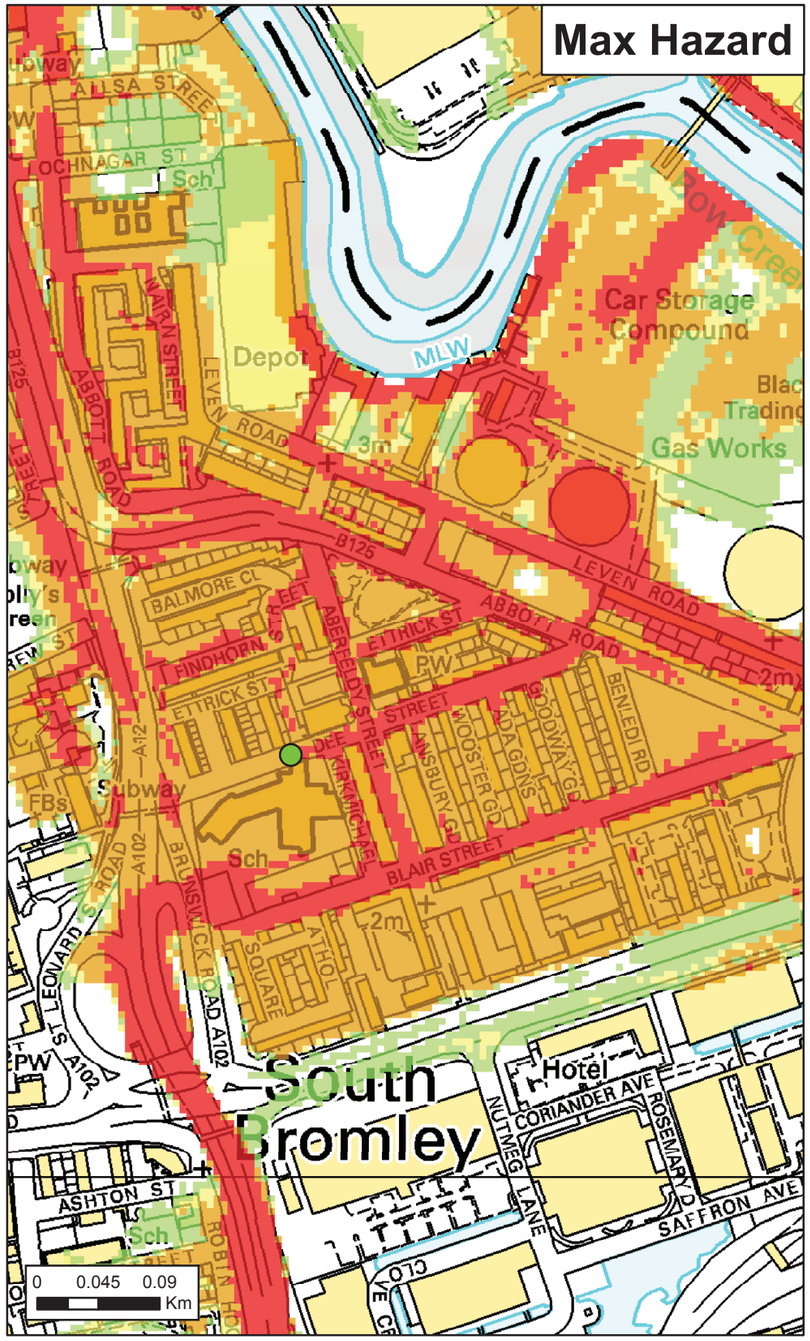
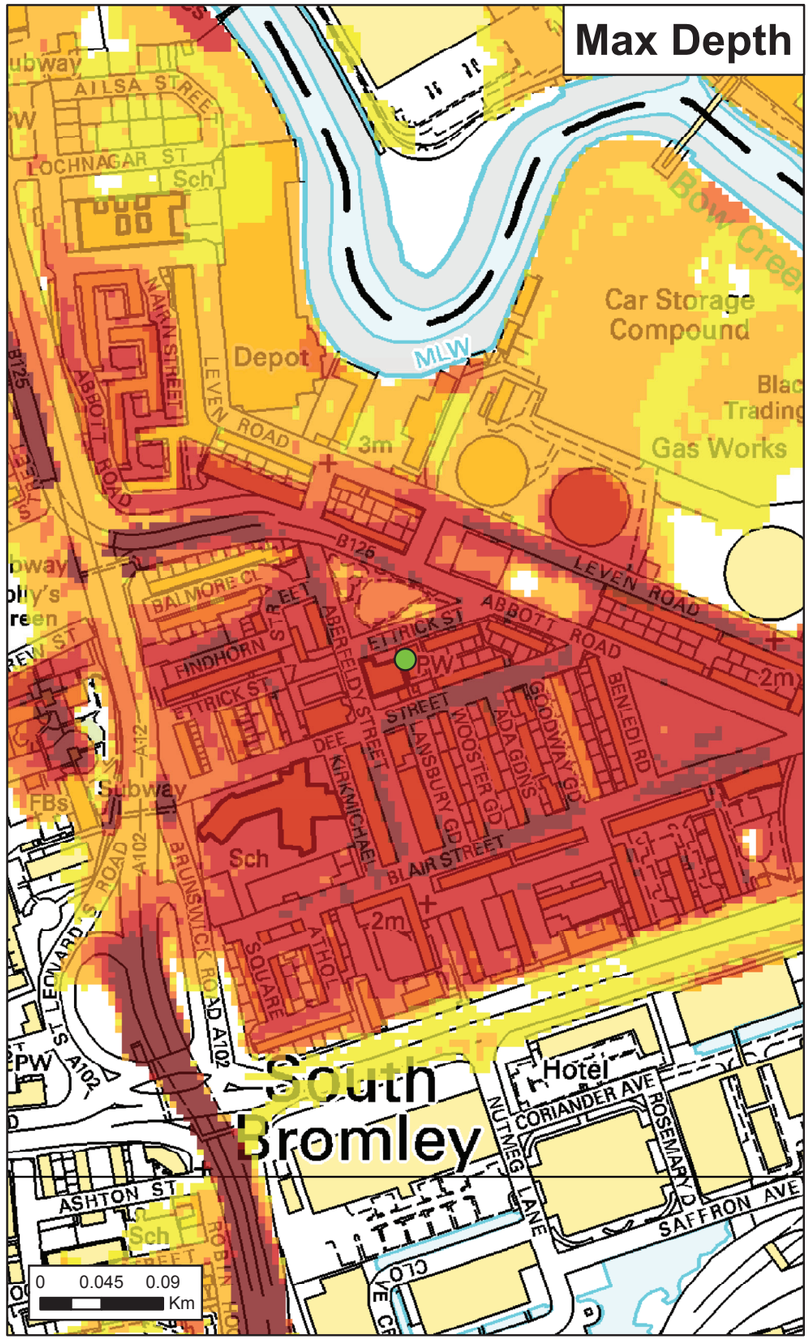
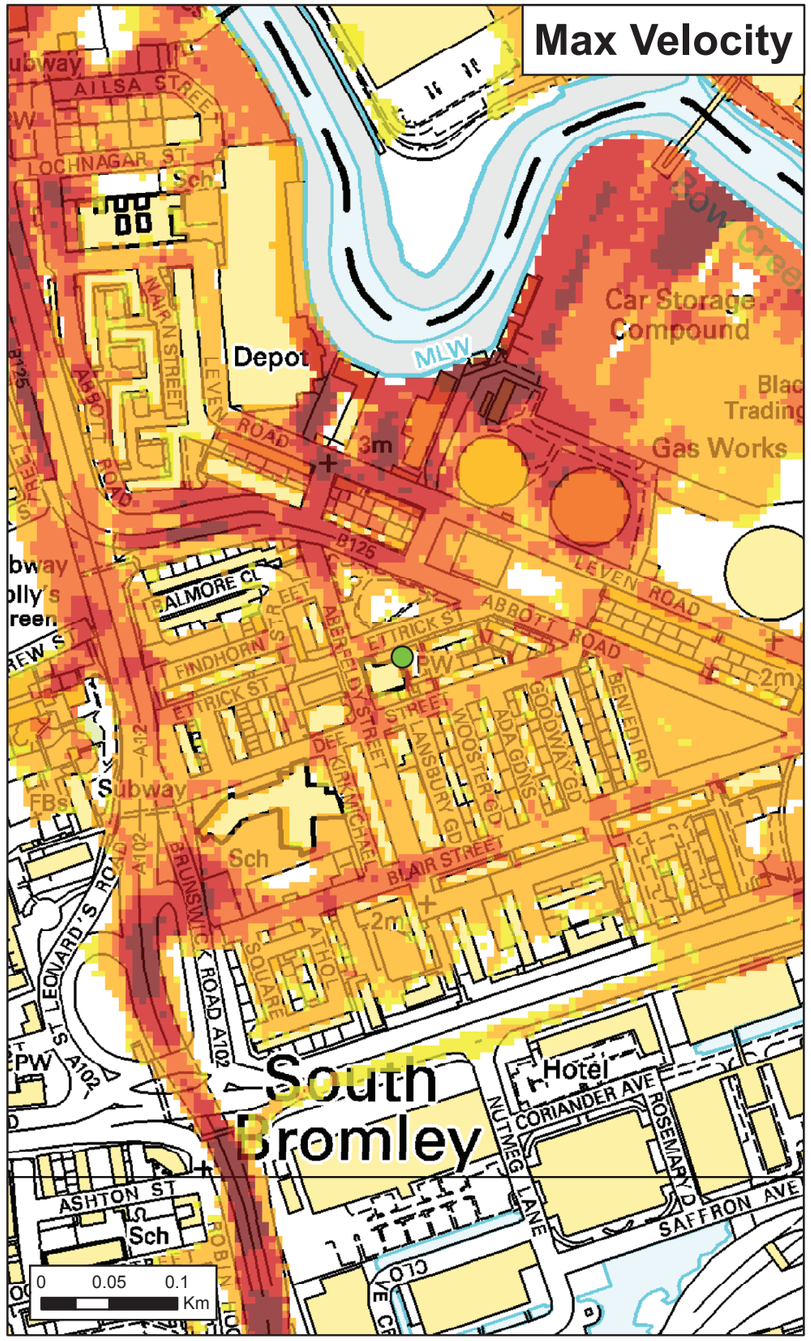






Max Hazard

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.00 (Danger for Most)
- Greater than 2.00 (Danger for All)

Max Depth (m)

- 0 - 0.25
- 0.25 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- > 2.00

Max Velocity (m/s)

- 0 - 0.3
- 0.3 - 1.0
- 1.0 - 1.5
- 1.5 - 2.5
- > 2.5

Date Printed	03/12/2020	**Scenario year**	2100	**Scenario Annual Chance**	0.5% (1 in 200)

This map shows the level of flood hazard to people (called a hazard rating) if our flood defences are breached at certain locations, for a range of scenarios. The hazard rating depends on the depth and velocity of floodwater, and maximum values of these are also mapped.

