PROPOSED REDEVELOPMENT AT 62a HAVERSTOCK HILL/201 PRINCE OF WALES ROAD, LONDON, NW3 2BH

FLOOD RISK ASSESSMENT

JANUARY 2015

REPORT REF: 1383/RE/12-14/01

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CONTRACT

Evans Rivers and Coastal Ltd has been commissioned by Geotechnical and Environmental Associates to carry out a Flood Risk Assessment for a proposed redevelopment at 62a Haverstock Hill/201 Prince of Wales Road, London, NW3 2BH.

QUALITY ASSURANCE, ENVIRONMENT AND HEALTH AND SAFETY

Evans Rivers and Coastal Ltd operates a Quality Assurance, Environmental, and Health and Safety Policy.

This project comprises various stages including data collection; hydrological and hydrogeological assessments; surface water drainage designs; and reporting. Quality will be maintained throughout the project by producing specific methodologies for each work stage. Quality will also be maintained by initiating internal quality procedures including the validation of third party deliverables; creation of an audit trail to record any changes made; and document control using a database and correspondence log file system.

To adhere to the Environmental Policy, data will be obtained and issued in electronic format and alternatively by post. Paper use will also be minimised by communicating via email or telephone where possible. Documents and drawings will be transferred in electronic format where possible and all waste paper will be recycled. Meetings away from the office of Evans Rivers and Coastal Ltd will be minimised to prevent unnecessary travel, however for those meetings deemed essential, public transport will be used in preference to car journeys.

The project will follow the commitment and objectives outlined in the Health and Safety Policy operated by Evans Rivers and Coastal Ltd. All employees will be equipped with suitable personal protective equipment prior to any site visits and a risk assessment will be completed and checked before any site visit. Other factors which have been taken into consideration are the wider safety of the public whilst operating on site, and the importance of safety when working close to a water source and highway. Any designs resulting from this project and directly created by Evans Rivers and Coastal Ltd will also take into account safety measures within a “designers risk assessment”.

Report carried out by:

…….
Rupert Evans, BSc (Hons), MSc, CEnv, C.WEM, MCIWEM, AIEMA

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1. INTRODUCTION

1.1 Project Scope

1.1.1 Evans Rivers and Coastal Ltd has been commissioned by Geotechnical and Environmental Associates to carry out a Flood Risk Assessment for a proposed redevelopment at 62a Haverstock Hill/201 Prince of Wales Road, London, NW3 2BH.

1.1.2 It is understood that this Flood Risk Assessment will be submitted to the Planning Authority as part of a planning application. Specifically, this assessment intends to:

1) Carry out an appraisal of flood risk from all sources such as fluvial/tidal, groundwater, surface water/sewers, artificial sources in accordance with NPPF and other documents such as the SFRA and SWMP;

2) Recommend mitigation measures where appropriate;

3) Report findings and recommendations.

1.1.3 This assessment is carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) and associated Technical Guidance, both dated March 2012. Other documents which have been consulted include:

- DEFRA/EA document entitled *Framework and guidance for assessing and managing flood risk for new development Phase 2 (FD2320/TR2)*, 2005;
- DEFRA/Jacobs 2006. *Groundwater flooding records collation, monitoring and risk assessment (ref HA5)*.
- National Planning Practice Guidance – Flood Risk and Coastal Change updated 6th March 2014.
- London Borough of Camden Preliminary Flood Risk Assessment (PFRA) Version 0.2 dated 2011.
- London Borough of Camden Strategic Flood Risk Assessment (SFRA) dated 2014.
- London Borough of Camden Surface Water Management Plan (SWMP) Version 1 dated 2011.
- London Borough of Camden flood risk management strategy (FRMS) dated 2013.
- London Borough of Camden, Camden geological, hydrogeological and hydrological study – Guidance for subterranean development dated 2010.

