



**PROPOSED REMODELLING
OF EXISTING BUILDING
AND CREATION OF
BASEMENT LEVEL BENEATH
FOOTPRINT TO FORM
FLATS AT 11-15 KINGS
TERRACE, CAMDEN,
LONDON**

FLOOD RISK ASSESSMENT

OCTOBER 2021

REPORT REF: 2818/RE/10-21/01

CONTRACT

Evans Rivers and Coastal Ltd has been commissioned by Geotechnical & Environmental Associates to carry out a Flood Risk Assessment for a proposed remodelling of existing building and creation of basement level beneath building footprint to form flats at 11-15 Kings Terrace, Camden, London.

QUALITY ASSURANCE, ENVIRONMENT AND HEALTH AND SAFETY

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This project comprises various stages including data collection; depth analysis; and reporting. Quality will be maintained throughout the project by producing specific methodologies for each work stage. Quality will also be maintained by providing specifications to third parties such as surveyors; 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".

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1. INTRODUCTION

1.1 Project Scope

1.1.1 Evans Rivers and Coastal Ltd has been commissioned by Geotechnical & Environmental Associates to carry out a Flood Risk Assessment for a proposed remodelling of existing building and creation of basement level beneath building footprint to form flats at 11-15 Kings Terrace, Camden, London.

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:

- a) Review any literature and guidance specific to this area;
- b) Assess the risks to people and property and propose mitigation measures accordingly;
- c) Review existing evacuation and warning procedures for the area;
- d) Carry out an appraisal of flood risk from all sources as required by NPPF;
- e) Report findings and recommendations.

1.1.3 This assessment is carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) dated 2021. 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.
- Woods-Ballard., et al. 2015. *The SUDS Manual, Report C753*. London: CIRIA.
- National SUDS Working Group. 2004. *Interim Code of Practice for Sustainable Drainage Systems*.
- 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.
- *Camden Planning Guidance – Water and Flooding* dated 2018.
- *Camden Planning Guidance – Basements* dated 2018.

2. DATA COLLECTION

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

- 1:250,000 *Soil Map of South East England* (Sheet 6) published by Cranfield University and Soil Survey of England and Wales 1983.
- Ordnance Survey 1:10,000 street view map obtained via Promap (Evans Rivers and Coastal Ltd OS licence number 100049458).
- 1:625,000 *Hydrogeological Map of England and Wales*, published in 1977 by the Institute of Geological Sciences (now the British Geological Survey).
- Filtered LIDAR data at 1m resolution.
- British Geological Survey, *Online Geology of Britain Viewer*.
- British Geological Survey, *Groundwater Susceptibility Map*.

3. SITE CHARACTERISTICS

3.1 Existing Site Characteristics and Location

- 3.1.1 The site is located at 11-15 Kings Terrace, Camden, London. The approximate Ordnance Survey (OS) grid reference for the site is 529178 183491 and the location of the site is shown on Figure 1.