The map is based on computer modelling of simulated breaches at specific locations. Each breach has been modelled individually and the results combined to create this map. Multiple breaches, other combinations of breaches, different sized tidal surges or flood flows may all give different results.

The map only considers the consequences of a breach, it does not make any assumption about the likelihood of a breach occurring. The likelihood of a breach occurring will depend on a number of different factors, including the construction and condition of the defences in the area. A breach is less likely where defences are of a good standard, but a risk of breaching remains.

Please contact the Environment Agency for further information on emergency planning associated with flood risk in this area.

General Enquiries No: 03708 506 506. Weekday Daytime calls cost 5p plus up to 6p per minute from BT Weekend Unlimited. Mobile and other providers' charges may vary

Environment Agency

Thames Tidal Breach Hazard Mapping

Map Centred on 538,503 181,371

APPENDIX D

ENVIRONMENT AGENCY RESPONSE LETTERS

creating a better place

Environment Agency

Clare Richmond
Development Management
Planning & Building Control
Town Hall, Mulberry Place
5 Clove Crescent
London
E14 2BG

Our ref: NE/2021/133603/01-L01
Your ref: PA/21/01820/NC

Date: 14 September 2021

Dear Clare,

Aberfeldy Estate, Abbott Road, Land to the north of East India Dock Road (A13), London E14

Request for an Environmental Impact Assessment (EIA) scoping opinion under Regulation 15 of the Town and Country Planning (Environmental Impact Assessment) regulations 2017 (as amended), in respect of a hybrid planning application for the demolition of existing buildings and the redevelopment of the site to comprise approximately 1,600 residential units, 7,500sqm of non-residential uses, new and improved access arrangements, associated servicing and landscaping, and public open space. Full planning permission will be sought for approximately 270 residential units and 2,500sqm of non-residential uses.

Thank you for consulting us on the above Environmental Impact Assessment (EIA) on 16 August 2021.

The site is located within **Flood Zone 3** and is protected to a very high standard by the Thames tidal flood defences up to a 1 in 1000 (0.1%) chance in any year flood event. Our latest flood modelling shows the site would be at risk if there was to be a breach in the defences or they were to be overtopped.

We would require an assessment of the most up to date breach data to be included within the Flood Risk Assessment (FRA) to ensure there is appropriate consideration of the residual flood risk. The submitted FRA will need to demonstrate that there will be no sleeping accommodation below the modelled tidal breach flood level OR that there will be a permanent fixed barrier in place at or above the modelled tidal breach flood level to prevent floodwater entering any sleeping accommodation below the modelled breach flood level.

The FRA will need to demonstrate how the proposed development and the site users will be kept safe for the lifetime of the development. The proposal will need to consider a safe means of access and/or egress in the event of flooding from all new buildings to an area wholly outside the floodplain. Lastly, to improve flood resilience, we recommend that, where feasible, finished floor levels are set above the 2100 breach flood level.

Cont/d..

Advice to LPA

Sequential Test
In accordance with the NPPF (paragraph 158), development should not be permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. It is for the local planning authority to determine if the sequential test has to be applied and whether or not there are other sites available at lower flood risk. Our flood risk standing advice reminds you of this and provides advice on how to apply the test.

Insurance eligibility
New homes built in flood risk areas after 1 January 2009 are not covered by the Flood Re-insurance scheme and may not be eligible for home insurance. We advise contacting an insurance provider to discuss whether your development would qualify for insurance.

Flood Risk Management Scheme Funding eligibility
New properties and buildings converted to housings within areas of flood risk after 1 January 2012 will not be counted towards the outcome measures of any proposed future flood alleviation scheme. This is to avoid inappropriate development in flood risk areas. Further information can be found at https://www.gov.uk/government/publications/calculate-grant-in-aid-funding-flood-risk-management-authorities

Flood resistance and resilience
We strongly recommend the use of flood resistance and resilience measures. Physical barriers, raised electrical fittings and special construction materials are just some of the ways you can help reduce flood damage.

To find out which measures will be effective for this development, please contact your building control department. If you'd like to find out more about reducing flood damage, visit the Flood Risk and Coastal Change pages of the planning practice guidance. Further guidance on flood resistance and resilience measures can also be found in:

Government guidance on flood resilient construction
https://www.gov.uk/government/publications/flood-resilient-construction-of-new-buildings

CIRIA Code of Practice for property flood resilience
https://www.ciria.org/Research/Projects_underway2/Code_of_Practice_and_guidance_for_property_flood_resilience_.aspx

British Standard 85500 – Flood resistant and resilient construction
https://shop.bsigroup.com/ProductDetail/?pid=000000000030299686

Advice to applicant

Water Resources
Increased water efficiency for all new developments potentially enables more growth with the same water resources. Developers can highlight positive corporate social responsibility messages and the use of technology to help sell their homes. For the homeowner lower water usage also reduces water and energy bills.

We endorse the use of water efficiency measures especially in new developments. Use of technology that ensures efficient use of natural resources could support the environmental benefits of future proposals and could help attract investment to the area. Therefore, water efficient technology, fixtures and fittings should be considered as part of new developments.

Residential developments
All new residential development are required to achieve a water consumption limit of a maximum of 125 litres per person per day as set out within the Building Regulations &c. (Amendment) Regulations 2015.

However, we recommend that in areas of serious water stress (as identified in our report Water stressed areas - final classification) a higher standard of a maximum of 110 litres per person per day is applied. This standard or higher may already be a requirement of the local planning authority.

Commercial/Industrial developments
We recommend that all new non-residential development of 1000sqm gross floor area or more should meet the BREEAM 'excellent' standards for water consumption.
We also recommend you contact your local planning authority for more information.

Signing up for flood warnings
The applicant/occupants should phone Floodline on 0345 988 1188 to register for a flood warning, or visit https://www.gov.uk/sign-up-for-flood-warnings. It's a free service that provides warnings of flooding from rivers, the sea and groundwater, direct by telephone, email or text message. Anyone can sign up.

Flood warnings can give people valuable time to prepare for flooding – time that allows them to move themselves, their families and precious items to safety. Flood warnings can also save lives and enable the emergency services to prepare and help communities.

For practical advice on preparing for a flood, visit https://www.gov.uk/prepare-for-flooding.

To get help during a flood, visit https://www.gov.uk/help-during-flood.

For advice on what do after a flood, visit https://www.gov.uk/after-flood.

Final comments
Thank you for contacting us regarding the above application. Our comments are based on our available records and the information submitted to us. Please quote our reference number in any future correspondence. Please provide us with a copy of the decision notice for our records. This would be greatly appreciated.

Should you have any queries regarding this response, please contact me.

Yours sincerely,

Hannah Malyon
Sustainable Places Planning Advisor

Direct dial: 0208 474 9666
E-mail: HNLSustainablePlaces@environment-agency.gov.uk

creating a better place

Environment Agency

Nelupa Malik
London Borough of Tower Hamlets
Development Control
PO Box 55739
London
E14 1BY

Our ref: NE/2021/133954/01
Your ref: PA/21/02377

Date: 21 December 2021

Dear Nelupa

Hybrid application seeking detailed planning permission for Phase A and outline planning permission for future phases, comprising: Outline planning permission (all matters reserved) for the demolition of all existing structures and redevelopment to include a number of buildings ranging between maximum heights of 13.5m AOD and 100m AOD and up to 141,014sqm (GEA) of floorspace comprising the following mix of uses: ? Up to a maximum of 133,971sqm (GEA) of Residential floorspace (Class C3); ? Up to 4,444sqm (GEA) of retail, workspace, food and drink uses (Class E); ?Car and cycle parking; ?Formation of new pedestrian route through the conversion and repurposing of the Abbott Road vehicular underpass for pedestrians and cyclists; ?Landscaping including new open spaces and public realm and ?New means of access, associated infrastructure and highways works. In Full, for 30,133sqm (GEA) residential (Class C3) floorspace to include a number of buildings ranging between maximum heights of 25.17m (AOD) and 42.73m (AOD), 1341 sqm of retail, food and drink uses associated with a replacement Neighbourhood Centre and a temporary marketing suite (Class E and Sui Generis), together with access, car and cycle parking, associated landscaping and new public realm, and improvements to Braithwaite Park and Leven Road Open Space. This application is accompanied by an Environmental Statement.

Aberfeldy Estate, Phase A, Land to the north of East India Dock Road (A13), east of the Blackwall Tunnel Northern Approach Road (A12) and to the south west of Abbot Road.

Thank you for consulting us on this planning application. We have **no objections** to the proposed development.

The site is located within Flood Zone 3 and is protected to a very high standard by the Thames tidal flood defences up to a 1 in 1000 (0.1%) chance in any year flood event. Our latest flood modelling shows the site would be at risk if there was to be a breach in the defences or they were to be overtopped.