2. DATA COLLECTION

2.1 To assist with this report, the data collected included:

- Geotechnical and Environmental Associates desk study, ground investigation and Basement Impact Assessment (BIA) dated December 2014.
- 1:250,000 *Soil Map of South East England* (Sheet 6) published by Cranfield University and Soil Survey of England and Wales 1983.
- 1:625,000 *Hydrogeological Map of England and Wales*, published in 1977 by the Institute of Geological Sciences (now the British Geological Survey).
- Information and data from:
    - London Borough of Camden Preliminary Flood Risk Assessment (PFRA) Version 0.2 dated 2011.
    - London Borough of Camden Strategic Flood Risk Assessment (SFRA) dated 2014.
    - London Borough of Camden Surface Water Management Plan (SWMP) Version 1 dated 2011.
    - London Borough of Camden Flood Risk Management Strategy (FRMS) dated 2013.
    - London Borough of Camden, Camden geological, hydrogeological and hydrological study – Guidance for subterranean development dated 2010.

2.2 All third party data used in this study has been checked and verified prior to use in accordance with Evans Rivers and Coastal Ltd Quality Assurance procedures.

3. SITE CHARACTERISTICS

3.1 Existing Site Characteristics and Location

3.1.1 The site is located at number 62a Haverstock Hill/201 Prince of Wales Road, London. The approximate Ordnance Survey (OS) grid reference for the site is 528009 184587 and the location of the site is shown on Figure 1.

