

Flood Risk Assessment

29 High Street, Lindfield, RH16 2HJ

Rev -

Reference **C3275**

Date **16.07.2024**

<i>Revision</i>	<i>Status</i>	<i>Description</i>	<i>Date</i>	<i>Issued</i>	<i>Checked</i>
-	Final v1	Issued for Approval	16.07.24	RH	RH

1 SITE AND DEVELOPMENT OVERVIEW

DEVELOPMENT DESCRIPTION	EXISTING (PRE-DEVELOPMENT)	PROPOSED (POST-DEVELOPMENT)
Site Use	Existing dwelling	Rear extension to existing dwelling, including extension of the existing basement
Development Use	Residential	Residential
Use Design Life		100 years
Number of Dwellings	1	1
EA Vulnerability Classification	More Vulnerable	More Vulnerable
Development Class		Minor
County Planning Authority	Mid Sussex County Council	
District Planning Authority	Mid Sussex District Council	
Local Sewer Authority	Southern Water	
SITE CATCHMENT CHARACTERISTICS	DESCRIPTION	SOURCE
River Management Catchment	Adur and Ouse Management Catchment	https://environment.data.gov.uk/
River Basin District	South East	https://environment.data.gov.uk/
Nearest EA Main River	Scrase Stream located approximately 756m to the south of the site	https://environment.maps.arcgis.com/
Nearest Ordinary watercourse or surface waters	A pond located approximately 25m to the south	Online Mapping
KEY FLOOD RISK AND DATA SOURCES	DATA TYPE	SOURCE
EA Fluvial and Tidal Planning Data	UK Government Flood Maps for Planning (ref: FMP)	https://flood-map-for-planning.service.gov.uk/
EA Surface Water Data	DEFRA Risk of Flooding from Surface Water Sources GIS Data (ref: RoFSW)	https://environment.data.gov.uk/DefraDataDownload/?Mode=rofsw
EA Long term Flood Risk	UK Government Long term Flood Risk Maps (ref: LTFRM)	https://www.gov.uk/check-long-term-flood-risk
Environment Agency Product 4/5 Data	N/A (report ref: EA Product Data)	EA Detailed Flood Model
Historic Flood Risk Data	DEFRA Historic Flood Outlines GIS Data	https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/HistoricFloodMap&Mode=spatial
Strategic Flood Risk Assessment Data	Mid Sussex (ref SFRA)	Council Website
Local Flood Risk Assessment Data	(refer to SFRA)	Council Website
Topographic Information	DEFRA Opensource LIDAR Data	https://environment.data.gov.uk/DefraDataDownload/?Mode=survey
River or Sea Flood Risk Present	Low	Refer Section 1: Table 2
Surface Water Flood Risk Present	Low	Refer Section 1: Table 2
DESIGNATION	FLOOD RISK DESIGNATION	NOTE
EA/LLFA Designated Flood Zone	Flood Zone 1 – Low Risk	*Designation based on highest flood risk between River, Sea or Surface Water - Refer Section 1: Table 2

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2 INTRODUCTION

- 2.1 The following report is a Flood Risk Assessment (FRA) for the development proposals at 29 High Street, Lindfield, RH16 2HJ (see site location map, Figure 1).
- 2.2 This assessment is required under the National Planning Policy Framework (NPPF) and Local and District Councils given the location, scale and associated flood risks.

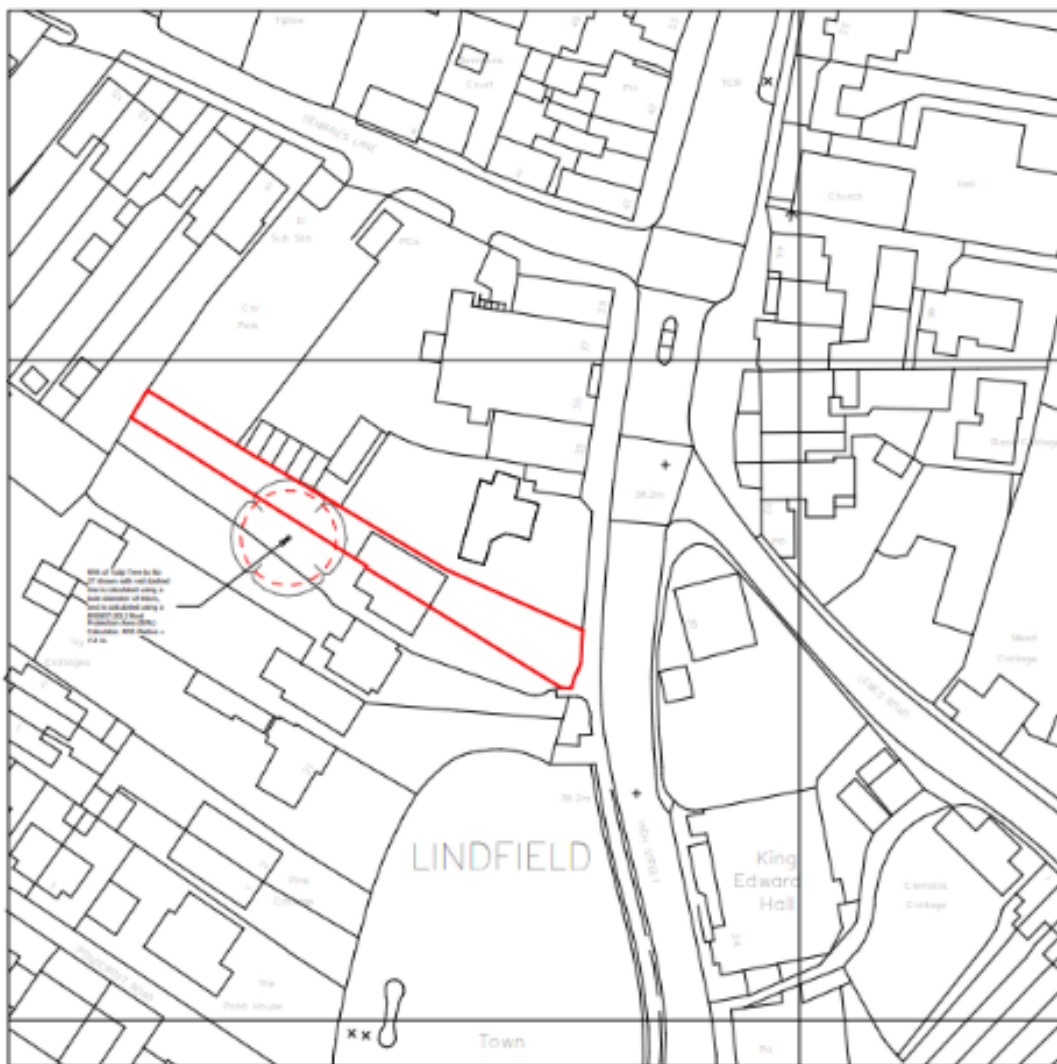


Figure 1 - Site Location Plan (site bordered red) Source: Location Map

- 2.3 This FRA has been written in general accordance with the National Planning Policy Framework (NPPF) and its Technical Guidance, Environment Agency (EA) Standing Advice, LFRMS, County SFRA and associated guidance. This FRA has relied upon publicly available information and data provided from the EA (where relevant). The interpretation of this data has been undertaken with the understand of its accuracy and to a detail deemed suitable for this development type, location and relevant flood risk.

DEVELOPMENT PROPOSALS

- 2.4 The development proposals are for the rear extensions to the existing dwelling, including extension of the existing basement. Architectural proposals are included in Appendix 1.

FLOOD RISK ASSESSMENT SCOPE

- 2.5 The purpose of this FRA is to inform the feasibility and appropriateness of the proposals and to ensure the development proposals incorporate flood resilient measures appropriate to its flood risk.

- 2.6 It should be noted, where up to date flood risk or climate change models are not available, best efforts have been made to assess these risks and extrapolate the available data where necessary. However, this approach may require further detailed modelling if deemed necessary by the reviewing authorities. Detailed hydraulic modelling is deemed outside the scope of this report.
- 2.7 These works are considered to fall under the EA's Standing Advice for Minor Extensions as the works are less than 250sqm and are solely for the purpose of improving the existing residential use.

FLOOD RISK VULNERABILITY

- 2.8 This FRA has been undertaken with due regard to the statutory requirements of the NPPF and with reference to the Planning Practice Guidance (PPG) in relation to development and flood risk. This FRA has been undertaken to inform on the current flood risk to the site. Therefore, this FRA aims to ensure that the development proposals take into account the site-specific flood risk and to avoid inappropriate development in areas potentially at risk of flooding.
- 2.9 Annex 3 of the NPPF Flood Risk Vulnerability Classification provides guidance on assigning development vulnerability. A summary of this information is provided in Table 1.

Table 1 – Extract from Annex 3 of the National Planning Policy Framework and Table 2: Flood risk vulnerability classification of PPG detailing Flood Risk Vulnerability Classification by use. (Existing Site Classification is Shaded Gray, Proposed Site specific classification shaded blue).

ESSENTIAL INFRASTRUCTURE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE	WATER-COMPATIBLE
Essential transport infrastructure	Police and ambulance stations; fire stations and telecom installations	Hospitals	Police, ambulance and fire stations which are not required to be operational during flooding.	Flood control infrastructure.
Essential utility infrastructure which has to be located in a flood risk area for operational reasons	Emergency dispersal points.	Residential institutions such as residential care homes, prisons and hostels.	Buildings used for commercial purposes and of a non-residential nature	Water transmission infrastructure and pumping stations.
Wind turbines.	Basement dwellings.	Buildings used for dwelling houses and sleeping, drinking establishments	Land and buildings used for agriculture and forestry.	Sewage transmission infrastructure and pumping stations.
Solar farms.	Caravans, mobile homes and park homes intended for permanent residential use.	Non-residential uses for health services, nurseries and educational uses	Waste treatment (except landfill* and hazardous waste facilities).	Sand and gravel working.
	Installations requiring hazardous substances consent.	Landfill* and sites used for waste management facilities for hazardous waste.	Minerals working and processing (except for sand and gravel working).	Docks, marinas and wharves and Navigation facilities.
		Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.	Water treatment and Sewage treatment works which do not need to remain operational during times of flood.	Ministry of Defence installations.

2.10 The site is presently considered 'More Vulnerable' in accordance with Table 1 and the NPPF.

2.11 The development proposals are considered 'More Vulnerable'.

3 FLOOD RISK ASSESSMENT SCOPE

3.1 Flood risk as defined by the NPPF, is a combination of the probability and the potential consequences of flooding. Areas at risk of flooding are those at risk of flooding from any source, now or in the future. Sources include rivers and the sea, direct rainfall on the ground surface, rising groundwater, overwhelmed sewers and drainage systems, reservoirs, canals and lakes and other artificial sources. Flood risk also accounts for the interactions between these different sources. This term is key to the application of the presumption in favour of sustainable development in paragraph 11 of the National Planning Policy Framework (NPPF).

3.2 The NPPF requires flood risk to be considered on all sites, however more detailed site-specific FRA's are required when one or more of the following criteria apply to the site:

- Where a site is affected by the **Design Flood Event** (DFE) from any source (typically the 1% AEP) for all proposals of any new development (including minor development and change of use); or
- Greater than 1 ha in size and located in Flood Zone 1; or
- Located in Flood Zone 1 where there are critical drainage problems or within a designated Critical Drainage Area (CDA) as notified to the LPA by the Environment Agency; or
- Subject to a change of use to a higher vulnerability classification which may be subject to other sources of flooding; or
- A Major planning application (i.e. more than 10 residential dwellings).

3.3 The NPPF designates that the '**Design Flood Event**' (DFE) is used to assess the suitability of a development proposal against the criteria of the NPPF. The design flood, is a flood event of a given annual flood probability, but is generally taken as:

- River flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), typically shown as Flood Zone 3a as designated on the EA's Flood Map for Planning; or
- Tidal flooding with a 0.5% annual probability (1 in 200 chance each year), typically shown as Flood Zone 3a as designated on the EA's Flood Map for Planning; or
- Surface water flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), typically shown as the Medium Risk of Surface Water flooding as designated on the EA's Long Term Flood Risk mapping,

3.4 In addition to assessing present day risk, the DFE also must be assessed to include and appropriate allowance for climate change (refer to Section 5 for climate change allowances) based on the site's geographical location, vulnerability and design life.

3.5 For the purpose of this FRA, the worst case DFE (whether this be from tidal, river or surface water sources), has been used to steer the recommendations of this report. Consideration of extreme events above that of the DFE have not been considered further beyond identifying these as residual risks.

3.6 Table 1 of the NPPF provides definitions of the Flood Zones, from low to high probability of river and sea flooding and also in regards to surface water flood risk. These Flood Zone Classification for the purpose of this FRA are:

- Flood Zone 1 - land assessed as having a less than a 1 in 1,000 annual probability (<0.1%);
- Flood Zone 2 - land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river (1% – 0.1%), 1:100 year or greater of surface water flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year;

- Flood Zone 3 - land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. Flood Zone 3b is land have greater than 1 in 20 to 1 in 30 year annual probability of flooding.

