PARKHURST GARDENS

DRAINAGE ASSESSMENT REPORT

June 2014

FIRST BASE

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Appendix A - Drainage Drawings

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Revision	Date	Status
P3	20.06.2014	Revised Planning Issue
P2	27.11.2013	Planning Issue
P1	22.11.2013	Preliminary

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1 Introduction

The following report is an assessment of the surface and foul water drainage along with a Flood Risk Assessment prepared by AKT II for the proposed development at 65-69 Parkhurst Road, Islington.

The assessment has been updated to take account of revisions made to the proposals during the course of the planning application. It also provides additional information to address comments made by the London Borough of Islington on the December 2013 scheme.

2.0 Surface Water Drainage

2.1 Existing Site Conditions

The available Thames Water record plans indicate that there is a combined sewer running under Holbrooke Court to the east of the site and a combined sewer running under Parkhurst Road to the south of the site. Neither of these sewers have their size recorded on the Thames Water Asset Plan but it is anticipated that the sewer in Holbrooke Court will be a small diameter due to being at the head of a run whereas the sewer in Parkhurst Road is likely to be much larger diameter. An extract from the record plans is shown in Figure 2.1 for reference.

Based on the topographical survey information available, it is believed that the surface water from the building and yard areas currently discharges directly to the public sewer in Parkhurst Road without any form of attenuation through a combined network but a CCTV survey of the existing site drainage network must be undertaken to confirm the location and size of all existing connections from the site. Drawing No. 3472-C-001 contained in Appendix A shows the existing drainage network as recorded by the topographical survey for information.

The total site area is approximately 5,810m² of which only 80m² is currently permeable surface. In accordance with the Modified Rational Method, the peak existing run-off from the site is calculated from the formula:

$Q = 3.61 \times C_v \times A \times i$

where C_v is the volumetric runoff coefficient, A is the catchment area in hectares and i is the peak rainfall intensity in mm/hr.

For the peak 1 in 1 year return period storm event this gives an existing discharge rate from the site of:

$\mathbf{Q_1}$ = 3.61 x 0.75 x 0.573 x 33.8 = **52.5 litres/sec**

and for the peak 1 in 100 year return period storm event this gives an existing discharge rate from the site of:

$\mathbf{Q_{100}}$ = 3.61 x 0.75 x 0.0573 x 97.6 = **151.4 litres/sec**

These figures are both in excess of the total capacity of the 150mm and 100mm diameter outlet pipes noted on the topographical survey and so this reinforces the need for further clarification of the existing network through the CCTV survey.

2.2 Proposed Scheme

The landscaping plans indicate that there will be an increased area of soft landscaping incorporated into the proposed scheme (approximately 970m²), Cedec footpaths (40m²) and rubber play surfacing (145m²) giving a reduced impermeable area of 4,655m². Therefore, again using the Modified Rational Method, the proposed (unattenuated) peak run-off from the site for the 1 in 1 year return period storm would be:

$\mathbf{Q_1}$ = 3.61 x 0.75 x 0.4655 x 33.8 = **42.6 litres/sec**

and for the peak 1 in 100 year return period storm event:

$\mathbf{Q_{100}}$ = 3.61 x 0.75 x 0.460 x 97.6 = **123.0 litres/sec**

Making an allowance for climate change of 30% this would give an unattenuated design discharge of:

$\mathbf{Q_{1\,(+30\%)}}$ = **55.4 litres/sec** and $\mathbf{Q_{100\,(+30\%)}}$ = **159.9 litres/sec**

In accordance with the Environment Agency's guidelines, the Building Regulations and the Water Authority's advice, the preferred means of surface water drainage for any new development is into a suitable soakaway or infiltration drainage system. Sustainable Urban Drainage Systems (SuDS) can reduce the impact of urbanisation on watercourse flows, ensure the protection and enhancement of water quality and encourage recharging of groundwater in a manner which mimics nature.

In addition to this, the National Planning Policy Framework requires that surface water arising from a developed site should, as far as is practicable, be managed in a sustainable manner to mimic surface water flows arising from the site prior to the proposed development, whilst reducing flood risk to the site itself and elsewhere, taking climate change into account.

