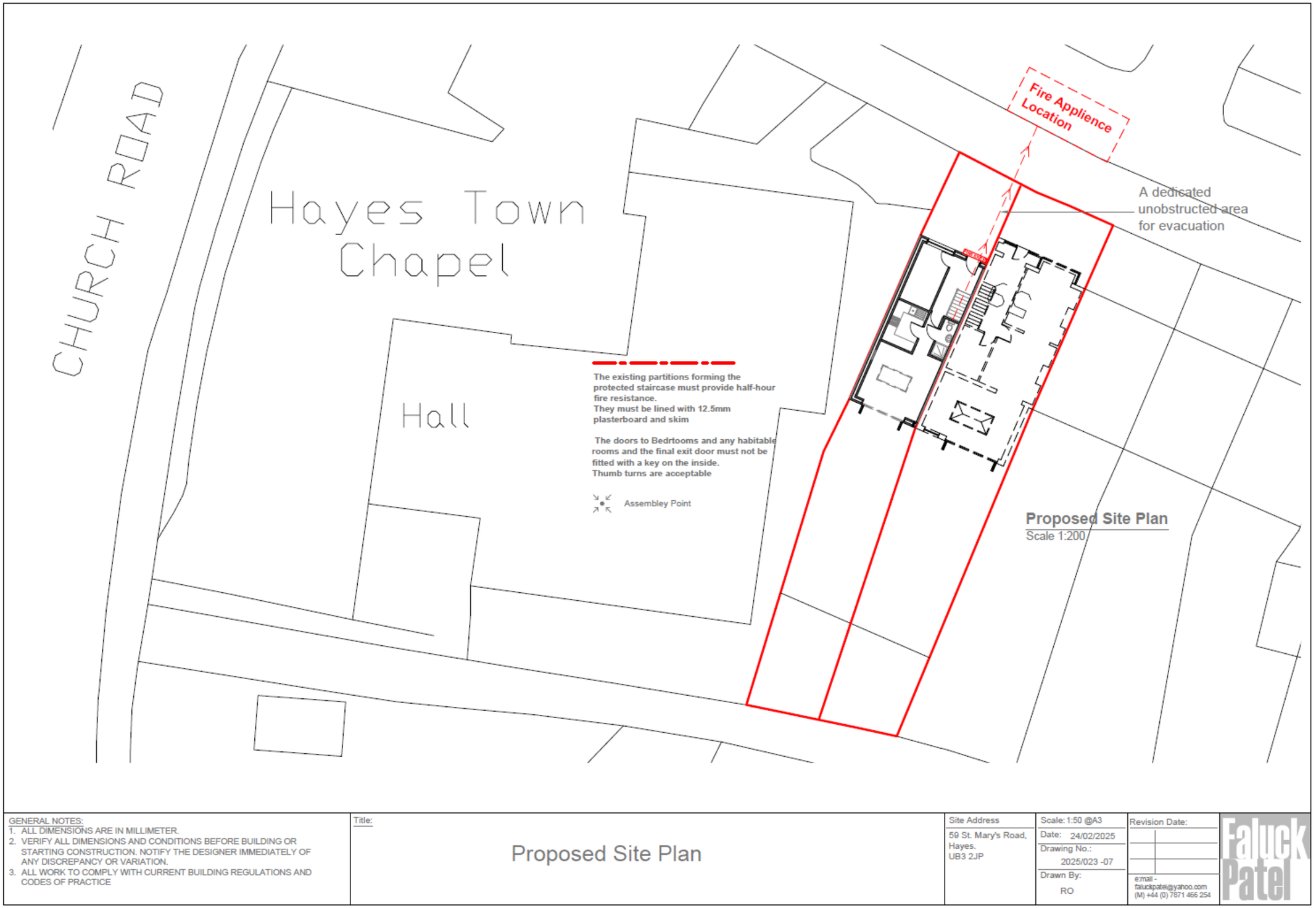
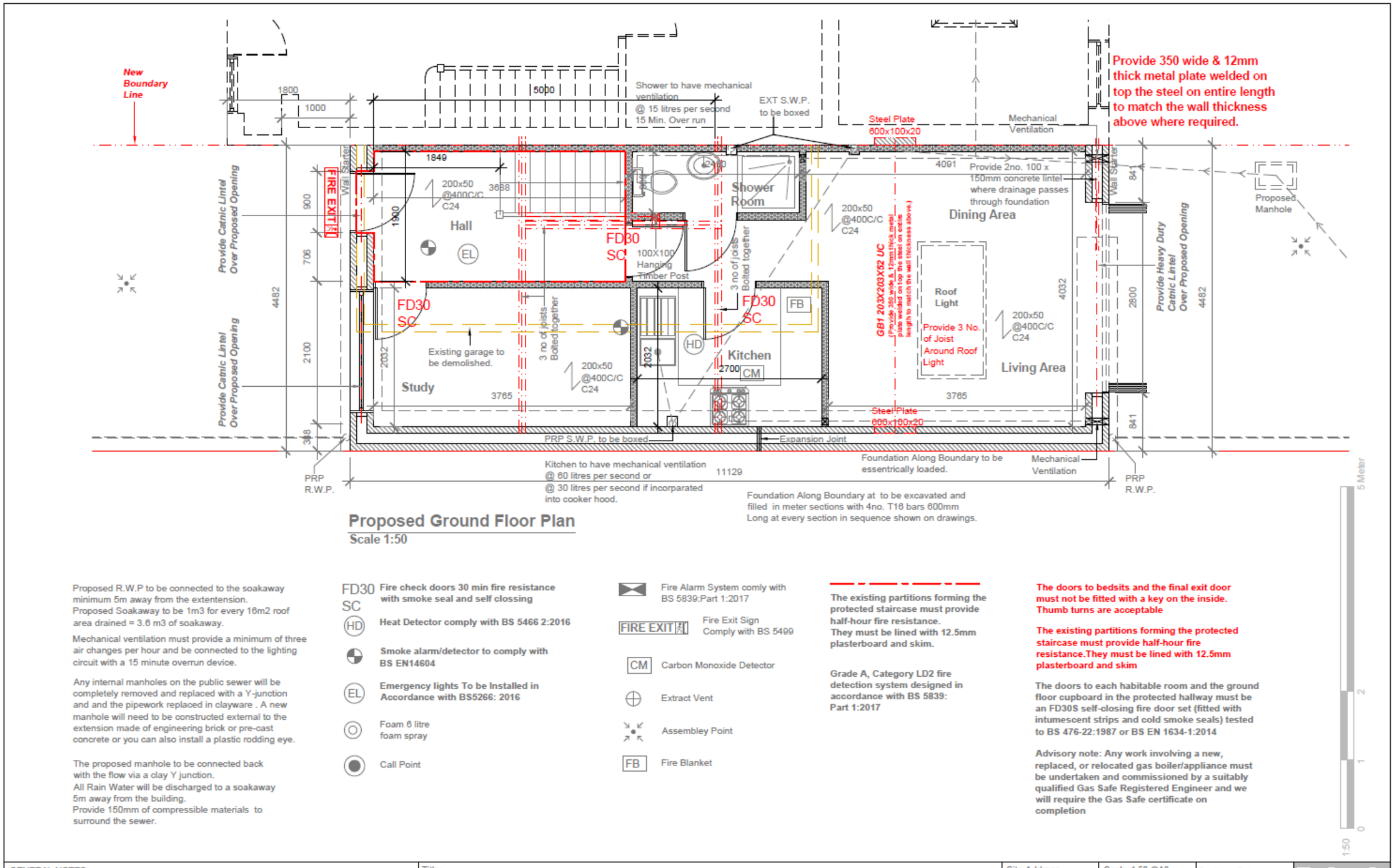
Faluck Patel