We are satisfied that:

- *The developer has assessed the risk from a breach in the Thames tidal flood defences using the latest modelled tidal breach data.*
- The developer has not proposed any sleeping accommodation below the modelled tidal breach flood level.

Cont/d..

The proposal does not have a safe means of access and/or egress in the event of flooding from all new buildings to an area wholly outside the floodplain however, safe refuge within the higher floors of the development has been suggested.

To improve flood resilience, we recommend that, where feasible, finished floor levels are set above the 2100 breach flood level, **which is 3.68mAOD in the Southern parcel and 5.10mAOD in the northern parcel of the development**.

Informative – advice to LPA

We do not normally comment on or approve the adequacy of flood emergency response procedures accompanying development proposals, as we do not carry out these roles during a flood. Our involvement with this development during an emergency will be limited to delivering flood warnings to occupants / users covered by our flood warning network.

In line with the Planning Practice Guidance (PPG) to the National Planning Policy Framework, any assessment of the safety of a development from flooding should consider the ability of site residents / users to safely access and exit the building during a design flood event, as well as their ability to evacuate ahead of an extreme flood. One of the key considerations to ensure that any new development is safe is whether or not adequate flood warnings would be available to people using the development.

In all circumstances where warning and emergency response is fundamental to managing flood risk, we advise local planning authorities to formally consider the emergency planning and rescue implications of new development in making their decisions. As such, we recommend you consult with your emergency planners and the emergency services to determine whether the proposals are safe and in accordance with the guiding principles of the PPG.

We have considered the findings of the flood risk assessment in relation to the likely duration, depths, velocities and flood hazard rating against the design flood for the proposal. This does not mean we consider that the access is safe nor the proposals acceptable in this regard. We remind you to consult with your emergency planners and the emergency services to confirm the adequacy of the evacuation proposals. Any assessment should be based on the breach data included within the submitted FRA.

Final comments:

Once again thank you for consulting us on this planning application. Please contact me should you have any questions.

Yours sincerely,

Mr Demitry Lyons
Sustainable Places Planning Advisor

End

Aberfeldy Village, London

Masterplan, Below Ground Drainage Strategy

Stage 2+ Planning Issue

Issue P08 – 6th April 2022

Prepared For:

ABERFELDY VILLAGE, LONDON

BELOW GROUND DRAINAGE STRATEGY

ISSUED FOR PLANNING

Quality Assurance Page

Issue	Date	Prepared By	Checked By	Approved By	Remarks
DRAFT	18/12/2020	Mrs. M. Burca	Mr. C. Ryan	Mr. C. Ryan	Draft Issue
P01	17/09/2021	Mr. L. Hornblow	Mr. L. Boustead	Mr. C. Marchant	Draft Stage 2+ Planning Issue
P02	06/10/21	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Draft Stage 2+ Planning Issue
P03	12/10/21	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Stage 2+ Planning Issue
P04	22/10/21	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Stage 2+ Planning Issue
P05	26/10/21	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Updated to address ES comments.
P06	08/03/22	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Draft revised planning issue
P07	01/04/22	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Revised planning issue
P08	06/04/22	Mr. L. Boustead	Mr. C. Marchant	Mr. G. Bansal	Revised planning issue

Table of Contents

Executive Summary

Meinhardt UK Ltd has been appointed by Ecoworld International to undertake the foul and surface water below ground drainage design for the proposed construction of Aberfeldy Village. The scheme consists of approximately 1500 units proposed across multiple Phases. The proposals comprise of a number of blocks including podiums and some towers up to 29 stories in height. The Site is located within the London Borough of Tower Hamlets in an area known as Poplar Riverside, Aberfeldy Village, E14, London.

The proposed surface water drainage strategy for each phase has been developed to utilise sustainable drainage techniques (SuDS) to attenuate surface water at source and reduce the risk of downstream flooding of the Thames Water sewer network in the local area. A scheme has been developed that utilises blue, green and podium deck attenuation roof structures along with below ground cellular attenuation tanks designed for the 1:100 year plus 40% climate change storm event.

The developments QBAR greenfield runoff rate has been calculated to be 22.4/s. It is proposed that the entire site will discharge at this rate as agreed with the London Borough of Tower Hamlets. Each building and associated hardstanding being proposed to discharge at a proportion of this flow rate, this has been split between 13 separate connections across the site receiving the total 22.4/s. Each buildings associated storm water drainage is conveyed by a traditional gravity run system to the nearest Thames Water Asset, with all connection discharging into the Thames Water combined water Sewer network.

As the development must ensure that private and public drainage areas remain separate, due to ownership and future maintenance as well as adoption requirements the total site area considered for the drainage strategy is based on the private areas, and not the entire site area of 9.1ha. The site area is circa 5.92ha, which excludes council adopted roads and green areas, as such the total hardstanding (impermeable area) is circa 3.2ha.

The option of infiltrating has been dismissed due to the requirement to ensure an exclusion zone of 5m is provided from each soakaway structure to either buildings or public highway, as such no space is available to allow for an full infiltration strategy, additionally although it is feasible to drain into the River Terrace Deposits (gravels) it would not be recommended as it can cause flooding of existing basements given the impermeable London Clay cap below.

The proposed foul water drainage strategy for the site involves the MEP engineer's coordination of the superstructure drainage up until it exits the buildings and enters the below ground drainage network. A below ground drainage network of pipes and manholes will collect the foul water discharge from the buildings and convey to a demarcation chamber, before discharging via gravity to the existing Thames Water combined water sewers within the site or surrounding the site. This will be coordinated during detailed design.

A pre planning enquiry has been submitted to Thames Water stating the proposed foul and surface water discharge rates from the new development. Thames Water had responded giving approval for both however, new plans have been submitted since and flow rate applied from the scheme has reduced from that agreed in the pre planning, it is therefore assumed this is still accepted.

The Thames Water asset records for the site highlighted potential foul and surface water connection points however further CCTV survey works will need to be undergone before any detailed design.

Refer to drainage drawings 2812-MHT-CV-BG-DR-100 and 2812-MHT-CV-RF-DR-101 within the appendix for proposed drainage layout.

1 Introduction

This Drainage Strategy Report has been prepared by a Meinhardt and is submitted in support of a hybrid planning application for the Aberfeldy Village Masterplan. The hybrid planning application is made in relation to the north of East India Dock Road (A13), east of the Blackwall Tunnel Northern Approach Road (A12) and to the southwest of Abbot Road (the “Site”) on behalf of The Aberfeldy New Village LLP’ (“The Applicant”). The hybrid planning application is formed of detailed development proposals in respect of Phase A for which no matters are reserved ("Detailed Proposals"), and outline development proposals for the remainder of the Site, with all matters reserved ("Outline Proposals"). The Detailed Proposals and Outline Proposals together are referred to as the “Proposed Development”.

This report is an update to the version dated 22/04/2021 (P04) that was submitted to the Council in support of the hybrid planning application. This updated version has been prepared in response to the changes to the planning application boundary as explained in the covering letter to accompany the amendments to the Proposed Development as well as comments received from the GLA and Water Resources ES Chapter on the ES chapter and technical reports for which the Drainage Strategy formed part off. The sections of this report that are different from those contained in the original version submitted in 2021 are contained [on pages 3, 10, 11, 13, 14, 15 and 23 and relate to Jolly’s Green/please describe the relevant amendment. We have highlighted these changes in red within the document for ease.

The Proposed Development comprises the comprehensive redevelopment of the Site. The Proposed Development will provide new retail and workspace floorspace along with residential dwellings and the pedestrianisation of the A12 Abbott Road vehicular underpass to create a new east to west route. The Development will also provide significant, high quality public realm, including a new Town Square, a new High Street and a public park.

The purpose of the Drainage Strategy Report is to assist our client and the Local Planning Authority to make an informed decision regarding the drainage strategy for the proposed development in addition to assist the BREEAM assessor with the rewarding of credits under Pol 03.

2 Existing Drainage

1.1 Existing Site

The existing site is located in an area known as Poplar Riverside, Aberfeldy Village, E14, London, within the London Borough of Tower Hamlets.

The existing site is a mixed-use development consisting of residential housing and non-residential floor space, including shops, professional services, food and drink, residential institution, storage, community and cultural uses.

The Site is located in Poplar, within the administrative boundary of the London Borough of Tower Hamlets. The Site is 9.1 hectares (approx. 22 acres) in total and comprises:

- Abbott Road;
- Aberfeldy Street;
- Balmore Close;
- Blairgowrie Court;
- Heather House;
- Jura House;
- Tartan House;
- Thistle House;
- Kilbrennan House;
- Nos. 33-35 Findhorn Street;
- 2a Ettrick Street;
- 384 Abbott Road;
- Lochnagar Street;
- Aberfeldy Neighbourhood Centre;
- Nairn Street Estate; and
- Leven Road Open Space and Braithwaite Park are included for their enhancement.
- Jolly’s Green

The total site area is 9.1Ha, and the total drained site area totals circa 5.92ha which excludes council adopted roads and green areas. The total hardstanding (impermeable area) is circa 3.2ha. 3.2ha has been used in the drainage calculations.

The River Lee is located to the east of the site and flows in a generally southerly direction to its confluence with the River Thames. The entire site is noted on the Gov.uk website’s Flood map for planning to be wholly within flood zone 3 however benefits from the presence of flood defences.