3.7 Following an assessment from the various sources of flood risk for the DFE, this site-specific FRA has applied the key principles for decision making when flood risk is a consideration and includes in order of importance:

1. **Avoid** – This is to physically locating the development proposals to areas of lowest flood risk within the site and/or determined how to vertically place the proposals to such that more vulnerable uses are positioned above the design flood level (such as raising floor levels or placing more vulnerable uses on upper levels). Developers should refer to the BS 85500:2012-Flood resistant and resilient construction. Guide to improving the flood performance of buildings for applicable strategies);
2. **Control** - Planning authorities and developers can investigate measures to control the risk of flooding affecting the site (this may be through flood defences, flood gates, flood storage or other engineered solutions such as SUDS). This is rarely applied at the site level and is mostly address through strategic and county level flood defence strategies. At this site level, typically this will be through applying a Water Exclusion or Water Entry strategy when design a building or space.
3. **Mitigate** – Is the use of flood resistance and resilience measures to address any residual risks remaining after the use of the avoidance and control measures described above. Passive measures should be prioritised overactive measures as they are likely to be more effective and more reliable. Flood Resilience is an approach to building design which aims to reduce flood damage and speed recovery and reoccupation following a flood. It uses a combination of flood resistance and recovery measures (referred to here as resilience measures), and is described in the industry-developed CIRIA Property Flood Resilience Code of Practice, which provides advice for both new-build and retrofit.
4. **Managing Residual Risk** – this will usually involve ensuring either safe access and egress is available from the safe in a DFE, Flood Warning Systems/Evacuation Plans are in place, safe refuge is on site during a DFE, the building is designed to account for flood loadings etc.
5. **Flood Risk is not increased elsewhere** – assuming all the above items can be address, it is critical that the development does not increase flood risk elsewhere as a result. Typically this is addressed by ensuring flood waters are not displaced (in surface water or river flood affected areas, the loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure or where the source of flood risk is **solely** tidal.) or appropriate hydraulic modelling is provided in support of an application to demonstrate that flood risk is not increased outside of a site (such as through on site flood compensation or detailed site specific hydraulic modelling).

3.8 It should be noted, where up-to date flood risk or climate change models are not available, best efforts have been made to assess these risks and extrapolate the available data where necessary. However, this approach may require further detailed modelling if deemed necessary by the reviewing authorities. Detailed hydraulic modelling is deemed outside the scope of this report.

SEQUENTIAL TEST/EXCEPTION TEST

3.9 For the purpose of this assessment, the application of the Sequential Test has been broken down into three levels. Passing the Sequential Test at the strategic level is a weighting of the risks versus benefit of a development against a wider criterion (such as meeting other sustainability targets, housing needs or other strategic planning goals) than just purely avoiding flood risk issues. However, the Sequential Test can also be applied at the site level, where development is steered towards lower areas of flood risk within a site boundary and is much more objective in its assessment. For the purpose of this FRA, the assessment 'Level' of the Sequential Test is considered to be:

Level 1 - At the high-level, this test is first implemented by local planning authorities (LPA) at the strategic planning scale. The Sequential Test is applied to steer local planning policy by directing particularly vulnerable new

developments (e.g., residential, hospitals, mobile homes etc.) outside of the floodplain and for designating new land uses and future development areas.

Level 2 - At the second instance, the Sequential Test is implemented for a specific development at the request of the LPA to assess other sites within an area defined by the LPA, this type of Sequential Test is present where there is a significant conflict between a proposed development and flood risk.

Level 3 - The third instance is where the Sequential Test is applied with the confines of the site, namely by steering development proposals to **avoid** areas of flood risk within a site itself.

3.10 Application of the first and second level of the Sequential Test is deemed outside the scope of this report.

ENVIRONMENT AGENCY FLOOD RISK DESIGNATION

3.11 Table 2 below presents a helpful guide in identifying the suitability of a site prior to applying Level 1 and 2 of the Sequential Tests and identifies when the Exception Test is required.

Table 2 - The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF. Shaded cells denote the proposed re-development. Please note: ✓ means development is appropriate; x means the development should not be permitted and should be subject to a full sequential test. Refer to Table 2 for selected Flood Zone Designation

FLOOD RISK VULNERABILITY CLASSIFICATION		ESSENTIAL INFRASTRUCTURE	WATER COMPATIBLE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE
FLOOD ZONE	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	x	Exception Test Required	✓
	Zone 3b <i>Functional Floodplain</i>	Exception Test Required	✓	x	x	x

3.12 Based on the principles above, a development of this nature is considered appropriate and acceptable and full application of the Sequential Test is not deemed necessary at this time. Therefore, this FRA presents the findings of the Exception Test and recommendations for incorporation of flood resilient measures to improve long term flood resilience of the proposals.

3.13 Based on the EA's Flood Maps for Planning data, the site is wholly located in Flood Zone 1 for fluvial and/or tidal flooding. However, the RoFSW mapping shows that the flooding shown within the site boundary of 29 High Street is caused by surface water flooding directed from the northwest towards the pond located south of the site. The RoFSW mapping shows the site is unaffected in the high-risk event, and only marginally affected in the medium risk event (with dwelling wholly unaffected). Surface water flooding is the dominant source.

3.14 Table 3 summarises the sites primary flood risk classifications and the source for the DFE. This designation is based on the EA's Flood Map for Planning (extract provided in Figure 2) and the EA's Long Term Flood Risk Maps (LTFRM): Risk of Flooding from Surface Water (RoFSW) (extract provided in Figure 3).

3.15 Based on the EA's Flood Maps for Planning data, the site is wholly located in Flood Zone 1 for fluvial and/or tidal flooding. However, the RoFSW mapping shows that the flooding shown within the site boundary of 29 High Street is caused by surface water flooding directed from the northwest towards the pond located south of the site. The RoFSW mapping shows the site is unaffected in the high-risk event, and only marginally affected in the medium risk event (with dwelling wholly unaffected). Surface water flooding is the dominant source.

Table 3 - Summarises the overall Flood Zone designation based on the highest rated flood risk from either rivers and sea or surface water.

FLOOD ZONE AND SOURCE IDENTIFICATION SUMMARY		
	FLOOD ZONES AFFECTING THE SITE	DOMINANT SOURCE FOR THE DESIGN FLOOD EVENT (DFE)

	Flood Zone 2 (medium risk)	Flood Zone 3 (high risk)	Source
River Or Sea	No	No	Surface Water Flooding
Surface Water	Yes (Partial)	No	

**Flood Zone Designation for assessment is based on the highest flood risk from river, sea or surface water flooding taken from EA's Flood Map for Planning and EA's LTFRM:RoFSW*

3.16 This site is located entirely in Flood Zone 1 with regards to river and sea flooding, as such is not considered further in this flood risk assessment. Other sources of flood risk such as groundwater, surface water and historical flood risk is considered further in the following sections.

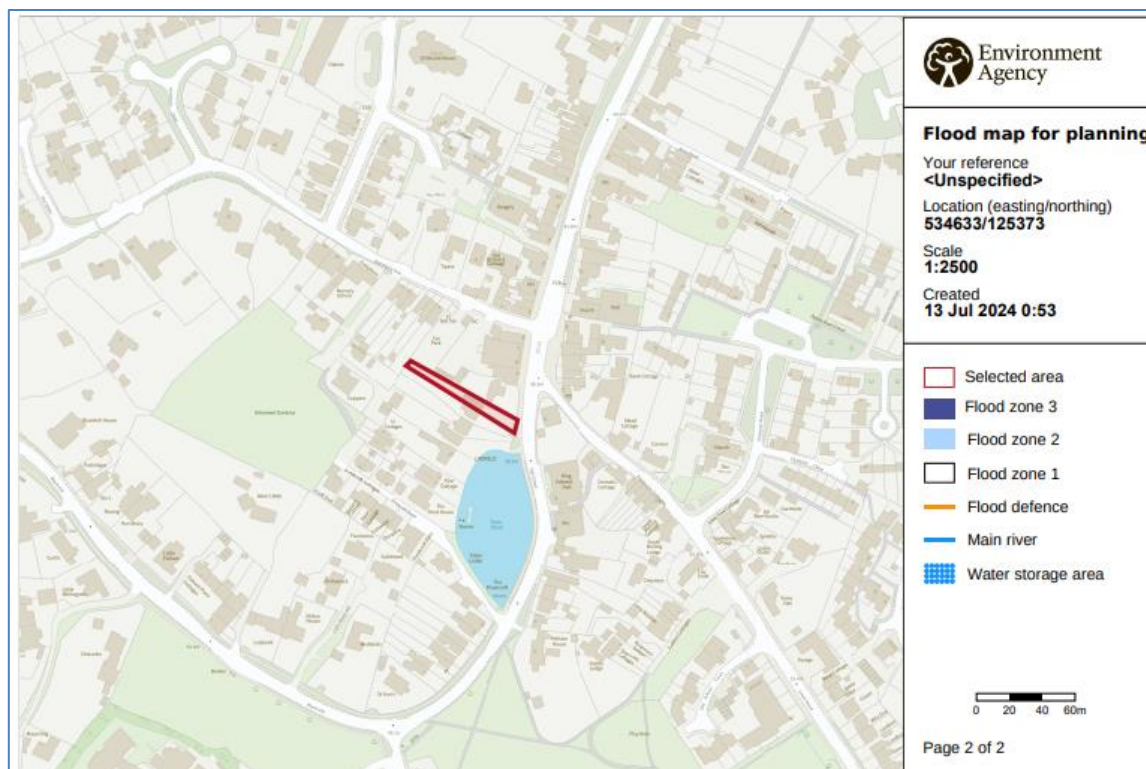


Figure 2 extract from EA Flood Maps for Planning (Source: DEFRA)



Extent of flooding from surface water

● High
 ● Medium
 ● Low
 Very low
 ⊕ Location you selected

Figure 3 - extract from the EA's Long-Term Risk of Flooding from Surface Water (RoFSW) maps

4 LOCAL FEATURES

LOCALITY

- 4.1 29 High Street is a residential property with residential properties either side of the dwelling. Opposite the site are commercial properties. The site can be accessed directly via B2028.
- 4.2 The site is located approximately 54m northwest of King Edward Hall, and 106m southeast from The Acorns Nursery and Forest School.

RIVERS AND WATERCOURSES.

- 4.3 The nearest EA main river is Scrase Stream located approximately 746m south of the site. Scrase Stream belongs to a network of similar rivers and is a narrow stream approximately 4.07km in length, where the network it belongs to appears to be isolated from any large bodies of water.
- 4.4 A pond exists approximately 25m from the south of the site.

TOPOGRAPHY

- 4.5 The site has a steady fall from the northwest to southeast at approximately 1.5m. When reviewing the site topology, the existing building appears to be constructed in line with this steady gradient. This review is based on 1m LIDAR grid data.
- 4.6 Figure 4 below provides long and cross-sectional data through the site demonstrating an approximation of existing site levels based on the available LIDAR information.

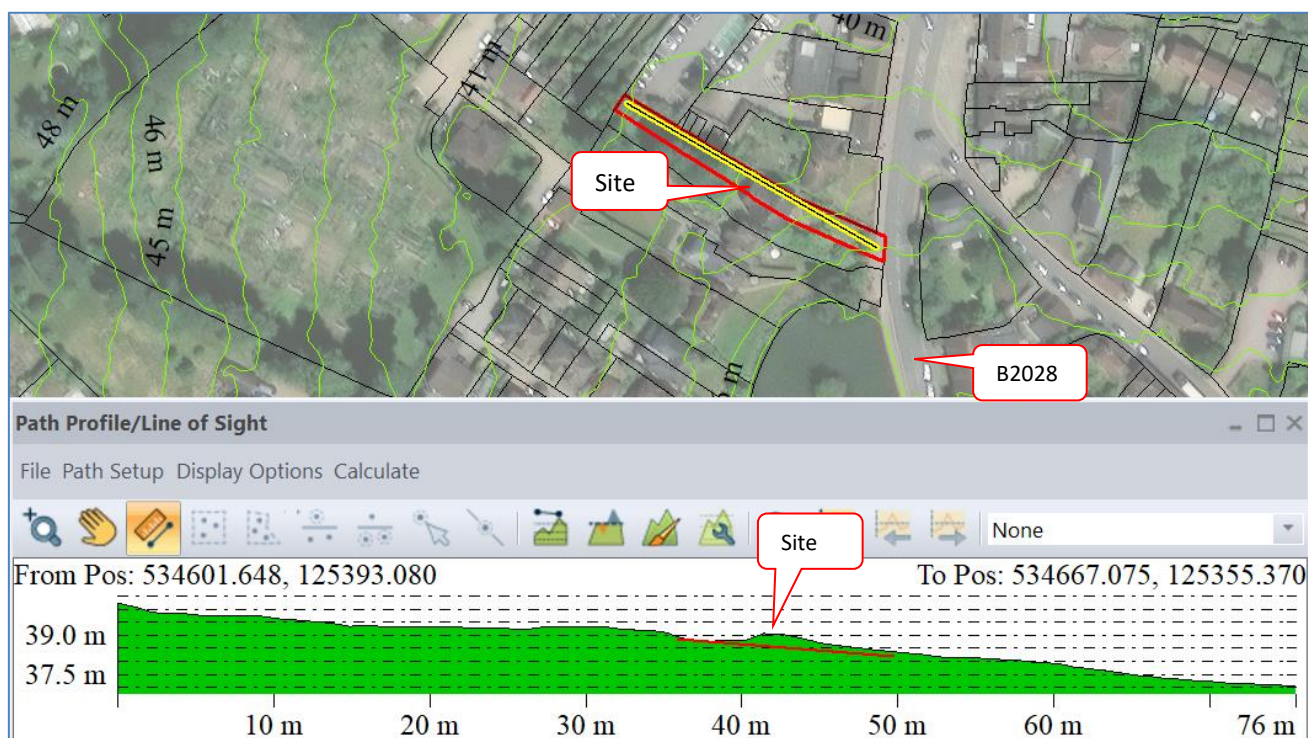


Figure 4 –Terrain profile (Northwest to Southeast) (source: DEFRA Lidar Data 1m)

GEOLOGY & HYDROGEOLOGY

- 4.7 The online British Geological Survey (BGS) (Figure 5) shows the site to be underlain by 1:50 000 scale bedrock geology description: Upper Tunbridge Wells Sand – Sandstone and siltstone, imbedded.

