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Flood Risk Assessment

22 Park Drive, London, SW14 8RD.

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Contents

Drawings

Appendices

Appendix A	Site Plans & Elevations

Executive Summary

FPS Environmental ("FPS") on behalf of Rachael & Ryan McKinley ("the client"), have undertaken a Flood Risk Assessment ("FRA") to support a planning application for a proposed residential extension and construction of a basement beneath the proposed extension area at 22 Park Drive, London, SW14 8RD ("the site").

The Beverley Brook, designated as an EA Main River, flows in a north easterly direction approximately 230m to the east of the site. The River Thames, also designated as an EA Main River, flows in an easterly direction approximately 970m to the north of the site. The EA Flood Map for Planning (Drawing 04) and mapping within the London Borough of Richmond Level 1 Strategic Flood Risk Assessment (SFRA) shows that the site is located in Flood Zone 1. Flood Zone 1 is land assessed as having less than a 1 in 1,000 (0.1% AEP) chance of river flooding in any given year.

In accordance with Table 2 of the NPPF: Flood Risk and Coastal Change, the proposed development is considered to be 'More Vulnerable'. More vulnerable developments are considered appropriate in Flood Zones 1 & 2.

The proposed development will result in an increase in impermeable area within the site and a surface water drainage design will therefore need to be developed to ensure there is no increase in surface water run-off from the site. New infiltration systems and/or surface water attenuation within the site may be required.

The risk of Groundwater flooding is considered to be Medium. Flooding from Artificial Sources is considered to be Low. While surface water flooding and fluvial flooding are considered to be Very Low. Reservoir flooding and tidal are considered to be Negligible.

This FRA demonstrates that the proposed development:

- Is suitable in the location proposed;
- Is unlikely to place additional persons at risk of flooding; and,
- Is unlikely to increase flood risk elsewhere through the loss of floodplain storage, impedance of flood flows or increase in surface water run-off.

Introduction

1.1 Authorisation & Context

FPS Environmental ("FPS") on behalf of Rachael & Ryan McKinley ("the client"), have undertaken a Flood Risk Assessment ("FRA") to support a planning application for a proposed residential extension and construction of a basement beneath the proposed extension area at 22 Park Drive, London, SW14 8RD ("the site").

1.2 Aims and Objectives

The overall aim is to demonstrate that the proposed development at the site is appropriate in context of flood risk. The proposed site plan, existing site layout, proposed site layout and elevations are included within Appendix A for reference. FPS Environmental has undertaken this FRA in accordance with the most up to date local and national policies on development and flood risk by:

- Assessing whether the site is likely to be affected by flooding from different sources;
- Providing an assessment of the vulnerability of the proposed development and its suitability in relation to the identified flood risk;
- Providing an opinion in relation to the likely impacts of the proposed development on flooding and elsewhere; and,
- Where required, presenting flood risk mitigation measures necessary to ensure that the proposed development and occupants will be safe, whilst ensuring flood risk is not increased elsewhere.

1.3 Information Sources Used

To prepare this report, the following information sources and general guidance documents have been used:

- National Planning Policy Framework (NPPF), Flood Risk and Coastal Change Planning Practice Guidance;
- The London Borough of Richmond Upon Thames (LBR) Level 1 Strategic Flood Risk Assessment (SFRA) – Metis, 2021;
- LBR Preliminary Flood Risk Assessment (PFRA) – CAPITA Symonds, March 2011;
- LBR Surface Water Management Plan (SWMP) – December, 2021;
- Existing Ground Floor Plan – Drawing no. 2022/02/01 – HB Planning Services, dated February 2022;
- Proposed First Floor Plan – Drawing no. 2022/02/02 – HB Planning Services, dated February 2022;
- Proposed Basement – Drawing no. 2022/02/03 – HB Planning Services, dated February 2022;
- Proposed Ground Floor Plan – Drawing no. 2022/02/04 – HB Planning Services, dated February 2022;

- Proposed First Floor Plan – Drawing no. 2022/02/05 – HB Planning Services, dated February 2022;
- Proposed Second Floor Plan – Drawing no. 2022/02/06 – HB Planning Services, dated February 2022;
- Existing Front Elevation – Drawing no. 2022/02/07 – HB Planning Services, dated February 2022;
- Existing Side Elevation – Drawing no. 2022/02/08 – HB Planning Services, dated February 2022;
- Existing Rear Elevation – Drawing no. 2022/02/09 – HB Planning Services, dated February 2022;
- Existing Side Elevation – Drawing no. 2022/02/10 – HB Planning Services, dated February 2022;
- Proposed Front Elevation – Drawing no. 2022/02/11 – HB Planning Services, dated February 2022;
- Proposed Side Elevation – Drawing no. 2022/02/12 – HB Planning Services, dated February 2022;
- Proposed rear Elevation – Drawing no. 2022/02/13 – HB Planning Services, dated February 2022;
- Proposed Side Elevation – Drawing no. 2022/02/14 – HB Planning Services, dated February 2022;
- Existing Roof Plan – Drawing no. 2022/02/15 – HB Planning Services, dated February 2022;
- Proposed Roof Plan – Drawing no. 2022/02/16 – HB Planning Services, dated February 2022;
- Existing Section – Drawing no. 2022/02/17 – HB Planning Services, dated February 2022;
- Proposed Section – Drawing no. 2022/02/18 – HB Planning Services, dated February 2022;
- Environment Agency (EA) Interactive Online Flood Mapping - Accessed July 2023;
- EA Surface Water Dataset – Accessed July 2023;
- 1m Resolution Light Detection and Ranging (LiDAR) Data – Downloaded July 2023; and,
- British Geological Survey Drift & Geology Maps - Accessed July 2023.

1.4 Report Limitations

This assessment of flood risk has looked to use the most accurate and up to date flood mapping for the location. The site boundary has been supplied by the client and the assessment of risk is based on this.

This report has been prepared with due care and diligence in accordance with industry best practice and guidance. The conclusions in this report are valid only to the extent that the information provided to FPS was accurate and complete at time of receipt.

1.5 Site Setting

The site is located at National Grid Reference (NGR): 520911(E), 175055(N).

The site covers an area of approximately 245m^2 and comprises the existing two-storey semi-detached residential dwelling, rear garden and front driveway area. The north, east and south of the property is bordered by neighbouring residential properties and gardens, and to the west by Park drive. The Beverley Brook, an EA Main River, is located approximately 230m east of the site.

The site location can be seen in Appendix A and Drawings 01 and 02 for reference.

1.6 Topographic Mapping & Levels

In the absence of a topographical survey, freely available 1m resolution Light Detection and Ranging (LiDAR) data has been downloaded for the site and local area. An extract of the LiDAR data is provided on Drawing 03.

In the vicinity of the site ground levels generally fall in an easterly direction.

The LiDAR data indicates ground levels at the site fall from a level of approximately 13.63m aOD (above Ordnance Datum) at the western boundary of the site adjacent to Park Drive, to approximately 12.68m aOD along the rear eastern boundary of the site bordering adjacent residential properties.

Ground levels adjacent to where the proposed extension area is to be located are approximately 13.12m aOD.

1.7 Local Hydrology

The Beverley Brook, designated as an EA Main River, flows in a north easterly direction approximately 230m to the east of the site. The Beverley Brook confluences with the River Thames, also a designated EA Main River approximately 2.8km north-east of the site.

From a review of the Flood Estimation Handbook (FEH) web portal, the catchment area of the Beverley Brook watercourse to the property site is approximately 51.5km^2. The upstream catchment is urban, consisting of areas to the south of the property.

1.8 Existing Drainage

Details of the existing drainage at the site are shown within the architect drawings (Appendix A). It is understood that any rainwater and surface water run-off on site outfalls into public / highways drainage systems within the road.

At the rear section of the site, surface water run-off is drained into the neighbour's soakaway as it is a shared drain pipe. There are also water butts at the site which will alleviate the pressure on the existing drainage infrastructure.

According to the client, any future rainwater at the rear of the property will drain into larger water butts with excess going into a new separate drainage system within the rear garden. Additional water butts will also be installed at the front section of the site.

Thames Water sewer asset plans have not been obtained as part of this FRA.

Flood Risk Evaluation

The following sections provide an evaluation of the risk posed by the key flood sources in relation to the site location. Consideration is given to the severity of flood risk to the site as a whole, making use of existing flood mapping, high-level local strategic studies, and available topographic information.

2.1 Fluvial Flood Risk

Fluvial flood risk originates from a watercourse of any size that may affect a site when the channel capacity is exceeded. This type of flooding often occurs following an extreme rainstorm event or a prolonged period of wet weather.

The EA Flood Map for Planning indicates that the site is located within Flood Zone 1. Flood Zone 1 is land assessed as having less than a 1 in 1,000 (0.1% AEP) chance of river flooding in any given year.

The EA Flood Map for Planning can be seen on Drawing 04.

A request for EA Product 4 data/ flood risk information was issued to the Environment Agency and received on the 23rd July 2023. However, the Environment Agency stated:

The site is situated outside of Flood Zone 2 and Flood Zone 3. Therefore, we do not have any relevant 1D/ 2D modelled water level or depth data to provide.

The LBR Level 1 SFRA states:

The River Thames is an EA designated main river that flows through the middle of the borough. In the London Borough of Richmond upon Thames it is both a tidal and non-tidal river, the tidal section having affected parts of the borough numerous times through flooding. The non-tidal section is upstream of Teddington Lock.

The River Crane and the Beverley Brook are EA designated main rivers that also flow through the borough. Both rivers are tributaries of the River Thames, with the River Crane situated to the north of the Thames (in the west of the borough), and the Beverley Brook situated to the south of the Thames (in the east of the borough). They both pose a fluvial flood risk to properties in their hydrological catchment. Compared to the River Thames, they are flashier systems that have a faster response to heavy or prolonged periods of rainfall.

Historic Flooding

Both the EA Data response and EA historic flood maps show the site to be located outside of areas that have historically flooded.

Historic flooding datasets are not always complete and comprehensive and therefore the absence of historic flood records does not mean that a site has never flooded or is not at risk from flooding.

Fluvial flood risk is considered to be **Very Low.**

The site is located within Flood Zone 1. Flood Zone 1 is land assessed as having less than a 1 in 1,000 (0.1% AEP) chance of river flooding in any given year.

Both the EA Data response and EA historic flood maps show the site to be located outside of areas that have historically flooded.

Further considerations are made within Section 3 of this FRA to ensure that the risk remains at or below this level for the lifetime of the development.

2.2 Tidal Flood Risk

Tidal flood risk can affect the coastline as well as estuaries and rivers that are tidally influenced. Flood events often coincide with the tidal regime, high rainfall events or other natural phenomena, which can lead to water levels covering low-lying land or exceeding natural or man-made defences.

The Fluvial and Tidal Flood Risk Web Map provided as part of the LBR Level 1 SFRA confirms that the site is not located within areas affected by tidal flooding. The SFRA states:

The Thames Tidal Defences (TTD) are a collection of walls, embankments, flood gates, pumping stations and barriers designed to protect at-risk properties against flooding from the River Thames. Of these assets, the Thames Barrier is the most significant structure that offers protection against tidal flooding. The barrier provides protection against extremely high tides and storm surges moving from the North Sea up through the Thames Estuary. These flood defences currently protect properties within the floodplain up to a 1 in 1000 year event.

The site is located upstream of any areas shown to be potentially affected by tidal flooding, and furthermore has an elevation of >12m aOD. Therefore, this source of flooding is not considered to pose a risk to the site.

Tidal flood risk is considered to be **Negligible,** and no further consideration from this risk source is deemed necessary as part of this FRA.

2.3 Surface Water Flooding

Surface water flooding occurs when local drainage networks are overwhelmed during an extreme rainfall event, causing water to flow over the surface and follow gravity to the lowest point where it often pools. This flood source is increasingly becoming one of the major contributors of flood risk, due to changing weather patterns and increased extreme rainfall events occurring across the UK. This places more pressure than ever on drainage systems, which are often overwhelmed during flash flood events, normally only designed to take between a 1 in 20 and a 1 in 30 return period event.

EA Risk of Flooding from Surface Water mapping can be seen on Drawings 05, 06 and 07, showing the flood extents and potential flood depths for the high, medium, and low risk events. These are defined as follows:

- High risk: annual chance of flooding of greater than 3.3%;
- Medium risk: annual chance of flooding of between 1% and 3.3%;
- Low risk: annual chance of flooding of between 0.1% and 1%;
- Very Low risk: annual chance of flooding of less than 1%.

The property is shown to remain unaffected from surface water flooding in all modelled scenarios.