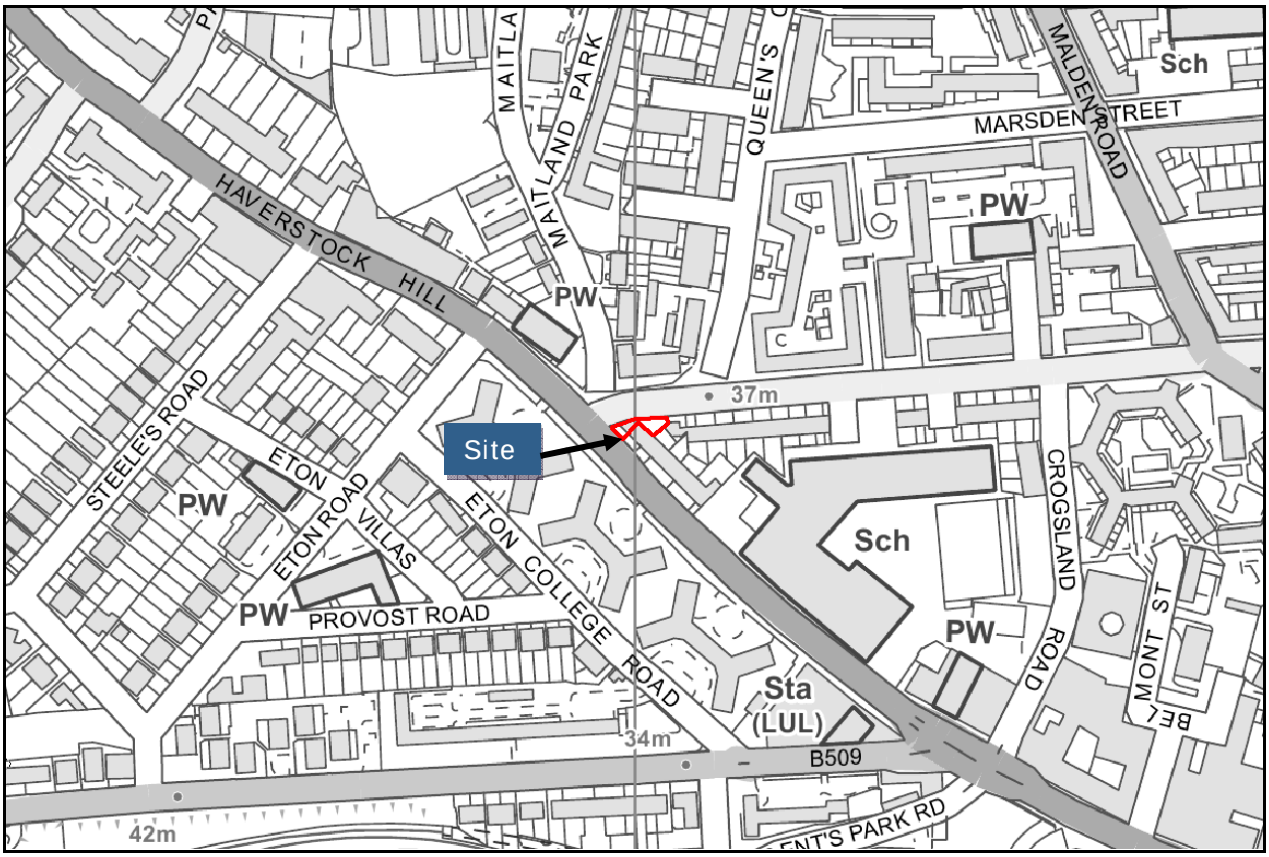

Figure 1: Site location plan (Source: Ordnance Survey, 2014)

3.1.2 The site is located in a mainly residential area in the London Borough of Camden, approximately 225 m to the southeast of Chalk Farm London Underground Station. It is located on a corner plot, such that it fronts onto Haverstock Hill to the southwest and Prince of Wales Road to the north. It is bounded to the northeast by No 200 Prince of Wales Road; a single storey building with semi-basement and to the southeast by a row of terraced houses with semi-basement fronting onto Haverstock Hill.

3.1.3 The site is roughly triangular in shape, measuring approximately 20 m northeast-southwest by 10 m northwest-southeast and is currently occupied by a derelict two-storey building, comprised of No 62 Haverstock Hill and No 201 Prince of Wales Road.

3.1.4 The site is devoid of significant vegetation and is sensibly level, although Haverstock Hill slopes down towards the south.

3.1.5 Both buildings are in poor condition with ceiling damage in No 62 Haverstock Hill, thought to be the result of a leak along with rotten floorboards locally. It is understood that the buildings were squatted for the last few years.

3.2 Site Proposals

3.2.1 It is proposed to demolish the existing two-storey building and to subsequently construct a three-storey residential building with a single level basement beneath the entire footprint of the site. The proposed new basement will extend to a depth of about 4.00 m below the site.

3.2.2 The proposed layouts have been produced by Carmody Groarke and can be seen on Drawing Numbers 126/P/21/01, 126/P/22/01 and 126/P/35/01.

4. SOURCES OF FLOODING

4.1 Fluvial / Tidal

4.1.1 The Environment Agency Flood Map shows that the site is located within the NPPF Flood Zone 1, 'Low Probability' which comprises land as having less than a 1 in 1000 year annual probability of fluvial or tidal flooding (i.e. an event more severe than the extreme 1 in 1000 year event). NPPF states that all uses of land, including basements, are appropriate in this zone.

4.1.2 The SFRA also states that there has been no historical flooding within the Borough from fluvial or tidal sources. Furthermore, the SWMP confirms that the Borough does not fall within the Environment Agency's flood zones and therefore is not at significant risk from fluvial or tidal flooding.

4.1.3 The SFRA and SWMP states that all main rivers historically located within the Borough are now culverted and incorporated into the sewer network. The SWMP discusses the River Fleet which is one of London's "lost rivers" and which historically originates from springs on Hampstead Heath and drains to the Thames through the Borough. The Fleet is entirely incorporated within the sewer network.

4.1.4 The SFRA continues to discuss the Borough's historic rivers and in addition to the Fleet, the Tyburn, Kilburn and Brent were also located in the area of Hampstead Heath. All of these "lost rivers" are also now incorporated into the local sewer system maintained by Thames Water. It is for these reasons that the Borough is located entirely within Flood Zone 1.