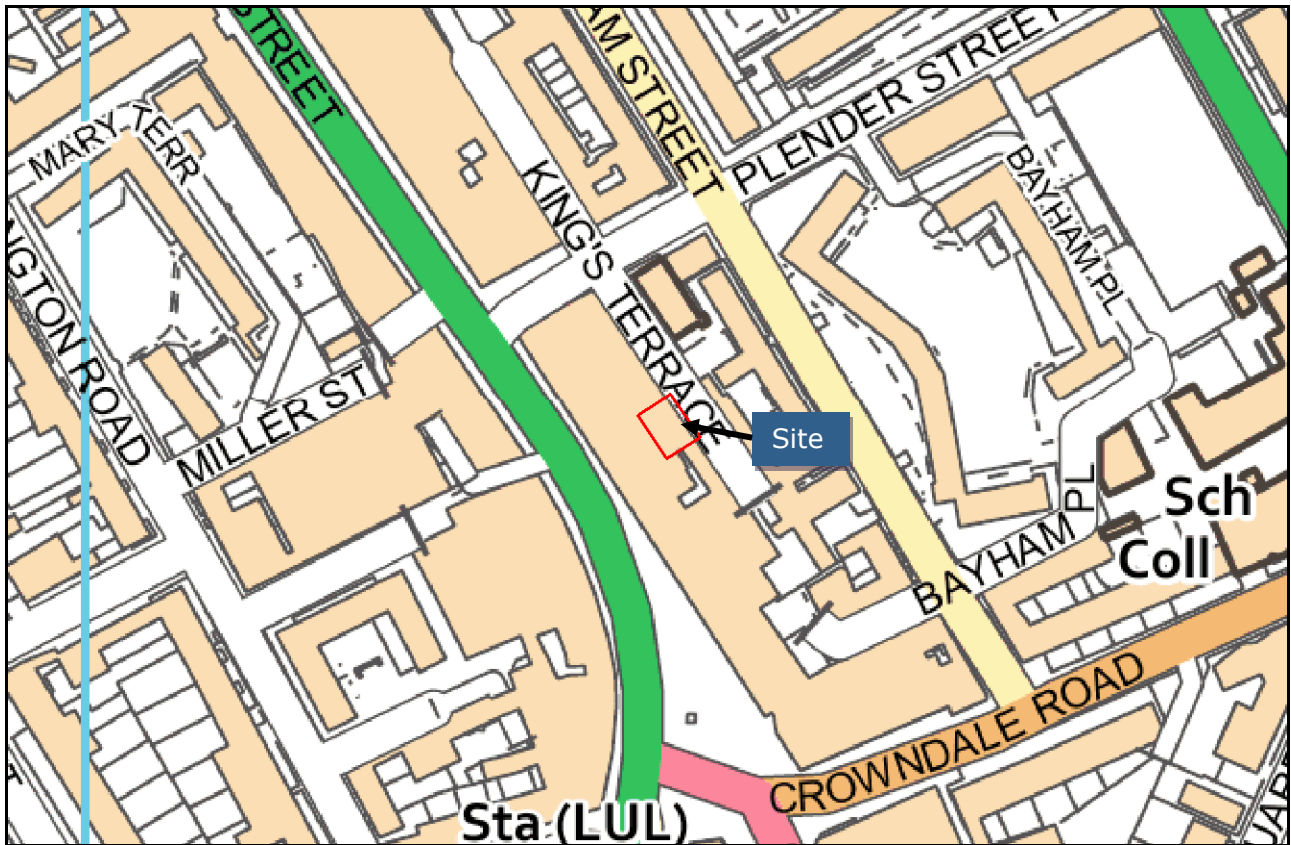


Figure 1: Site location plan (Source: Ordnance Survey)

- 3.1.2 The site comprises an existing building accessed from Kings Terrace adjacent to the north eastern frontage of the site.
- 3.1.3 Filtered LIDAR data at 1m resolution has been obtained to determine and illustrate the topography of the site and surrounding area (Figure 2).
- 3.1.4 By reviewing the site layout and LIDAR data it can be seen that ground levels fall in a north easterly direction and that the floor level of the building is approximately 0.15m higher than the road.



Figure 2: LIDAR survey data where higher ground is denoted as red, orange and yellow colours and lower areas denoted by blue and green colours

3.2 Site Proposals

- 3.2.1 It is the Client's intention to remodel the existing building to form flats and to provide a single level basement below the building footprint which will be used for recreational purposes.
- 3.2.2 The site proposals can be seen on Drawing Number GDA-11-A.

4. SOURCES OF FLOODING

4.1 Fluvial

- 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 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.
- 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/Rev 2 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 addition to the information provided in the SFRA and SWMP, in order to assess the potential for groundwater flooding, 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 The various soil and geological data outlined in Chapter 2, together with Figure 4b/Rev 1 of the SFRA indicates that the soils beneath the site comprise London Clay.
- 4.3.3 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.
- 4.3.4 The basement will need to be designed to achieve a Grade 3 level of waterproofing protection as outlined in BS8102:2009. A new reinforced concrete lining wall and

ground-bearing concrete slab should be constructed using water resistant concrete to form the primary barrier. Appropriate groundwater control such as sump pumping may be required especially during the construction phase.

