

JM Enviro Limited

Environmental Consulting

Water, Air & Land

**Flood Risk Assessment &
Drainage Strategy (including SUDS)**

of

**145-148 Friar Street & 1-15 Queen Victoria
Street, Reading**

For

Thackeray Estates Limited

August 2022

PROJECT RECORD		
PROJECT NAME	145-148 Friar Street & 1-15 Queen Victoria Street	
CLIENT	Thackeray Estates Limited	
REPORT DETAILS		
TYPE	Flood Risk Assessment	
REFERENCE	JME263.145-148FriarStreet.FRA_QVS1	
ISSUE DATE		
APPROVED	Julian Moore BSc, MSC, DIC Director	
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REGISTRATION OF AMENDMENTS

APPENDICES

APPENDIX D: DRAINAGE STRATEGY (INCLUDING LAYOUT & CALCULATIONS)

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1.0 INTRODUCTION

1.1 Brief

JM Enviro Limited was instructed by Axiom Structures on behalf of Thackeray Estate Limited (The Client) to undertake a Flood Risk Assessment including a drainage strategy. The scope of work also includes a SUDS appraisal and a drainage assessment based on the available information for the redevelopment of the site (145-148 Friar Street & 1-15 Queen Victoria Street, Reading). The site boundary is shown on Figure 1.1.



Figure 1.1a. Site Location (Site Boundary in red and applicant's ownership in blue) (based on Google maps image – looking south)

1.2 Project Context

The site comprises 145-148 Friar Street, a 1,500m² parcel of land comprising numerous buildings which cover the majority of the area, located on the southern site of Friar Street and western side of Queen Victoria Street as shown in Figure 1.1.

Number 145 Friar Street (the westernmost part of the site) is a 4-storey building with retail (WHSmith Ltd) on the ground floor and office space on the upper 3 floors. Number 146 comprises a 3-storey building with retail (Reading Food & Wine) on the ground floor and offices above. No. 147 comprises a Timpson and Nail Bar on the ground floor and office space on the upper three floors. 148 and 1-3 Queen Victoria Street is in use as a café on the ground floor with Offices above. 3-15 Queen Victoria Street is a 4 storey Victoria-era building with retail spaces on the ground floor (Talk & Vape...but is it art, and Rush Hair) retail units on the ground floor and office space in the upper 3 floors. A basement runs under all of the properties listed above. At the rear of the site is a 2-storey building (vacant/derelict – most recent use unknown though assumed commercial). Figure 1.2 shows the layout of the site with detailed existing site layout drawings included in Appendix A.

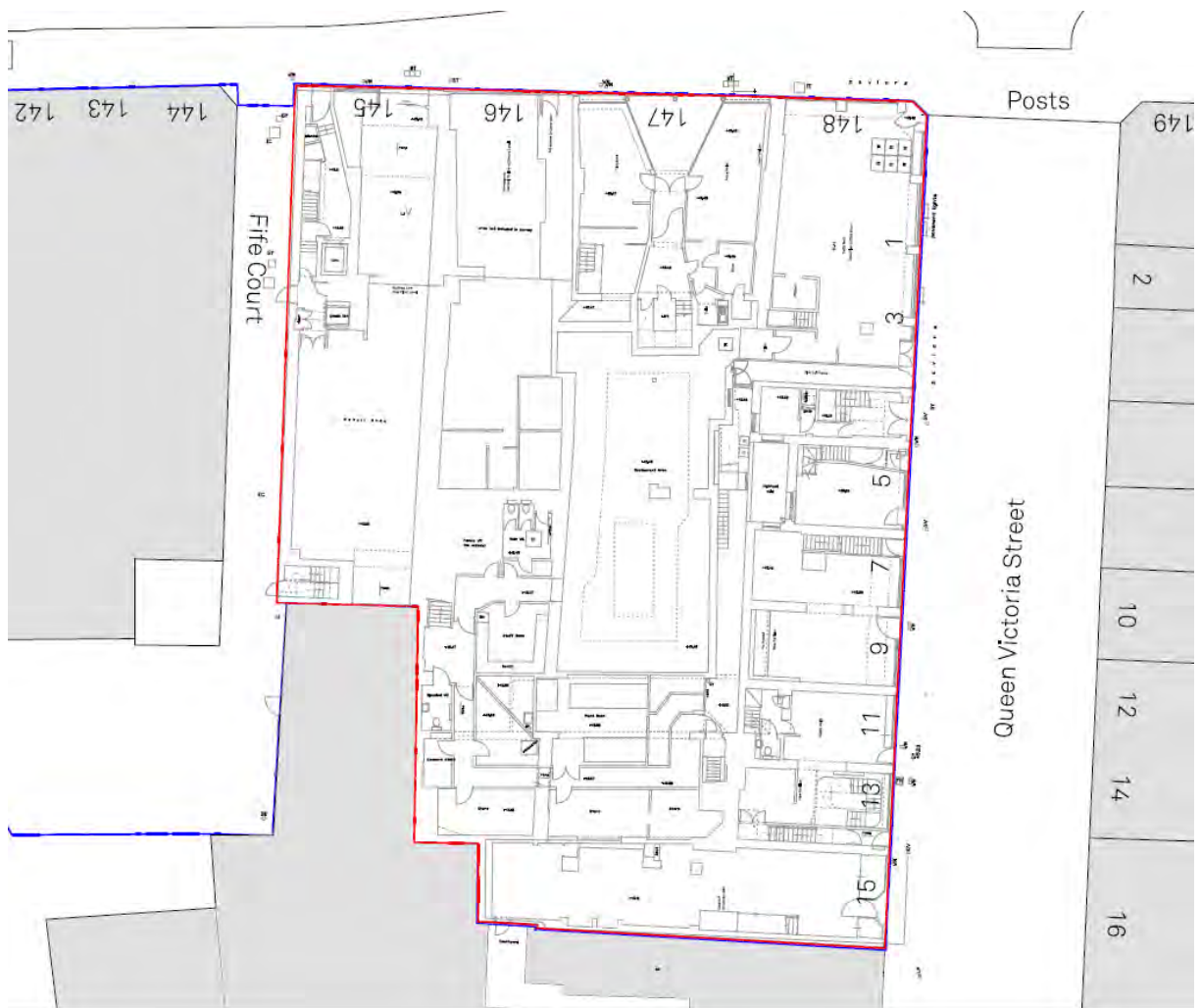


Figure 1.2 Existing site layout (Ground floor)

The client intends to submit a planning application to redevelop the site to create a 104 bedroom hotel over 4 floors with 3 retail units on Friar Street at ground floor level, retail units on the ground floor of the buildings along Queen Victoria Street will refurbished and extended. In addition to the roof and façade of 1-15 Queen Victoria Street, the façade of 147-148 Friar Street and the rear of 145 will also be retained and incorporated into the new building, with a central courtyard accessed via a passageway where 4 Queen Victoria Street currently lies. The existing basement of 146 Friar Street will be retained and slightly enlarged to provide a stair well and lift core for the refurbished basement which will be accessible from a new central corridor. It will also provide some plant space, laundry for the hotel and a small gym. The basements beneath 1-15 Queen Victoria Street will remain in retail use. A food and beverage area, reception/lobby will occupy the western part of the new building at ground level. Additional plant will be located on the roof of the new building.

It is noted that the client intends to submit a separate planning application to redevelop a second parcel of land, west of the site, (138-144 Friar Street) with a 7 storey building to create an aparthotel with 163 rooms. All buildings will be demolished apart from the front (3 storey part of the Bugle Public House and the existing basements which will be retained and incorporated

The proposed scheme is shown on Figure 1.3 and Architect Drawings included as Appendix A.



Figure 1.3 Proposed Development

1.3 Objectives

To prepare an FRA report in accordance with National Planning Policy Framework¹ (NPPF) and Planning Practice Guidance² (PPG), local planning policy and guidance (summarised in Section 3) and other published information sources as set out in Table 2.1.

This report also includes a summary and assessment of the drainage strategy for the proposed development, which has been developed for the scheme.

1.4 Report Structure

Section 2 provides a summary of the sources of information upon which this report is based. Section 3 summarises the flood risk and drainage planning policy and guidance relevant to the proposed development. Section 4 summarises the site setting including a summary of the site and its surroundings as well as a detailed summary of the hydrological setting. Section 5 summarises the proposed development including a summary of the foul and surface water drainage strategy including a SuDS appraisal. Section 6 includes the flood risk assessment including a consideration of the flood risk posed to the development and arising from the development including a drainage assessment. Section 6 also sets out how climate change has been considered and includes a summary of the residual risks. Section 7 includes conclusions and recommendations for further work.

¹ NPPF accessed online (June 2022)

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

² PPG accessed online (June 2022) <http://planningguidance.planningportal.gov.uk/>

2.0 SOURCES OF INFORMATION

The information contained in this report is based on a review of readily available information pertinent to the site and consultation with interested parties.

2.1 Records Review

Key reports, drawings and websites pertinent to this assessment are detailed below in Table 2.1.

Table 2.1: Key Information Sources

Document/Website	Author/Publisher	Date
Flood Maps for Planning, Rivers and Sea Flood Maps, Reservoir Flood Maps, Surface Water Flood Maps https://flood-warning-information.service.gov.uk/long-term-flood-risk and https://flood-map-for-planning.service.gov.uk/	Environment Agency	Accessed June 2022
Design & Access Statement – Draft	Falconer Chester Hall	July 2022
Existing and Proposed Layout Plans (Key drawings in Appendix A): - Existing floor plans: P22018-FCH-BA-B1-DR-A-1105, P22018-FCH-BA-00-DR-A-1100, P22018-FCH-BA-01-DR-A-1101, P22018-FCH-BA-02-DR-A-1102; P22018-FCH-BA-03-DR-A-1103, P22018-FCH-BA-RF-DR-A-1104 - Proposed Floor Plans (Drawings P22018-FCH-BA-B1-DR-A-0306, P22018-FCH-BA-00-DR-A-0300, P22018-FCH-BA-01-DR-A-0301, P22018-FCH-BA-02-DR-A-0302, P22018-FCH-BA-03-DR-A-0303, P22018-FCH-BA-04-DR-A-0304, P22018-FCH-BA-RF-DR-A-0305, P22018-FCH-BA-RF-DR-A-0307)	Falconer Chester Hall	9 th August 2022
Pre-application Advice (ref 220816)	Reading Borough Council	12 th July 2022
Preliminary Drainage Survey (Appendix B)	CJ Uden	July 2022
QVS1 Floor Areas -1-15 Queen Victoria Street and 145 to 148 Friar Street, Reading (Ref URB-482b-FN18).	Town Planning Bureau	5 th July 2022
Topographic Survey - Drawing 0867-T (Appendix B)	Cloud 10 Ltd	May 2022
Thames Water Asset Plans (Appendix C)	Thames Water	June 2022
Various photos supplied by the structural engineer	Axiom Structures	May 2022
Thames Water Sewer Flood History Report (Appendix C)	Thames Water	18 th July 2022
Reading Borough Local Plan	Reading Borough Council	Adopted November 2019
Station Hill South Planning and Urban Design Brief	Reading Borough Council	March 2007
Reading Borough Council Strategic Flood Risk Assessment	Peter Brett	June 2017
Reading Borough Council Level 2 Strategic Flood Risk Assessment	Peter Brett	December 2017
Reading Borough Council Local Flood Risk Management Strategy	Peter Brett	October 2015

2.2 Consultation

Key parties consulted as part of this Flood Risk Assessment are detailed in Table 2.2.

Table 2.2: List of Parties Consulted and Summary of Outcome

Consultee	Form of Consultation	Topics Discussed and Actions Agreed
Thames Water - Developer Services Team	Sewer flood history search dated 18 th July 2022	Requested details of any property flooding – Thames Water indicated that they held no records of flooding at the property.
Reading Borough Council - Lead Local Flood Authority (LLFA)	Pre-application advice dated 12 th July 2022	The client has engaged with Reading Borough Council as part of a Pre-Application Advice (220816) the council provided the following response in relation to drainage <i>"As a future major development, this is a mandatory national information requirement as part of your future proposal. Given the proposed courtyard and demolition of No's 145 & 146 Friar Street, there are considered to be a number of ways in which your SuDS strategy could be advanced, with details required to be submitted at application stage to satisfy the Lead Local Flood Authority"</i> .

3.0 PLANNING POLICY & GUIDANCE

The potential consequences of inappropriate development in a flood risk area for occupiers, either of the development or elsewhere, pose significant risks in terms of personal safety and damage to property. The approach taken in the assessment of flood risk at planning stage is set out in national, and local planning policy and associated technical guidance. The following section summarises the key policies and guidance relevant to the proposed development.

3.1 National planning policy and guidance

The approach taken in the assessment of flood risk at planning stage is set out in national, regional and local planning policy and associated guidance. The following section summarises the key policies and guidance relevant to the proposed development.

The National Planning Policy Framework (revised July 2021) includes Government policy on development and flood risk, stating that:

“159. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere....

167. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment⁵⁵. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
- b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
- c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
- d) any residual risk can be safely managed;*
- e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.....*

168. Applications for some minor development and changes of use⁵⁶ should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote⁵⁵.

169. Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:

- a) take account of advice from the lead local flood authority;*
- b) have appropriate proposed minimum operational standards;*
- c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and*
- d) where possible, provide multifunctional benefits”.*

Footnote 55 of the NPPF states:

“A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be

subject to other sources of flooding, where its development would introduce a more vulnerable use”.

Footnote 56 of the NPPF states:

“This includes householder development, small non-residential extensions (with a footprint of less than 250m²) and changes of use; except for changes of use to a caravan, camping or chalet site, or to a mobile home or park home site, where the sequential and exception tests should be applied as appropriate”.

An FRA should be appropriate to the scale, nature and location of the development and should identify and assess the risk from all sources of flooding to and from the development and demonstrate how any flood risks will be managed over the lifetime of the development.

Supporting guidance relating to development and flood risk is set out in The Planning Practice Guidance (PPG) for ‘Flood risk and coastal change’.

Paragraph 1 of the PPG requires that the applicant should take full consideration of surface water runoff and drainage impacts stating that:

“developers should seek flood risk management opportunities (e.g. safeguarding land), and to reduce the causes and impacts of flooding (e.g. through the use of sustainable drainage systems in developments”;

Paragraph 83 requires that DEFRA standards³ for SUDS are met where practicable, and paragraph 84 requires that:

“...developers need to ensure their design takes account of the construction, operation and maintenance requirements of both surface and subsurface components allowing for any personnel, vehicle or machinery access required to undertake this work. Any sustainable drainage system should be designed so that the capacity takes account of the likely impacts of climate change and likely changes in impermeable area within the development over its lifetime and continues to provide effective drainage for properties. Whether maintenance and operation requirements are economically proportionate should be considered by reference to the costs that would be incurred by consumers for the use of an effective drainage system connecting directly to a public sewer”.

3.2 Local Planning Policy

The Reading Borough Local Plan (Reading Borough Council, 2019) provides the starting point for the consideration of planning applications in the borough. The Plan is supported by other documents that provide more detailed advice or guidance.

Reading Borough Local Plan includes several policies relating to flood risk and drainage specifically in relation to flooding and sustainable drainage systems (Policy EN18).

Policy EN18: Flooding and Sustainable Drainage Systems states:

“Development will be directed to areas at lowest risk of flooding in the first instance, following the Sequential and Exceptions Test set out in the NPPF, and taking into account

³ <https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards> -Department for Environment, Food and Rural Affairs Sustainable Drainage Systems Non-statutory technical standards for sustainable drainage systems March 2015

the effects of climate change. It will consider flooding from all sources, including fluvial, surface water, groundwater and sewer flooding. Where development in areas at risk of flooding is necessary, it will not reduce the capacity of the flood plain to store floodwater, impede the flow of floodwater or in any way increase the risks to life and property arising from flooding. Wherever possible, development should be designed to reduce flood risk, both on- and off-site.

All major developments⁶³ must incorporate sustainable drainage systems (SuDS) as appropriate and in line with the Government's Technical Standards⁶⁴. Smaller schemes are encouraged to incorporate SuDS, where possible. Runoff rates should aim to reflect greenfield conditions and, in any case, must be no greater than the existing conditions of the site. Schemes should ensure that the movement of water through vertical infiltration as well as horizontal run-off does not worsen contamination effects. Wherever possible, SuDS provision should maximise ecological benefits, link into the existing Green Network, incorporate tree planting and landscaping and avoid damage to existing significant trees, including through changes to the site hydrology. All new developments in areas of flood risk should give priority to SuDS."

The site is also allocated within the Station Hill South Planning and Urban Design Brief prepared by Reading Borough Council, dated March 2007 which sets out design guidance principles. Principle 8 'incorporating high environmental standards' requires that:

"..Development should include water management scheme addressing flood risk and water usage...

- o A water management scheme will need to address the management of rainfall to avoid flooding and the minimisation of water usage to reasonable levels.*
- o Applicants should investigate and adopt where appropriate, techniques of sustainable urban drainage (SUDS) to reduce grey water run-off".*

3.3 Other Guidance

The Reading Borough Council Strategic Flood Risk Assessment (SFRA) (2017) and Reading Borough Council Level 2 Strategic Flood Risk Assessment (SFRA) (2017) provide a summary of the flood risks for the whole of the Borough and summarises the Lead Local flood Authority's requirements for SUDS.

Information from the SFRA and Level 2 SFRA relevant to the site setting and proposed development are provided throughout report.

The requirements for flood risk assessments are set out in Reading Borough Council's 'Planning Applications Validation Information Requirements Checklists & Guidance' dated December 2016 which states that:

"A Flood Risk Assessment should address the issue of flood risk to both property and people. It should identify and assess the risks of all forms of flooding to and from the development and demonstrate how these flood risks will be managed, taking climate change into account".

It also states that utilities statements should demonstrate:

- "(a) that the availability of utility services has been examined and that the proposals would not result in undue stress on the delivery of those services to the wider community;*
- (b) that proposals incorporate any utility company requirements for substations, telecommunications equipment or similar structures;*
- (c) that service routes have been planned to avoid as far as possible the potential for damage to trees and archaeological remains.*

(d) That surface water run-off has been minimised, that the drainage system is sustainable and has been designed in accordance with national guidance on sustainable drainage systems (see SuDS above)".

In relation to SUDS proposals for major planning applications that:

"The proposal should provide:

- Detailed designs for the drainage system including (components, levels, volumes of storage);*
- Infiltration tests of the existing ground;*
- Design calculations to show that the runoff from the site post development is no greater than the existing runoff from the site for a 1 in 100 year, 6 hour rainfall event, that no flooding occurs anywhere on site for a 1 in 30 year rainfall event and no flooding occurs in any building (including basement) or any utility plant susceptible to water during a 1 in 100 year rainfall event;*

Connection details to existing watercourse and drainage networks if infiltration methods are not used together with acceptance of these connections from the relevant approving body (EA, LFA, Canal and River trust, Sewage undertaker)".

4.0 SITE SETTING

4.1 Site Location

The site is approximately centred at National Grid reference SU 71496 73557 as shown in Figure 1.1.

The site comprises 145-148 Friar Street and 1-5 Queen Victoria Street; a 1,500m² parcel of land comprising four adjoining buildings located on the southern site of Friar Street and a row of period terraced properties on western side of Queen Victoria Street.

Friar Street is mainly composed of retail on ground floor and office and residential spaces are located above. Building heights along Friar Street vary from 3 to 6 storeys, except from the Novotel that rises to 13 storeys.

To the west of the site boundary, there are mixed use buildings (retail, a pub, an optician, a restaurant, office and residential), and to the east of the site is Queen Victoria Street, that links Friar Street to Broad Street (main shopping area). The site is also located generally between Reading station to the north and the main shopping area to the south, including both Broad Street and the Oracle Shopping Centre.

4.2 Site Topography

Friar Street falls from west to east towards the junction with Station Road, where it rises to form a level footway across the mouth of each of the side roads, with manhole 5501 (at 45.39mAOD and 5501 at 45.29mAOD located in the centre of the junction.

The finished floor level of the buildings on site are flush to the pavement but surface drainage is facilitated by a drainage channel set into the pavement.

Station Road falls to the north away from the site, from 45.39mAOD at manhole 5501 to 44.61mAOD at manhole 5601, over a distance of 43m.

Queen Victoria Street falls from north to south, with a level of 45.17mAOD, recorded at manhole 5553, to 45.12mAOD at manhole 5504 in front of the site.

The level of the basement in 145-148 Friar Street is 42.62mAOD to 43.10mAOD. Basement levels in the Queen Victoria Street terrace vary between 42.67 and 42.83mAOD.

4.3 Hydrological Setting

4.3.1 Surface watercourses

There are no surface water features on the Site. The closest watercourse is the River Kennet canal, located approximately 333m south east of the site. The River Kennet is a tributary of the River Thames.

4.3.2 Estuaries and Coastal Watercourses

There are no estuaries or coastal waters in the vicinity of the site.

4.3.3 Artificial waterbodies

The closest waterbody to site is the Kennett and Avon canal, located 333m south-east of the site. Also, within the vicinity of the site lies both the Caversham Lakes and Whiteknights Lake located respectively at 1.4km north-east of the site and 2.5km south-east of the site.

4.3.4 Ground Conditions

Based on information in the SFRA and BGS (accessed online at [bgs.ac.uk](https://www.bgs.ac.uk), June 2022), the following general geological progression is anticipated beneath the Site (Table 4.1).

Table 4.1: Summary of main Geology and Hydrogeology based on nearby BGS records

Strata	Geology Description	Aquifer Status	Aquifer Description
Made Ground	Tarmac and brown clay with brick fragments	Unproductive Strata	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.
Alluvium	Silt, sand, clay and gravel	Secondary A Aquifer	These are permeable layers that can support local water supplies and may form an important source of base flow to rivers.
Taplow Gravel Member (Superficial deposits)	Sand and gravel	Secondary A Aquifer	These are permeable layers that can support local water supplies and may form an important source of base flow to rivers.
Seaford Chalk Formation and Newhaven Chalk Formation (Bedrock)	Undifferentiated chalk	Principal	Capable of providing a high level of water storage and may support water supply or river base flow.

According to BGS (accessed online at [bgs.ac.uk](https://www.bgs.ac.uk), June 2022), superficial deposits of Taplow Gravel Member comprised of sand and gravel is anticipated beneath the site.

There are no published boreholes records for the site itself.