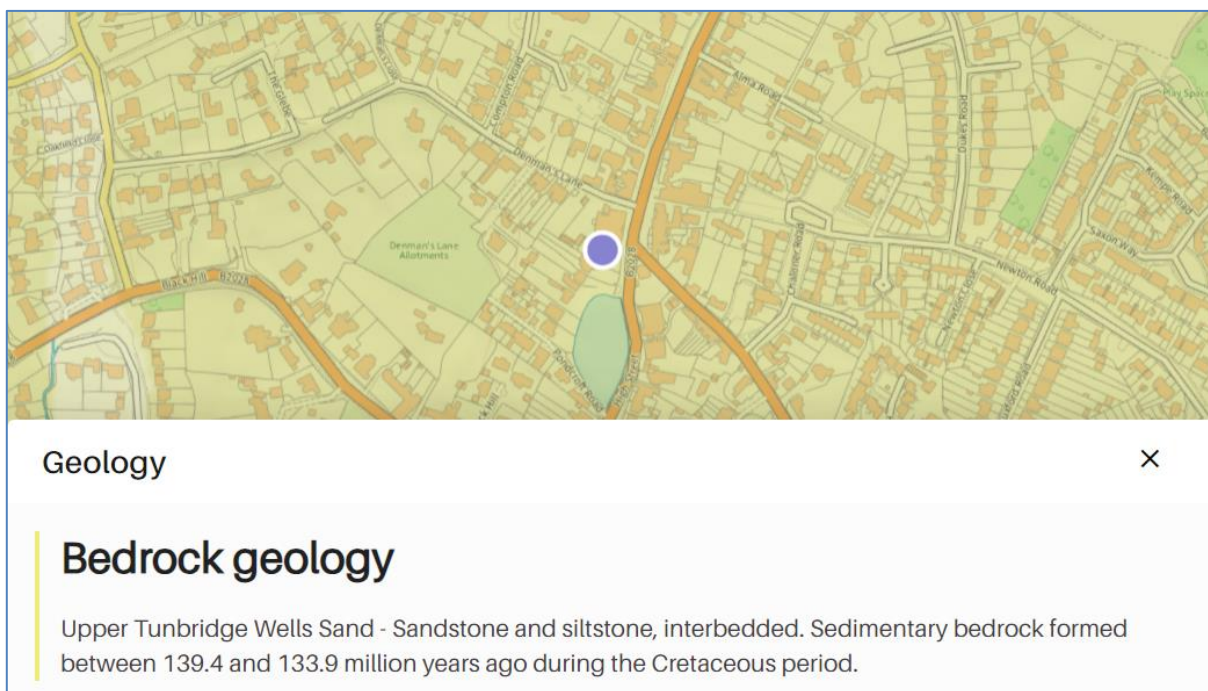


Figure 5 extract from BGS Bedrock and Superficial Deposits Mapping (source: BGS)

- 4.8 Table 4 below present a summary of the site hydrogeological classifications and considerations.

Table 4 - Summary of Hydrogeology Classifications (source Magic Map, BGS) – applicable classification shaded Blue

HYDROGEOLOGY CLASSIFICATIONS			
Aquifer Designation (Bedrock)	Principle	Secondary	Unproductive
Aquifer Designation (Superficial)	Principle	Secondary	Unproductive
Groundwater Vulnerability	High	Medium	Low
Located within Source Protection Zone	Yes	No	N/A
Soluble Rock Risk	Present	Not Present	N/A

- 4.9 The BGS GeoIndex: Borehole Records provides publicly available borehole data at locations around England. These can provide general information relating to groundwater and can provide greater insight into site specific ground conditions.
- 4.10 However, the BGS data should be taken as only indicative and should not be relied upon for detailed design of surface water management systems and during construction. Details of groundwater levels and soil permeability are unknown and should be confirmed. The design permeability should be investigated further for the purpose of surface water management on the site.

FLOOD DEFENCES

- 4.11 The Environment Agency releases a range of flood asset information as Open Data through their AIMS Defence (Spatial Flood Defences) GIS mapping. They are the only comprehensive and up-to-date group of datasets in England that show flood defences currently owned, managed or inspected by the EA.
- 4.12 Based on the EA and SFRA data, the site is protected from flooding any existing defences.

5 CLIMATE CHANGE

- 5.1 In 2022, the EA issued updated guidance on the impacts of climate change on flood risk in the UK18 to support the NPPF. This guidance sets out that peak rainfall intensity, sea level, peak river flow; offshore wind speed and extreme wave heights are all expected to increase in the future as a result of climate change.
- 5.2 The guidance acknowledges that in relation to certain factors there is considerable uncertainty with respect to the absolute level of change that is likely to occur. As such, in these instances, the guidance provides estimates of possible changes that reflect a range of different emission scenarios (Table 5).

Table 5 - Extract from NPPF designating Flood Risk Climate Change Allowances by Flood Zone and Use. The developments required climate change probability scenario is highlighted blue

FLOOD ZONE	ESSENTIAL INFRASTRUCTURE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE	WATER COMPTABLE
1/2	Higher Central and Upper End	Higher Central and Upper End	Central and Higher Central	Central	None of these allowances
3a	Upper End	Development should not be permitted	Higher Central and Upper End	Central and Higher Central	Central
3b	Upper End	Development should not be permitted	Development should not be permitted	Development should not be permitted	Central

INCREASES IN SURFACE WATER FLOODING AND RAINFALL ALLOWANCES

- 5.3 When considering climate change impacts to surface water (pluvial) flooding, The DEFRA peak climate change rainfall allowances detail predicted rainfall increase due to climate change in different regions around England. For all developments with a design epoch up to (and presently beyond) 2070, the NPPF states developments should adopt the Upper End and Central allowances. The site-specific climate change allowances based on the DEFRA data is summarised in Table 6 below and should also be adopted for the purposes of surface water drainage design.

Table 6 - Summary of Table 2: peak rainfall intensity allowance in small catchments (less than 5km²) or urban drainage

Management Catchment peak rainfall allowances 2070's	3.3% Annual Exceedance Probability Event	1% Annual Exceedance Probability Event
Central	20%	25%
Upper End	40%	45%

- 5.4 Unfortunately, neither the EA or LPA have provided detailed climate change affected surface water flood risk models for this site, and so it's not possible to directly determine the DFE level or depth with an allowance for climate change.
- 5.5 In the absence of site-specific climate change modelling for surface water flooding, this FRA has assessed potential climate change risks for the 1 in 100 year event by looking at the 0.1% AEP event (that is the RoFSW low risk event). The 0.1% AEP flood depths have therefore been used to direct and advise on mitigation measures to protect the site from this source.

6 SOURCES OF FLOOD RISK

- 6.1 In order to assist the implementation of the Governments NPPF, the EA has undertaken national scale flood risk mapping. This mapping considers a range of sources including flooding from rivers, sea, surface water and reservoir breach. Furthermore, each Council produces a Strategic (county scale) Flood Risk Assessments (SFRA) that aim to specifically identify local flood risk issues (such as critical drainage areas and local groundwater flooding).
- 6.2 The following section reviews both the EA data as well as the relevant information available from the SFRA.

PLUVIAL (SURFACE WATER)

- 6.3 Surface water flooding is the term applied to flooding when intense rainfall overwhelms the ability of the land to infiltrate water, or in urban areas for the sewers and road drains to drain the water away, resulting in surface water runoff and consequent flooding. It is a particular problem in urban areas where the excess water will often travel along streets and paths, between and through buildings and across open space. It can result in indiscriminate flooding to properties when not controlled. The high-profile flooding across the UK in the summer of 2007 was largely attributed to excess runoff where the capacity of the drains was exceeded by intense summer rainstorms and led to the Government commissioning the independent Pitt Review in 2008.
- 6.4 The RoFSW maps use remotely sensed LiDAR data to determine large areas of topography. In all urban areas this LiDAR has been edited to remove the buildings. This editing process results in a slightly un-even surface profile, which can result in the production of small depressions that fill with water but in reality, is not at risk of surface water flooding. This should be taken into account where very localised areas of flooding are evident and are independent of wider surface water flood flows and routes.
- 6.5 The EA mapping shows 3 event scenarios for the 1 in 30 (3.3% chance of occurring in any one year) return period (high risk – Figure 6), 1 in 100 (1% chance of occurring in any one year) return period (medium risk – Figure 7) and 1 in 1000 (0.1% chance of occurring in any one year) return period (low risk – Figure 8). Extracts of this mapping is provided below, along with an analysis of their likely source and projected impacts on the development.
- 6.6 Figure 6 shows the high-risk scenario (1 in 30-year event). In this event, the immediate building and surrounds are wholly unaffected by surface water flooding. It is noted that low-level flooding is present just east of the site as runoff is directed down the B2028 and into the pond just south of the site. However, this is unlikely to affect the site and is present only outside of the eastern boundary line.



Figure 6 EA Long Term Flood Risk Maps (Depths) – High Risk of surface water flooding (source: EA Long Term Flood Risk Maps), site bordered red.

- 6.7 Figure 7 present the medium risk scenario (1 in 100-year return period). In this event, low-level flooding is present within the site boundaries as runoff from the carpark north of the site, with a depth of at most 50mm. However, this surface water flooding is unlikely to affect the dwelling itself as the runoff is at a lower elevation to the dwelling hence constraining this flooding to the west of the site. However, the existing dwelling (including the proposed extension) is wholly unaffected in this event.



Figure 7 EA Long Term Flood Risk Maps – Medium Risk of surface water flooding depths (source: EA Long Term Flood Risk Maps), site bordered red

- 6.8 As the existing dwelling (or proposed extension works) are not considered to be risk of flooding from surface water flooding in the near future, flood risk to the dwelling can generally be considered to be low.

Impacts of Climate Change

- 6.9 With changes in climate profiles, it is expected that rainfall intensities and frequencies will increase, and as such the risk to property will increase with this.
- 6.10 Figure 11 presents the high-risk scenario (1 in 1000-year return period). This event has been used to assess the long-term flood risks to the site and provide mitigation measures to reduce flood risk to the site in the future. This figure shows that surface water flooding may be directed through the site from the north towards the south. The rear of the building could be affected by up to 300mm in this event, with the southern elevation being affected by up to 600mm. The mapping continues to show that the existing building is not flooded in this event.
- 6.11 The proposals can be considered to align with the EA's Standing Advice in relation to Extension of the Existing Use. At its core, this guidance stipulates that where a development classifies as a minor extension to an existing use (and the LPA considers negligible flood risk), that at a minimum, FFLs should be no lower than existing, and the development should aim to minimise flood risk as much as possible.
- 6.12 The development proposals show that the existing dwelling has an existing basement with internal access only and a ground floor FFL of 38.86mAOD. The development proposals will see the rear of the building extended, along with basement. The FFL of the extension and point of access to the basement will remain as per existing at 38.86mAOD. Therefore, the proposed extension aligns with the EAs standing advice by neither reducing existing FFLs or creating additional openings to the basement, as such flood risk to the dwelling not increasing.

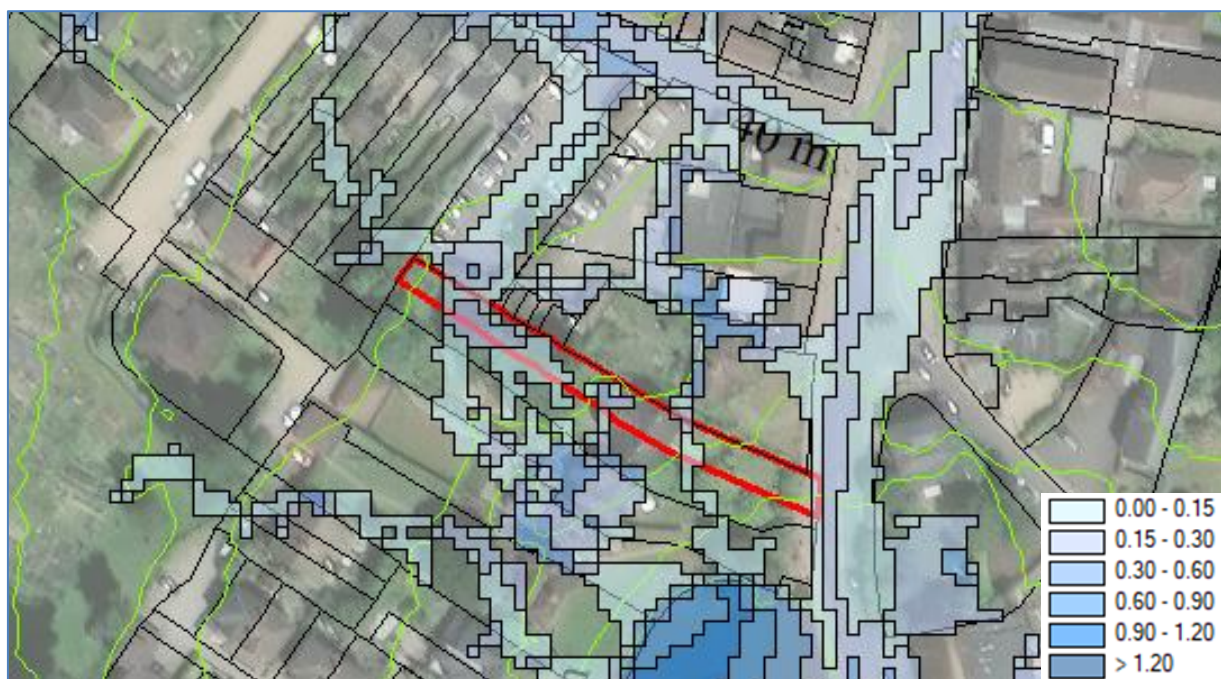


Figure 8 EA Long Term Flood Risk Maps – Low risk of surface water flooding depth (source: EA Long Term Flood Risk Maps), site bordered red.