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.
- 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. Figure 3ii/Rev 1 of the SFRA shows that Kings Terrace was not affected during the 1975 event or 2002 event.
- 4.4.4 Figure 3ii/Rev 1 of the SFRA and the Agency's Surface Water Flooding Map (Figure 3) indicates that there is a very low surface water flood risk across the site (i.e. chance less than 1 in 1000 years).
- 4.4.5 It is generally accepted that the low risk flood event (i.e. between 1 in 1000 years and 1 in 100 years) on the Agency's map is used as a substitute for the climate change 1 in 100 year event to provide a worst-case scenario.

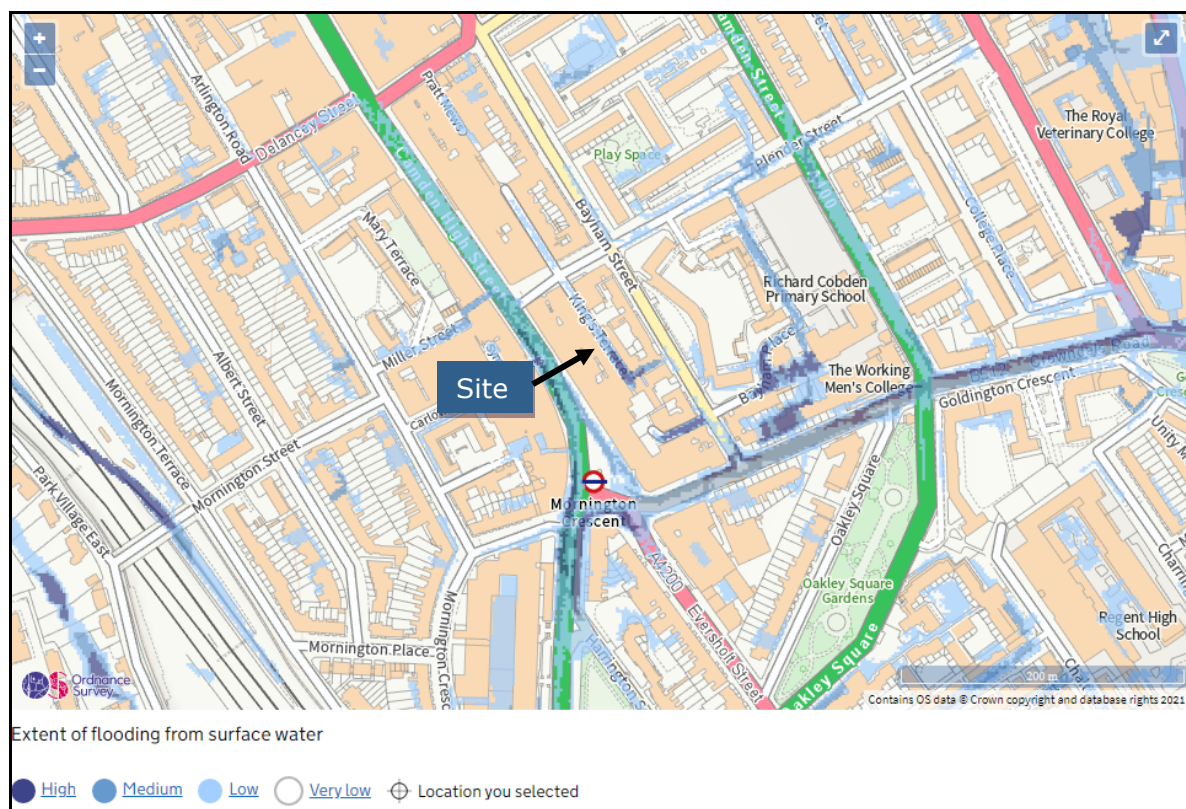


Figure 3: Environment Agency Surface Water Flooding Map (Source: Environment Agency, 2021)