Historic borehole records have been identified relating to boreholes drilled within the general vicinity of the site and surrounding area. The closest historic borehole is recorded approximately 44m south-west of the site (SU77SW45). Boreholes (SU77SW191 and SU77SW192) are also recorded approximately 107m south-west of the site. A summary of ground conditions encountered in those three boreholes is as follows:

- Made Ground: Tarmac and brown clay with brick fragments. Typical thickness: 2.9m.
- Seaford Chalk Formation and Newhaven Chalk: white fragmented chalk in remoulded chalk matrix, with occasional flints. Extended to depths of 18.29m.

4.3.5 Infiltration potential

According to the RBC SRFA (2017), the site is located in an area where “*infiltration drainage may be suitable, at least to some degree, subject to further investigation of the ground conditions (i.e. soil permeability, groundwater levels etc)*”.

4.3.6 Groundwater

In the 26.21m BGS borehole located 44m south-west of the site, groundwater was encountered at a depth of approximately 9m.

According to MAGIC (accessed online at magic.defra.gov.uk, June 2022), the site is not located within a groundwater Source Protection Zone (SPZ). The nearest SPZ (Zone III) is located approximately 1.6km north-east of the site. Zone III is the total (outer) catchment.

According to the 2019 ES Addendum prepared for Station Hill, Reading (located approximately 100m west of the site), groundwater was found within the Alluvium, Taplow Gravel Formation and Upper Chalk Formation, at depths between 2.7m bgl and 5.3m bgl, usually at or near the boundary of the Alluvium and Taplow Gravel Formation.

4.3.7 Public Sewers

A Thames Water Asset Location Search for the site (included in Appendix C) indicates that the area in which the site is located is served by combined and separate foul and surface water sewers.

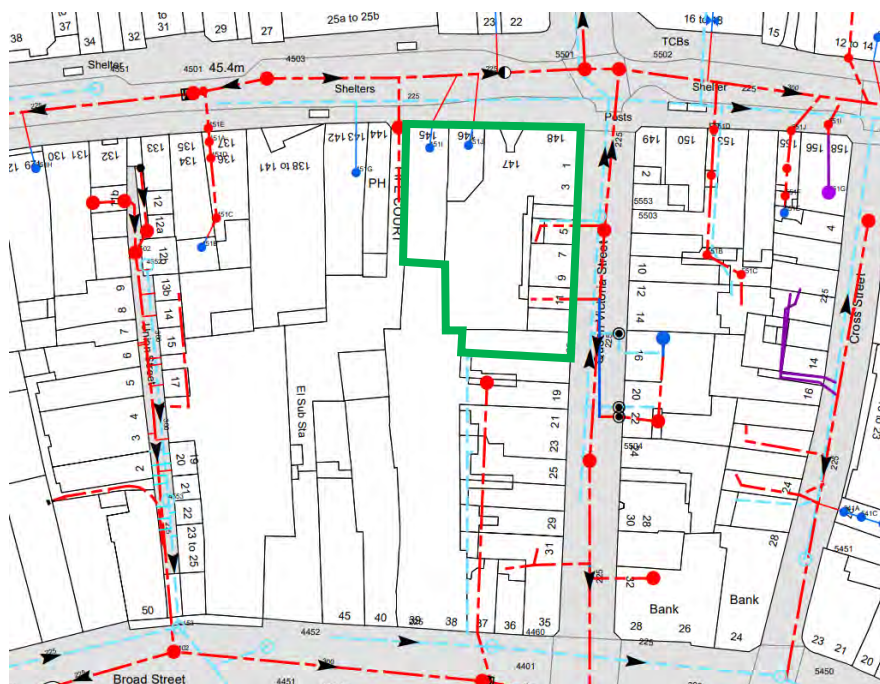


Figure 4.1– Thames Water Asset Records - drainage (full records in Appendix C)

The public sewer network is shown on Figure 4.1 and can be summarised as follows:

- **Friar Street:**
 - A 225mm diameter foul sewer runs east along Friar Street and adjacent to the site boundary from 138 Friar Street (MH 5502 in the junction with Queen Victoria Street has a cover level of 45.29mbgl and invert level of 41.75mbgl – depth 3.54mbgl).
 - 2 combined sewers (no dimensions) are shown within the curtilage of the site (145 and 146 Friar Street), shown to connect to the foul sewer in Friar Street.
 - A 225mm diameter surface water sewer runs east along Friar Street and adjacent to the site boundary from 136 Friar Street (No manhole information is available).
- **Fife Court:**
 - A 150mm sewer marked as foul (but proven to be combined) with a depth of 1.9mbgl at the final manhole) runs north along Fife Court and joins the 225mm diameter foul sewer running east along Friar Street.

- **Queen Victoria Street:**
 - A 225mm diameter foul sewer runs north past the site along Queen Victoria Street and adjacent to the site boundary. It is shown to flow north towards Station Road in front of 1 Queen Victoria Street past the site, but south in front of 15 Queen Victoria Street.
 - 2 foul sewers (no dimensions) are shown within the curtilage of the site (5 and 11 Queen Victoria Street) connecting to the foul sewer in Friar Street.
 - A 225mm diameter surface water sewer runs parallel to the foul sewer, running north along Queen Victoria Street and adjacent to the site boundary, from 27 Queen Victoria Street and joins the 225mm diameter surface water sewer running east along Friar Street.
- **Broad Street:**
 - A surface water sewer (no depths or dimensions) runs from just inside the rear of 15 Queen Victoria Street south to the 225mm diameter surface water sewer running east beneath Broad Street.
 - A foul sewer runs from a manhole to the rear of 17/19 Queen Victoria Street (no details) south parallel to the surface water serving the rear of 15 Queen Victoria Street. A manhole connects to MH 4401 in Broad Street which has a cover level of 45 mbgl and invert level of 41.14mbgl – depth 3.86mbgl)

4.3.8 Site Drainage

The site is covered 100% with hard surfacing, with the majority of the site (>95%) covered by buildings. A small passageway runs to the rear of the terraced properties on Queen Victoria Street.

It is assumed that there are numerous connections to public sewer network based on site observations, a preliminary drainage survey and the public sewer records. The following summarises our current understanding of the existing site drainage (also see Figure 4.2 and Appendix B):

- Some of the roof and possibly rear foul drainage of 145 Friar Street discharges via the combined sewer located in Fife Court visible from above ground drainage and the preliminary drainage survey.
- No. 145 and 146 Friar Street have their own foul connections to the foul public sewer based on public sewer records. The latter can be accessed from a MH chamber in the basement at the front of the store.
- A separate foul and surface water connection appears to be present at the rear of no 4/5 Queen Victoria Street – assumed to drain to the sewers in Queen Victoria Street. It was not possible to lift these covers, but it is considered likely to drain at least half of the Queen Victoria Street terrace within the site boundary, and potentially the rear of 147-148 Queen Victoria Street
- A surface water connection is shown to the rear of 15 Queen Victoria Street, which may also collect surface water runoff from the central and southern part of the site (possibly the southern half of the Queen Victoria Street terrace within the site).
- The surface water runoff from the front of the buildings most likely have a direct connection to the public sewer network.
- It is uncertain how the remainder of the site drains, but it is considered likely that there may be more direct connections to the public sewer network given the age and the history of the site, as well as the potential for misconnections.

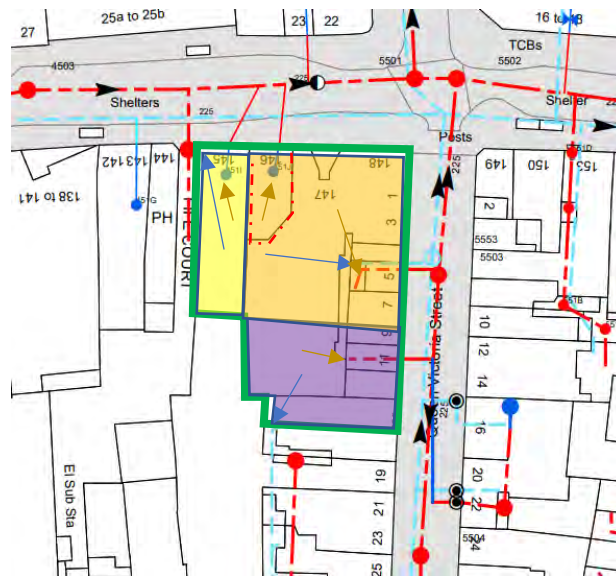


Figure 4.2 – Site drainage (assumed catchment areas shaded) – foul (brown)– surface water (blue)

Surface water drainage is assumed to be ‘unrestricted’, though capacity of the existing drainage pipes are likely to restrict flows to some extent.

Greenfield run off rates for the site are included in Appendix D along with existing brownfield calculations which are also summarised in Table 4.1.

Table 4.1: Existing brownfield run off rates

	Description	Area m ²	Existing run off Rate l/s
Drained	Multiple connections to public sewer network – TBC following survey	1,500	20.6

Calculations provided by Axiom Structures – see Appendix D.

4.3.9 Water Mains

Thames Water’s water supply records (Figure 4.3) show a number of water mains in close proximity to the site.

The watermains can be summarised as follows:

- **Friar Street:**
 - A 180mm and a 90mm HPPE runs along Friar Street, both are located adjacent to the northern site boundary
 - Two single hydrants and one general purpose/valve are located along the 90mm HPPE
 - Two single hydrants and two general purpose/valves are located along the 180mm HPPE
- **Queen Victoria Street:**
 - A 125mm HPPE runs along Queen Victoria Street, connecting the water main between Friar Street to Broad Street
 - The HPPE runs adjacent to the eastern site boundary
 - One single hydrant and three general purpose/valves are located along the HPPE

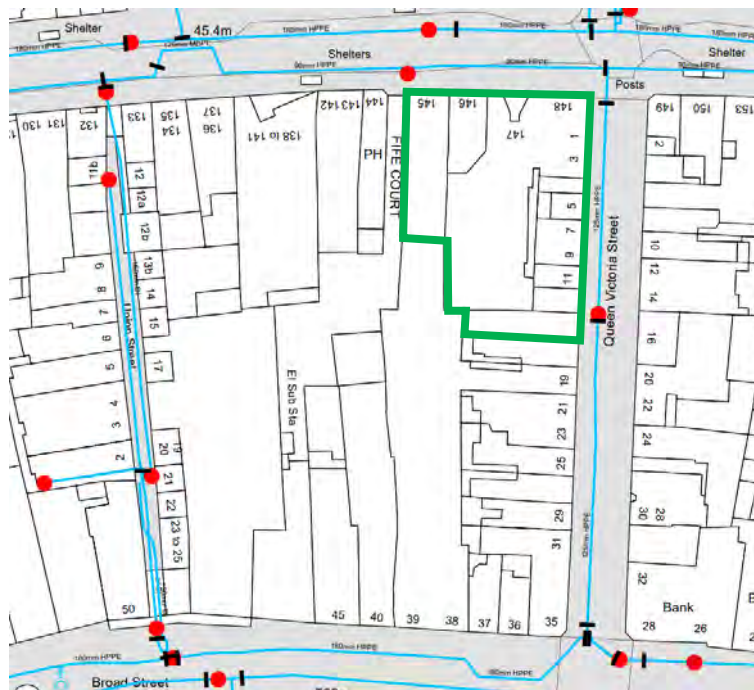


Figure 4.3 Thames Water Asset Records – water supply (Dated June 2022)

4.3.10 Flood Zones, Flood Defences and Flood Mapping

The site lies within the Flood Zone 1 according to the 'Flood Map for Planning' (accessed on the Gov.uk website in June 2022, see Figure 4.4) which is described within the NPPF Technical Guidance 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 one year.

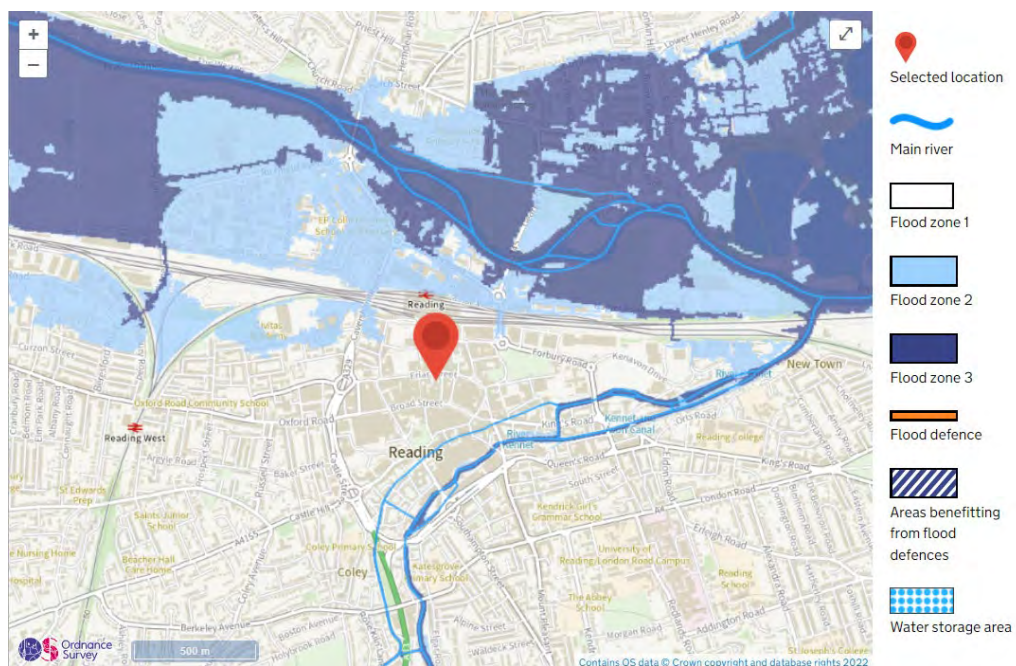


Figure 4.4 EA Floodmap (accessed online June 2022)

The reservoir flood maps (accessed online at Gov.uk, June 2022) confirm that the site lies safely outside of the area that may be flooded in the event of a breach of any reservoirs.

The site is shown to be located in an area of where there is greater than 75% chance of being susceptible to groundwater flooding according to Map F8 of the RBC SFRA (See Figure 4.5).

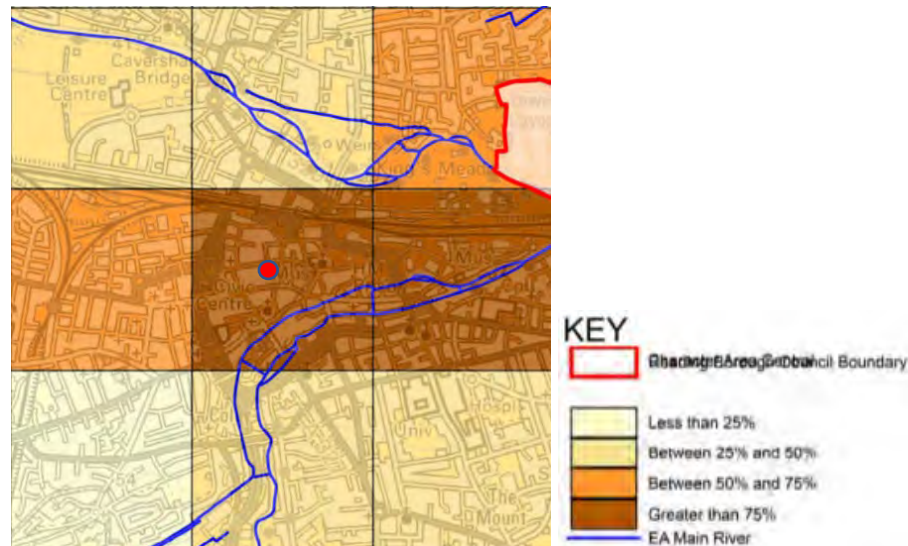


Figure 4.5 Areas susceptible to groundwater flooding – source: RBC (2017)

The Surface Water Flood Map (accessed online at Gov.uk, June 2022), indicates that the site is at a very low risk of surface water flooding (See Figure 4.6). No significant areas of flooding are shown on site or in the adjoining streets in the high scenario.

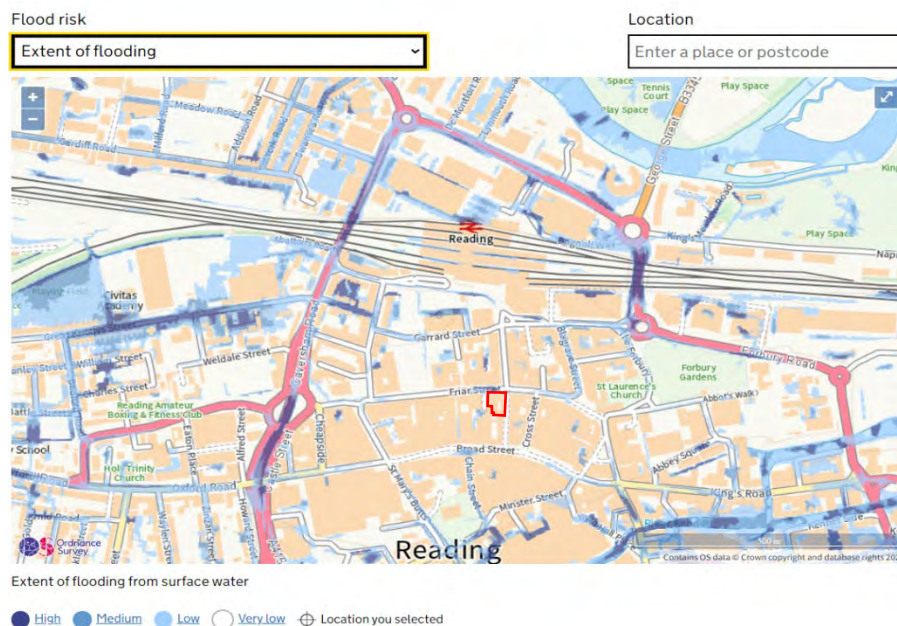


Figure 4.6 Surface water flood map (Extent of flooding map) – Source: gov.uk

During the “low risk scenario” (See Figure 4.7), ponding is shown to the southwest of the site in Fife Court and north of the site along Friar Street. Low risk means that each year this area has an annual probability of flooding of between 0.1% and 1% (extreme flood event).

In the low risk scenario, flood depths are shown to be <300mm on Friar Street, and 300-900mm (Figures 4.7) and have a velocity of less than 0.25 m/s (Figure 4.8). Neither of these two isolated areas are on a significant flow path.

Ponding on Friar Street appears to be associated with the raised junction on the corner of Friar Street and Station Road, and the ponding in is associated with a topographic low spot.

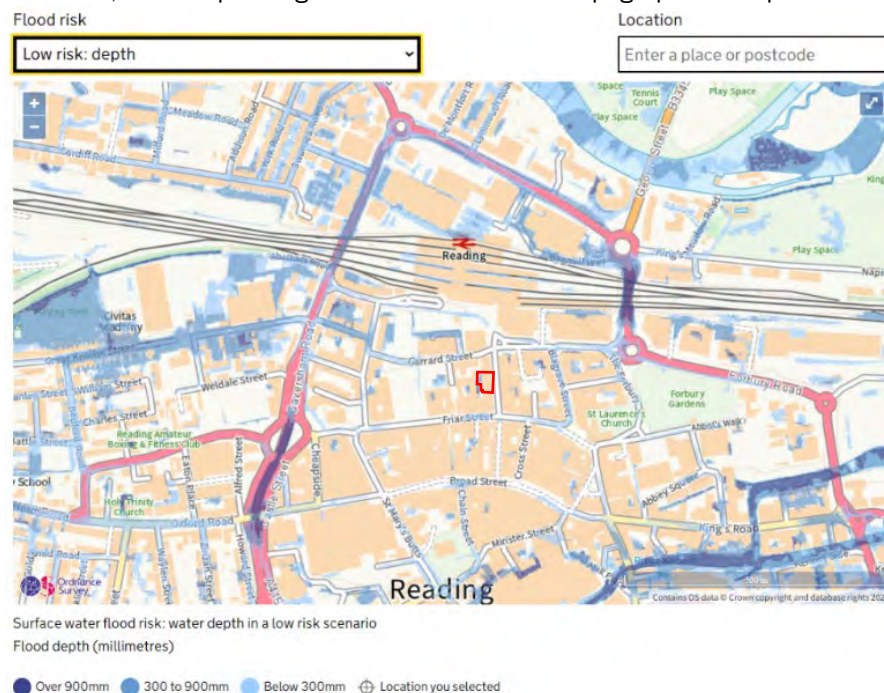


Figure 4.7 Surface water flood map (depth during low risk flood event) – Source: gov.uk

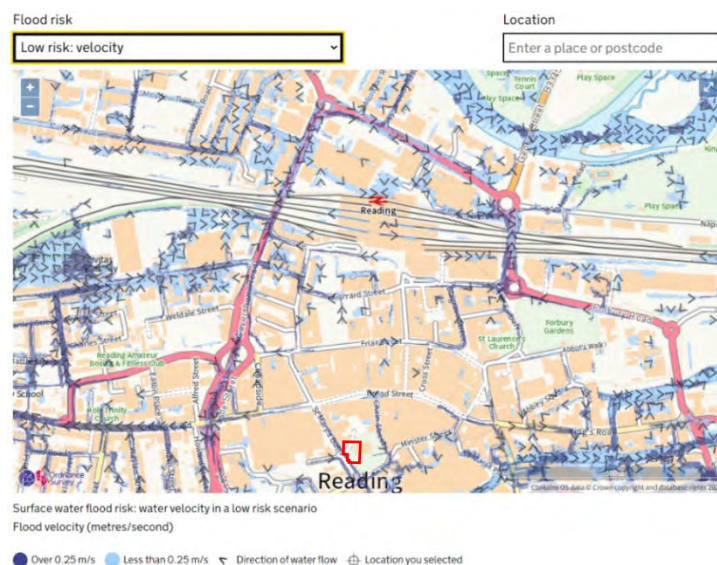


Figure 4.8 Surface water flood map (velocity during low risk flood event) – Source: gov.uk

During the “medium risk scenario” (See Figure 4.9), ponding is shown in similar areas to the low risk scenario. Medium risk means that each year this area has an annual probability of flooding of between 1% and 3.3%.

In the medium risk scenario, flood depths are <300mm (Figure 4.9) and have a velocity of less than 0.25 m/s (Figure 4.10).