- 6.13 It should be noted that the Council considers the implementation of SuDS as an essential element of reducing future flood risk to both the site and its surroundings. Indeed, reducing the rate of discharge from sites is one of the most effective ways of reducing and managing flood risk. SuDS can effectively be used to minimise the potential increase of risk to the property and users in the future. In accordance with the NPPF, the sites surface water drainage should account for minimum 40% climate change allowance to site rainfall profiles, to ensure climate change is appropriately considered.
- 6.14 SUDS should try to achieve an infiltration solution, however careful consideration of the underlying geology and its principal nature as an aquifer needs to be considered in the water quality and treatment aspects of the drainage design.

HISTORICAL, SEWERS AND DRAINAGE

- 6.15 A common source of flooding is a result of sewer or other drainage infrastructure becoming surcharged and flooding.
- 6.16 The EA and SFRA have confirmed that there are no historical records of flooding affecting the site directly.
- 6.17 There have been no other noted flood events specifically at the site, however this does not directly indicate that the site has not flooded in the past or may flood in the future.
- 6.18 Therefore, it is considered the risk of sewer flooding to the site is considered low, assuming that any new development flows include appropriate protective measures to manage runoff and not increase the risk of sewer flooding.

GROUNDWATER

- 6.19 Groundwater flooding is the emergence of groundwater at the ground surface or into subsurface voids arising as a result of:
- ⇒ abnormally high groundwater heads or flows;
 - ⇒ the introduction of an obstruction to groundwater flow; or
 - ⇒ the rebound of previously depressed groundwater levels.

- 6.20 Groundwater flooding usually occurs following a prolonged period of low intensity rainfall. As groundwater flow is much slower than surface flow, the flooding may not recede for long periods of time, typically weeks or even months. It is important to recognise the risk of groundwater flooding is typically highly variable and heavily dependent upon local geology, topography and weather conditions, as well as local abstraction regimes. Groundwater flooding is hard to predict and challenging to mitigate.
- 6.21 According the SFRA, groundwater flood risk in the county is typical moderate. However, there is limited information to suggest that groundwater flood risk to the site is high. Based on the sloping nature of the local topography, its likely that groundwater flood depths are greater than 3m below ground level and therefore groundwater emergence is likely to be very low.
- 6.22 Site specific boreholes should be undertaken to confirm groundwater depths (and ground conditions) and appropriate measure implemented to waterproof and protect the basement.
- 6.23 As a basement is already present, the minor extension of the basement shouldn't result in any additional flood risk to the site or the surrounding area and is unlikely to negatively impact hydrogeology.
- 6.24 As existing topography naturally drains to the south, should groundwater emergence occur, it is unlikely to significantly affect the site, being directed to the south, and away from the dwelling.

Impacts of Climate Change

- 6.25 The potential effects of climate change on groundwater levels are uncertain. Greater seasonality in groundwater level fluctuation is a potential outcome under a pattern of higher winter rainfall and less summer rainfall. Broad predictions of the impacts of climate change on groundwater levels are difficult to make at the present time

RESIDUAL RISKS

- 6.26 Residual risks are those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:
- the failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;
 - failure of a reservoir, or;
 - a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with.
- 6.27 Given that the site is not located behind flood defences or in a reservoir failure area, the primary risk to the site is residual failure of onsite drainage or an extreme exceedance even from surface water sources.
- 6.28 Reservoir flooding is very different from other forms of flooding. It may happen with little, or no warning and evacuation will need to happen immediately. The likelihood of such flooding is difficult to estimate, but it is less likely than flooding from rivers or surface water. It may not be possible to seek refuge upstairs from floodwater as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure. The risk of inundation to the study area as a result of reservoir breach or failure of a number of reservoirs within the area was assessed as part of the National Inundation Reservoir Mapping (NIRIM) study. Several reservoirs are located within the study area. However, there are also reservoirs outside of the area whose inundation mapping is shown to affect the study area. Maps of the flood extent can be found on the Government's Long term flood risk information website.
- 6.29 The EA has undertaken failure scenarios of the UK reservoirs and summarised these extents through their Long Term Flood Risk Maps for Reservoir Flooding. This mapping shows the site is not in an area at risk of reservoir flooding.

7 FLOOD MITIGATION MEASURES

- 7.1 The proposals allow the opportunity to improve flood resilience of the site by incorporating a number of flood mitigation measures, both through the incorporation of flood resilient building materials, surface water drainage improvements and signing up to the EA Flood Warning/Alert System.
- 7.2 Table 7 presents the key flood mitigation measures based the critical DFE on the NPPF and PPG decision making principles:

Table 7 - Key Decision Making principles and measures applied to avoid, control, mitigate, and manage flood risk

DECISION MAKING: ORDER OF PRIORITY	PROPOSED MEASURES
1. Avoid	The proposed residential extension has been designed in accordance with the EA's Standing Advice by ensuring FFLs are no lower than existing, therefore avoiding any increase in flood risk to the dwelling
2. Control	Surface Water Drainage systems should be designed to accommodate the 1 in 100 year plus climate change DFE.
3. Mitigate	Recommend that the developer incorporates the recommendations of BS 85500:2012-Flood resistant and resilient construction. Basement construction should follow best practice, with ground investigations undertaken to confirm conditions and groundwater depths to inform construction. Refer to Section 8 below for recommended Building Measures
4. Manage residual flood risk	Grade ground levels to fall away from building thresholds to avoid surface water ponding against the structure.
5. Flood Risk is not increased elsewhere	Any new drainage should be designed in accordance with Building Regulations Part H, SuDS Manual and 'DCG' guidance, ensuring drainage proposals include an allowance for climate change Any additional flows to be directed into the Local Sewer Authorities public sewers or water courses to receive confirmation of capacity and connection approvals prior to detailed design and construction.

8 BUILDING MATERIAL MITIGATIONS

8.1 The national government produced guidance for improving the flood resilience of building in the Communities and Local Government (CLG) 2007 'Improving the Flood Performance of New Buildings' publication. This publication provides recommendations on how to protect buildings in the case of a flood event, and propose two scenarios based on maximum expected flooded depths, and provides an explanation between flood resistance and resilient measures, these are summarised below:

- ⇒ **Water exclusion strategy** is when the emphasis is placed on minimising water entry whilst maintaining structural integrity, and on using materials and construction techniques to facilitate drying and cleaning. This strategy is favoured when low flood water depths are involved (not more than 0.3m). According to the definitions adopted in this Guidance, this strategy can be considered as a resistance measure, but it is part of the aim to achieve overall building resilience
- ⇒ **Water entry strategy** is when the emphasis is placed on allowing water into the building, facilitating draining and consequent drying. Standard masonry buildings are at significant risk of structural damage if there is a water level difference between outside and inside of about 0.6m or more. This strategy is therefore favoured when high flood water depths are involved (greater than 0.6m) by utilising resilient materials, and construction methods.
- ⇒ **Flood resistant measures** are incorporated where it is considered feasible to prevent floodwater entering the building and take the form of flood barriers. However, given the height of flooding in the DFE (up to 1.47m), it is not considered practical to implement flood resistant measures to the whole site where flood depths are over 0.68m. The core reason to this is the listed nature of the site and constraints around retrofitting many flood resistant measures within such a building. In addition, many flood resistant products/barriers are only suitable to typical maximum height being 0.68m, before the risk of structural damage is incurred. As this is a historic structure with limited scope for structural reinforcement.
- ⇒ **Flood resilient measures** are incorporated where it is accepted that, in severe flood events, water may enter parts of the building so it is necessary to ensure the building will remain useable after the floodwater has receded and the area has been cleaned. Therefore, materials should be incorporated that retain their structural integrity and have good drying and cleaning properties or are waterproof, and services and sockets etc. are located as high as practical to minimise flood damage.

8.2 Given the primary risk is related to surface water flooding most likely from an exceedance event or failure of onsite drainage, it is considered that some key principles of the **Water Exclusion Strategy** should be adopted for the buildings on the site. Some simple construction measures can greatly protect buildings during such an event without incurring large additional construction costs. Some recommendations include:

- The route of all electrical services will run from ceilings at ground floor (where possible), down toward sockets;
- All plumbing insulation to be of closed-cell design;
- Non-return valves to be fitted to all drain and sewer outlets;
- FFLs to be no lower than existing and grade ground levels to fall away from building thresholds.

8.3 Further detail can be found at <https://assets.publishing.service.gov.uk/> and within BS 85500:2012-Flood resistant and resilient construction. Guide to improving the flood performance of buildings for applicable strategies.

BASEMENT CONSTRUCTION IN FLOOD PRONE AREAS

8.4 One of the key aspects of basement construction in areas prone to flooding is to ensure that the basement is adequately waterproofed and resistant to water ingress. The UK basement construction flood risk guidance, published by the Basement Information Centre (TBIC) in 2015, provides a comprehensive overview of the best

practices and standards for designing and building basements in flood risk areas. The guidance covers the following topics:

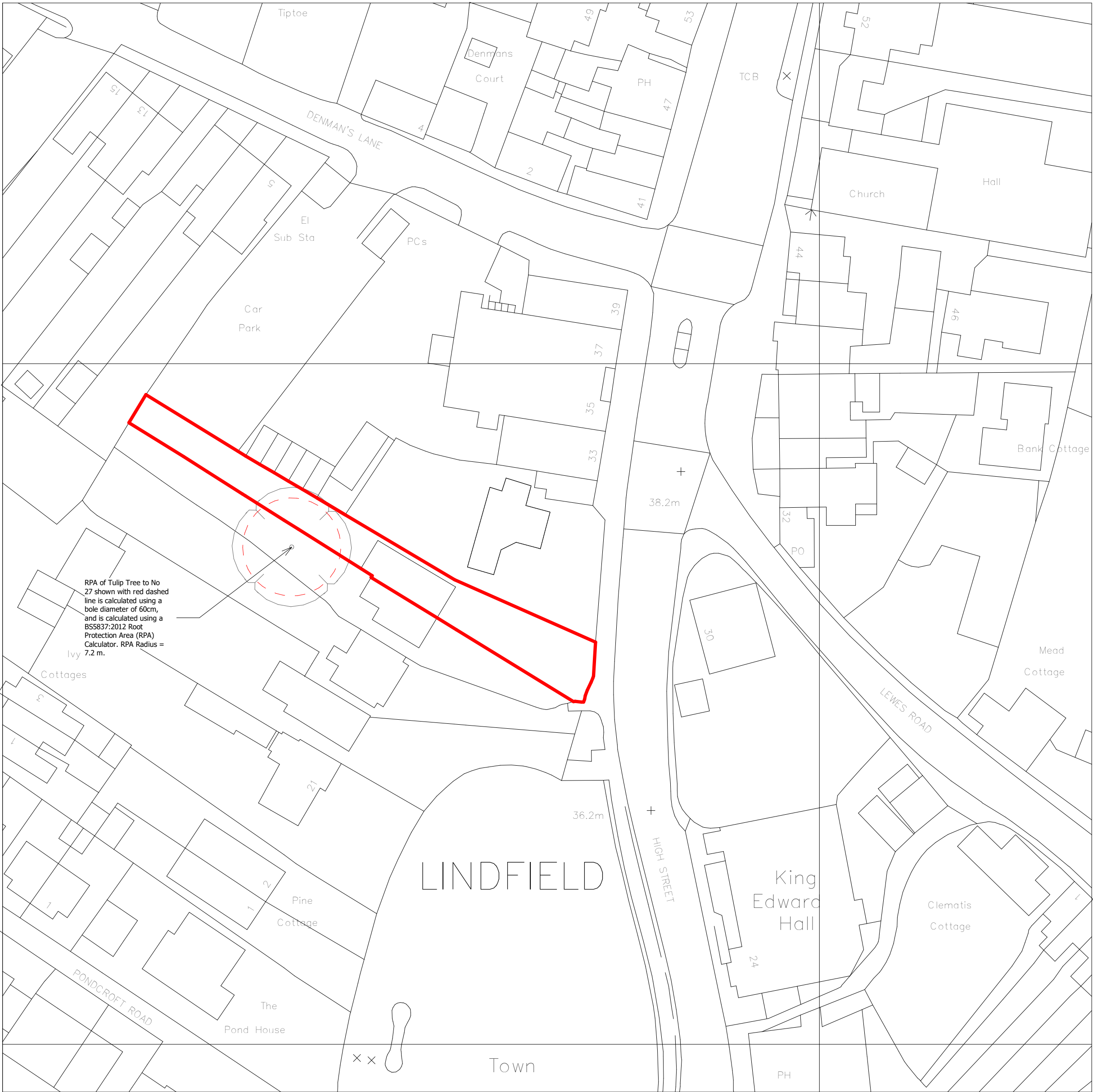
- The principles and options for waterproofing basements in flood risk areas, such as the use of tanking systems, cavity drainage systems, combined systems, or integral systems, and the factors that influence the choice of waterproofing system, such as the type and level of flooding, the basement depth and usage, the ground conditions, and the structural design.
- The design considerations and recommendations for basements in flood risk areas, such as the use of flood resilient materials and finishes, the provision of adequate ventilation and drainage, the installation of sump pumps and backwater valves, the protection of services and utilities, the incorporation of flood resilience measures, and the development of emergency plans and maintenance regimes.
- The construction issues and challenges for basements in flood risk areas, such as the need for appropriate site investigation and preparation, the prevention of water ingress during excavation and construction, the quality control and testing of waterproofing systems, the health and safety of workers and occupants, and the compliance with relevant standards and codes of practice.

8.5 The guidance also provides several case studies of basements in flood risk areas, illustrating the different approaches and solutions adopted by various projects across the UK. The guidance is intended to be used by architects, engineers, contractors, developers, homeowners, and planners involved in basement construction in flood risk areas, and to complement the existing guidance and standards on basement design and construction.