- 4.4.6 The mapping shows that there is a low to medium risk along Kings Terrace adjacent to the site.
- 4.4.7 Further more detailed data has been obtained via the Data.gov.uk site (<https://environment.data.gov.uk/DefraDataDownload/?Mode=rofsw>). The flood extent, depth and hazard GIS *shape file* was downloaded from Data.gov.uk (for tile TQ_28).
- 4.4.8 Inspection of the data indicates that during low risk events the depth along Kings Terrace is between 0m and 0.15m. Therefore, the floor level will be set above the flood depth.
- 4.4.9 Due to the uncertainties associated with the flood depth, consideration should be given to further prevent the risk of water entry into the ground floor by introducing a *Water Exclusion Strategy*. For example, flood resilient doors could be used to prevent water entry and less reliance on human implementation during the event.

Reducing Vulnerability to the Hazard

- 4.4.10 Flood Warnings for surface water flooding do not currently exist, however, the occupants should sign up to the Met Office weather warning system <https://www.metoffice.gov.uk/public/weather/warnings> and safe refuge is available at all times.
- 4.4.11 There are additional ways in which the residents can reduce the risk themselves. The occupants should develop a *Family Flood Plan*. Further guidance is offered in the Environment Agency's guidance document entitled *What to do before, during and after a flood*. The *Family Flood Plan* should consider, for example, information about vital medication needed and a *Flood Kit*.

Table 1: Flood Event Action Plan

Alert	Level Definition	Action	Responsibility
Yellow: be aware	Yellow warnings can be issued for a range of weather situations. Many are issued when it is likely that the weather will cause some low level impacts, including some disruption to travel in a few places. Other yellow warnings are issued when the weather could bring much more severe impacts to many people but the certainty of those impacts occurring is much lower. It is important to read the	Monitor flood risk through media. Locate family members and inform them of risk. If away from the site make assessment on risk if considering returning to site (i.e. how long it will take to return etc). Check flood kit, check occupants, check pets – BE PREPARED in case the situation gets worse.	Occupants

	content of yellow warnings to determine which weather situation is being covered by the yellow warning.		
Amber: be prepared	<p>There is an increased likelihood of impacts from severe weather, which could potentially disrupt your works plans.</p> <p>This means there is the possibility of travel delays, road and rail closures, power cuts and the potential risk to life and property.</p>	<p>Monitor weather through media and local observations.</p> <p>Consider advice given from authorities including Council, Environment Agency and emergency services.</p> <p>Begin to implement Flood Plan.</p> <p>Check insurance, Check flood kit, Check Pets.</p>	Occupants
Red: Take Action	<p>Dangerous weather is expected and, if you haven't already done so, you should take action now to keep yourself and your works force safe from the impact of the severe weather.</p>	<p>Follow advice given by Emergency Services, Environment Agency and Council.</p> <p>Maintain communication through the media.</p>	Occupants

	<p>It is very likely that there will be a risk to life, with substantial disruption to travel, energy supplies and possibly widespread.</p> <p>You should avoid travelling, where possible, and follow the advice of the emergency services and local authorities.</p>	<p>Occupants can evacuate themselves if they feel unsafe providing that they make a judgement in relation to any external flood hazard. Take flood kit, occupants and pets with you.</p> <p>People who do not evacuate should reside across building.</p>	
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Safe Access/Egress

4.4.12 The flood hazard along Kings Terrace can be calculated based on different combinations of floodwater depth and velocity, and subsequently by using the hazard equation as cited in the DEFRA/EA R&D Document *Framework and guidance for assessing and managing flood risk for new development Phase 2 (FD2320/TR2)*. The numerical hazard rating is then categorised into four degrees of flood hazard in accordance with *FD2320/TR2*, shown on Table 2 below.