Figure 4.9 Surface water flood map (depth during medium risk flood event) -Source: gov.uk

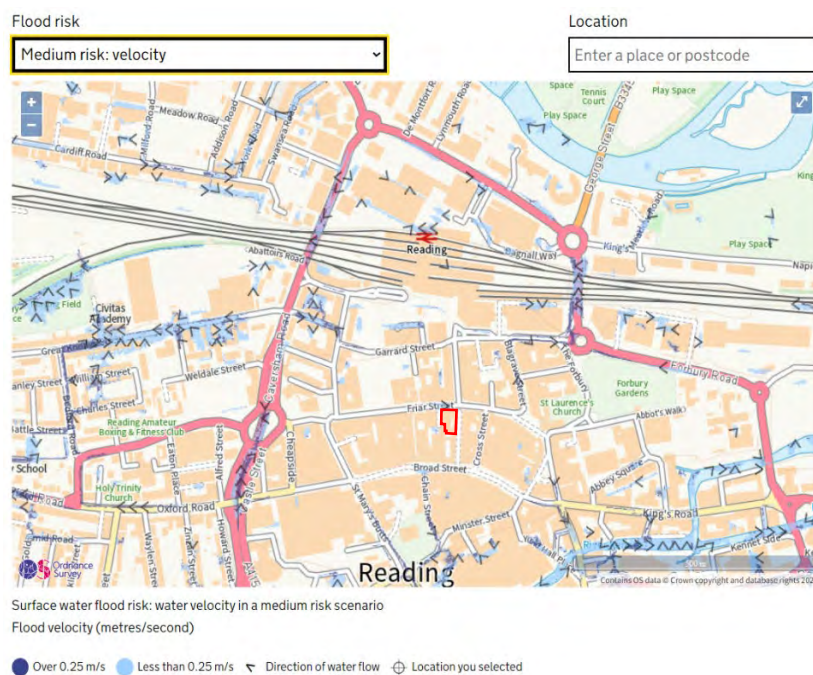


Figure 4.10 Surface water flood map (velocity during medium risk flood event)–Source gov.uk

The site is not located in a “flood warning” or “flood alert area” according to EA mapping shown on the Reading Borough Council SFRA (Peter Brett, 2017).
According to mapping in the Appendices to the LFRMS (dated October 2015) the site is not located in a priority local flood spot.

4.3.11 Flood History

Figure 4.11 (extract of Figure F2_C1-3 from the 2017 SFRA Appendices) indicates there are no flood records within the vicinity of the site.

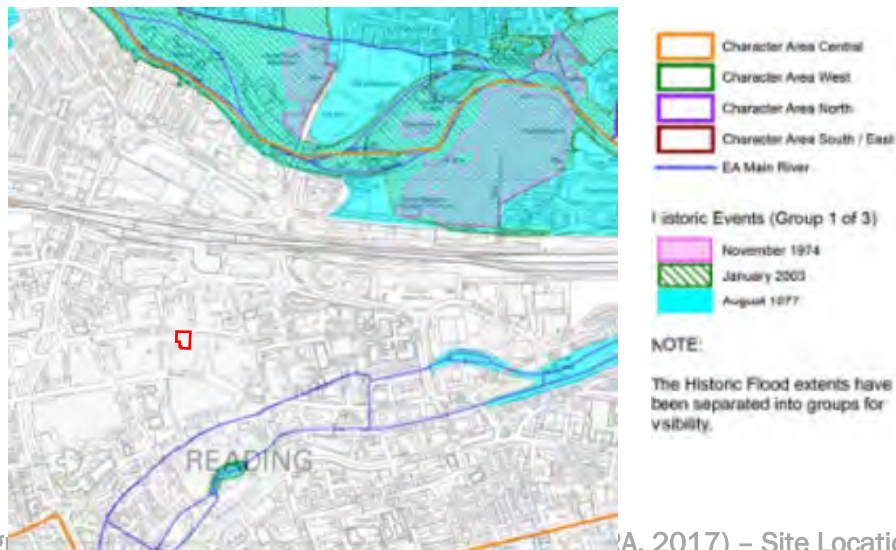


Figure 4.11a – Location of Historic flood events (SFRA, 2017) – Site Location in red

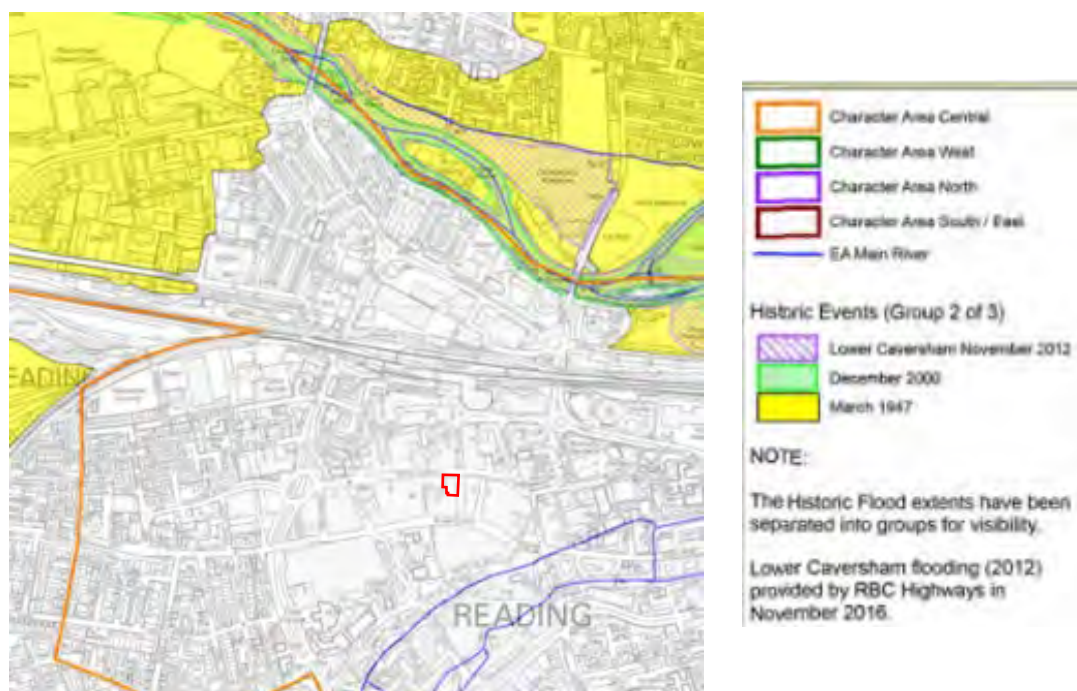


Figure 4.11b – Location of Historic flood events (SFRA, 2017) – Site Location in red

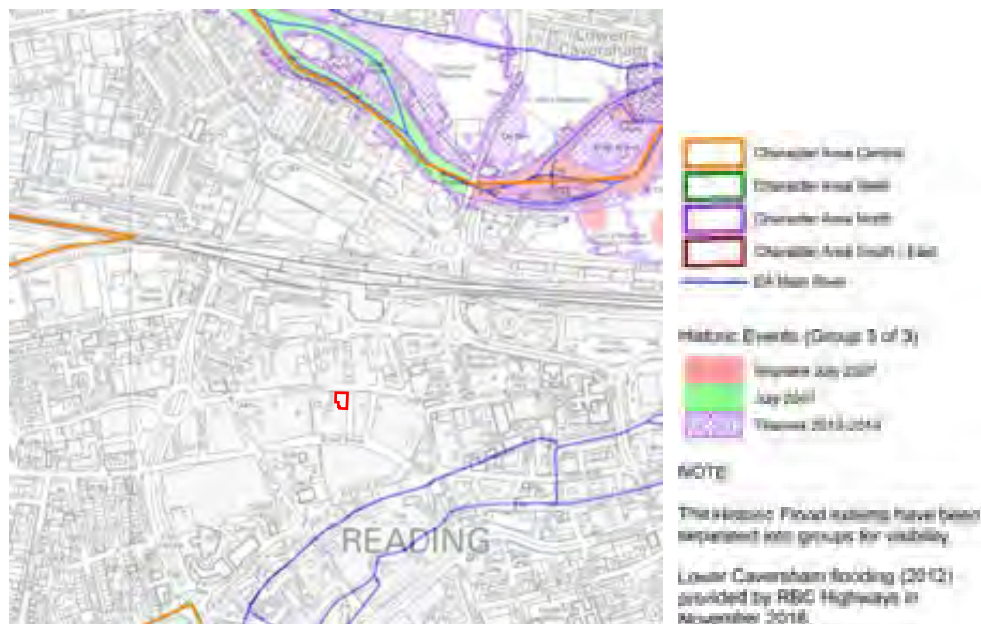


Figure 4.11c – Location of Historic flood events (SFRA, 2017) – Site Location in red

The SFRA (2017) provides further information regarding historic flooding in the Reading Borough Council. For Reading Central where the site is located, four groundwater flooding events were experienced between 2000 and 2003. Two along the south bank of the Thames on Caversham Road and one located near The Forbury and another on the corner of Caversham Road and Brigham Road, also on the south bank of the Thames.

Additionally, the SFRA (2017) states that the Thames Water DG5 flooding records indicate the postcode areas RG1 1, RG1 3, RG1 4, RG1 6, RG1 7 have between 51-100 records of sewer flooding and RG12 has between 21-50 flooding instances recorded.

A Thames Water Sewer Flood History Enquiry dated 18th July 2022 was obtained from Thames Water which states that:

“The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers”.

148 Friar Street (undergoing refurbishment) experienced some flooding on Thursday 30th July 2022, as did several other properties in the area including 1 Station Road opposite 148 and also at 142 Friar Street. 148 Friar Street also flooded in March/April 2020. The causes are not known but are suspected to be surcharges in the public sewer network. It is understood that an investigation is underway.

5.0 PROPOSED DEVELOPMENT

5.1 Scheme description

The client intends to submit a planning application to redevelop the site to create a 104 bedroom aparthotel over 4 floors with 3 retail units on Friar Street at ground floor level, retail units on the ground floor of the buildings along Queen Victoria Street will be refurbished and extended. In addition to the roof and façade of 1-15 Queen Victoria Street, the façade of 147-148 Friar Street and the rear of 145 will also be retained and incorporated into the new building, with a central courtyard accessed via a passageway where 4 Queen Victoria Street currently lies. The existing basement of 146 Friar Street will be retained and slightly enlarged to provide a stair well and lift core for the refurbished basement which will be accessible from a new central corridor. It will also provide some plant space, laundry for the hotel and a small gym. The basements beneath 1-15 Queen Victoria Street will remain in retail use. A food and beverage area, reception/lobby will occupy the western part of the new building at ground level. Additional plant will be located on the roof of the new building.



Figure 5.1 Proposed scheme

The basement and ground floors are shown on Drawings P22018-FCH-BA-B1-DR-A-0306 and P22018-FCH-BA-00-DR-A-0300, in Appendix A (See Figure 5.2 & 5.3). The roof level is shown on P22018-FCH-BA-RF-DR-A-0305, in Appendix A (See Figure 5.4).



Figure 5.2 Proposed Basement Level

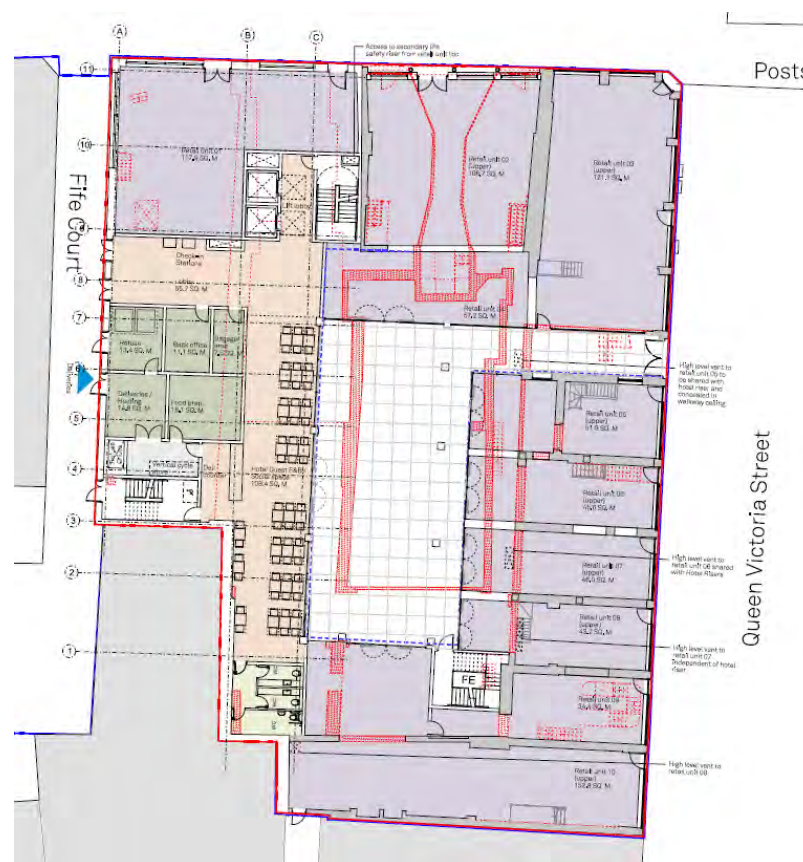


Figure 5.3 Proposed Ground Level

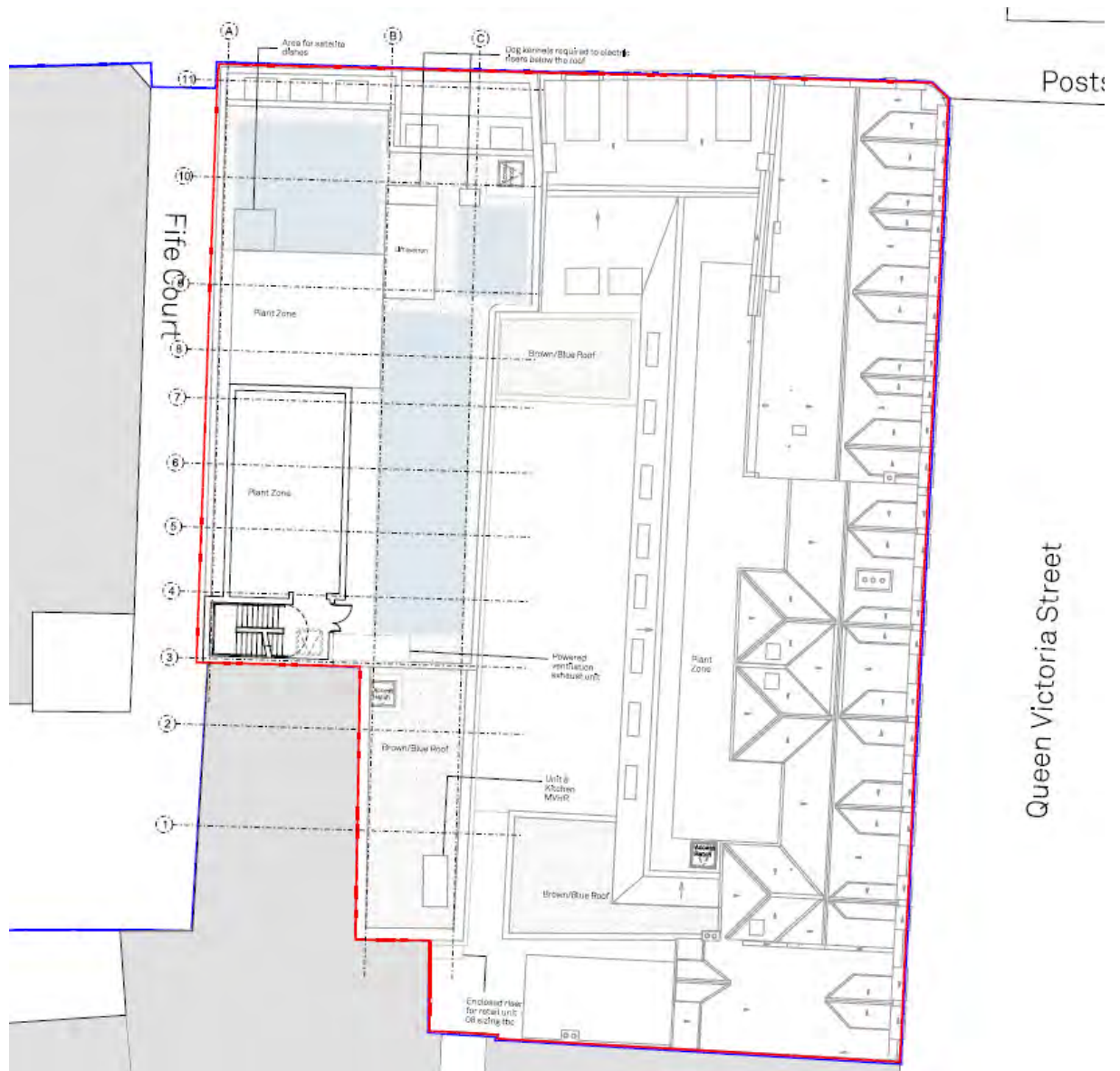


Figure 5.4 Proposed Roof Level – showing brown/blue roof areas

5.2 Drainage Strategy

5.2.1 Overview

This section summarises the planning and policy guidance considerations that have informed the drainage strategy.

As the NPPF states that flood risk should not be increased elsewhere by the development, adequate drainage for the proposed new building will need to be provided as part of the redevelopment proposals.

A 40% allowance for climate change should be considered and included where appropriate in line with best practice set out in the latest UK government advice on climate change for flood risk assessments⁴.

National, regional & local planning policy, building regulations and best practice guidance requires that, where feasible, site drainage should utilise Sustainable urban Drainage Systems (SuDS) to collect, treat, convey, and dispose of surface water safely. SuDS are a natural approach to managing drainage in and around properties and other developments. They work by slowing and holding back the water that runs off from a site, allowing natural processes to break down pollutants.

In accordance with the SuDS hierarchy and best practice guidance, source control measures such as green roofs should preferably be used in conjunction with infiltration forms of SuDS, such as permeable paving, soakaways, swales and soakage basins being used where viable to manage surface water as close to source as possible. If infiltration is not viable, or if attenuation of surface water is required, then above ground attenuation systems such as blue roofs, detention basins and ponds will ideally need to be used to ensure runoff is attenuated and restricted to greenfield run off rates prior to discharge to a suitable waterbody. Below ground storage, pumped drainage, and below ground attenuation, with an outfall to surface water sewer (or a combined sewer, as a last resort) may be necessary, but will only be considered where infiltration or above ground storage SuDS are not viable.

A proposed drainage layout which considers the scheme in the context of the hydrological setting, information available on the ground conditions, existing drainage regime and site constraints, is shown on Sketch JME-P263 002 in Appendix D along with supporting calculations, and is summarised below.

5.2.2 Proposed Surface Water Strategy

All new on-site drainage will be separate until the point of connection to the existing sewer network in order to meet Thames Water requirements and best practice/building regulations.

The surface water drainage strategy is summarized in this section and on Sketch JME-P263 002 in Appendix D.

The drainage hierarchy has been considered in preparation of the drainage strategy, as follows:

- **Rainwater Harvesting** – It is not deemed practical to incorporate rainwater harvesting for this scheme.
- **Infiltration** – Due to the proposed building footprint across the majority site, including retained basements, the use of infiltration systems has been discounted;
- **Discharge to surface watercourse** – No direct connection to a surface watercourse is available. Site is more than 330m away from the nearest watercourse in an urban area and therefore it is not considered feasible to make a direct connection.
- **Discharge to Surface Water sewer** - The scheme as shown is based upon the principle of minimising the impact on the existing public sewer network by controlling the peak runoff using SUDS with discharge at rates as low as practicable to the existing surface water public sewer network adjacent to the site.
- **Discharge to combined sewer** – This is a last resort and will only be proposed where an existing connection is retained for example the retained terrace on Queen Victoria Street.

The surface water drainage strategy has been informed by a SuDS appraisal which has considered the SuDS hierarchy (Table 4.1). SuDS measures have therefore been implemented where possible within the bounds of the scheme to meet the requirements of the national, regional and local planning policy requirements and best practice guidance.

⁴ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#peak-rainfall-intensity-allowance> – last updated 27 May 2022

Table 5.1: SuDS Options

SuDS Option	Suitability/ Included in the Scheme?	Comments
Soakaways and porous paving (infiltration)	X	Although the ground is potentially suitable for infiltration forms of SUDS, due to the proposed building footprint across the site, and the presence of made ground, the use of infiltration systems has been discounted.
Soft landscaping including rain gardens, verges or raised planters or tree pits	*	Opportunities for soft landscaping are limited. The external areas at ground level are paved but raised planters will be considered and included at the next stage of design where these are deemed viable.
Green Roofs/Brown Roofs/Blue Roofs	✓	Figure 5.4 and Architect drawings in Appendix A show brown/blue roofs on 5 of the roof areas. Blue roof is the primary method of attenuation for the scheme. 220m ² of the roof, approximately 15% of the site area, has been shown as a brown/blue roof. This will capture and attenuate approximately 500m ³ of the roof (approximately 34% of the site).
Porous paving (sub base treatment/storage)	✓	The internal courtyard (140m ²) will be permeable paving to provide treatment, conveyance and potentially storage (see below).
Rainwater Harvesting	*	There is insufficient space alongside the commercial and residential MEP plant spaces to provide enough storage to make it economically viable to use rainwater harvesting within the scheme. That said, there is the potential for small scale rainwater harvesting to be incorporated within the raised planters, and therefore the inclusion of SUDS planters will be considered fully at the next stage of design.
Swales	X	Buildings cover the majority of the site and thus space constraints meaning this is not a viable system for this scheme.
Attenuation ponds (above ground storage)	X	A building covers the whole of the site except for a small ramp on the entrance to the basement at the rear of the site thus this is not a viable system for this scheme.
Below ground storage in cellular system	*	Permavoid is proposed beneath the permeable paving of the central courtyard to provide some attenuation/and or to convey flow to the public sewer network. The amount of storage that can be created will depend on the invert levels of the sewer, and is subject to further drainage survey, site investigation, and detailed design including services coordination.
Flow control devices	*	The opportunity to restrict the flows from the permavoid to attenuate surface water flows will be explored at the next stage of design if viable.

Key:

- ✓ Suitable for use and included in the scheme
- * Possibly suitable for use – not included in the client and architect design proposal at present – should be considered further as part of the next stage of design
- X Unlikely to be suitable for use

To provide source control and minimise runoff from the new building, a brown/blue roof will cover 240m² (collecting 35% of the runoff from the site) and 150m² (9% of the site area) will be designed as permeable paving with the potential for attenuation to be provided beneath the permeable paving using permavoid subject to detailed design. The inclusion of raised planters, including SUDS planters (self-irrigated using captured rainwater stored within the base) will be considered further at the next stage of design.

Initial design calculations are being prepared by Polypipe and are pending at the time of submission. The design of the blue and green areas will be progressed jointly with a blue roof designer and the design team at the next stage of design based on the following principles:

- Flow Restrictors will be installed on the outfalls from the blue roof to restrict flows – the number of outlets envisaged will be stated in the blue roof calculations.