4.2 Critical Drainage Areas (CDA)

4.2.1 Despite the site being located within Flood Zone 1, it is understood from Figure 6 of the SFRA and Figure 3.1 of the SWMP, that the site is located within the Group3-003 Critical Drainage Area (CDA).

4.2.2 The SWMP defines the CDA as:

"A discrete geographic area (usually a hydrological catchment) where multiple and interlinked sources of flood risk (surface water, groundwater, sewer, main river and/or tidal) cause flooding in one or more Local Flood Risk Zones during severe weather thereby affecting people, property or local infrastructure."

4.3 Groundwater Flooding

4.3.1 In order to assess the potential for groundwater flooding during higher return period rainfall events, the Jacobs/DEFRA report entitled *Strategy for Flood and Coastal Erosion Risk Management: Groundwater Flooding Scoping Study*, published in May 2004, was consulted, together with the guidance offered within the document entitled *Groundwater flooding records collation, monitoring and risk assessment (ref HA5)*, commissioned by DEFRA and carried out by Jacobs in 2006.

4.3.2 According to Cobby et al (2009), groundwater flooding can be defined as flooding caused by the emergence of water originating from subsurface permeable strata. The greatest risks of groundwater flooding are considered to be from either:

- a rise of groundwater in unconfined permeable strata, such as Chalk, after prolonged periods of extreme rainfall;

- a rise of groundwater in unconsolidated, permeable superficial deposits, which are in hydraulic continuity with local river water levels and where the hydraulic gradient of the water table is low.

4.3.3 As described above, it is widely accepted that groundwater flooding generally occurs from both permeable strata (e.g. Chalk) and superficial deposits (e.g. sands and gravels). In particular, unconfined water-bearing deposits (i.e. those with permeable soils above them) are susceptible to a rise in groundwater during prolonged, extreme rainfall and during periods of high recharge throughout autumn and winter. Antecedent conditions, such as, above average groundwater levels prior to the rainfall event, are also a contributing factor to a variation in the water table.

4.3.4 Permeable superficial deposits can also hold quantities of groundwater, although these tend to be insignificant compared to the stored quantities within consolidated aquifers. Unconsolidated deposits such as sand and gravels are sufficiently permeable to store water; however such deposits which yield a low quantity of water are commonly termed a non-aquifer.

Soil and Geology at the Site

4.3.5 The BIA report carried out by Geotechnical and Environmental Associates (GEA) indicates that the soils beneath the site comprise a moderate thickness of made ground, and then London Clay.

4.3.6 The BIA states that the Made Ground generally comprised brown silty clay with flint gravel with fragments of brick, burnt coal and concrete, which extended to depths of between 1.5 m and 1.8 m, where proved.

4.3.7 The BIA indicates that the London Clay comprised typical weathered firm becoming stiff brown mottled grey silty fissured clay with occasional partings of orange-brown fine sand and silt, proved to the maximum depth investigated of 4.00 m.

4.3.8 Groundwater was not encountered during the initial BIA investigation; however perched water was encountered around the base of the existing foundations at depths of 0.87 m and 1.40 m respectively. Subsequent monitoring on one occasion to date has measured groundwater at depths of between 1.69 m and 3.28 m.

4.3.9 According to the BIA, water infiltrating the underlying London Clay will generally tend to flow vertically downwards at a very slow rate towards the lower chalk aquifer. Due to the predominantly cohesive nature of the soils, the groundwater flow rate is unlikely to be particularly high.

Groundwater Flooding Potential at the Site

4.3.10 Figure 4e/Rev 1 of the SFRA shows that the site has not been affected in the past from groundwater flooding incidents and that the site is not located within an area of increased susceptibility to elevated groundwater and is therefore expected to remain at depth. Figure 4a/Rev 1 of the SFRA also shows that the site is not located across an area with superficial (and more permeable) deposits beneath the surface.

4.3.11 The evidence suggests that it is unlikely that the water table has the potential to breach the ground surface and flow into the building and basement via the ground floor.