Appendix II: The layout of the proposed development.





Proposed Ground Floor Plan
Scale 1:50

Proposed R.W.P to be connected to the soakaway minimum 5m away from the extentension.
Proposed Soakaway to be 1m3 for every 16m2 roof area drained = 3.6 m3 of soakaway.

Mechanical ventilation must provide a minimum of three air changes per hour and be connected to the lighting circuit with a 15 minute overrun device.

Any internal manholes on the public sewer will be completely removed and replaced with a Y-junction and and the pipework replaced in clayware . A new manhole will need to be constructed external to the extension made of engineering brick or pre-cast concrete or you can also install a plastic rodding eye.

The proposed manhole to be connected back with the flow via a clay Y junction.
All Rain Water will be discharged to a soakaway 5m away from the building.
Provide 150mm of compressible materials to surround the sewer.

FD30 SC **Fire check doors 30 min fire resistance with smoke seal and self clossing**

HD **Heat Detector comply with BS 5466 2:2016**

Smoke alarm/detector to comply with BS EN14604

EL **Emergency lights To be Installed in Accordance with BS5266: 2016**

Foam 6 litre foam spray

Call Point

Fire Alarm System comly with BS 5839:Part 1:2017

FIRE EXIT Fire Exit Sign Comply with BS 5499

CM Carbon Monoxide Detector

Extract Vent

Assembley Point

FB Fire Blanket

The existing partitions forming the protected staircase must provide half-hour fire resistance. They must be lined with 12.5mm plasterboard and skim.

Grade A, Category LD2 fire detection system designed in accordance with BS 5839: Part 1:2017

The doors to bedsits and the final exit door must not be fitted with a key on the inside. Thumb turns are acceptable

The existing partitions forming the protected staircase must provide half-hour fire resistance.They must be lined with 12.5mm plasterboard and skim

The doors to each habitable room and the ground floor cupboard in the protected hallway must be an FD30S self-closing fire door set (fitted with intumescent strips and cold smoke seals) tested to BS 476-22:1987 or BS EN 1634-1:2014

Advisory note: Any work involving a new, replaced, or relocated gas boiler/appliance must be undertaken and commissioned by a suitably qualified Gas Safe Registered Engineer and we will require the Gas Safe certificate on completion

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3. ALL WORK TO COMPLY WITH CURRENT BUILDING REGULATIONS AND CODES OF PRACTICE