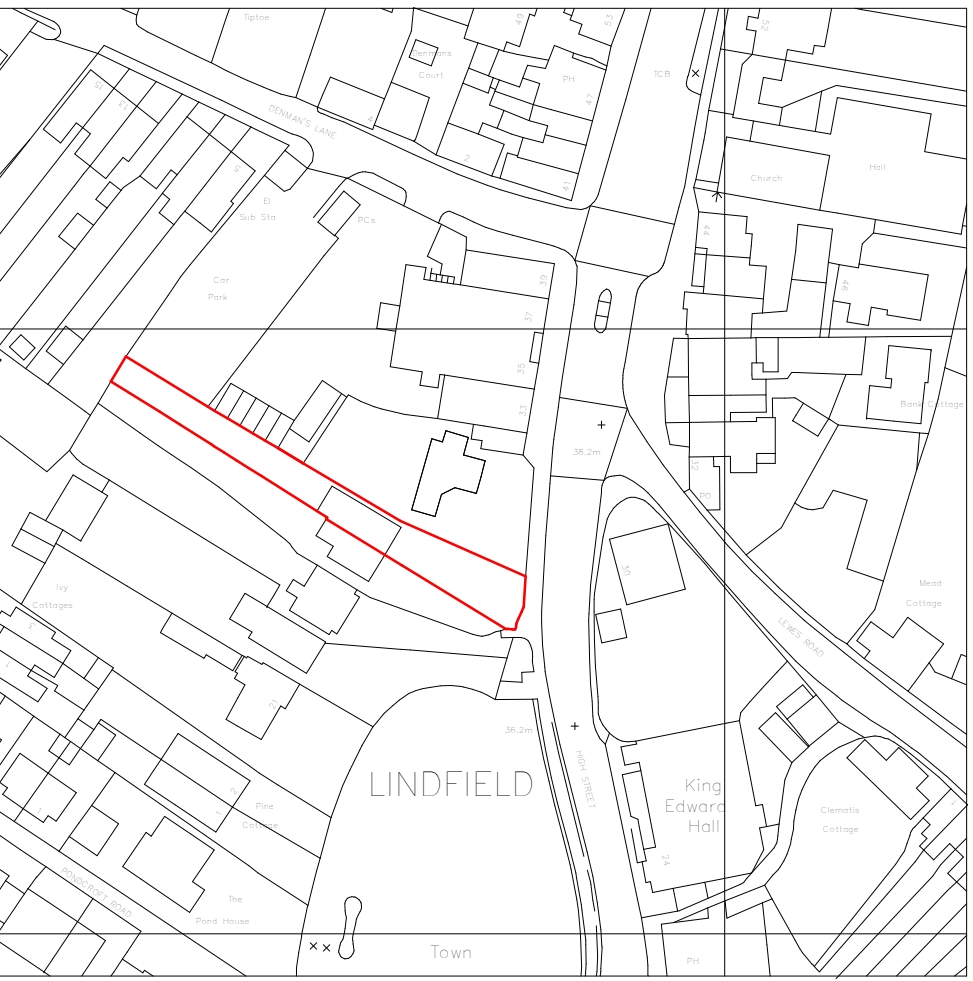
9 CONCLUSION

- 9.1 A review of flood risk from all other sources, has been undertaken, the dominant source of flood risk to the site is considered to be from surface water sources. Flood risk from this source is considered low, with the dwelling only being affected in the most extreme 1 in 1000 year event.
- 9.2 Flood risk has been reviewed from fluvial, tidal, groundwater and sewer flood risk, with flood risk from these sources considered low.
- 9.3 To assist in mitigating the present flood risk to the site's users based on the development proposals, a number of recommendations have been discussed, the core of these include:
- Finish Floor Levels to be no lower than existing.
 - Where possible, retrofit the existing site drainage to cater for climate change impacts. Any new drainage should be designed in accordance with Building Regulations Part H, SuDS Manual and 'DCG' guidance, ensuring drainage proposals include an allowance for climate change;
 - Any additional flows to be directed into the Local Sewer Authorities public sewers to receive confirmation of capacity and connection approvals prior to detailed design and construction
 - Adopt the measures (as applicable) within Local Government (CLG) 2007 'Improving the Flood Performance of New Buildings' publication.
- 9.4 This report demonstrates that the proposals could be accommodated within the site by in accordance with the EA guidance, Council SFRA, and the NPPF. It is considered that as long as the development follows the advice presented in this report, that the development proposals may be considered appropriate at this location.

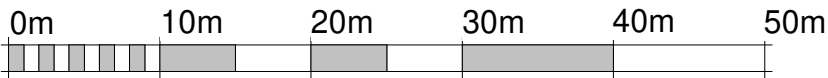
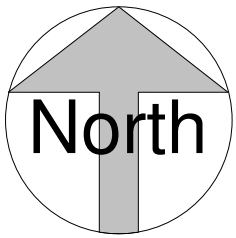
APPENDIX 1 – ARCHITECTURAL PROPOSALS



Site Plan
1 : 500



Location Plan
1 : 1250



VISUAL SCALE 1:500 @ A1



VISUAL SCALE 1:1250 @ A1

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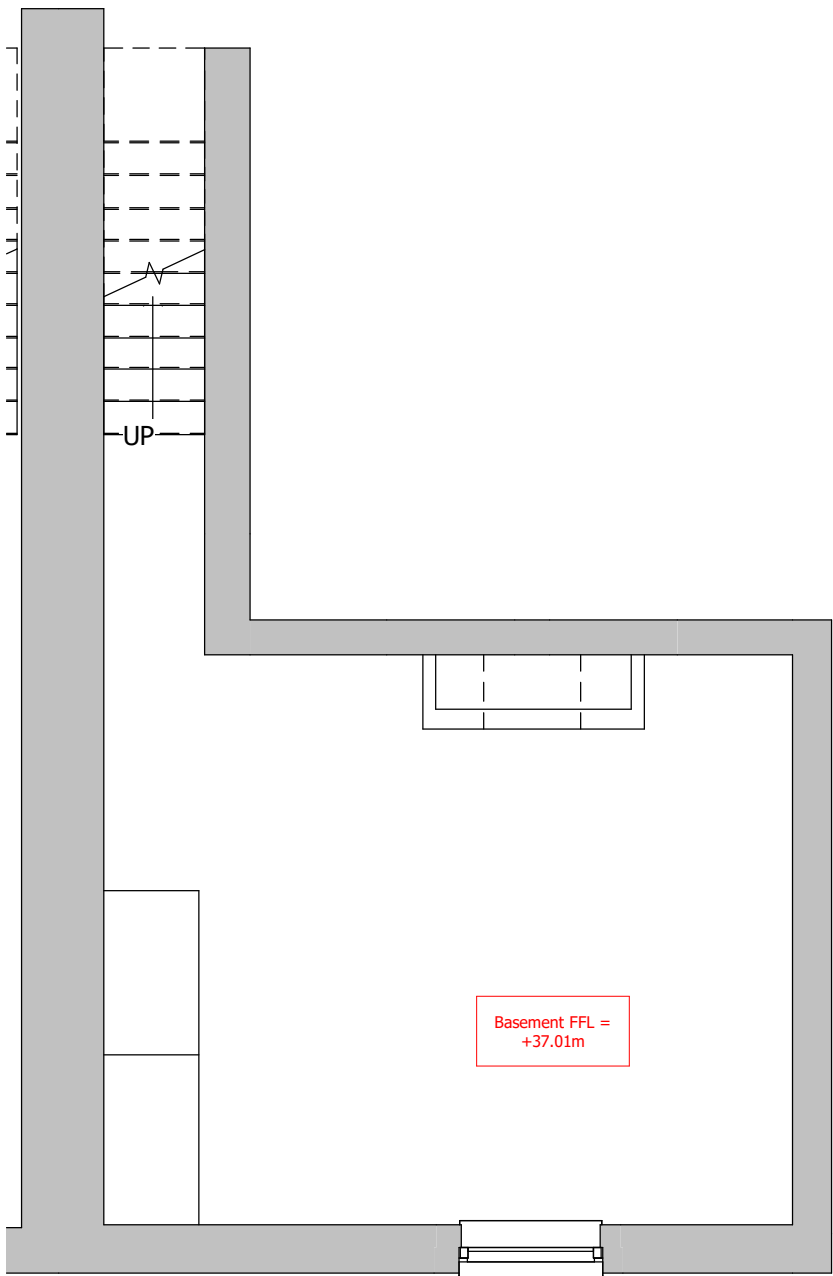
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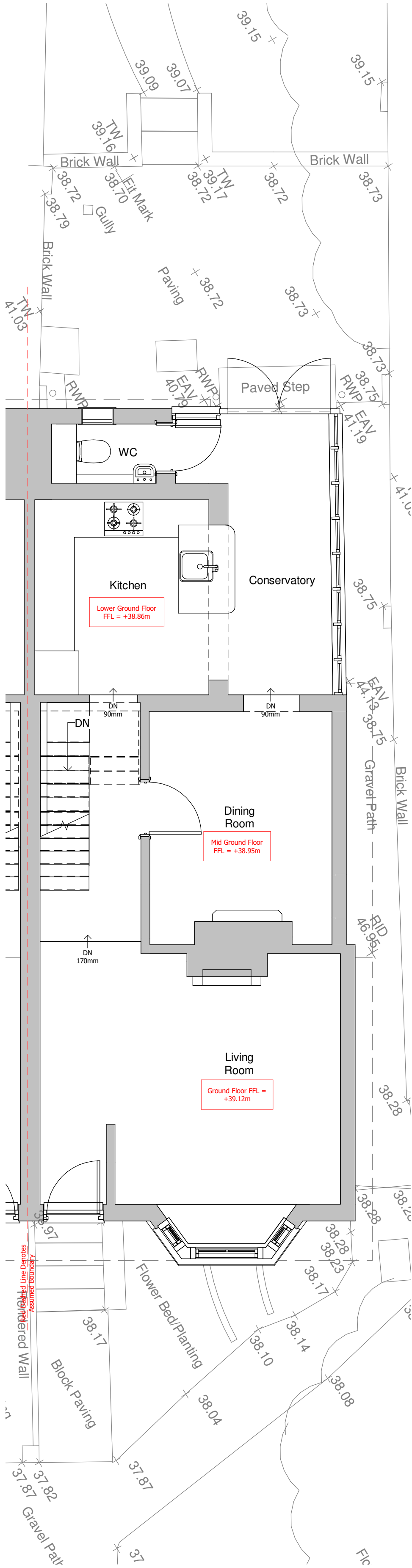
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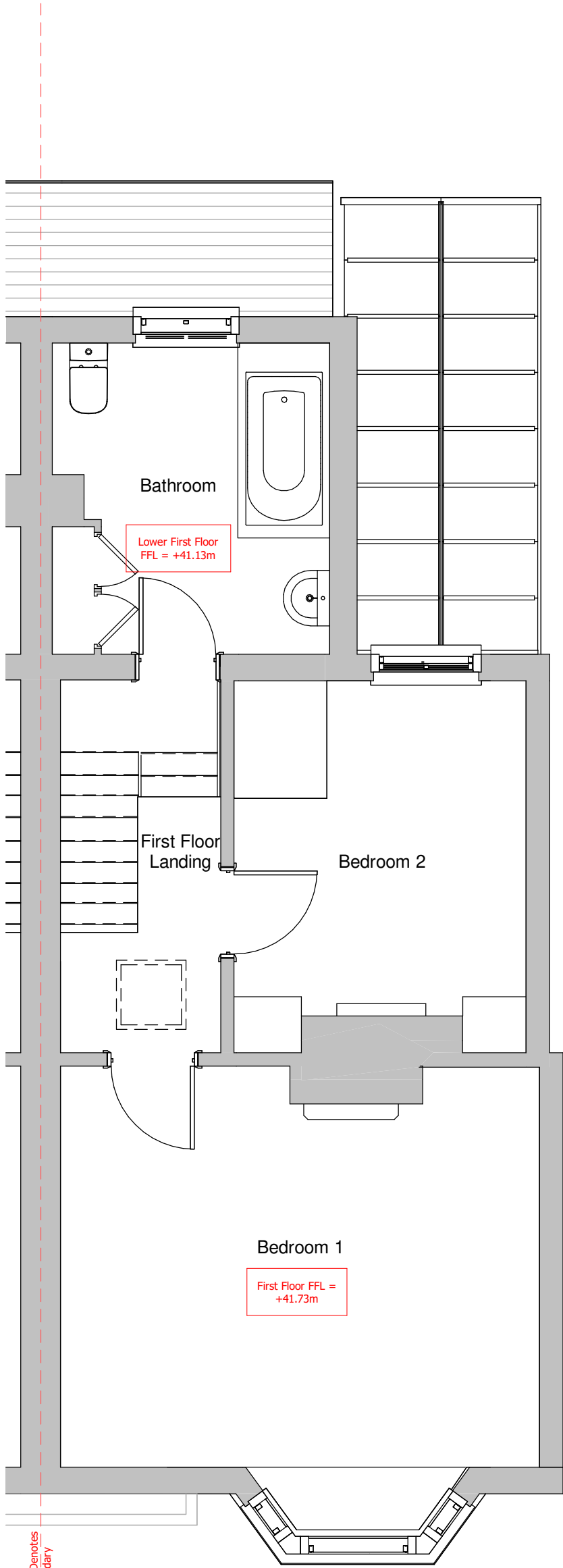
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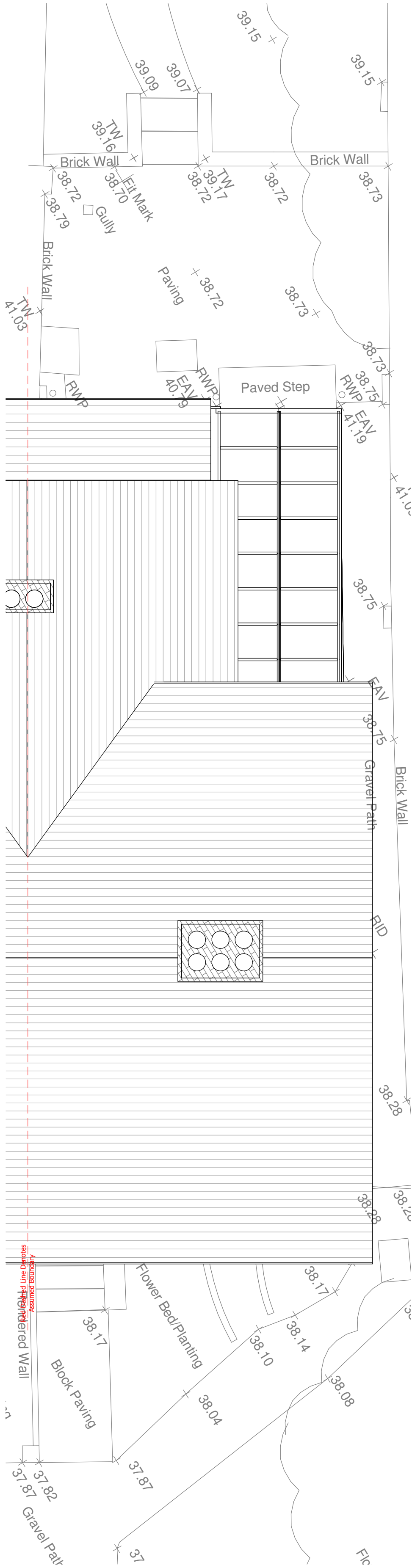
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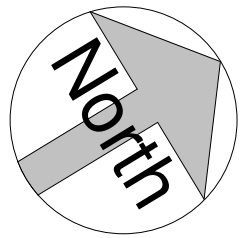
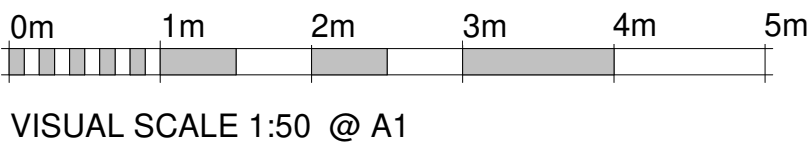
Ground Floor
1 : 50