In the low- risk scenario, shallow surface water flood depths of up to 0.15m are indicated to accumulate along Park Drive. However, these surface water accumulations are shown to be contained to the public highway to the north and south of the property and not encroach into the property grounds.

No further information has been identified relating to surface water flooding within the vicinity of the site.

Surface water flood risk is considered to be **Very Low.**

The property is shown to remain unaffected from surface water flooding in all modelled scenarios.

Surface water flooding can occur in very localised areas as a result of ground levels and absence of drainage infrastructure within a site.

Further considerations are made within Section 3 of this FRA to ensure that the risk remains at or below this level for the lifetime of the development.

2.4 Reservoir Failure

Assessment of risk of a reservoir failure may be interpreted as the extent of flooding that would occur, should any reservoir that has a capacity larger than 25,000m^3, suffer a catastrophic failure. Mapping of this nature is described by EA as a worst-case scenario, with a flood event of this type being extremely unlikely to occur.

The online EA Flood Risk from Reservoirs map shows that the site is not located within, or close to any, areas at risk in a failure event.

In any case current legislation ensures that reservoirs are inspected regularly, and essential safety work is carried out as required. The likelihood of a failure event occurring is therefore considered to be very low.

The risk of flooding from reservoir failure is considered to be **Negligible**, and no further consideration from this risk source is deemed necessary as part of this FRA.

2.5 Groundwater Flooding

Flooding from a groundwater source often occurs during or following a period of prolonged wet weather within areas that are low lying underlain by permeable rocks (aquifers). When aquifers are at their maximum holding potential, flooding at surface level can occur from beneath the ground.

Groundwater as a sole flooding mechanism is often regarded as low risk, as it often relies on a coinciding rainfall, or flood event from an additional source to become a risk. The main contributory factor that will enhance the risk of groundwater flooding is prolonged periods of high rainfall, which result in the groundwater saturation level rising to the point where it reaches the surface.

Online BGS mapping shows the bedrock geology beneath the site comprises the *London clay Formation-Clay and Silt.* The *London Clay formation* is defined by the EA as an 'Unproductive Aquifer'. Unproductive Aquifers are largely unable to provide usable water supplies and are unlikely to have surface water and wetland ecosystems dependent on them.

The BGS mapping also indicates the presence of superficial deposits beneath the site comprising *Taplow Gravel Member- Sand and Gravel.* This is defined as a *Secondary Undifferentiated Aquifer.* Secondary Undifferentiated Aquifers are aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These only have minor value.

The Hydrogeological Map of the UK defines the bedrock as *Rocks with essentially no groundwater.*

The Cranfield University online "Soilscapes" map identifies the soils below the site comprise *Loamy soils with naturally high groundwater,* which are indicated to drain into shallow groundwater supplies.

Mapping within the LBR Level 1 SFRA indicates that the site is located within an area of between 50-74.9% susceptibility to groundwater flooding. The Areas Susceptible to Groundwater Flooding (AStGWF) map *shows the proportion of each 1km grid square where geological and hydrogeological conditions indicate that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring. It does not take account of the change of flooding from groundwater rebound. This dataset covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.*

The LBR Level 1 SFRA states:

The bedrock geology for the entirety of the London Borough of Richmond upon Thames is London Clay, a geology type comprised of clay and silt, and one with very low permeability. This geological unit generally has a low hydraulic conductivity, which means water does not easily move through it. However, because of this characteristic and poor drainage, ponding can occur if aquifer outcrops are located uphill of areas only underlain with London Clay.

The superficial geology for the London Borough of Richmond upon Thames is predominantly a range of different river terrace deposits, including the Kempton Park Gravel Member, Taplow Gravel Member, Boyn Hill Gravel Member, and Black Park Gravel Member. Each of these geological units are comprised of sand and gravel, geology with a higher hydraulic conductivity than those comprised of clay and silt. The other dominant superficial geology type is the Langley Silt Member, a geological unit comprised of clay and silt. Water moves less easily through this geology as it has a low hydraulic conductivity.

Shallow deposits such as those found along the corridor typically have good hydraulic connectivity with nearby watercourses, and therefore when water levels in the watercourse rise, the groundwater level within these deposits can also rise. In topographically lower areas, this can result in groundwater emerging at the surface. Groundwater flooding may only subside once the water table naturally lowers when levels in the watercourse decrease.

There is no evidence to suggest the site has previously been affected by groundwater flooding.

Overall, the risk of flooding from groundwater is considered to be **Medium.**

The site is located within an area of between 50-74.9% susceptibility to groundwater flooding. The presence of superficial deposits also exacerbates the risk of groundwater flooding to the site.

Further considerations are made within Section 3 of this FRA to ensure that the risk remains at or below this level for the lifetime of the proposed development.

2.6 Artificial Flood Sources

Flood risk from artificial sources would include the failure of man-made drainage or the water supply network. Although the likelihood of such an occurrence is highly unpredictable, it is recommended that any potential future development at the site takes into account the location of any existing below ground services, in order to avoid any inadvertent flooding taking place during the construction phase and in the future.

The LBR Level 1 SFRA states:

Wastewater sewerage in the London Borough of Richmond upon Thames is serviced by TWUL. The borough is predominantly served by separate surface water and foul sewer systems. Modern sewer systems are designed to be separate systems, typically accommodating up to 1 in 30 year rainfall events in surface water sewers. However, sewer system segments across London vary in capacity due to age. Older segments have a smaller capacity and may not be designed to accommodate rainfall events as significant as 1 in 30 year events. TWUL have responsibilities for all 'public sewers' (the drainage network which serves more than one property, including associated manholes) under the Water Industry Act 1991.

Consideration needs to be given to the existing sewer network as part of all new development proposals.

Historic incidents of sewage flooding recorded by the Thames Water DG5 Database are identified within the LBR Level 1 SFRA. The Sewer Flooding Map within the SFRA indicates there have been no previous incidences of sewage flooding within close proximity of the property.

Thames Water have not been contacted for records of historic sewer flooding as part of this FRA.

There is no evidence to suggest that there has been historic flooding from artificial sources at the site.

The risk of flooding from sewers and artificial sources is considered to be **Low.**

Although records show there have been no historic incidents of flooding attributable to surcharge from the public sewer, any buried system can be at risk of surcharge due to localised blockages and there therefore remains a low risk to the site.

Further considerations are made within Section 3 of this FRA to ensure that the risk remains at or below this level for the lifetime of the proposed development.

2.7 Summary

Table 1 provides a summary of the classification of risk to the site from all flood sources and indicates where further considerations are required in the context of the proposed development.

Table 1 – Flood Risk Summary

Risk Source	Overall Risk Classification	Additional Considerations
Fluvial	Very Low	See Section 3
Tidal	Negligible	None
Surface Water	Very Low	See Section 3
Reservoir Failure	Negligible	None
Groundwater	Medium	See Section 3
Artificial Flood Sources	Low	See Section 3

Flood Risk in Planning Context

This report has so far evaluated all potential flood sources that may affect the site. The following sections describe the identified flood risks in the context of the proposed development and provide recommendations where required, for the mitigation or reduction of those risks to enable safe development.

3.1 Flood Risk Status and Development Viability

The EA Flood Map for Planning (Drawing 04) shows that the site is located within Flood Zone 1.

In accordance with Table 2 of the NPPF: Flood Risk and Coastal Change, the development type is considered to be 'More Vulnerable'. More vulnerable developments are considered appropriate in Flood Zones 1 & 2.

The development proposals comprise:

- A proposed ground floor rear and double storey extension.
- The construction of a basement area is to be located beneath the proposed extension area.

Given the dwelling is located within Flood Zone 1, fluvial flooding is not expected to impact the development proposals.

3.2 Design Principles for Development

It is recommended that, based on the current design proposals, the following design principles should be incorporated to demonstrate its long-term resistance to flooding:

Where possible, the internal finished floor levels should be raised a minimum of 150mm above immediate surrounding external ground levels. This will minimise the likelihood of water ingress from any residual isolated external surface water accumulations.

It is understood from the site plans that the proposed extension area will have the same elevation as the existing dwelling, which is raised above the adjacent garden area.

Consideration should be given to the nature and location of any existing subterranean surface water drainage especially soakaways / infiltration systems that could impact the ground conditions adjacent to the proposed basement.

Access/Egress

Access and Egress to the site is via Park Drive.

The EA Flood Map for Planning indicates that Park Drive may be flooded from surface water during an extreme 1 in 1000 (0.1%) year event. Shallow depths of up to 150mm are indicated.

Access and Egress to the site may be restricted during a flood event should the public highway flood.

Should the public highway ever flood, the occupants should remain within the site until floodwater has receded so that safe access and egress can be achieved.

The occupants should not drive through flood water.

It is recommended that all occupants are signed up to the EA Flood Warning Service and are aware of weather warnings that could provide an indication as to when surface water flooding may occur. A Flood Action Plan could also be prepared.

Flood Resistance

Although the dwelling is located within Flood Zone 1 and has a Very low surface water and fluvial risk. The following flood resistance measures could be considered as part of the design proposals should the occupier wish to mitigate against extreme flooding scenarios. Flood resistance measures that could be considered include:

- **Flood Doors or Barriers:** Flood doors could be installed at external entrances at the lower ground floor level. Alternatively, demountable barrier systems could be installed across doorway openings to prevent water ingress.

- **Raised Floor Levels:** It is good practice to raise the ground floor above adjacent external ground levels to minimise the risk of water ingress should localised surface water flooding occur adjacent to the building. It is recommended that ground floor levels are set a minimum of 150mm above surrounding external ground levels.

- **Air Bricks / Vents:** Should a suspended floor (timber or beam and block) be proposed as part of the development, self-closing anti-flood air bricks can be provided to prevent water ingress into the floor void should low-level flooding ever occur adjacent to the site.

- **Non-Return Valves:** To mitigate against sewer surcharging within the private drainage system, surcharge protection would be achievable through the use of non-return valves within the drainage system, or pan seals with backflow valves on sink outlets.

- **Masonry:** The occupier should keep external walls in good condition in order to minimise the potential for flood water to ingress through this point. Basic maintenance includes keeping

masonry pointing in good order. Brickwork could be treated with a waterproofing cream to help reduce ingress, and pointed with a waterproof additive.

Flood Resilience

Flood resilience is where emphasis is placed upon making a site recoverable from a flooding event as quickly and economically as possible. Flood resilient buildings are designed and constructed to reduce the impact of flood water entering the building so that no permanent damage is caused, structural integrity is maintained and drying and cleaning is easier. There is an opportunity to consider flood resilience measures within the internal fixtures and fittings proposed. However, as the flood risk at the dwelling is low, such measures are not considered critical.

Flood resilience measures that could be adopted include:

- **Internal Walls:** Promoting the use of water-resistant plaster and plasterboard (horizontal application where possible).
- **Skirting boards:** There are various options available for skirting boards. Wooden skirting boards can be treated with sealants such as Yacht Varnish to improve their flood resistance, or alternative materials can be used such as Tricoya or Plastic. It is also possible to use a tiled upstand.
- **Wiring:** Raising of electrical sockets as far up the wall as reasonably practicable and avoiding low level junction boxes or fuse boards will reduce any water damage to these items;
- **Flooring:** The use of water-resistant flooring (such as concrete, tiles or stone), which would minimize the time and effort to clean away any flood water.
- **Raise Internal Apparatus:** Where possible, any internal apparatus that is not designed to resist water ingress should be raised (e.g. white goods); and,
- **Puddle Pump/Wet Vac:** To enable the efficient dewatering of the site in the event of water ingress, the provision of such items should be kept internally.

Surface Water Drainage

As part of the development design, it should be ensured that the proposals do not increase flooding elsewhere.

Planning Policy

Policy SI 13 of **The London Plan 2021**, a key policy with regards to flood risk and water resource management states:

Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:

1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)

2) rainwater infiltration to ground at or close to source

3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)

4) rainwater discharge direct to a watercourse (unless not appropriate)

5) controlled rainwater discharge to a surface water sewer or drain

6) controlled rainwater discharge to a combined sewer.

Development proposals for impermeable surfacing should normally be resisted unless they can be shown to be unavoidable, including on small surfaces such as front gardens and driveways.

Drainage should be designed and implemented in ways that promote multiple benefits including increased water use efficiency, improved water quality, and enhanced biodiversity, urban greening, amenity and recreation.

The LBR states:

SuDS incorporate a range of measures and management techniques designed to manage surface water runoff. All new developments should incorporate SuDS in line with the Non-Statutory Technical Standards for Sustainable Drainage Systems.