4.4.13 The hazard rating has been extracted from the surface water hazard map which was downloaded from Data.gov.uk and is identified as being 0.75-1.25 adjacent to the site during worst-case low risk events.

4.4.14 Therefore, according to Table 2 below the hazard to people would therefore be *Dangerous for Some*.

Table 2: Hazard to people categories (based on *FD2320/TR2*)

Hazard Rating	Degree of Flood Hazard	Description
< 0.75	Very low hazard	Caution "Flood zone with shallow flowing water or deep standing water"
0.75 – 1.25	Danger for Some	Dangerous for some (i.e. children) "Danger: Flood zone with deep or fast flowing water"
1.25 – 2.0	Danger for Most	Dangerous for most people (i.e. general public) "Danger: Flood zone with deep fast flowing water"
> 2.0	Danger for All	Dangerous for all "Extreme danger: flood zone with deep fast flowing water"

4.4.15 By reviewing the flood hazard GIS *shape file* downloaded from Data.gov.uk in the same way as above across the wider area, it can be seen that the flood hazard from the site would be *Dangerous for Some* for 11m and *Very low* thereafter.

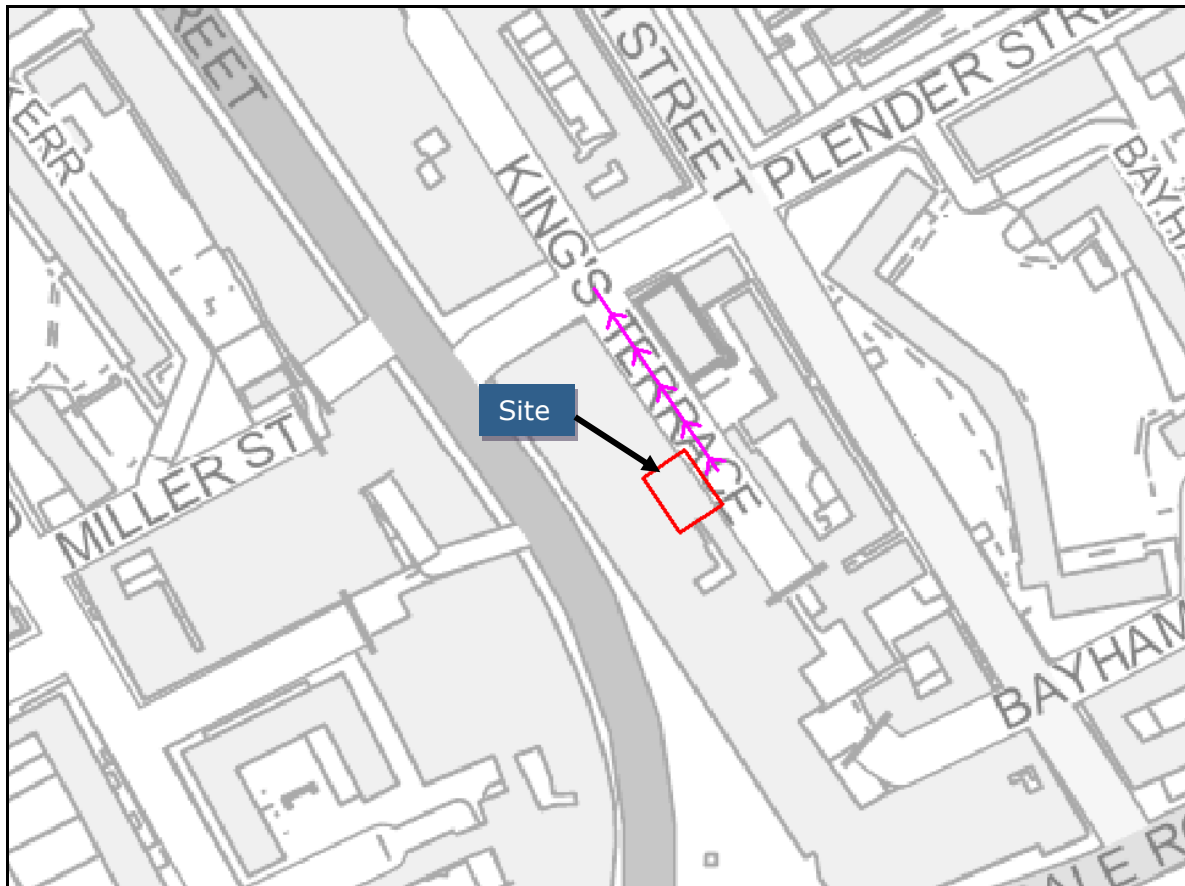


Figure 4: Evacuation route

Sewer Flooding

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

4.4.17 It is considered that there is an overall low risk of sewer flooding at the site.

4.4.18 It is considered that the site should be fitted with a positive pumped device so that it will be protected further from sewer flooding.

4.4.19 In addition to the pumped device there should be a non-return valve (e.g. <http://www.forgevalves.co.uk/>) installed so that if the sewers become completely full during a heavy storm, foul water does not backflow into the property.

4.4.20 This approach is recommended in section 6.16 of the *Camden Planning Guidance – Basements* dated 2018.

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 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 reservoirs.

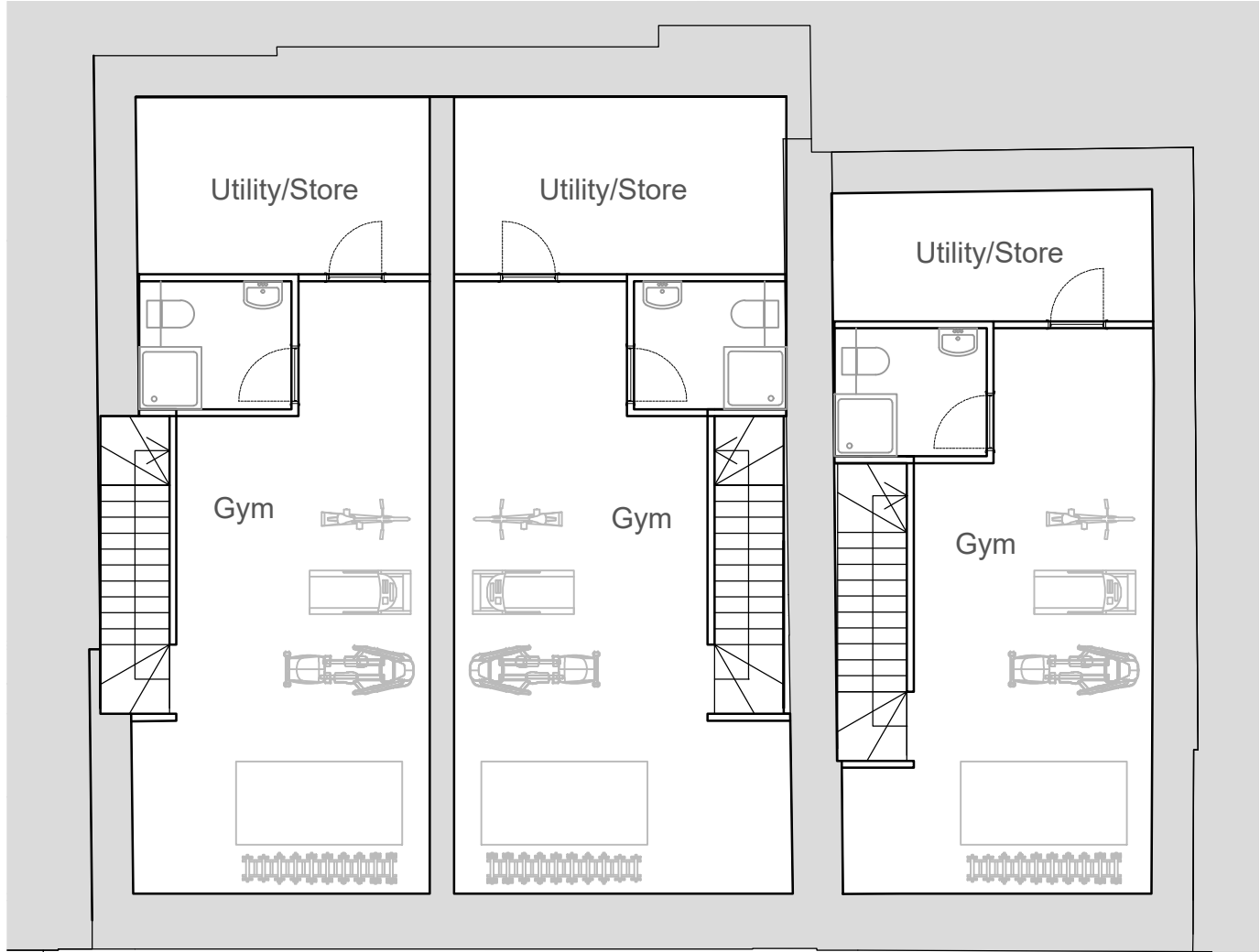
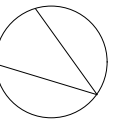
5. CONCLUSIONS