First Floor
1 : 50



Roof Plan
1 : 50



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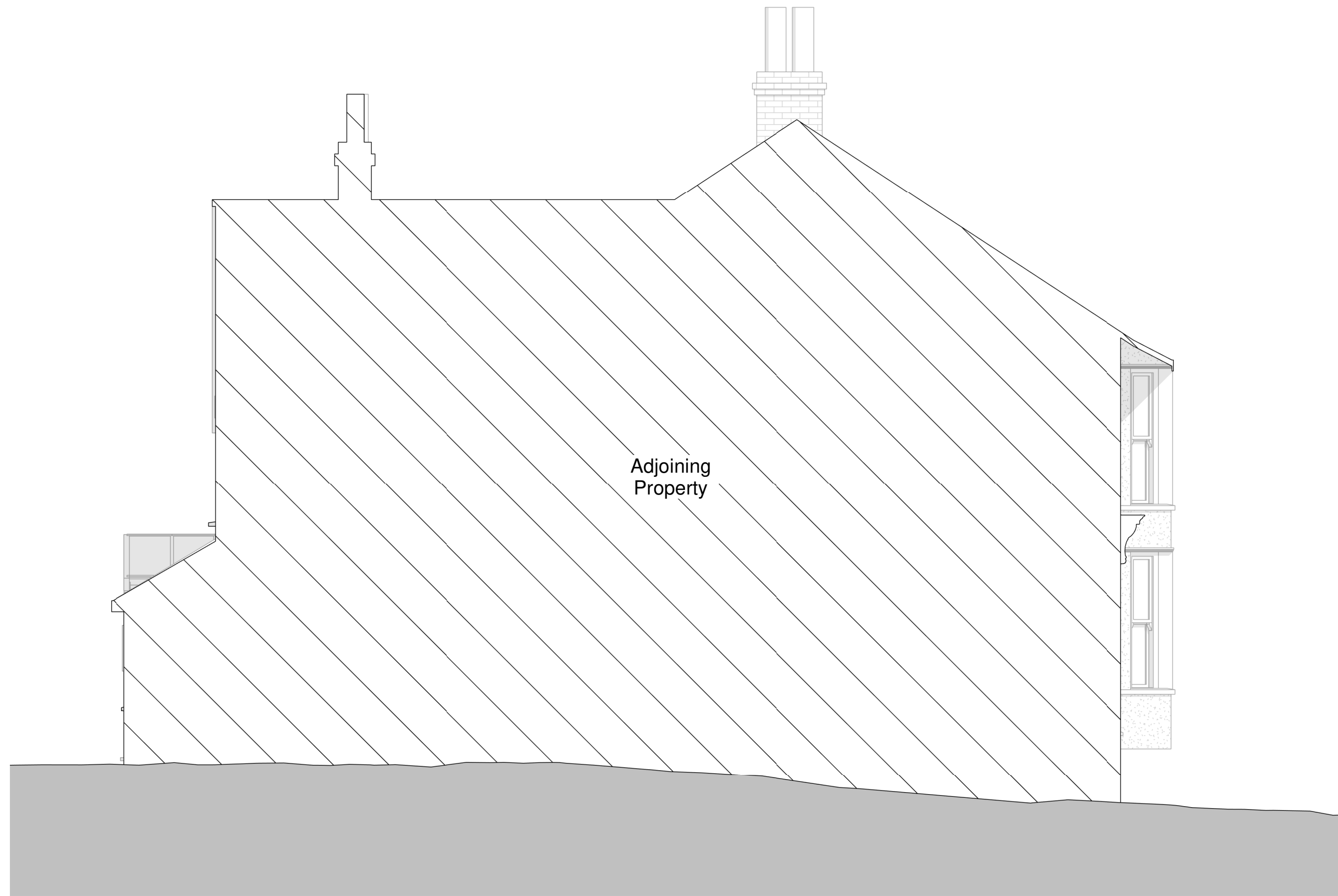
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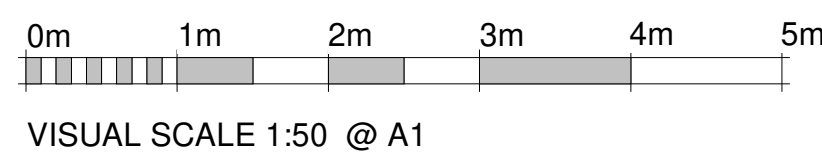
South West Elevation
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North West Elevation
1 : 50



North East Elevation
1 : 50



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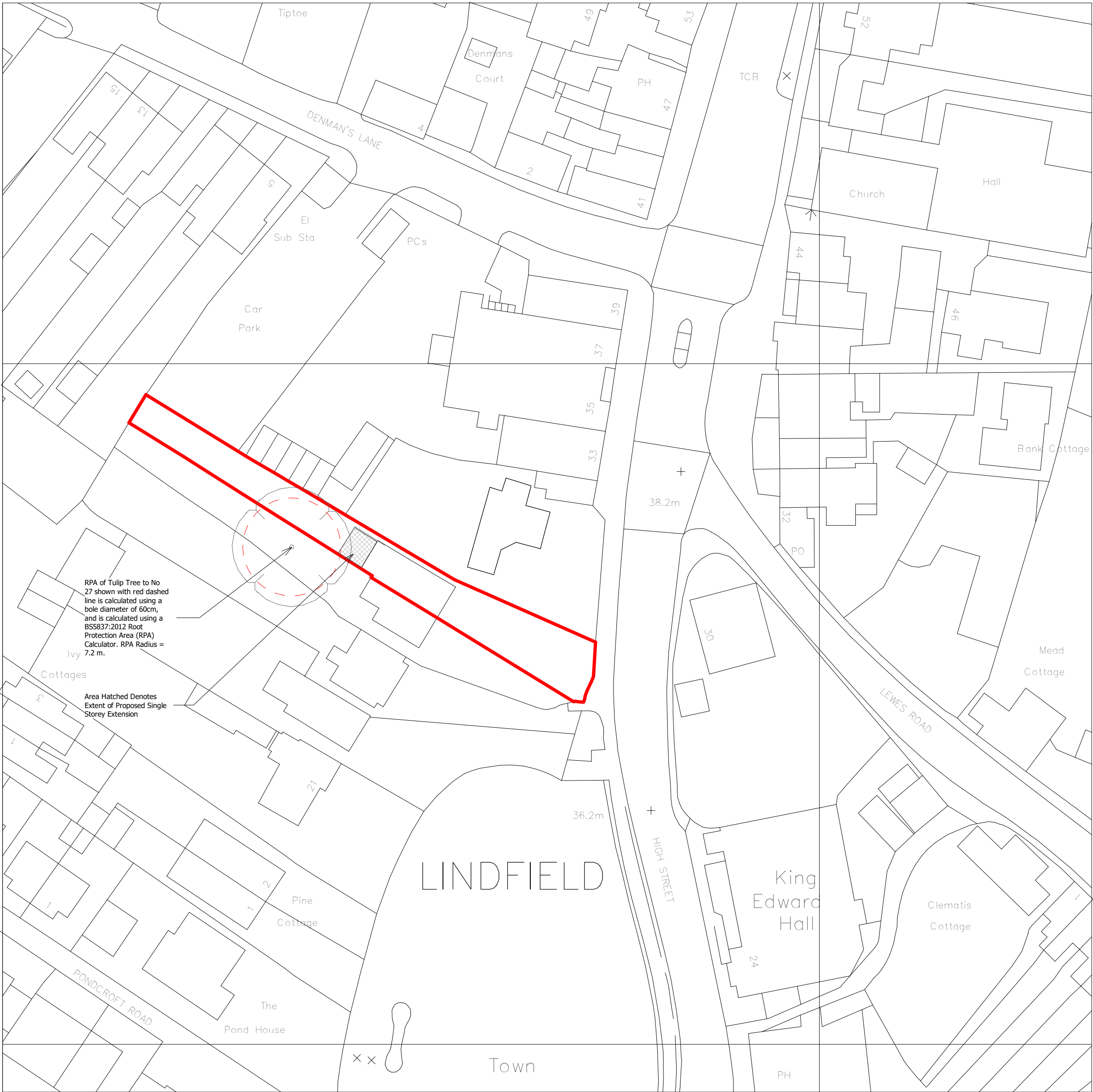
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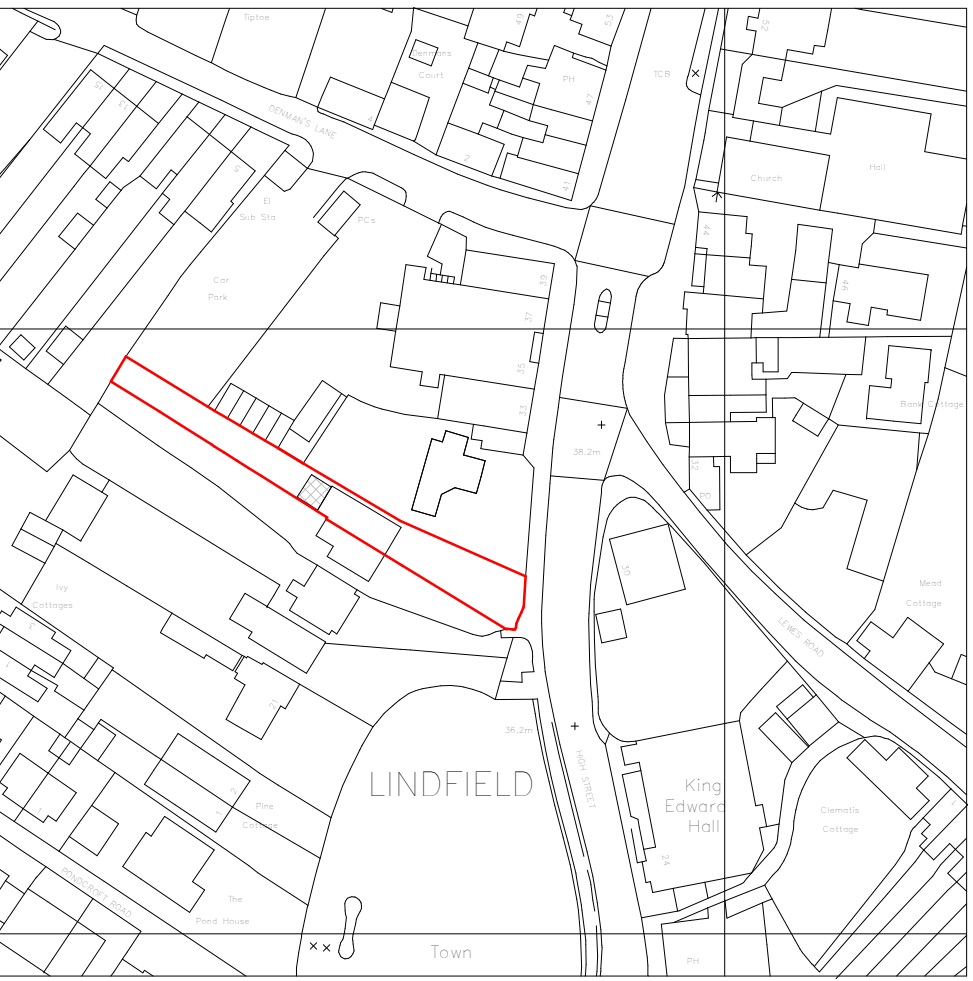
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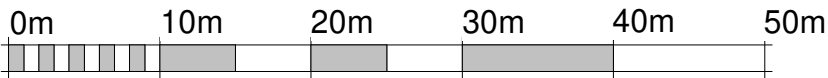
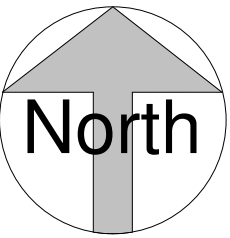
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Site Plan
1 : 500