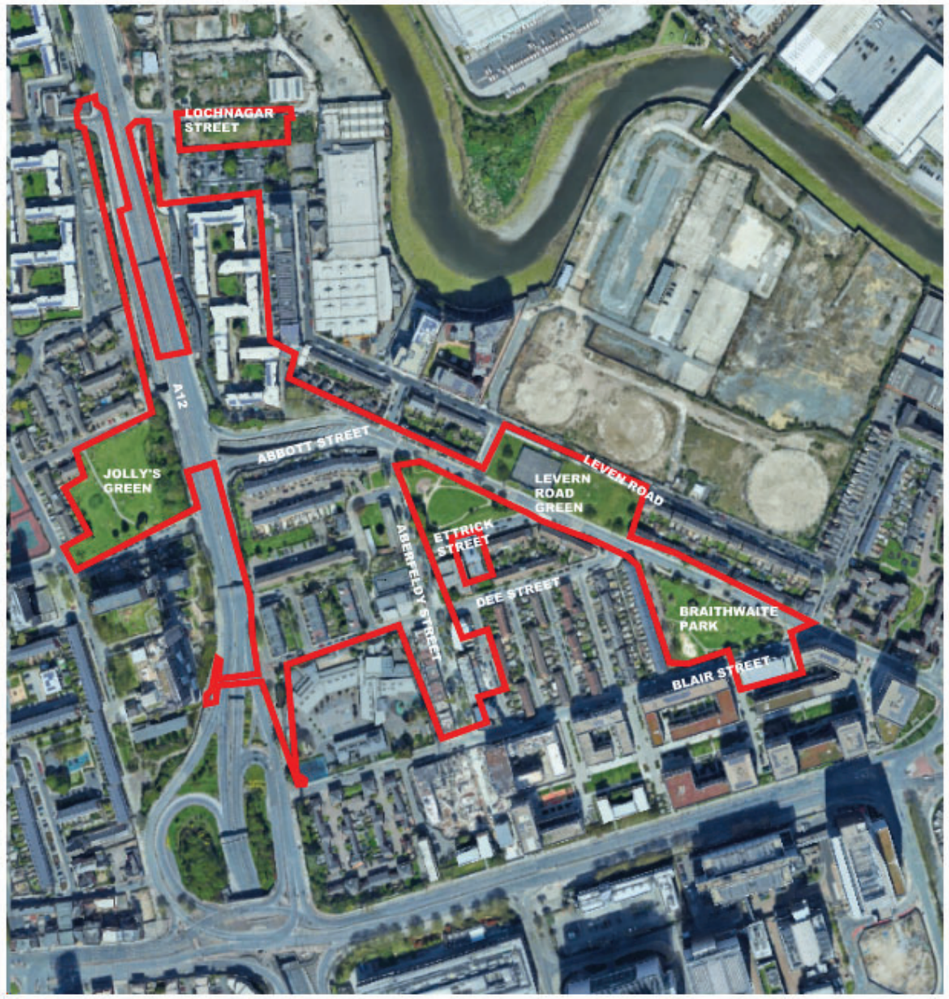


Figure 1: Site Location

1.2 Existing Drainage

1.2.1 Private Onsite Drainage

A topographical survey of the site has been completed by Aworth Survey in December 2009 and a utility survey was carried out for the site by Sumo Services Survey in August 2020.

Based on these surveys the existing private drainage network consists of surface water, foul water and combined water pipes and manholes. All of the existing private drainage has been shown to be draining to the closest Thames Water public sewer via multiple existing connections to the Thames Water surface and combined water sewers crossing through the site.

Figure 2: Topographical Survey

A CCTV survey will be undertaken to confirm the exact line, level, and condition of the connections to the surrounding public sewer network.

A copy of the topographical and utility surveys can be found in the appendices.

1.2.2 Public Sewers

Asset records obtained in November 2020 from Thames Water have revealed public surface and combined water sewers crossing through the proposed Aberfeldy Village site. The arrangement of the network is summarised below:

Thames Water Surface Water Sewers

The surface water sewers crossing the proposed site are located within:

- Abbott Road (B125) within the proposed site boundary (From MH Ref: 3406 – 3403 to 3402). The diameter of the surface water sewer is 225mm;
- Abbott Road (B125) within the proposed site boundary (From MH Ref: 2420 – 3403 to 3402). The diameter of the surface water sewer is 225mm. It is assumed to be a Thames Water pumping station for the road fly under. A CCTV survey will be required to establish what it serves.

These two sewers are assumed to be picking up Abbott Roads highway drainage and will therefore be abandoned along with the road itself as dictated by the scheme.

Thames Water Combined Water Sewers

The combined water sewers crossing the proposed site are located within:

- Lochnagar Street to the north of the site (the public combined water sewer is running west within Lochnagar Street to MH Ref: 2704). The diameter of the combined water sewer is 305mm and changes to 381mm just before connecting into Thames Water manhole 2704;
- Bromley Hall Road to the north west of the site (From MH Ref: 2630 to 2705). The diameter of the combined water sewer is 225mm and changes to 305mm just before connects to Thames Water manhole 2705;
- Leven Road to the east of the site (the public combined water sewer is running south within Leven Road: from MH Ref: 3605 to 5403). The diameter of the combined water sewer starts at 225mm and increases in size to 300mm sewer. The combined water sewer then changes into a 600mm before entering the proposed site and connecting into Thames Water combined manhole 5403;
- Leven Road to the east of the site (the public combined water sewer is running north within Leven Road: from MH Ref: 7403 to 5405). The diameter of the combined water sewer starts at 305mm, changes in size to 300mm sewer and then to 225 before connecting into Thames Water combined manhole 5405;
- Darnaway Place to the east of the site (the public combined water sewer is running south within Darnaway Place: from MH Ref: 4511 to 4407). The diameter of the combined water sewer is 229mm;
- Blair Street to the south of the site and running north through the proposed site boundary (From MH Ref: 7303 to 6302). The diameter of the combined water sewer is 305mm and changes to 457mm after the junction with Thames Water combined sewer which is running north to the combined Thames Water manhole 6302;
- Blair Street to the south of the site (the public combined water sewer is running east within Blair Street from: MH Ref: unknown-4203 to 5205). The diameter of the combined water sewer is 305mm and changes to 457 before connecting into Thames Water combined manhole 5205;
- Aberfeldy Street within the proposed site boundary (the public combined water sewer entering through the south of the site and is running north within Aberfeldy Street: from MH Ref: 5205 to 4407). The diameter of the combined water sewer starts at 457mm and changes to 533mm before connecting into Thames Water combined water manhole 4301A. The combined water sewer exiting Thames Water manhole 4301A is 610mm and changes to 686mm after Thames Water combined manhole 4420, before connecting into Thames Water combined manhole 4407;

- Dee Street within the proposed site boundary (the public combined water sewer is running east within Dee Street from MH Ref: 3222 to 4312). The diameter of the combined water sewer is 305mm;
- Ettrick Street within the proposed site boundary (the public combined water sewer is running east from MH Ref: 3316 to 4301A). The diameter of the combined water sewer is 300mm and changes to 305 before connecting into Thames Water combined manhole 4301A;
- Abbott Road (B125) within the proposed site boundary (From MH Ref: 8301 to the combined trunk running north within Joshua Street). The diameter of the combined water sewer is 914mm and changes to 991mm just before connects to the combined trunk in Joshua Street;
- Abbott Road (B125) within the proposed site boundary (From MH Ref: 4407 to the combined trunk running north within Joshua Street). The diameter of the combined water sewer is 991mm.
- Jolly's Green; there is a 1524 x 1227mm combined sewer running underneath Jolly's Green. This large trunk sewer has connecting sewers that run under the roads adjacent to the green space prior to discharging to the trunk, these roads being Andrew Street and Joshua Street.

There is a combined water trunk sewer located to the west of the site within the proposed site boundary running north. The diameter of the combined water sewer is 2250mm.

Refer to the Appendix B for the complete Thames Water Asset Records.

Meinhardt has overlaid the existing sewer information from the Thames Water Asset Records and the proposed architectural masterplan on a sketch to determine whether there are any areas where proposed structure will sit over the existing Thames Water assets. The sketch has highlighted a number of the proposed buildings are located directly above the existing Thames Water sewers and manholes. Where this occurs either a build over agreement or a sewer diversion will be required with Thames Water to proceed with the current site layout.

Based on the Thames Water Assets Records all of the existing private drainage has been shown to be draining to the north of the site where there are multiple existing connections to the Thames Water surface and combined water sewers crossing through the site.

Refer to the sketch 2812-MHT-CV-BG-DR-050 in the appendices for details of the existing Thames Water sewers crossing the site.

2 Drainage Strategy

2.1 Surface Water Drainage

2.1.1 Drainage Design Parameters

The industry standards along with the Environment Agency and Sewers for Adoption 7th Edition dictate for below ground surface water drainage that:

- There will be no surcharging of the drainage system for a 1 in 2-year storm;
- The drainage can be surcharged with no flooding for a 1 in 30-year storm; and
- The drainage can flood on-site for a 1 in a 100-year storm with a 40% climate change allowance provided the flood water remains on site and does not flood habitable areas or affect safe ingress and egress to the site for occupiers.

All surface water drainage options outlined in this report adhere to these principles.

Hydraulic calculations have been carried out using the Micro Drainage hydraulic modelling software unless otherwise specified. Refer to Appendix C for calculations.

2.1.2 Initial Consultations

2.1.2.1 Local Authority/Planning Authority – Tower Hamlets Council

Tower Hamlets Council were contacted on 01/09/21 to discuss the proposed drainage strategy prior to planning submissions, however, no response has been received at the time of writing.

2.1.2.2 Thames Water

A predevelopment enquiry has been submitted to Thames Water to confirm if there is sufficient capacity within the Thames Water public sewer network to accommodate the proposed development. Thames Water have confirmed there is sufficient capacity in the surrounding public sewers to accept the flows from the proposed development.

2.1.3 Proposed Surface Water Drainage Strategy

The proposed site will discharge at the equivalent QBAR greenfield rate of 22.4/s. Hydraulic calculations indicate that the attenuation volume required for the development to discharge at the proposed discharge rate of 22.4/s for a 1 in 100 year + 40% climate change storm event is approximately 3662m^3, to be confirmed during detail design. This strategy should also include measures to improve run-off quality whilst maximising bio-diversity, amenity and other multifunctional benefits to provide a sustainable drainage system as noted in PPG.