Title: Proposed Ground Floor Plan

Site Address: 59 St. Mary's Road, Hayes. UB3 2JP

Scale: 1:50 @A3
Date: 24/02/2025
Drawing No.: 2025/023 -02
Drawn By: RO

Revision Date:

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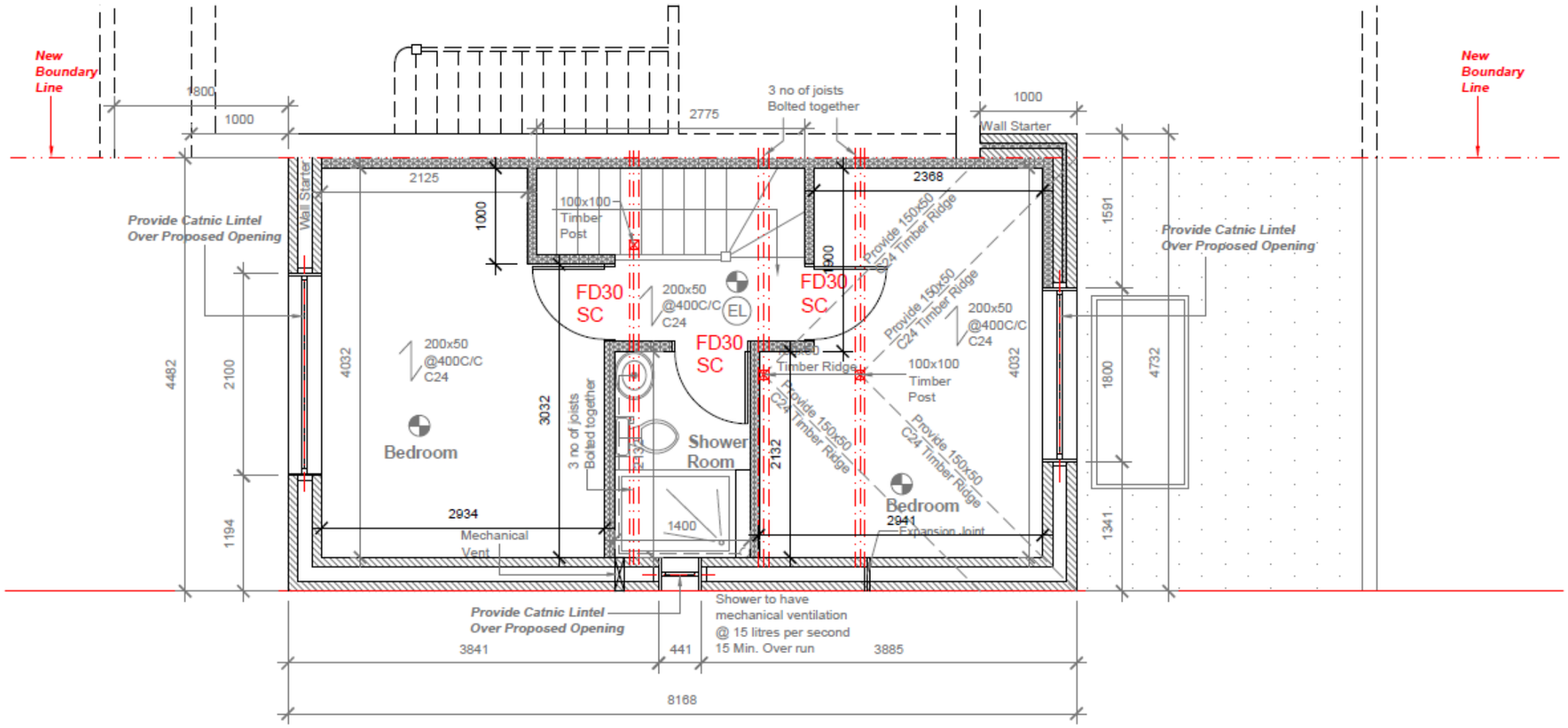

Proposed First Floor Plan

Scale 1:50

GENERAL NOTES:
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3. ALL WORK TO COMPLY WITH CURRENT BUILDING REGULATIONS AND CODES OF PRACTICE

Title: Proposed First Floor Plan

Site Address: 59 St. Mary's Road, Hayes. UB3 2JP

Scale: 1:50 @A3
Date: 24/02/2025
Drawing No.: 2025/023 -03
Drawn By: RO

Revision Date:

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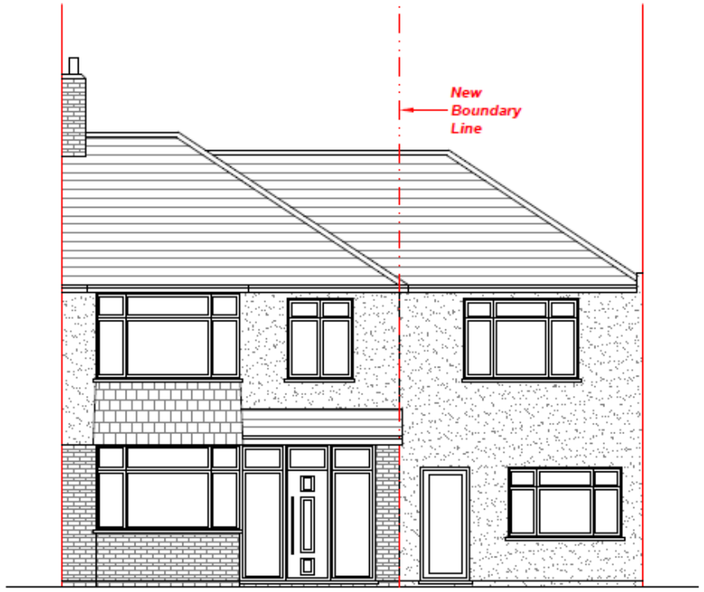
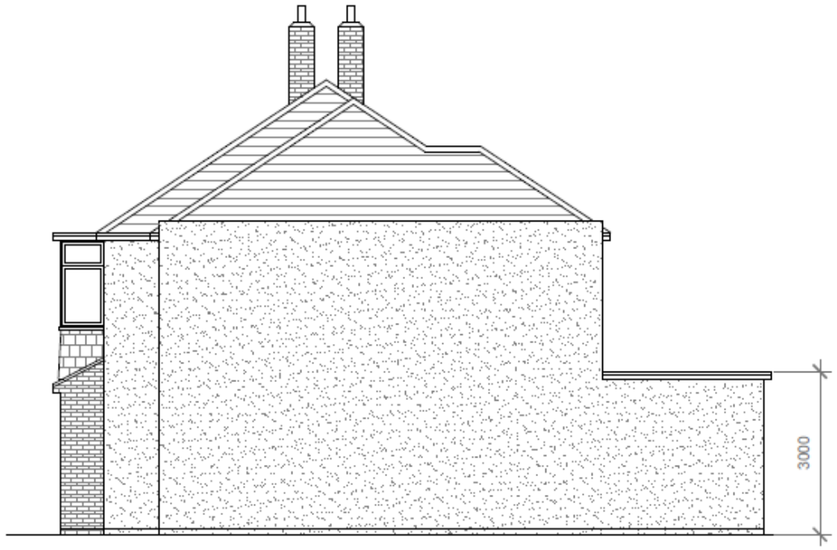
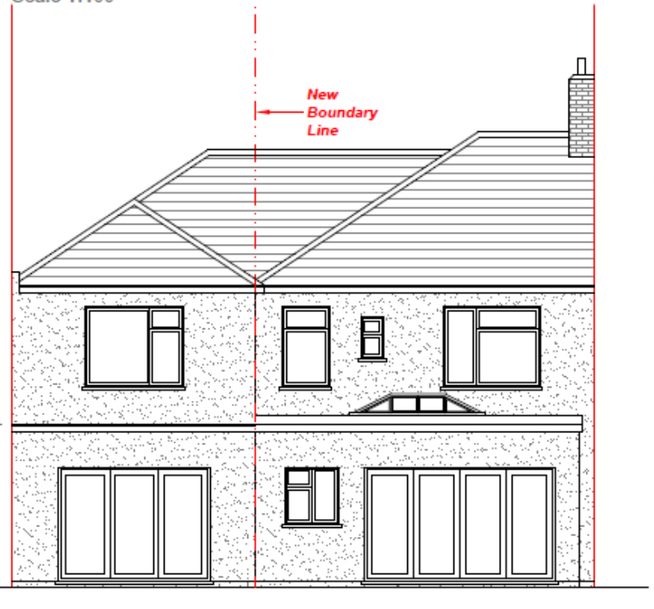


Proposed Front Elevation
Scale 1:100



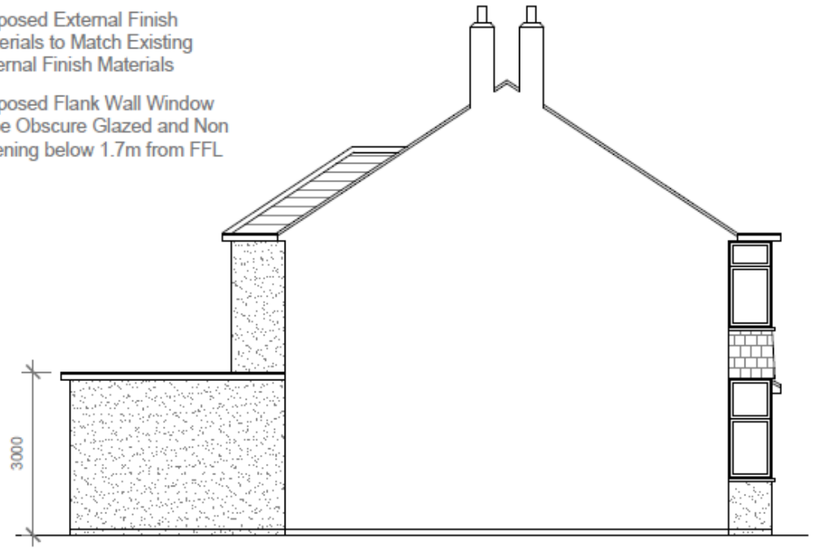
Proposed Side Elevation
Scale 1:100



Proposed Rear Elevation
Scale 1:100

Proposed External Finish
Materials to Match Existing
External Finish Materials

Proposed Flank Wall Window
to be Obscure Glazed and Non
Opening below 1.7m from FFL



Proposed Side Elevation
Scale 1:100

GENERAL NOTES:
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3. ALL WORK TO COMPLY WITH CURRENT BUILDING REGULATIONS AND CODES OF PRACTICE

Title:

Proposed Elevations

Site Address
59 St. Mary's Road,
Hayes.
UB3 2JP

Scale: 1:100 @A3
Date: 24/02/2025
Drawing No.: 2025/023 -04
Drawn By: RO

Revision Date:

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Appendix III: Borehole data, reference to British Geological Survey.