Policy DM25.3 of the **LBR Local Plan 2018** states:

All developments should avoid, or minimise, contributing to all sources of flooding, including fluvial, tidal, surface water, groundwater and flooding from sewers, taking account of climate change and without increasing flood risk elsewhere.

The Council will require the use of Sustainable Drainage Systems (SuDS) in all development proposals. Applicants will have to demonstrate that their proposal complies with the following:

1. A reduction in surface water discharge to greenfield run-off rates wherever feasible.

2. Where greenfield run-off rates are not feasible, this will need to be demonstrated by the applicant, and in such instances, the minimum requirement is to achieve at least a 50% attenuation of the site's surface water runoff at peak times based on the levels existing prior to the development.

These requirements could be achieved through the following measures:

Collect Rainwater for Re-use

Where feasible, surface water run-off from roof areas should be collected for re-use in the form of rainwater harvesting systems and/or water butts.

Rainwater Attenuation

It is recommended that bioretention features are also considered within landscaped areas and/or adjacent to areas of hardstanding. Such features can include rain gardens and green roofs.

Basement Requirements

Policy LP11 of the **LBR Local Plan 2018** states that basement developments must comply with the following:

1. Extend to no more than a maximum of 50% of the existing garden land or more than half of any other undeveloped garden area (this excludes the footprint of the original building);

2. Demonstrate the scheme safeguards the structural stability of the existing building, neighbouring buildings and other infrastructure, including related to the highway and transport; a Structural Impact Assessment will be required where a subterranean development or basement is added to, or adjacent to, a listed building.

3. Use natural ventilation and lighting where habitable accommodation is provided;

4. Include a minimum of 1 metre naturally draining permeable soil above any part of the basement beneath the garden area, together with a minimum 200mm drainage layer, and provide a satisfactory landscaping scheme;

5. Demonstrate that the scheme will not increase or otherwise exacerbate flood risk on the site or beyond, in line with policy LP 21 Flood Risk and Sustainable Drainage;

6. Demonstrate as part of a Construction Management Statement that the development will be designed and constructed so as to minimise the impact during construction and occupation stages (in line with the Local Environmental Impacts, Pollution and Land Contamination policy of this Plan);

All basement and subterranean development should be installed with a pumped sewerage system to prevent flooding from back flow in public sewerage system as recognised in Part H of the Building Regulations. Issues of groundwater ingress to basement levels should be addressed by property owners.

In areas at risk of flooding, policy LP 21 in 6.2 'Flood Risk and Sustainable Drainage' will be applied, which restricts certain types of basements and uses in accordance with the relevant flood zones, for example, restricted uses include self-contained units and bedrooms at basement level.

Policy LP21 within the LBR Local Plan 2018 indicates there are no restrictions which prohibit the development of a basement in Flood Zone 1.

Richmond upon Thames Council may request a Basement Impact Assessment (BIA) is undertaken to provide further guidance on the site's suitability with regards to groundwater and ground conditions.

Risk Management and Site Investigations- Implications for development

Ground water monitoring investigations were conducted at the property by Risk Management Ltd on Monday 3rd October 2022 and Tuesday 6th June 2023.

In the first test (project number RML 8627), a borehole was drilled within the rear garden area at the site. However, the borehole was terminated at a depth of 2m due to impenetrable ground conditions; no ground water was observed during this investigation.

On the second investigation (project number RML 8515), a borehole was drilled within the front garden area at the property. The borehole was drilled to a depth of 6m and ground water was identified to emerge at a level of 2.4m below the surface. It is understood that following a return visit, the groundwater was found to have risen to 2.04m below the surface; an increase of 360mm approx.

It is understood the homeowner is continuing to monitor the groundwater level to identify if there are any seasonal fluctuations.

Given that groundwater was identified at a level of 2.4m below the surface, this could potentially have implications for the development with regards to its groundwater flood risk. However, because there is only one useful borehole to gauge water depths from, it is advisable additional boreholes are drilled within the rear garden area of the property in order to see how the water level fluctuates between the front section of the property and for data accuracy. Until more boreholes are drilled, flood risk potential can only be based off RML 8515.

It is unknown how far down below the ground surface the proposed basement will be situated. The national standard sets a minimum floor to ceiling height of 2.3m. This national standard level and the identified groundwater level of 2.4m below the surface would only give a small leeway of approximately 100mm for groundwater fluctuations to potentially affect the basement area.

Hydrostatic Pressure- Implication for development

Hydrostatic pressure is the pressure exerted by a fluid, such as water, at rest, due to the weight of the fluid above it. In the context of basement flooding, hydrostatic pressure refers to the pressure that groundwater can exert on the walls and floor of a basement.

A shallow groundwater level can significantly contribute to hydrostatic pressure concerns. When the groundwater level is close to the surface or basement foundations, it can exert significant hydrostatic pressure on the basement walls and floors. This pressure occurs because the weight of the water in the saturated soil creates pressure that pushes against the basement structure.

Shallow groundwater levels can lead to hydrostatic pressure in the following ways:

- Saturation of Soil: In areas with a high water table or where the soil is consistently saturated, the soil around and beneath a basement can become waterlogged. As the soil becomes saturated, it can transmit the weight of the water to the walls and floor of the basement.
- Hydrostatic Head: The depth at which the groundwater level intersects the basement wall or floor is known as the hydrostatic head. The higher the groundwater level, the greater the hydrostatic head and the more pressure it exerts on the basement.
- Seepage and Leakage: The hydrostatic pressure can force water through cracks, joints, or porous materials in the basement's foundation, leading to seepage and leakage. This can result in basement flooding and water damage.
- Structural Stress: Prolonged exposure to hydrostatic pressure can exert significant stress on the basement walls, potentially leading to cracks, bulging, or even structural failure in extreme cases.

To address the impact of a shallow groundwater level and mitigate hydrostatic pressure, basement waterproofing measures such as installing sump pumps, French drains, and proper foundation waterproofing systems is critical. These systems are designed to divert water away from the foundation and relieve the hydrostatic pressure on the basement structure, reducing the risk of water intrusion and structural damage.

Underlying Geology- Implication for development

Online BGS mapping and observations made during the ground water monitoring investigations conducted by Risk Management Ltd, suggest the presence of clay formations beneath the site.

Clay soil can contribute to basement flooding through several mechanisms, primarily related to its high water retention and low permeability characteristics:

Clay soil has a low permeability, meaning it doesn't allow water to pass through it easily. When it rains heavily or there is an excess of groundwater, the clay soil can become saturated and hold onto water. This saturation can lead to water pooling around the foundation of a building.

Additionally, as clay soil becomes saturated, it exerts hydrostatic pressure against the foundation walls of a basement. This pressure can force water through any cracks, gaps, or porous materials in the foundation, leading to basement seepage and flooding.

Clay soil is also known for its ability to expand when it absorbs water and shrink when it dries. This expansion and contraction can put stress on the foundation walls, potentially leading to cracks and openings through which water can enter.

Even after the rain has stopped, clay soil can take a long time to drain and dry out because of its low permeability. This means that once water has infiltrated around the foundation, it may persist for an extended period, increasing the risk of prolonged basement moisture problems.

Exceedance Design

A consideration of the effect of extreme rainfall events on the proposed drainage system is required in order to mitigate the effects of climate change.

Areas adjacent to the building should be landscaped such that any surcharged flows are directed away from the properties and retained within landscaped garden areas. These areas would then be allowed to infiltrate to ground.

Maintenance

Gutters, downpipes and gullies should be cleared and maintained regularly to ensure the system operates as required.

If a pumped drainage system is required, the pump system will need to be regularly serviced and maintained.

The nature of the surface water drainage system serving the existing development at the site is to be confirmed during the site works and retained as part of the proposed development.

3.3 Flood Awareness & Maintenance

It is important that all residents at the site have an awareness of flood risk at a local level, and that any necessary actions can be taken prior to flooding.

- **Flood Warnings & Alerts:** The site is not located within close proximity to an EA Flood Alert Area. The extent of the Flood Warning and Flood Alert Areas within the vicinity of the site are shown on Drawing 08. It is recommended that all occupants of the site are subscribed to the EA Flood Warning service through the following website:
  https://www.gov.uk/sign-up-for-flood-warnings

- **Weather Alerts:** The Met Office provide weather warnings when extreme weather is forecast. Their service includes warnings for rain and thunderstorms. Surface water flooding typically occurs during and following torrential and/or high intensity rainfall and therefore these warnings may provide an indication of when flooding could happen. The occupants can check the local weather forecast and register to receive weather warnings from the Met Office through the following website:
  https://www.metoffice.gov.uk/weather/warnings-and-advice

- **Flood Plan:** In order to efficiently prepare for a potential future flood event, the occupants could prepare an all-encompassing Flood Action Plan. The action plan should consider how to respond in the event of a flood. The Environment Agency provide template flood plan documents, copies of which are provided can be downloaded from the following webpages:
  https://www.gov.uk/government/publications/personal-flood-plan

- **Drainage:** The site occupants should regularly inspect guttering and downpipes and clear any debris that exists. This will reduce the likelihood of any blockages and subsequent increase in surface water risk during heavy rainfall events.

Conclusion

The site has been assessed for a variety of flood sources, and based upon detailed analysis, this FRA has identified that flooding from Groundwater is considered to be Medium. Flooding from Artificial Sources is considered to be Low. While surface water flooding and fluvial flooding are considered to be Very Low. Reservoir flooding and tidal are considered to be Negligible. The client's development aspirations can manage/mitigate any residual flood risk as part of the design. It is recommended that a surface water drainage design should be developed to ensure there is no increase in surface water run-off from the site.

This FRA has therefore demonstrated that the proposed development can be undertaken in-line with NPPF guidance, and that it is:

- Suitable in the location proposed;
- Unlikely to place additional persons at risk of flooding; and,
- Unlikely to increase flood risk elsewhere through the loss of floodplain storage, impedance of flood flows, or increase in surface water run-off.

Limitations of the report

This report has been prepared by FPS Environmental (FPS) solely for the benefit of Rachael & Ryan McKinley ("the Client") and has not been assigned to any other third parties. If reliance on this report was required by a third party, this could be arranged for an agreed fee. This report should not be used by the client in relation to any other matters not covered specifically by the scope of the report. If this report does not contain a signature in the Document Control window, then this is an uncontrolled electronic copy and should not be relied upon by the client or any other recipient, as FPS Environmental cannot give assurance on the source or content of the document. FPS has used all reasonable skill, care and diligence in the preparation of this report.

The Flood Risk Assessment report has been designed to satisfy planning requirements, as outlined in Section 1. It is a desktop review of information provided by the client and from selected private and public databases. It only includes a site investigation where specifically referenced. This report does not make a detailed site-specific assessment of the suitability of the existing drainage on the Site. If this is required, then a site survey should be considered. FPS Environmental accepts no responsibility for the accuracy or completeness of third-party data reviewed within this assessment.

This report is provided under FPS Environmental Standard Terms and Conditions.