4.3.12 It is understood from the BIA that the single level basement will extend to a depth of about 4.00 m and beneath the entire footprint of the site. The evidence indicates that

groundwater is likely to be encountered within the basement excavation but it is not clear to what extent and whether this is indicative of perched groundwater within the made ground, or if there is a more general water level in the London Clay.

4.3.13 Shallow monitored groundwater levels within standpipes is a common feature of low permeability clay strata and is not necessarily indicative of a consistent water table as would be the case within a permeable water bearing strata. Thus, although the basement may extend below the monitored water levels in standpipes it is not the case that it extends below a general groundwater table.

4.3.14 Further monitoring should be undertaken as detailed in Section 8.1.1 of the BIA. Reference should be made to BS8102:2009 with regard to requirements for waterproofing and design with respect to groundwater pressures.

4.3.15 The groundwater flooding risk to the property and basement is considered to be overall low.

4.4 Surface Water Flooding and Sewer Flooding

4.4.1 Surface water and sewer flooding across urban areas is often a result of high intensity storm events which exceed the capacity of the sewer thus causing it to surcharge and flood. Poorly maintained sewer networks and blockages can also exacerbate the potential for sewer flooding.

Surface Water Flooding

4.4.2 It has been established that the site lies within the Group3-003 Critical Drainage Area. The SFRA notes that the surface water mapping indicates that the surface water flood extent broadly follows the natural topography of the borough and man-made features such as roads and rail lines. During extreme modelling scenarios, the SFRA states that there is increased ponding in areas of properties. For example, the SWMP indicates that the modelling shows deep flooding at Gospel Park, affecting Oak Village, Lamble St, Grafton Road and Kiln Place, caused by railway embankments creating a “basin” into which surface water collects.

4.4.3 The SFRA discusses the two large surface water flooding events in the Borough, which occurred in 1975 and 2002 and caused widespread damage. It is understood that during these events the sewers reached maximum capacity and Figure 3ii/Rev 1 of the SFRA shows that Prince of Wales Road which runs adjacent to the northern frontage of the site was flooded during the 2002 event. However, it should be noted that the map illustrates that the site and adjacent properties were not flooded during this event.

4.4.4 Figure 3ii/Rev 1 of the SFRA also shows that the site and surrounding properties are not at risk from surface water flooding during events up to and including the 1 in 1000 year event. In fact, the site is located across an area with a less than 1 in 1000 year return period of surface water flooding.

4.4.5 However, Figure 3ii/Rev 1 of the SFRA shows that Haverstock Hill is at risk of flooding during the 1 in 100 year event. This is also likely to be the case along Prince of Wales Road as suggested by Figure 3ii/Rev 1.

4.4.6 Despite this, it is considered that the site is not at risk of surface water flooding as indicated by the maps. As discussed in paragraph 4.4.2 above, the evidence suggests that within the vicinity of the site, surface water is being routed along the road surface

without significant ponding and flooding of properties. This is possible attributed to the topography of the area.

Sewer Flooding

4.4.7 The SFRA states that the majority of the Borough is served by a combined surface and foul water system which is designed to accommodate rainfall events of up to 1 in 30 years return period.

4.4.8 The combined sewer network outfalls into the River Thames during intense rainfall events when the sewer network reaches capacity. The evidence suggests that as the sewer capacity becomes exceeded this results in surcharging of the network prior to sufficient discharge into the Thames.

4.4.9 Figure 5a/Rev 1 and Figure 5b/Rev 1 of the SFRA indicates that the site is located across an area which has had no internal or external recorded sewer flooding incidents.

4.4.10 It is considered that there is an overall low risk of surface water and sewer flooding at the site.

4.5 Reservoirs, Canals And Other Artificial Sources

4.5.1 The failure of man-made infrastructure such as flood defences and other structures can result in unexpected flooding. Flooding from artificial sources such as reservoirs, canals and lakes can also occur suddenly and without warning, leading to high depths and velocities of flood water which pose a safety risk to people and property.