British Geological Survey

BGS ID: 18775610 : BGS Reference: TQ18SW279
British National Grid (27700) : 510690,180860

Project: UXBRIDGE ROAD SHOPPING CENTRE, HAYES, MIDDLESEX
Client: [redacted]
Engineer: [redacted]
Ground Level: 31.70 m.A.O.D. Coordinates: m.E. m.N.
Boring Methods: LIGHT CABLE PERCUSSION 150 mm DIAMETER CASED 150 mm DIAMETER G.L. TO 7.50 m UNCASED 7.50 TO 15.00 m
Hole No. BH8 Sheet 1 of 2 Job No 8770

WATER Date/Time at Depth	Depth of Casing m	Depth to Water m	Inst.	STRATA Description	Legend	Level m.O.D.	Depth m	SAMPLING/IN SITU TEST Depth m	Type & No.	Blows/ Strength	LAB TESTING % <4.25	w %	Wp %	WL %	ρd Mg/m³	Cu kN/m²	OTHER TESTS AND NOTES
				Made Ground (Flexible surfacing)		31.60	0.10	0.20	D1								Hand excavated from 0.10 to 1.20 m (75mins)
				Made Ground (Dark grey brown slightly silty clayey sandy subangular fine-coarse gravel sized material predominantly composed of flint gravel with some brick and concrete fragments)		31.45	0.25	0.30-0.70	B1								
								0.50	D2								
								1.00	D3								
				Made Ground (Dark grey brown silty clayey sandy subangular fine-coarse gravel sized material composed of crushed brick and concrete rubble mixed with grey brown silty fine-medium 'humic' sand and containing occasional ash fragments)				1.20-1.65	C1	N=25							
								1.25-1.65	B2								CLEA Screen. Speciated PAH. Speciated TPH (B2)
						30.10	1.60	1.70	D4								
				Medium dense grey brown clayey silty very sandy subangular-subrounded fine-coarse flint GRAVEL with occasional rounded fine-medium quartzite gravel (River Terrace Deposits)		29.80	1.90	2.20-2.65	C2	N=38							Water added to borehole between 1.90 and 6.60 m to assist drilling (1100 litres)
								2.20-2.65	B3								
				Medium dense grey brown slightly silty sandy subangular-subrounded fine-coarse flint GRAVEL with occasional rounded quartzite gravel (River Terrace Deposits)				3.10-3.55	C3	N=27							
								3.10-3.55	B4								
								4.00-4.45	C4	N=21							
								4.00-4.45	B5								
				- becoming medium dense with increasing depth													
								5.10-5.55	C5	N=32							
								5.10-5.55	B6								
22/04/03	5.80	(1) ▼															
								6.00	W1								
								6.40-6.85	C6	N=16							
						25.10	6.60	6.40-6.85	B7								
				Firm-stiff closely fissured grey brown slightly sandy silty CLAY with occasional partings of silt and fine sand (London Clay)		24.70	7.00										
								7.10	D5		100	28	26	73			
				Firm-stiff closely fissured dark grey to blue grey silty CLAY with occasional partings of silt and fine sand (London Clay)													
								8.00-8.45	U1	(55)		29			1.99	92	
								8.45	D6								
								9.00	D7								
				- becoming stiff with increasing depth													
								9.50-9.95	S7	N=15							
						21.70	10.00	9.95	D8								

Water Level observations during boring, depths below GL.

Strike	Depth Obs.	Depth after 5min	10 min	15 min	20 min
(1)	5.80				5.50

WATER: ▼ 1 First Strike; ⧖ 2 Subsequent Strike; N - Overnight Depth; C- Completion Depth; S Seepage not rising

SAMPLE KEY: D Small disturbed sample; B Bulk disturbed sample; W Water sample; U Undisturbed sample; P Piston sample

TEST KEY: S Standard penetration test; C Cone penetration test; K Permeability test; V In situ vane test

BLOWS / STRENGTH: N = N value; 26/150 blows, for 150mm, drive after seating; 26*, blows for part or whole of seating drive only; (26) U sample blow count; V = Vane Strength - kN/m²

Fieldwork By MN; Dates 22/04/03; Log AJS

BH8 Sheet 1 of 2

RSA GEOTECHNICS LTD (01449) 615483

British Geological Survey

BGS ID: 18775610 : BGS Reference: TQ18SW279
British National Grid (27700) : 510690,180860