- Each of the blue roof areas will be designed to drain itself with the exception of the highest roof which is a vertical extension to an existing building and therefore will shed to the adjacent roof (~275mm lower). The detailed design process may result in changes to the current proposed flows but the flows from the blue roofs will target a combined flow of 2l/s.
- Overflow discharge requirements will need to be considered as the design progresses and an allowance should be made in the above ground drainage.
- A max storage level of at least 35mm above maximum depth above the design level should be allowed for in the structural design – subject to confirmation in the preliminary design of the blue roof.

It is proposed to re-use existing sewer connections subject to survey and detailed design based on the following principles:

- **New build – Flat roofs (502m² - 38% of the site)** will be designed to attenuate at roof level using blue roofs – depth of storage, number of overflows and proposed discharge rate is subject to confirmation by blue roof designer;
- **New build extension to existing buildings/retained facades on Friar Street (518m²)** - will need to be discharged unrestricted due to inclusion of Mansard roofs to match retained facades which precludes the use of blue roof – Flow unchanged from existing.
- **Retained Queen Victoria Street terrace – 420m²** - Unrestricted discharge (as existing) to public sewer via existing connections – Flow unchanged from existing.
- **Courtyard –(140m²)** – Drain via permeable paving which potentially could be restricted using a flow control device subject to detailed design

All opportunities to attenuate runoff at roof level has been included (34% of the site), and limited options are available for attenuation at ground level (limited to the courtyard using the permeable paving to provide storage (140m² of permeable paving and estimated approx. 92m x 85mm = 7.8m³ storage in the permavoid/subbase). In total 43% of the site will be attenuated following development.

Additional storage in the piped network may be achievable but this will be subject to survey and detailed design.

It is not possible to include attenuation in tanks on the site, the need to keep the courtyard free for services and the relatively space available without a building or proposed structure (existing/proposed) including extensive basements (to be retained) and the need to avoid pumping of surface water.

The attenuation and drainage network will need to be sized to accommodate the 1 in 100 year +40% climate change allowance flows at roof level or below the paved level of the roof terraces within the drainage network without flooding the properties based on initial calculations in Appendix D.

In the event of exceedance flows/blockage flow will be diverted via an overflow into rainwater pipes, other roofs or to other drained areas away from building entrances.

Where feasible, surface water will be separated from the foul/combined sewers, though it is noted, that this may not be feasible in some cases especially in the retained listed building and will need to be discussed with Thames Water once the location and cause of recent flooding in the public sewer network adjacent to the site has been established.

5.2.3 Proposed Foul Strategy

The foul water drainage strategy is summarised in this section and on Sketch JME-P263 002 in Appendix D. Connection points are shown indicatively on the drainage strategy plan in Appendix D and will be confirmed following consultation with Thames Water and further drainage surveys.

Foul flows will comprise the flows from the retail and hotel (domestic in nature) and from wash down areas in the basement plant room areas.

The drainage from the basement areas will need to include a pumped connection to prevent flooding of the basement. Any covers in the basement areas should include sealed bolt down covers.

5.2.4 Diversions, remedial works, upgrades and surveys

A detailed survey of the existing site drainage will need to be undertaken to inform the drainage design and agree the drainage strategy with Thames Water.

This will be confirmed as part of a focussed drainage survey as the design progresses beyond planning.

The survey will also confirm the exact location and invert levels of any drainage that is not shown on the public sewer records or any drainage that serves areas outside of the site. It will include a survey of the existing sewer connections.

This information will be used to inform the detail of new connections, any diversions, remedial/upgrade works and design of reinforcement/protection works.

5.2.5 Maintenance of the site drainage

A site management company appointed by the client will be responsible for maintaining the private site drainage. The site management company will ensure routine inspection and maintenance of the site drainage is undertaken by a private maintenance contractor and ensure that the public sewers in the vicinity are being maintained by Thames Water for the life of the development.

A drainage plan will be prepared at the next stage of design based on the principles set out in the SUDS manual and manufacturers specifications for the blue/green roof and pumped drainage.

The brown/blue roof maintenance requirements are set out as follows:

- Following any significant storm event, the outlets should be visually inspected to ensure no blockage has occurred.
- Following any significant traffic or remedial works that take place on or around the roof, each of the outlets should be visually inspected to ensure all drainage holes are clear and free draining.
- Quarterly each outlet, should be inspected and cleared of any build up or debris. All leaf litter mainly autumnal visit, should be removed from the roof surface. Debris must be removed from the roof and not simply flushed down rainwater pipes.
- It is also recommended during maintenance visits to visually inspect the waterproofing system at all upstands, to ensure it is firmly adhered to the detail that it is waterproofing.
- Any permeable paving will need sweeping in accordance with the SUDS manual and any flow control devices inspected and maintained in line with the designers and manufacturers specification.

The drainage maintenance plan will need to be finalised at the next stage of design and issued to the site management company for them to implement. It will need to include maintenance of the brown/blue roofs which will need to be in accordance with the manufacturer's specification.

6.0 FLOOD RISK ASSESSMENT

6.1 Scope of Work

The scope of this FRA was refined to meet the objective set in Section 1 of this report and considers the following:

- Suitability of the Proposed Development (sequential/exception test);
- Flood risk to the development from all sources;
- Potential for the design, construction and operation of the site to increase the risk of flooding to neighbouring properties;
- Any necessary mitigation measures to mitigate identified potential flood risks;
- Climate change;
- Residual flood risks.

6.2 Suitability of the Proposed Development

As the site is wholly located in Floodzone 1, and no significant flood risk issues have been identified from other sources, the NPPG does not require application of the Sequential Test or demonstrate that the exception test is passed, and therefore the proposed development is therefore considered 'appropriate' in flood risk terms in line with local and national planning policy.

6.3 Flood risk to the development

Based on our understanding of the scheme, current level of design and the site setting, the potential sources of flooding have been identified and assessed in Table 6.1.

Table 6.1 Sources of Flooding

Source of Flooding	Pathway	Potential Linkage to Site	Justification
Infrastructure failure from water mains and internal water supply system	Failure of the Thames Water supply network (water mains) and/or internal water supply and distribution system may result in flooding of the building and the surrounding area	Yes	Flood risk from this source is considered to be a residual risk with the main threat being damage to water mains during construction and from internal pipe work during any building works. Flooding from the water supply network serving the site poses a residual risk to the proposed development. Appropriate mitigation measures are discussed in Table 6.4.
Sewer flooding from Thames Water assets, highway drainage and private site drainage	Surcharge in site drainage and the public sewer network due to pump failure, blockage and/or exceedance of capacity	Yes	Sewer flooding has occurred at several properties in Friar Street from surcharge in the public sewer network in Spring 2020 and June 2022. Sewer flooding from blockage of internal building drainage as well as the site drainage, highway drainage and Thames Water network is a residual risk managed by the design of the site drainage and any connections/upgrades to the public sewer network to accommodate the proposed scheme, as well as the regular inspection and maintenance of the public and private sewer network. The flood risk associated with

Source of Flooding	Pathway	Potential Linkage to Site	Justification
			this source may also increase over time due to the effects of climate change. Appropriate mitigation measures are discussed in Table 6.4.
Surface water flooding as a result of extreme rainfall and runoff from overland flow	Flooding of the site and surrounding roads due to extreme rainfall	Yes	The risk of surface flooding is very low to the site based on the EA mapping, some ponding is possible north of the site in Friar Street and to the south west of the site in Fife Court during the medium risk and low (extreme) risk scenarios. Flooding from this source is however considered a residual risk. Appropriate mitigation measures are discussed in Table 6.4.
Shallow groundwater	Sub-surface flow to buried services/foundations	Yes	The presence of shallow groundwater may affect design of foundations/basement waterproofing and buried services. Appropriate mitigation measures are discussed in Table 6.4.

6.4 Flood Risk from the Proposed Development

6.4.1 Drainage Assessment

This section assesses the impact of the proposed development and the drainage strategy on the receiving sewer environment.

Change in Foul Flows - The proposed development will slightly increase overall foul flows in the local sewer network.

Using the method described in Sewers for Adoption 8th Edition and industry accepted methodologies (including guidance in BS EN 752 and Butler *et al.*, 2018, the proposed development will increase peak foul sewer flows to the public foul sewer network by approximately from 4.1 l/s to 4.73 l/s.

Change in Surface Water Flows - The site is currently 100% hard landscaping. Following development, the site will remain 100% hardstanding but SuDS (blue roof) and permeable paving (tanked) with some storage to reduce runoff to comply with planning policy requirements. 43% of the site will be restricted following development.

Impact on Receiving Sewers – The proposal is to separate the foul and surface water flows to Friar Street to provide a significant betterment subject to survey, detailed design and Thames Water approval.

The development proposals will result in an overall reduction in peak surface water flow which will reduce the risk of flooding.

Further opportunities to reduce the impact of the site on the public sewer network are discussed in Table 6.4.

6.4.2 Exceedance Flows and Overland Flowpaths

The detailed design of the external levels and the design of the below ground drainage will need to allow for exceedance flows.

The detailed design of the blue roofs will need to ensure that overflows are provided to route exceedance flows onto lower roofs, into the rainwater pipes and/or into the adjoining highways (as at present) but away from building entrances in line with best practice guidance.

On that basis, there will be no detrimental change to overland flowpaths is anticipated given that the site is 100% hardstanding and covered almost entirely with buildings.

6.4.3 Displacement of Groundwater

There is no significant increase in basement footprint and therefore no significant impacts to groundwater flows or levels are anticipated.

A site investigation should be undertaken to confirm groundwater levels and inform the waterproofing design at the next stage of design (see Table 6.3).

6.5 Mitigation measures

Table 6.3 sets out appropriate mitigation measures to minimise the identified flood risks.

Table 6.3: Mitigation measures

Type of Flooding	Issue	Mitigation Measures	Justification	Residual Risk * ⁵
Flooding from surface and foul water sewers shown on the public sewer asset records and site drainage from sewer blockage/ pump failure/ pump failure/ surcharging following intense rainfall in excess of design rainfall events.	Blockages/pump failure/surcharges in the site drainage or the public sewer network in the site vicinity may result in backing up of the site drainage/ drainage serving the site which may result in flooding of the basement, ground floor and site surroundings. Flooding from this source is considered to pose residual risk to the proposed development.	A drainage survey should be undertaken to confirm the existing drainage size, routes, flow types and condition of the sewers in order to confirm the existing connection(s) are suitable for reuse, inform the need for any required upgrades, extension or refurbishment to the existing outfalls to the public sewer network. Following the drainage survey, the design of the drainage should be progressed to ensure that the proposed drainage systems, connections to the public sewer (including any essential upgrades and/or remedial works) are undertaken and agreed with Building Control and Thames Water as necessary and agreed with the LLFA and Thames Water. SUDS (including brown/blue roofs) and permeable paving should be included as set out in Section 5.2.2. If sewer flows from the site are not currently separate, then separate connection will be sought from Thames Water to serve the new development, subject to survey and detailed design. New connections to the public sewer may be required.	These measures will ensure flood risk from these sources is minimised.	Low

⁵ Following adoption of the proposed mitigation measures

Type of Flooding	Issue	Mitigation Measures	Justification	Residual Risk * 5
		The detailed design should ensure that the above ground building drainage serving the new and retained buildings are appropriately sized and agreed with Building Control. Pumped threshold drainage should be included across the entrance to 145/146 and flood resistant/ resilient design should be incorporated where practicable on the ground floor to protect the basement from flooding. The need for this will be confirmed by further surveys and detailed design. Any drainage at ground and basement levels should be sealed with bolt down covers. Ensure specialist input to the design of the brown/blue roof and ensure that the roof is fitted with overflows in line with best practice. These overflows should be routed into rainwater pipes, other roofs or to other drained areas away from building entrances. The contractor should ensure live/retained sewers within the site boundary are decommissioned, diverted or adequately protected during construction. The construction management plan should prevent silt/concrete entry to all retained drainage during the works including highway drainage and the private drainage within the site and surrounding streets. An appropriate management plan for the drainage should be prepared for the development once the drainage strategy is finalised. This should ensure that routine inspection of the site drainage, and public sewers by the site owner, Reading Borough Council Highways Team and Thames Water for the life of the development. In particular, the highway and pavement drainage in front of the site should be regularly maintained.		
Flooding from Water mains and internal water supply system.	Failure of the water supply and distribution system may result in flooding of the building and surrounding property. Risk of damage is highest during construction works.	The contractor should ensure live/retained water mains within the site boundary are decommissioned, diverted and/or adequately protected during construction. All water mains that are live and need to be retained should be assessed for condition and upgraded as necessary. Routine inspection of the site and public water supply and distribution system by the site owner and Thames Water for the life of the development. Any water mains or sewers encountered on or adjacent to site that are shown in addition to or located in a different position than that shown on the current records should be reported by the contractor to the project engineer and the designs changed to the satisfaction of the project engineer and/or Thames Water.	Will ensure the likelihood of causing damage resulting in any flooding is minimised	Low

Type of Flooding	Issue	Mitigation Measures	Justification	Residual Risk * 5
Flooding from groundwater	Shallow/perched groundwater is unlikely but if present it may affect the design.	Undertake appropriate site investigation at the next stage of design and consider in design of substructure (including design of basement, piles and below ground services).	Will ensure flood risk from this sources is minimised.	Low
The proposed development will change flows to the public sewer network (locations of connections) and flows will change)	The development will result in increased foul flows, offset by reduced surface water flows). Changes to site drainage may change risk of flooding from sewers to the local area following development.	The existing drainage should be surveyed and any necessary changes to the connection points and flow rates to be agreed with the LLFA and Thames Water as the design progresses. The cause of local sewer flooding issues recently experienced in the area should be investigated and understood to inform the detailed design of the drainage. The purpose of this will be to ensure opportunities to separate and divert foul/surface water flows away from sewers with known capacity issues where feasible. Any necessary upgrades to the public sewer or private site drainage must take place before operation of the development. Water efficient fixtures and fittings should be used to minimise potable water demand and foul sewer flows. Raised planters including 'SUDS Planters' will be considered as the design of the courtyard progresses at the next stage of design.	Will ensure that any impacts of the development are mitigated	Low
Change in overland flow routes (surface water runoff) and exceedance pathways.	No impacts are anticipated to overland flows as the site is currently occupied by buildings, however the detailed design will need to consider exceedance flows.	The detailed design of the FFL of the new build, external levels and the design of the below ground drainage will need to allow for exceedance flows. The design of the blue roofs will need to ensure that overflows are provided to route exceedance flows onto lower roofs, into the rainwater pipes and/or into the highways (as at present) away from building entrances in line with best practice guidance.	Will ensure that any impacts of the development are mitigated	Low

6.6 Residual Risk

A number of residual risks have been identified, associated with flooding from blockage/pump failure/surcharge of public sewers, site drainage and burst water supply pipes, groundwater and intense rainfall.

Appropriate mitigation measures have been provided in Table 6.3 to address and manage the residual risk from these forms of flooding.

As long as the mitigation measures are implemented and public sewer networks, site drainage/water supply infrastructure are regularly inspected and maintained by the responsible authority, then the residual risk will be minimised.

These risks are typical of a site like this in an urban area.

6.7 Climate Change

Climate change has important implications for the assessment of flood risk. The NPPF requires that the effect of climate change is considered when assessing flood risk posed to development.

Climate change has the potential to affect all sources of flooding. The likely impacts of climate change relevant to the scheme could include increased severity and frequency of storms, wetter winters leading to higher groundwater levels, increased rainfall intensity and an increase in the frequency of surface water flooding and sewer flooding incidents.

Site drainage will need to be designed to allow for a 40% increase in rainfall intensity in line with the latest UK Government guidance (Published 19th February 2016, last updated 27 May 2022).

The future monitoring of local flood risk studies (including SFRA and LFRMS) for any changes in flood risk status will increase knowledge over flood depths and help to manage as far as possible the increased risks from climate change.

7.0 CONCLUSIONS AND RECOMMENDATIONS

A flood risk assessment (including drainage assessment) has been undertaken for the proposed development.

To inform the FRA, a drainage strategy has been prepared for the proposed development following a review of relevant planning policy and guidance. To comply, the drainage hierarchy has been followed and SUDS have been considered from the outset of the design process. This has enabled significant areas of brown/blue roofs (222m²) to be included across the roof at 6 locations and permeable paving (including permavoid) across 140m² of courtyard at ground level. Raised planters including 'SUDS Planters' will be considered as the design of the courtyard progresses at the next stage of design.

This will result in 43% of the site draining via SUDS which has the opportunity to more than offset the foul increases arising from the development (+0.63 l/s compared to existing) as long as the receiving sewers are carefully considered and agreed with Thames Water. By attenuating the surface water flows significantly and by removing surface water flows from the foul sewer in Friar Street there will be an overall positive impact on the receiving sewers.

A pre-planning enquiry will be submitted to Thames Water to confirm the changes in foul flows and to seek confirmation of the cause of flooding in and agree the discharge locations for the proposed foul and surface water drainage network.

Based on our understanding of the site setting and the development proposals, some flooding has occurred to nearby property following heavy rain in the public sewer network in the vicinity of the site identified in the local area, the cause of which is currently being investigated. It is however considered that the development can be operated safely and without significantly increasing flood risk elsewhere with the inclusion of SUDS and the mitigation measures set out in Table 6.4.

A number of residual risks have been identified, associated with flooding from blockage/pump failure/surcharge of public sewers, site drainage and burst water supply pipes, groundwater and surface water flooding following intense rainfall. These risks are typical of a site like this in an urban area. Appropriate mitigation measures have been provided in Table 6.4 to address and manage the residual risk from these forms of flooding.

As long as the mitigation measures are implemented and public sewer networks, site drainage/water supply infrastructure are regularly inspected and maintained by the responsible authority, then the residual risk will be minimised.

We recommend that the assessment of residual risks should be reviewed by site owners as new flood risk information becomes available, and the flood risk associated with adjacent sewers may also increase over time in the area due to climate change. Any changes to the level of risk should be incorporated into the site management procedures and communicated to the site users.

APPENDICES

APPENDIX A

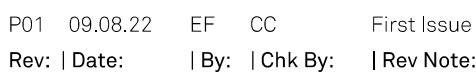
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Internal measured survey of No 146 Friar Street is required.



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Project Title
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Client

Thackeray Group

Drawing Title
Existing Basement Floor Plan

Existing Basement Floor Plan
Drawing No.

P22018-FCH-BA-B1-DR-A-1105

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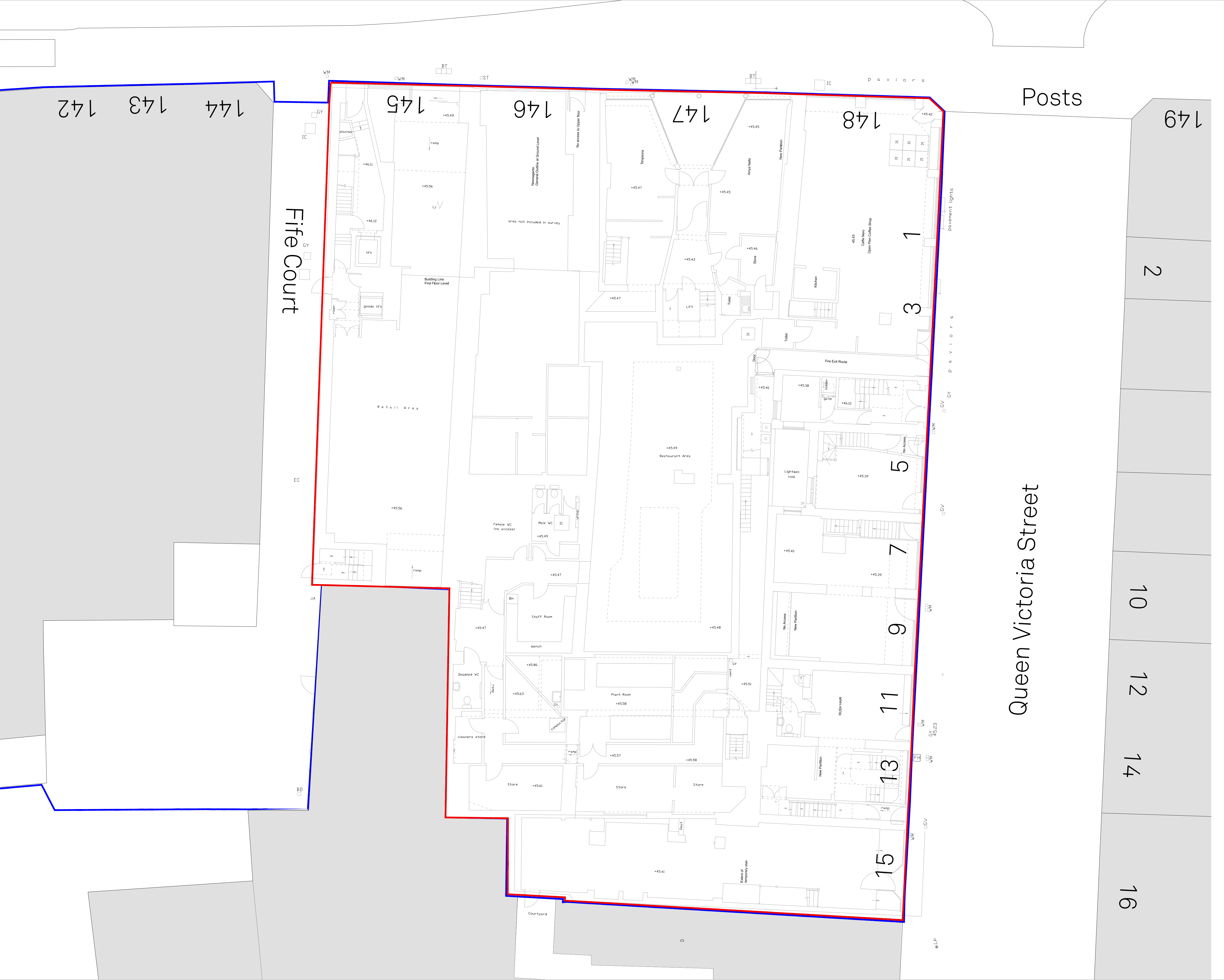
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P01