Drawings

Legend

Site Boundary

Main River

Google Satellite

Scale @ A4: **1:750**

Drawing Title
Site Location Plan

Project
22 Park Drive, london, SW14 8RD

Client
Rachael Graham

Drawing No. & Revision	Date
01	25/07/2023
Drawn By	**Approved By**
RH	VV

FPS environmental
www.fpsenvironmental.co.uk

Legend

- Site Boundary
- Main River

Google Satellite

Scale @ A4: **1:7,500**

Drawing Title	Site Location Plan
Project	22 Park Drive, london, SW14 8RD
Client	Rachael Graham
Drawing No. & Revision: 02	Date: 25/07/2023
Drawn By: RH	Approved By: VV

FPS environmental
www.fpsenvironmental.co.uk

Legend

- Site Boundary
- Main River

LiDAR Data
(Metres above Ordnance Datum)

- 10
- 11.25
- 12.5
- 13.75
- 15

Google Satellite

Scale @ A4: **1:750**

Drawing Title
LiDAR Data

Project
22 Park Drive, london, SW14 8RD

Client
Rachael Graham

Drawing No. & Revision	Date
03	25/07/2023
Drawn By	**Approved By**
RH	VV

FPS environmental
www.fpsenvironmental.co.uk

Legend

- Site Boundary
- Main River
- Flood Zone 3
- Flood Zone 2

Google Satellite

Scale @ A4: **1:3,500**

Drawing Title
EA Flood Map for Planning

Project
22 Park Drive, london, SW14 8RD

Client
Rachael Graham

Drawing No. & Revision	Date
04	25/07/2023
Drawn By	**Approved By**
RH	VV

FPS environmental
www.fpsenvironmental.co.uk

Legend

- Site Boundary
- Main River

Risk of Flooding from Surface Water
1 in 30 year depth (m)

- > 1.20
- 0.90 - 1.20
- 0.60 - 0.90
- 0.30 - 0.60
- 0.15 - 0.30
- < 0.15

Google Satellite

Scale @ A4: **1:750**

Drawing Title
Risk of Flooding from Surface Water
1 in 30 year (3.3%) Flood Depth

Project
22 Park Drive, london, SW14 8RD

Client
Rachael Graham

Drawing No. & Revision	Date
05	25/07/2023
Drawn By	**Approved By**
RH	VV

FPS environmental
www.fpsenvironmental.co.uk

Legend

- Site Boundary
- Main River

Risk of Flooding from Surface Water
1 in 100 year depth (m)

- > 1.20
- 0.90 - 1.20
- 0.60 - 0.90
- 0.30 - 0.60
- 0.15 - 0.30
- < 0.15

Google Satellite

Scale @ A4: **1:750**

Drawing Title
Risk of Flooding from Surface Water
1 in 100 year (1%) Flood Depth

Project
22 Park Drive, london, SW14 8RD

Client
Rachael Graham

Drawing No. & Revision	Date
06	25/07/2023
Drawn By	**Approved By**
RH	VV

FPS environmental
www.fpsenvironmental.co.uk

Legend

- Site Boundary
- Main River

Risk of Flooding from Surface Water
1 in 1000 year depth (m)

- > 1.20
- 0.90 - 1.20
- 0.60 - 0.90
- 0.30 - 0.60
- 0.15 - 0.30
- < 0.15

Google Satellite

Scale @ A4: **1:750**

Drawing Title
Risk of Flooding from Surface Water
1 in 1000 year (0.1%) Flood Depth

Project
22 Park Drive, london, SW14 8RD

Client
Rachael Graham

Drawing No. & Revision	Date
07	25/07/2023
Drawn By	**Approved By**
RH	VV

FPS environmental
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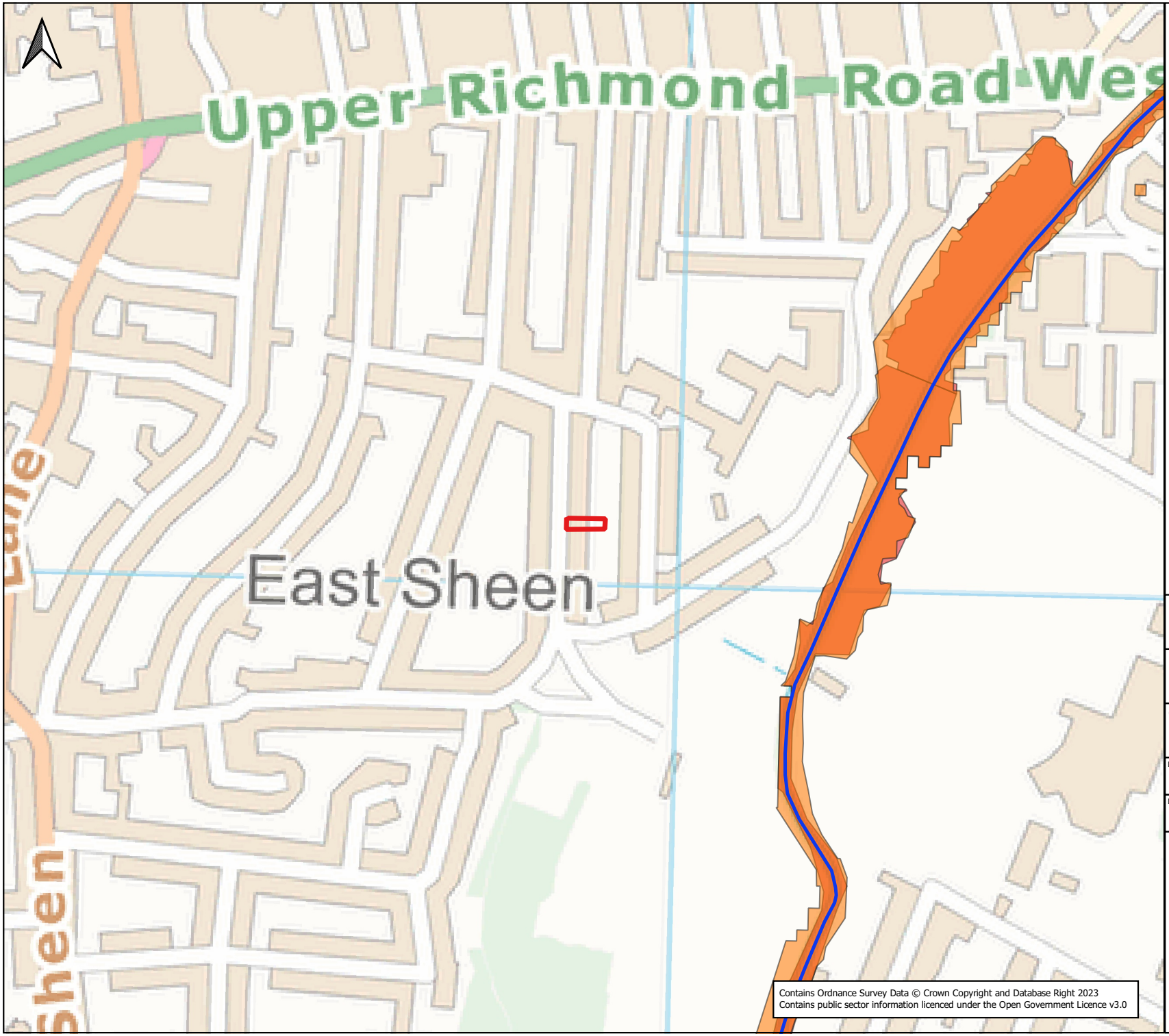


Legend

- Site Boundary
- Main River
- Flood Alert Areas
- Flood Warning Areas

Scale @ A4: **1:7,500**

Drawing Title
EA Flood Warning & Flood Alert Areas

Project
22 Park Drive, london, SW14 8RD

Client
Rachael Graham

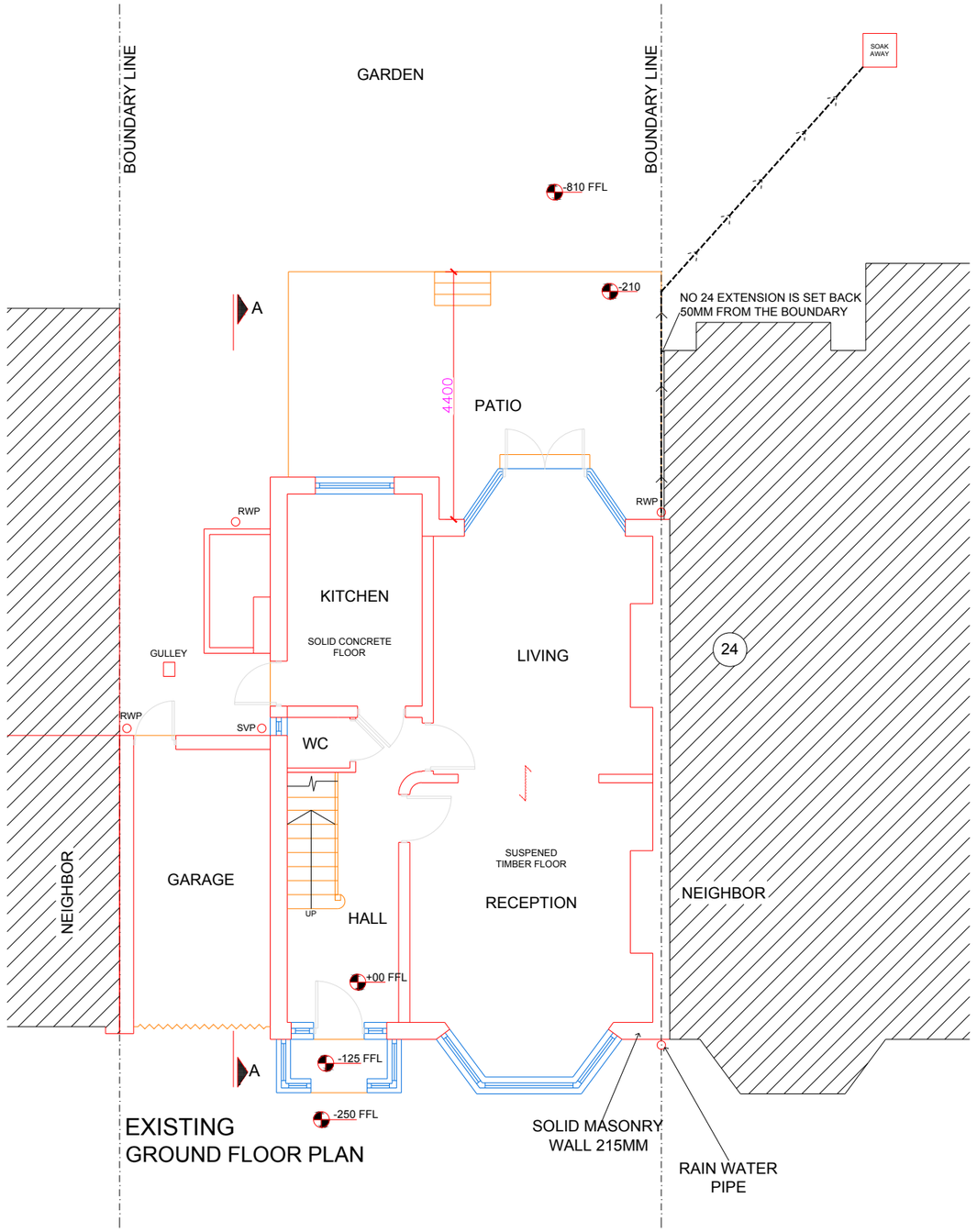
Drawing No. & Revision	Date
08	25/07/2023
Drawn By	**Approved By**
RH	VV

FPS environmental
www.fpsenvironmental.co.uk

Appendices

Appendix A

Site Plans & Elevations



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Scale bar 1:100 @ A3

RW WASTE

SOIL WASTE

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

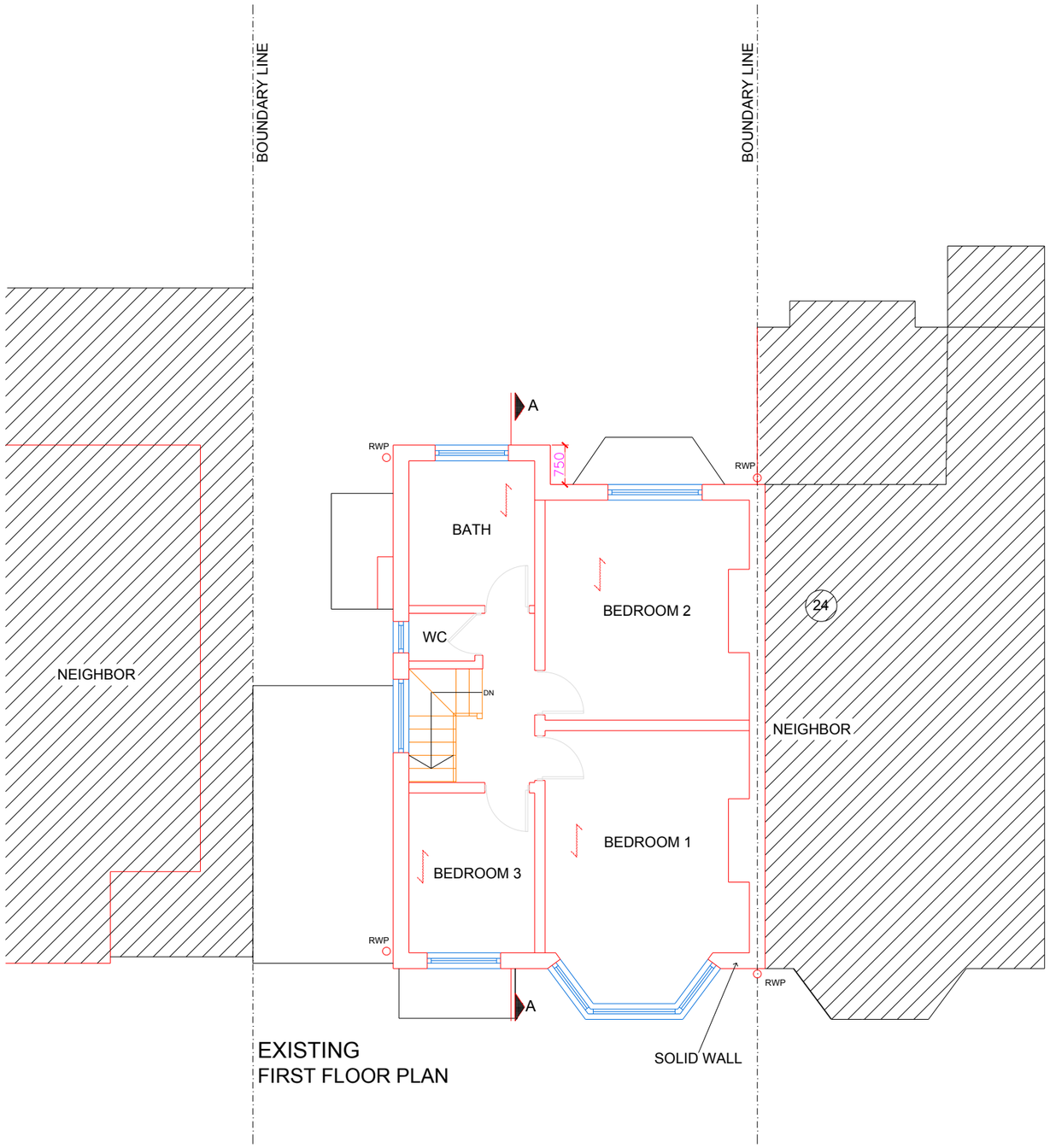
Project
22 Park Drive East Sheen,
SW14 8RD