Project: UXBRIDGE ROAD SHOPPING CENTRE, HAYES, MIDDLESEX
Client: [redacted]
Engineer: [redacted]
Ground Level: 31.70 m.A.O.D. Coordinates: m.E. m.N.
Boring Methods: LIGHT CABLE PERCUSSION 160 mm DIAMETER CASED 150 mm DIAMETER G.L. TO 7.50 m UNCASED 7.50 TO 15.00 m
Hole No. BH8 Sheet 2 of 2 Job No 8770

WATER Date/Time at Depth	WATER Depth of Casing m	WATER Depth to Water m	Inst.	STRATA Description	Legend	Level m.O.D.	Depth m	SAMPLING/IN SITU TEST Depth m	Type & No.	Blows/ Strength	LAB TESTING % <425	W %	Wp %	WL %	ρ Mg/m³	Cu kN/m²	OTHER TESTS AND NOTES
				Stiff closely fissured dark grey to blue grey silty CLAY with occasional partings of silt and fine sand (London Clay)				11.10-11.55	U2	(75)							
								11.55	D9								
								12.00	D10								
								12.60-13.05	S8	N=23							
								13.05	D11								
								14.50-14.95	U3	(100)	100	25	23	67	1.99	146	
22/04/03	7.50	DRY															
22/04/03		14.00				16.70	15.00	14.95	D12								Borehole complete at 15.00 m

On completion of fieldwork a 50 mm diameter HDPE slotted pipe with granular surround was installed to 4.00 m

Pipework capped with a gas valve and protected at ground level with a flush lockable cover

RSA GEOTECHNICS LTD (01449) 615483

Water Level observations during boring, depths below GL.

Strike	Depth Obs.	Depth after 5min	10 min	15 min	20 min

WATER
▼ 1 First Strike
▽ 2 Subsequent Strike
N - Overnight Depth
C- Completion Depth
S Seepage not rising

SAMPLE KEY
D Small disturbed sample
B Bulk disturbed sample
W Water sample
U Undisturbed sample
P Piston sample

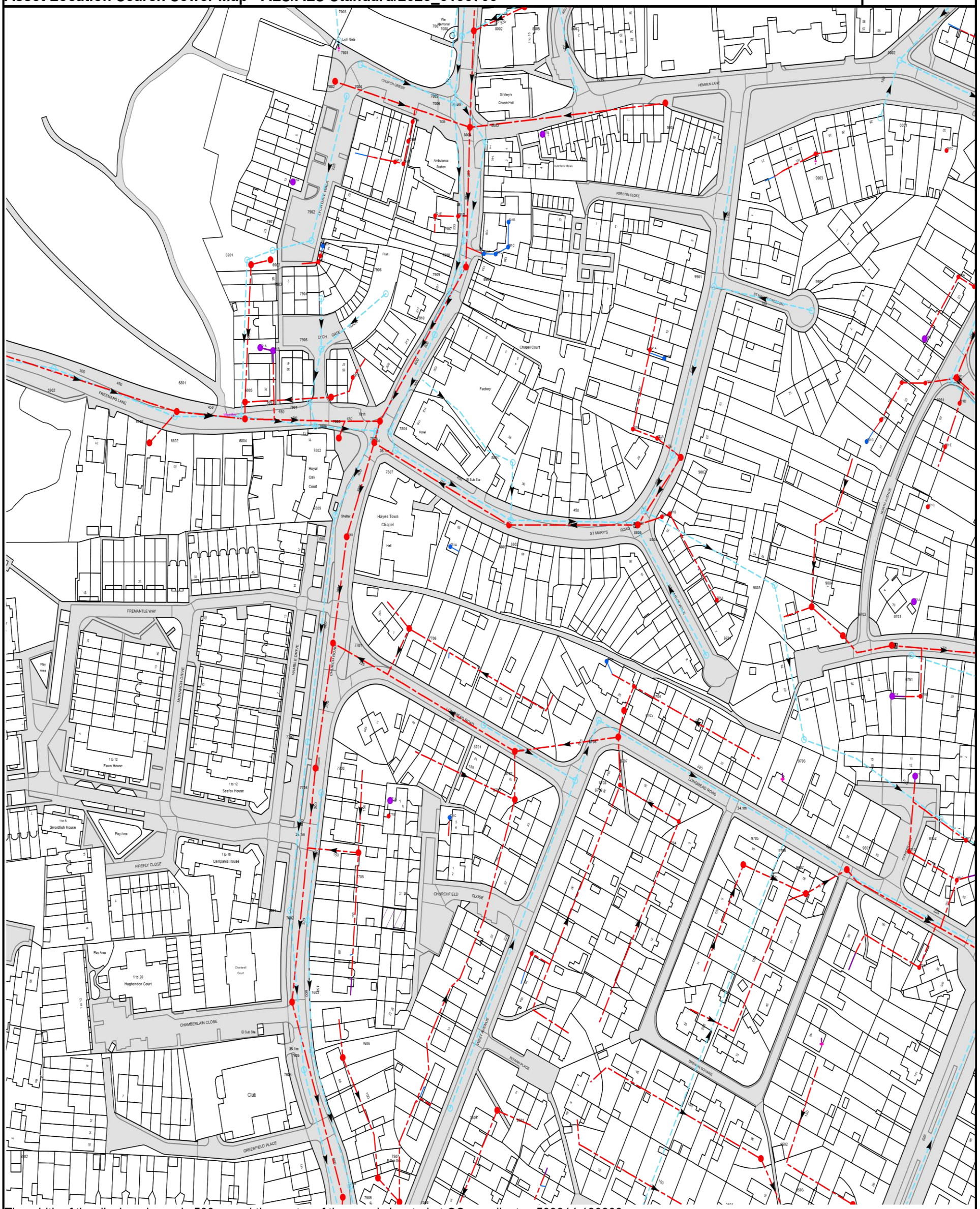
TEST KEY
S Standard penetration test
C Cone penetration test
K Permeability test
V In situ vane test