Drawn B
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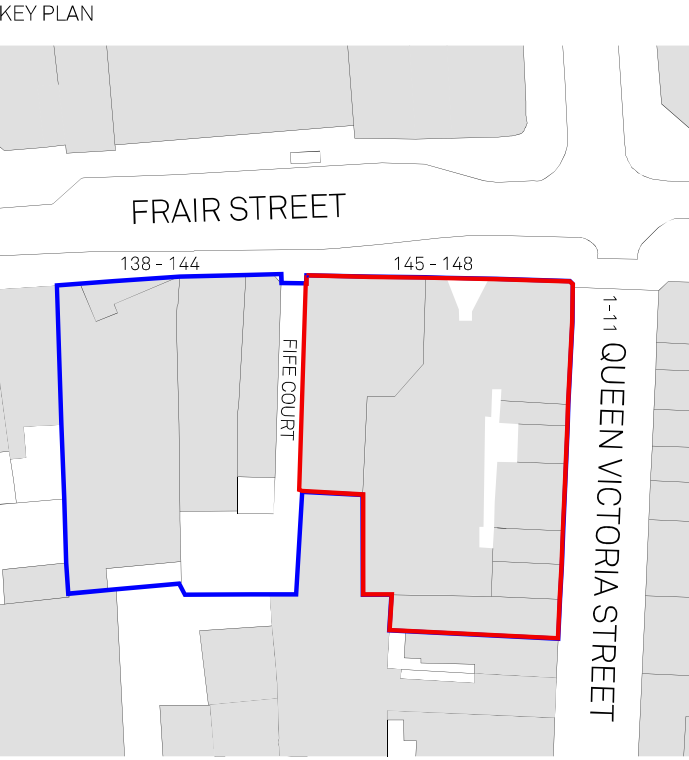
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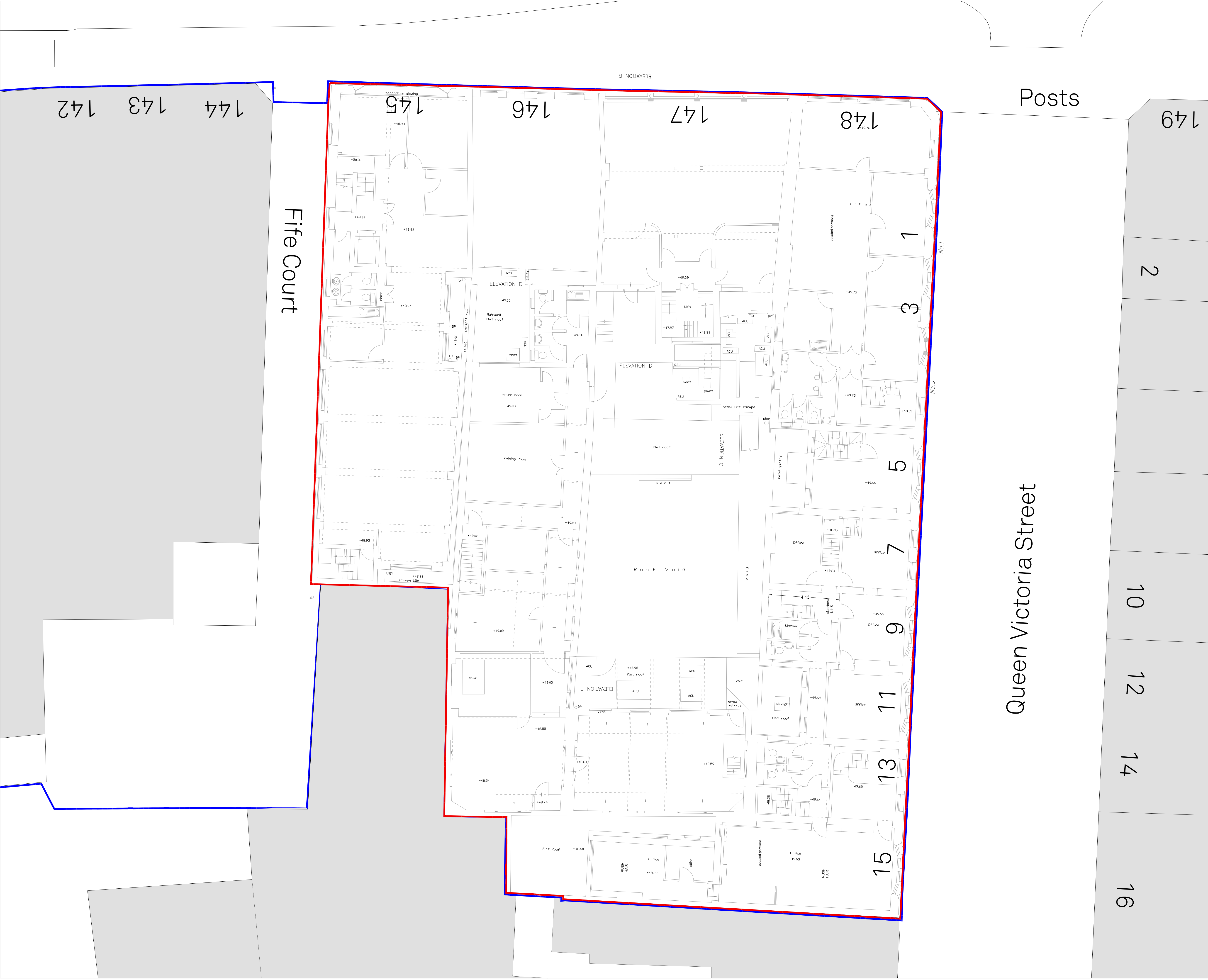
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Client
Thackeray Group
Drawing Title
Existing Ground Floor
Drawing No.
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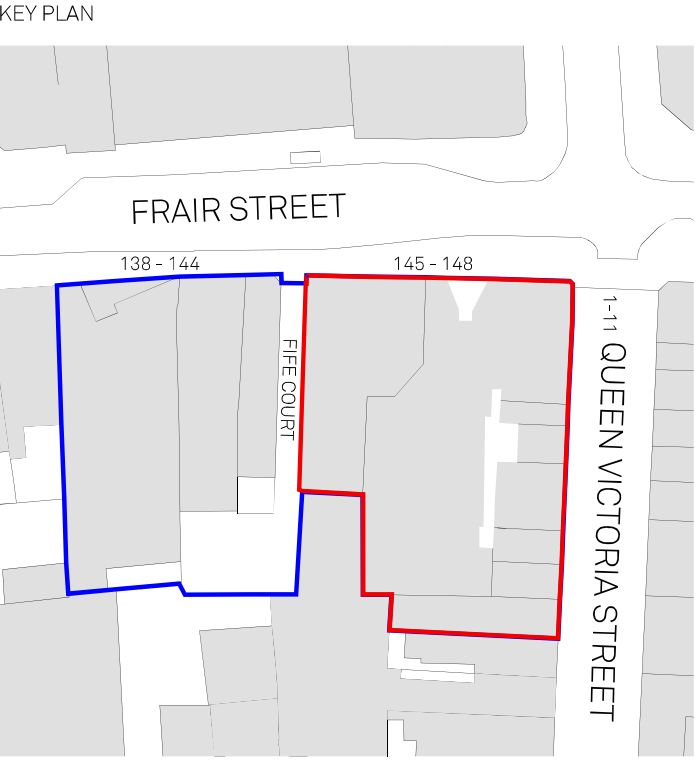
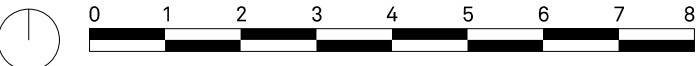
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Drawing Stage
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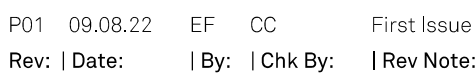
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Project Title
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Thackeray Group

Existing Second Floor

Drawing No. _____

Status Issue suitable for: D

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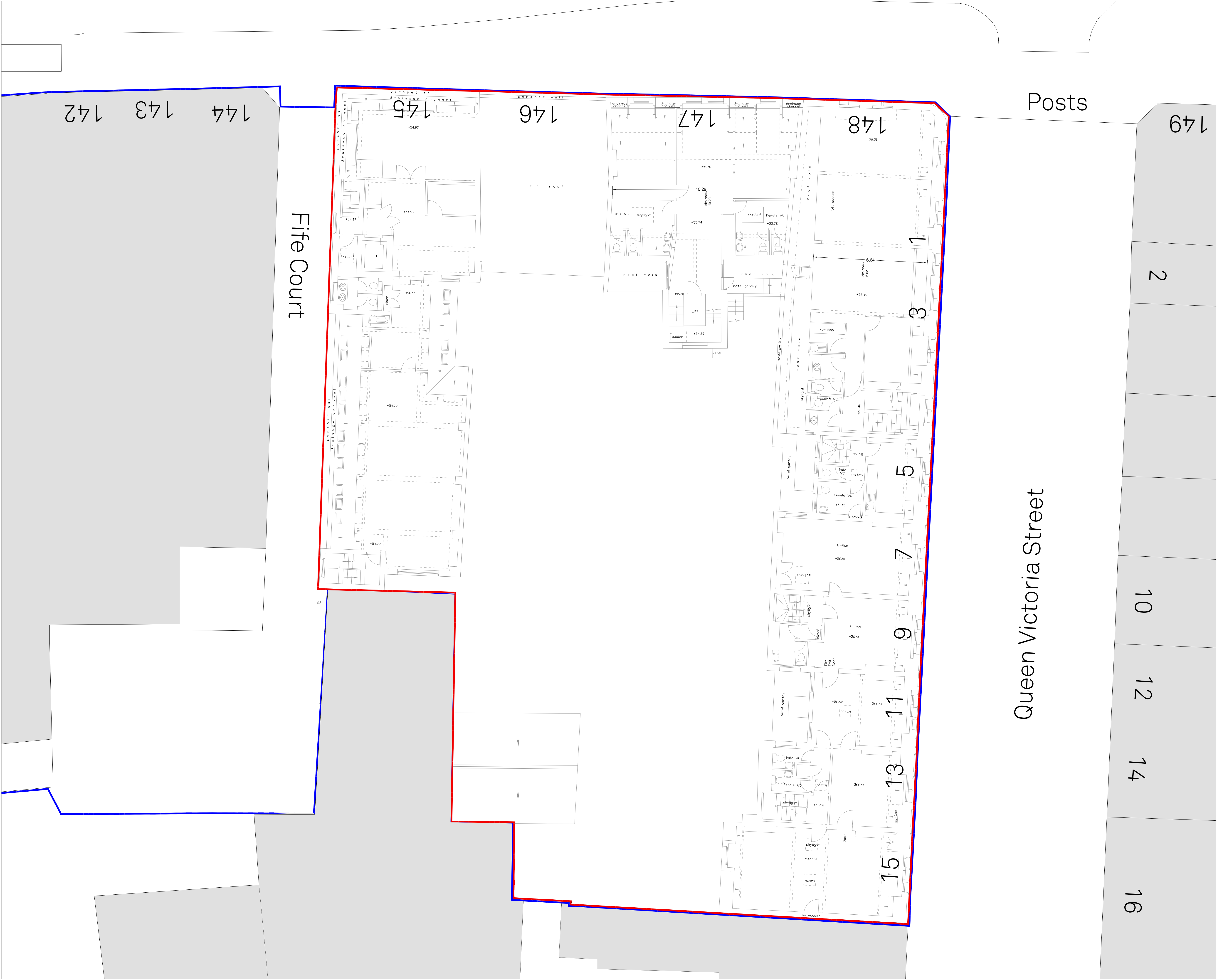
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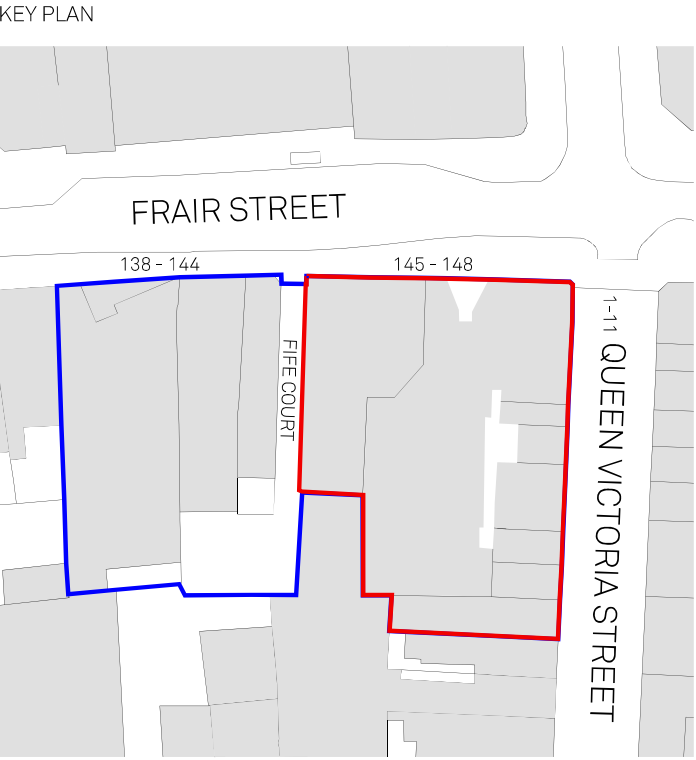
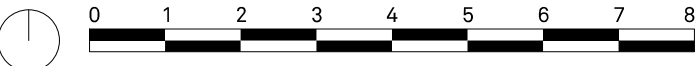
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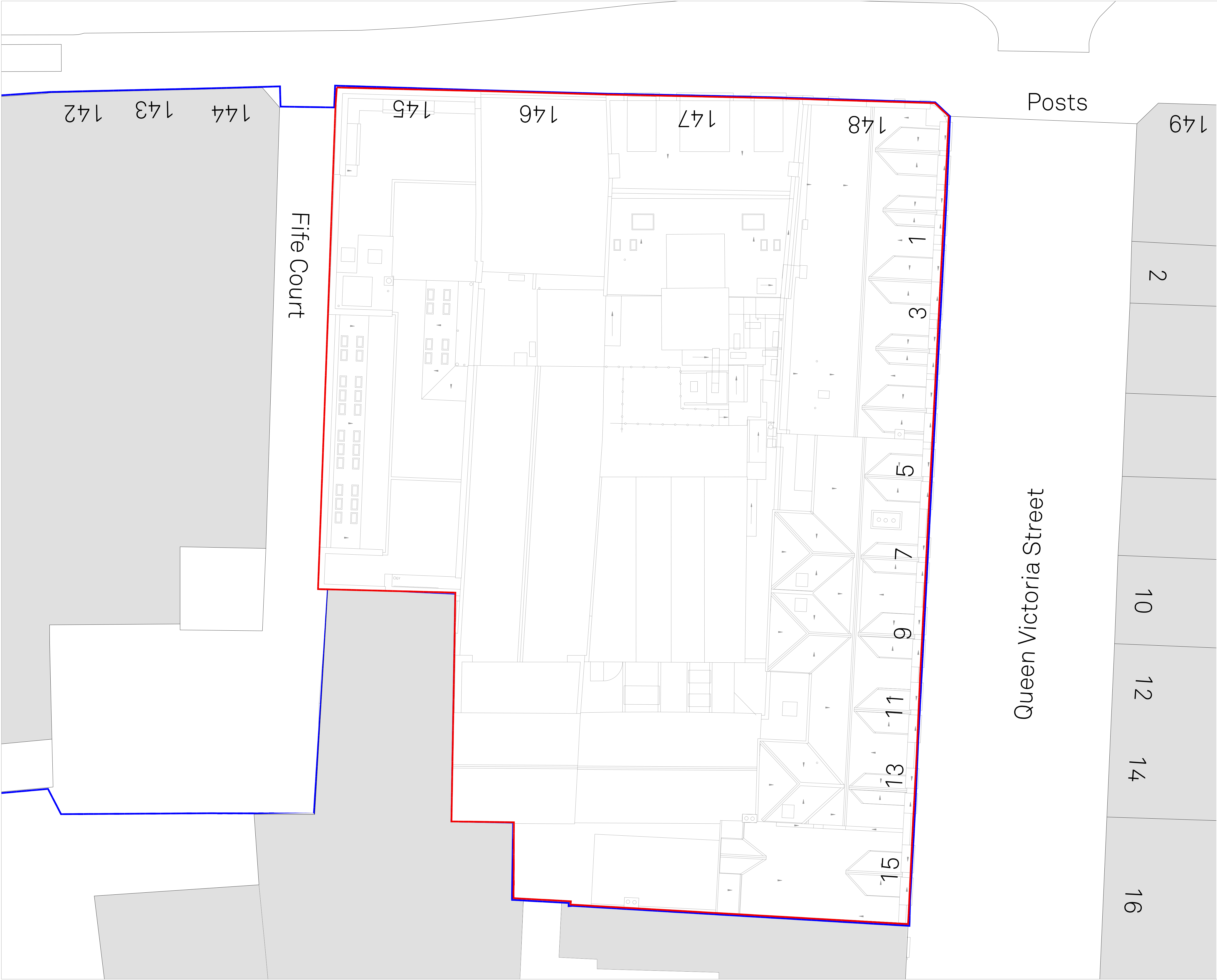


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Internal measured survey of No 146 Friar Street is required.

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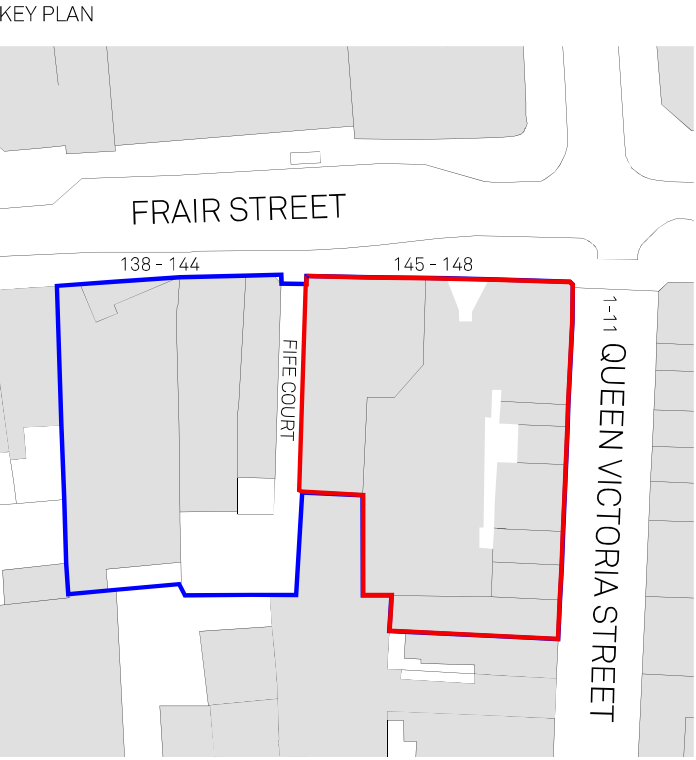
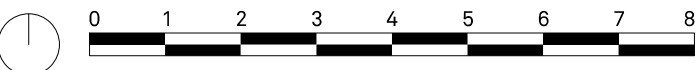
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Client
Thackeray Group
Drawing Title
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Job No.
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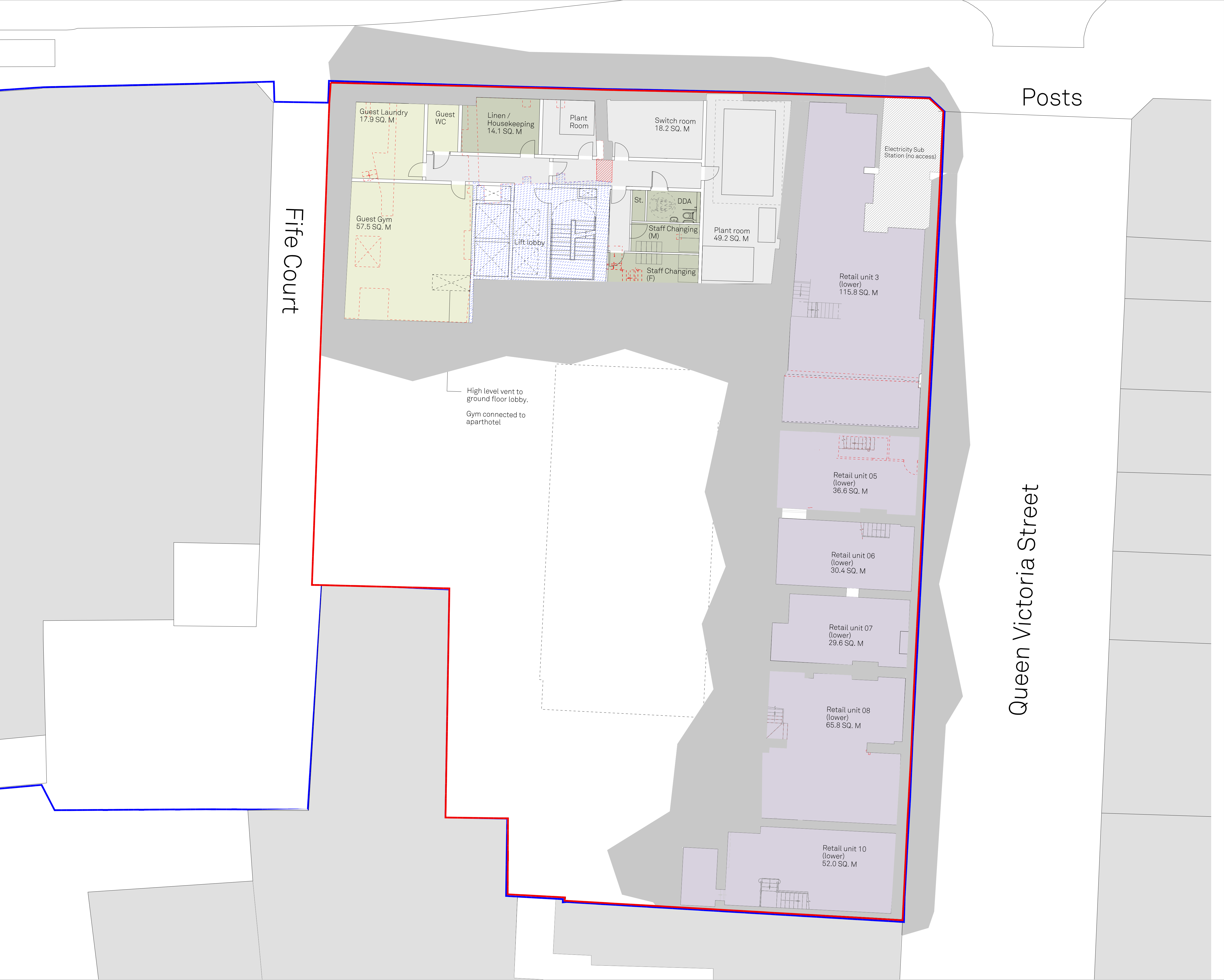
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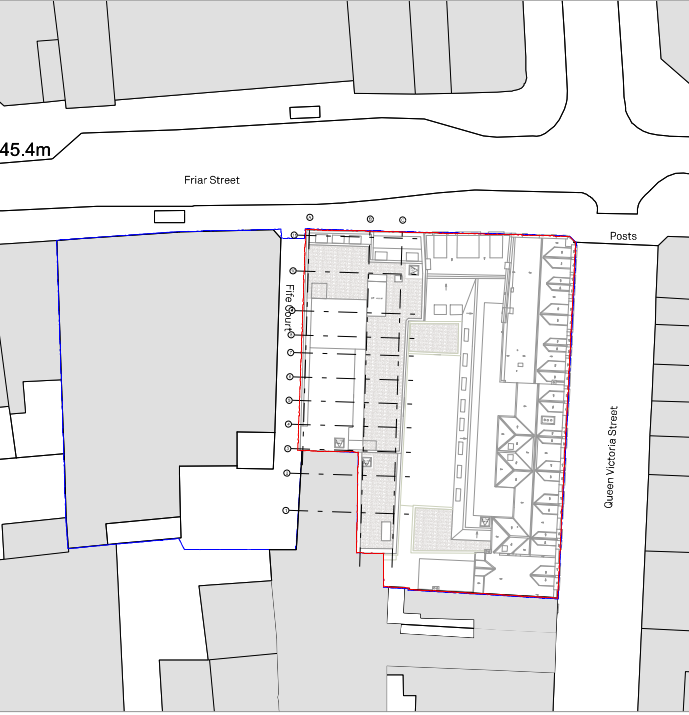
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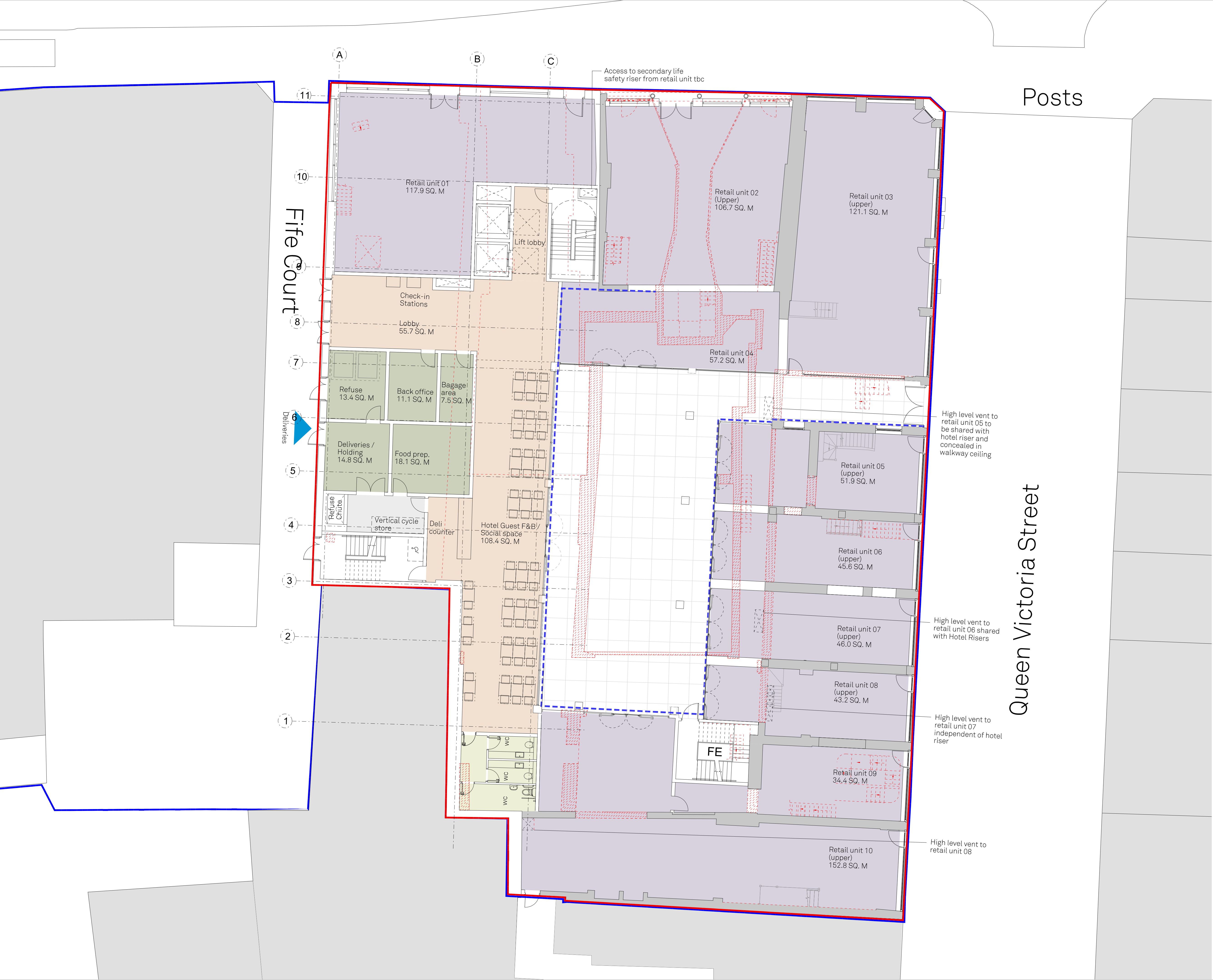
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- Pv's