Table 2-1: Discharge Opportunities

London Sustainable Drainage Hierarchy	Site Specific Application
Store rainwater for later use	There are limited opportunities for rainwater harvesting on this project due to the proposed usage of the building and limited external space that requires irrigation. It has therefore been discounted.

Use infiltration techniques, such as porous surfaces in non-clay areas	Due to the underlying geology of the site being London Clay and poor infiltration rates, infiltration devices are not used on this site. Furthermore, there are limited locations that comply with the requirement of Building Regulations to be more than 5m from a highway or structure. The use of infiltration techniques has therefore been discounted including infiltration basins/ponds.
Attenuate rainwater in ponds or open water features for gradual release	Due to the constrained nature of the site, there is little opportunity for above ground storage structures like ponds. Although green spaces are provided in the proposals, the areas are not suitable to be used for controlled flooding due to the proposed nature of the areas i.e. ponds. Furthermore, the existing levels across the site do not offer any suitable locations where controlled flooding may occur.
Attenuate rainwater by storing in tanks or sealed water features for gradual release	Excess surface water flows during high intensity rainfall events are proposed to be stored using a combination of podium/blue roofs, green roofs bio-retention/SuDS planters and below ground geo-cellular storage crates.
Discharge rainwater direct to a water course	Not possible because there are no watercourses in area surrounding site
Discharge rainwater to a surface water sewer/drain	Not possible because there are no surface water drains in area surrounding site, nearby public sewers are combined.
Discharge rainwater to a combined sewer	Discharge to a combined system at the restricted rate equivalent to QBAR greenfield rates.

The proposed surface water strategy for the site will be developed to utilise sustainable drainage techniques (SuDS) to attenuate surface water at source and reduce the risk of downstream flooding. Due to the limited areas of landscaping available on the site there are constraints to which SuDS can be incorporated into the development. SuDS with large land take such as detention basins or ponds are not suitable for an urban development therefore not applicable for development. It is also found that the use of infiltration SuDS will not be feasible for the site due to the existing ground conditions. The proposed drainage strategy for the development has therefore been made sustainable through the use of blue roofs, high level podiums attenuation and below ground attenuation tanks.

Due to the segregation of parcels, due to ensuring private drainage is separate to public highway drainage its not possible to integrate or provide a holistic surface water design whereby one parcel is potentially using an area in another parcel for attenuation, including any open green space that is proposed aspart of the wider strategy, as this would require a new public TW sewer network to be placed within an existing built environment which is unviable given the context of the scheme.

It is proposed that each phase will have a separate drainage network.

Phase A Strategy – Detailed Planning Application

Based on the above, the only feasible surface water discharge location is the public sewers surrounding the site. Phase A is divided into 3 different locations therefore it is proposed that Blocks I1, J1, F1, H1&H2 and H3 to drain separately into the closest Thames Water sewer. Therefore the strategy is outlined below.

Block I1:
The proposed surface water drainage strategy for Building I1 has been made sustainable through the use of a blue roof and a below ground attenuation tank. The approximate volume of attenuation for this building is 69m^3. Of which 34.2m^3 attenuation is provided by cellular attenuation crates and 35m^3 is provided by the blue/green roof.

The surface water drainage network will drain via gravity to the northwest of Building I1 into a demarcation chamber restricting the discharge rate to 1l/s which is to be controlled via a hydrobrake, prior to discharging to the Thames Water sewer network. It is proposed that controls will be used on the blue roof to ensure that all attenuation is fully utilised. It is proposed that a new connection will be made to the northwest corner of the building into the Thames Water combined water network in Blair Street (TWMH7303). The Thames Water sewer asset records have no cover level or Invert level information for the manhole THMH7303 therefore a survey is required for the existing combined water sewer running along Blair Street.

Block J1:
The proposed surface water drainage strategy for Building J1 has been made sustainable through the use of a below ground attenuation tank. It is proposed to discharge surface water from Building J1 via gravity into Thames Water combined water sewer in Leven Road (TWMH3602) via a new connection. Surface water discharge from the building is to be restricted to 1.25l/s which is to be controlled via a hydrobrake on a demarcation manhole prior to discharging into Thames Water combined water sewer. The approximate required storage for building J1 is 346m^3 this is to be provided through the proposed cellular attenuation crates.

Block F1:
To attenuate surface water at source and reduce the risk of downstream flooding it is proposed that Building F1 will use of blue roofs, high level podium attenuation and a below ground attenuation tank. The approximate volume of attenuation is 185m^3. It is proposed that controls will be used on the blue roofs and high level podium to ensure that all attenuation is fully utilised. The surface water drainage network will drain via gravity to the northeast of the building into a demarcation chamber restricting the discharge rate to 1.25l/s which is to be controlled via a hydrobrake, prior to discharging to the Thames Water combined sewer. It is proposed that a new connection will be made to the southeast corner of the building, branching into the Thames Water combined water sewer in Aberfeldy Street between manholes TWMH4313 & TWMH4312.

Block H1/H2 & H3:
The proposed surface water drainage strategy for the buildings H1&H2 and H3 has been made sustainable through the use of two below ground attenuation tanks (one attenuation tank serving buildings H1&H2 and one attenuation tank serving building H3) and blue/green roof areas to attenuate surface water at source and reduce the risk of downstream flooding.

The proposed surface water drainage network for buildings H1&H2 will drain via gravity to the east of the buildings into a demarcation chamber restricting the discharge rate to 1.5l/s which is to be controlled via a hydrobrake, prior to discharging to the Thames Water combined sewer. The approximate volume of attenuation for buildings H1&H2 is 161m^3, of which 49m^3 is provided through the blue roof and 112m^3 is provided through the below ground cellular attenuation crates.

The same strategy is applied to Building H3 which will discharge surface water via gravity to the west of the building into a demarcation chamber restricting the discharge rate to 1.25l/s which is to be controlled via a hydrobrake, prior to discharging to the Thames Water combined sewer. The approximate volume of attenuation for building H3 is 135m^3, of which 24m^3 is provided through the blue roof and 111.2m^3 is provided through the below ground cellular attenuation crates.

Buildings H1&H2 and H3 will discharge surface water via two new separate connections into Thames Water combined sewer in Aberfeldy Street (TWMH4215).

The proposed new connections are subject to a CCTV survey which will survey the line, level and condition of the existing sewers. If this survey identifies any available existing connections in those locations there may be an opportunity to reuse. This will be explored during detailed design.

To achieve the proposed discharge rates 6.25l/s it is required to attenuate an approximate volume of 896m^3.

Phase B Strategy – Outline Planning Application

The proposed surface water strategy for the phase B has been developed to utilise sustainable drainage systems (SuDS) to attenuate surface water at source and reduce the risk of downstream flooding of the Thames Water sewer network. The scheme that has been developed to utilise a combination of blue roofs, high level podium attenuation and attenuation tanks.

The proposed strategy includes a total of three new connections to the existing Thames Water combined sewer network. These are outlined below:

- One connection to the Thames Water combined sewer network in Leven Road (TWMH3605), through a new connection serving the adjacent Block A1/A2 receiving a restricted discharge rate of 1.5l/s.
- One connection to the Thames Water combined sewer network in Abbott Road (TWMH3517 to TWMH2536), through a new connection serving Block A3, B1/B2 & B4 receiving a total restricted discharge rate of 3.5l/s.
- One connection to the Thames Water combined sewer network in Abbott Road (TWMH3516), through a new connection serving Blocks B3 and B5 receiving a total restricted discharge rate of 2.3l/s.

The proposed new connections are subject to a CCTV survey which will survey the line, level and condition of the existing sewers. If this survey identifies any available existing connections in those locations there may be an opportunity to reuse. This will be explored during detailed design.

To achieve the proposed discharge rates 7.3l/s it is required to attenuate an approximate volume of 862m^3

The Jolly's Green area will be delivered as part of Phase B. The area is proposed to be public realm and is proposed to discharge surface water at a restricted rate equivalent to the QBAR greenfield for all storms up to and including the 1 in 100 year +40% climate change storm. This rate has been calculated to be 3.9l/s and approximately 100m³ of surface water attenuation will be required to facilitate this. This will be provided through the use of permeable paving.

Phase C Strategy – Outline Planning Application

The proposed drainage strategy for Phase C is similar to that of Phase B. It is proposed that surface water will be attenuated through the use of SuDS to minimise the likelihood of downstream flooding. It is proposed that the primary source of attenuation for Phase C will be below ground attenuation tanks with further attenuation to be provided via blue roofs and high levels podium attenuation.

It is proposed that surface water from the Phase C will flow via gravity to the east of this phase where a new connection to the Thames Water network in Ettrick Street (TWMH4303), will be made. This is subject to a CCTV survey which will survey the line, level and condition of the existing sewer. If this survey identifies any available existing connections in this location there may be an opportunity to reuse. This will be explored during detailed design.

Each block shall attenuate and restrict flows separately before connecting into TWMH4303, the below summaries the proposed discharge rates and required attenuation for each block within phase C;

- Block C1/C2/C3/C4 shall restrict discharge rate to 1.5l/s requiring a total 651m³ attenuation of which 425m³ is to be provided through below ground cellular attenuation crates and 238m³ provided via blue roofs and high levels podium attenuation.

- Block C5 & C6 have been designed to have a shared flow control structure limiting discharge to 1l/s with attenuation however split both buildings to receive 10m³ attenuation provided through below ground cellular attenuation crates. Flows from Blocks C5 and C6 are to be conveyed into a combined running along Ettrick Street to the east before discharging into TWMH4303.

- Block E1/E2/E3 is to restrict discharge rate to 1.5l/s requiring a total 563m³ attenuation of which 400.4m³ is to be provided via below ground cellular attenuation crates and 162m³ provided via blue roofs and high levels podium attenuation.

The Phase C development shall therefore discharge at a maximum 4.0l/s for the 1:100 year plus 40% climate change event, this flow is all conveyed into the Thames Water Manhole TWMH4303 in Ettrick Street. The total amount of attenuation to be provided for this phase is 1233m³.