Drawing:
Existing Ground Floor Plan

Number:
2022/02/01

Date:
February 2022

D:\WORK\2022\00 Sheet\LOGO\HB PLANNING SERVICE.jpg



EXISTING
FIRST FLOOR PLAN

0 1 2 3 4 5 6 7 8 9 10 [m]

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

Project
22 Park Drive East Sheen,
SW14 8RD

Drawing:
Proposed First Floor Plan

Number:
2022/02/02

Date:
February 2022

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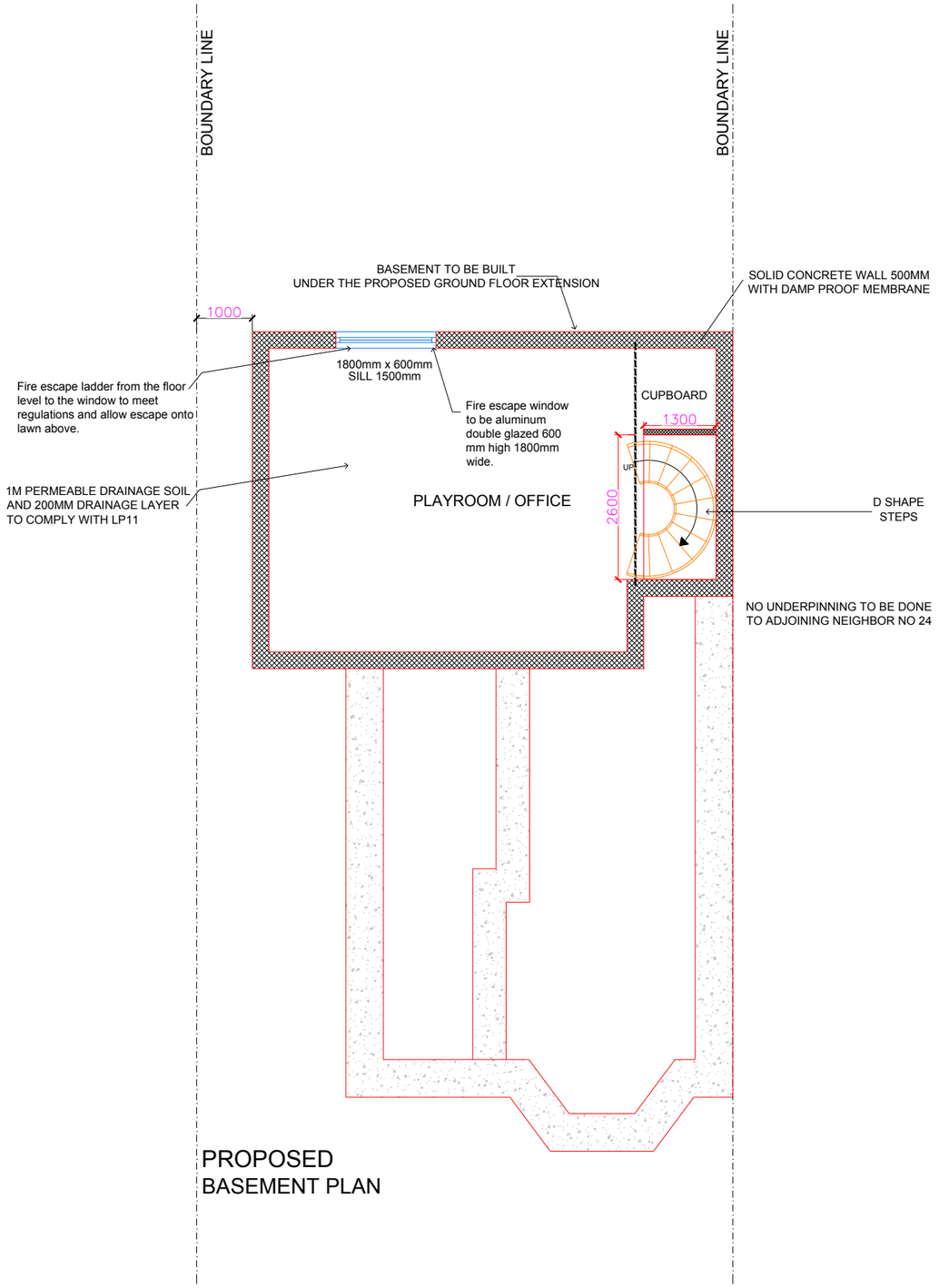

PROPOSED
BASEMENT PLAN

0 1 2 3 4 5 6 7 8 9 10

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

Project
22 Park Drive East Sheen,
SW14 8RD

Drawing:
Proposed Basement

Number:
2022/02/03

Date:
February 2022

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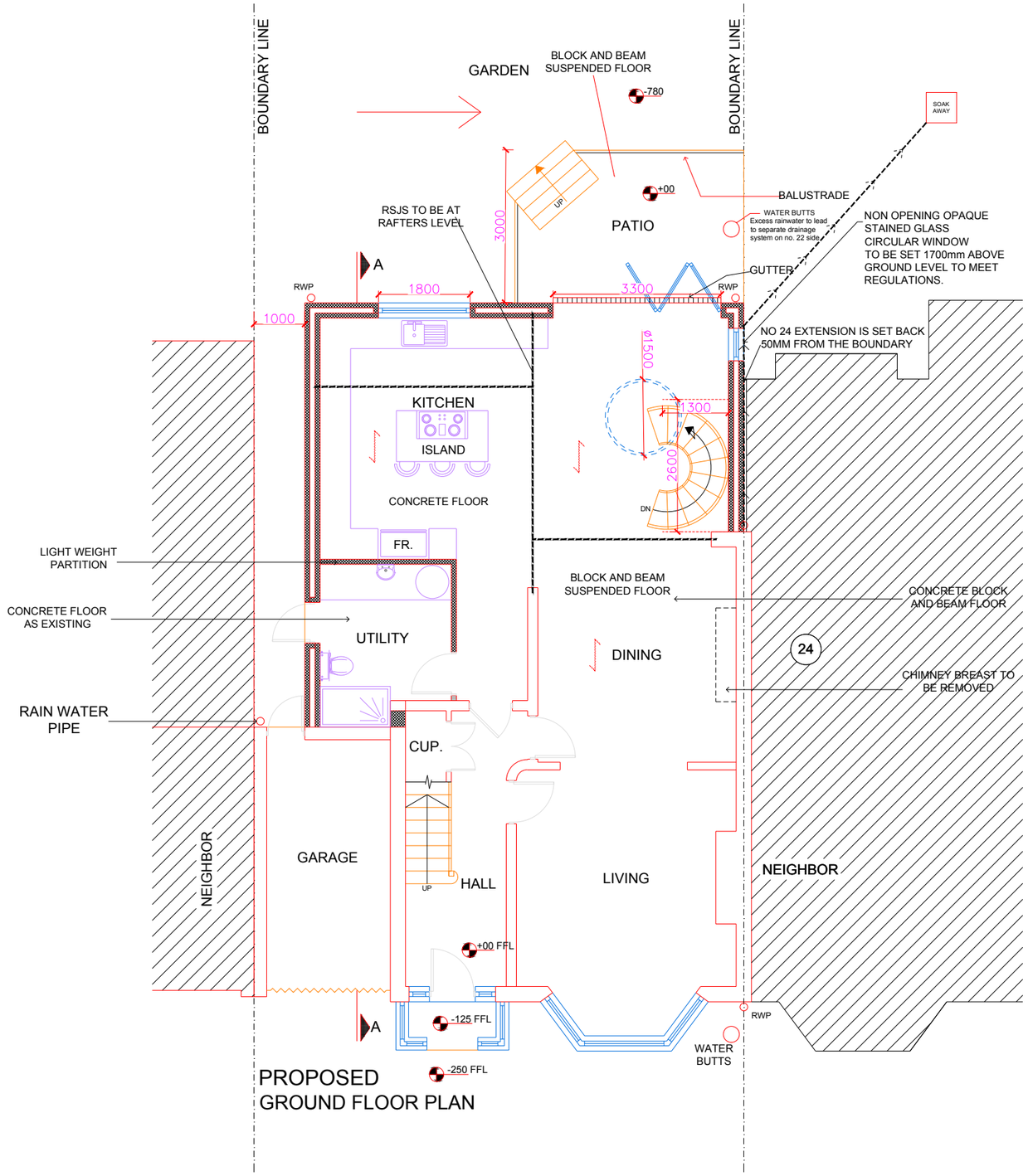

0 1 2 3 4 5 6 7 8 9 10 [m]

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

Project
22 Park Drive East Sheen, SW14 8RD

Drawing:
Proposed Ground Floor Plan

Number:
2022/02/04

Date:
February 2022

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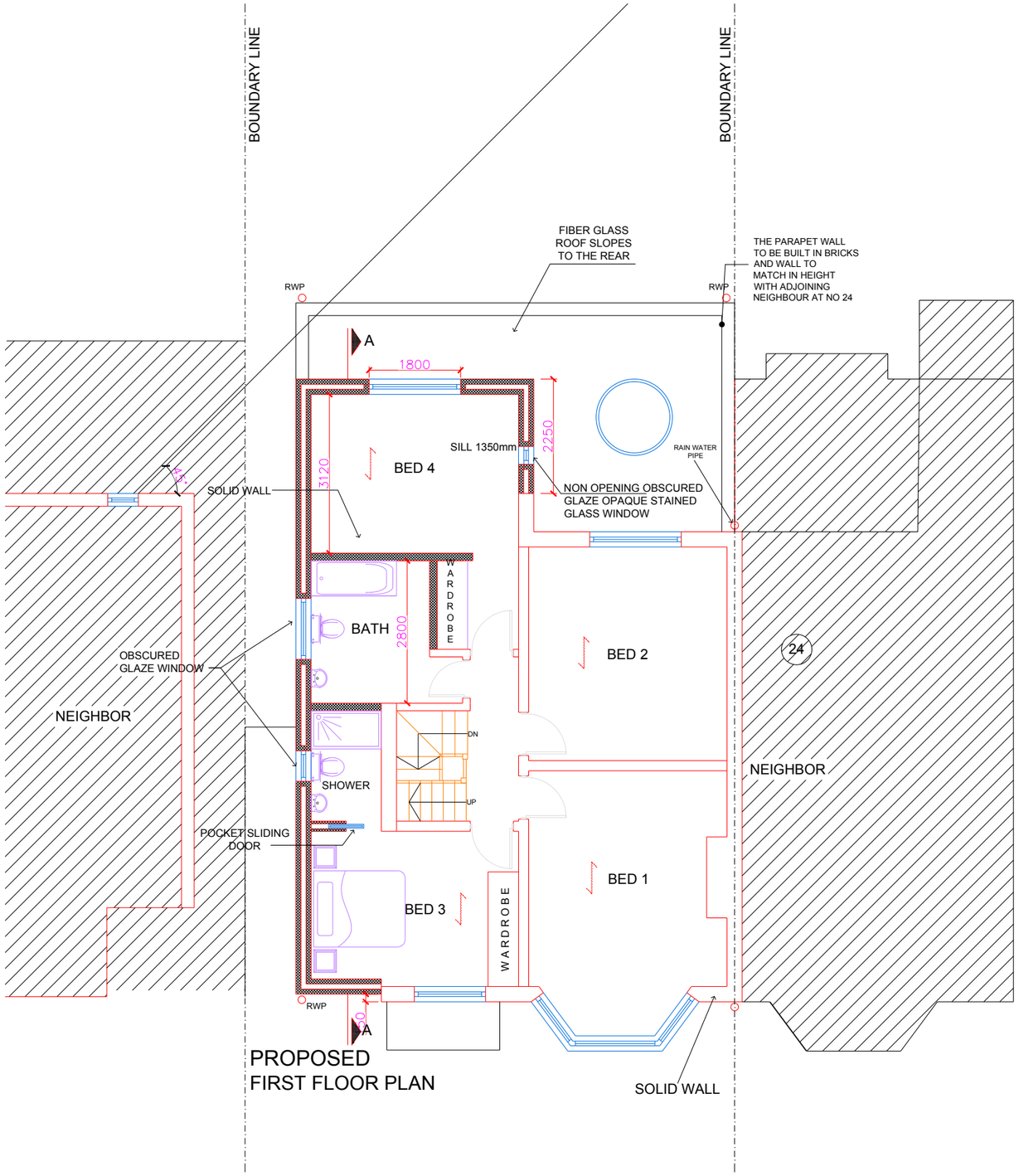