BLOWS / STRENGTH
N = N value
26/150 blows, for 150mm, drive after seating
26*, blows for part or whole of seating drive only
(26) U sample blow count
V = Vane Strength - kN/m²

Fieldwork By MW
Dates 22/04/03
Log AJS
Sheet 2 of 2
BH8

Appendix IV: Sewer drainage network data at the Site, reference to Thames Water.

Asset Location Search Sewer Map - ALS/ALS Standard/2025_5135703



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 509814,180809

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

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
771C	n/a	n/a
801A	n/a	n/a
091B	n/a	n/a
091C	n/a	n/a
091A	n/a	n/a
0903	35.11	n/a
081A	n/a	n/a
081C	n/a	n/a
081E	n/a	n/a
081D	n/a	n/a
0801	n/a	n/a
0951	34.67	32.54
0901	34.67	32.15
061C	n/a	n/a
9601	34.06	31.24
071D	n/a	n/a
071H	n/a	n/a
0752	33.67	31.81
071E	n/a	n/a
071G	n/a	n/a
071F	n/a	n/a
9505	n/a	n/a
061B	n/a	n/a
8009	37.35	35
7801	35.61	33.98
7803	35.8	34.5
791C	n/a	n/a
5902	36.31	34.5
791B	n/a	n/a
7905	36.16	34.16
691A	n/a	n/a
7904	36.4	34.9
7906	36.3	34.8
6902	37.03	34.28
791J	n/a	n/a
6901	37.03	34.73
7903	37.02	34.38
791I	n/a	n/a
7901	37.03	34.83
791H	n/a	n/a
7902	36.48	34.98
791A	n/a	n/a
791F	n/a	n/a
791G	n/a	n/a
7002	37	35.5
7001	n/a	n/a
7004	n/a	n/a
7003	n/a	n/a
701B	n/a	n/a
7706	n/a	n/a
701A	n/a	n/a
7910	36.19	34.45
791E	n/a	n/a
7005	n/a	n/a
7909	36.23	34.05
781A	n/a	n/a
7006	n/a	n/a
7007	36.67	34.15
791D	n/a	n/a
7008	n/a	n/a
7908	n/a	n/a
7907	36.21	34.18
8901	n/a	n/a
8003	n/a	n/a
8002	36.8	33.1
891E	n/a	n/a
8004	n/a	n/a
891D	n/a	n/a
891C	n/a	n/a
891B	n/a	n/a
8803	n/a	n/a
8802	n/a	n/a
8801	n/a	n/a
8005	37.35	34.7
8007	37.4	34.9
8010	36.75	35.4
881B	n/a	n/a
8804	34.98	33.53
8806	n/a	n/a
8805	n/a	n/a
891A	n/a	n/a
881A	n/a	n/a
981C	n/a	n/a
991A	n/a	n/a
9001	n/a	n/a
981B	n/a	n/a
9801	n/a	n/a
9802	n/a	n/a
9901	n/a	n/a
981A	n/a	n/a
9803	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
9804	n/a	n/a
9902	n/a	n/a
9903	n/a	n/a
9702	n/a	n/a
081G	n/a	n/a
0001	n/a	n/a
081F	n/a	n/a
0701	33.92	31.93
0002	36.15	34.08
0904	34.49	33.26
0751	33.87	32.26
7705	n/a	n/a
771B	n/a	n/a
771A	n/a	n/a
7704	n/a	n/a
7703	35.29	31.85
7702	35.62	33.32
7701	35.56	32.04
7810	n/a	n/a
7809	35.75	33.57
7807	35.67	33.96
6806	n/a	n/a
7808	35.81	32.42
7806	n/a	n/a
7811	n/a	n/a
7805	35.68	34.23
7802	35.69	34.06
7804	35.79	32.37
6805	35.81	32.73
6804	35.82	34.24
6802	36	32.82
6801	36.02	34.27
6803	36	33.85
7601	35.18	34.06
7603	34.96	31.62
7604	34.85	32.73
7602	n/a	n/a
7605	n/a	n/a
7606	n/a	n/a
7505	34.66	31.32
7506	n/a	n/a
7507	n/a	n/a
7508	n/a	n/a
7607	n/a	n/a
8701	34.87	33.28
8501	n/a	n/a
8702	n/a	n/a
8703	n/a	n/a
861A	n/a	n/a
8709	34.72	33.04
8706	35	33.04
871A	n/a	n/a
8707	n/a	n/a
8708	n/a	n/a
8705	n/a	n/a
8704	n/a	n/a
9704	n/a	n/a
9701	34.61	33.96
9705	n/a	n/a
9502	n/a	n/a
9706	34.01	32.37
9703	n/a	n/a
9602	n/a	n/a