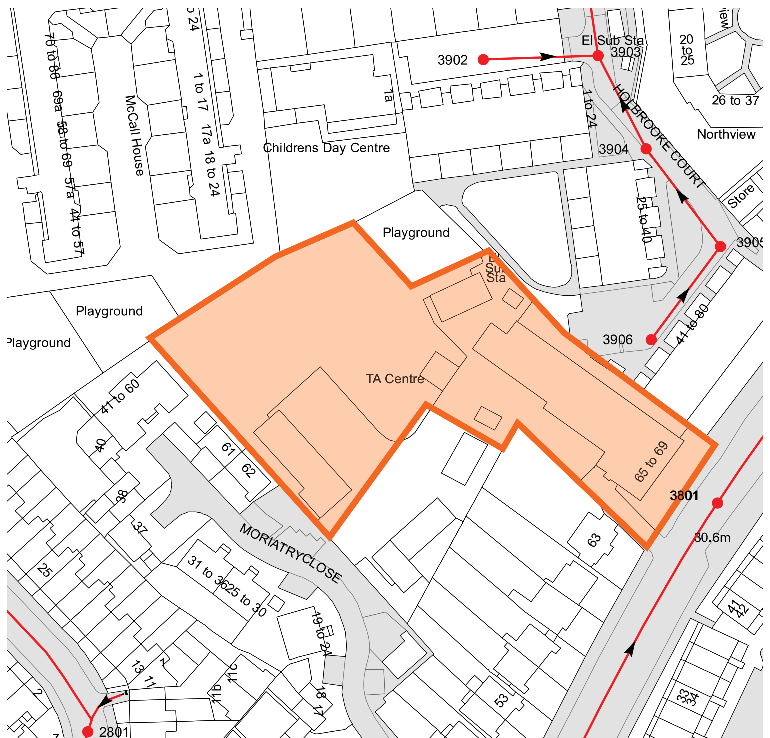

Fig. 2.1: Thames Water Sewer Record

Therefore, as an absolute minimum, the proposed site discharge under the 1 in 100 year storm plus climate change should be no greater than the existing 1 in 100 year storm discharge (i.e. mitigate the impact of climate change). In this case, this would mean that, rather than discharging 160 litres/sec, the maximum permissible discharge from the site would be 151 litres/sec.

Further to the above, the London Plan Essential Standard states that Developers should aim to achieve a 50% reduction on the existing discharge rate (reduced to 75 litres/sec in this case) and the Environment Agency (EA) suggests that Developers should aim to achieve greenfield run off from their site. This is echoed by Islington Council's Development Management Policy 6.6 which "schemes must be designed to reduce flows to a greenfield rate of runoff where feasible" and, if this is not feasible, "the maximum permitted runoff rate will be 50 litres/sec/hectare" - **29 litres/sec** in this case. In accordance with the method outlined in the Institute of Hydrology Report 124, the Greenfield runoff for the site is calculated from the formula:

$\mathbf{Q_{BAR}} = 0.00108 \times AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$

where AREA is the site area in km² (pro rata of 50ha if the site is less than 50ha), SAAR is the Standard Average Annual Rainfall in mm and SOIL is the Soil Index both read from The Wallingford Procedure maps. This gives a greenfield runoff for the site of:

$\mathbf{Q_{BAR}} = 0.00108 \times 0.5^{0.89} \times 600^{1.17} \times 0.45^{2.17}$ = **183.4 litres/sec (for 50ha)**

Scaling this for the actual site area gives:

$\mathbf{Q_{BAR}}$ = (183.4 x 0.581) / 50 = **2.13 litres/sec**

Using the Hydrological Growth Curve for south east England, the growth factor from Q_{BAR} to Q_{100} is 3.146 which gives a value for $\mathbf{Q_{100}}$ = **6.71 litres/sec.**

As the project involves the complete redevelopment of the current site we would expect that the Local Authority, Thames Water and the EA would look to enforce the requirements of Development Management Policy 6.6 as a minimum i.e. a maximum discharge of **29 litres/sec** with a preference for Greenfield rate if possible.

2.3 Disposal Methods

SuDS Management Train

A useful concept used in the development of sustainable drainage systems is the SuDS management train (sometimes referred to as the treatment train). Just as in a natural catchment, drainage techniques can be used in series to change flow and quality characteristics of the runoff in stages. There are a variety of measures that can be implemented to achieve these goals:

Site Management / Prevention

Site management procedures are used to limit or prevent runoff and pollution and include:

- Minimising the hardened areas within the site
- Frequent maintenance of impermeable surfaces
- Minimising the use of de-icing products

Source Control

Source control techniques will be used where possible as they control runoff at source in smaller catchments. They can also provide effective pollution control and treatment, thereby improving the quality of the effluent discharged to the receiving waters.

Site Control

Where source control techniques do not provide adequate protection to the receiving watercourses in terms of flood protection and pollution control, site control may be required.

Regional Control

Where large areas of public space are available regional control can be incorporated to provide additional "communal" storage and treatment to runoff from a number of sites. However, in this case, all storage and treatment will be implemented on-site.

Drainage Hierarchy

Based on the above, the following drainage hierarchy has therefore been considered when preparing the surface water disposal strategy:

1. Store water for later use
2. Use infiltration techniques such as porous surfaces in non-clay areas
3. Attenuate rainwater in ponds or open water features for gradual release to a watercourse
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release to a watercourse
5. Discharge rainwater direct to a watercourse
6. Discharge rainwater to a surface water drain
7. Discharge rainwater to a combined sewer

As the project involves the complete redevelopment of the existing site, it may be practical to install a rainwater harvesting system. Water collected here could be reused to flush toilets, or for irrigation of the soft landscaping and this option should be investigated further during the next design stage (as the MEP proposals are developed) to assess if it provides sufficient environmental benefit to merit it's inclusion.

However, as there may be instances where the harvesting tank is full during the critical storm event, the potential reduction in quantity provided by rainwater harvesting has been conservatively ignored in the subsequent calculations meaning that the scheme still achieves the quantity requirements of Development Management Policy 6.6 even without it's inclusion.

The proposed site layout does not have sufficient space to allow ponds or water features to be incorporated into the strategy for surface water disposal and so these have been discounted.

Section 7.6 of the SoilTechnics' Site Investigation report dated October 2013 confirms that "The London Clay deposits are, in our opinion, effectively impermeable and would not be able to dispose of water using soakaway systems." which would preclude the use of infiltration systems for disposal. An extract from this report is contained in Appendix B for reference. However, it has been possible to introduce swales and bio-retention areas as part of the soft landscaping which will provide treatment and control to the runoff and enhancing biodiversity contributing to all three DMP6.6 criteria - quantity, quality and amenity. In addition to this, approximately 140m² of hardstanding will be shed to adjacent planted ares / rain gardens rather than being discharged to the drainage network.

It is also proposed to introduce areas of permeable paving for the conveyance and treatment of surface water on the site. There will be approximately 560m² of permeable paving provided (an increase on the original proposal) allowing an element of evaporation and also providing treatment to runoff by removing contaminants as it filters down through the granular sub-base improving the quality of the water collected by the perforated drain at the base.

In addition to this, the use of green and brown roofs is proposed which will substantially improve the sustainability and amenity of the development and also help reduce the peak surface water runoff from the site. Approximately 1,125m² of green or brown roof will be provided relatively evenly spread across all six blocks (again, a significant increase on the original proposals). This will provide significant attenuation and water treatment during the smaller storm events although in large storm events the impact will be reduced.

There are no adjacent rivers or ponds and so discharge to a watercourse will not be a viable disposal method.

Finally, it is also proposed to introduce a geocellular tank to store the remaining volume of back-up caused by reducing the permitted discharge rate. The discharge will be limited using a flow control device located in the final manhole before connecting to the public sewer. Although the geocellular tank does not offer any quality or amenity benefits it will provide a large part of the quantity reduction.

Figure 2.4 below provides a summary of the proposed SuDS measures and their relevance to the SuDS management train and Policy DM6.6.

The preliminary calculation for the surface water network indicate that a tank volume of 90m³ combined with the areas of green roof, permeable paving and soft landscaping quoted above is sufficient to limit the maximum discharge rate to **27.7 litres/sec** and also prevent any flooding of the drainage network under the critical 1 in 100 year storm (including an allowance of 30% for climate change). A copy of these calculations is enclosed in Appendix D for reference.

Once the CCTV and level survey of the existing network has been undertaken the exact location and layout of the outfall can be determined. Drawing Nos. 3472-C-100, C-101, C-700 and C-710 contained in Appendix A give details of the schematic drainage layout for the proposed development for information.

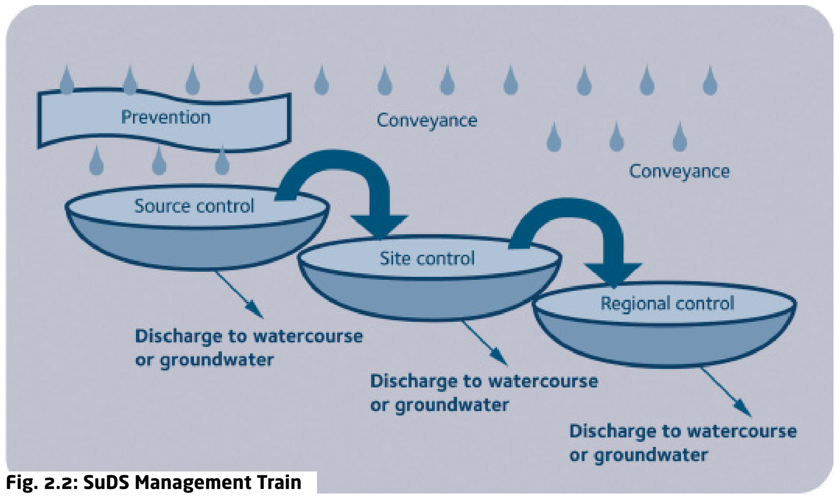

Fig. 2.2: SuDS Management Train

Policy DM6.6

Flood prevention

A. Applications for major developments creating new floorspace and major Changes of Use that are likely to result in an intensification of water use are required to include details to demonstrate that Sustainable Urban Drainage Systems (SUDS) have been incorporated and meet the following design standards:
   i) Quantity: schemes must be designed to reduce flows to a 'greenfield rate' of run-off (8 litres/second/hectare for Islington), where feasible. The volume of run-off that must be stored on site should be calculated based on the nationally agreed return period value of a 1 in 100 years flood plus a 30% allowance for climate change for the worst storm duration. Where it is demonstrated that a Greenfield run-off rate is not feasible, runoff rates should be minimised as far as possible. The maximum permitted runoff rate will be 50litres/second/hectare.
   ii) Quality: the design must follow the SUDS 'management train', maximise source control, provide the relevant number of 'treatment stages' and identify how the 'first flush' will be dealt with.
   iii) Amenity and biodiversity: the design must maximise amenity and biodiversity benefits, while ensuring flow and volumes of run-off entering open space are predictable and water at the surface is clean and safe. Schemes should maximise areas of landscaping and/or other permeable surfaces to support this.

B. Sites located in Local Flood Risk Zones (LFRZs) will be required to submit a Flood Risk Assessment (FRA) to assess the risk of flooding, particularly surface water flooding, taking climate change projections into account. Where the FRA indicates that an additional volume of run-off must be stored above and beyond the amount calculated based on the method above, this must be provided on site.

C. All minor new build developments of one unit or more are required to reduce existing run-off levels as far as possible, and as a minimum maintain existing run-off levels, including through the incorporation of SUDS.

D. Developments may be required to make contributions to addressing surface water flood risk, particularly where they are located in areas considered at high risk of surface water flooding and in exceptional cases where the SUDS quantity standards cannot be achieved on site.

Fig. 2.3: London Borough of Islington Development Management Policy 6.6

Element	Management Stage	Water Quantity	Water Quality	Amenity & Biodiversity
Soft Landscaping	Prevention	✓	✓	✓
Swales	Source Control	✓	✓	✓
Bio-retention	Source Control	✓	✓	✓
Green / Brown Roof	Source Control	✓	✓	✓
Permeable Paving	Source Control	✓	✓	×
Geocellular Tank	Site Control	✓	×	×
Flow control Device	Site Control	✓	×	×

Fig. 2.4: Summary of Proposed SuDS Devices

3. Foul Water Drainage

3.1 Existing Site Conditions

The available Thames Water record plans indicate that there is a combined sewer running under Holbrooke Court to the east of the site and a combined sewer running under Parkhurst Road to the south of the site. Neither of these sewers have their size recorded on the Thames Water Asset Plan but it is anticipated that the sewer in Holbrooke Court will be a small diameter due to being at the head of a run whereas the sewer in Parkhurst Road is likely to be much larger diameter. An extract from the record plans is shown in Figure 2.1 for reference.

Based on the topographical survey information available, it is believed that the foul water from the existing buildings currently discharges directly to the public sewer in Parkhurst Road but a CCTV survey of the existing site drainage network must be undertaken to confirm the location and size of all existing connections from the site. Drawing No. 3472-C-001 contained in Appendix A shows the existing drainage network as recorded by the topographical survey for information.

No floor plans have currently been made available for the existing buildings and so it has not been possible to assess the current foul water discharge rate from the site.

3.2 Proposed Scheme

The final architectural proposals indicate that the development will comprise of 109 residential units varying in size from 1 to 4 bedroom apartments. The anticipated foul flow has therefore been conservatively assessed based on Clause 2.12.1 of Sewers for Adoption 6th Edition as follows:

No. of units	=	112
Flow	=	4000 litres/day/unit
Total Flow	=	(112 x 4000) / (24 x 60 x 60)
	=	5.2 litres/sec

Thames Water have previously advised on other London-based projects that they assess flows from residential developments on the basis of:

- First fifty 1 bedroom units at 4000 litres/day/unit
- Remaining 1 bedroom units at 600 litres/day/unit
- First fifty 2 and 3 bedroom units at 2,500 litres/day/unit
- Remaining 2 and 3 bedroom units at 375 litres/day/unit

Using this approach would reduce the estimated foul flow to approximately 2.7 litres/sec. However, at this design stage it is suggested that an allowance is made for 7 litres/sec to accommodate any design development and also the communal areas such as plant rooms and bin stores.

Although it has not been possible to make an assessment of the existing foul water flow, it is believed that it will be significantly lower than the proposed rate given the current site use. Any increase will need to be agreed with Thames Water and their written approval of this will be required once a more detailed assessment can be made of the existing and proposed situations. However, it is assumed that the large reduction in surface water discharge to the same combined sewer (approximately a 24 litre/sec reduction under the 1 in 1 year storm event and a 120 litres/sec reduction under the 1 in 100 year event) will more than offset the increase and therefore be acceptable to Thames Water.

It is recommended that, if possible, the existing foul drainage connection should be re-used to minimise cost and disruption. Drawing Nos. 3472-C-100, C-101 and C-700 contained in Appendix A show the schematic drainage layout for the proposed development for information. A copy of the supporting calculations are enclosed in Appendix D for reference.

4. Flood Risk Assessment

4.1 Fluvial and Pluvial Flooding

The Environment Agency's Indicative Floodplain Map (see Figure 4.1) shows that the site lies in Zone 1 - an area with a low probability of flooding. As the site is also less than 1 Ha in area, there would be no requirement for a Flood Risk Assessment in accordance with the National Planning Policy Framework.

Also, as there is a reduction in the area of hardstanding on the site and it is proposed to further restrict the discharge rate, there is actually a decrease in the flood risk from the site itself to adjacent or downstream properties.

The site is therefore at low risk of flooding from fluvial and pluvial sources.

4.2 Groundwater Flooding

Groundwater flooding is caused by the emergence of water originating from sub-surface permeable strata and is often highly localised and complex. After a prolonged period of rainfall, a considerable rise in the water table can result in inundation for extended periods of time.

A site investigation has been carried out which consisted of a mixture of boreholes and trial pits across the site. Trial pits were excavated up to a depth of 4m below ground level with "minor inflow" of groundwater generally being encountered in all pits at a depth coinciding with the boundary between strata of Made Ground and London Clay which suggests that this is related to trapped surface water rather than actual groundwater. This is confirmed by the SoilTechnics Site Investigation report dated October 2013 - the relevant extract is enclosed in Apendix B for reference.

The presence of London Clay close to the surface acts as a barrier to groundwater held in the lower soil strata impacting the site due to it's low permeability.

Therefore,the site is at low risk of flooding from groundwater sources.

4.3 Sewer Flooding and Overland Flow

Surface water flooding occurs as a result of overland flow leading to ponding. Overland flow occurs following heavy or prolonged rainfall (or snow melt) where intense rainfall is unable to soak into the ground or enter drainage systems due to blockages or capacity issues. It can also be as a result of sewers surcharging due to blockages rather than extreme rainfall events. Unless it is channelled elsewhere, the run-off travels overland, following the gradient of the land. Ponding occurs as the overland flow reaches low lying areas in the local topography. These flood events tend to have a short duration and depend on a number of factors such as geology, topography, rainfall, saturation, extent of urbanisation and vegetation.

A Sewer Flooding History Enquiry has been lodged with Thames Water who have confirmed that there have been no incidences of flooding in the area as a result of surcharging public sewers. A copy of this correspondence is contained in Appendix C for reference.

4.4 Flooding from Artificial Sources

Where infrastructure exists that retains, transmits or controls the flow of water; flooding may result if there is a structural, hydraulic, geotechnical or mechanical failure of the infrastructure.

There are no artificial sources of flooding in the immediate vicinity of the site. However, the Environment Agency's "Risk of Flooding from Reservoirs" map in Figure 4.2 shows that the site is close to an area that could be impacted if there were to be a failure of the Maiden Lane Reservoir which is located approximately 1.25km to the west of the site.

The map shows the maximum extent of the flooding that could occur if the reservoir were to fail and release it's contents unrestricted and is therefore a conservative estimate of the flood extent. This indicates that water could reach the north and east boundaries of the site but would not enter the site which is consistent with the topographical survey showing a drop of between 0.5m and 1m from the site to the adjacent properties on these boundaries.

Therefore, the site is at low risk of flooding from artificial sources.

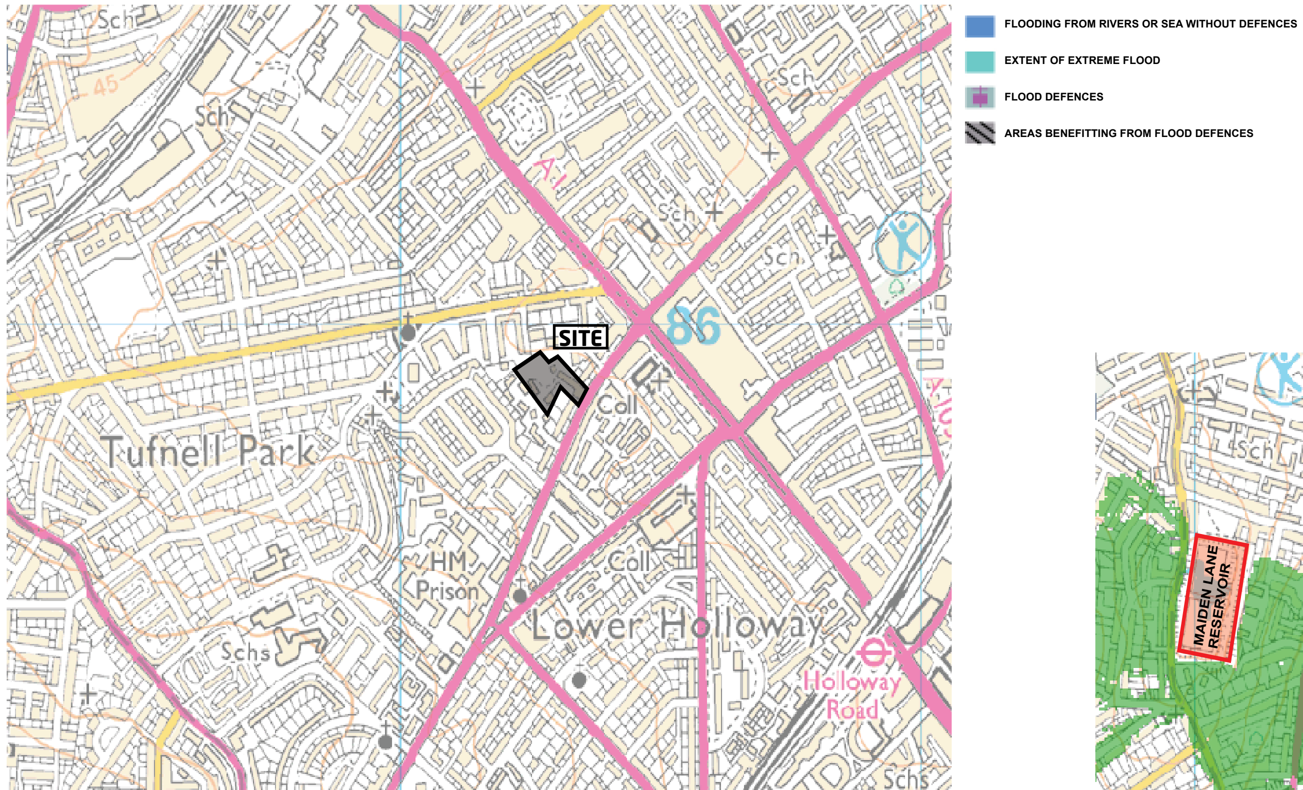

Fig. 4.1: Environment Agency Indicative Flood Map

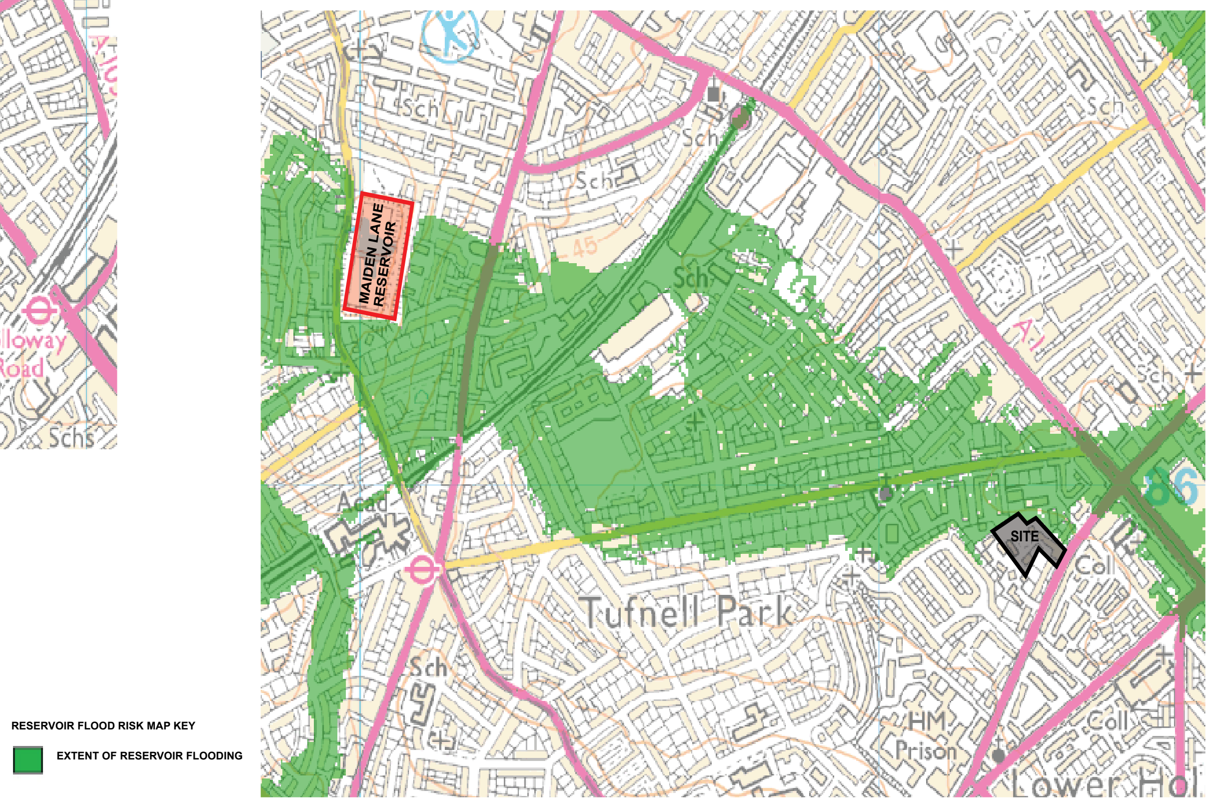

Fig. 4.2: Environment Agency's Reservoir Flood Risk Map

5. Code for Sustainable Homes

Sur1: Management of Surface Water Run-off from Developments

Hydraulic Control Criteria (mandatory)

1. **Peak Rate of Run-off**

   If there is no increase in the man-made impermeable area as a result of the new development, then the peak rate of run-off criterion does not apply.

   Where there is an increase in impermeable area, ensure that the peak rate of runoff over the development lifetime, allowing for climate change, will be no greater for the developed site than it was for the pre-development site. This should comply at the 1 year and 100 year return period events.

   Where the pre-development peak rate of run-off for the site would result in a requirement for the post-development flow rate (referred to as the limiting discharge) to be less than 5 litres/sec at a discharge point, a flow rate of up to 5 litres/sec may be used where required to reduce the risk of blockage.

2. **Volume of Run-off**

   If there is no increase in the man-made impermeable area as a result of the new development, then the volume of run-off criteria does not apply.

   If the developed site would otherwise discharge, over the development lifetime allowing for climate change, a greater volume of rainwater run-off than the pre-development site for the 100 year 6 hour event, (see Calculation Procedures) then criterion A applies. If A cannot be satisfied then B applies.

   A: Ensure that the post development volume of run-off, allowing for climate change over the development lifetime, is no greater than it would have been before the development

   The additional predicted volume of run-off for the 100 year 6 hour event must be prevented from leaving the site by using infiltration or other SuDS techniques.

   OR

   B: If A cannot be satisfied (full justification must be provided) then reduce the post development peak rate of run-off to the limiting discharge.

   The limiting discharge is the pre-development flow rate equivalent to the 1-year peak flow rate, mean annual flood flow rate (Q_{bar}) or 2 l/s/ha, whichever is the highest flow rate.

   For the 1-year peak flow rate the 1 year return period event criterion in section 1 above, applies. For all other events up to the 100 year return period event, the peak rate of run-off for the developed site must not exceed the limiting discharge.

   Where the limiting discharge flow rate would require a flow rate of less than 5 litres/sec at a discharge point, a flow rate of up to 5 litres/sec may be used where required to reduce the risk of blockage.

3. **Designing for Local Drainage System Failure**

   Demonstrate that the flooding of property would not occur in the event of local drainage system failure caused either by extreme rainfall or a lack of maintenance.

Water Quality Criteria

1. One credit can be awarded by ensuring there is no discharge from the developed site for rainfall depths up to 5 mm.
2. One credit can be awarded by ensuring that the run-off from all hard surfaces shall receive an appropriate level of treatment in accordance with the SuDS Manual to minimise the risk of pollution.

AKT II assessment of available credits - Hydraulic Control Criteria

1. **Peak Rate of Run-off**

	Pre-development	Post Development
Site Area	5,810 m²	5,810 m²
Impermeable area	5,730 m²	4,655 m²
Permeable area	80 m²	1,155 m²
1 year peak run-off	52.5 litres/sec	42.6 litres/sec
100 year peak run-off	151.4 litres/sec	123.0 litres/sec

However, as there is a reduction in the man-made impermeable area this mandatory criterion has been satisfied by default.

2. **Volume of Run-off**

For the 1 in 100 year event with a 6 hour duration:

Condition	Rate
Pre-development volume of run-off	330 m³
Volume of run-off caused by the new development **prior to mitigation**	348 m³
Additional volume caused by the new development prior to mitigation	18 m³

However, as there is a reduction in the man-made impermeable area this mandatory criterion has been satisfied by default.

Limiting Discharge Condition	Rate
Pre-development 1 year peak flow rate	52.5 litres/sec
Mean annual flow rate Q_{bar}	2.13 litres/sec
2 litres/sec/ha	1.16 litres/sec

However, as there is no increase in the man-made impermeable area this mandatory criterion has been satisfied by default.

3. **Designing for Local Drainage System Failure**

The design considers the consequences of system failure caused by extreme rainfall, lack of maintenance, blockage or other causes, have been considered and evaluated fully and there will be no increased risk to dwellings either on or off site. Therefore, this mandatory criterion is satisfied.

AKT II assessment of available credits - Waste Quality Criteria

1. As confirmed in Section 2.3 above, no infiltration is possible and therefore this credit cannot be achieved.
2. As there is no designated delivery area there is no requirement for a petrol separator. Therefore, all surfaces are deemed to be low risk and so we therefore believe that this credit could potentially be achieved.

6. Drainage Design Standards

The following guides and current British Standards have been used for the design of the drainage elements on this project:

- BS EN 752 Building Drainage: Parts 1-7
- BS EN 12056 Gravity Drainage Systems Inside Buildings: Part 2
- Building Regulations 2000 Part H1 – Sanitary Pipework and Drainage
- Building Regulations 2000 Part H2 – Cesspools and Tanks
- Building Regulations 2000 Part H3 – Rainwater Drainage
- Environment Agency "Control of Runoff from New Developments Interim Regional Guidance"
- National Planning Policy Framework
- The London Plan
- London Borough of Islington's Core Strategy and Development Management Policies
- Promoting Sustainable Drainage Systems: Design Guidance for Islington
- Environmental Design Planning Guidance: Tackling fuel poverty, enhancing quality of life and environment for all

7. Materials

	Item	Material	British Standard
a)	Drainage pipe work	Vitrified Clayware	BS EN 295-1
b)	Precast Inspection Chambers	Precast Concrete	BS 5911 Part 200
c)	Drainage Gullies and Gratings	Vitrified Clayware	BS EN 295-1
		Ductile Iron	BS EN 124 D 400
d)	Drainage Channels & Gratings	Polymer Concrete	
		Ductile Iron	BS EN 124 D 400
e)	Access Covers	Grey Iron	BS EN 124
		Galvanised Steel	Facta Class A, B & D
f)	Cellular Units	Polypropylene	
g)	Geotextiles		

8. Conclusions

The findings of this Drainage Assessment Report have been summarised below:

- The existing surface water discharge rates have been calculated as **52.5 litres/sec** for the 1 in 1 year event and **151.4 litres/sec** for the 1 in 100 year event.
- The proposed surface water discharge rate will be limited to a maximum of **29 litres/sec** in line with Islington Council's guidelines.
- To achieve this:
  - An attenuation tank with **90m³** of storage will be provided on the site.
  - Approximately **1,125m²** of green or brown roofs will be provided as part of the scheme.
  - Approximately **560m²** of permeable paving will be provided as part of the scheme.
  - Approximately **1,155m²** of soft or permeable landscaping including swales and bio-retention will be provided as part of the scheme.
- Additionally, rainwater harvesting will continue to be considered.
- It is considered that a new connection to the public sewer will be required for surface water.
- It is considered that it will be possible to reuse an existing combined sewer connection from the site for the foul water system.
- The site has been assessed as being at a low risk of flooding from all sources.
- It is believed that the mandatory Hydraulic Control Criteria of Code for Sustainable Homes - Credit Sur1 are met by the proposed development.
- The Water Quality Criteria of Code for Sustainable Homes - Credit Sur1 cannot be met as there is no infiltration possible on site due to the presence of London Clay.

9. Further Work

The key areas of further work required to develop and complete the design of the below ground drainage are summarised below:

1. Existing Drainage Network
   The location, level and condition of the discharge point(s) for the existing drainage network are currently unknown. A CCTV survey of the existing network is therefore required during the detailed design stage in order to determine this and allow the drainage design to be finalised.
2. Public Sewers
   At present, the invert levels of the existing public sewers are unknown. In order to finalise a connection level to the existing sewer a CCTV survey will be required during the detailed design stage to determine these levels and the condition of the existing pipes.
3. Water Authority Discharge Agreement
   Permission will be required from Thames Water to discharge surface and foul water to the existing public sewer and an agreement reached as to an acceptable discharge rate from the site to allow the drainage design to proceed.

Whilst this is not exhaustive it covers the main areas that affect the design of the drainage strategy.