PADDINGTON GREEN
POLICE STATION

NOVEMBER 2022

Drainage Strategy (Part 1)

Drainage Strategy (Part 1) – November 2022 - GLA0711

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Drainage Strategy

Paddington Green Police Station

Date: October 2022

St Edward
Designed for life

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Drainage Strategy

Paddington Green Police Station

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As required by standards, Walsh confirm this report has been prepared by suitably qualified and experienced professionals. This report has been prepared by Phoebe Tribe, a Project Engineer with over 5 years of professional experience, under the direction and approval of Jacqui Kantor, a Walsh Group Associate Director with over 18 years professional experience working on projects in all aspects of the public and private realm.

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Contents

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Executive Summary

This report contains a site-specific drainage and SuDS strategy for the development known Paddington Green Police Station located in Paddington, London.

This report has been produced to support the linked planning application pursuant to the Paddington Green Police Station site.

New independent foul and surface water drainage networks will be provided to serve the development site.

The surface water strategy proposes the discharge all runoff to the public combined water sewer via a new direct connection. Infiltration and discharge into a watercourse have both been discounted during the early design stages due to the impermeable underlying strata and distance to a suitable watercourse.

Surface water discharge rates will be restricted to greenfield runoff rates, at a total rate of 4.86l/s for the 1 in 100-year (1% AEP) including 40% climate change event.

Through an assessment of the site constraints and layouts, site specific SUDS features have been implemented into the drainage design to manage and control the resulting attenuation volumes, for all storms up to and including the 1 in100yr (1% AEP) + 40% CC event. A required storage volume of 450m³ has been calculated in order to reduce the peak flow rate to the greenfield runoff rate of 4.86l/s.

SUDS in the form of green roofs, rainwater harvesting, permeable paving and below ground attenuation tanks have been provided sitewide within the ownership boundary.

All drainage and SUDS features within the ownership boundary will be privately maintained by the Client's appointed site maintenance Contractor.

Foul water will discharge to the 450mm Thames Water combined water sewer running along the Newcastle Place carriageway to the north of the site.

A pre-planning enquiry has been issued to Thames Water to confirm the capacity in the sewer network for the proposed foul and surface water flows. TW have confirmed sufficient capacity in the receiving sewer (October 2022, ref:DS6099583). Thames Water Section 106 discharge consent will be obtained prior to construction.

1. Introduction

This report contains a site-specific drainage and SuDS strategy for the Paddington Green Police Station development, located in Paddington, London, UK.

Paddington Green Police Station is a mixed-use regeneration scheme, comprised of 3 towers of varying storey height, each consisting of primarily of residential units and retail units at ground floor level. A two storey basement consisting of car parking, cycle stores and refuse areas spans the three blocks.

Flood risk is expressed in terms of a return period (1:x years) as well as an Annual Exceedance Probability (AEP) which is the percentage likelihood of an event occurring in any given year.

1. 1. Limitations

This report has been produced with the consideration of the outline principles set out by WSP Below Ground Drainage Strategy Report PGPS-WSP-XX-XX-RP-DR-0001 (March 2021) which formed part of the outline planning application to the Paddington Green Police Station development Ref:21/02193/FULL. This Drainage Strategy Report should however be considered independent of this WSP report and as a stand-alone document.

The information, views and conclusions drawn concerning the site are based, in part, on information supplied to Walsh by other parties. Walsh has proceeded in good faith on the assumption that this information is accurate. Walsh accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to Walsh by or from others.

1. 2. Sources of Information

Prior to the production of this site-specific drainage strategy, a desk top study was undertaken, and the following documents obtained which are referenced throughout this report:

- Architect's (Squires & Partners) Drawings and Information (Appendix A)
- Landscape Architect's (Murdoch Wickham) Drawings and Information (Appendix A)
- Plowman Craven Surveying Topographic Survey (Appendix B)
- Mapmatic Measured Surveys GPR Utility Survey (Appendix B)
- Thames Water Asset Data (Appendix B)
- WSP's Below Ground Drainage Report - PGPS-WSP-XX-XX-RP-DR-0001 (March 2021)
- WCC City Plan 2019-2040 Policy 35 concerning Flood Risk & SuDS design
- WCC Surface Water Management Plan, Westminster City Council (2011)
- WCC Strategic Flood Risk Assessment, Westminster (2011)
- WCC Preliminary Flood Risk Assessment, Westminster City Council (2011, 2017 addendum)
- WCC Local Flood Risk Management Strategy, Westminster City Council (2017).

1. 3. Glossary of Terms

As referred to multiple times throughout this report the following acronyms are defined as follows:

WCC Westminster City Council, *Local Authority for the Development.*

TW Thames Water, *Water and Sewerage Company for the Paddington Area.*

EA Environmental Agency, *Government authority with respect to environmental approvals.*

LLFA Lead Local Flood Authority, *are responsible for developing, maintaining, and applying a strategy for local flood risk management in their areas and for maintaining a register of flood risk assets.*

SuDS Sustainable Urban Drainage Systems, m*ethods to capture, store, treat, control and discharge surface water in urban environment using sustainable techniques.*

FRA Flood Risk Assessment, *Site Specific Flood Risk Assessment outlining known flood risk within the site and strategies for mitigating flood risk where necessary. Undertaken by Waterman as part of the planning process.*

DSR Drainage Strategy Report, *Site Specific Drainage Strategy outlining possible discharge methods, locations, and system (including SuDS) for the management of surface and foul water from the proposed development.*

AEP Annual exceedance probability, *this is the percentage probability that a given event could occur in any given year.*

2. Site Overview

2. 1. Site Location

The Paddington Green Police Station development is located in Paddington, in Westminster City Council. The site is located between the Edgware Road carriageway and Edgware Road Underground Station to the east, Newcastle Place carriageway and West End Gate development to the north, Paddington Green to the west and Harrow Road and the A40 Marylebone Flyover to the south. The ownership boundary for the site is approximately 0.5ha in size and has a National Grid reference to the approximate centre of TQ 26941 81738.

The planning boundary for the site is approximately 0.82ha and includes the landscaping areas along Harrow Road, Edgware Road and the Newcastle Place carriageway located between the adjacent West End Gate development and the Paddington Green Police Station site.

Figure 1: Paddington Green Police Station Site Location

A site location plan is included within Appendix A.

2. 2. Site History

The existing site currently consists of the existing Paddington Green Police Station, which is currently vacant. The building comprises of two tower blocks east and west, 16 and 8 storeys high respectively, with a 2 to 3 storey block between them and exposed level one car parking. The existing building has a one storey basement which extends across the majority of the site.

All of the existing buildings are to be demolished as part of the proposed development.

2. 3. Site Topography

A Topographical survey (drawing ref:34043-001T-01-1) was undertaken for the site by Plowman Craven in April 2016. This survey indicates the existing levels across the site based upon the UK Ordinance Survey National Grid and level Datum.

Site levels across the site extent are relatively flat with levels ranging from approximately 31.2m AOD to 32.2 AOD. There are pedestrian underpasses south and east of the site, with levels generally lower at approximately 28.40m AOD and 28.15mAOD respectively.

On the western side of the site there are two ramps, one going upwards to a car parking area at first floor level and one routing downwards to the existing basement. The survey shows the top of the ascending ramp at 33.19m AOD and the descending ramp ending at a level of 30.25m AOD.

Topographical survey information has been included in Appendix B.

2. 4. Geology & Hydrogeology

The British geological Survey (BGS) Geology of Britain Map indicates that the site is underlain by superficial deposits of Langley Silt Member (Clay and Silt) and has a London Clay Formation (clay, silt and sand) bedrock geology. The EA's online Groundwater Vulnerability map confirms that the site is located within an 'Unproductive' zone, therefore consists of bedrock or superficial deposits with low permeability. This is confirmed within WCC's Strategic Flood Risk Assessment which includes a Groundwater map demonstrating that the site is not located within an area permeable superficial deposits.

Following a review of BGS's online maps, there are no borehole records within the site boundary, however a review of a number of boreholes just south of the site reveals that no groundwater was found within the samples.

Ground Engineering Limited produced a Ground Investigations Report (ref:C15340), within which the site geology was assessed. As part of the investigation, 10 borehole samples were scheduled within the site boundary. Two of the boreholes BH1A & BH2 were carried out with standard cable percussive boring rigs at completed depths of 51m & 50m respectively. BH1A results show made ground to depths of 4.80m, below which lies a Langley Silt Member strata, until 6.0 deep where Lynch Hill Gravel Member is discovered. At 13.9m deep, London Clay formation is found, and presents for the remainder of the sample.

BH2 results show that Langley Silt member was found below made ground at depths between 4.15m and 8.40m. Beneath which Lynch Hill Gravel Member is found and at 11.5m deep, London clay Formation was discovered. Ground water was observed at 10.50m and 9.80m deep within BH1A and BH2 respectively.

Additionally, eight window sample boreholes were undertaken, where pits were dug to shallower depths at approximately 6.0m. The samples reflect the findings within the deeper boreholes and no water was struck.

2. 5. Proposed Development

The proposed development consists of the following:

"*Demolition of the existing building and redevelopment of the site to provide three buildings of 39, 24 and 17 storeys in height, providing residential units (including affordable units)(Class C3), commercial uses (Class E), a*

community use (Class F.2), landscaping, tree and other planting, public realm improvements throughout the site including new pedestrian and cycle links, provision of public art and play space, basement level excavation to provide associated plant, servicing, disabled car parking and cycle parking and connection through to the basement of the neighbouring West End Gate development"

3. Current Policy and Guidance

This report has been undertaken with reference to the following national and strategic level planning and borough specific guidance adopted by the relevant authorities.

3. 1. National Planning Policy Framework 2021 (NPPF)

The National Planning Policy Framework sets out the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate, and necessary to do so. The NPPF states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, that is should be made safe without increasing flood risk elsewhere.

The NPPF is set out so that Local Plans should be supported by a Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as lead local flood authorities and internal drainage boards. The policies in the Local Plans should outline the consideration to be given to flood risk and the associated issues, whilst also recognizing the uncertainties associated with predicting flood risk. The impact of climate change must also be considered and its effect on increasing flood risk.

The NPPF states that Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change.

3. 2. London Plan 2021

The London Plan is the overall strategic plan for London, setting out an integrated economic, environmental, transport and social framework for the development of London over the next 20–25 years. The document brings together the geographic and locational aspects of the Mayor's other strategies, including those dealing with transport, economic development, housing, culture, social and environmental issues, and as an essential part of achieving sustainable development. The latest version of the London Plan, was adopted in early 2021.

The key policies of The New London Plan applicable to this report are Policy SI.12 Flood Risk Management and Policy SI.13 Sustainable Drainage.

3. 3. Westminster City Council – City Plan 2019-2040

This document sets out how Westminster City will grow and develop from now 2019 on until 2040. It identifies how many new homes, jobs and services are needed to support its growing population, and where and how they should be provided. It will also shape how its places will look and feel and influence the way that their communities interact with each other and the spaces around them. It also provides a series of policies to ensure development is well-designed, accessible, safe and respects and enhances the environment, and can be delivered alongside new infrastructure and local services
The policy relevant to this drainage strategy report is Policy 35: Flood Risk, with the relevant items as follows:

1. All developments should be safe for their lifetime from the risk of flooding, complying with the council's Strategic Flood Risk Assessment (SFRA), Surface Water Management Plan (SWMP), Local Flood Risk Management Strategy (LFRMS) and the Mayor of London's Regional Flood Risk Appraisal (RFRA).

2. A site-specific Flood Risk Assessment (FRA) must be submitted for:
    a. developments of 1 hectare or greater;
    b. all developments in Flood Zones 2 and 3; and
    c. all developments within a Surface Water Flood Risk Hotspot.

    FLOOD MANAGEMENT INFRASTRUCTURE

3. Where appropriate, planning permission for developments which result in the need for off-site upgrades to the water or sewerage network, will be subject to conditions to ensure the occupation is aligned with the delivery of necessary infrastructure upgrades.

    SUSTAINABLE DRAINAGE

4. New development must incorporate Sustainable Drainage Systems (SuDS) to alleviate and manage surface water flood risk. Development should aim to achieve greenfield run-off rates and demonstrate how all opportunities to minimise site run-off have been taken.

3. 4. Westminster City Council – Guidance Documents

The WCC provides guidance documents and independent flood risk assessments for use by developers proposing new development within their borough. These outline strategies for the mitigation of flood risk, management of surface water including the implementation of Sustainable Urban Drainage Systems (SuDS) on new developments, with allowances for the impact of climate change. The relevant documents are as follows:

1. Strategic Flood Risk Assessment (Level 1&2)
2. Preliminary Flood Risk Assessment
3. Surface Water Management Plan
4. Local Flood Risk Management Strategy

3. 5. CIRIA C753 – The SuDS Manual 2015

The CIRIA SuDS Manual incorporates the very latest research, industry practice and guidance in relation of Sustainable Urban Drainage Systems known as SuDS. In delivering SuDS there is a requirement to meet the framework set out by the Government's 'non statutory technical standards' and the revised SuDS Manual complements these but goes further to support the cost-effective delivery of multiple benefits including technical design, construction, and maintenance of SuDS systems.

4. Existing Infrastructure

Information herein, with respect to the existing infrastructure within and surrounding the development site, has been established following review of available survey information and asset records.

4.1. Existing Drainage

Based on the TW Asset Plans (Appendix B), several existing public sewers are present within the highways surrounding the site, namely:

- A 457mm Thames Water combined water sewer running west to east along the Newcastle Place carriageway, depth unknown.
- The 457mm sewer connects to a larger 1989x914 combined sewer routing from north west to south east within Edgware Road at a depth of 4.79mbgl at TW Manhole ref:0701.
- Within the Paddington Green carriageway records show a 1499x787 combined sewer routing south east, depth unknown, before connecting to the trunk sewer in Harrow Road.

A GPR Utility survey (drawing ref:4570-0001) was undertaken for the site by Magmatic Measured Surveys for RGI Surveys in September 2021. The survey indicates that a 375mm to 450mm combined water sewer routes east within Newcastle Place carriageway. It is likely that the sewer continues east and connects to the trunk sewer in Edgware Road as shown in the TW Asset location plans, however the connection is outside of the survey area. The sewer is shown to collect highway drainage via gullies, combined water discharge from the adjacent WEG site via 375mm & 150mm drains, and 300mm combined water sewer from the existing police station site. Within the site boundary, the survey shows a 225mm and a 300mm foul drain and a 100mm surface water drain connecting to a demarcation chamber before discharging into the 450mm sewer via a 300mm connection.

To the west of the site, the survey shows a system of 150mm combined water drains, thought to serve the existing site, discharging towards the combined sewer network in Paddington Green via a 150mm combined connection.

The survey appears to be in line with the TW asset location records, however there is an additional combined manhole upstream of the TW manhole ref:9704. Based on discussions with the client, who also own the adjacent sites, 14-17 Paddington Green and WEG, there have not been any adaptations to the Newcastle Place sewer associated with the works to the St Edwards developments. It is therefore considered to be possible that the entire length of the sewer in Newcastle Place is currently TW owned and this will need to be confirmed with Thames Water during detailed design. A CCTV drainage survey is recommended to confirm the extent of the sewer and to confirm what is it currently serving.

Based on the GPR survey information, it is assumed that the site currently drains both foul and surface water via gravity into the public combined sewer network in Newcastle Place and Paddington Green. A CCTV drainage survey has been recommended to understand how the existing site drains and to confirm the exact alignment and size of the sewers surrounding the site.

All survey information is included in Appendix B.

Foul drainage from the existing site is believed to discharge to the TW combined water network surrounding the site. The existing building was previously a functional police station which consisted of office space and police cells in the basement areas. Based on this information, it is estimated that the existing site's peak flow discharge rate was 3.9 l/s.

Surface water drainage from the existing site is believed to discharge to the combined sewer network adjacent to the site at an unrestricted rate.

The existing surface water discharge rates for the site have been calculated using the modified rational method and Flood Estimation Handbook (FEH) rainfall data. The calculations are based on a 60-minute duration storm and the existing impermeable area of approximately 0.5 ha. The results are provided in Table 1 below:

Table 1: Existing surface water discharge runoff calculations

Return Period	Discharge Rate (l/s)
1 in 2 year	20.1
1 in 30 year	52.4
1 in 100 year	70.6

5. Diversions and Connections

5.1. Existing Sewer Divestment Agreement

The alignment of the existing combined sewer in Newcastle Place is currently shown to route east along the carriageway towards Edgware Road. The proposed basement line is shown to clash with a portion of the combined sewer. It is therefore expected that the combined sewer in Newcastle Place will require a divestment to a point just upstream of the existing TW manhole ref:9705.

Based on the clients understanding, there are two existing private connections from the adjacent site into the combined sewer network at manhole ref:9704, one routing via gravity from the 14-17 Paddington Green Site and one being a rising main connection for pumped foul flows from WEG. This reflects the information shown in the GPR survey as discussed in Section 4.1. It is proposed that the connections associated with the adjacent site will be rerouted towards a new manhole outside of the basement extent line, upstream of TW manhole ref:9704.

An application to divest a section of the combined sewer will need to be approved by Thames Water, for which confirmation of the existing systems discharging to this sewer and any required diversions will need to be provided.

A CCTV drainage survey is recommended to confirm the exact details of the combined sewer network.

Details of the GPR Utility Survey information can be found in Appendix B.

6. Surface Water Drainage Strategy

In accordance with BS EN 16933-2:2017 and Building Regulations Part H, a surface water network will be provided for the control and management of surface water within the development without flooding that could pose a risk to persons or property.

The new surface water system is proposed for the capture and discharge of all surface water runoff within the site boundary to privately owned surface water sewers via one new indirect gravity connection.

All runoff will be restricted to the agreed discharge rate by implementing sustainable drainage measures to control, treat and store runoff before discharge.

An overview of the surface water drainage and SUDS strategy is included in Appendix D.

6.1. Sustainable Drainage Principals

In accordance with the London Plan 2021 and WCC Policies, all new developments should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to reduce runoff rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

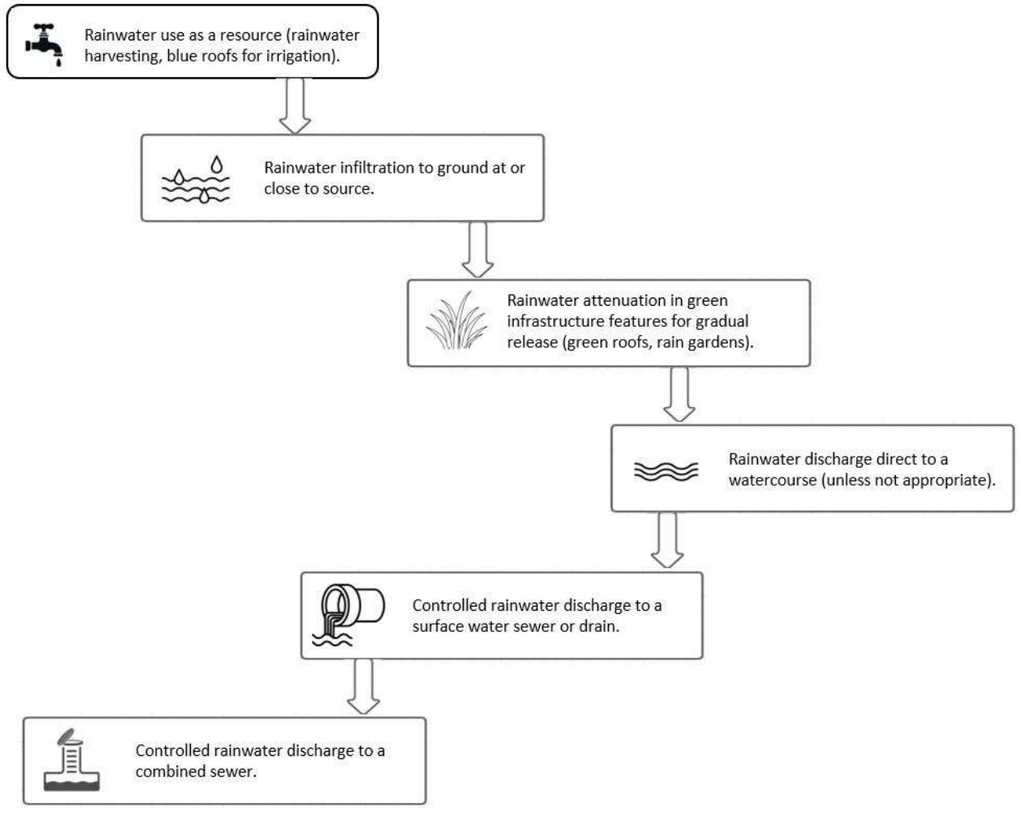


Figure 2: The London Plan 2021 Policy SI13 Discharge Hierarchy

Walsh have undertaken an assessment of the feasible SUDS in line with drainage hierarchy as summarised below.

6.1.1. Rainwater Used as a Resource

Rainwater harvesting is proposed to be used for irrigation through the use of a harvesting system and filter within water storage tanks at basement level. Refer to M&E Engineer's design for further information.

6.1.2. Infiltration to Ground at or Close to Source

Concentrated infiltration has been discounted across the scheme due to the following reasons:

- The sub-surface geology has been identified as London Clay which is known to have very limited permeability and is not considered suitable for infiltration-based SUDS;
- The proposed basement extent for the development spans the majority of the site boundary line. Due to the recommendation for infiltration solutions to be 5m away from permanent structures, infiltration is not considered viable.

With concentrated infiltration not being feasible, options to control rainwater as close to source as possible were considered.

Open water features such as detentions basins or ponds require large amounts of available area due to the requirement for shallow sloped sides and as such are not considered viable due to the confined nature of the site. The proposed basement extends across the majority of the site and therefore there is limited external landscaped areas within the site boundary outside of the building envelope areas, making the use of open water features unfeasible.

At ground level two key strategies have been implemented to manage runoff as close to the source as possible.

1. Permeable block paving has been proposed where feasible, capturing and treating runoff from adjacent areas at source whilst providing storage within the subbase below.
2. Impermeable hardstanding areas will be designed where possible to slope towards permeable areas or to soft landscaping areas providing at source capture and treatment.

6.1.3. Rainwater Attenuation in Green Infrastructure

Green/brown roofs are multi-layered vegetated systems, built on roof and podium areas. These systems are designed to return the surface water runoff from a development to its natural state and are suitable for any building with flat or gently sloping roofs. Green or brown roofs can provide multiple benefits to a development including, creation of biodiverse habitats for wildlife, improved water quality through the filtration of rainwater and the ability to control runoff at the source, resulting in decreased peak runoff rates and volumetric discharge through the interception of rainfall. Combined with the use of landscaped surfaces and play areas, green roofs can become areas of significant amenity for occupants of the development.

Extensive green roofs can also support a range of other ecosystem services such as thermal insulation, reduced air pollution, urban cooling and sound absorption.

In line with the proposals set out by the Landscape Architects design (Appendix E) green roofs are proposed on all three blocks I, J & K.

As discussed above, dry swales and open water features are not considered viable due to the building envelope and proposed basement extent.

It is proposed that the surface run off from hard landscaping areas will be routed towards adjacent soft landscaped areas to provide a degree of source control which will include initial gross silt and debris removal and flows from low intensity storms will also be discharged via evapo-transpiration.

6.1.4. Discharge to Watercourse

The closest statutory river is noted as Paddington Basin, which is located approximately 130m from the development site with multiple roads and residential properties in between.

Therefore, discharge to watercourse is not feasible for the development site.

6.1.5. Discharge to Sewer

There is no surface water sewer in close proximity to the site, therefore discharge to the combined water sewer is the proposed discharge method for the development site. An existing 450mm TW combined water sewer currently runs west to east along the Newcastle Place carriageway north of the site. As discussed in Section 5.1 above it is proposed to divert this sewer along a preferential alignment within the carriageway and new connection(s) will be established into the sewer to serve the development site.

6.2. Surface Water Drainage Strategy

As part of the surface water strategy for the site area within the ownership boundary, it is proposed that all surface water runoff catchments are collected via a below ground surface water network designed to convey up to 1in100year +40% climate change event prior to discharging via a new gravity connection into the TW 450mm combined water sewer in Newcastle Place at restricted rates.

In line with requirements set out in the London Plan and WCC Policy 35, all new developments on brownfield sites should aim to reduce surface water run-off to greenfield runoff rates. Using HR Wallingford Greenfield Runoff Estimation Tool and latest FEH data, the greenfield runoff rate (1% AEP, Q100) for the total 0.5ha site is estimated to be 4.86 l/s. It is therefore proposed that a rate of 4.86l/s is achieved for the site for all storm events up to the 1 in 100 year storm event + 40% climate change.

The required attenuation volume for the redevelopment catchment have been calculated using the industry standard Innovyze MicroDrainage software and FEH data. The total ownership boundary area of 0.5ha has been considered and a climate change allowance of 40% has been applied to the critical (1in100yr) storm event. It is calculated that a storage volume of 450m³ will be required in order to reduce the peak flow rate to 4.86l/s.

It is proposed for all surface water runoff from sitewide catchments, including building roofs and ground floor external landscaping to be routed to an attenuation storage tank located below the basement B1 slab. Stored water is then to be pumped to ground level at restricted rate, before discharging to the public combined network under gravity via a demarcation chamber.

Full details of the surface water calculations are included in Appendix F.

A pre-planning application was submitted to TW by WSP in September 2020 to confirm capacity for the proposed surface water rates. TW have confirmed approval of the surface water rate of 4.86l/s. Despite the rates being unchanged from the previous issue, the TW approval for the proposals has expired given the time passed since the application. Therefore, for completeness a new pre-planning enquiry has been issued to TW to confirm the capacity in the sewer for the proposed flows. TW have confirmed sufficient capacity for the proposed rates in October 2022 (ref:DS6099583), as per the approval letter within Appendix C.

All connections to the public sewer will be subject to approval by Thames Water under Section 106 of the Water Industry Act.

The above strategy only relates to the private land within the ownership boundary. There is a section of third party land, which is located outside of the site ownership boundary but within the planning application boundary and which is to be included development's landscaping proposals, in line with the Landscape Architect's design (appendix E). A separate surface water drainage network is proposed to be provided for these rainwater catchments, which will require separate connections into the Thames Water sewer at restricted rates. The owners of the adjacent land, TfL and WCC, will need to approve the design proposals and provide necessary guidance on the rate of restriction and therefore coordination with third parties will be required at the next stage of design to understand the conditions.

Refer to drawings within Appendix E for Landscape Architect's design.

6.3. Sustainable Drainage

Sustainable drainage systems will be implemented throughout the new redevelopment and will include provision for the required attenuation storage volume of 450m³ as outlined above. A mixture of green roofs, rainwater harvesting and permeable paving is proposed sitewide.

The roofs of all three blocks provide an opportunity to control surface water at source through the use of a green/brown roof system with a total area of approximately 800m². The first level basement occupies almost the entire building footprint and therefore a large proportion of the ground floor soft landscaping areas are suspended above the basement structure. These areas will therefore act similarly to green roof features, by managing water at source.

Green roofs promote biodiversity and reduce the surface water runoff by slowing down flows and retaining low intensity rainfall events. Rainwater is treated at source by intercepting the surface water runoff and therefore increasing water quality. The feature can also benefit the thermal performance of buildings, as the plants cool the roof through evapotranspiration.

There is an area south of Block K which is located outside of the basement extent line and is considered an opportunity area for permeable block paved landscaping areas. The permeable paving will manage and treat surface water runoff from a section of the paved areas by means of sloping the hardstanding towards the block paving.

This area currently spans across both private and third-party land and, based on the landscape architect design, it is proposed that the landscaping aesthetically merges across the ownership boundary line. The sitewide drainage network is not proposed to drain public land as all third-party areas will be served via a separate system as noted above. Therefore, the feasibility of incorporating permeable paving in this area will ultimately depend on the final landscaping design and how much these areas will connect. If in detailed design it emerges that the area that can be used for the permeable paving is very small and will only serve a small catchment, then there may be little benefit with regards to the treatment of rainwater and therefore the incorporation of permeable paving may be disregarded.

Permeable pavements store water temporarily beneath the overlying surface before discharge to the sewer system. Permeable pavement construction is an effective means of managing runoff close to the source, intercepting runoff, reducing volume and frequency of runoff, and providing a treatment medium. Permeable

pavements are proven as an effective treatment medium for silt and hydrocarbons typically found in surface water runoff from road areas, through processes that occur on the stone surface and geotextile membranes.

An opportunity for close to source attenuation in the form of blue roofs has been recognised within the podium areas, provided there is sufficient pavement build up above the ground floor slab available to incorporate a shallow blue roof attenuation tank. The inclusion of attenuation at podium level will allow for the shallow surface water runoff from podium areas to bypass the attenuation tank at basement level and avoid being pumped.

A blue roof is a void layer on a roof, explicitly designed to store and control water. The implementation of blue roofs controls peak runoff rates, slowing the rate of discharge into the below-ground network. However, like below ground storage tanks, they do not reduce overall volumetric release. Orifice plates are fitted on the outgoing pipe network, routing runoff into the below ground network at a gradual release.

Rainwater harvesting is proposed to be used for irrigation through the use of a harvesting system and filter within water storage tanks at basement level. These will be separate from the below ground attenuation tanks proposed below basement slab for rainwater storage. Refer to M&E Engineer's design for further information.

Even with the implementation of 'at source' SuDS features within the development, achieving the restricted runoff rates for a development's catchment generates a requirement for storing large volumes of runoff in a controlled manner to prevent flooding within site. Given the basement extent of the site, attenuating the volumes in below-ground storage is the only practical method by which one can manage runoff effectively. It is proposed that the attenuation storage tank will be located below basement B1 slab and pumped up to ground level at restricted rates.

The interception of surface water runoff by pervious pavements, catch-pits and trapped gullies/channels will limit suspended sediments entering the below-ground storage tanks, reducing blockage risk.

Outfall points for the new private surface water system will be established into the Thames Water combined water sewer in Newcastle Place and are shown on the drainage drawings provided in Appendix D.

Bioretention systems in the form of rain gardens are proposed within the wider planning application boundary area to the east of Block K in the locations of the existing underpass, which will collect and treat runoff from adjacent hard landscaping areas prior to discharge into the sewer system. As noted above, the design and requirements for the works outside of the ownership boundary will require further coordination with the relevant authorities at the next stage of design.

6. 4. Impact of Climate Change

As outlined by the Environmental Agency Flood Risk Assessment Guidance all flooding and drainage impact assessments must include an appropriate allowance to account for the impact of climate change over the life of the development.

In accordance with this guidance the design of the surface water system will consider the 40% (upper end) allowance to assess the impact of climate change over the life of the development.

6. 5. Impact of Urban Creep

The proposed development does not include provision for private garden areas for which a resident would hold rights to alter these over time, hence there is no risk of increased impermeable areas being brought forward throughout the life of the development.

The onsite surface water system does not accommodate any additional offsite surface water flows at risk of increasing over time, due to upstream urban creep.

Therefore, the impact of urban creep is considered to be negligible and hence has not been factored into the surface water calculations.

6. 6. Surface Water Quality

Appropriate treatment has been incorporated into the surface water drainage system through the use of SuDS based on the principles of the SuDS management train, to ensure that the surface water quality is acceptable when discharged to the receiving TW sewer. The CIRIA SUDS Manual outlines practical guidance on methods for measuring and managing pollution risks. The risk posed by surface water runoff to the receiving environment is a function of:

- The effectiveness of SUDS treatment components and underlying soils
- The sensitivity of the receiving environment
- The pollution hazard at a particular site

The risk level associated with a particular development site can be attributed to the land use activities on the site. The pollution risk associated with surface water draining into the below ground network can be attributed to the land use classifications per CIRIA SUDS Manual, Table 4.3.

For residential roofs' the pollution hazard level is 'very low' therefore the removal of gross solids and sediments would be considered adequate. It is proposed that a series of catchpit manholes below ground are used to collect gross solids and residues such as silt and debris. It is recommended that these elements be maintained as per Appendix G of this report to ensure they perform at the required level.

Where possible, hard-standing areas will be drained directly onto adjacent permeable paving, soft landscaped areas or alternatively towards trapped road gullies to provide initial gross silt and debris removal before discharge into the below ground network.

The Site Surface Water system has been designed in accordance with SuDS Management Train outlined in the CIRIA SuDS Manual (section 26.8). Surface water mitigation measures will be implemented via SuDS features in order to reduce the surface water pollution hazard indices discharging from our site to combined sewer network.

CIRIA SuDS Manual Table 26.2 'Pollution hazard indices for different land use classifications' provides guidance on the potential pollution hazard level from surface water based on its source. The table assesses the pollution hazard indices based on the catchment's land use and details the indicative mitigation indices for surface water discharge that the proposed SuDS features could achieve.

It is noted that the indicated mitigation indices noted on Table 26.2 are only delivered by the SuDS component so long as they are constructed and maintained in line with CIRIA guidance. Section 8 of this report outlines the minimum operation and maintenance requirements across the site.

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Car Park/Low traffic Road (including general access roads)	Low	0.5	0.4	0.4
Residential Roofs	Very Low	0.2	0.2	0.1
Type of Suds Component		**Mitigation Indices**		
		TSS	**Metals**	**Hydrocarbons**
Permeable Paving and Blue roof		0.7	0.6	0.7
Bioretention System		0.8	0.8	0.8

Table 2 – Pollution Hazard Indices/SuDS Mitigation Indices for discharge to surface waters, Ref CIRIA SuDS Manual 2015, Table 26.2, Table 26.3

6.7. Exceedance Flow Routes

The impact of exceedance events and their corresponding flow routes have been assessed. Figure 3 below shows the expected routes of flow. The arrows refer to the direction of surface water runoff from external ground floor areas within the ownership boundary, based on the landscape architect's proposed levels design.

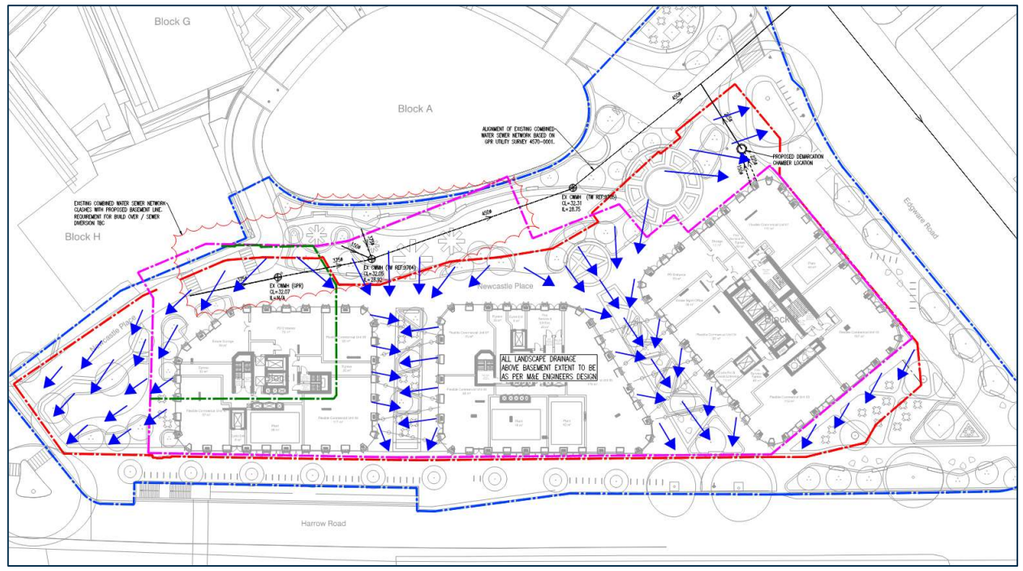


Figure 3 – Exceedance Flow Routes

During an exceedance event, surface water runoff from external landscaping will generally flow from north to south towards Harrow Road where it will collect in the carriageway and follow the existing topography. This demonstrates that post development overland flows will direct runoff flow to Harrow Road as per the existing scenario. All landscape levels will be directed away from building entrances.

A full exceedance flow routes plan has been provided in Appendix F.

7. Foul Water Drainage Strategy

In accordance with BS EN 16933-2:2017 and Building Regulations Part H, a new site wide foul water network will be provided for the sanitary disposal of foul water generated by the development.

All foul drainage from the upper levels of each block will drop below the structural slab at ground level where it is routed under gravity into the new foul connections into site-wide foul network.

All of the blocks share a double level basement, with the first level consisting of car parking facilities and plant equipment and the lower basement level comprising of a small refuse holding area. Despite the being covered, gullies will be incorporated to drain wash down runoff and a by-pass separator will be provided to address the pollution risk from car parking areas. Basement level drainage will be pumped and will provide 24 hour storage and a full back-up pump system in accordance with Building Regulations Part H.

It is proposed to discharge all foul water via demarcation chambers and through new connections to the 450mm Thames Water combined water sewer within the Newcastle Place carriageway north of the site.

A non-return valve is proposed at the outgoing pipe to prevent surcharged sewer water from backing up into the onsite below ground foul water network.

A pre-planning application was submitted to TW by WSP in September 2020 to confirm capacity for the proposed foul water rates, to which TW confirmed approval. Despite the number of residential and commercial unit mix being similar to the previous issue, the TW approval for the proposals has expired given the time passed since the application. Therefore, for completeness a new pre-planning enquiry has been issued to Thames Water to confirm the capacity in the sewer for the proposed foul flows. TW have confirmed sufficient capacity for the proposed rates in October 2022 (ref:DS6099583), as per the approval letter within Appendix C.

All connections to the public sewer will be subject to approval by Thames Water under Section 106 of the Water Industry Act.

Foul effluent is generated from a mixture of residential units and commercial space. The calculated peak foul water flow has been estimated as 30.9 l/s, based on the following:

- 556 no. unit; est. population of 2051 persons at 220 l/person/24hr (x6 ‘dry weather’ peak flow factor)
- 1079m² commercial (retail) space at an estimated 20l/year/employee discharge over 8hrs (x4 ‘dry weather’ peak flow factor)

Refer to drainage strategy drawings in Appendix E for the foul drainage layout.

8. Third Party Consultation

8. 1. Thames Water Utilities Ltd (TW)

A pre-planning enquiry submitted by WSP in September 2020 to confirm capacity for the proposed foul and surface water rates was approved by TW. The proposals to restrict flows to greenfield runoff of 4.86l/s is unchanged, however the TW approval for the proposals has expired given the time passed since the application. Therefore, for completeness a new pre-planning enquiry has been issued to Thames Water to confirm the capacity in the sewer for the proposed foul and surface water flows. TW have confirmed sufficient capacity for the proposed rates in October 2022 (ref:DS6099583), as per the approval letter within Appendix C.

All new proposed permanent connections to the public sewer will require consent under Section 106 of the Water Industry Act 1991. Walsh will apply for Section 106 approval to Thames Water at the appropriate juncture.

As discussed in Section 5, the alignment of the existing combined sewer in Newcastle Place is currently shown to route east along the carriageway towards Edgware Road. The proposed basement line is shown to clash with a portion of the combined sewer. It is therefore expected that the combined sewer in Newcastle Place will require a divestment to a point just upstream of the existing TW manhole ref:9705.

An application to divest a section of the combined sewer will need to be approved by Thames Water, for which confirmation of the existing systems discharging to this sewer and any required diversions will need to be provided.

9. Design Criteria

9.1. Drainage Design Standards

BS EN 752:2017	Drain and sewer systems outside buildings. Sewer system management
BS EN 16933-2:2017	Drain and sewer systems outside buildings. Design. Hydraulic design
BS EN 12056-2:2000	Gravity drainage systems inside buildings. Sanitary pipework, layout & calculation

9.2. General References

CIRIA Report C753	The SuDS Manual
Water UK	Code for Adoptions
The Building Regulations Approved Document H	Drainage and waste disposal
Greater London Authority	The London Plan
National Planning Policy Framework	PPS 25 - Development and Flood Risk Practice Guide
DEFRA	Non-statutory technical standards for sustainable drainage systems

9.3. Surface Water Network Design

When designing the below ground surface water drainage network, it should be assessed against the following criteria to comply with British and European Standards BS EN 752:2017 and BS EN 16933-2:2017.

- No significant surcharging (gravity flow only) for storm flows with a 50% AEP
- No flooding within the site for storm flows with a 3.3% AEP
- No flooding off-site or flooding that would present a risk to person or property for storms with a 1% AEP.
- 40% allowance for climate change will be applied to all calculations for network design.
- The network will be checked against the effects of 40% climate change to check there is no significant flooding that could cause risk to person or property.

Based on the above assessment, the volume of storage required on site has been determined using the Micro drainage analysis software based on the following input variables.

- Storm Water Return Periods – 1 in 2, 1 in 10yr, 1 in 30y & 1 in 100 years + 40% CC
- FEH rainfall data – obtained from the Flood Estimation Handbook Service
- Site location – to determine other rainfall hyetograph characteristics.
- Pipe network volume – calculated by the automated process.
- Out flow control devices – Pump
- Coefficient of Volumetric Runoff (CV) values set to default values of 0.75 and 0.84 for summer and winter scenarios respectively

9.4. Foul Water Network Design

Foul water drainage design will be in accordance with BS EN 752:2017 and BS EN 16933-2:2017.

Flow rates will be based on the following:

- The frequency factor will be determined by the buildings use. (Table 3 BS EN 12056-2:2000)
- The volume of discharge will be determined by the number of appliances. (Table 2 BS EN 12056-2:2000)

The value of the summation of discharge units is then converted into a flow rate using where applicable cl 6.3.3 of BS EN 12056-2:2000. Where the flow rate requires the use of a sewer greater than 150mmØ, the Population Method will be used based on flows of 0.015 l/s/person. For peak flow, the maximum proportional depth is to be no more than 0.75.

Minimum gradients to achieve self-cleansing velocities will be in accordance with BS EN 16933-2:2017 NA.5.2.4. Where it is not possible to achieve self-cleansing velocities, the following table will be used.

Table NA.7 — Minimum recommended gradients for foul drains and sewers

Peak flow [l/s][a]	Pipe size [mm]	Minimum gradient[b,c,d]
<1	75	1 in 40
	100	1 in 40
>1	75	1 in 80
	100	1 in 80[e]
	150	1 in 150[f,g]

[a] Peak flows should be based on probability flow calculation methods.

[b] These gradients have been empirically demonstrated on the basis of 6 l WC flush volumes. Further research is necessary to evaluate the recommended gradients for use in systems with very low WC flush volumes.

[c] Exceptionally, where the length of drain or sewer serving a small number of properties is very long, steeper gradients may be required.

[d] Where ground settlement is expected, steeper gradients are recommended.

[e] Minimum of one WC connected.

[f] Minimum of five WCs connected.

[g] Exceptionally, where a 150 mm diameter pipe is used to carry flows from fewer than five WCs, the minimum gradient should be 1 in 60.

It may be possible to use flatter gradients if standards of design and workmanship are high, and where buildings are close together so that the lengths of drain or sewer are short. Exceptionally, where the length of drain or sewer serving a small number of properties is very long, steeper gradients may be required.

9.5. Provision for Maintenance

Foul drainage will be designed to promote self-cleansing velocities. The surface water system which is designed to surcharge in heavy rainfall events will reduce the likelihood of siltation. Attenuation features will

be situated with access and capability for jet cleaning. Where possible drainage infrastructure will be located in areas accessible by public roadway.

10. Operation and Maintenance Requirements

10. 1. Introduction

All below ground drainage and SUDS components on the development are to be inspected regularly and maintained to ensure design flow conditions are maintained.

A detailed operations, maintenance and health & safety manual will be produced by the Contractor/Developer as part of the project handover documents. The manual will include important information specific to the final below ground drainage system including product information, specialised maintenance requirements and Health & Safety Standards. It is expected that the manual will cover general operation, maintenance activities and their frequency.

10. 2. Maintenance Plan

The purpose of a Maintenance Plan is to ensure that the drain and sewer system is kept in such a condition that it can perform its function satisfactorily and meet the performance requirements. A maintenance plan should cover:

- Pipelines including inspection chambers, manholes and outfalls, considering the gradient and/or velocity.
- Pumping installations, according to potential risk and type of equipment.
- Overflows and detention tanks, considering storm frequency.
- Flow controls/inverted siphons, depending on risk of blockage and potential consequences.
- Separators, according to technical requirements.
- Grit chambers, gullies etc., considering storm frequency, capacity, and land use.
- Sustainable Drainage features, according to specific requirements of each feature.

Reference should be made to Section 6.0 of BS EN 752:2017 and The SuDS Manual (CIRIA) but in general maintenance activities are likely to comprise of:

1. Regular Maintenance - Litter collection, gardening to control vegetation growth, inlet checks.
2. Occasional Tasks - Checking the drainage & SuDS features and removing any silt that builds up.
3. Remedial Work - Repairing damage where necessary.

For all attenuation and rainwater harvesting systems, proprietary treatment systems, backflow prevention devices and pumps the above maintenance plan is to be read in conjunction with any specific inspection and maintenance requirements set by product manufacturers.

The Maintenance Plan shall consider any site specific and special circumstances including:

- Special inspection and immediate appraisal may be required in the event of a structural accident, fire, flooding, reported structural distress or suspected inadequacy.
- It is recommended that in situations where an expected severe storm is to hit that all gullies, drainage channels and manhole sumps are cleared of any debris material.
- Refer to the manufactures of all attenuation systems and flow control devices for their specific inspection regime requirements for their products.
- All inspections should be carried out by the appropriate persons and they should be confined space trained if entering below ground structures such as manholes or attenuation tanks.

It is recommended that the above Below Ground Drainage Maintenance Plan be adopted and undertaken for the development and incorporated into the wider Integrated Operations and Management Plan for the entire development and overseen by suitable facilities management personnel.

A Maintenance Plan has been included in Appendix H of this report, for inclusion with the Contractor/Developer's detailed operations, maintenance, and health & safety manual.

11. Summary & Conclusion

This report contains a site-specific drainage and SuDS strategy for the development known Paddington Green Police Station located in Paddington, London.

This report has been produced to support the linked planning application pursuant to the Paddington Green Police Station site.

New independent foul and surface water drainage networks will be provided to serve the development site.

The surface water strategy proposes the discharge of all runoff to the public combined water sewer via a new direct connection. Infiltration and discharge into a watercourse were both discounted at the early design stages due to the impermeable underlying strata and distance to a suitable watercourse.

Surface water discharge rates will be restricted to the QBar100 Greenfield run off rate, a maximum rate of 4.86l/s for the 1 in 100-year (1% AEP) including 40% climate change event.

Through an assessment of the site constraints and layouts, site specific SUDS features have been implemented into the drainage design to manage and control the resulting attenuation volumes, for all storms up to and including the 1 in100yr (1% AEP) + 40% CC event. A required storage volume of 450m³ has been calculated in order to reduce the peak flow rate to the greenfield runoff rate of 4.86l/s.

SUDS in the form of green roofs, rainwater harvesting, permeable paving and attenuation tanks have been identified to be implemented across the site.

All drainage and SUDS features will be privately maintained by the Client's appointed site maintenance Contractor.

Foul water will discharge to the 450mm Thames Water combined water sewer running along the Newcastle Place carriageway to the north of the site.

The relevant Thames Water consent will be obtained prior to construction.

Appendix A **Site Information & Layouts**

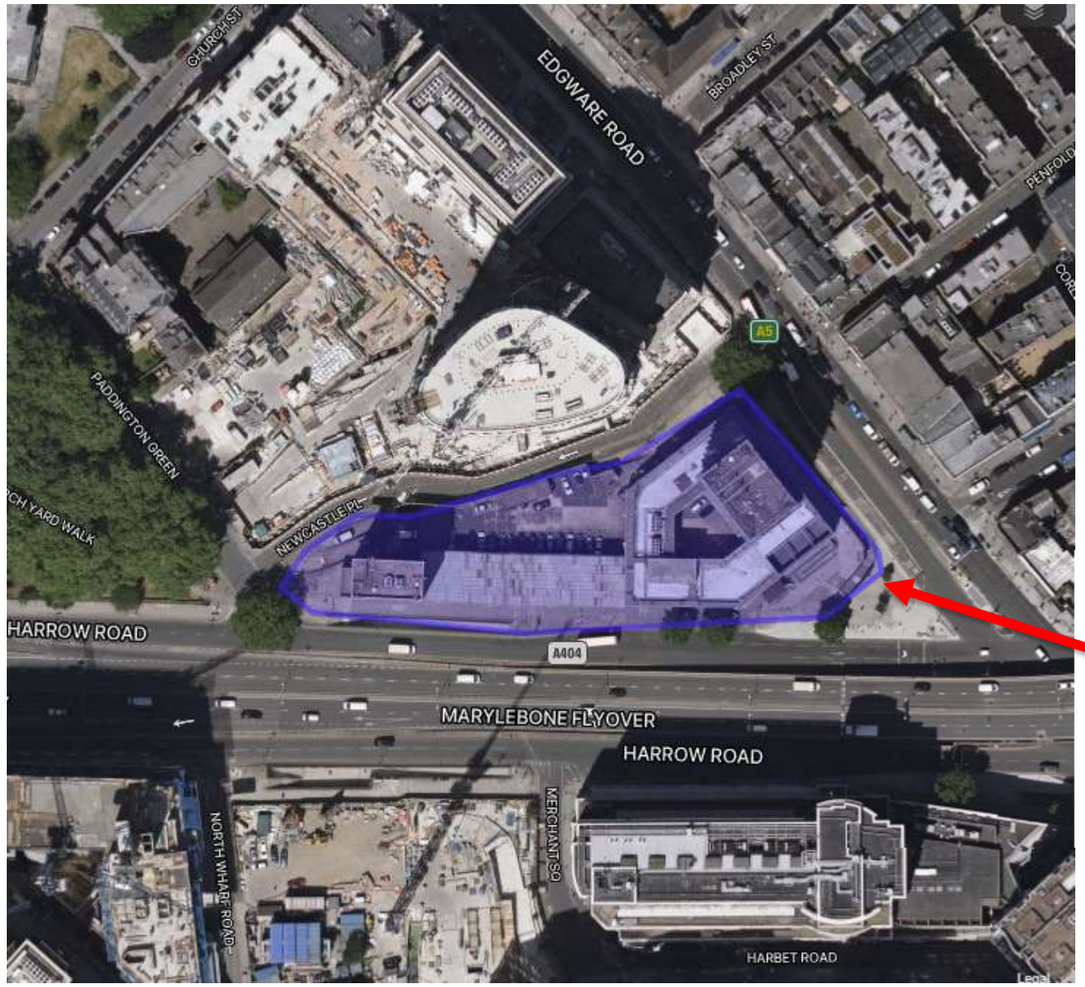
Walsh
walsh.co.uk

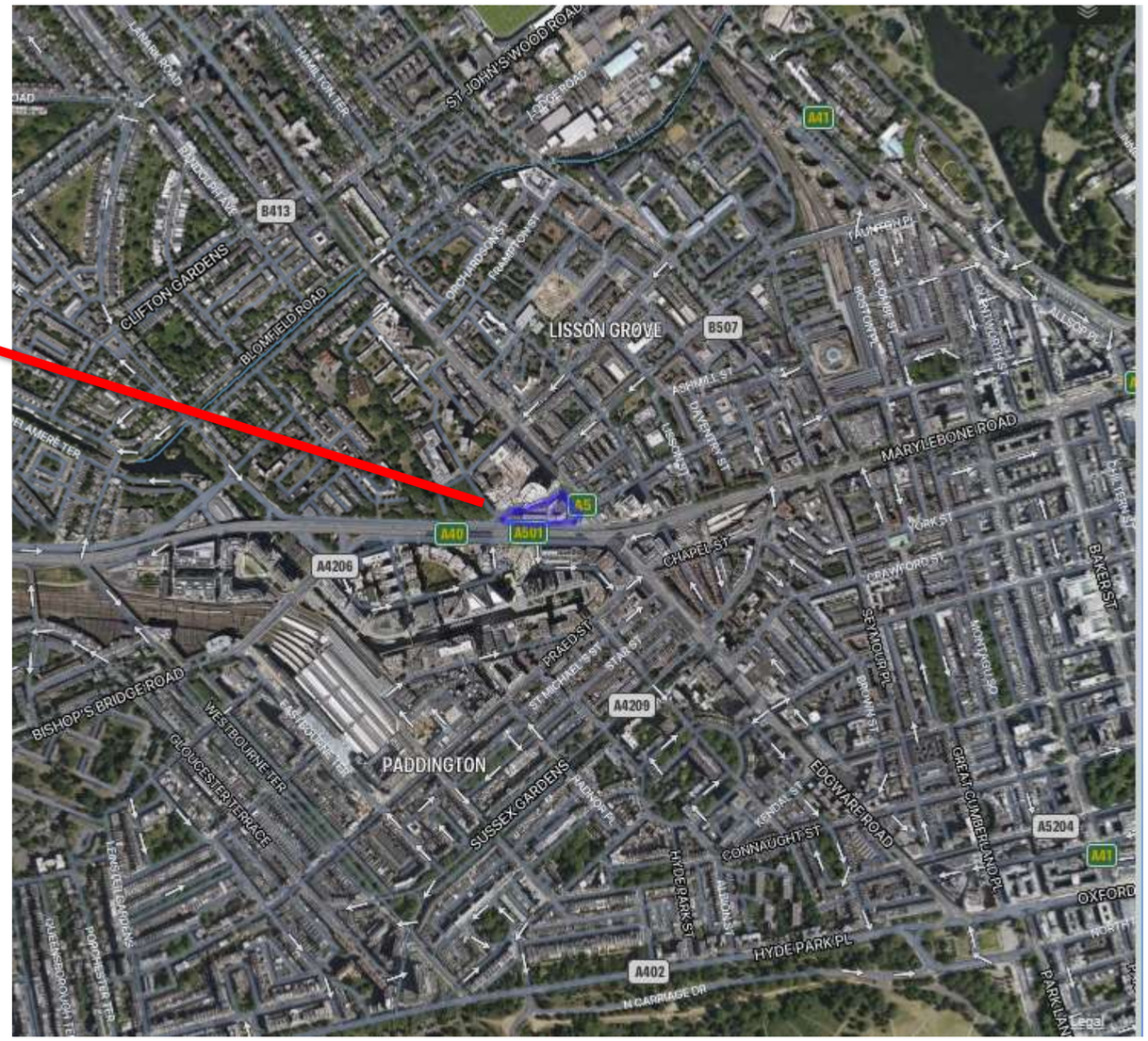
+44 (0) 20 7089 6800
london@walsh.co.uk

32 Lafone Street,
London, SE1 2LX

Location Plan

Paddington Green Police Station, Paddington, London



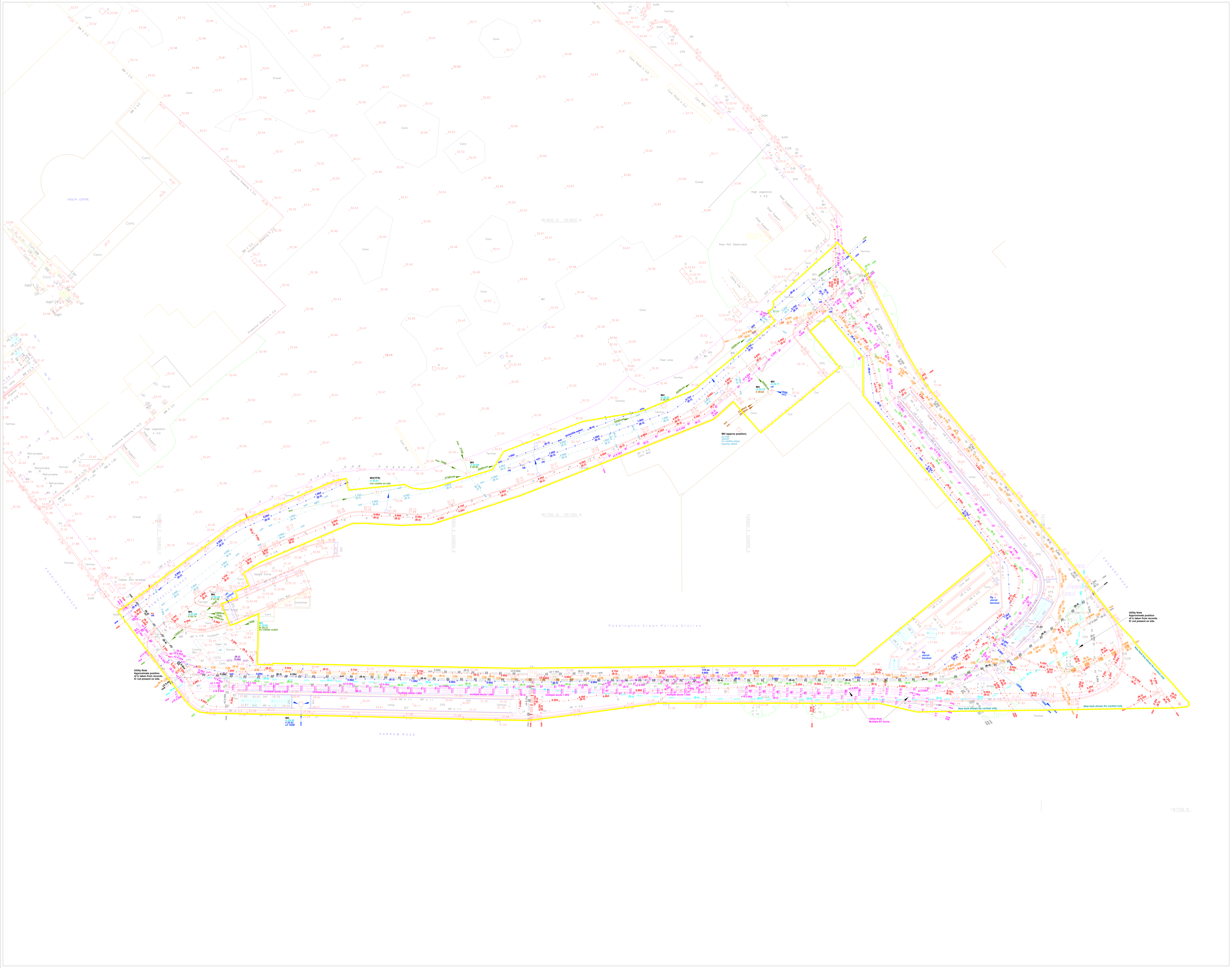


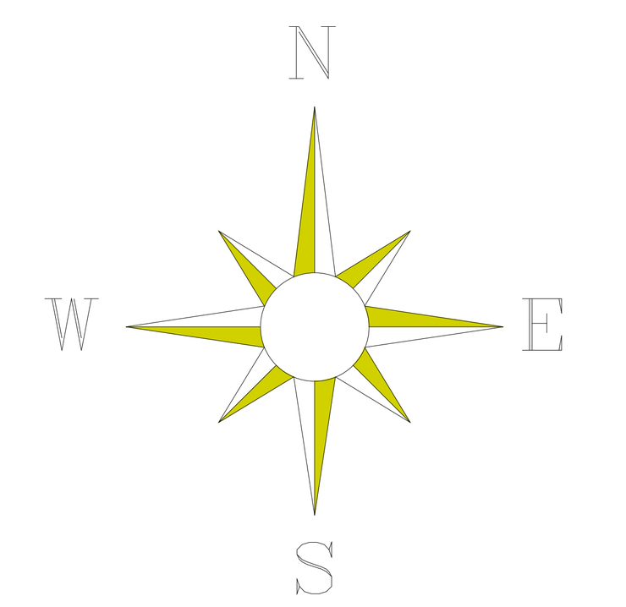
Appendix B **Record and Survey Information**

Walsh
walsh.co.uk

+44 (0) 20 7089 6800
london@walsh.co.uk

32 Lafone Street,
London, SE1 2LX





KEY FOR UNDERGROUND SERVICES

Foul water	
Surface water	
Other	
Gas	GAS
Electric	E
Telephone	BT
Cable TV	CATV
Unidentified	U
Water	W
Closed Circuit TV	CCTV
Communications	COM
Heating Pipe	HP
Empty Duct	ED
Fibre Optics	FO
Vents	V
Pipe	PIPE
Traffic Signal	TS
Gauge Lines	G
Vapor Recovery	VR
Offsets	O
Fuel	F

Where chamber extents are significantly greater than the cover size, their approximate extents are shown thus;

ABBREVIATION KEY

AR	assumed route	PTG	pipe to ground
BD	base bend	PTS	pipe to surface
BD	backdrop	RE	rodding eye
BL	bed level	RWP	rainwater pipe
CL	cover level	SV	stop valve
CR	cable riser	SVP	soil vent pipe
DP	down pipe	TE	trapped exit
EOT	end of trace	TFR	taken from records
EP	electricity pole	TP	telegraph pole
FH	fire hydrant	UTF	unable to find
G	gully	UTL	unable to lift
GV	gas valve	UTS	unable to survey
HOR	head of run	UTT	unable to trace
HL	high level	VP	vent pipe
IC	inspection chamber	WL	water level
IL	invert level	WM	water meter
MH	manhole	WO	wash out valve
PR	pipe riser	D	depth

UTILITY SURVEY NOTES

ELECTROMAGNETIC AND/OR GROUND PENETRATING RADAR TECHNIQUES HAVE BEEN USED TO LOCATE AND MAP UNDERGROUND UTILITIES AND FEATURES ON THIS DRAWING. MAPMATIC HAVE MADE EVERY ENDEAVOUR TO MAKE SURE THAT THE INFORMATION CONTAINED WITHIN THIS DRAWING IS ACCURATE AND OF THE HIGHEST QUALITY. HOWEVER, THE RESULTS FROM THESE TYPES OF SURVEYS ARE NOT INFALLIBLE AND SHOULD THE LOCATION OR DEPTH OF SERVICES/FEATURES BE OF PARTICULAR IMPORTANCE TO A PROJECT, THEN IT IS STRONGLY ADVISED THAT TRIAL EXCAVATIONS SHOULD BE UNDERTAKEN TO CONFIRM SURVEY RESULTS.

MAPMATIC HAVE USED ALL RECORD DRAWINGS THAT WERE AVAILABLE TO US BY THE CLIENT OR BY THE STATUTORY UTILITY PROVIDERS AT THE TIME OF THE SURVEY. ANY INFORMATION TAKEN FROM THESE DRAWINGS (IE PIPE SIZES, MATERIAL) IS NOT GUARANTEED. SERVICES LOCATED FROM RECORD DRAWINGS WILL BE SHOWN AND ANNOTATED AS TAKEN FROM RECORDS (TFR). HISTORIC RECORD INFORMATION IS OFTEN INCOMPLETE/INACCURATE AND CANNOT BE RELIED UPON.

A SINGLE LINE INDICATING A UTILITY MAY INDICATE THE PRESENCE OF MULTIPLE SERVICES WITHIN CLOSE PROXIMITY TO EACH OTHER. WHERE A SINGLE LINE TYPE IS SHOWN WE RECOMMEND HAND DIGGING WITHIN 0.5m, TO EXPOSE HIDDEN SERVICES.

WHERE QUOTED, DEPTH INFORMATION OF UNDERGROUND SERVICES/FEATURES IS STATED. DEPTHS ARE GENERALLY +/- 10% ACCURATE, BUT CANNOT BE GUARANTEED. ANY DEPTHS SHOWN ARE USUALLY TO THE TOP OF THE SERVICE/FEATURE. GRAVITY SEWERS AND DRAINS ARE USUALLY TO INVERT (BASE OF DRAINAGE CHANNEL) UNLESS OTHERWISE STATED.

AT MAPMATIC WE USE SKILLED STAFF AND MODERN CALIBRATED EQUIPMENT TO PERFORM OUR SURVEYS. HOWEVER, THE COMPLETENESS OF ANY UNDERGROUND SURVEY CANNOT BE 100% GUARANTEED AND WE CANNOT BE HELD RESPONSIBLE FOR ANY INACCURACIES BEYOND THOSE THAT COULD BE REASONABLY EXPECTED BY A COMPETENT COMPANY.

CONTRACTORS UTILIZING OUR DRAWINGS FOR INTRUSIVE WORK SHOULD TAKE ALL REASONABLE MEASURES TO WORK SAFELY IN ACCORDANCE WITH HSG47 GUIDELINES "AVOIDING DANGER FROM UNDERGROUND SERVICES".

SITE SPECIFIC NOTES-

THE SURVEY AREA IS INDICATED ON THE DRAWING WITHIN THE LAYER UG-SURVEY BOUNDARY.

TOPOGRAPHICAL DRAWING WAS SUPPLIED BY A THIRD PARTY, THEREFORE MAPMATIC ACCEPTS NO RESPONSIBILITY FOR THE ACCURACY OF THIS SURVEY. SECTIONS OF KREB LINE WITHIN THE SURVEY AREA HAVE CHANGED SIGNIFICANTLY SINCE THE PREVIOUS SURVEY WAS CARRIED OUT. THESE SECTIONS OF KREBS HAVE BEEN MEASURED IN FOR CONTEXT BUT ARE NOT TO BE TREATED AS ACCURATE.

ANY SERVICE WITH B-4 IS TO BE USED AS A GUIDE ONLY AND IS NOT TO BE TREATED AS ACCURATE.

MAPMATIC WOULD STRONGLY RECOMMEND HAVING A CCTV SURVEY OF ALL DRAINAGE WITHIN THE SURVEY AREA TO OBTAIN A MORE COMPLETE PICTURE INCLUDING LATERAL CONNECTIONS AND INACCESSIBLE/BURIED MANHOLES.

WITHIN THE PATH ADJACENT TO THE POLICE STATION THERE ARE SOME DUCTS WITH FIBRE OPTIC CABLES WHICH COULD NOT BE LOCATED USING RADIO DETECTION OR GROUND PENETRATING RADAR. A FLEXI TRACE WAS USED TO MAP THE DUCTS AS FAR AS POSSIBLE TO AN END OF TRACE, THE ROUTE THEREAFTER HAS BEEN TAKEN FROM RECORDS AND IS TO BE USED AS A GUIDE ONLY.

WATER THROUGHOUT THE SITE IS POLYETHYLENE AND COULD NOT BE LOCATED USING RADIO DETECTION. IT HAS BEEN PARTIALLY LOCATED USING GROUND PENETRATING RADAR AND THE SECTIONS WITH A HIGH CONGESTION OF OTHER SERVICES WHERE IT WAS NOT POSSIBLE TO LOCATE WITH THE GROUND PENETRATING RADAR IT HAS BEEN ADDED FROM STATUTORY RECORDS.

DUE TO THE NATURE OF THE SURVEY AREA THERE IS AN EXTREMELY HIGH POSSIBILITY OF COMING ACROSS OLD DISUSED AND DISCONNECTED SERVICES DURING EXCAVATION.

Ordnance Survey information is provided for a guide only.
OS BUILDING OUTLINE
OS DETAIL

Station	Easting (m)	Northing (m)	Level (m)
1			
1			
1			
1			
1			
1			
1			
1			

REV	DATE	DESCRIPTION OF WORK	SURVEYOR	CHECKED BY

MAPMATIC
MEASURED SURVEYS

SETTING OUT M UTILITY SURVEYS M CAMERA SURVEYS M FLOOD RISK ASSESSMENT
AERIAL PHOTOGRAPHY M EARTHWORK CALCULATIONS M MEASURED BUILDING SURVEYS M TOPOGRAPHICAL SURVEYS

Mapmatic, Suite 1, Woburn House, South Street, Vernon Gate, Derby, DE1 1UL
Tel: 01332 650 580 www.mapmatic.com Email: info@mapmatic.com

CLIENT
RGI
Surveys

PROJECT
Paddington Green
Edgeware Road
London W2 1BB

TITLE
Utility
Survey

Scale	1: 200@A0	Date	14.09.2021
Drawn	CL	Checked	TH
Level datum	GNSS	Grid orientation	GNSS
Job number	4570	Revision	0
Drawing no.	0001	Sheet	1 of 1

Notes:

All critical measurements should be checked on site prior to design. No liability will be taken for this plan if passed onto 3rd parties. Trees and other survey data may be omitted due to dense vegetation. Some services may have been omitted due to parked vehicles and vegetation. Please note the drainage information has been ascertained by visual inspection from the surface and therefore values are estimated.

This survey has been orientated to the Ordnance Survey (OS) national grid via a Global Navigation Satellite System (GNSS) and the OS Active Network (OS NET). A true OSGB36 coordinate has been established near to the site centre via a transformation using the OSTN15 & OSGM15 transformation models. The survey has been correlated to this point and a further one or more OSGB36 points established to create a true OS bearing for angle orientation. No scale factor has been applied to the survey therefore the coordinates shown are arbitrary and not true OS coordinates.
Please refer to the survey station table to enable establishment of the on-site grid.

RICS ICES

Asset Location Search

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0845 850 2777
Email: developer.services@thameswater.co.uk

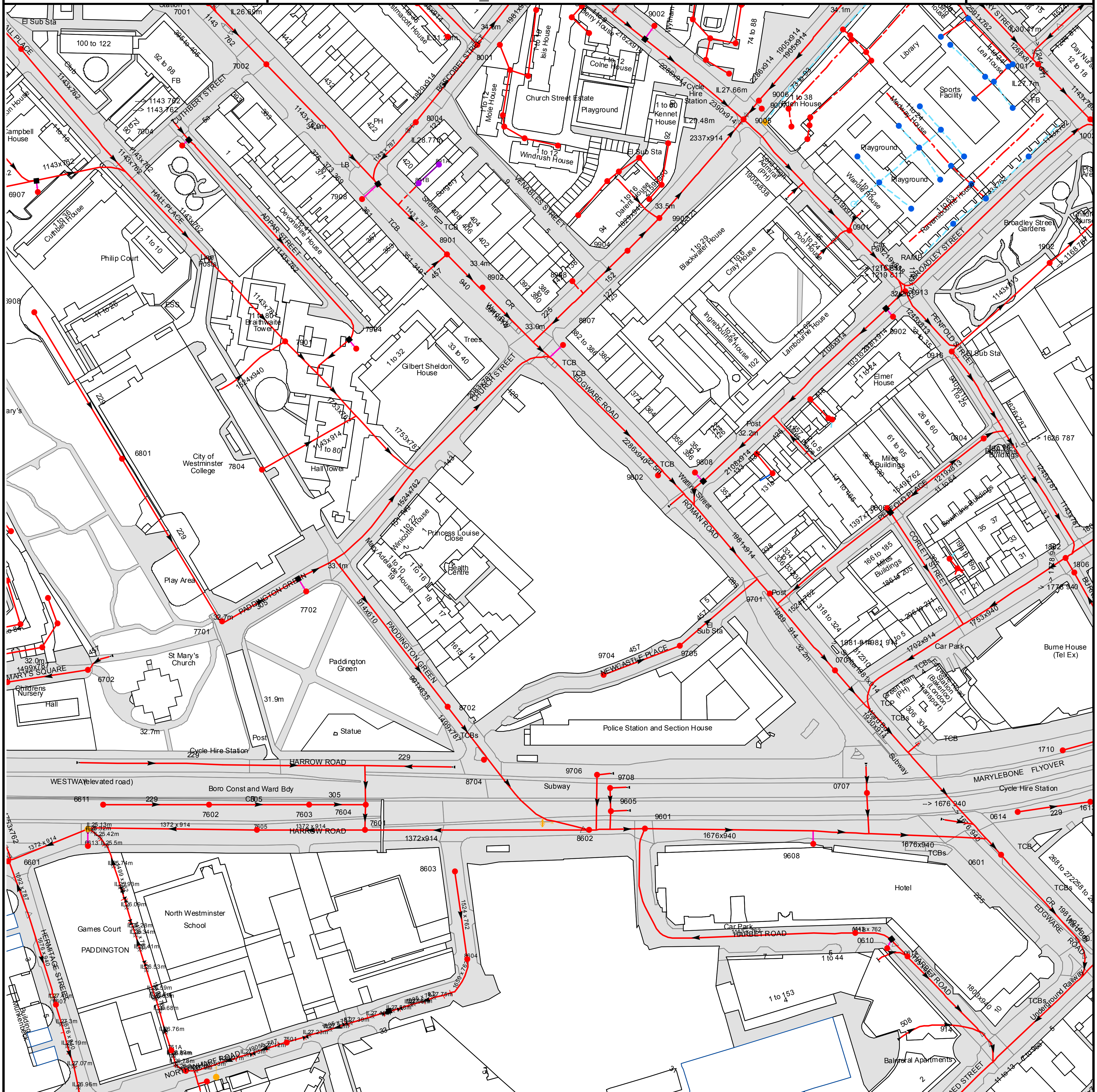
Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0845 850 2777
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2014_2898724



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 526879,181815

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.

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
0804	31.96	28.25
00CH	n/a	n/a
09BI	n/a	n/a
00CG	n/a	n/a
00CF	n/a	n/a
00CJ	n/a	n/a
00CE	n/a	n/a
09CA	n/a	n/a
1001	32.99	29.69
1902	32.71	27.34
1002	32.52	n/a
1806	n/a	n/a
08BD	n/a	n/a
08BC	n/a	n/a
1802	32.34	26.94
0806	n/a	n/a
061A	n/a	n/a
0610	n/a	n/a
0601	30.89	25.65
0614	n/a	29.37
1613	n/a	28.96
0707	n/a	26.56
1710	n/a	29.64
00BD	n/a	n/a
09CH	n/a	n/a
09DC	n/a	n/a
00AJ	n/a	n/a
00BE	n/a	n/a
09CG	n/a	n/a
0902	n/a	n/a
00CB	n/a	n/a
0913	32.31	28.51
09DB	n/a	n/a
09CF	n/a	n/a
00CA	n/a	n/a
09DA	n/a	n/a
00BJ	n/a	n/a
00CC	n/a	n/a
00CI	n/a	n/a
09CB	n/a	n/a
0916	32.48	27.72
09BH	n/a	n/a
09CJ	n/a	n/a
00CD	n/a	n/a
09CC	n/a	n/a
00DA	n/a	n/a
99AH	n/a	n/a
99BA	n/a	n/a
99BB	n/a	n/a
9002	n/a	n/a
99BC	n/a	n/a
90DA	n/a	n/a
90CI	n/a	n/a
90CE	n/a	n/a
90CD	n/a	n/a
90CJ	n/a	n/a
90CC	n/a	n/a
90CB	n/a	n/a
9005	33.7	29.36
9006	n/a	n/a
9007	n/a	n/a
90BA	n/a	n/a
90BF	n/a	n/a
90AJ	n/a	n/a
90BB	n/a	n/a
90BC	n/a	n/a
90BD	n/a	n/a
00BB	n/a	n/a
00BA	n/a	n/a
8702	32.02	27.85
9704	n/a	29.21
0701	31.69	26.9
9705	n/a	28.4
7701	32.49	30.01
9701	n/a	n/a
7702	32.8	n/a
9802	32.45	n/a
98BI	n/a	n/a
9808	32.54	n/a
7804	n/a	30.39
98BJ	n/a	n/a
08AH	n/a	n/a
08AJ	n/a	n/a
98AE	n/a	n/a
7904	n/a	n/a
8907	32.94	n/a
7901	n/a	28.3
8902	33.27	28.37
8908	n/a	n/a
8901	33.47	28.53
9904	33.28	30.36

Manhole Reference	Manhole Cover Level	Manhole Invert Level
0901	32.53	28.78
9902	33.45	30.13
89AJ	n/a	n/a
99BD	n/a	n/a
7908	33.78	n/a
7507	n/a	n/a
7501	30.82	27.17
8604	30.87	28.02
061B	n/a	n/a
8603	31.15	28.37
9608	n/a	n/a
7601	n/a	26.33
8602	n/a	n/a
7605	n/a	n/a
9601	n/a	26.55
9605	n/a	30.1
7604	n/a	26.57
7603	n/a	29.68
7602	n/a	29.92
9708	n/a	30.4
9706	n/a	29.41
8704	n/a	n/a
7002	34.46	29.13
8004	34.47	31.35
891B	n/a	n/a
891A	n/a	n/a
80BD	n/a	n/a
8001	34.64	31.07
80CA	n/a	n/a
80CD	n/a	n/a
80CC	n/a	n/a
80BJ	n/a	n/a
80CF	n/a	n/a
80BI	n/a	n/a
80BH	n/a	n/a
80CE	n/a	n/a
80CH	n/a	n/a
80CI	n/a	n/a
80CG	n/a	n/a
6601	n/a	24.72
6607	30.55	27.45
6613	31.33	26.98
6611	n/a	30.18
751A	n/a	26.87
7502	30.66	26.82
6704	n/a	n/a
6702	32.12	29.56
67BG	n/a	n/a
67BB	n/a	n/a
67BF	n/a	n/a
67BE	n/a	n/a
67BA	n/a	n/a
68AC	n/a	n/a
6801	33.42	30.86
6908	34.11	33.73
6907	30.49	n/a
7004	n/a	n/a
6001	34.9	29.04

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

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

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

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

Control Valve

Drop Pipe

Ancillary

Weir

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.

Outfall

Undefined End

Inlet

Other Symbols

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

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.

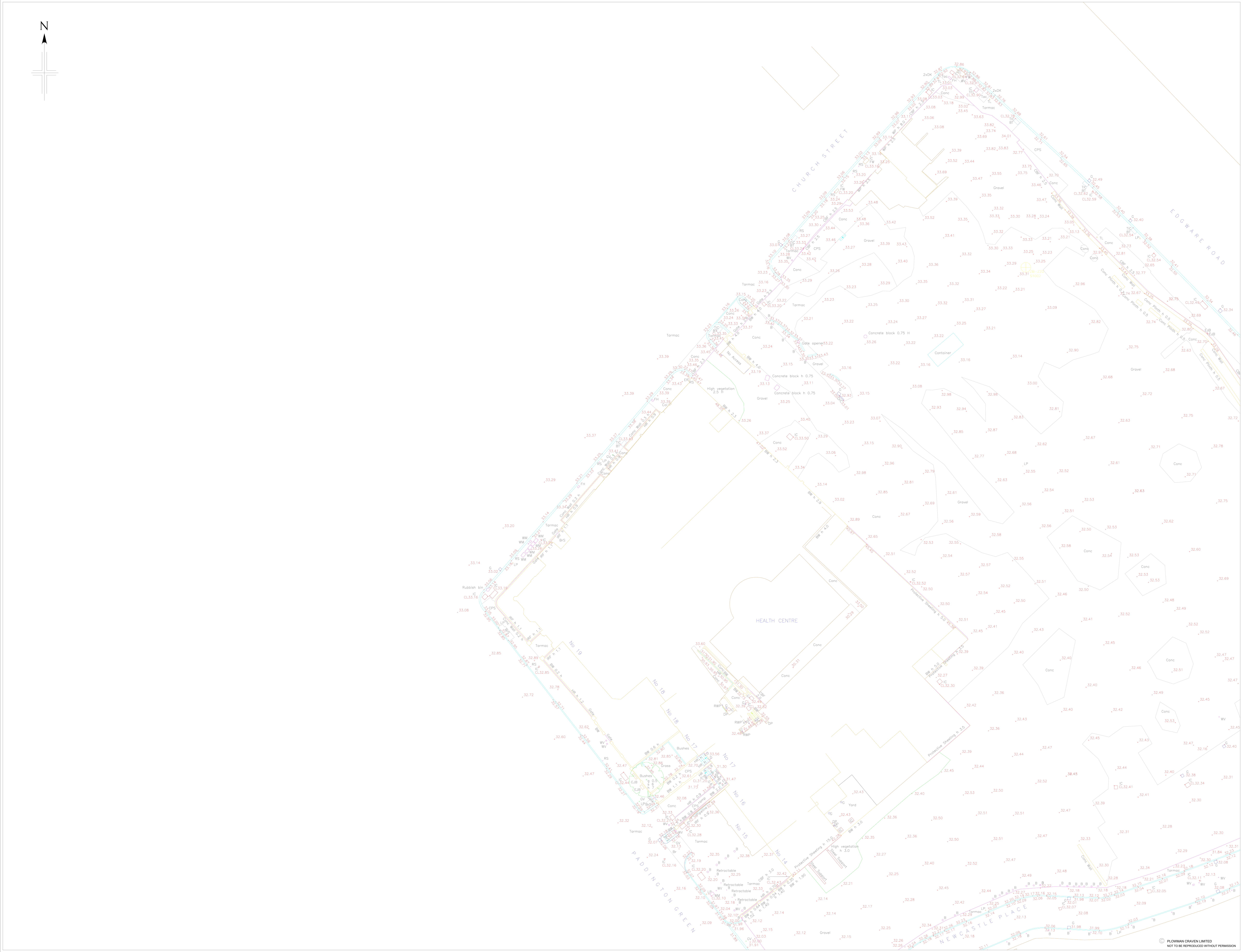
2) All measurements on the plans are metric.

3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate 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 level indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. 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 present on the plan, please contact a member of Property Insight on 0845 070 9148.



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ATM	Automated Telling Machine	LP	Lamp Post
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B	Bollard	Mb	Multibole
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GV	Gas Valve	TLCB	Traffic Light Control Box
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HR	Handrail	TP	Telephone Pole
IB	Illuminated Bollard	Typ	Typical
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IRF	Iron Railing Fence	W	Window
IRS	Illuminated Road Sign	WP	Wood panelling
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LEGEND

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ISSUES & REVISIONS

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C	Additional Data	PCL	21/04/2016

SHEET LAYOUT

34043-001T-01-1
34043-001T-01-2
34043-001T-01-3

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CLIENT

Berkeley Homes (Urban Developments) Limited

3rd Floor,
Ergon House,
Horseferry Road,
London,
SW1P 2AL

PROJECT TITLE

West End Green
London

2D Topographical Survey

SURVEYED AND DRAWN BY

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Hertfordshire
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PRESENTATION SCALE 1:200 @ A0

DATE OF ORIGINAL SURVEY 05/03/2016

PC PROJECT No.34043-001 CHECKED

DRAWING No. 34043-001T-01-1

ISSUE C

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A/C	Air Conditioner	LB	Litter Bin
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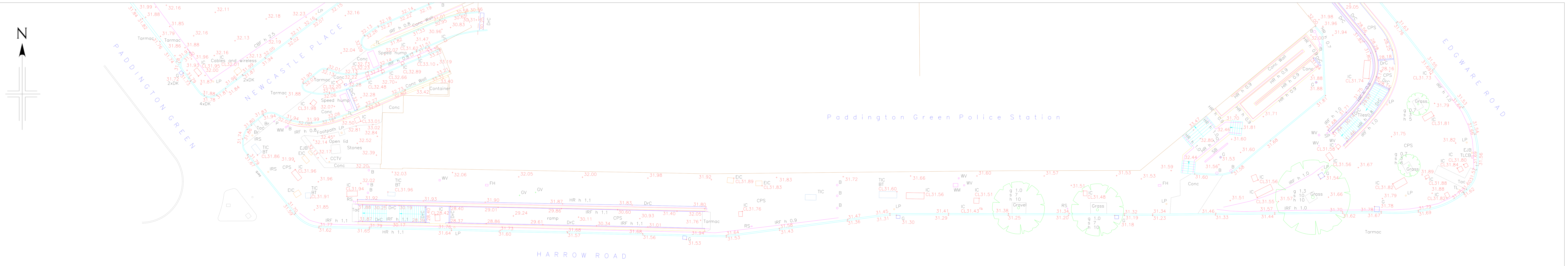
PRESENTATION SCALE 1:200 @ A0

DATE OF ORIGINAL SURVEY 05/03/2016

PC PROJECT No.34043-001 | CHECKED

DRAWING No. 34043-001T-01-1

ISSUE C



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ISSUE C