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

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

- Storm Sewer
- Sludge Sewer
- Foul Trunk Sewer
- Surface Trunk Sewer
- Combined Trunk Sewer
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Vacuum
- Thames Water Proposed
- Vent Pipe
- Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

- Sewer
- Culverted Watercourse
- Proposed
- Decommissioned Sewer
- Content of this drainage network is currently unknown
- Ownership of this drainage network is currently unknown

Sewer Fittings

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

- Air Valve
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

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

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

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

- Inlet
- Outfall
- Undefined End

Other Symbols

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

- Change of Characteristic Indicator
- Public / Private Pumping Station
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

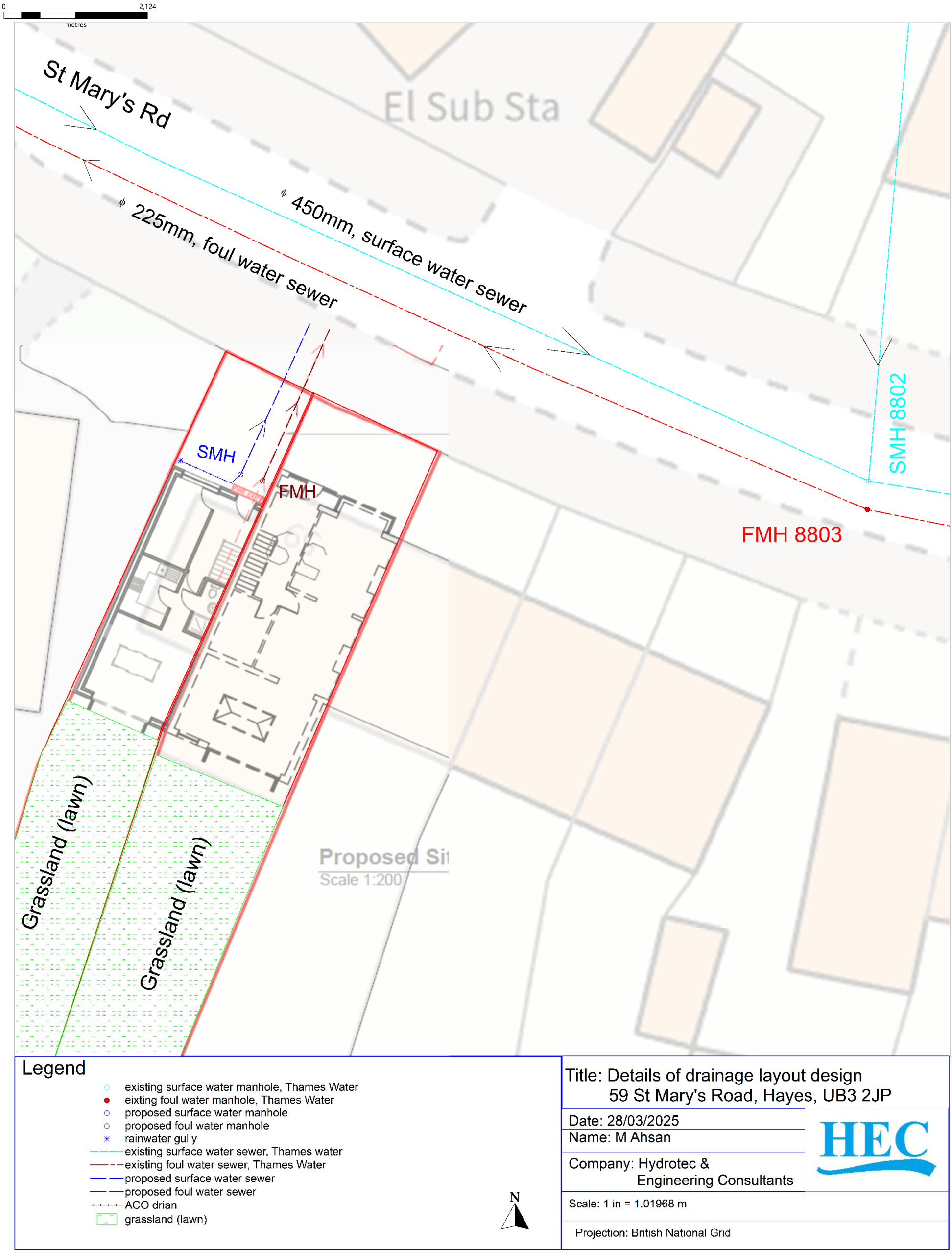
- Casement — Ducts may contain high voltage cables. Please check with Thames Water.
- Conduit Bridge
- Subway
- Tunnel

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement.

If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

Appendix V: The proposed drainage layout at the Site.



Appendix VI: A typical vertical water tank for rainwater harvesting (capacity 250 litres).

Appendix VII: A typical ACO drain (channel drainage).