4.5.2 The Environment Agency's "Risk of flooding from reservoirs" map suggests that the site is not at risk from reservoir flooding. This supported by the SFRA which also states that the risk of flooding from the Regent's Canal is low.

5. DRAINAGE

5.1.1 As there will not be an increase in impermeable area across the site post-development, there will not be an increase in runoff rate into the local sewer network. However, the SFRA suggests that for proposed developments in a CDA, the Council should consider setting as a requirement a minimum reduction in surface water runoff rates post-development of 50%, in order to reduce the strain on the combined sewer network.

5.1.2 Therefore, it is recommended that this requirement is investigated further by the Client and opportunities identified to incorporate SUDS measures such as attenuation or rainwater harvesting at the site.

5.1.3 Despite the evidence suggesting an overall low risk of surface water and sewer flooding to the site, it has been determined in Section 4.4 of this FRA that the adjacent roads are at risk from surface water flooding during periods when the combined sewers are at full capacity. It is therefore recommended that consideration is given to the installation of non-return valves at the site, and especially across the basement area, in order to prevent water entering the property from drains and sewers. The SFRA suggests that more information can be found in the CIRIA publication 'Low cost options for preventing flooding from sewers'.

5.1.4 As the site and CDA falls outside of the Flooding Local Improvements Project (FLIP) it is unlikely that financial assistance will be provided by the Council or Thames Water. However, a similar approach could be pursued by the Client whereby a Counters Creek Valve is installed, which is essentially a "cut and pump" system involving the disconnection of the foul and surface water drainage from the property to the sewer in the road by a small chamber that lifts the flow from the basement level to ground level and then into the sewer. If the sewer in the road becomes completely full during a heavy storm, foul water does not backflow into the property but flows from the property can be received by the sewer.

6. CONCLUSIONS

- A review of the relevant guidance documents and various types of data collected at the site has enabled a full assessment of the flood risks to be quantified.

- The site is located within the Flood Zone 1 therefore all uses of land are appropriate in this zone.

- This assessment has investigated the possibility of groundwater flooding and flooding from other sources at the site. It is considered that there will be a low risk of groundwater flooding across the site and low risk of flooding from other sources such as surface water and sewers.

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DRAWINGS

Revisions

Rev.	Description	Drawn	Check	Issued to	Date Issued
P1	Pre-planning	MK	LK	LB Camden	31.01.2014

Notes

Do not scale from drawings.

Errors to be reported immediately to the Architect.

To be read in conjuntion with all relevant Architects', Services and Structural Engineers' drawings.

All existing site, tree and building information has been compiled from different sources.
All dimensions to be checked on site.

Flat A
Flat B
Flat C

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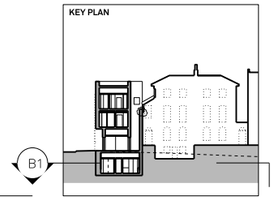
KEY PLAN



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Date	17 July 2014	**Drawn** RM	**Issue**
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CAD Reference	P/Projects/XXCAD/sheets	**Approved** XX	
Drawing Name	Prop. basement	**Drawing No.**	126_P_21_01

Revisions

Rev.	Description	Drawn	Check	Issued to	Date Issued
P1	Pre-planning	MK	LK	LB Camden	31.01.2014

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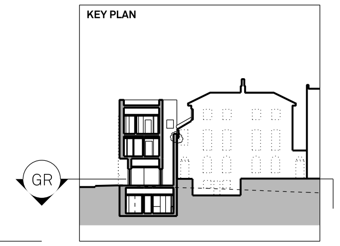