Phase D Strategy – Outline Planning Application

The proposed surface water drainage strategy for the building Phase D has been made sustainable through the use of a below ground attenuation tank and blue roofs and high levels podium attenuation

The proposed surface water strategy for the building Phase D is to discharge surface water via gravity to the southeast of Phase D into Thames Water combined water sewer in Ettrick Street (TWMH4302) via a new connection. This is subject to a CCTV survey which will survey the line, level and condition of the existing sewer. If this survey identifies any available existing connections in this location there may be an opportunity to reuse. This will be explored during detailed design.

Surface water discharge from the site is to be restricted to 1.5l/s which is to be controlled via a hydrobrake on a demarcation manhole prior to discharging into Thames Water combined water sewer. The approximate volume of attenuation for Phase D is 576m³, of which 490m³ is to be provided via below ground attenuation crates and 87m³ provided via and blue roof attenuation.

For full drainage strategy drawings refer to the Appendix C, including exceedance flow routes. Summary of the drainage strategy can be found in the Tower Hamlets SUDS proforma in Appendix D.

2.1.4 Proposed Discharge Rates Summary

The table below shows the volume of surface water attenuation required to suit a 1 in 100-year storm event + 40% climate change. A breakdown of the proposed discharge rates and required attenuation volumes is shown in Table 1.

	Storm Event	Proposed Discharge Rate	Required Surface Water Attenuation
Phase A Blocks I1, J1, F1, H1&H2 and H3	1 in 100 year + 40% CC	6.0 l/s	896m³
Phase B	1 in 100 year + 40% CC	10.9 l/s	965m³
Phase C	1 in 100 year + 40% CC	4.0 l/s	1231m³
Phase D	1 in 100 year + 40% CC	1.5 l/s	576m³
Total		22.4 l/s	3668m³

Table2-2: Proposed Surface Water Discharge Rates

2.1.5 Water Quality

The proposed drainage strategy manages pollution risk for the site based on a simple qualitative method as defined in the CIRIA SuDS Manual C753, consisting of an assessment of likely pollution hazard levels for the site and SuDS performance capacities:

Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 2-3: Extract from CIRIA C753: Pollution Hazard Indicines

The site is predominantly roof areas and pedestrian walkways and as such, the site has a Low Pollution hazard level. Surface water run-off will be managed using a range of SuDS detailed previously that will offer water quality benefits.

The car parking a ground level is covered and therefore will be discharged to the foul network.

SuDS bio-retention planters and green roofs will provide pollution control as they assit with removing heavy metals and hydrocarbons from surface water run-off.

2.1.6 Amenity, Bio-diversity and Multi-functional benefits

The proposed drainage strategy offers a number of multifaceted benefits across amenity, biodiversity and other areas. Blue/green roofs provide a positive impact on amenity for the site and green roofs and SuDS bio-retention areas help to improve and increase bio-diversity. As discussed in the section above, the SuDS bio-retention planters and green roofs in particular in addition to other SuDS features help to improve water quality from the site.

2.2 Foul Water Drainage

2.2.1 Drainage Design Parameters

The below-ground foul drainage system will be designed to Sewers for Adoption 8th Edition, BS EN 752 Parts 3 and 4, and the Building Regulations Document H where appropriate.

2.2.2 Proposed Foul Water Drainage Strategy

Due to size and phasing of the development, it is proposed that foul drainage from the site will be split into 10 individual outfalls into the Thames Water combined network. Splitting the foul discharge from the site is important due to the potential increase in flow, reducing the impact on the existing Thames Water combined drainage network.

The proposed foul water drainage strategy for the site involves the MEP engineer's coordination of the superstructure drainage up until it exits the building and enters the below ground drainage network. A below ground drainage network of pipes and manholes will collect the foul water discharge from the buildings and convey to a demarcation chamber, before discharging via gravity to the existing Thames Water combined water sewers within the site or surrounding the site. This will be coordinated during detailed design.

The proposed strategy includes various connections to the existing Thames Water combined sewer network. These are outlined below.

As phase A is divided into 3 different locations it is proposed that Blocks I1, J1, F1, H1&H2 and H3 to drain separately into the closest Thames Water combined water sewer network. Therefore five connections to the Thames Water combined water sewer network are proposed for phase A:

- For the building I1 it is proposed that a new connection will be made to the northwest corner of the building into the Thames Water combined water network in Blair Street (TWMH7303);
- It is proposed that building J1 to discharge foul water into Thames Water combined water sewer in Leven Road (TWMH3602) via a new connection;
- It is proposed that a new connection will be made to the southeast corner of the building F1 into the Thames Water combined water sewer in Aberfeldy Street (TWMH4313-TWMH4312); and
- Buildings H1&H2 and H3 will discharge foul water via two new separate connections into Thames Water combined sewer in Aberfeldy Street (TWMH4215).

The proposed strategy for phase B includes a total of three connections to the existing Thames Water combined sewer network. These are outlined below:

- One connection to the Thames Water combined sewer network in Leven Road (TWMH3605), through a new connection serving building A1/A2;
- One connection to the Thames Water combined sewer network in Abbott Road (TWMH3517 to TWMH2536), through a new connection serving buildings A3, B1/B2 and B4;
- One connection to the Thames Water combined sewer network in Abbott Road (TWMH3516), through a new connection serving building B3/B5.

It is proposed that foul water from the Phase C will flow via gravity to the east of this phase where a new connection to the Thames Water network in Ettrick Street (TWMH4303) will be made. This will be serving the buildings C1/C2/C3/C4, C5, C6 & E1/E2/E3.

The proposed foul water strategy for the building Phase D is to discharge foul water via gravity to the southeast of the phase D into Thames Water combined water sewer in Ettrick Street (TWMH4302) via a new connection.

The proposed new connections are subject to a CCTV survey which will survey the line, level and condition of the existing sewers. If this survey identifies any available existing connections in those locations there may be an opportunity to reuse. This will be explored during detailed design.

The discharge locations and foul water strategy will be confirmed during detailed design and a Section 106 drainage connection application for each connection will be submitted at the construction stage to Thames Water for formal approval of the proposed connections arrangement.

2.2.3 Proposed Foul Water Discharge Rates

Based on the most recent accommodation schedule (as at 17.09.21), the peak foul water discharge rate from the site will be in the region of 75l/s. This proposed discharge rate has been calculated in accordance with BS EN 12056-2, however, this will be confirmed by Meinhardt's MEP engineer during detailed design.

Thames Water have been contacted and have confirmed they have sufficient capacity in their network to accept the proposed flows from the development (surface water and foul water).

2.3 Proposed Combined Water Flow Rates

The proposed combined water discharge rates for the site are outlined in Table 1.

Contributing Area (ha) – Hardstanding areas	Proposed Surface Water Discharge Rate [1 in 100 year storm + 40% CC] (l/s)	Proposed Peak Foul Water Discharge Rate (l/s)	Proposed Combined Peak Discharge Rate (l/s)	Reduction compared to Existing Combined Discharge Rate
3.2	22.4	75.58	97.98	67%

Table 1: Proposed Combined Water Discharge Rates

The proposed discharge rates will be confirmed during detailed design.

2.4 Site Wide Foul Water Drainage Coordination

The proposed foul water drainage strategy for the site involve coordination with Meinhardts MEP engineer's to coordination the superstructure drainage up until it enters the below ground drainage network. A below ground drainage network of pipes and manholes will collect the foul water discharge from the buildings before discharging via gravity into the Thames Water combined sewer located in the surrounding roads.

Any ground floor or basement level foul water drainage that can't be drained by gravity will be routed to private basement foul water pump chambers which will lift foul water from the basements into the internal drainage network before draining via gravity into the external below ground drainage network.

2.5 Operations and Maintenance

2.5.1 Pipes (Including Oversized)

2.5.1.1 Location and Description

Pipes are proprietary products and the materials can vary across the site and as such where used the manufacturer's recommendations should be followed. Regardless of the product used, the pipes will be fully compliant with the Meinhardt drainage specification.

2.5.1.2 Operation

They are intended to be dry except for during rainfall events. These have been designed to be self-cleansing for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.

Access for maintenance is provided through access chambers, manholes, rodding plates and rodding eyes.

2.5.1.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be draining correctly thus exposing the development to a greater level of flood risk. Maintenance responsibility for the pipes should be placed with Ecoworld.

Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, as run-off is taken from potentially contaminated areas such as car parks/service yards.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection should be provided as post construction CCTV survey.	N/A
	Inspect for evidence of poor operation via water level in chambers. If required, take remedial action.	3-monthly, 48 hours after large storms.
Occasional maintenance	Check and remove large vegetation growth near pipe runs.	6 monthly
Remedial actions	Rod through poorly performing runs as initial remediation.	As required.
	If continued poor performance jet and CCTV survey poorly performing runs.	As required.
	Seek advice as to remediation techniques suitable for the type of performance issue and location.	As required If above does not improve performance.

2.5.2 Green/Blue Roofs, Location and Description

A green/blue roof specialist will be required at later design stages.

2.5.2.1 Inspection and Maintenance Regime

Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be draining correctly thus exposing the development to a greater level of flood risk. Maintenance responsibility for the pipes should be placed with Ecoworld.

Maintenance Schedule	Required Action	Typical Frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify and sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie. Year one), replace dead plans as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where >5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly and annually or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly and annually or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required - clippings should be removed and not allowed to accumulate	Six monthly and annually or as required
Remedial Actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

2.5.3 Bioretention Systems

2.5.3.1 Location and Description

Bio-retention systems (including rain gardens) are shallow landscaped depressions can reduce runoff rates and volumes, and treat pollution through the use of engineered soils and vegetation. They are particularly effective in delivering interception and can also provide:

- Attractive landscape features that are self-irrigating and fertilizing
- Habitat and biodiversity
- Cooling of the local microclimate due to evapotranspiration.

Bio-retention systems have been specified to be used in various privately managed public spaces throughout the site.