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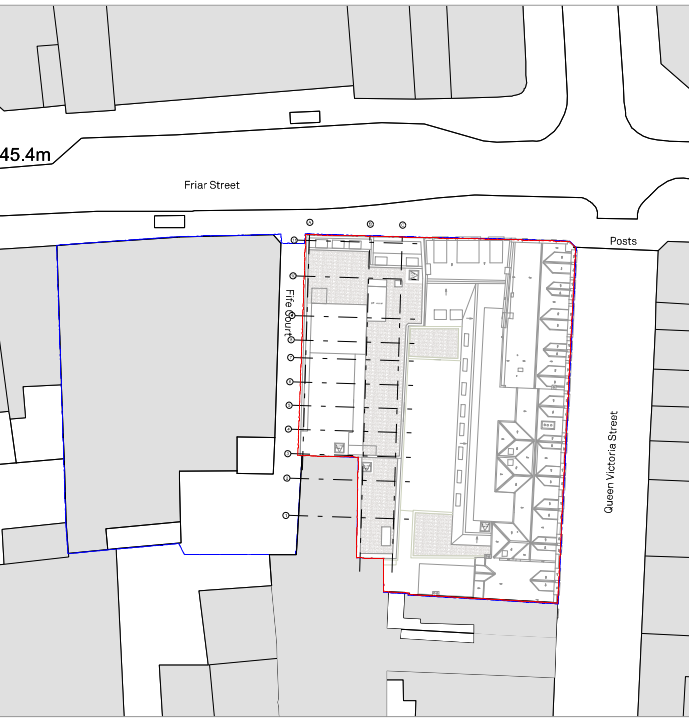
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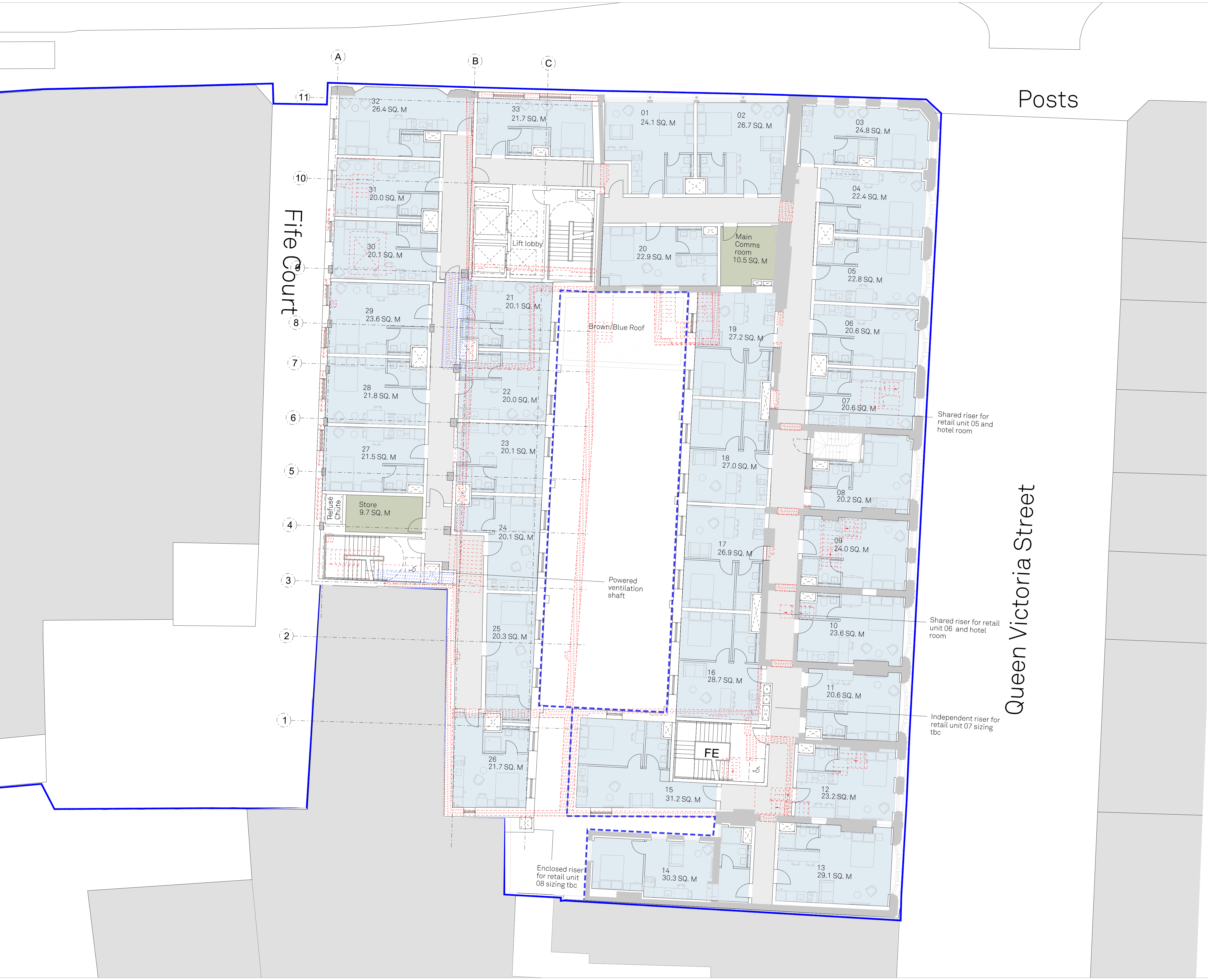
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- Pv's

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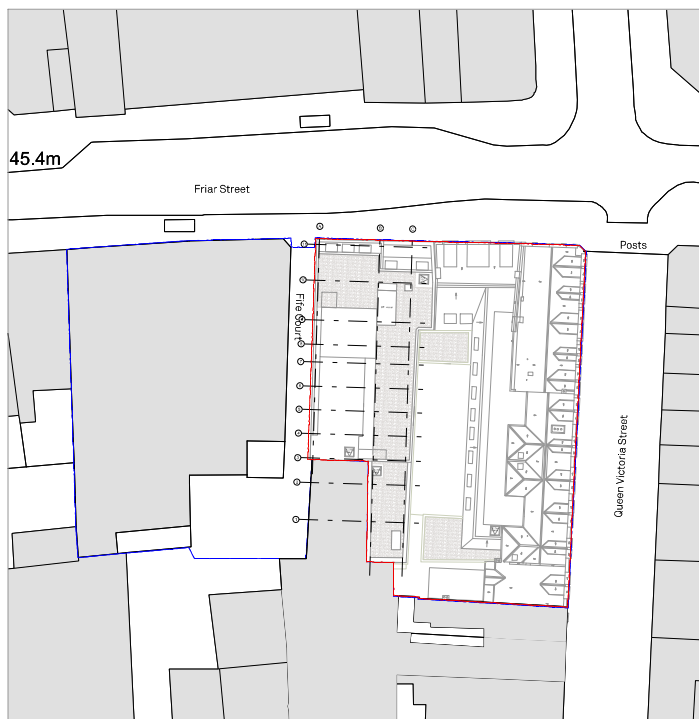
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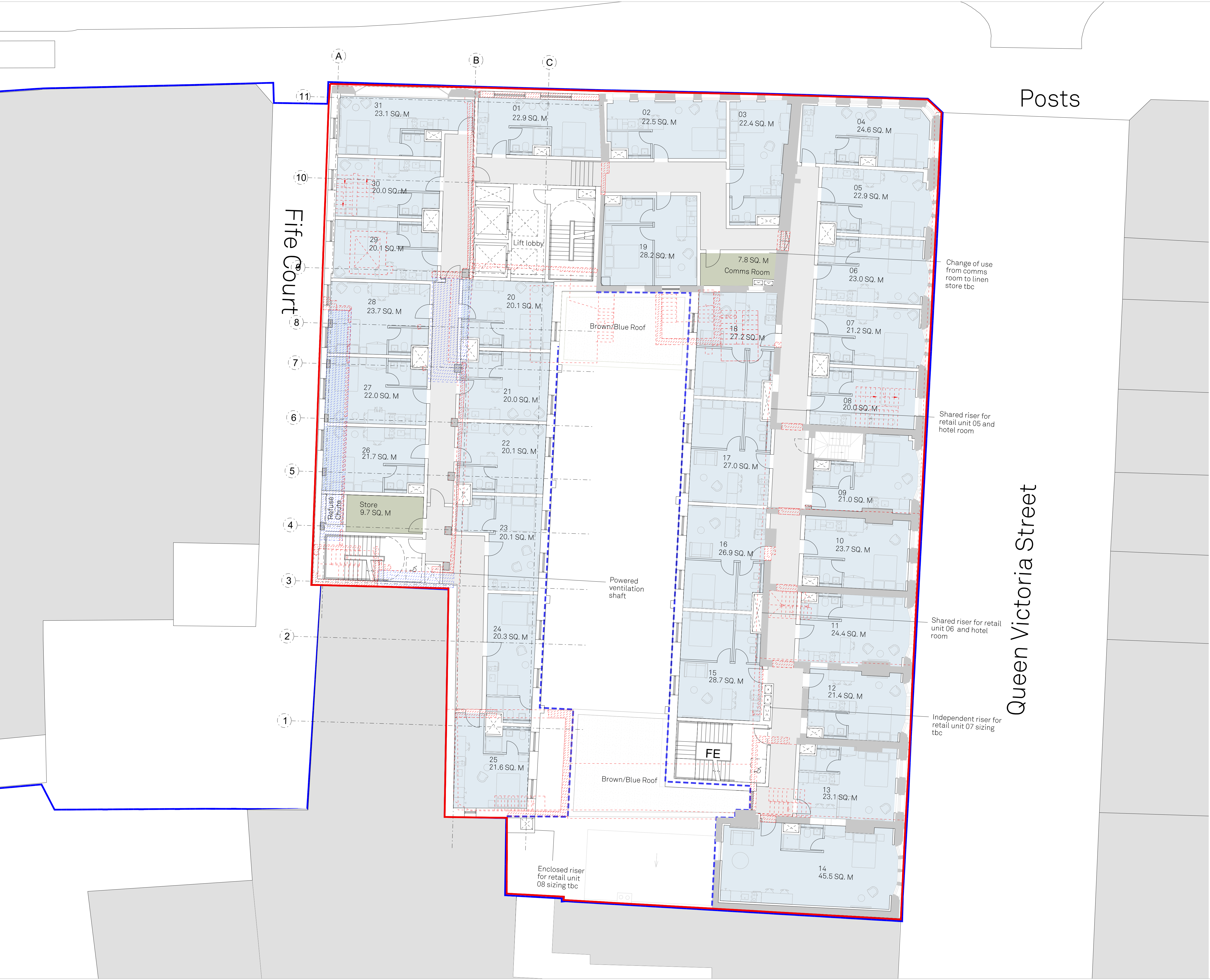


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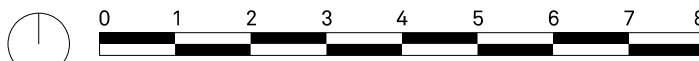
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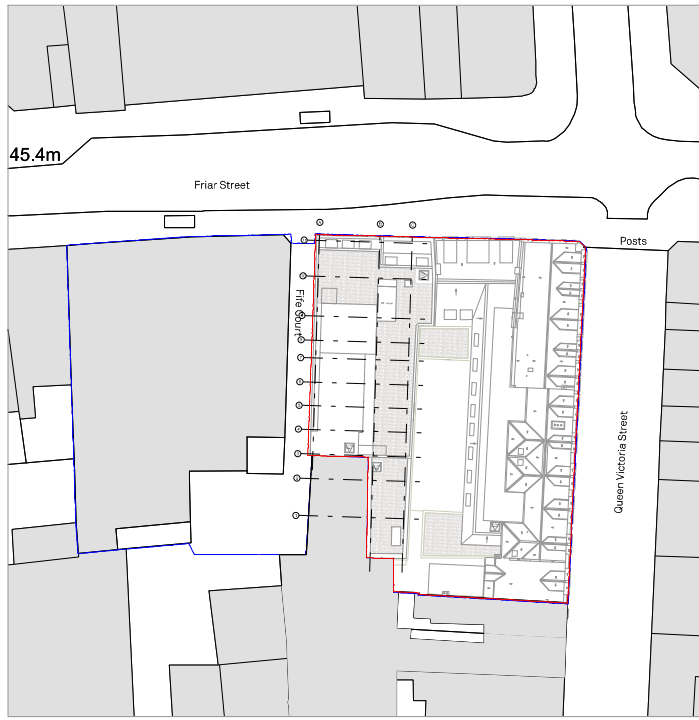
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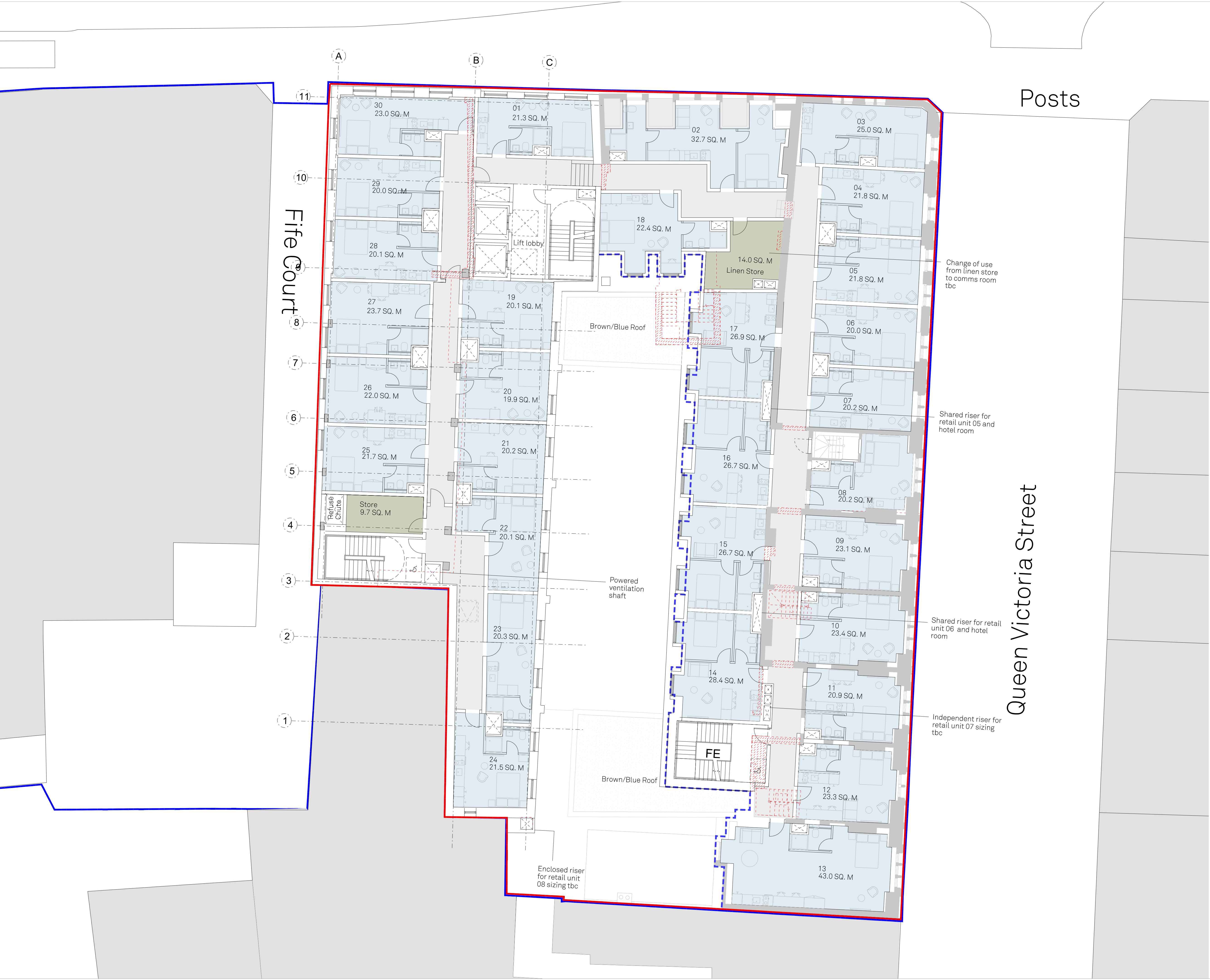
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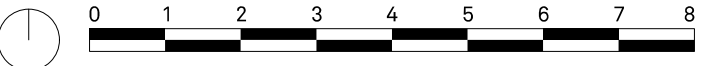
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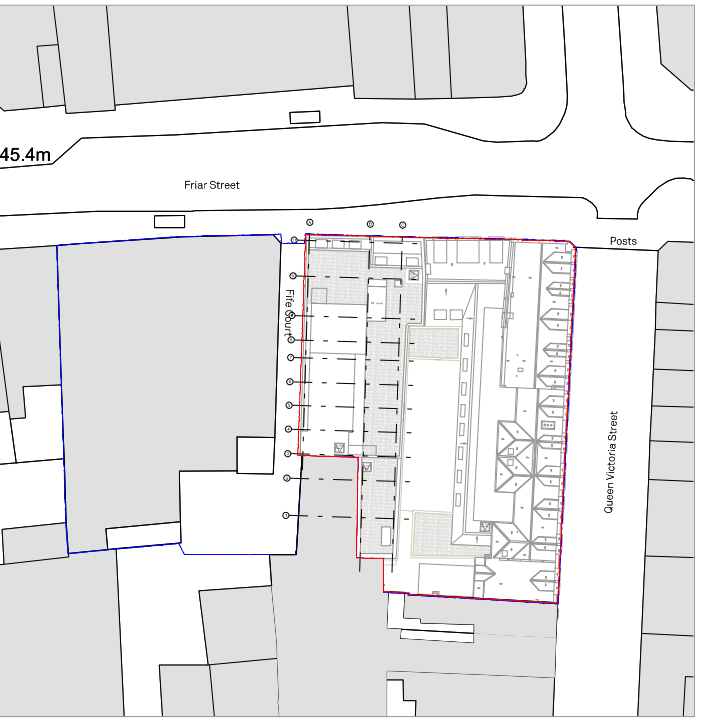
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11.05.22
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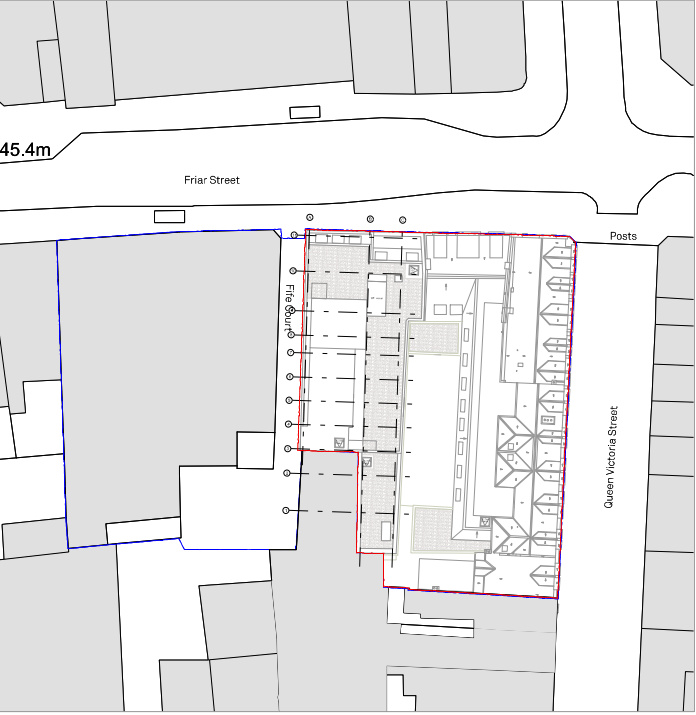
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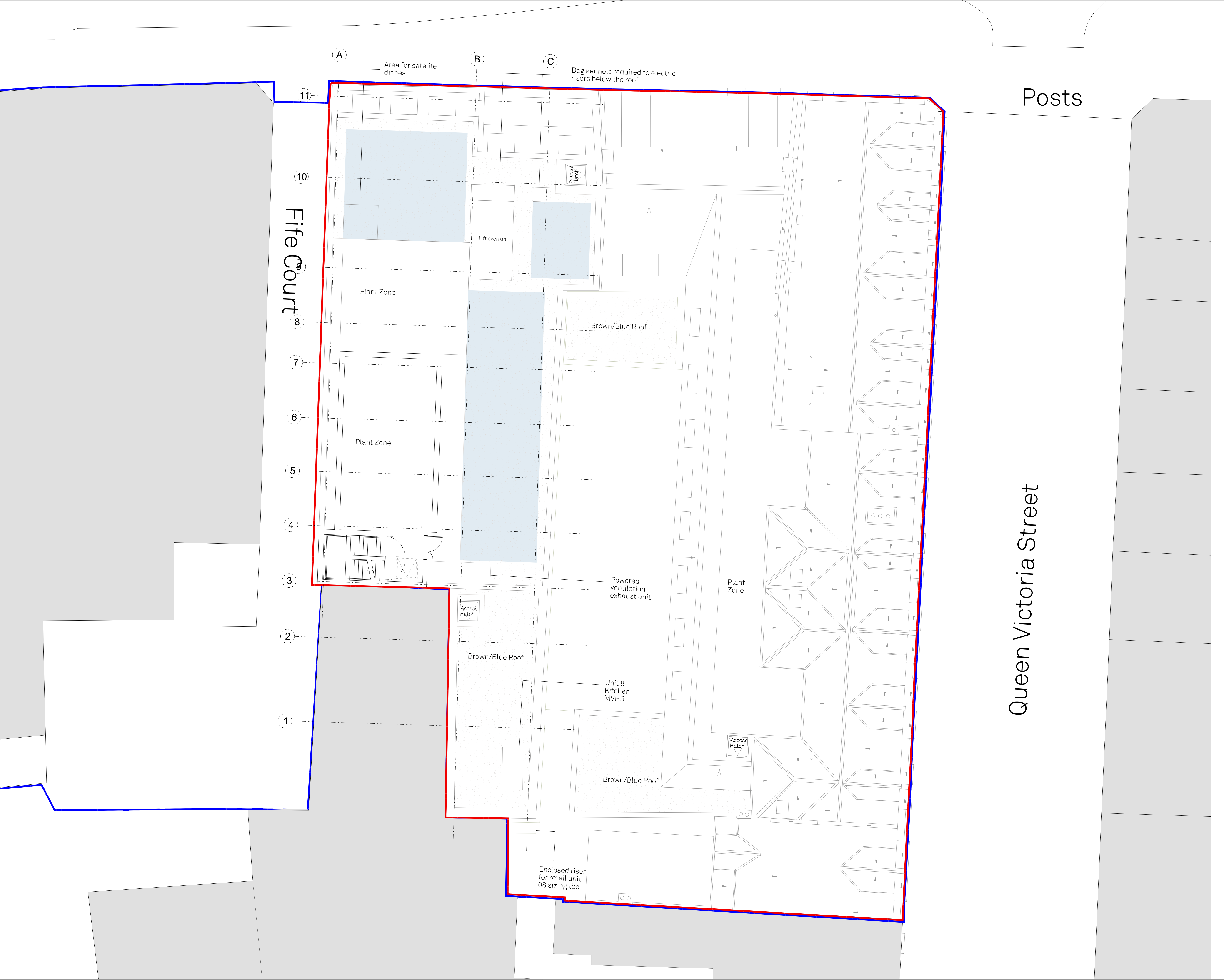