0 1 2 3 4 5 6 7 8 9 10 [m]

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

Project
22 Park Drive East Sheen, SW14
8RD

Drawing:
Proposed First Floor Plan

Number:
2022/02/05

Date:
February 2022

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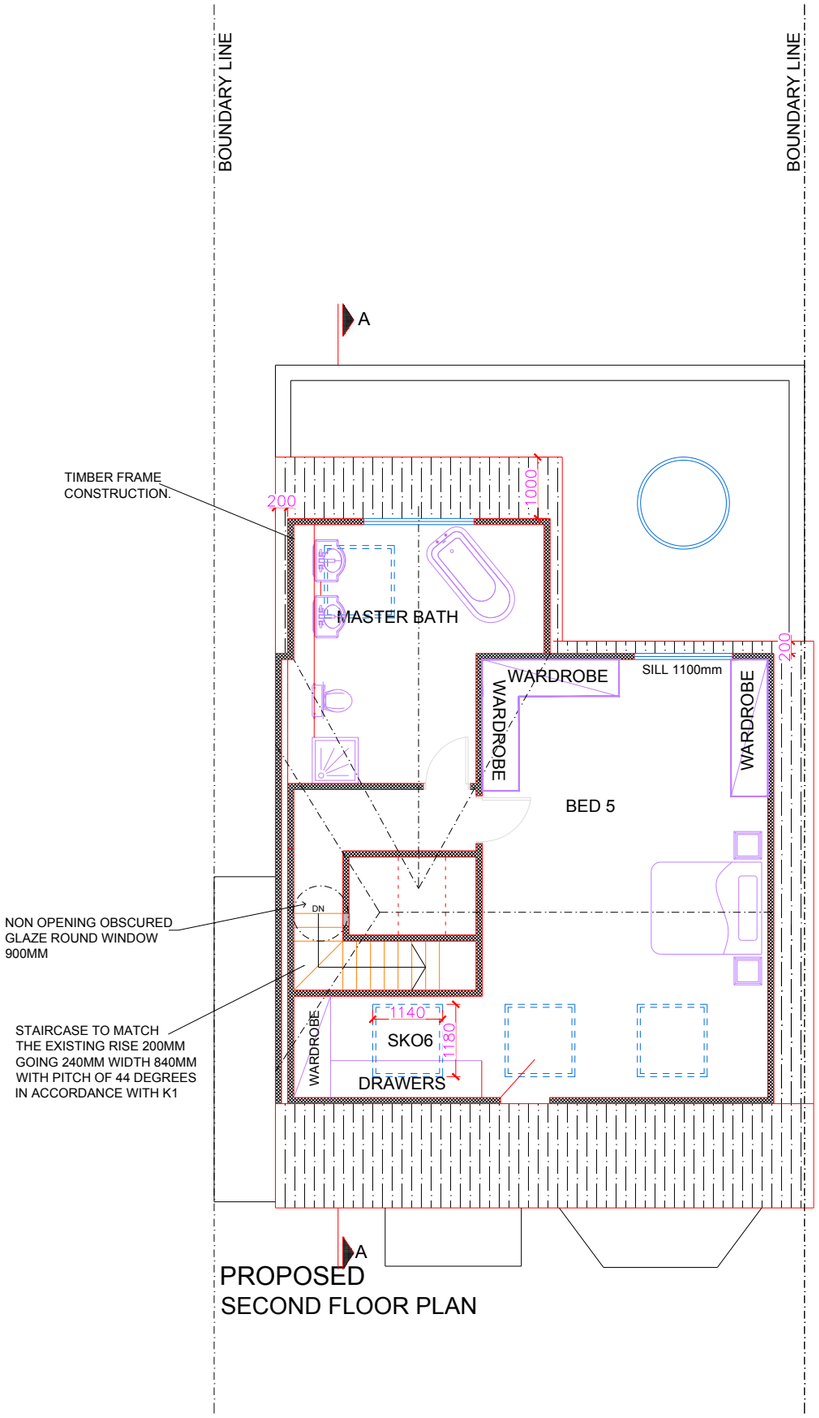

PROPOSED
SECOND FLOOR PLAN

0 1 2 3 4 5 6 7 8 9 10 [m]

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

Project
22 Park Drive East Sheen, SW14
8RD

Drawing:
Proposed Second Floor Plan

Number:
2022/02/06

Date:
February 2022

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EXISTING
FRONT ELEVATION

0 1 2 3 4 5 6 7 8 9 10 [m]

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

Project
22 Park Drive East Sheen, SW14 8RD

Drawing:
Existing Front Elevation

Number:
2022/02/07

Date:
February 2022

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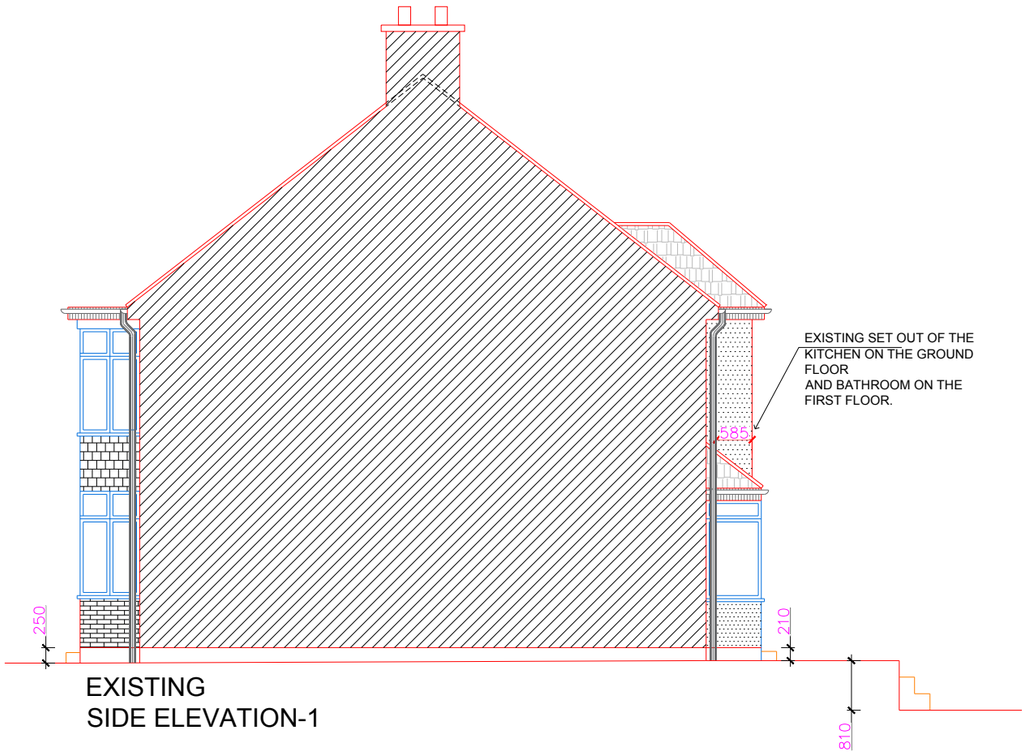

EXISTING
SIDE ELEVATION-1

0 1 2 3 4 5 6 7 8 9 10 [m]

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

Project
22 Park Drive East Sheen, SW14
8RD

Drawing:
Existing Side Elevation

Number:
2022/02/08

Date:
February 2022

D:\WORK\2022\00 Sheet\LOGO\HB PLANNING SERVICE.jpg

EXISTING
REAR ELEVATION

0 1 2 3 4 5 6 7 8 9 10 [m]

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

Project
22 Park Drive East Sheen, SW14 8RD

Drawing:
Existing Rear Elevation

Number:
2022/02/09

Date:
February 2022

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EXISTING
SIDE ELEVATION-2

0 1 2 3 4 5 6 7 8 9 10 [m]

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

Project
22 Park Drive East Sheen, SW14 8RD

Drawing:
Existing Side Elevation

Number:
2022/02/10

Date:
February 2022

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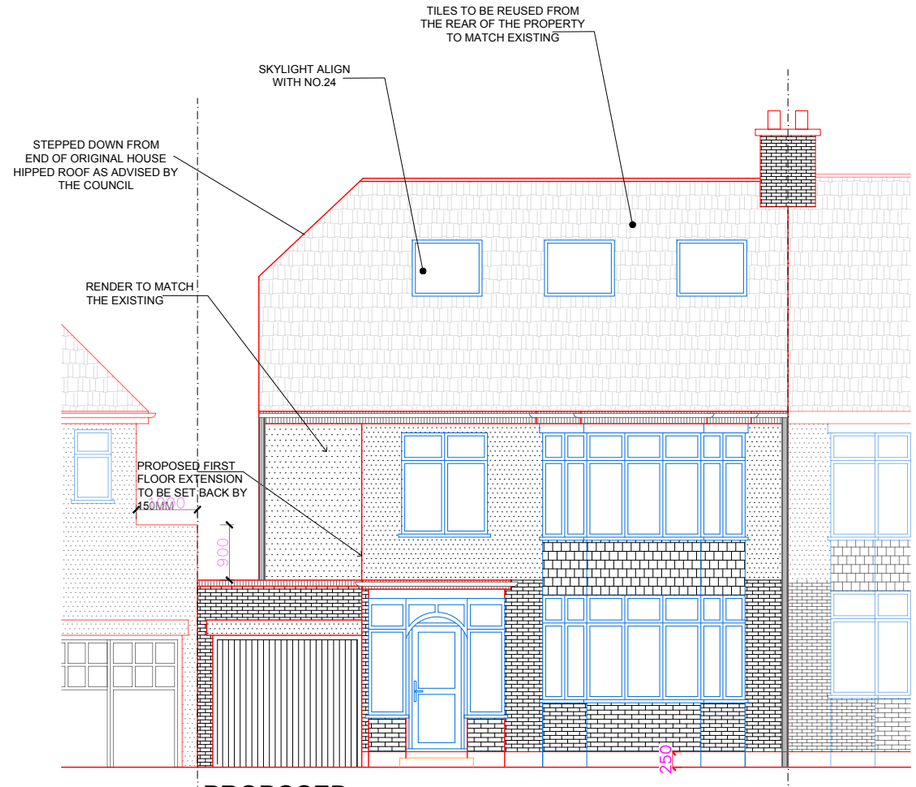


PROPOSED
FRONT ELEVATION

0 1 2 3 4 5 6 7 8 9 10 [m]

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

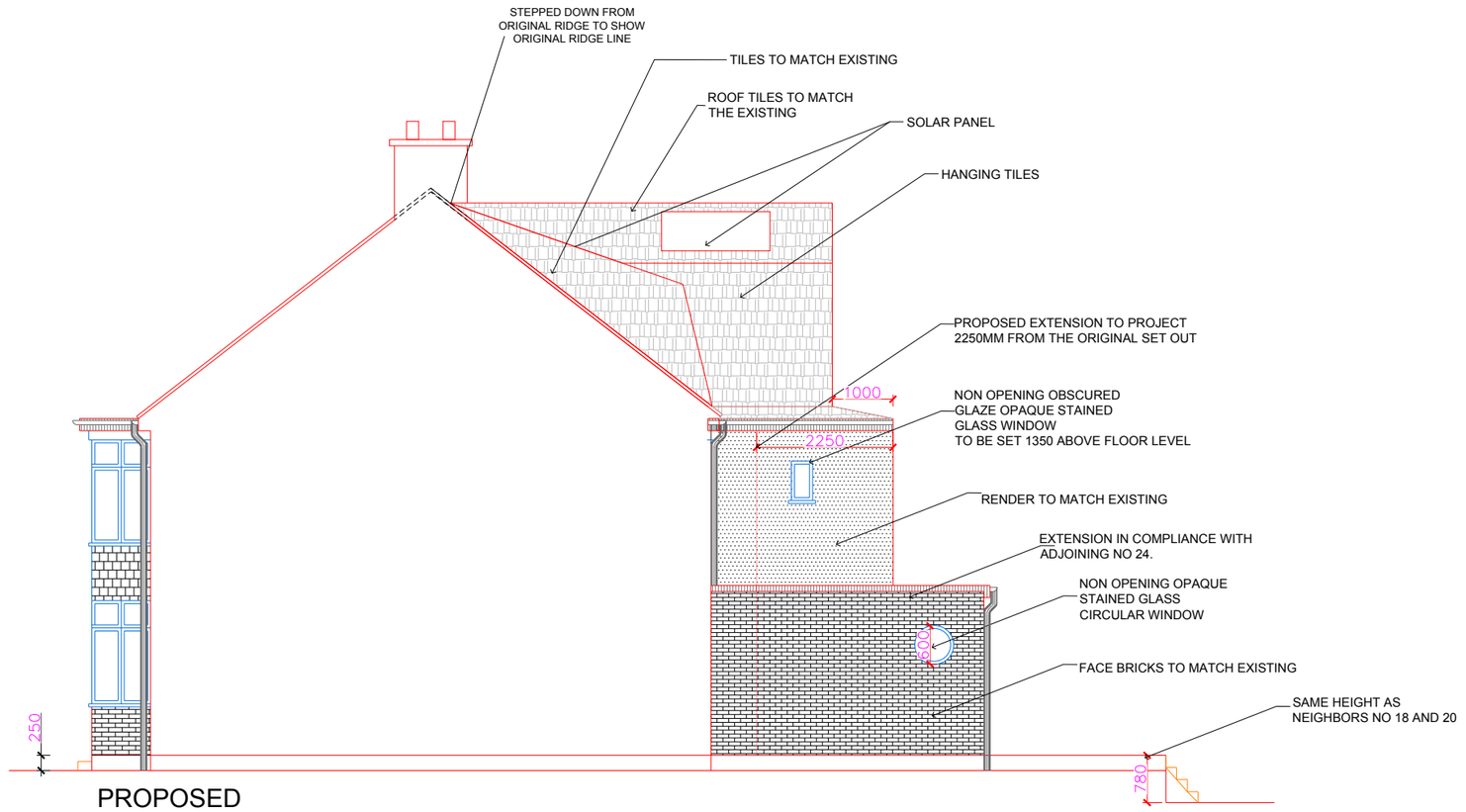
Project
22 Park Drive East Sheen, SW14
8RD

Drawing:
Proposed Front Elevation

Number:
2022/02/11

Date:
February 2022

D:\WORK\2022\00 Sheet\LOGO\HB PLANNING SERVICE.jpg



PROPOSED
SIDE ELEVATION-1

0 1 2 3 4 5 6 7 8 9 10 [m]

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

Project
22 Park Drive East Sheen, SW14
8RD

Drawing:
Proposed Side Elevation

Number:
2022/02/12

Date:
February 2022

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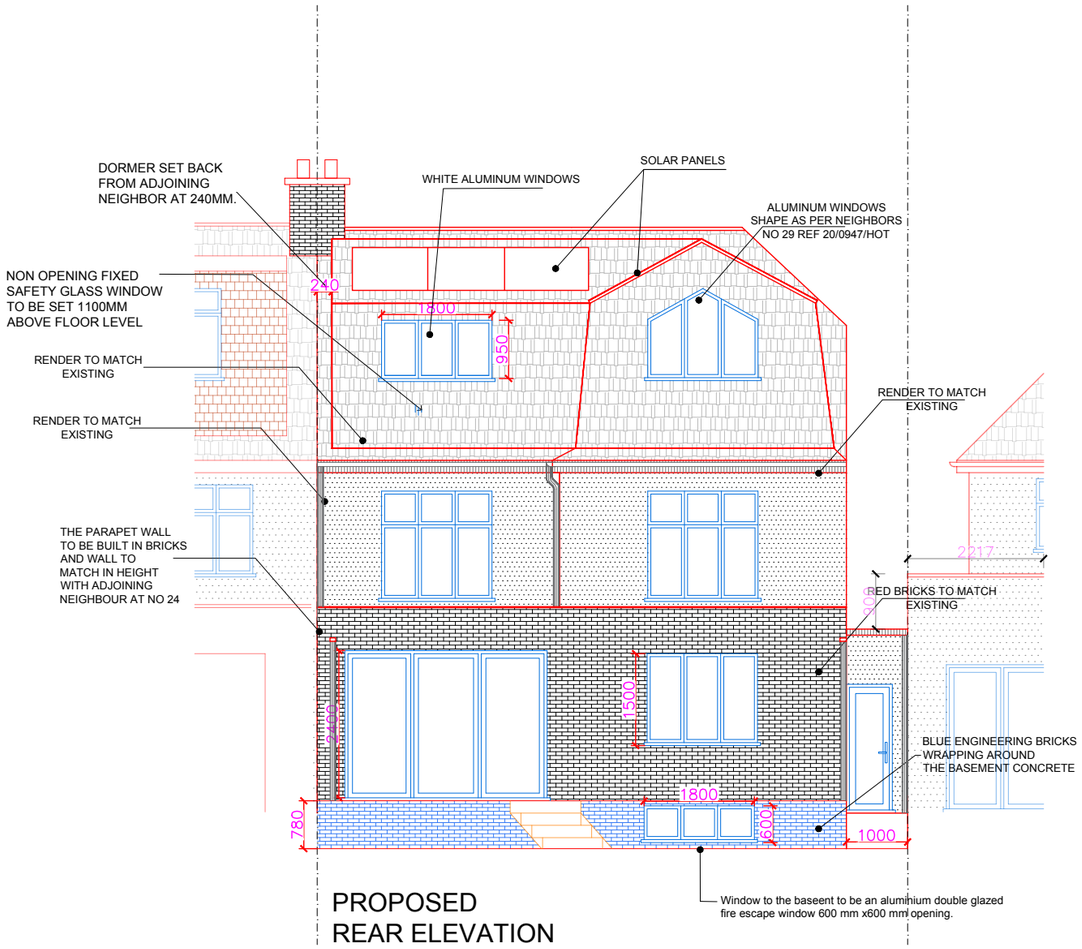

PROPOSED
REAR ELEVATION

0 1 2 3 4 5 6 7 8 9 10 [m]

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

Project
22 Park Drive East Sheen, SW14
8RD

Drawing:
Proposed Rear Elevation

Number:
2022/02/13

Date:
February 2022

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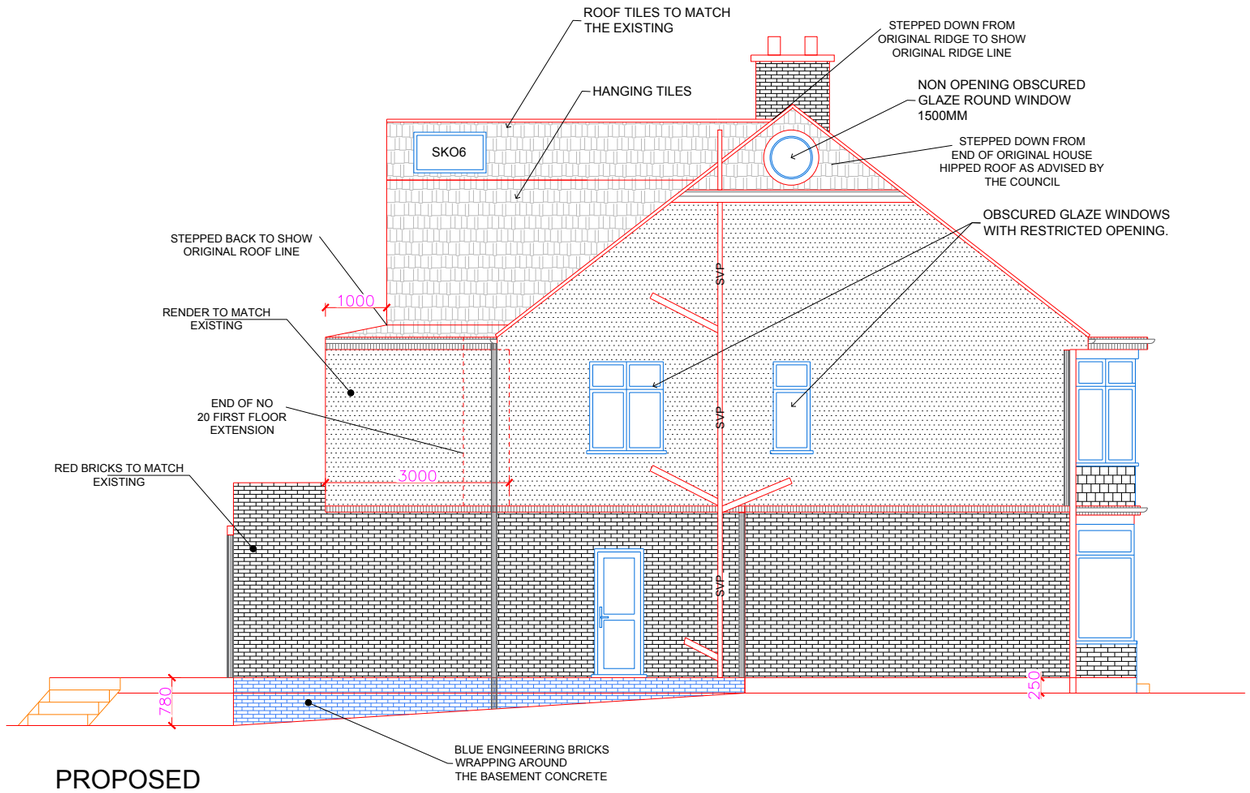


PROPOSED
SIDE ELEVATION-2

0 1 2 3 4 5 6 7 8 9 10 [m]

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

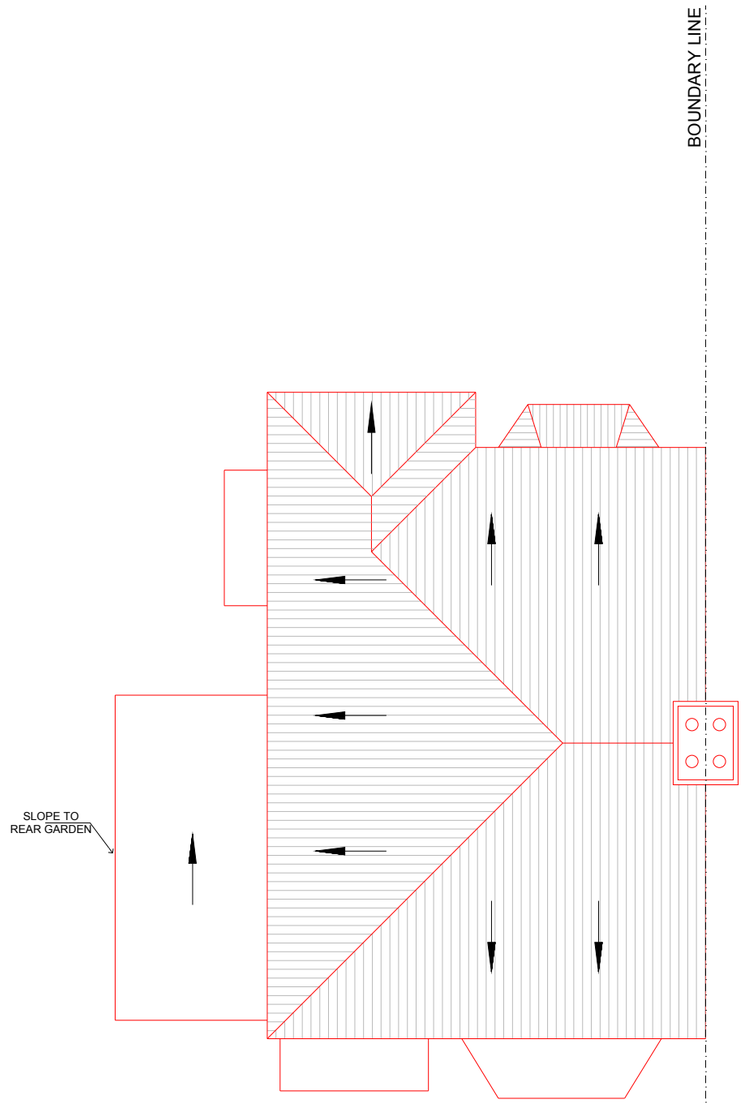
Project
22 Park Drive East Sheen, SW14
8RD