Location Plan
1 : 1250



VISUAL SCALE 1:500 @ A1



VISUAL SCALE 1:1250 @ A1

B	28/05/24	SM	Revisions Following Planning/Conservation Officer Comments
A	01/02/24	SM	Minor Amendments

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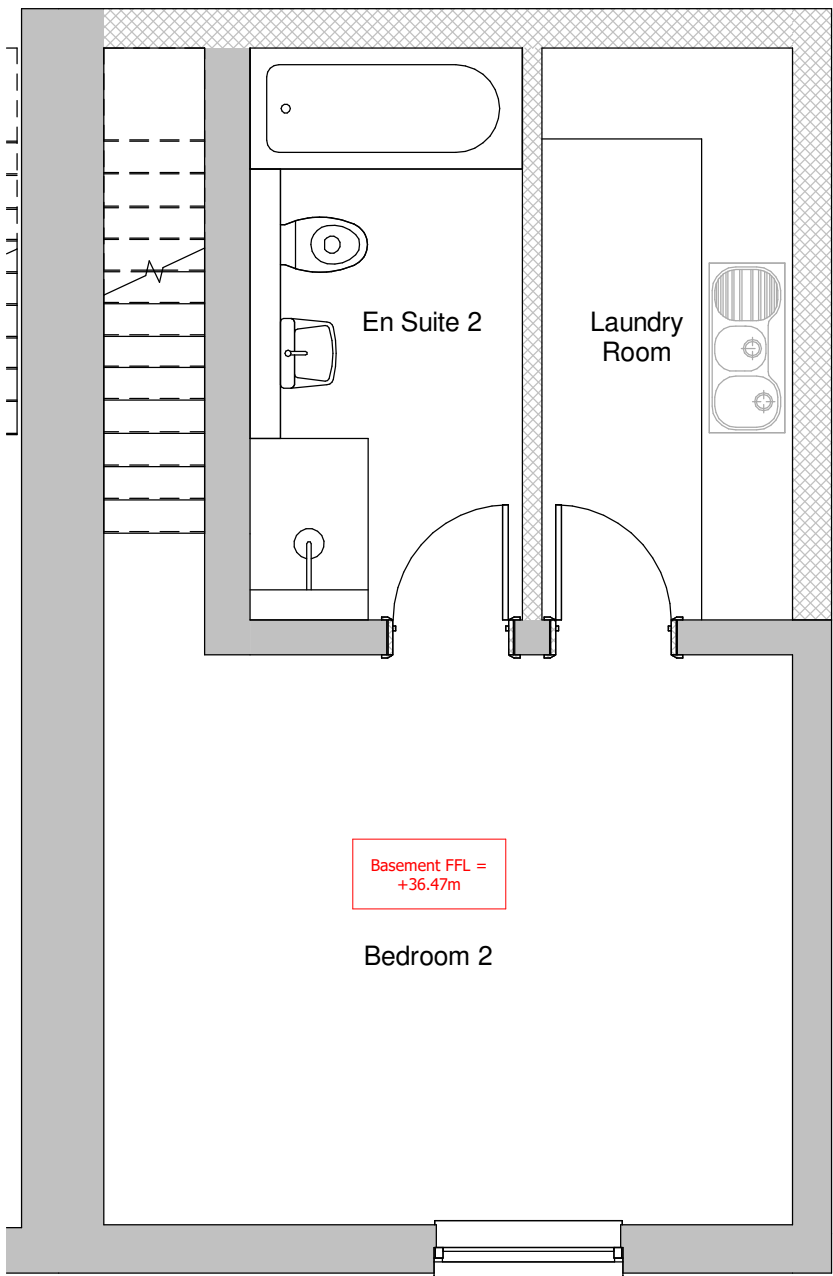
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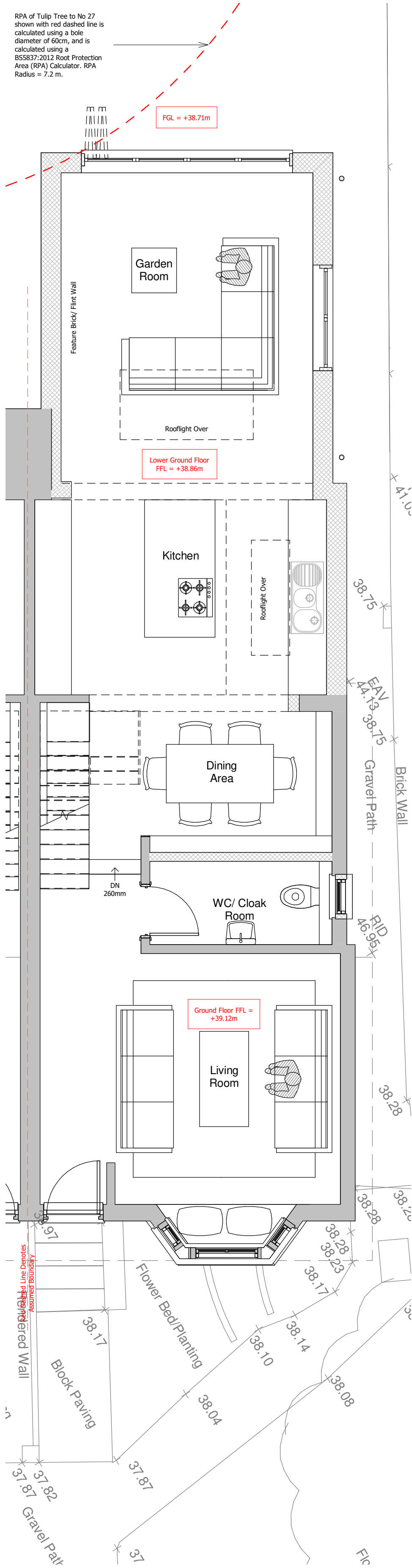
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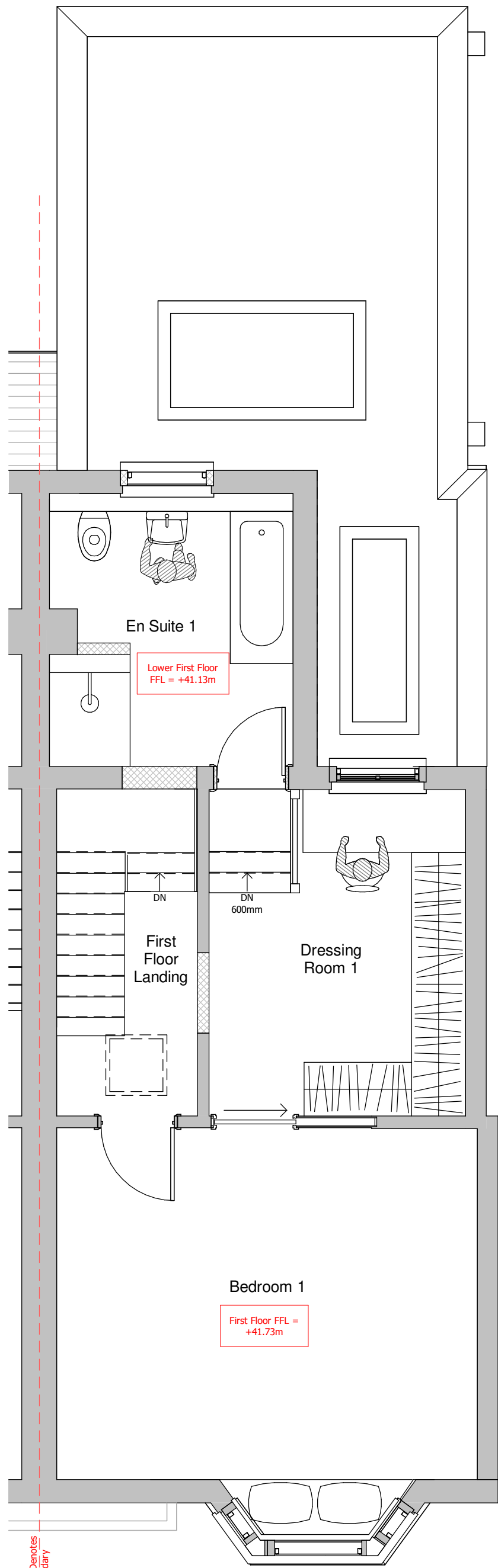
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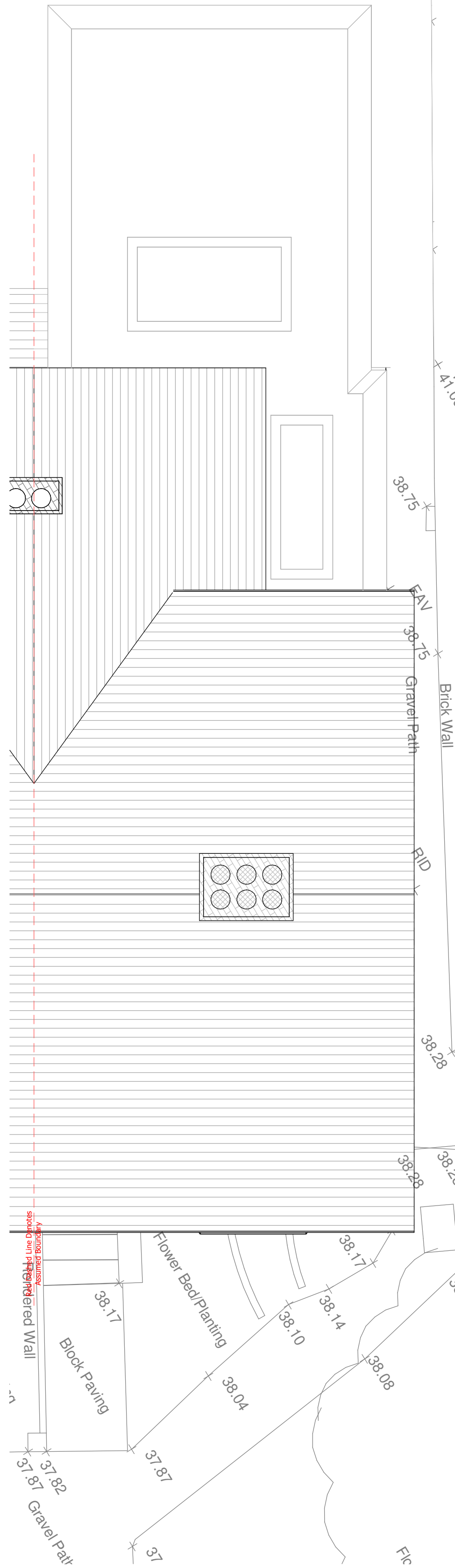
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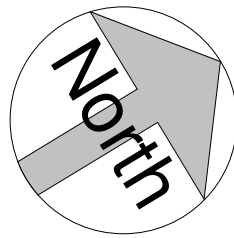
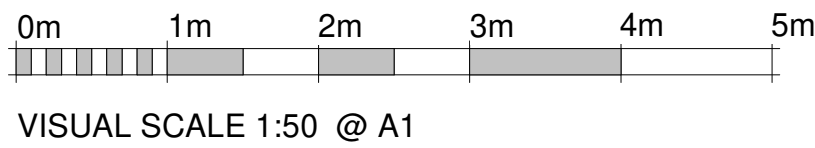
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First Floor
1 : 50



Roof Plan
1 : 50



D	28/05/24	SM	Revisions Following Planning/Conservation Officer Comments
C	02/04/24	SM	Revisions Following Conservation Officer Response
B	16/02/24	SM	Rear Ground Floor FFL Revised
A	01/02/24	SM	Minor Amendments

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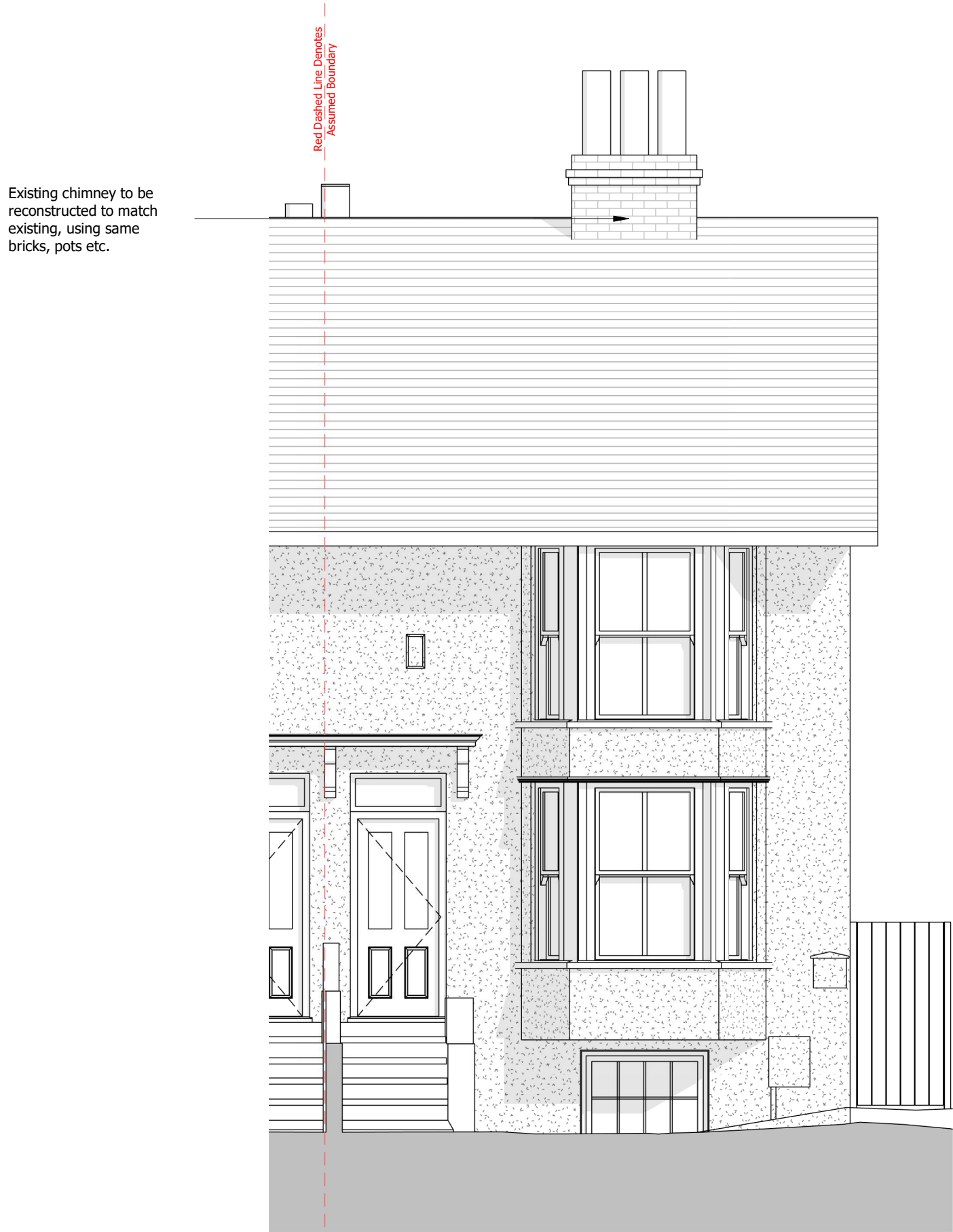
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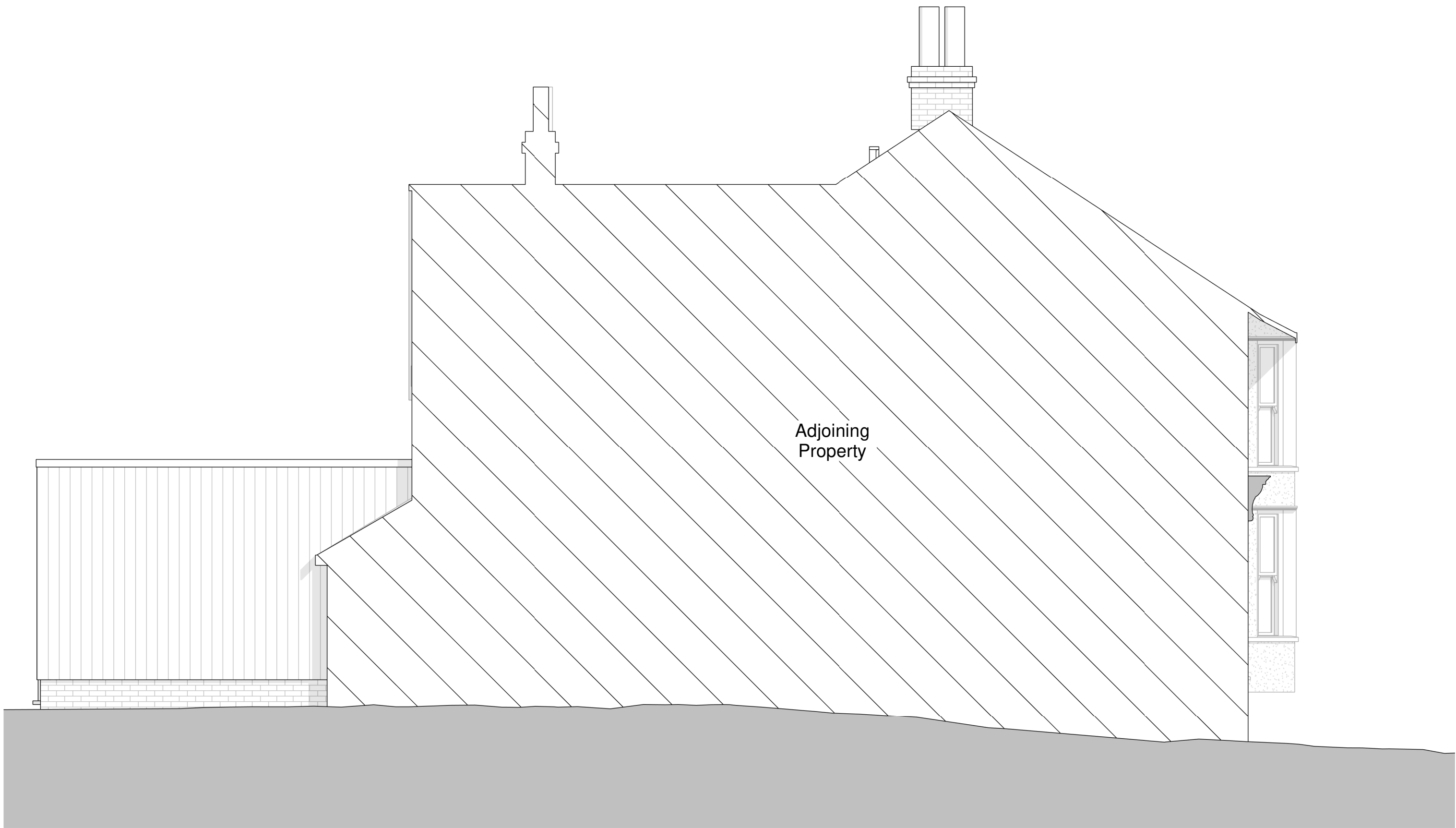
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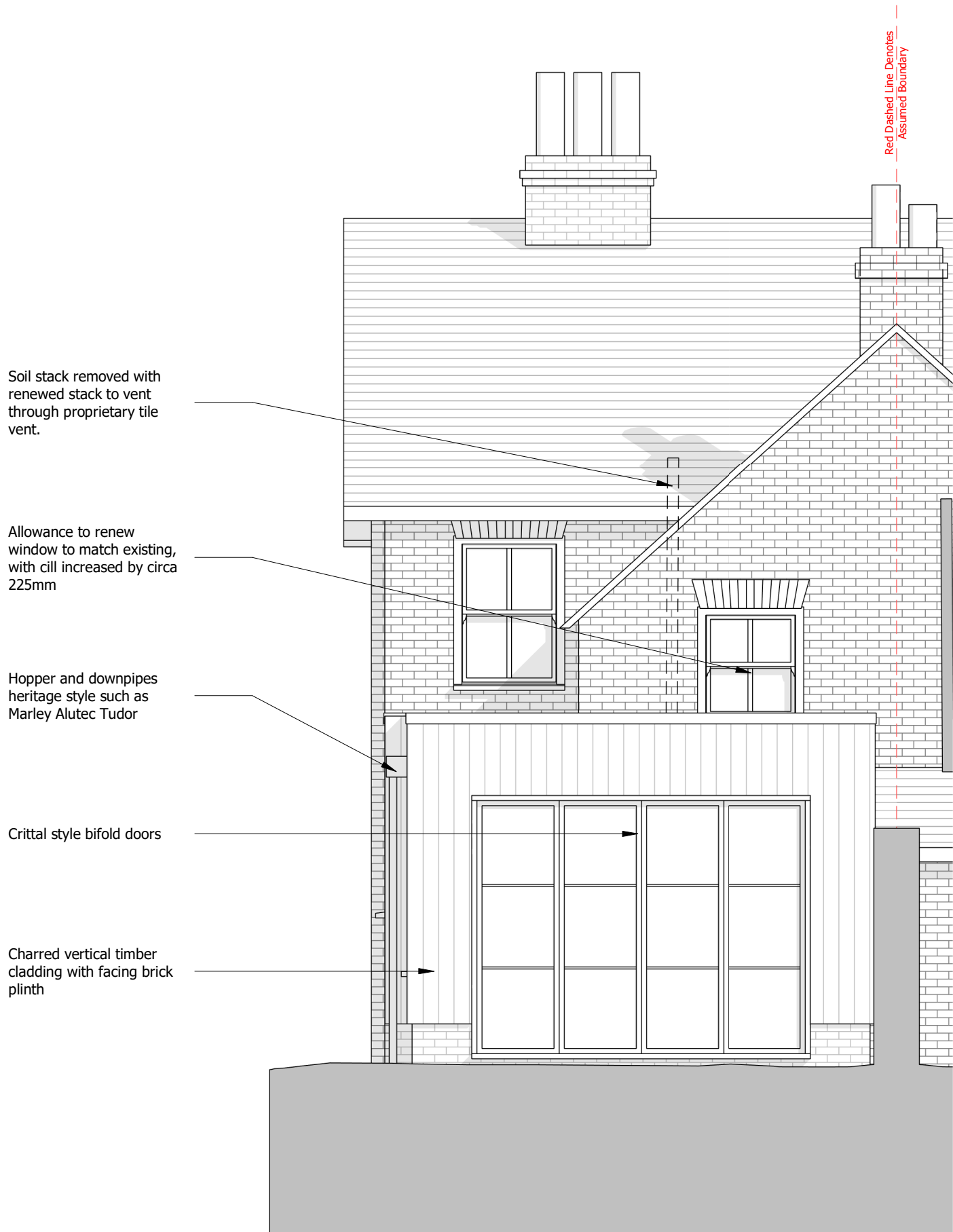
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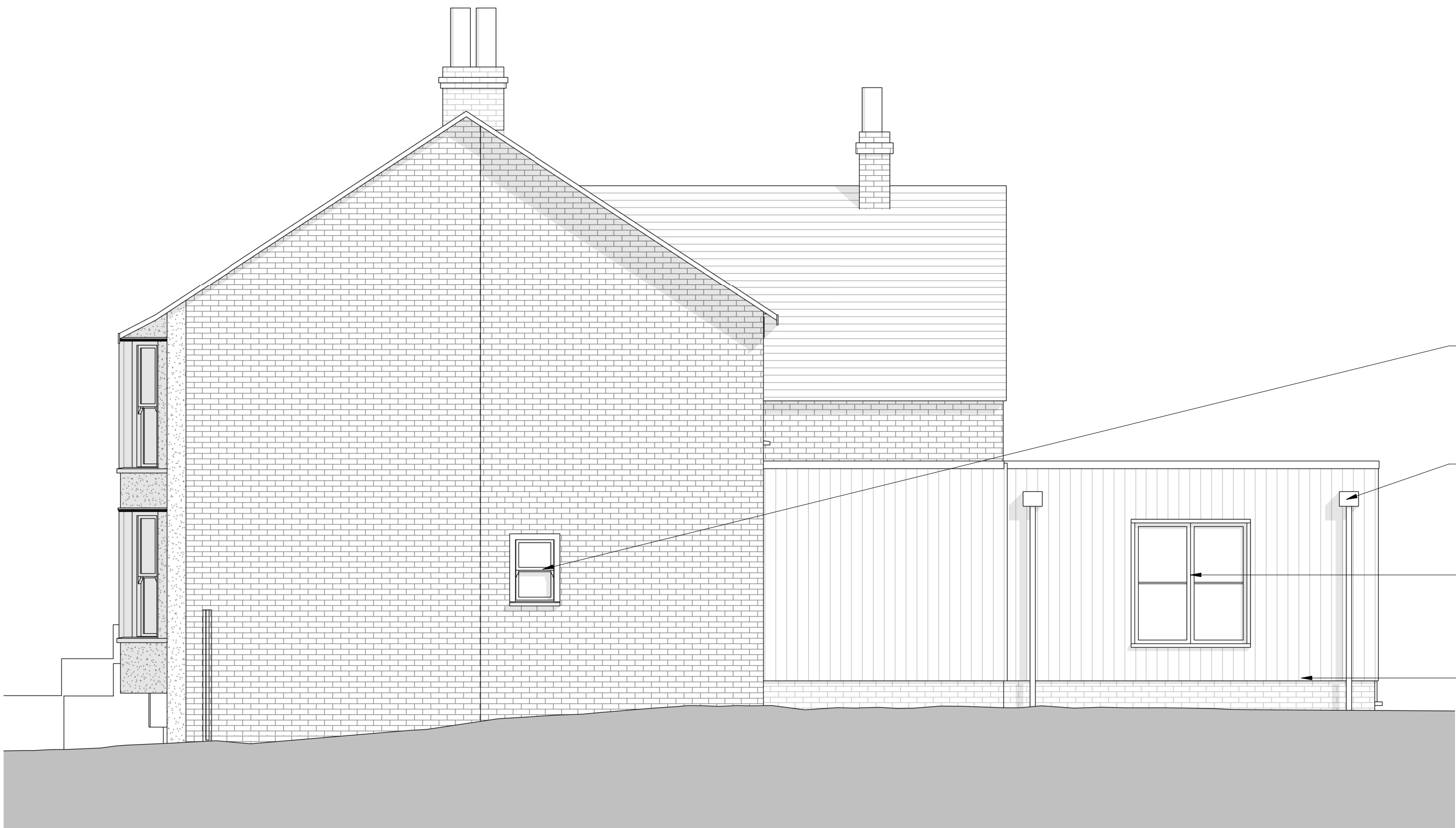
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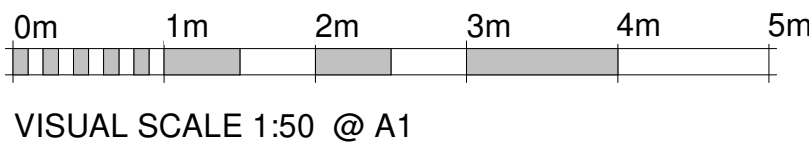
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North West Elevation
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North East Elevation
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C	28/05/24	SM	Revisions Following Planning/Conservation Officer Comments
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A	01/02/24	SM	Minor Amendments

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JOB NO. GH633	DRAWING NO. PL011	REV. C
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APPENDIX 2 – EA DATA

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
534633/125373

Created
15 Jul 2024 21:20

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following**:

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
534633/125373

Scale
1:2500

Created
15 Jul 2024 21:20

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area

0 20 40 60m