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- Extent of Consented Scheme
- Extended Floor Plate
- Pv's

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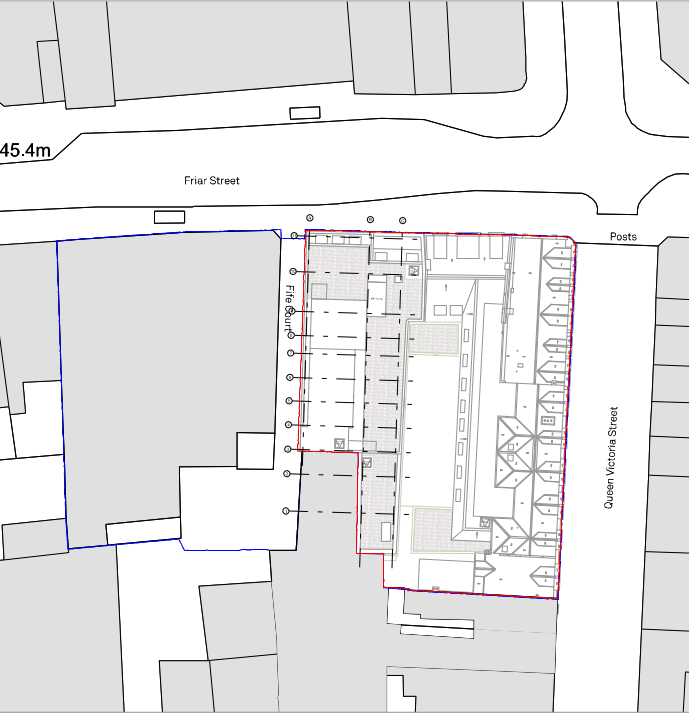
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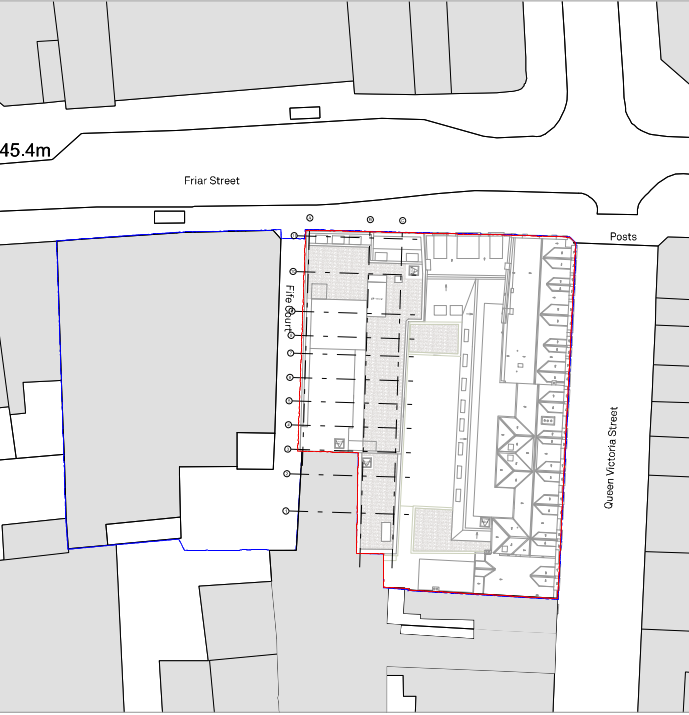
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Drawing Title
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Project Title
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Client
Thackeray Group
Drawing Title
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APPENDIX B

Topographic Survey



ABBREVIATIONS	
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92	92.000
93	93.000
94	94.000
95	95.000
96	96.000
97	97.000
98	98.000
99	99.000
100	100.000

GRID & DATUM
Coordinates related to OS grid and via GPS observations
Levels related to OS datum via GPS observations
Units: metres



NOTES
For Elevations see Dwg 0867 - E

THE SURVEY ASSOCIATION	
CLOUD	
Cloud 10 Ltd, 27-29 Goswell Street, London, EC1N 3AX T: 020 8437 1322 F: 020 8437 1323 www.cloud10.co.uk	
Topographical Survey	
136-144 Friar Street Reading	
Thackeray Estate	
1:100 @ A0	
Author	RM
Checker	ST
Drawn	ST
Scale	1:100
Sheet	0867 - T

DRAINAGE SURVEY REPORT

**142 – 144 FRIAR STREET
1 – 11 QUEEN VICTORIA STREET
READING**

On behalf of

**Thackeray Estates Reading City Ltd
C/o Mr Cameron Mitchell
Queripel House
1 Duke of York Square
London
SW3 4LY**

Date: 20th July 2022

Job No: 220631 / db

Prepared by: Andy Hill

C J Uden & Co.

Drainage Consultants & Surveyors

The Old Builders Yard, 52 – 53 Dene Street, Dorking, Surrey, RH4 2DP

Telephone: 01306 882495 Email: contact@cjuden.co.uk

Dear Mr Moore

Re: 142 – 144 Friar Street & 1 – 11 Queen Victoria Street, Reading

Further to your recent instructions we attended at the above on the 28th June 2022 to carry out a CCTV survey of the drainage as detailed on the enclosed sketch plan.

We would report as follows; all measurements in metric and approximate all materials assumed to be clay unless noted otherwise.

Foul Water Manhole 1 (Interceptor)	Thames Water Manhole Fife Court
	Depth 1900 Silt Level Face Brickwork
	150 Clayware Channel

2 No Inlets

150mm	Upstream – Foul Water Manhole 5 and 4A – Invert Level 1900
100mm	Left Hand Branch High Level – Rainwater Downpipe – Invert Level 300

Trap blocked with silt. Movement to top course brickwork.
Manhole size: 680 x 800. Cover size: 630 x 790.

Run 1 Foul Water Manhole 1 – Downstream (Clayware)

0.00	DEE	Attached deposits, scale starts
0.18		Passes over trap, trap severely blocked
0.46	JDS	Joint displaced small
1.10	JDS	Joint displaced small
1.24	JN	Junction 10 o'clock, use not known
1.70	DEE	Attached deposits, severe scale starts
1.93	LR	Line of drain bends right slight
4.19	JDS	Joint displaced small
4.74	JDS	Joint displaced small
5.43	JDS	Joint displaced small
6.90	JDS	Joint displaced small
9.43	JDS	Joint displaced small
10.12	JDS	Joint displaced small
11.68	OFF	Outfall joins main sewer

Foul Water Manhole 2 (Interceptor)	Thames Water Manhole Queen Street
	Depth 3400 Face Brickwork
	255 Clayware Channel

1 No Inlet

225mm Upstream – Not Inspected – Invert Level 3350

Fitted with chain on rodding eye. Cap rusted in place.
Manhole size: 560 x 560. Cover size: 550 x 550.

**Foul Water
Manhole 3
(Interceptor)**

Depth 100 Face Brickwork
100 Clayware Channel

3 No Inlets

100mm	Upstream – Possibly Capped Off – Invert Level 950
100mm	Left Hand Branch 1 – Presumed Internal Waste Gully – Invert Level 800
100mm	Left Hand Branch 2 – Presumed Internal Soil Stack – Invert Level 800

Blocked on inspection. Cover and frame rusted.
Manhole size: 480 x 600. Cover size: 500 x 660.

Run 2

Foul Water Manhole 3 – Downstream (Clayware)

0.00	DEE	Attached deposits, scale starts
0.18		Passes over trap, trap severely scaled
0.69	LD	Bend down
1.10		Unable to push further discharging onto main sewer run discharging down to foul water manhole 1

Run 3

Foul Water Manhole 3 – Left Hand Branch 1 (Clayware)

0.00	DEE	Attached deposits, scale starts
0.37	FC	Circumferential fracture
0.46	JN	Junction 3 o'clock, use not known, object in outlet
0.64	FC	Circumferential fracture
	JDS	Joint displaced small
0.74	LL	Line of drain bends left
1.15		Presumed internal gully

Run 4

Foul Water Manhole 3 – Left Hand Branch 2 (Clayware)

0.00	JDS	Joint displaced small
0.14	JDS	Joint displaced small
	DEE	Attached deposits, scale starts
1.38	JN	Junction 3 o'clock
1.98	WL	Water level 10%
2.16	JN	Junction 9 o'clock
4.97	LU	Line of drain bends up
5.11		Presumed internal soil stack

Run 5 Foul Water Manhole 3 – Upstream (Clayware)

0.09	JDS	Joint displaced small
0.32	JN	Junction 9 o'clock
	OBX	Other object, waste 40%
1.93	DEE	Attached deposits, severe scale starts
	FC	Circumferential fracture
	JDS	Joint displaced small
2.25	FC	Circumferential fracture open
2.62		Possibly capped off with concrete

Foul Water Manhole 4 (Interceptor) Depth 1000 Fully Rendered
100 Clayware Channel

4 No Inlets

100mm	Upstream – Soil Stack – Invert Level 980
100mm	Left Hand Branch – Internal Manhole – Invert Level 890
100mm	Right Hand Branch – Gully – Invert Level 920
100mm	High Level Branch – Possible Channel Drain – Invert Level 380

Blocked on inspection.

Manhole size: 600 x 450. Cover size: 510 x 660.

Run 6 Foul Water Manhole 4 – Downstream (Clayware)

0.00	LD	Bend down
0.14		Bend pipe levels out
0.41	WL	Water level slight
0.74		Enters foul water manhole 4A, unable to lift cover
1.10		Drops into channel
1.47		Enters discharging pipework
2.12	WL	Water level slight
2.35	JN	Junction 9 o'clock
	DES	Settled deposits, shingle
6.26	JN	Junction 9 o'clock
10.17	DEE	Attached deposits, heavy scale
10.63	JDS	Joint displaced small
11.22	WL	Water level slight
	DES	Settled deposits
11.32	JDS	Joint displaced small
11.32	WL	Water level 20%
	JN	Junction 9 o'clock
11.96	CUW	Loss of vision
13.98	OBX	Other object, waste
	FL	Longitudinal fracture
14.35	FM	Multiple fractures
15.18	FM	Multiple fractures
	WL	Water level slight
15.69	WL	Water level 20%

15.96	JDS	Joint displaced small
	WL	Water level slight
16.65	JDS	Joint displaced small
17.11	CUW	Loss of vision
20.56	MHF	Foul water manhole 1

Run 7 Foul Water Manhole 4 – Left Hand Branch (Clayware)

0.00	DEE	Attached deposits, slight scale starts
0.32	JDS	Joint displaced small
1.20	JDS	Joint displaced small
3.31	FC	Circumferential fracture
3.40	JDS	Joint displaced small
3.73	MHF	Foul water manhole internal of public house

Run 8 Foul Water Manhole 4- Right Hand Branch (Clayware)

0.18	JDS	Joint displaced small
	FC	Circumferential fracture open
0.32	LU	Line of drain bends up
0.92	GYF	Gully

Run 9 Foul Water Manhole 4 – Upstream (Clayware)

0.00	DEE	Attached deposits, scale starts
0.14	FC	Circumferential fracture
0.55	JDS	Joint displaced small
1.24	H	Hole in drain 12 o'clock – 2 o'clock
	JN	Junction 3 o'clock
	FM	Multiple fractures
1.70	LL	Line of drain bends left
	JN	Junction 9 o'clock
3.31	FC	Circumferential fracture
	JDS	Joint displaced small
3.82	JN	Junction 9 o'clock
6.07	JDS	Joint displaced small
6.26	JDS	Joint displaced small
6.44	LU	Line of drain bends up
6.90		Soil stack (internal) public house

Run 10 Foul Water Manhole 4 – High Level Branch (Clayware)

0.05	OBX	Other object, debris 100%, use not known
------	-----	--

Foul Water Manhole 5 Depth 1150 450 uPVC
100 uPVC Channel

3 No Inlets

100mm Upstream – Not Inspected – Invert Level 1150
100mm Left Hand Branch 1 – Not Inspected – Invert Level 1050
100mm Left Hand Branch 2 – Not Inspected – Invert Level 1050

Generally satisfactory.
Manhole size: 450 diameter. Cover size: 500 x 500.

Foul Water Manhole 6 Depth 960 Fully Rendered
150 – 100 Tapered Clayware Channel

3 No Inlets

100mm Upstream – Not Inspected – Invert Level 950
100mm Left Hand Branch – Not Inspected – Invert Level 880
100mm Right Hand Branch – Not Inspected – Invert Level 900

Channel scaled.
Manhole size: 600 x 480. Cover size: 540 x 680.

Foul Water Manhole 4A Unable to Lift

Foul Water Manhole 7 Unable to Lift

Conclusions: The results of the CCTV survey highlight areas where the drainage requires attention. We would therefore recommend the following in accordance with our standard definitions.

	Further to our recent site visit we would note that foul water manhole 1 would be the responsibility of Thames Water to unblock the trap and clear / repair all runs within this section of the drainage system which is a combined drainage system. We were unable to CCYV survey foul water manhole 2 which is the Thames Water sewer manhole in Queen Street which is quite deep and has a rodding eye cap on chains which was found to be severely corroded and due to the cover size would restrict access for a confined spaces entry. Upon inspection to the rear of the Opticians we found the channel drain and yard gully was completely full of silt and debris this discharges to the nearby soakaway. Also the pump chamber from the adjacent shop also discharges over the channel drain which should be emptied and high pressure jetted to clear.

	There were some manhole chambers around the various units that we were unable to lift including foul water manhole 7 and would need to be lifted using hydraulic lifters and a breaker.
--	---

We trust the above meets with your requirements and look forward to receiving your further instructions. If we can be of any further assistance, please do not hesitate to contact us.