Drawing:
Proposed Side Elevation

Number:
2022/02/14

Date:
February 2022

D:\WORK\2022\00 Sheet\LOGO\HB PLANNING SERVICE.jpg



EXISTING ROOF PLAN

0 1 2 3 4 5 6 7 8 9 10 [m]

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

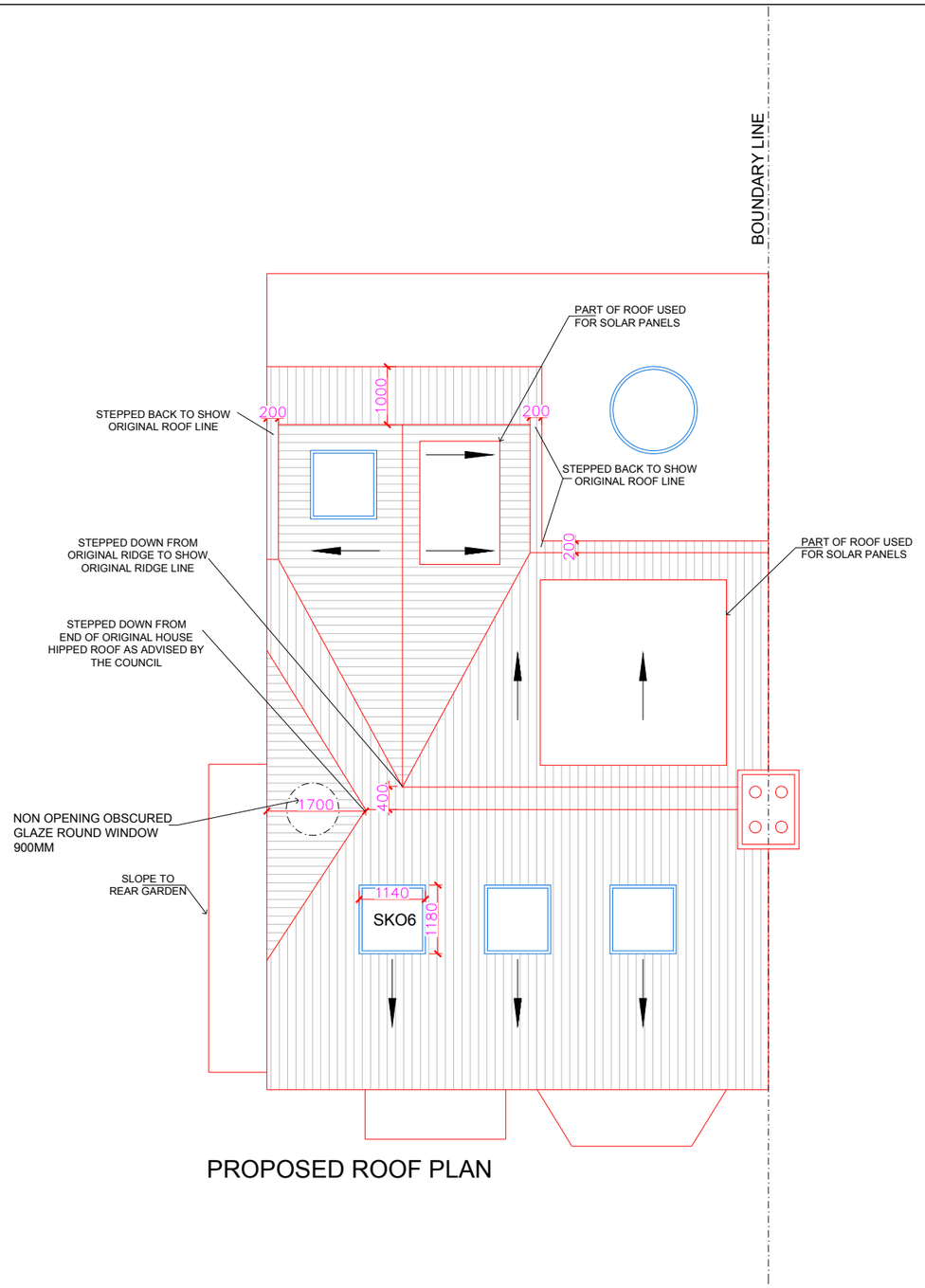
Project
22 Park Drive East Sheen, SW14
8RD

Drawing:
Existing Roof Plan

Number:
2022/02/15

Date:
February 2022

D:\WORK\2022\00 Sheet\LOGO\HB PLANNING SERVICE.jpg



PROPOSED ROOF PLAN

0 1 2 3 4 5 6 7 8 9 10 [m]

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

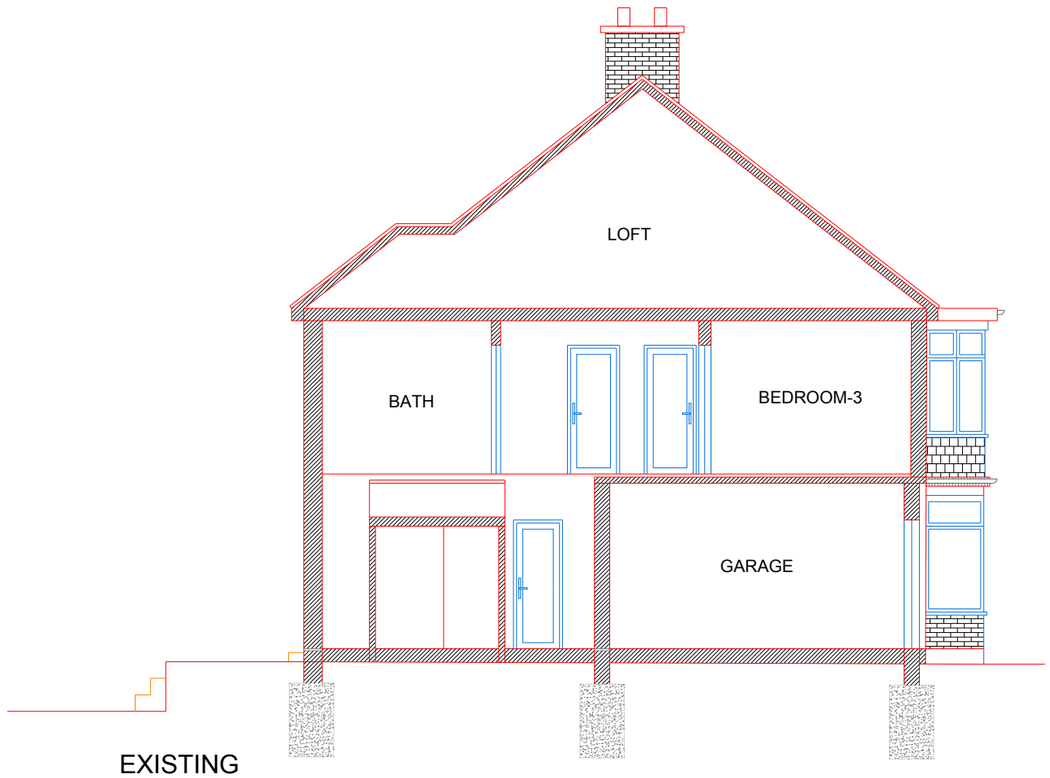
Project
22 Park Drive East Sheen, SW14 8RD

Drawing:
Proposed Roof Plan

Number:
2022/02/16

Date:
February 2022

D:\WORK\2022\00 Sheet\LOGO\HB PLANNING SERVICE.jpg



EXISTING
SECTION-AA

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Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

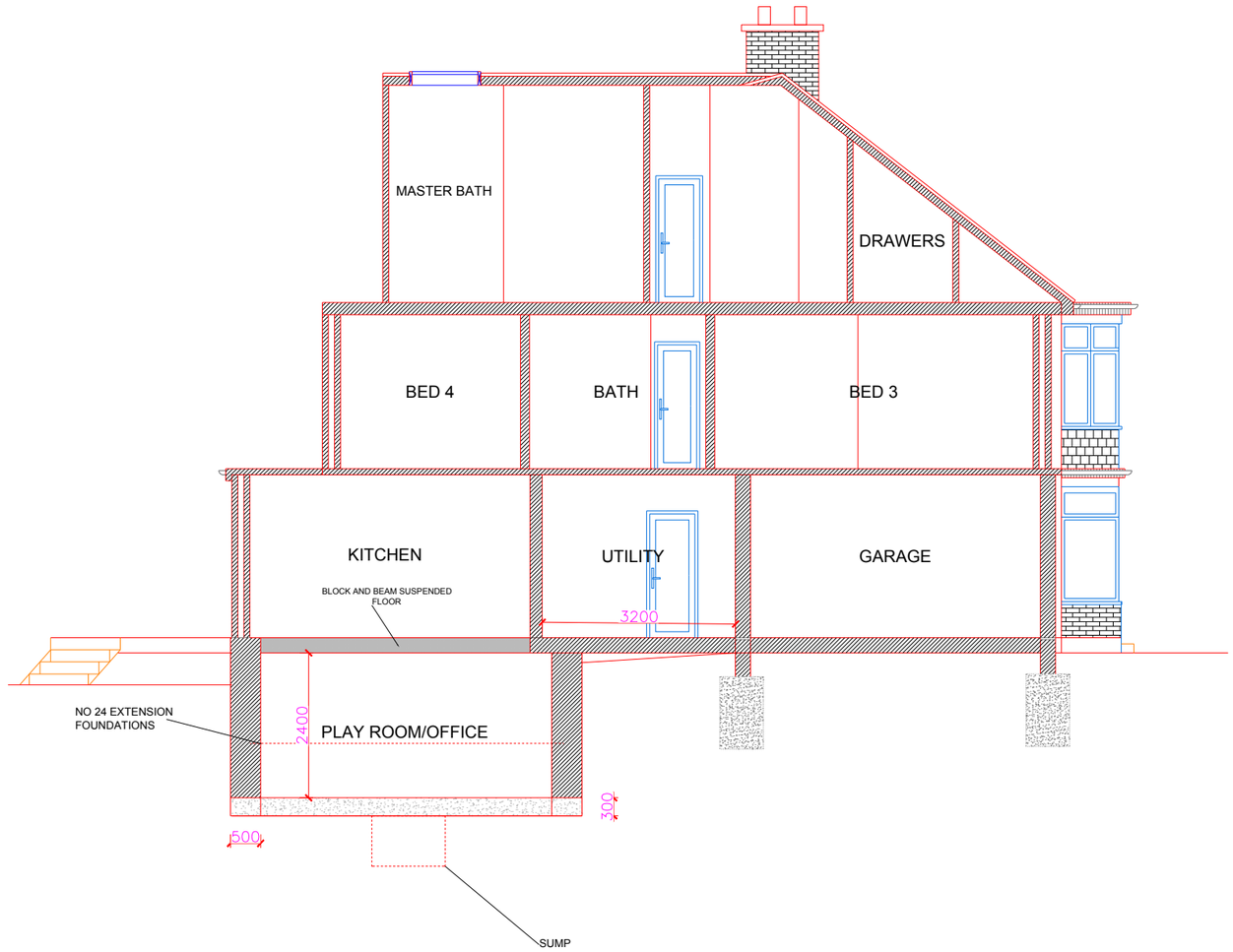
Project
22 Park Drive East Sheen, SW14
8RD

Drawing:
Existing Section

Number:
2022/02/17

Date:
February 2022

D:\WORK\2022\00 Sheet\LOGO\HB PLANNING SERVICE.jpg



PROPOSED SECTION-AA

0 1 2 3 4 5 6 7 8 9 10 [m]

Scale bar 1:100 @ A3

HB PLANNING SERVICES
EMAIL INFO@HBPLANNINGSERVICES.CO.UK
CONTACT 02038539648

Scale 1:100 @ A3

Project
22 Park Drive East Sheen, SW14 8RD

Drawing:
Proposed Section

Number:
2022/02/18

Date:
February 2022

D:\WORK\2022\00 Sheet\LOGO\HB PLANNING SERVICE.jpg