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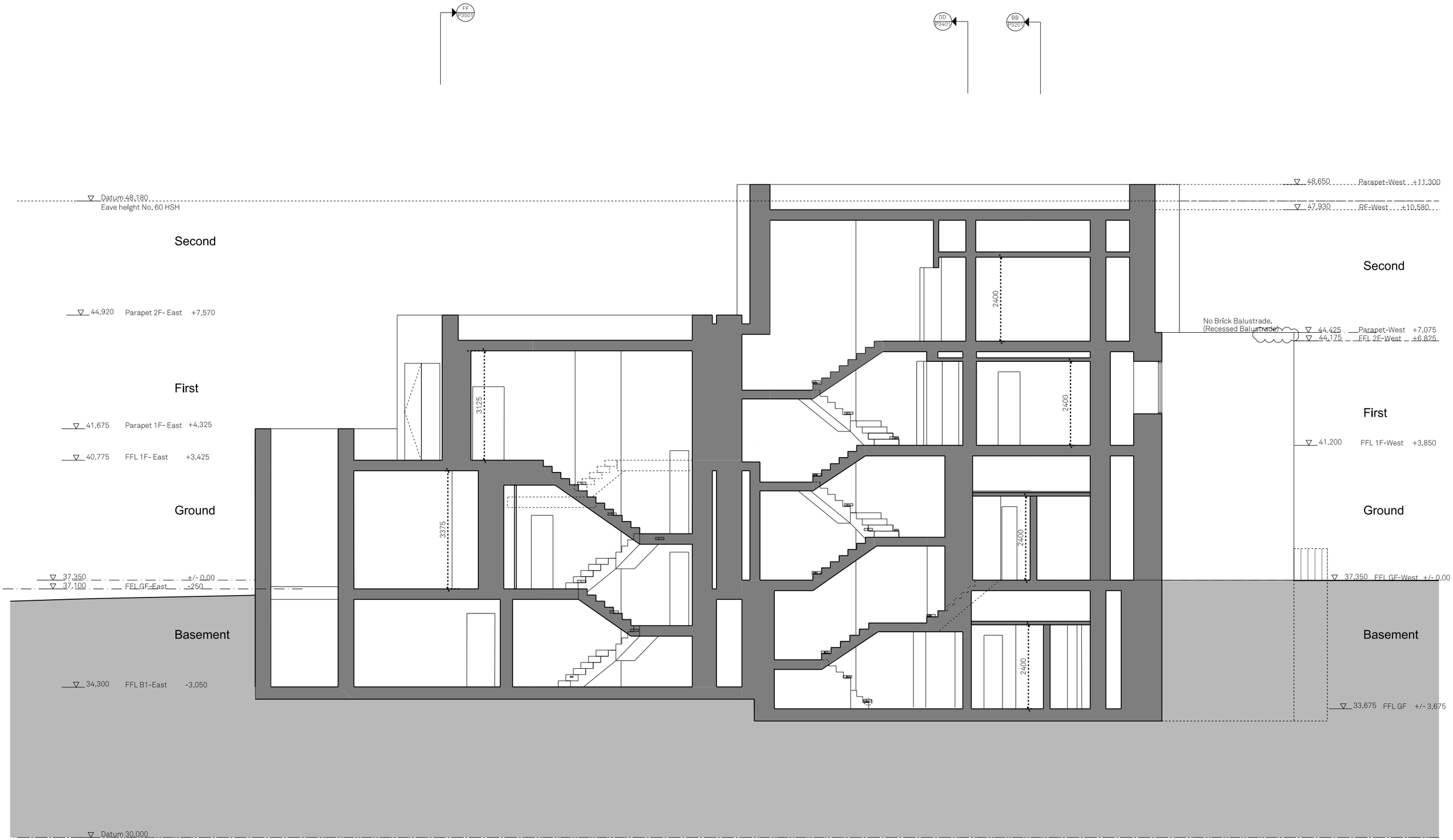

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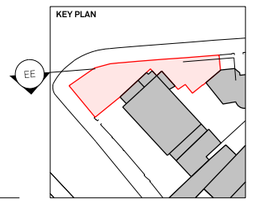

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Drawing Name	Prop.Section EE	**Drawing No.**	126_P_35_01


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