Yours sincerely

Andy Hill

For and on behalf of
C J Uden & Co

47110CE

SWMIT

Soakaway

Depth 1750 to silt level

Channel drain

Y9

P7

Channel + Y9

Pump chamber
discharging over channel

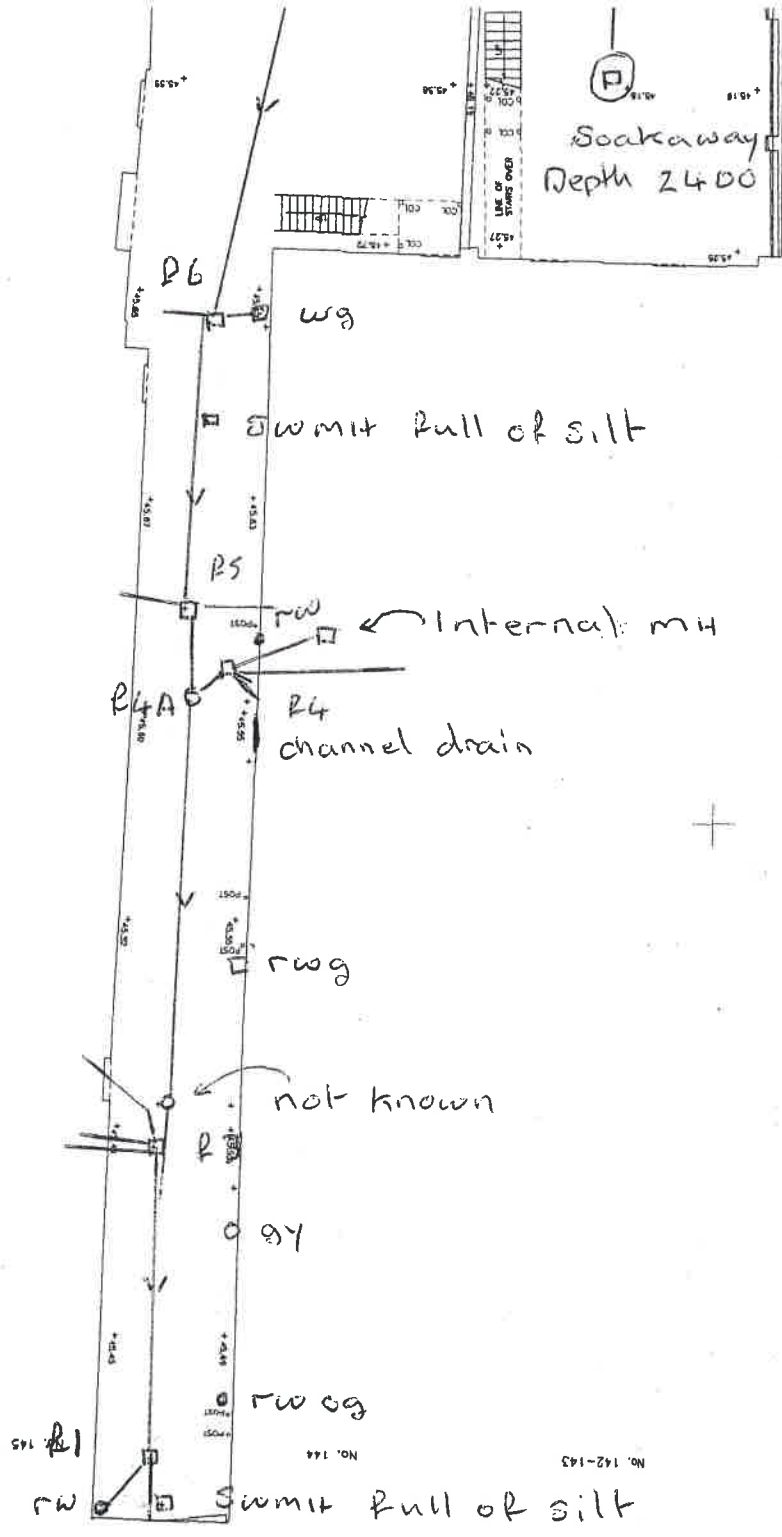
Soakaway

silt level

STREET

discharging over channel

Soakaway
Depth 2400 to silt level



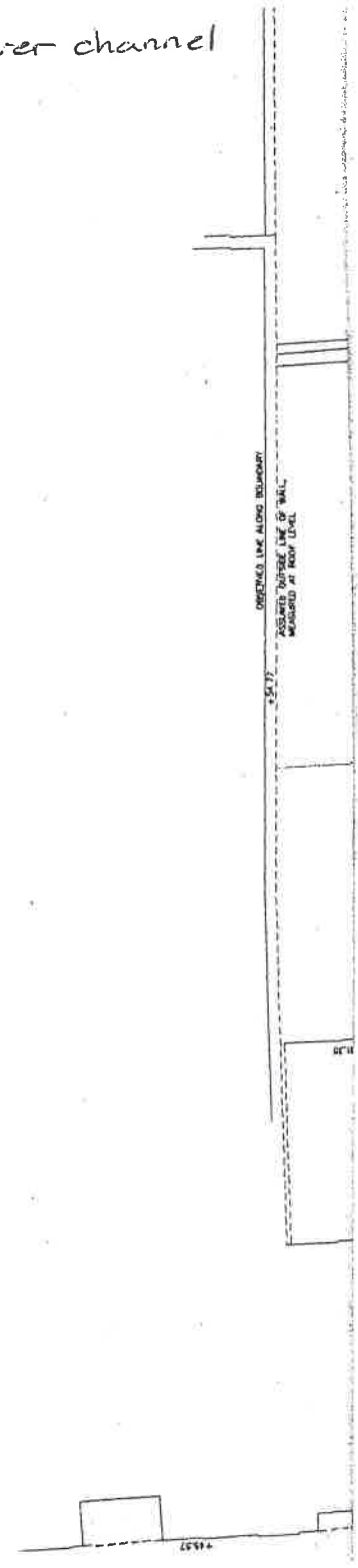
No. 146

No. 145

No. 144

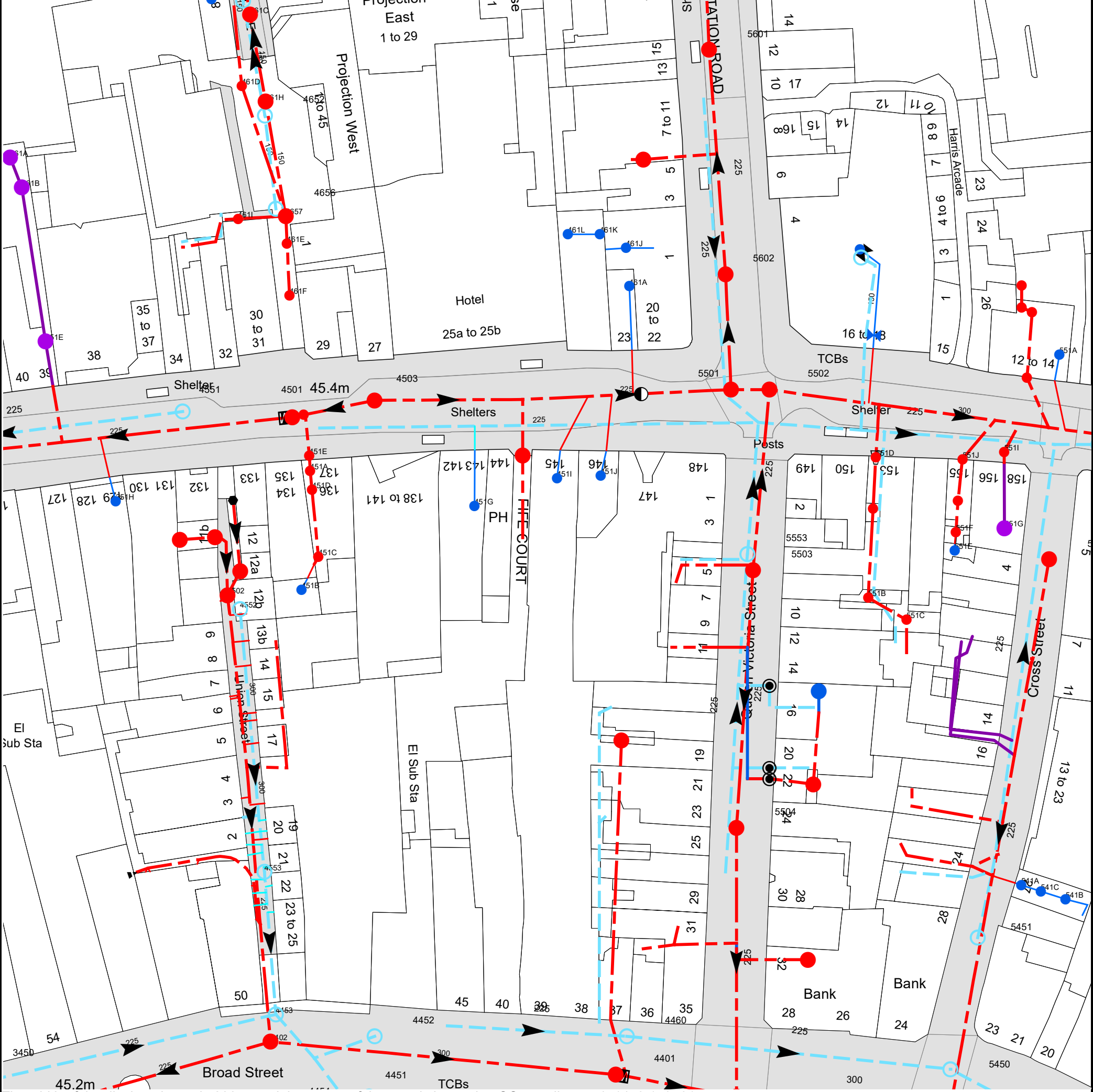
No. 142-143

No. 130-141



APPENDIX C
Thames Water
Records & Correspondence

Asset Location Search Sewer Map - ALS/ALS Standard/2022_4665027



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 471478,173561
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
4401	45	41.14
5551	44.92	43.39
5603	n/a	n/a
5604	n/a	n/a
551B	n/a	n/a
5555	n/a	n/a
551D	n/a	n/a
551C	n/a	n/a
551E	n/a	n/a
551F	n/a	n/a
5557	n/a	n/a
551J	n/a	n/a
551I	n/a	n/a
551G	n/a	n/a
56MN	n/a	n/a
56MM	n/a	n/a
55EM	n/a	n/a
56EN	n/a	n/a
5505	45.13	42.55
551A	n/a	n/a
451J	n/a	n/a
461J	n/a	n/a
461A	n/a	n/a
46NL	n/a	n/a
5601	44.61	40.83
5602	45.13	n/a
5501	45.39	n/a
5553	45.17	43.99
5503	45.17	41.91
5502	45.29	41.75
5450	44.76	43.18
4402	45.1	41.67
4460	n/a	n/a
4452	45.03	43.72
4453	45.02	43.81
54NK	n/a	n/a
5451	n/a	n/a
541B	n/a	n/a
541C	n/a	n/a
541A	n/a	n/a
4553	45.02	44.06
5504	45.12	41.59
55JJ	n/a	n/a
45NE	n/a	n/a
55JK	n/a	n/a
4552	45.52	44.71
4502	45.53	42.88
451B	n/a	n/a
4556	n/a	n/a
451C	n/a	n/a
4557	n/a	n/a
451G	n/a	n/a
451D	n/a	n/a
451I	n/a	n/a
451A	n/a	n/a
451E	n/a	n/a
45MJ	n/a	n/a
4501	45.54	42.35
4503	n/a	n/a
461F	n/a	n/a
461E	n/a	n/a
461L	n/a	n/a
461K	n/a	n/a
461I	n/a	n/a
4657	n/a	n/a
4656	n/a	n/a
4652	44.08	42.78
461H	n/a	n/a
461D	n/a	n/a
461C	n/a	n/a
4653	42.67	41.26
4558	n/a	n/a
351H	n/a	n/a
4551	45.62	43.9
351E	n/a	n/a
361B	n/a	n/a
361A	n/a	n/a
461G	n/a	n/a
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

	Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Storm Sewer
	Sludge Sewer
	Foul Trunk Sewer
	Surface Trunk Sewer
	Combined Trunk Sewer
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Vacuum
	Thames Water Proposed
	Vent Pipe
	Gallery

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

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

Sewer Fittings

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

	Air Valve
	Meter
	Dam Chase
	Vent
	Fitting

Operational Controls

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

	Ancillary
	Drop Pipe
	Control Valve
	Well

End Items

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

	Inlet
	Outfall
	Undefined End

Other Symbols

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

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

Areas

Lines denoting areas of underground surveys, etc.

	Agreement
	Chamber
	Operational Site

Ducts or Crossings

	Cassment
	Conduit Bridge
	Subway
	Tunnel

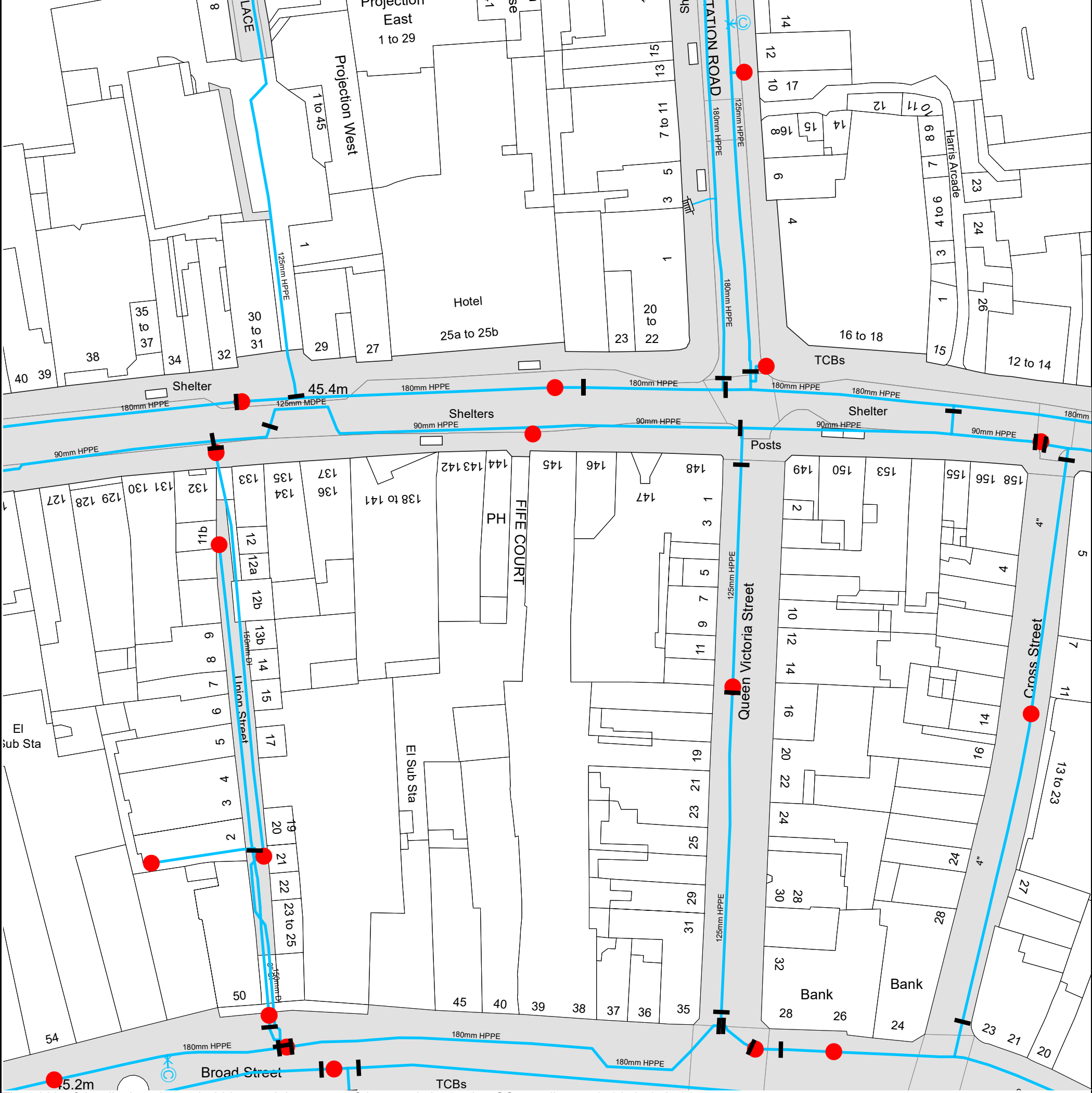
Ducts may contain high voltage cables. Please check with Thames Water.

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plan are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

5) 'na' or '0' on a manhole indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 471478, 173561.
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.
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Asset Location Search - Water Key

Water Pipes (Operated & Maintained by Thames Water)

-  **Distribution Main:** The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.
-  **Trunk Main:** A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.
-  **Supply Main:** A supply main indicates that the water main is used as a supply for a single property or group of properties.
-  **Fire Main:** Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.
-  **Metered Pipe:** A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.
-  **Transmission Tunnel:** A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.
-  **Proposed Main:** A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	300mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 6")
600mm and bigger (24" and over)	1000mm (8')

Valves

-  General Purpose Valve
-  Air Valve
-  Pressure Control Valve
-  Customer Valve

Hydrants

-  Single Hydrant

Meters

-  Meter

End Items

Symbol indicating what happens at the end of a water main.

-  Blank Flange
-  Capped End
-  Emptying Pit
-  Undefined End
-  Manifold
-  Customer Supply
-  Fire Supply

Operational Sites

-  Booster Station
-  Other
-  Other (Proposed)
-  Pumping Station
-  Service Reservoir
-  Shaft Inspection
-  Treatment Works
-  Unknown
-  Water Tower

Other Symbols

-  Data Logger
-  **Casement:** Ducts may contain high voltage cables. Please check with Thames Water.

Other Water Pipes (Not Operated or Maintained by Thames Water)

-  **Other Water Company Main:** Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.
-  **Private Main:** Indicates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Sewer Flooding

History Enquiry



Property
Searches

JM Enviro Limited

Search address supplied 138-148
Friar Street
Reading
RG1 1EX

Your reference QVS 1 & 2

Our reference SFH/SFH Standard/2022_4685088

Received date 18 July 2022

Search date 18 July 2022



Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13



searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk



0800 009 4540

Sewer Flooding

History Enquiry



Property
Searches

Search address supplied: 138-148, Friar Street, Reading, RG1 1EX

This search is recommended to check for any sewer flooding in a specific address or area

TWUL, trading as Property Searches, are responsible in respect of the following:-

- (i) any negligent or incorrect entry in the records searched;
- (ii) any negligent or incorrect interpretation of the records searched;
- (iii) and any negligent or incorrect recording of that interpretation in the search report
- (iv) compensation payments



Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13



searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk



0800 009 4540

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is “overloaded” when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- “Internal flooding” from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- “At Risk” properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company’s reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk



Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

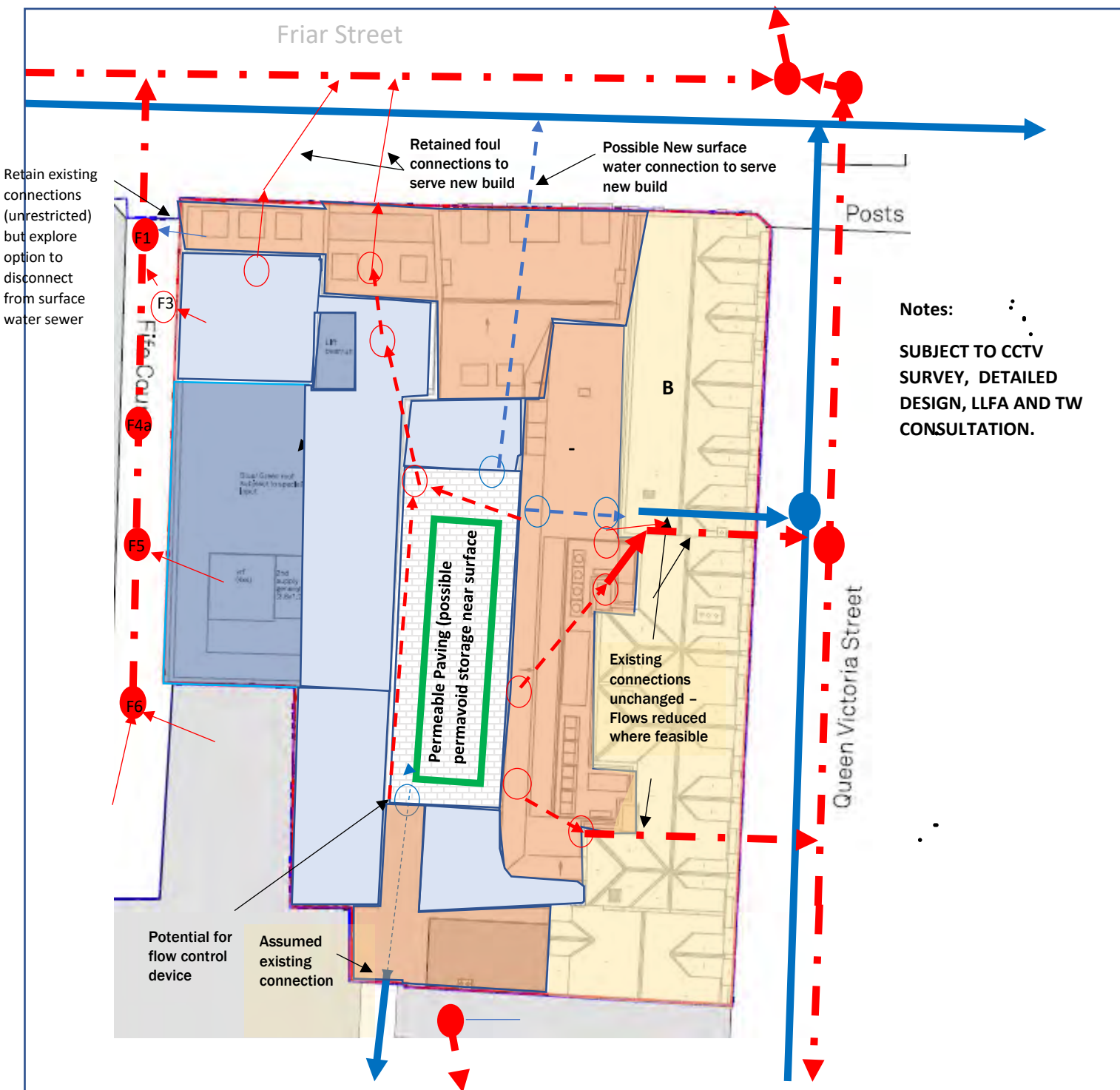


searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk



0800 009 4540

APPENDIX D
Drainage Strategy
(including layout and calculations)



KEY

	Brown/Blue roof - attenuated		Retained listed building Unrestricted - as existing - reuse existing connections		Existing public SW chamber		New private SW sewer
	Sheds to Brown/blue Roof - attenuated		Unrestricted - as existing - reuse existing connections		Existing public FW chamber		New private FW sewer
	Permeable paving		Public foul sewer		Proposed new public SW chamber		Existing private SW sewer
	Permavoid below ground storage (near surface) - attenuated subject to detailed design		Public surface water sewer		Proposed new public FW chamber		Existing private FW sewer
			Public combined water sewer				Private SW chamber
							Private FW chamber

Drawing Title: **Proposed Drainage Strategy Layout**
 Client: **Thackeray Group Ltd**
 Name: **145-148 Friar Street & 1-15 Queen Victoria Street**
 Drawing No: **JME-P263 002_REVA**
 Date: **12th August 2022**
 Drawn: **JM**
 Purpose: **DRAFT FOR DISCUSSION**

JM Enviro Limited
Environmental Consulting
Water, Air & Land

Email: flood@jmenviro.co.uk

AXIOM STRUCTURES

Page 1

Tel: 020 3637 2751
177 Southwark Bridge Road
London
SE1 0ED

1-11 Queen Victoria Street
Reading
Greenfield Runoff



Date 17/07/2022 12:01

Designed by jdh

File

Checked by

Micro Drainage

Source Control 2020.1.3

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.300
Area (ha)	0.150	Urban	0.000
SAAR (mm)	700	Region Number	Region 6

Results 1/s

QBAR Rural 0.3
QBAR Urban 0.3

Q100 years 0.9

Q1 year 0.2
Q30 years 0.6
Q100 years 0.9

Existing Surface Water Runoff

The SuDS C753 v3 Manual recommends in Chapter 24, page 519 – 24.6.2 The Modified Rational Method – “The peak runoff rate can be estimated using the equation given in Equation 24.5”, using the rainfall intensity of 50mm per hour.

EQ. 24.5 Modified rational method equation to determine peak flow rates

$$Q = 2.78 C i A$$

where:

Q = design event peak rate of runoff (l/s)

C = non-dimensional runoff coefficient which is dependent on the catchment characteristics

$$C = C_V C_R$$

where C_V = volumetric runoff coefficient

C_R = dimensionless routing coefficient

i = rainfall intensity for the design return period (in mm/hr) and for a duration equal to the “time of concentration” of the network

A = total catchment area being drained (ha)

Note: 2.78 is a conversion factor to address the rainfall unit being in mm/hr.

Where: i = Rainfall Intensity of 50mm per hour

C_V and C_R = 1

A = Total Catchment area being drained 0.15ha

Therefore, the existing runoff is $Q = 2.78 \times 1 \times 50 \times 0.15 = 20.6$ litres per second.