- The site is located within Flood Zone 1.
- 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 which will be further mitigated by tanking of the basement.
- There is a very low surface water flood risk across the site. However, there is a low to medium risk along Kings Terrace adjacent to the site.
- There is a low sewer flooding risk, however, it is considered that the site should be fitted with a positive pumped device so that it will be protected further from sewer flooding. In addition to the pumped device there should be a non-return valve (e.g. <http://www.forgevalves.co.uk/>) installed so that if the sewers become completely full during a heavy storm, foul water does not backflow into the property.

6. BIBLIOGRAPHY

- i. *Camden Planning Guidance – Basements* dated 2018.
- ii. *Camden Planning Guidance – Water and Flooding* dated 2018.
- iii. Communities and Local Government 2018. *National Planning Policy Framework*.
- iv. DEFRA/EA 2005. *Framework and guidance for assessing and managing flood risk for new development, Phase 2, Flood and Coastal Defence R&D Programme, R&D Technical Report FD2320/TR2*. Water Research Council.
- v. DEFRA/Jacobs 2004. *Strategy for Flood and Coastal Erosion Risk Management: Groundwater Flooding Scoping Study (LDS), Final Report, Volumes 1 and 2*.
- vi. Geological Society of London 2006. *Groundwater and Climate Change*. Geoscientist magazine, Volume 16, No 3.
- vii. Institute of Geological Sciences 1977. *Hydrogeological Map of England and Wales*, 1:625,000. NERC.
- viii. London Borough of Camden Preliminary Flood Risk Assessment (PFRA) Version 0.2 dated 2011.
- ix. London Borough of Camden Strategic Flood Risk Assessment (SFRA) dated 2014.
- x. London Borough of Camden Surface Water Management Plan (SWMP) Version 1 dated 2011.
- xi. London Borough of Camden flood risk management strategy (FRMS) dated 2013.
- xii. Water UK 2012. *Sewers for Adoption 7th Edition, A design and construction guide for developers*. Water Research Council.

DRAWINGS



No.11

No.13

No.15

Basement



No.11

No.13

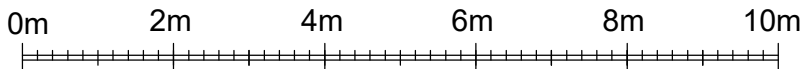
No.15

Ground Floor

ALL DIMENSIONS APPROXIMATE

SCHEME DESIGN SUBJECT TO
STRUCTURAL ENGINEER /SERVICES ENGINEER,
& PLANNERS COMMENT

FOR PRE-APP



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project
11-15 Kings Terrace
NW1 0JP

drawing
Basement and Ground Floor Plans
Proposed

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scale
1:100

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