2.5.3.2 Operation

It has been concluded in literature (Dalrymple, 2013) that bio-retention systems will typically require approximately 2.5 times more maintenance than typical landscaped designs.

Maintenance schedule	Required Action	Typical Frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary)	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace if necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace and plants to maintain planning density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly or biannually
Occasional maintenance	Infill nay holes or scour in filter medium, improve erosion protection of required	As required
	Repair minor accumulations of silt by raking away surface mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

2.5.4 Geocellular units

2.5.4.1 Location and Description

Geocellular units are proprietary products and therefore manufacturer's specific recommendations should also be taken into consideration above what has been prepared in this document. Additionally, different manufacturers may have different connection types and arrangements which will need to be taken in to consideration.

2.5.4.2 Operation

The geocellular units, along with permeable paving, are intended to attenuate the discharge from the site up to and including the 1 in 100 year plus 40% climate change event.

Access for maintenance has been provided through inspection chambers.

2.5.4.3 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of geocellular units as designed. As the feature is buried a regularly inspection regime is very important to ensure the correct functionality of the surface water drainage network. Maintenance responsibility for the geocellular units and their surrounding areas should be placed with Ecoworld.

Sediment\material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as car parks/service yards.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Inspect inlets, outlets and overflows for blockages, and clear if required. If faults persist jetting and CCTV survey may be required.	Monthly and after large storms.
	Check penstocks and other mechanical devices (if present).	Half yearly.
	Inspect ventilation cowl (if present)	Monthly and after large storms.
Regular maintenance\inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures	Annually (or as required after heavy rainfall events)
Remedial actions	Repair/rehabilitation of inlets, outlet, overflows and vents.	As required.

2.5.5 Permeable Pavements

2.5.5.1 Location and Description

The permeable pavement is located at the Jolly's Green area of the development.

The permeable pavement has been designed in accordance with CIRIA C753.

Permeable pavements contain proprietary products and as such, the manufacturer's recommendations should be followed where used.

2.5.5.2 Operation

Permeable pavements are an efficient mean of managing surface water runoff close to its source – intercepting runoff, reducing the volume and frequency of runoff, and providing a treatment medium.

The surface has been designed to be porous or to contain gaps where rain can flow through the upper construction layers into the voided stone which makes up the sub-base.

2.5.5.3 Inspection and Maintenance Regime

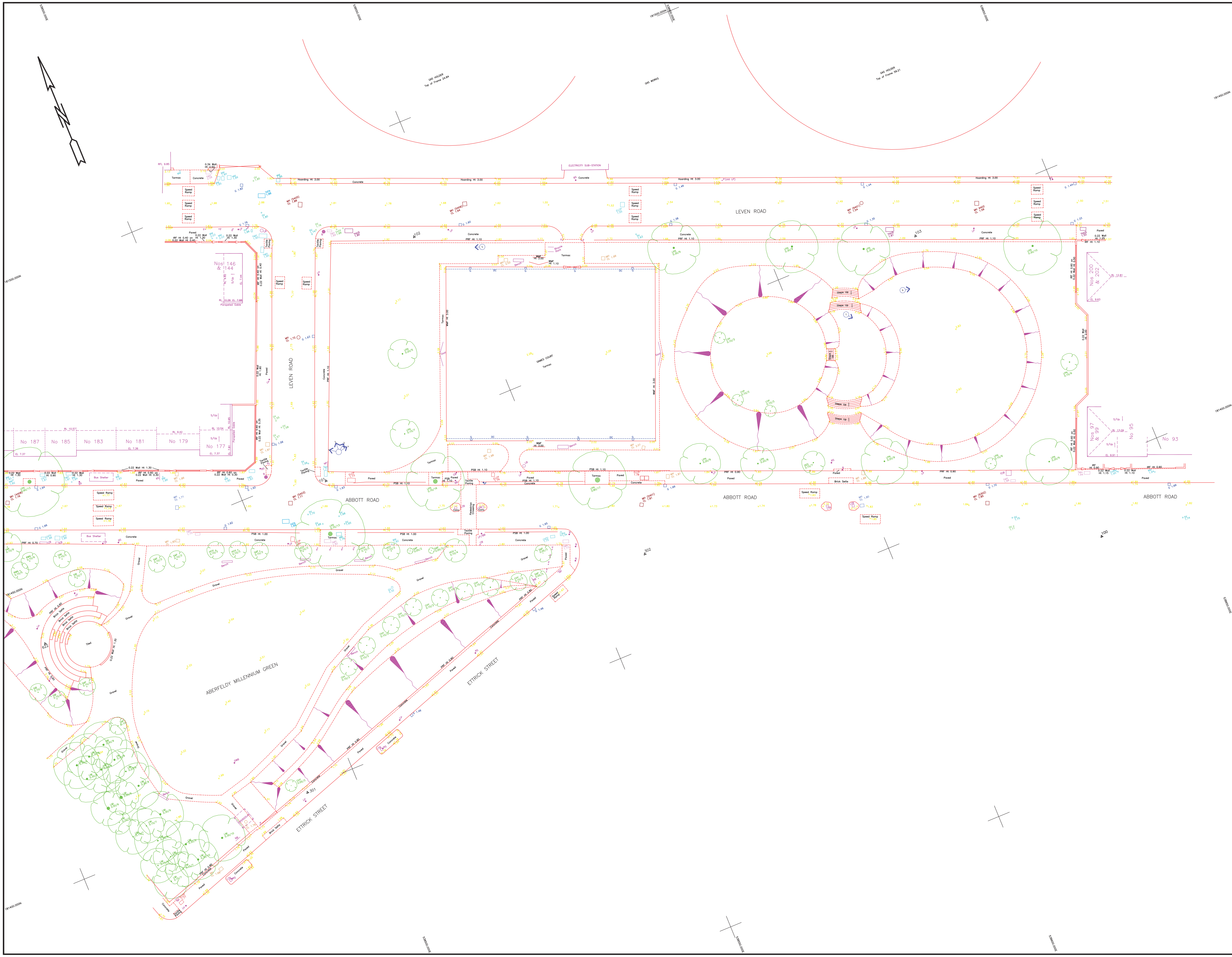
Regular inspection and maintenance is important for the effective operation of the pervious pavement. Maintenance responsibility for the pavement and its surrounding area should be placed with Ecoworld.

Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols, as run-off is taken from potentially contaminated areas such as car parks/service yards.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection.	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth. If required, take remedial action.	3-monthly, 48 hours after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspection chambers.	Annually.
Regular maintenance/inspection	Brushing and vacuuming.	Three times/year at end of winter, mid-summer, after autumn leaf fall, or as required based on site-specific observations of clogging or manufacturers' recommendations.
Occasional maintenance	Removal of weed or management using glyphospate applied directly into the weeds by an applicator rather than spraying.	As required – one per year on less frequently used pavements.
	Stabilise and mow contributing and adjacent areas.	As required.
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing materials.	As required.
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging).

Aberfeldy Village, London
Masterplan, Below Ground Drainage Strategy

Appendix A – Topographical & Utility Surveys



SIZES AND SPECIES ARE INDICATIVE ONLY, WITH THE MEAN SPREAD DRAWN TO SCALE.

Coordinate Table

Aworth SURVEY CONSULTANTS

STATION	DESCRIPTION	EASTING	NORTHING	LEVEL
100	PN	538634.795	181387.889	1.889
101	PKN	538514.670	181447.628	1.737
102	PKN	538544.730	181480.753	1.873
103	PKN	538624.766	181447.996	1.674
300	??	538463.462	181378.864	1.771
301	PN	538491.308	181399.170	1.700
302	PKN	538560.752	181415.049	1.811
622	PN	538459.194	181440.085	3.221
C1	PN	538663.947	181376.651	1.940
C2	PN	538687.952	181279.286	1.783
C3	PKN	538506.884	181219.790	1.829
C4	PN	538429.831	181475.704	1.957

HN – Hilti® Nail PKN – Parker Kalon® Nail PGM – Permanent Ground Marker
PM – Punch Mark PN – Pipe Nail W – Washer (used with PKN and PN)

SHEET LAYOUT

NOTE:

PHOTO POSITIONS SHOWN THUS:

FOR PHOTO'S REFER TO DRAWING 3553–7 SHEET 3.

NOTES

LEVELLING THE SURVEY LEVELS ARE BASED ON OS NEWLYN DATUM BY GPS USING OSGM02.

GRID THE SURVEY IS ON A PLANE LOCAL GRID RELATED TO OS NATIONAL GRID BY GPS USING OSTN02. THE LOCAL GRID ORIGIN IS STN C1, CO–ORDINATES 538663.947E, 181376.651N.

LLOYD'S REGISTER QUALITY ASSURANCE CERTIFICATED COMPANY

THE SURVEY ASSOCIATION

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Drawing No	Sheet	Revision
3553–7	1	
	Scale 1:200	@ A0

Surveyed	NW/CS
Drawn	TP
Checked	PE
Date	18/12/09

Project

ABERFELDY VILLAGE
POPLAR
PHASE 7

Client

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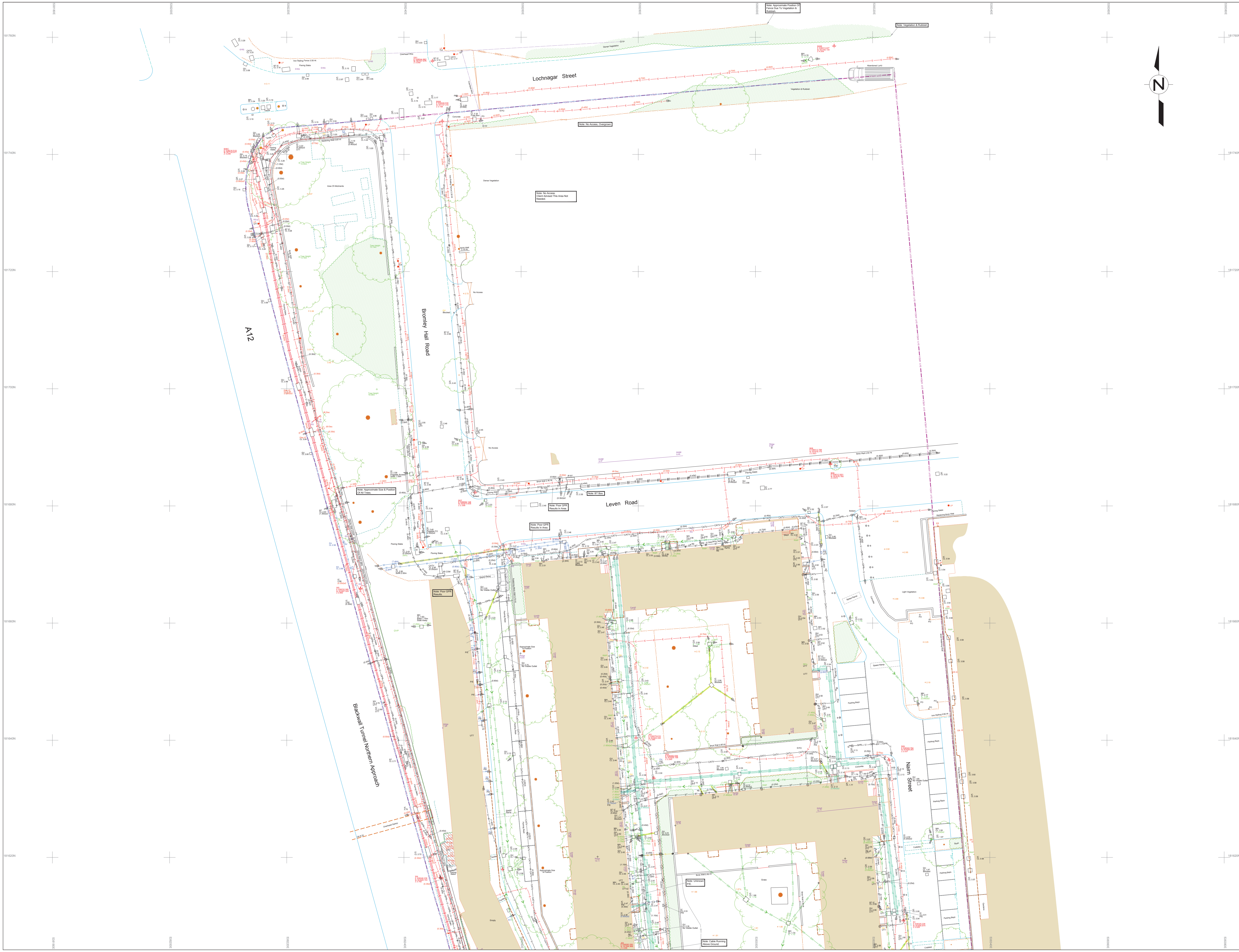
14 THOMAS ROAD
LONDON E14 7AF



LEGEND

UTILITY LINETYP/ES

British Telecom	BT	Gas	G
Cable Television	CATV	Heating PiP/Es	HP
Closed Circuit Television	CCTV	HV Cables	HV
Communications	C	Multiple Services Route	MSR
Drainage	DR	Oil	OIL
Drainage - Combined Water	CW	Oxygen	OXY
Drainage - Foul Water	FW	Street Lighting	SL
Drainage - Storm Water	SW	Traffic Signal Loop	TSL
Empty Duct	ED	Unknown found by GPR	GPR U
Electric	E	Unknown	U
Fire Hydrant Main	FH	Unknown Cable	UC
Fibre Optic	FO	Unknown PiP/Eline	UPL
Fuel	FUEL	Water	W

Assumed Service Route - See GENERAL NOTES (Using abbreviation of service and colour as above) — ASR XXX ASR XXX

UTILITY SURVEY INFORMATION

Area of Concern	AOC	Unable to Survey	UTS
Contracted Survey Area	SVY AREA	Unable to Lift (cover)	UTL
Previous Survey Area	PREVIOUS	Unable to Trace	U
Extent of (Post processed) GPR	GPR Survey	Unable to Trace (due to blockage)	B
Depth to Top of Service (metres)	(O.60d)	Unable to Trace Further	F
		End of Trace	E

ABREVIATIONS used on a PAS 128 Survey

(O.65d B2P) 0.65d = Depth in metres, B2 = Quality Level, P = Post processed GPR

TOPOGRAPHIC & UTILITY DETAILS

Barrier (symbol - sized)		PiP/E into Ground (symbol)	
Belisha Beacon (symbol)	BB	Post (symbol)	PO
Bollard (symbol)	B	Rain Water PiP/E (symbol)	RWP
Borehole (symbol)		Road Sign (symbol)	RS
British Telecoms IC (sized)	BTIC	Rodding Eye (symbol)	RE
Building (incomplete detail)		Sapling (symbol)	S
Cable into Ground (symbol)		Sign Post (symbol)	SP
Cable TV Box (symbol)	CTV	Spot Light (symbol)	SL
CCTV Camera (symbol)		Spot Height	50.00 +
Cover Level in metres	CL 50.00	Stop Cock (symbol)	SC
Direction of Flow (Drainage)		Stop Valve (symbol)	SV
Distribution Board (symbol)	DB	Survey Station (symbol)	
Earth Rod (symbol)	ER	Telephone Pole (symbol)	TP
Electric Cabinet (sized)	EC	Traffic Bollard (symbol)	B
Electric Pole (symbol)	EP	Tree (dimensions in metres - e.g.) Diameter at 1mh: (bole) Height: Spread: SP/Ecies:	Dia: 0.3 Sp: 7.5 Ht: 10.2 Maple
Electric Sign (symbol)	ES		
Embankment	Bottom Top		
Feeder Pillar (sized)	FP	Traffic Light (symbol)	TL
Fire Hydrant (sized)	FH	Unknown Valve (symbol)	UV
Flag Pole (symbol)	FP	Vent PiP/E (symbol)	VP
Flat Roof Level in metres	FRL 50.00	Wall	
Flood Light (symbol)	FL	Waste PiP/E (symbol)	WP
Gas Valve (symbol)	GV	Water Meter (symbol)	WM
	Single Double	Water Valve (symbol)	WV
Ground Level in metres	GL 50.00	Building Canopy	
Gulley (sized)	GU	Crash Barrier	
InsP/Ection Cover (sized)	IC	Drainage Channel	Drainage Channel
Invert Level in metres	IL 50.00	Drop Kerb (level in metres)	50.00
Junction Box - BT (sized)	JB BT	Edge Detail (level in metres)	50.00
Junction Box - Comms (sized)	JB COM	Footpath (level in metres)	50.00
Junction Box - Elec (sized)	JB	Fence	
Lamp Post (symbol)	LP	Heras Fence	
Light Bollard (symbol)	LB	Kerb channel (level in metres)	50.00
Light in ground (symbol)	LIG	Kerb top (level in metres)	50.00Tk
Manhole (sized)	MH	Overhead Service Line	OHS
Manhole CapP/Ed Port		P/Edestrian Railing	
ParaP/Et Level in metres	PL 50.00		
PiP/E Diameter in millimetres	Ø100		

GENERAL NOTES

IrresP/Ective of the information provided by a utility survey and statutory plans, excavation work should be undertaken with extreme caution and in accordance with HSE Guidelines - HSG47 Avoiding Danger from Underground Services

Only sub-surface utility information is provided. Above ground utility information may be shown where it assists with positional referencing.

Utilities may continue outside of the survey area. Any paint marks outside of the area are for investigative purposes only and may not represent the full extent of the sub-surface utilities.

Where logic indicates a utility exists but which cannot be positively confirmed with the technology, an assumed route (ASR) is recorded. All assumed service routes (ASR) have been highlighted with a background yellow colour for visual enhancement.

Sewer and manhole details shown on this drawing have been obtained by observation and measurement from the surface and as such cannot be guaranteed

Vertical & Horizontal Position - Vertical position (depth) is indicative to the top of the utility/feature and is recorded as (x.xxd) i.e. (1.25d) - (depth to top of service) and should not be taken as exact, as this could be the surround to the service rather than the service itself. Where depth information from the technology is unclear, depth is not shown. Drains and piP/Es/ducts may have been detected using threading and the depth indicated could be between the top (soffit) and the bottom (invert). Horizontal position is indicative to the centre of the utility/feature and should not be taken as exact.

Warranty - Biodegradable paints are used to mark-out the position of the utilities. Markings may become illegible quickly deP/Ending on ground, weather and traffic conditions. No warranty is given in resP/Ect of the durability of the paint markings and that they are a complete representation of the sub-surface utilities, therefore, this drawing should be used as the primary reference for the survey results.

This drawing does not provide an absolute representation of the sub-surface. Utilities have been detected using non-invasive technologies only and the P/Erformance can be adversely affected by ground, weather and site conditions outside of SUMO's control, therefore, some utilities may be undetectable. While SUMO uses reasonable endeavours to detect all utilities, it does not warrant that 100% detection will be achieved and that approximate depth P/Enetration of the technologies SUMO uses will not be greater than two metres.

SHEET LAYOUT

Sheet 01

Sheet 02

Sheet 03

Rev	Notes	Drawn	Date

Notes:

Survey is referenced to OS Grid and Level Datum.

Previous Sumo Survey "SOR016539.dwg" has been inserted into this model for reference.

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Title: Utility Mapping

Client: Aberfeldy New Village LLP

Project: Aberfeldy Village, Tower Hamlets, London

Date Completed:	15/08/2020	Post Code:	E14 0ND
Surveyed:	DW, JHG, CE	Scale:	1/200 (A0 Sheet)
Drawn:	DM		
Checked:	DW, JHG, CE		
Job No:	SOR017679	Dwg No: 01	Rev: