Flood Risk Assessment
&
SUDS Strategy

in connection with the proposed development at

155-157 Regent's Park Road
Camden
London
NW1 8BB

for

Uchaux Ltd

LBH4540fra Ver. 1.0

July 2018

LBH WEMBLEY

ENGINEERING

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			Darcy Kitson-Boyce MEng (Hons) GMICE FGS FRGS	Seamus Lefroy-Brooks BSc(hons) MSc CEng MICE CGeol FGS CEnv MIEnvSc FRGS SiLC RoGEP UK Registered Ground Engineering Adviser NQMS SQP DoWCoP QP
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LBH WEMBLEY ENGINEERING
Unit 12 Little Balmer
Buckingham Industrial Park
Buckingham
MK18 1TF

Tel: 01280 812310

email: enquiry@lbhgeo.co.uk
website: www.lbhgeo.co.uk

1. Contents

Foreword - Guidance Notes

GENERAL

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The report may present an opinion based upon information received from third parties. However, no liability can be accepted for any inaccuracies or omissions in that information.

1. Introduction

1.1 Background

Following demolition of the existing building at Nos. 155 – 157 Regent's Park Road, it is proposed to construct a part six, part eight storey hotel with a two level basement extending to a depth of approximately 7m below existing ground level.

This Flood Risk Assessment (FRA) and SUDS Statement has been prepared alongside a Basement Impact Assessment, in support of a planning application for the proposed basement development at this site.

An FRA is required in order to assess the potential effect of the new development on surface water run-off, in addition to assessing the site vulnerability to flooding from other sources including groundwater and overland runoff, rivers and the sea.

The purpose of this report is to assess the existing flood risk, including mitigation measures and whether the site is suitable for hotel accommodation. The report identifies whether there are any flooding or surface water management issues, whether the site lies within an area that is at risk of flooding or whether the development may increase flood risk due to increased run-off. This is achieved through identification of the sources of flooding which may affect the site, and includes the following:-

- An appraisal of the availability and adequacy of existing information
- A qualitative appraisal of the flood risk posed to the site, and potential impact of the development on flood risk elsewhere
- An appraisal of the scope of possible measures to reduce the flood risk to acceptable levels

The report will demonstrate to the Local Planning Authority (LPA) that the applicant is considering flood risk to the development from all sources and how this will be managed. The assessment also considers the disposal of drainage water, potential impacts on adjacent land and climate change effects.

The assessment has been based on existing reports and archive information together with information from historical maps and photographs.

1.2 Guidance

The Ministry of Housing, Communities and Local Government have published their online guidance for Flood Risk and coastal change that supersedes the National Planning Policy Framework Technical Guidance of March 2012.

Paragraph: 032 (Reference ID: 7-032-20150415) of the guidance refers developers preparing a flood risk assessment to a further Department for Environment, Food & Rural Affairs (DEFRA) and EA joint guidance (Flood Risk Assessment for Planning Applications online guidance [26th March 2014, updated 27th February 2017]). This guidance states that a flood risk assessment is necessary when developments are:

- *"in flood zone 2 or 3 including minor development and change of use*
- *more than 1 hectare (ha) in flood zone 1*
- *less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (e.g. from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (e.g., surface water drains, reservoirs)*

- ***in an area within flood zone 1 which has critical drainage problems as notified by the Environment Agency"***

The London Borough of Camden Surface Water Management Plan has identified 3 Critical Drainage Areas (CDA) within the borough.

CDAs are defined by the Environment Agency (EA) as areas within Flood Zone 1, which have critical drainage issues, due to potential interlinked sources of flood risk and where severe weather is known to cause flooding.

Although the site is less than 1ha in size, it is located within a CDA (Group3_003 – River Fleet Catchment). As a result, a Flood Risk Assessment is required.

The London Borough of Camden provides guidance for water and flooding under Policy CC3 of the Local Plan (June 2017), where the council will seek to ensure a development reduces the risk of flooding where possible and will require a development to :

a. *incorporate water efficiency measures;*
b. *avoid harm to the water environment and improve water quality;*
c. *consider the impact of development in areas at risk of flooding (including drainage);*
d. *incorporate flood resilient measures in areas prone to flooding;*
e. ***utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible;*** *and*
f. *not locate vulnerable development in flood-prone areas.*

Additionally, the Camden Planning Guidance for Sustainability (July 2015, updated March 2018) states:

"*All developments are expected to manage drainage and surface water on-site or as close to the site as possible, using Sustainable Drainage Systems (SUDS) and the* [SUDS] *hierarchy (…).*

The Council will expect plans and application documents to describe how water will be managed within the development, including an explanation of the proposed SUDS, the reasons why certain SUDS have been ruled out and detailed information on materials and landscaping.

The Council will expect developments to achieve a greenfield surface water run-off rate once SUDS have been installed. As a minimum, surface water run-off rates should be reduced by 50% across the development."

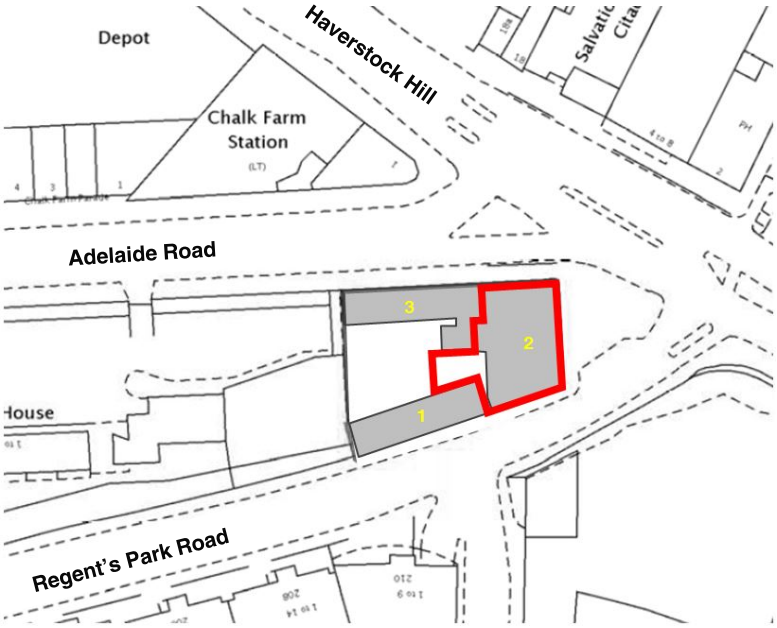
An outline SUDS strategy has therefore also been prepared to support the planning submission and is included in this report.

2. The Site

2.1 Site Location

The site is situated at the junction of Regent's Park Road, Haverstock Hill and Adelaide Road, approximately 15m to the south of Chalk Farm underground station.

The site may be located approximately by postcode NW1 8BB or by National Grid Reference 528155, 184380.



Location plan

1: Nos. 151 – 153 Regent's Park Road
2: Nos. 155 – 157 Regent's Park Road
3: Nos. 1 – 13 Adelaide Road

2.2 Topographical Setting

The site lies on a lower slope of Hampstead Hill that is gently falling to the southeast, towards a culverted tributary of the River Fleet.

2.3 Site Description

The site is occupied by three rows of four storey terraced buildings with mansard roofs at Nos. 151 – 153 Regent's Park Road, Nos. 155 – 157 Regent's Park Road and Nos. 1 – 13 Adelaide Road.

Street level immediately on the corner of Regent's Park Road and Adelaide Road is situated at approximately +31m OD.

Nos. 155 – 157 comprises a single storey basement that occupies most of the building footprint. It appears that the basement extends to approximately 3.5m depth below existing ground level. It is unknown whether or not Nos. 151 – 153 and Nos. 1 – 13 include basements.

A car park is enclosed by the three terraced buildings and is accessed from Regent's Park Road.

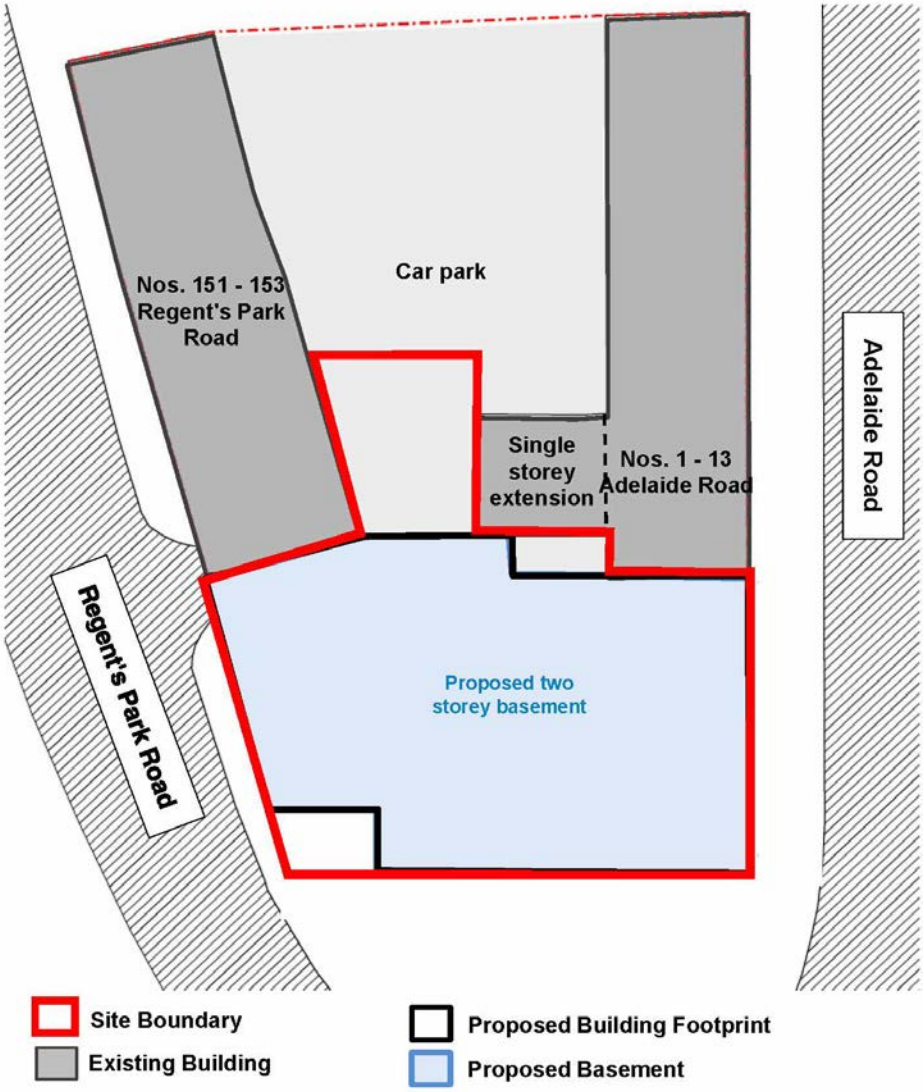
The site is entirely hard surfaced and is bordered by a seven storey blocks of flats (Bridge House) to the west.

2.4 Proposed Development

Following demolition of the existing four storey building at Nos. 155 – 157 Regent's Park Road, it is proposed to construct an eight storey hotel including a two storey basement.

It is understood that some parts of the basement will include hotel bedroom accommodation.

The site will remain entirely hard-surfaced as a result of the development.



Plan showing proposed development

3. Background

The Ministry of Housing, Communities and Local Government have published their online 'Flood Risk and coastal change' guidance that supersedes the National Planning Policy Framework Technical Guidance of March 2012. The following section has been prepared in accordance with this guidance.

3.1 Existing Flood Alleviation Measures

No evidence of any existing alleviation measures in the vicinity of the site has been identified.

3.2 Flood Risk Vulnerability Classification

Table 2 of the online guidance indicates that as the proposed building will be in use as a hotel, with basement partially occupied by hotel accommodation space, the site use will fall into the 'more vulnerable' flood risk classification.

3.3 The Sequential Test

The guidance requires that the risk based sequential test should be applied at all stages of planning, which aims to steer new development to areas at the lowest probability of flooding (Flood Zone 1). It is also recognised that some areas will also be at risk of flooding from sources other than tidal and fluvial.

Camden is enitely located in Flood Zone 1. In addition, the EA flood map of surface water flood risk indicates the site to be at a low risk of surface water flooding. As a result, it is considered that the Sequential Test is satisfied.

3.4 The Exception Test

Table 3 of the guidance does not require the Exception Test to be applied given that in Flood Zone 1 More Vulnerable Development is considered appropriate.

4. Hazard Identification

4.1 Flooding from Rivers and the Sea

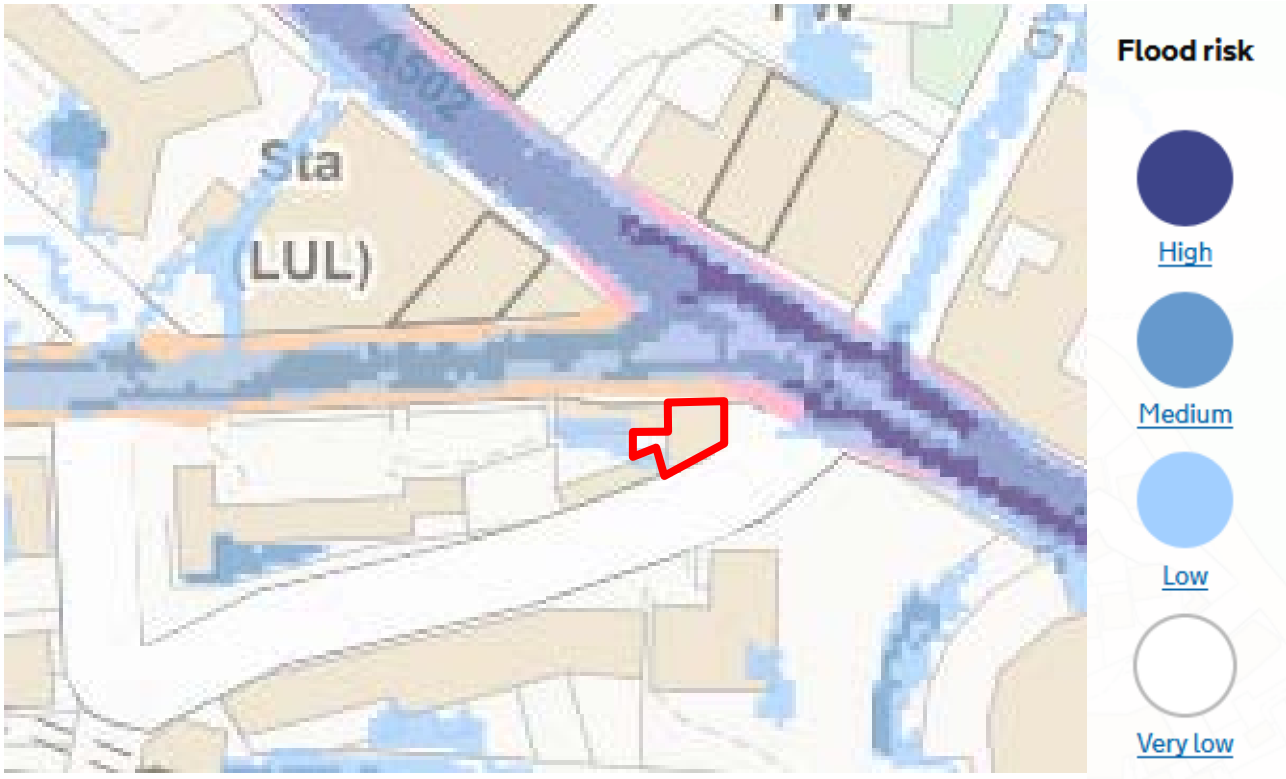
All main rivers located within the London Borough of Camden are culverted and are incorporated into the Thames Water sewer network. As a result, the London Borough of Camden is located entirely within Flood Zone 1. This indicates that the assessed annual probability of flooding at the site is less than 1 in 1000 (<0.1%).

In addition, the Camden SFRA records that no flooding has occurred within the borough from fluvial or tidal sources.

4.2 Flooding from Land

The EA's Surface Water Flood Map indicates that the site is at very low to low risk of surface water flooding, which equates to an assessed annual probability of flooding of <1%.

However, surrounding the site there is between a low and high risk of surface water flooding (0.1% to >3.3% annual probability of flooding) along Adelaide Road and Haverstock Hill.



Extract of the EA's Surface Water Flooding map showing the flood risk from surface water

Hazard mapping created by the EA indicates the hazard to people following a methodology presented by Defra in its R&D report on Flood Risks to People[1].

The following map indicates that even in the event of a 1 in 1000 rainfall event (<0.1% annual probability), the surface water flood hazard within the site is generally classed as Low (caution), although part of the existing courtyard is classes as Moderate (danger for some).

Extract of Figure 3 ix: Hazard 1 in 1000 year flood event (Camden SFRA, 2014)

Historic flood records indicate that the London Borough of Camden experienced significant flooding in 1975 and 2002. Regent's Park Road was not reported to have been affected by these water flood events.

4.3 Flooding from Groundwater

Groundwater flooding occurs when water levels within the ground rise above surface levels.

The British Geological Survey (BGS) records indicate that the site is underlain by the London Clay Formation, which the Environment Agency (EA) classifies 'Unproductive Strata'.

The intrusive site investigation confirmed that there is no shallow groundwater table present at this site.

It is therefore concluded that the risk of groundwater flooding at the site is negligible.

4.4 Flooding from Sewers

A sewer flooding history enquiry made to Thames Water[2] states "*The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers*".

The site is therefore considered to be at a very low risk of sewer flooding.

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[1] *Defra (2006) Defra Guidance Document FD2321/TR2: Flood Risks to People*
[2] *Thames Water, July 2018, Sewer Flooding History Enquiry, Ref: SFH/SFH Standard/2018_3836558*

4.5 Flooding from Reservoirs, Canals and other Artificial Sources

The EA's Reservoir Flood Map identifies areas that could be flooded if a large reservoir, canal or other artificial body of water were to fail or release the water it holds. The EA indicates that the site does not lie within an area at risk of reservoir flooding.

The SFRA has not identified any other significant artificial sources of flood risk within the borough that may adversely affect the site.

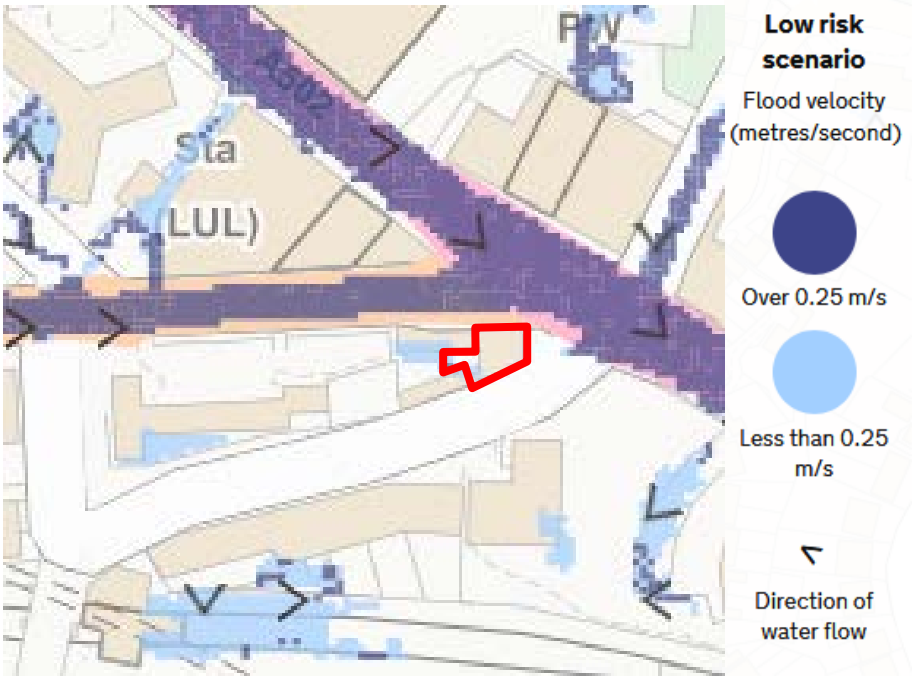
5. Risk Estimation

5.1 Rate and Duration of Flooding

No information is available on the predicted duration of any surface water flooding.

The EA's surface water flood map shows that, during a 1 in 1000 rainfall event, Adelaide Road and Haverstock Hill would experience floods moving at a rate of over 0.25m/s, with the two streets appearing to act as conduits for flood waters.

In such an event, the site would only be affected by surface water ponding in the existing car park.



Extract of the EA's surface water flooding map showing the flood velocities predicted in the vicinity of the site during a 0.1%AEP pluvial event.

5.2 Climate Change

5.2.1 Adjustment for Potential Flooding from the Sea

The site is not considered to be at risk of flooding from tidal sources and no adjustment is required.

5.2.2 Adjustment for Potential Flooding from the Land and Rivers

The predicted effects of climate change – more intense summer rainfall events and high winter fall – could increase the risk of surface water flooding.

The EA flood maps and flood zones do not currently take into account the possible future climate change impacts, although it could be said that the potential extent of an extreme flood shown on flood maps might in future become a more frequent occurrence as a result of climate change.

The EA published revised guidance on climate change allowances for flood risk assessment in 2016, anticipating the total percentage change over the next 100 years. The range for the increase in peak rainfall intensity is estimated between 10% and 40% across England, with a range of 25% and 70% for peak river flows in the Thames (using 1961-1990 baseline).

6. Risk Evaluation

6.1 Existing Situation

The risk of flooding from various sources has been assessed and the overall risk of flooding at this site is considered to be low.

6.2 Potential Situation after Development

The volume of surface water run-off likely to be generated from the developed is not expected to change, given that there will not be any increase in impermeable area and this can be further reduced and managed through introduction of SuDS features in the design of the new hotel.

7. Outline SUDS Statement

7.1 Guidance

Developments should provide betterment to the risk of surface water runoff by aiming to attenuate surface water on site through the use of SuDS.

The London Borough of Camden Planning Guidance for Sustainability (July 2015, updated March 2018) states:

"*All developments are expected to manage drainage and surface water on-site or as close to the site as possible, using Sustainable Drainage Systems (SUDS) and the hierarchy set out below.*

The Council will expect plans and application documents to describe how water will be managed within the development, including an explanation of the proposed SUDS, the reasons why certain SUDS have been ruled out and detailed information on materials and landscaping.

The Council will expect developments to achieve a greenfield surface water run-off rate once SUDS have been installed. As a minimum, surface water run-off rates should be reduced by 50% across the development."

A surface water drainage strategy for this site is therefore required to incorporate SuDS principles as laid out in the Non-Statutory Technical Standards[3] for Sustainable Drainage Systems and the London Plan[4].

SuDS systems are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible. They provide opportunities to:

- reduce the causes and impacts of flooding;
- remove pollutants from urban run-off at source;
- combine water management with green space with benefits for amenity, recreation and wildlife.

The aim is to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:

1. into the ground (infiltration);
2. to a surface water body;
3. to a surface water sewer, highway drain, or another drainage system;
4. to a combined sewer.

7.2 Existing Surface Water Drainage System

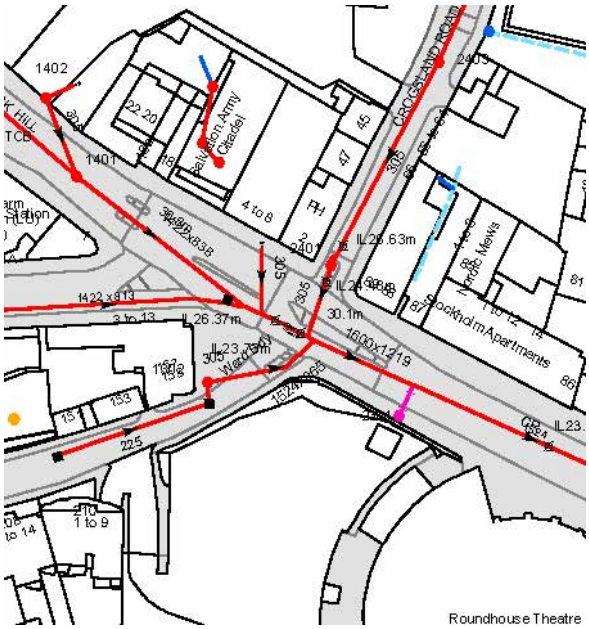
The site (0.07ha) is entirely hard surfaced with terraced buildings and car parking occupying all of the site area. There are no SUDS features on the site.

Rainfall incident on the roof is collected via pipework down the front and rear faces of each building and is fed to the combined sewer system. A gully system is present in the car park and directs surface water to the combined sewer system.

[3] DEFRA March 2015 Non-Statutory Technical Standards (NSTS) for sustainable drainage systems
[4] London Plan Chapter Five - London's Responses to Climate Change Policy 5.1.3 Sustainable Drainage

Extracts from public sewer records have been obtained from Thames Water[5] and are included within the Appendix; combined sewers are present beneath both Adelaide Road and Regent's Park Road. The sewer beneath Adelaide Road has local dimensions of 1422mm x 813mm, while the sewer beneath Regent's Park Road is 225mm in diameter. Both sewers connect and discharge to a combined sewer beneath Haverstock Hill that is falling south-eastwards.

The nearest manhole to the site is located just to the front of Nos. 155 – 157 Regent's Park Road (referenced 1302), with a cover level of +30.77m OD and invert level of +26.84m OD.



7.3 SUDS Objectives and Drainage Route Appraisal

The drainage strategy follows the guidance set out in the 2015 CIRIA C753 SuDS Manual; the principle of SUDS design is that surface water runoff is managed for maximum benefit.

The types of benefits that may be achieved by utilising SUDS are categorised by the design objectives

- **Water Quantity**
- **Water Quality**
- **Amenity**
- **Biodiversity**

These are outlined in the following sections.

7.3.1 Water Quantity Objective

The design objective is to control the quantity of runoff to support the management of flood risk and maintain and protect the natural water cycle.

In order to ensure that the surface water runoff from a developed site does not have a detrimental impact on people, property and the environment, it is important to control the rate and volume of the discharge from the site.

Sustainable Drainage Systems (SuDS) are to be incorporated into the design of a development. In aiming to achieve greenfield runoff rates, surface water runoff should be managed using the following techniques, as outlined in order of priority by the following drainage hierarchy:

[5] *Thames Water, June 2018*, Asset Location Search, Ref: ALS/ALS Standard/2018_3815781

SUDS Drainage Route Appraisal		
Drainage Route Option:	Suitable for the site? (Y/N)	Comment:
Store rainwater for later use	Y	Rainwater harvesting could be used to collect incident rainwater for re-use as grey water in the hotel.
Use infiltration techniques	N	The site is directly underlain by the London Clay, inhibiting infiltration.
Attenuate rainwater in ponds or open water features for gradual release	Y	A blue roof is proposed to be incorporated in the design of the new hotel.
Attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Attenuation storage may be provided by tanks constructed within the new building. Attenuation storage may be provided by tanks constructed in the ground below or outside the new building beneath the rear courtyard area.
Discharge rainwater direct to a watercourse	N	There is no available watercourse.
Discharge rainwater to a surface water sewer/drain	N	There is no surface water sewer serving the site.
Discharge rainwater to the combined sewer	Y	It is proposed that the new drainage system should ultimately include a discharge to the existing combined sewer serving the site as at present.

The hierarchy above seeks to ensure that surface water runoff is controlled as near to its source as possible to mimic natural drainage systems and retain water on or near to the site.

Before disposal of surface water to the public sewer is considered all other options set out in the above hierarchy need to be exhausted.

7.3.2 Water Quality

The water quality design objective is to manage the quality of runoff to prevent pollution, supporting the management of water quality in the receiving surface waters and groundwater and design system resilience to cope with future change.

7.3.3 Amenity

The amenity design objective is to create and sustain better places for people by implementing the following criteria for the site:

- Maximise multi-functionality
- Enhance visual character
- Deliver safe surface water management systems
- Support development resilience/adaptability to future change
- Maximise legibility
- Support community environmental learning

7.3.4 Biodiversity

The biodiversity design objective is to create and sustain better places for nature by implementing the following criteria for the site:

- Support and protect natural local habitats and species
- Contribute to the delivery of local biodiversity objectives
- Contribute to habitat connectivity
- Create diverse, self-sustaining and resilient ecosystems

7.4 Potential SuDS Components

The feasibility of various potential SuDS components are assessed in the following table:

Assessment of Potential SuDS Components			
SUDS Component	Description	Suitable for the site? (Y/N)	Comment
Rainwater harvesting	Collection of rainwater runoff from roofs or impermeable areas for reuse.	Y	Rainwater can potentially be harvested from the roof and collected in grey water storage tanks for re-use.
Green roofs	Vegetated areas installed on the top of buildings provide visual and ecological benefits in addition to surface water runoff reduction and enhanced building performance.	Y	Green roof could be considered to be implemented in the design of the roof of the hotel.
Blue roofs	Roof design intended to store water providing attenuation storage.	Y	It is understood the entire area of the roof of the new hotel is proposed to be considered for a blue roof.
Infiltration systems	Infiltration can contribute to reducing runoff rates and volumes while supporting base flow and groundwater recharge processes.	N	Infiltration is not possible into the London Clay Formation.
Proprietary treatment systems	Proprietary treatment systems are manufactured products which remove specified pollutants from surface water runoff.	N	Not required.
Filter strips/drains	Filter strips are gently sloping strips of grass that provide treatment of runoff from adjacent impermeable areas. Filter drains are gravel or stone filled trenches which provide temporary subsurface storage for attenuation conveyance and filtration of surface water runoff.	N	Not required.
Swales	Swales are shallow, flat bottomed, vegetated open channels designed to convey, treat, and attenuate surface water runoff.	N	Not required.
Bioretention systems	Rain gardens or shallow landscaped depressions that may reduce surface water runoff rates and volumes and/or treat pollution using engineered soils and vegetation.	N	There is insufficient space to create a Bioretention system.
Trees	Trees aid surface water management through transpiration, inception, infiltration and phytoremediation.	N	No new tree planting is proposed.

Pervious Pavements	Pervious pavements facilitate the infiltration of surface water into a subsurface structure where filtration, adsorption, biodegradation or sedimentation may also provide treatment of the runoff.	Y	The yard area in the western portion of the site could potentially be utilised for attenuation storage using pervious paving.
Attenuation storage tanks	Attenuation storage tanks provide below-ground void space for the temporary storage of surface water before infiltration, controlled release or use.	Y	Below-ground storage tanks could be incorporated to the design either underneath the yard area or within the proposed basement.
Detention basins	Attenuation storage in the form of dry landscaped depressions.	N	Not required.
Ponds and wetlands	Permanent water filled ponds or wetlands that provide attenuation storage or treatment of surface water runoff.	N	Not required.

7.5 Initial Design Considerations

An analysis has been undertaken of the pre- and post- development surface water run-off rates and volumes over a range of storm intensities and durations.

7.5.1 Greenfield runoff rate

The Greenfield runoff rates from the site have been calculated using the UK SuDS online tool and the Institute of Hydrology (IoH) 124 methodology.

Greenfield Rates:	
Qbar:	**0.09 l/sec**
1 in 1	**0.07 l/sec**
1 in 30	**0.20 l/sec**
1 in 100	**0.28 l/sec**
1 in 200	**0.33 l/sec**

7.5.2 Existing runoff rate

The site comprises an area of approximately 200m^2 of impermeable (100%) surfacing which includes the existing structures on site. There are considered to be no present SuDS features.

The existing peak storm runoff for the 1% (1 in 100 year) annual probability rainfall event on the site is estimated to be 5.7 l/sec. The calculation was based on the Wallingford Procedure and the resulting runoff was calculated using the Modified Rational Method with an M5-60 of 20mm, an 'r' value of 0.42 and a critical rainfall intensity of 163.2 mm/hr.

The rainfall runoff volume for the 1% (1 in 100 year) annual probability, 6 hour duration storm from the existing site is estimated to be 12.9 m^3.

7.6 Proposed Development

The proposed development will result in no change in impermeable area, as the site will remain being fully covered with impermeable building or paving.

Schedule of estimated approximate areas for outline SuDS assessment								
	Existing	**Cv**	**%**	**%**	**Proposed**	**Cv**	**%**	**%**
Garden	0m^2	0.40	0	0	0m^2	0.40	0	0
Building	150 m^2	0.77	75	100	150 m^2	0.77	75	100
Impermeable	50 m^2	0.77	25		50 m^2	0.77	25	
Total:	200 m^2		100	100	200 m^2		100	100

7.6.1 Proposed Drainage Scheme

The proposed development will not alter the amount of impermeable surfacing.

Although no increase in runoff is anticipated as a result of the development, there is a potential increase in runoff associated with future climate change.

The guidance seeks to limit the peak storm runoff for the 1% (1 in 100) annual probability rainfall event plus 40% allowance for future climate change to at least 50% of the current rate.

7.6.2 Attenuation storage

In order to limit the discharge rate to the combined sewer serving the site, attenuation storage is to be included as a SuDS element.

HR Wallingford's Surface water storage volume estimation tool has been used to undertake attenuation storage volume calculations. On the basis of a default minimum discharge rate of 5 l/sec these calculations indicate that no attenuation storage is required to maintain greenfield runoff rates for the 1 in 100 year rainfall event in consideration of up to 40% climate change allowance.

Nevertheless, it is proposed that surface water could possibly be collected in a 100mm deep blue roof to the entire roof area of the proposed hotel providing approximately 15m^3 capacity prior to discharge to the combined sewers serving the site.

Alternatively, a proportion of the roof may also be considered for green roof areas, which is expected to provide similar attenuation storage as the blue roof, while also promoting biodiversity as part of the development.

In addition, there may be an opportunity to provide further limited attenuation through introduction of pervious paving within the yard in the small western area of the site, to the rear of the proposed building. It is predicted this method could provide approximately 4m^3 of further attenuation storage.

7.6.3 Review of SuDS Objectives

7.6.3.1 Water Quantity

It is anticipated the use of a blue roof could reduce runoff rates and volumes by providing a potential storage capacity of around $20m^3$. A further $15m^3$ may be achievable should the pervious paving attenuation option be considered for the rear yard area.

7.6.3.2 Water Quality

The surface water runoff from the roofs is not expected to pick up any contamination. Therefore, there is no expectation that any treatment will be necessary to meet the appropriate water quality requirements for the method of discharge.

7.6.3.3 Amenity

There is not considered to be space in this case for opportunities to provide any above ground amenity features.

7.6.3.4 Biodiversity

There is opportunity to include green roofs as part of the development, promoting a positive contribution to biodiversity. The green roof will act as a "stepping stone" or "island" habitat providing ecological value in a highly urbanised area.

It is recommended that a sufficient depth of substrate is used on the green roof (no less than 80mm) and the topography is varied (80mm-150mm) in order to provide a range of habitats for invertebrates.

Conversely, the use of blue roofs will not provide any biodiversity benefits directly, however, controlling the runoff across the site will maximise biodiversity down gradient.

7.6.4 Maintenance

Maintenance activities and regularity are to be adopted in accordance with the 2015 CIRIA C753 SuDS Manual, with a brief summary presented below. Further maintenance or remedial activities should be applied as required following recommendations from regular inspection.

Suds Component	Maintenance	
Rainwater Harvesting	Regular	• Inspection of the tank for debris and sediment build-up, inlets/outlets/withdrawal devices, overflow areas, pumps and filters • Clearing of tank, inlets, outlets, gutters, withdrawal devices and roof drain filters of silts and other debris
Blue roof	Regular	• Inspect and clearing of the basins and outlets from litter and debris
Green roof	Regular	• Inspection and weed/invasive plant control
Pervious Pavement	Regular	• Inspect and clearing of litter and debris

APPENDIX

SEWER FLOODING HISTORY ENQURY

ASSET LOCATION SEARCH

Surface Water Drainage Pro-forma for new developments

1. Site Details

Site	**155 - 157 Regent's Park Road**
Address & post code or LPA reference	**NW1 8BB**
Grid reference	**528150, 184380**
Is the existing site developed or Greenfield?	**Developed**
Is the development in a LFRZ or in an area known to be at risk of surface or ground water flooding? If yes, please demonstrate how this is managed, in line with DP23?	**No**
Total Site Area served by drainage system (excluding open space) (Ha)*	**0.02**

***** The Greenfield runoff off rate from the development which is to be used for assessing the requirements for limiting discharge flow rates and attenuation storage from a site should be calculated for the area that forms the drainage network for the site whatever size of site and type of drainage technique. Please refer to the Rainfall Runoff Management document or CIRIA manual for detail on this.

2. Impermeable Area

	Existing	Proposed	Difference (Proposed-Existing)	Notes for developers
Impermeable area (ha)	**0.02**	**0.02**	**0**	If the proposed amount of impermeable surface is greater, then runoff rates and volumes will increase. Section 6 must be filled in. If proposed impermeability is equal or less than existing, then section 6 can be skipped and section 7 filled in.
Drainage Method (infiltration/sewer/watercourse)		**Combined Sewer**	N/A	If different from the existing, please fill in section 3. If existing drainage is by infiltration and the proposed is not, discharge volumes may increase. Fill in section 6.

3. Proposing to Discharge Surface Water via

	Yes	No	Evidence that this is possible	Notes for developers
Existing and proposed Drainage calculations	**Yes**		**HR Wallingford**	Please provide calculations of existing and proposed run-off rates and volumes in accordance with a recognised methodology or the results of a full infiltration test (see line below) if infiltration is proposed.
Infiltration		**No**	**Infiltration will not be possible as the site is directly underlain by impermeable London Clay.**	e.g. soakage tests. Section 6 (infiltration) must be filled in if infiltration is proposed.
To watercourse		**No**	**There is no nearby watercourse.**	e.g. Is there a watercourse nearby?
To surface water sewer		**No**	**There is no nearby surface water sewer**	Confirmation from sewer provider that sufficient capacity exists for this connection.
Combination of above		**No**	**See above - Not possible.**	e.g. part infiltration part discharge to sewer or watercourse. Provide evidence above.
Has the drainage proposal had regard to the SuDS hierarchy?	**Yes**		**HR Wallingford**	Evidence must be provided to demonstrate that the proposed Sustainable Drainage strategy has had regard to the SuDS hierarchy as outlined in Section 2.5 above.
Layout plan showing where the sustainable drainage infrastructure will be located on site.	**Yes**		**Possible small area of blue roof on rear extension**	Please provide plan reference numbers showing the details of the site layout showing where the sustainable drainage infrastructure will be located on the site. If the development is to be constructed in phases this should be shown on a separate plan and confirmation should be provided that the sustainable drainage proposal for each phase can be constructed and can operate independently and is not reliant on any later phase of development.

4. Peak Discharge Rates – This is the maximum flow rate at which storm water runoff leaves the site during a particular storm event.

	Existing Rates (l/s) (from Wallingford online tool and Procedure)	**Proposed Rates (l/s)** (taken as 50% Existing)	**Difference (l/s)** **(Proposed - Existing)**	**% Difference** **(Difference / existing x 100)**	**Notes for developers**
Greenfield QBAR	**0.09**	N/A	N/A	N/A	QBAR is approx. 1 in 2 storm event. Provide this if Section 6 (QBAR) is proposed.
1 in 1	**0.07**	**0.04**	**0.04**	**-50%**	Proposed discharge rates (with mitigation) should aim to be equivalent to greenfield rates for all corresponding storm events. As a minimum, peak discharge rates must be reduced by 50% from the existing sites for all corresponding rainfall events.
1 in 30	**0.20**	**0.10**	**0.10**	**-50%**	
1in 100	**0.28**	**0.14**	**0.14**	**-50%**	
1 in 100 plus climate change	N/A	**0.14**	N/A	N/A	The proposed 1 in 100 +CC peak discharge rate (with mitigation) should aim to be equivalent to greenfield rates. As a minimum, proposed 1 in 100 +CC peak discharge rate must be reduced by 50% from the existing 1 in 100 runoff rate sites.

5. Calculate additional volumes for storage – The total volume of water leaving the development site. New hard surfaces potentially restrict

the amount of stormwater that can go to the ground, so this needs to be controlled so not to make flood risk worse to properties downstream.

	Greenfield runoff volume (m^3)	Existing Volume (m^3)	Proposed Volume (m^3)	Difference (m^3) (Proposed-Existing)	Notes for developers
1 in 1	**2**	**4**	**4**	**0**	Proposed discharge volumes (with mitigation) should be constrained to a value as close as is reasonably practicable to the greenfield runoff volume wherever practicable and as a minimum should be no greater than existing volumes for all corresponding storm events. Any increase in volume increases flood risk elsewhere. Where volumes are increased section 6 must be filled in.
1 in 30	**5**	**10**	**10**	**0**	
1 in 100 6 hour	**6**	**13**	**13**	**0**	
1 in 100 6 hour plus climate change	N/A	N/A	**62**	**0**	The proposed 1 in 100 +CC discharge volume should be constrained to a value as close as is reasonably practicable to the greenfield runoff volume wherever practicable. As a minimum, to mitigate for climate change the proposed 1 in 100 +CC volume discharge from site must be no greater than the existing 1 in 100 storm event. If not, flood risk increases under climate change.

6. Calculate attenuation storage –

Attenuation storage is provided to enable the rate of runoff from the site into the receiving watercourse to be limited to an acceptable rate to protect against erosion and flooding downstream. The attenuation storage volume is a function of the degree of development relative to the greenfield discharge rate.

		Notes for developers
Storage Attenuation volume (Flow rate control) required to meet greenfield run off rates (m_3)	**12**	Volume of water to attenuate on site if discharging at a greenfield run off rate. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to reduce rates by 50% (m_3)	**5**	Volume of water to attenuate on site if discharging at a 50% reduction from existing rates. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to meet [OTHER RUN OFF RATE (as close to greenfield rate as possible] (m_3) . **3 x Greenfield**	**12**	Volume of water to attenuate on site if discharging at a rate different from the above – please state in 1st column what rate this volume corresponds to. On previously developed sites, runoff rates should not be more than three times the calculated greenfield rate. Can't be used where discharge volumes are increasing
Storage Attenuation volume (Flow rate control) required to retain rates as existing (m_3)	**4**	Volume of water to attenuate on site if discharging at existing rates. Can't be used where discharge volumes are increasing
Percentage of attenuation volume stored above ground,	**80%**	Percentage of attenuation volume which will be held above ground in swales/ponds/basins/green roofs etc. If 0, please demonstrate why.

7. How is Storm Water stored on site?

Storage is required for the additional volume from site but also for holding back water to slow down the rate from the site. This is known as attenuation storage and long term storage. The idea is that the additional volume does not get into the watercourses, or if it does it is at an exceptionally low rate. You can either infiltrate the stored water back to ground, or if this isn't possible hold it back with on site storage. Firstly, can infiltration work on site?

			Notes for developers
Infiltration	**State the Site's Geology and known Source Protection Zones (SPZ)**	**London Clay (nil SPZ)**	Avoid infiltrating in made ground. Infiltration rates are highly variable and refer to Environment Agency website to identify and source protection zones (SPZ)
	Are infiltration rates suitable?	**No**	Infiltration rates should be no lower than 1x10 $^{-6}$ m/s.
	State the distance between a proposed infiltration device base and the ground water (GW) level	**n/a**	Need 1m (min) between the base of the infiltration device & the water table to protect Groundwater quality & ensure GW doesn't enter infiltration devices. Avoid infiltration where this isn't possible.
	Were infiltration rates obtained by desk study or infiltration test?	**n/a**	Infiltration rates can be estimated from desk studies at most stages of the planning system if a back up attenuation scheme is provided..
	Is the site contaminated? If yes, consider advice from others on whether infiltration can happen.	**No**	Advice on contaminated Land in Camden can be found on our supporting documents webpage Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.
In light of the above, is infiltration feasible?	**Yes/No? If the answer is No, please identify how the storm water will be stored prior to release**	**No**	If infiltration is not feasible how will the additional volume be stored?. The applicant should then consider the following options in the next section.

Storage requirements

The developer must confirm that either of the two methods for dealing with the amount of water that needs to be stored on site.

Option 1 Simple – Store both the additional volume and attenuation volume in order to make a final discharge from site at the greenfield run off rate. This is preferred if no infiltration can be made on site. This very simply satisfies the runoff rates and volume criteria.

Option 2 Complex – If some of the additional volume of water can be infiltrated back into the ground, the remainder can be discharged at a very low rate of 2 l/sec/hectare.

A combined storage calculation using the partial permissible rate of 2 l/sec/hectare and the attenuation rate used to slow the runoff from site.

		Notes for developers
Please confirm what option has been chosen and how much storage is required on site.	**Simple**	The developer at this stage should have an idea of the site characteristics and be able to explain what the storage requirements are on site and how it will be achieved.

8. Please confirm

		Notes for developers
Which Drainage Systems measures have been used, including green roofs?	**Potentially 15m^3 Storage comprising a blue roof and potentially 4m^3 storage in porous subase to car park**	SUDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SUDS devices allows treatment but not infiltration. See CIRIA SUDS Manual C697.
Drainage system can contain in the 1 in 30 storm event without flooding	**YES**	This a requirement for sewers for adoption & is good practice even where drainage system is not adopted.
Will the drainage system contain the 1 in 100 +CC storm event? If no please demonstrate how buildings and utility plants will be protected.	**YES**	National standards require that the drainage system is designed so that flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.
Any flooding between the 1 in 30 & 1 in 100 plus climate change storm events will be safely contained on site.	**YES**	**Safely:** not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths. Flood waters must drain away at section 6 rates. Existing rates can be used where runoff volumes are not increased.

How will exceedance events be catered on site without increasing flood risks (both on site and outside the development)?	**As present**	**Safely:** not causing property flooding or posing a hazard to site users i.e. no deeper than 300mm on roads/footpaths. Flood waters must drain away at section 6 rates. Existing rates can be used where runoff volumes are not increased. Exceedance events are defined as those larger than the 1 in 100 +CC event.

How are rates being restricted (vortex control, orifice etc)	**Orifice**	Detail of how the flow control systems have been designed to avoid pipe blockages and ease of maintenance should be provided.
Please confirm the owners/adopters of the entire drainage systems throughout the development. Please list all the owners.	**TBA**	If these are multiple owners then a drawing illustrating exactly what features will be within each owner's remit must be submitted with this Proforma.
How is the entire drainage system to be maintained?	**by management**	If the features are to be maintained directly by the owners as stated in answer to the above question please answer yes to this question and submit the relevant maintenance schedule for each feature. If it is to be maintained by others than above please give details of each feature and the maintenance schedule. Clear details of the maintenance proposals of all elements of the proposed drainage system must be provided. Details must demonstrate that maintenance and operation requirements are economically proportionate. Poorly maintained drainage can lead to increased flooding problems in the future.

9. Evidence Please identify where the details quoted in the sections above were taken from. i.e. Plans, reports etc. Please also provide relevant drawings that need to accompany your proforma, in particular exceedance routes and ownership and location of SuDS (maintenance access strips etc

Pro-forma Section	Document reference where details quoted above are taken from	Page Number
Section 2	Suds Report	var

Section 3	Suds Report	var
Section 4	Calculation Sheets	var
Section 5	Calculation Sheets	var
Section 6	Calculation Sheets	var
Section 7	Suds Report	var
Section 8	Suds Report	var

The above form should be completed using evidence from the Flood Risk Assessment and site plans. It should serve as a summary sheet of thedrainage proposals and should clearly show that the proposed rate and volume as a result of development will not be increasing. If there is an increase in rate or volume, the rate or volume section should be completed to set out how the additional rate/volume is being dealt with.drainage proposals and should clearly show that the proposed rate and volume as a result of development will not be increasing. If there is an increase in rate or volume, the rate or volume section should be completed to set out how the additional rate/volume is being dealt with.

This form is completed using factual information from the Flood Risk Assessment and Site Plans and can be used as a summary of the surface water drainage strategy on this site.

VERSION	DATE	COMMENT	AUTHORISED
1	**19th July 2019**	**Initial Issue**	**SRLB**

GREENFIELD RUN-OFF

Catchment Area: 205sqm 0.021ha

PO Code : NW1 8BB

Hydrological Region: 6 *From Wallingford on-line tool*

SAAR: 625mm *From Wallingford on-line tool*

SOIL type: 4 *From Wallingford on-line tool*

SPR: 0.47 *Derived as follows:*

SOIL	*Sand*	*Clayey Sand*	*Sandy Clay*	*Clay*	*Rock*
	1	*2*	*3*	*4*	*5*
SPR	*0.1*	*0.3*	*0.37*	*0.47*	*0.53*

From Wallingford on-line tool using IH 124 Method

Qbar: 214.59 *Calculated from SPR and SAAR*

Greenfield Peak Run-off Rate:		*Growth curve Factor*
1 in 1	*182.4 l/sec*	*0.85*
1 in 30	*493.6 l/sec*	*2.30*
1 in 100	*684.5 l/sec*	*3.19*
1 in 200	*802.6 l/sec*	*3.74*

Qbar:	**0.09 l/sec**
Greenfield Peak Run-off Rate:	
1 in 1	**0.07 l/sec**
1 in 30	**0.20 l/sec**
1 in 100	**0.28 l/sec**
1 in 200	**0.33 l/sec**

National Non-Statutory Guidance:
For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.

For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event.

Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.

SuDs CALCULATIONS

Project: 155-157 Reg Pk Rd

GREENFIELD RUN-OFF

Sheet 1 of 7

Project Reference: LBH 4540

Date: 19/07/2019 Rev: 0

Client: Uchaux Ltd

LBH WEMBLEY ENGINEERING

RAINFALL PEAK INTENSITY (i)

M5-60 : 20 *From Wallingford Fig A1*

r: 0.42 *From Wallingford Fig A2*

D Duration		Z1	M5-D
5min	5min	0.38	7.6mm
10min	10min	0.55	11.0mm
15min	15min	0.65	13.0mm
30min	30min	0.75	15.0mm
1hr	60min	1.00	20.0mm
2hr	120min	1.20	24.0mm
4hr	240min	1.40	28.0mm
6hr	360min	1.60	32.0mm
10hr	600min	1.70	34.0mm
24hr	1440min	2.20	44.0mm
48hr	2880min	2.50	50.0mm

			Z2								
D Duration		M5-D	M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	7.6mm	0.62	0.79	0.89	0.97	1.02	1.19	1.36	1.43	1.79
10min	10min	11.0mm	0.61	0.79	0.90	0.97	1.03	1.22	1.41	1.49	1.91
15min	15min	13.0mm	0.61	0.79	0.90	0.97	1.03	1.22	1.41	1.49	1.91
30min	30min	15.0mm	0.62	0.81	0.90	0.97	1.03	1.24	1.44	1.53	1.99
1hr	60min	20.0mm	0.64	0.81	0.90	0.97	1.03	1.24	1.45	1.54	2.03
2hr	120min	24.0mm	0.64	0.81	0.90	0.97	1.03	1.24	1.45	1.54	2.03
4hr	240min	28.0mm	0.66	0.82	0.91	0.97	1.03	1.24	1.44	1.53	2.01
6hr	360min	32.0mm	0.68	0.83	0.91	0.97	1.03	1.22	1.42	1.51	1.97
10hr	600min	34.0mm	0.68	0.83	0.91	0.97	1.03	1.22	1.42	1.51	1.97
24hr	1440min	44.0mm	0.70	0.84	0.92	0.97	1.02	1.19	1.38	1.47	1.89
48hr	2880min	50.0mm	0.72	0.85	0.93	0.98	1.02	1.17	1.34	1.42	1.81

			MT-D								
D Duration		M5-D	M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	7.6mm	4.7mm	6.0mm	6.8mm	7.4mm	7.8mm	9.0mm	10.3mm	10.8mm	13.6mm
10min	10min	11.0mm	6.7mm	8.7mm	9.9mm	10.7mm	11.3mm	13.4mm	15.5mm	16.4mm	21.0mm
15min	15min	13.0mm	7.9mm	10.3mm	11.7mm	12.6mm	13.4mm	15.9mm	18.3mm	19.4mm	24.8mm
30min	30min	15.0mm	9.3mm	12.2mm	13.5mm	14.6mm	15.5mm	18.6mm	21.6mm	22.9mm	29.9mm
1hr	60min	20.0mm	12.8mm	16.2mm	18.0mm	19.4mm	20.6mm	24.8mm	29.0mm	30.9mm	40.6mm
2hr	120min	24.0mm	15.4mm	19.4mm	21.6mm	23.3mm	24.7mm	29.8mm	34.8mm	37.0mm	48.7mm
4hr	240min	28.0mm	18.5mm	23.0mm	25.5mm	27.2mm	28.8mm	34.7mm	40.3mm	42.9mm	56.3mm
6hr	360min	32.0mm	21.8mm	26.6mm	29.1mm	31.0mm	33.0mm	39.0mm	45.4mm	48.4mm	63.0mm
10hr	600min	34.0mm	23.1mm	28.2mm	30.9mm	33.0mm	35.0mm	41.5mm	48.3mm	51.5mm	67.0mm
24hr	1440min	44.0mm	30.8mm	37.0mm	40.5mm	42.7mm	44.9mm	52.4mm	60.7mm	64.5mm	83.2mm
48hr	2880min	50.0mm	36.0mm	42.5mm	46.5mm	49.0mm	51.0mm	58.5mm	67.0mm	71.0mm	90.5mm

			Intensity i								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	56.5mm/hr	72.0mm/hr	81.2mm/hr	88.5mm/hr	93.0mm/hr	108.5mm/hr	124.0mm/hr	130.1mm/hr	163.2mm/hr
10min	10min	0.17hr	40.3mm/hr	52.1mm/hr	59.4mm/hr	64.0mm/hr	68.0mm/hr	80.5mm/hr	93.1mm/hr	98.3mm/hr	126.1mm/hr
15min	15min	0.25hr	31.7mm/hr	41.1mm/hr	46.8mm/hr	50.4mm/hr	53.6mm/hr	63.4mm/hr	73.3mm/hr	77.5mm/hr	99.3mm/hr
30min	30min	0.50hr	18.6mm/hr	24.3mm/hr	27.0mm/hr	29.1mm/hr	30.9mm/hr	37.2mm/hr	43.2mm/hr	45.8mm/hr	59.7mm/hr
1hr	60min	1.00hr	12.8mm/hr	16.2mm/hr	18.0mm/hr	19.4mm/hr	20.6mm/hr	24.8mm/hr	29.0mm/hr	30.9mm/hr	40.6mm/hr
2hr	120min	2.00hr	7.7mm/hr	9.7mm/hr	10.8mm/hr	11.6mm/hr	12.4mm/hr	14.9mm/hr	17.4mm/hr	18.5mm/hr	24.4mm/hr
4hr	240min	4.00hr	4.6mm/hr	5.7mm/hr	6.4mm/hr	6.8mm/hr	7.2mm/hr	8.7mm/hr	10.1mm/hr	10.7mm/hr	14.1mm/hr
6hr	360min	6.00hr	3.6mm/hr	4.4mm/hr	4.9mm/hr	5.2mm/hr	5.5mm/hr	6.5mm/hr	7.6mm/hr	8.1mm/hr	10.5mm/hr
10hr	600min	10.00hr	2.3mm/hr	2.8mm/hr	3.1mm/hr	3.3mm/hr	3.5mm/hr	4.1mm/hr	4.8mm/hr	5.1mm/hr	6.7mm/hr
24hr	1440min	24.00hr	1.3mm/hr	1.5mm/hr	1.7mm/hr	1.8mm/hr	1.9mm/hr	2.2mm/hr	2.5mm/hr	2.7mm/hr	3.5mm/hr
48hr	2880min	48.00hr	0.6mm/hr	0.8mm/hr	0.8mm/hr	0.9mm/hr	0.9mm/hr	1.1mm/hr	1.3mm/hr	1.3mm/hr	1.7mm/hr
48hr	2880min	48.00hr	0.8mm/hr	0.9mm/hr	1.0mm/hr	1.0mm/hr	1.1mm/hr	1.2mm/hr	1.4mm/hr	1.5mm/hr	1.9mm/hr

SuDs CALCULATIONS

Project: 155-157 Reg Pk Rd

RAINFALL PEAK INTENSITY

Sheet 2 of 7

Project Reference: LBH 4540

Date: 19/07/2019 Rev: 0

Client: Uchaux Ltd

LBH WEMBLEY ENGINEERING

GREENFIELD PEAK RUN-OFF

Hydrological Region: 6 *From Wallingford on-line tool* **Qbar: 0.09 l/sec**

			Run-Off Q								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.07 l/sec	0.08 l/sec	0.09 l/sec	0.10 l/sec	0.11 l/sec	0.14 l/sec	0.17 l/sec	0.21 l/sec	0.28 l/sec
10min	10min	0.17hr	0.07 l/sec	0.08 l/sec	0.09 l/sec	0.10 l/sec	0.11 l/sec	0.14 l/sec	0.17 l/sec	0.21 l/sec	0.28 l/sec
15min	15min	0.25hr	0.07 l/sec	0.08 l/sec	0.09 l/sec	0.10 l/sec	0.11 l/sec	0.14 l/sec	0.17 l/sec	0.21 l/sec	0.28 l/sec
30min	30min	0.50hr	0.07 l/sec	0.08 l/sec	0.09 l/sec	0.10 l/sec	0.11 l/sec	0.14 l/sec	0.17 l/sec	0.21 l/sec	0.28 l/sec
1hr	60min	1.00hr	0.07 l/sec	0.08 l/sec	0.09 l/sec	0.10 l/sec	0.11 l/sec	0.14 l/sec	0.17 l/sec	0.21 l/sec	0.28 l/sec
2hr	120min	2.00hr	0.07 l/sec	0.08 l/sec	0.09 l/sec	0.10 l/sec	0.11 l/sec	0.14 l/sec	0.17 l/sec	0.21 l/sec	0.28 l/sec
4hr	240min	4.00hr	0.07 l/sec	0.08 l/sec	0.09 l/sec	0.10 l/sec	0.11 l/sec	0.14 l/sec	0.17 l/sec	0.21 l/sec	0.28 l/sec
6hr	360min	6.00hr	0.07 l/sec	0.08 l/sec	0.09 l/sec	0.10 l/sec	0.11 l/sec	0.14 l/sec	0.17 l/sec	0.21 l/sec	0.28 l/sec
10hr	600min	10.00hr	0.07 l/sec	0.08 l/sec	0.09 l/sec	0.10 l/sec	0.11 l/sec	0.14 l/sec	0.17 l/sec	0.21 l/sec	0.28 l/sec
24hr	1440min	24.00hr	0.07 l/sec	0.08 l/sec	0.09 l/sec	0.10 l/sec	0.11 l/sec	0.14 l/sec	0.17 l/sec	0.21 l/sec	0.28 l/sec
48hr	2880min	48.00hr	0.07 l/sec	0.08 l/sec	0.09 l/sec	0.10 l/sec	0.11 l/sec	0.14 l/sec	0.17 l/sec	0.21 l/sec	0.28 l/sec

			Run-Off Volume								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.1 m3	0.1 m3	0.1 m3
10min	10min	0.17hr	0.0 m3	0.0 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.2 m3
15min	15min	0.25hr	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.2 m3	0.2 m3	0.3 m3
30min	30min	0.50hr	0.1 m3	0.1 m3	0.2 m3	0.2 m3	0.2 m3	0.3 m3	0.3 m3	0.4 m3	0.5 m3
1hr	60min	1.00hr	0.3 m3	0.3 m3	0.3 m3	0.4 m3	0.4 m3	0.5 m3	0.6 m3	0.8 m3	1.0 m3
2hr	120min	2.00hr	0.5 m3	0.6 m3	0.6 m3	0.7 m3	0.8 m3	1.0 m3	1.2 m3	1.5 m3	2.0 m3
4hr	240min	4.00hr	1.1 m3	1.1 m3	1.3 m3	1.5 m3	1.6 m3	2.1 m3	2.5 m3	3.0 m3	4.0 m3
6hr	360min	6.00hr	1.6 m3	1.7 m3	1.9 m3	2.2 m3	2.4 m3	3.1 m3	3.7 m3	4.6 m3	6.1 m3
10hr	600min	10.00hr	2.7 m3	2.8 m3	3.2 m3	3.6 m3	4.1 m3	5.1 m3	6.2 m3	7.6 m3	10.1 m3
24hr	1440min	24.00hr	6.5 m3	6.7 m3	7.7 m3	8.7 m3	9.7 m3	12.3 m3	14.9 m3	18.2 m3	24.2 m3
48hr	2880min	48.00hr	12.9 m3	13.4 m3	15.4 m3	17.4 m3	19.5 m3	24.6 m3	29.9 m3	36.5 m3	48.5 m3

SuDs CALCULATIONS

Project: 155-157 Reg Pk Rd

GREENFIELD PEAK RUN-OFF

Sheet 3 of 7

Project Reference: LBH 4540

Date: 19/07/2019 Rev: 0

Client: Uchaux Ltd

LBH WEMBLEY ENGINEERING

EXISTING PEAK RUN-OFF

C_V: 0.77 *Volumetric Run-Off Coefficient*

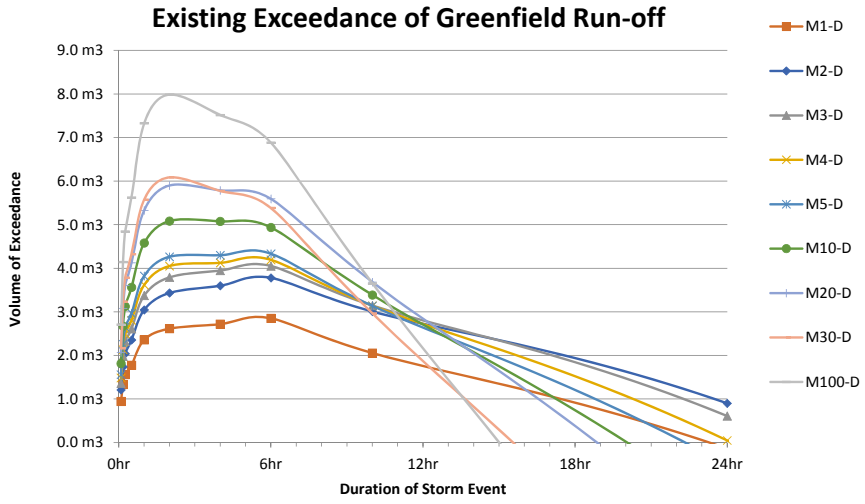
C_R: 1.3 *Routing Coefficient*

			Run-Off Q								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	3.2 l/sec	4.1 l/sec	4.6 l/sec	5.0 l/sec	5.3 l/sec	6.2 l/sec	7.1 l/sec	7.4 l/sec	9.3 l/sec
10min	10min	0.17hr	2.3 l/sec	3.0 l/sec	3.4 l/sec	3.7 l/sec	3.9 l/sec	4.6 l/sec	5.3 l/sec	5.6 l/sec	7.2 l/sec
15min	15min	0.25hr	1.8 l/sec	2.3 l/sec	2.7 l/sec	2.9 l/sec	3.1 l/sec	3.6 l/sec	4.2 l/sec	4.4 l/sec	5.7 l/sec
30min	30min	0.50hr	1.1 l/sec	1.4 l/sec	1.5 l/sec	1.7 l/sec	1.8 l/sec	2.1 l/sec	2.5 l/sec	2.6 l/sec	3.4 l/sec
1hr	60min	1.00hr	0.7 l/sec	0.9 l/sec	1.0 l/sec	1.1 l/sec	1.2 l/sec	1.4 l/sec	1.7 l/sec	1.8 l/sec	2.3 l/sec
2hr	120min	2.00hr	0.4 l/sec	0.6 l/sec	0.6 l/sec	0.7 l/sec	0.7 l/sec	0.8 l/sec	1.0 l/sec	1.1 l/sec	1.4 l/sec
4hr	240min	4.00hr	0.3 l/sec	0.3 l/sec	0.4 l/sec	0.4 l/sec	0.4 l/sec	0.5 l/sec	0.6 l/sec	0.6 l/sec	0.8 l/sec
6hr	360min	6.00hr	0.2 l/sec	0.3 l/sec	0.3 l/sec	0.3 l/sec	0.3 l/sec	0.4 l/sec	0.4 l/sec	0.5 l/sec	0.6 l/sec
10hr	600min	10.00hr	0.1 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.3 l/sec	0.3 l/sec	0.4 l/sec
24hr	1440min	24.00hr	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.2 l/sec	0.2 l/sec
48hr	2880min	48.00hr	0.0 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec

			Run-Off Volume								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	1.0 m3	1.2 m3	1.4 m3	1.5 m3	1.6 m3	1.9 m3	2.1 m3	2.2 m3	2.8 m3
10min	10min	0.17hr	1.4 m3	1.8 m3	2.0 m3	2.2 m3	2.3 m3	2.8 m3	3.2 m3	3.4 m3	4.3 m3
15min	15min	0.25hr	1.6 m3	2.1 m3	2.4 m3	2.6 m3	2.7 m3	3.3 m3	3.8 m3	4.0 m3	5.1 m3
30min	30min	0.50hr	1.9 m3	2.5 m3	2.8 m3	3.0 m3	3.2 m3	3.8 m3	4.4 m3	4.7 m3	6.1 m3
1hr	60min	1.00hr	2.6 m3	3.3 m3	3.7 m3	4.0 m3	4.2 m3	5.1 m3	6.0 m3	6.3 m3	8.3 m3
2hr	120min	2.00hr	3.2 m3	4.0 m3	4.4 m3	4.8 m3	5.1 m3	6.1 m3	7.1 m3	7.6 m3	10.0 m3
4hr	240min	4.00hr	3.8 m3	4.7 m3	5.2 m3	5.6 m3	5.9 m3	7.1 m3	8.3 m3	8.8 m3	11.6 m3
6hr	360min	6.00hr	4.5 m3	5.5 m3	6.0 m3	6.4 m3	6.8 m3	8.0 m3	9.3 m3	9.9 m3	12.9 m3
10hr	600min	10.00hr	4.7 m3	5.8 m3	6.4 m3	6.8 m3	7.2 m3	8.5 m3	9.9 m3	10.6 m3	13.8 m3
24hr	1440min	24.00hr	6.3 m3	7.6 m3	8.3 m3	8.8 m3	9.2 m3	10.8 m3	12.5 m3	13.3 m3	17.1 m3
48hr	2880min	48.00hr	7.4 m3	8.7 m3	9.5 m3	10.1 m3	10.5 m3	12.0 m3	13.8 m3	14.6 m3	18.6 m3

			Exceedance of Greenfield Run-Off Volume								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.9 m3	1.2 m3	1.4 m3	1.5 m3	1.6 m3	1.8 m3	2.1 m3	2.2 m3	2.7 m3
10min	10min	0.17hr	1.3 m3	1.7 m3	2.0 m3	2.1 m3	2.3 m3	2.7 m3	3.1 m3	3.2 m3	4.1 m3
15min	15min	0.25hr	1.6 m3	2.0 m3	2.3 m3	2.5 m3	2.6 m3	3.1 m3	3.6 m3	3.8 m3	4.8 m3
30min	30min	0.50hr	1.8 m3	2.4 m3	2.6 m3	2.8 m3	3.0 m3	3.6 m3	4.1 m3	4.3 m3	5.6 m3
1hr	60min	1.00hr	2.4 m3	3.0 m3	3.4 m3	3.6 m3	3.8 m3	4.6 m3	5.3 m3	5.6 m3	7.3 m3
2hr	120min	2.00hr	2.6 m3	3.4 m3	3.8 m3	4.1 m3	4.3 m3	5.1 m3	5.9 m3	6.1 m3	8.0 m3
4hr	240min	4.00hr	2.7 m3	3.6 m3	3.9 m3	4.1 m3	4.3 m3	5.1 m3	5.8 m3	5.8 m3	7.5 m3
6hr	360min	6.00hr	2.9 m3	3.8 m3	4.1 m3	4.2 m3	4.3 m3	4.9 m3	5.6 m3	5.4 m3	6.9 m3
10hr	600min	10.00hr	2.1 m3	3.0 m3	3.1 m3	3.1 m3	3.1 m3	3.4 m3	3.7 m3	3.0 m3	3.7 m3
24hr	1440min	24.00hr	-0.1 m3	0.9 m3	0.6 m3	0.0 m3	-0.5 m3	-1.6 m3	-2.5 m3	-5.0 m3	-7.2 m3
48hr	2880min	48.00hr	-5.5 m3	-4.7 m3	-5.9 m3	-7.4 m3	-9.0 m3	-12.6 m3	-16.1 m3	-21.9 m3	-29.9 m3

			C_V:
Catchment Area:	200sqm	100%	
Permeable:	0sqm	0%	0.40
Impermeable:	200sqm	100%	0.77
			0.77



SuDs CALCULATIONS

Project: 155-157 Reg Pk Rd

EXISTING PEAK RUN-OFF

Sheet 4 of 7

Project Reference: LBH 4540

Date: 19/07/2019 Rev: 0

Client: Uchaux Ltd

LBH WEMBLEY ENGINEERING

POST- DEVELOPMENT PEAK RUN-OFF + CC

C_V: 0.77 *Volumetric Run-Off Coefficient* Climate Change Allowance: 0%

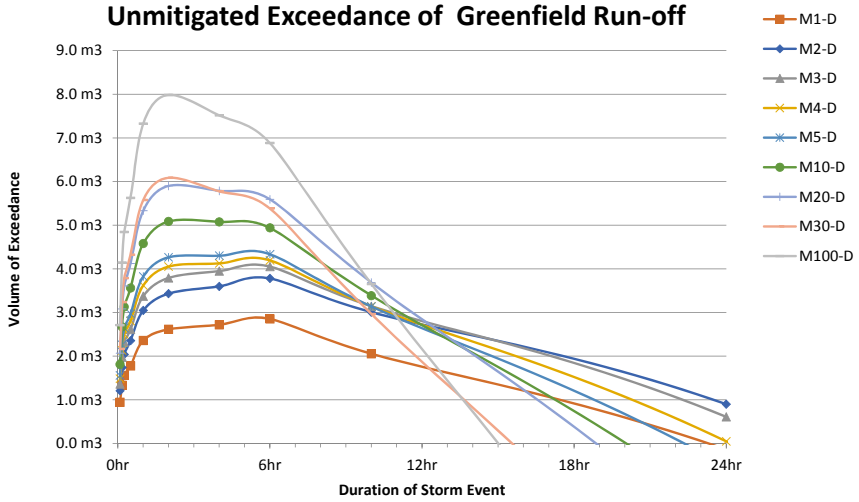
C_R: 1.3 *Routing Coefficient*

			Run-Off Q								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	3.2 l/sec	4.1 l/sec	4.6 l/sec	5.0 l/sec	5.3 l/sec	6.2 l/sec	7.1 l/sec	7.4 l/sec	9.3 l/sec
10min	10min	0.17hr	2.3 l/sec	3.0 l/sec	3.4 l/sec	3.7 l/sec	3.9 l/sec	4.6 l/sec	5.3 l/sec	5.6 l/sec	7.2 l/sec
15min	15min	0.25hr	1.8 l/sec	2.3 l/sec	2.7 l/sec	2.9 l/sec	3.1 l/sec	3.6 l/sec	4.2 l/sec	4.4 l/sec	5.7 l/sec
30min	30min	0.50hr	1.1 l/sec	1.4 l/sec	1.5 l/sec	1.7 l/sec	1.8 l/sec	2.1 l/sec	2.5 l/sec	2.6 l/sec	3.4 l/sec
1hr	60min	1.00hr	0.7 l/sec	0.9 l/sec	1.0 l/sec	1.1 l/sec	1.2 l/sec	1.4 l/sec	1.7 l/sec	1.8 l/sec	2.3 l/sec
2hr	120min	2.00hr	0.4 l/sec	0.6 l/sec	0.6 l/sec	0.7 l/sec	0.7 l/sec	0.8 l/sec	1.0 l/sec	1.1 l/sec	1.4 l/sec
4hr	240min	4.00hr	0.3 l/sec	0.3 l/sec	0.4 l/sec	0.4 l/sec	0.4 l/sec	0.5 l/sec	0.6 l/sec	0.6 l/sec	0.8 l/sec
6hr	360min	6.00hr	0.2 l/sec	0.3 l/sec	0.3 l/sec	0.3 l/sec	0.3 l/sec	0.4 l/sec	0.4 l/sec	0.5 l/sec	0.6 l/sec
10hr	600min	10.00hr	0.1 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.3 l/sec	0.3 l/sec	0.4 l/sec
24hr	1440min	24.00hr	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.2 l/sec	0.2 l/sec
48hr	2880min	48.00hr	0.0 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec

			Run-Off Volume								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	1.0 m3	1.2 m3	1.4 m3	1.5 m3	1.6 m3	1.9 m3	2.1 m3	2.2 m3	2.8 m3
10min	10min	0.17hr	1.4 m3	1.8 m3	2.0 m3	2.2 m3	2.3 m3	2.8 m3	3.2 m3	3.4 m3	4.3 m3
15min	15min	0.25hr	1.6 m3	2.1 m3	2.4 m3	2.6 m3	2.7 m3	3.3 m3	3.8 m3	4.0 m3	5.1 m3
30min	30min	0.50hr	1.9 m3	2.5 m3	2.8 m3	3.0 m3	3.2 m3	3.8 m3	4.4 m3	4.7 m3	6.1 m3
1hr	60min	1.00hr	2.6 m3	3.3 m3	3.7 m3	4.0 m3	4.2 m3	5.1 m3	6.0 m3	6.3 m3	8.3 m3
2hr	120min	2.00hr	3.2 m3	4.0 m3	4.4 m3	4.8 m3	5.1 m3	6.1 m3	7.1 m3	7.6 m3	10.0 m3
4hr	240min	4.00hr	3.8 m3	4.7 m3	5.2 m3	5.6 m3	5.9 m3	7.1 m3	8.3 m3	8.8 m3	11.6 m3
6hr	360min	6.00hr	4.5 m3	5.5 m3	6.0 m3	6.4 m3	6.8 m3	8.0 m3	9.3 m3	9.9 m3	12.9 m3
10hr	600min	10.00hr	4.7 m3	5.8 m3	6.4 m3	6.8 m3	7.2 m3	8.5 m3	9.9 m3	10.6 m3	13.8 m3
24hr	1440min	24.00hr	6.3 m3	7.6 m3	8.3 m3	8.8 m3	9.2 m3	10.8 m3	12.5 m3	13.3 m3	17.1 m3
48hr	2880min	48.00hr	7.4 m3	8.7 m3	9.5 m3	10.1 m3	10.5 m3	12.0 m3	13.8 m3	14.6 m3	18.6 m3

			Exceedance of Greenfield Run-Off Volume								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.9 m3	1.2 m3	1.4 m3	1.5 m3	1.6 m3	1.8 m3	2.1 m3	2.2 m3	2.7 m3
10min	10min	0.17hr	1.3 m3	1.7 m3	2.0 m3	2.1 m3	2.3 m3	2.7 m3	3.1 m3	3.2 m3	4.1 m3
15min	15min	0.25hr	1.6 m3	2.0 m3	2.3 m3	2.5 m3	2.6 m3	3.1 m3	3.6 m3	3.8 m3	4.8 m3
30min	30min	0.50hr	1.8 m3	2.4 m3	2.6 m3	2.8 m3	3.0 m3	3.6 m3	4.1 m3	4.3 m3	5.6 m3
1hr	60min	1.00hr	2.4 m3	3.0 m3	3.4 m3	3.6 m3	3.8 m3	4.6 m3	5.3 m3	5.6 m3	7.3 m3
2hr	120min	2.00hr	2.6 m3	3.4 m3	3.8 m3	4.1 m3	4.3 m3	5.1 m3	5.9 m3	6.1 m3	8.0 m3
4hr	240min	4.00hr	2.7 m3	3.6 m3	3.9 m3	4.1 m3	4.3 m3	5.1 m3	5.8 m3	5.8 m3	7.5 m3
6hr	360min	6.00hr	2.9 m3	3.8 m3	4.1 m3	4.2 m3	4.3 m3	4.9 m3	5.6 m3	5.4 m3	6.9 m3
10hr	600min	10.00hr	2.1 m3	3.0 m3	3.1 m3	3.1 m3	3.1 m3	3.4 m3	3.7 m3	3.0 m3	3.7 m3
24hr	1440min	24.00hr	-0.1 m3	0.9 m3	0.6 m3	0.0 m3	-0.5 m3	-1.6 m3	-2.5 m3	-5.0 m3	-7.2 m3
48hr	2880min	48.00hr	-5.5 m3	-4.7 m3	-5.9 m3	-7.4 m3	-9.0 m3	-12.6 m3	-16.1 m3	-21.9 m3	-29.9 m3

			C_V:
Catchment Area:	200sqm	100%	
Permeable Garden	0sqm	0%	0.40
Impermeable:	200sqm	100%	0.77
			0.77



SuDs CALCULATIONS

Project: 155-157 Reg Pk Rd

POST-DEV. PEAK RUN-OFF

Sheet 5 of 7

Project Reference: LBH 4540

Date: 19/07/2019 Rev: 0

Client: Uchaux Ltd

LBH WEMBLEY ENGINEERING

POST- DEVELOPMENT & SOURCE MITIGATION PEAK RUN-OFF + CC ATTENUATION STORAGE REQUIREMENTS

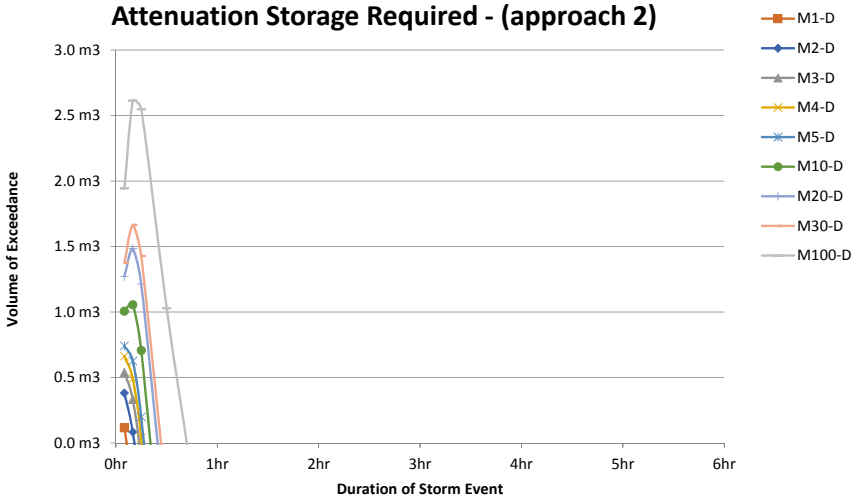
Proposed Discharge Rate: **2.83 l/sec** (approach 2 - 50% Existing)
0.09 l/sec *QBar*

			INFLOW								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	1.0 m3	1.2 m3	1.4 m3	1.5 m3	1.6 m3	1.9 m3	2.1 m3	2.2 m3	2.8 m3
10min	10min	0.17hr	1.4 m3	1.8 m3	2.0 m3	2.2 m3	2.3 m3	2.8 m3	3.2 m3	3.4 m3	4.3 m3
15min	15min	0.25hr	1.6 m3	2.1 m3	2.4 m3	2.6 m3	2.7 m3	3.3 m3	3.8 m3	4.0 m3	5.1 m3
30min	30min	0.50hr	1.9 m3	2.5 m3	2.8 m3	3.0 m3	3.2 m3	3.8 m3	4.4 m3	4.7 m3	6.1 m3
1hr	60min	1.00hr	2.6 m3	3.3 m3	3.7 m3	4.0 m3	4.2 m3	5.1 m3	6.0 m3	6.3 m3	8.3 m3
2hr	120min	2.00hr	3.2 m3	4.0 m3	4.4 m3	4.8 m3	5.1 m3	6.1 m3	7.1 m3	7.6 m3	10.0 m3
4hr	240min	4.00hr	3.8 m3	4.7 m3	5.2 m3	5.6 m3	5.9 m3	7.1 m3	8.3 m3	8.8 m3	11.6 m3
6hr	360min	6.00hr	4.5 m3	5.5 m3	6.0 m3	6.4 m3	6.8 m3	8.0 m3	9.3 m3	9.9 m3	12.9 m3
10hr	600min	10.00hr	4.7 m3	5.8 m3	6.4 m3	6.8 m3	7.2 m3	8.5 m3	9.9 m3	10.6 m3	13.8 m3
24hr	1440min	24.00hr	6.3 m3	7.6 m3	8.3 m3	8.8 m3	9.2 m3	10.8 m3	12.5 m3	13.3 m3	17.1 m3
48hr	2880min	48.00hr	7.4 m3	8.7 m3	9.5 m3	10.1 m3	10.5 m3	12.0 m3	13.8 m3	14.6 m3	18.6 m3

			OUTFLOW								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.8 m3	0.8 m3	0.8 m3	0.8 m3	0.8 m3	0.8 m3	0.8 m3	0.8 m3	0.8 m3
10min	10min	0.17hr	1.7 m3	1.7 m3	1.7 m3	1.7 m3	1.7 m3	1.7 m3	1.7 m3	1.7 m3	1.7 m3
15min	15min	0.25hr	2.5 m3	2.5 m3	2.5 m3	2.5 m3	2.5 m3	2.5 m3	2.5 m3	2.5 m3	2.5 m3
30min	30min	0.50hr	5.1 m3	5.1 m3	5.1 m3	5.1 m3	5.1 m3	5.1 m3	5.1 m3	5.1 m3	5.1 m3
1hr	60min	1.00hr	10.2 m3	10.2 m3	10.2 m3	10.2 m3	10.2 m3	10.2 m3	10.2 m3	10.2 m3	10.2 m3
2hr	120min	2.00hr	20.4 m3	20.4 m3	20.4 m3	20.4 m3	20.4 m3	20.4 m3	20.4 m3	20.4 m3	20.4 m3
4hr	240min	4.00hr	40.8 m3	40.8 m3	40.8 m3	40.8 m3	40.8 m3	40.8 m3	40.8 m3	40.8 m3	40.8 m3
6hr	360min	6.00hr	61.2 m3	61.2 m3	61.2 m3	61.2 m3	61.2 m3	61.2 m3	61.2 m3	61.2 m3	61.2 m3
10hr	600min	10.00hr	102.0 m3	102.0 m3	102.0 m3	102.0 m3	102.0 m3	102.0 m3	102.0 m3	102.0 m3	102.0 m3
24hr	1440min	24.00hr	244.8 m3	244.8 m3	244.8 m3	244.8 m3	244.8 m3	244.8 m3	244.8 m3	244.8 m3	244.8 m3
48hr	2880min	48.00hr	489.5 m3	489.5 m3	489.5 m3	489.5 m3	489.5 m3	489.5 m3	489.5 m3	489.5 m3	489.5 m3

			ATTENUATION STORAGE REQUIRED TO MEET PROPOSED DISCHARGE RATE								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.1 m3	0.4 m3	0.5 m3	0.7 m3	0.7 m3	1.0 m3	1.3 m3	1.4 m3	1.9 m3
10min	10min	0.17hr	-0.3 m3	0.1 m3	0.3 m3	0.5 m3	0.6 m3	1.1 m3	1.5 m3	1.7 m3	2.6 m3
15min	15min	0.25hr	-0.9 m3	-0.4 m3	-0.1 m3	0.0 m3	0.2 m3	0.7 m3	1.2 m3	1.4 m3	2.5 m3
30min	30min	0.50hr	-3.2 m3	-2.6 m3	-2.3 m3	-2.1 m3	-1.9 m3	-1.3 m3	-0.7 m3	-0.4 m3	1.0 m3
1hr	60min	1.00hr	-7.6 m3	-6.9 m3	-6.5 m3	-6.2 m3	-6.0 m3	-5.1 m3	-4.2 m3	-3.9 m3	-1.9 m3
2hr	120min	2.00hr	-17.2 m3	-16.4 m3	-16.0 m3	-15.6 m3	-15.3 m3	-14.3 m3	-13.3 m3	-12.8 m3	-10.4 m3
4hr	240min	4.00hr	-37.0 m3	-36.1 m3	-35.6 m3	-35.2 m3	-34.9 m3	-33.7 m3	-32.5 m3	-32.0 m3	-29.2 m3
6hr	360min	6.00hr	-56.7 m3	-55.7 m3	-55.2 m3	-54.8 m3	-54.4 m3	-53.2 m3	-51.9 m3	-51.2 m3	-48.2 m3
10hr	600min	10.00hr	-97.2 m3	-96.2 m3	-95.6 m3	-95.2 m3	-94.8 m3	-93.5 m3	-92.1 m3	-91.4 m3	-88.2 m3
24hr	1440min	24.00hr	-238.4 m3	-237.2 m3	-236.5 m3	-236.0 m3	-235.6 m3	-234.0 m3	-232.3 m3	-231.5 m3	-227.7 m3
48hr	2880min	48.00hr	-482.1 m3	-480.8 m3	-480.0 m3	-479.5 m3	-479.1 m3	-477.5 m3	-475.8 m3	-475.0 m3	-470.9 m3

Approach 2 ATTENUATION STORAGE REQUIRED: 2.6 m3



SuDs CALCULATIONS

Project: 155-157 Reg Pk Rd

STORAGE REQUIREMENTS

Sheet 6 of 7

Project Reference: LBH 4540

Date: 19/07/2019 Rev: 0

Client: Uchaux Ltd

LBH WEMBLEY ENGINEERING

POST- DEVELOPMENT & SOURCE MITIGATION PEAK RUN-OFF + CC ATTENUATION STORAGE REQUIREMENTS

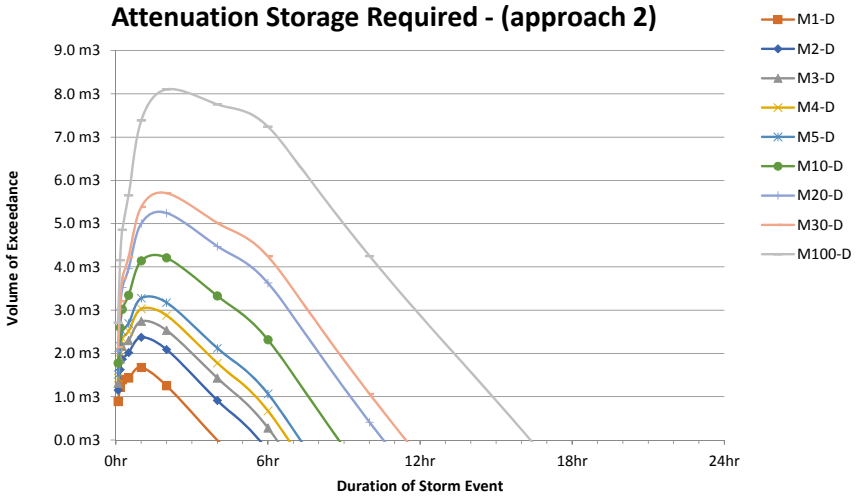
Proposed Discharge Rate: **0.26 l/sec** (3 x Qbar approach 2)
0.09 l/sec *QBar* 0.04 l/sec *(2.0 l/sec/ha)*

			INFLOW								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	1.0 m3	1.2 m3	1.4 m3	1.5 m3	1.6 m3	1.9 m3	2.1 m3	2.2 m3	2.8 m3
10min	10min	0.17hr	1.4 m3	1.8 m3	2.0 m3	2.2 m3	2.3 m3	2.8 m3	3.2 m3	3.4 m3	4.3 m3
15min	15min	0.25hr	1.6 m3	2.1 m3	2.4 m3	2.6 m3	2.7 m3	3.3 m3	3.8 m3	4.0 m3	5.1 m3
30min	30min	0.50hr	1.9 m3	2.5 m3	2.8 m3	3.0 m3	3.2 m3	3.8 m3	4.4 m3	4.7 m3	6.1 m3
1hr	60min	1.00hr	2.6 m3	3.3 m3	3.7 m3	4.0 m3	4.2 m3	5.1 m3	6.0 m3	6.3 m3	8.3 m3
2hr	120min	2.00hr	3.2 m3	4.0 m3	4.4 m3	4.8 m3	5.1 m3	6.1 m3	7.1 m3	7.6 m3	10.0 m3
4hr	240min	4.00hr	3.8 m3	4.7 m3	5.2 m3	5.6 m3	5.9 m3	7.1 m3	8.3 m3	8.8 m3	11.6 m3
6hr	360min	6.00hr	4.5 m3	5.5 m3	6.0 m3	6.4 m3	6.8 m3	8.0 m3	9.3 m3	9.9 m3	12.9 m3
10hr	600min	10.00hr	4.7 m3	5.8 m3	6.4 m3	6.8 m3	7.2 m3	8.5 m3	9.9 m3	10.6 m3	13.8 m3
24hr	1440min	24.00hr	6.3 m3	7.6 m3	8.3 m3	8.8 m3	9.2 m3	10.8 m3	12.5 m3	13.3 m3	17.1 m3
48hr	2880min	48.00hr	7.4 m3	8.7 m3	9.5 m3	10.1 m3	10.5 m3	12.0 m3	13.8 m3	14.6 m3	18.6 m3

			OUTFLOW								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3
10min	10min	0.17hr	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.2 m3
15min	15min	0.25hr	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.2 m3
30min	30min	0.50hr	0.5 m3	0.5 m3	0.5 m3	0.5 m3	0.5 m3	0.5 m3	0.5 m3	0.5 m3	0.5 m3
1hr	60min	1.00hr	1.0 m3	1.0 m3	1.0 m3	1.0 m3	1.0 m3	1.0 m3	1.0 m3	1.0 m3	1.0 m3
2hr	120min	2.00hr	1.9 m3	1.9 m3	1.9 m3	1.9 m3	1.9 m3	1.9 m3	1.9 m3	1.9 m3	1.9 m3
4hr	240min	4.00hr	3.8 m3	3.8 m3	3.8 m3	3.8 m3	3.8 m3	3.8 m3	3.8 m3	3.8 m3	3.8 m3
6hr	360min	6.00hr	5.7 m3	5.7 m3	5.7 m3	5.7 m3	5.7 m3	5.7 m3	5.7 m3	5.7 m3	5.7 m3
10hr	600min	10.00hr	9.5 m3	9.5 m3	9.5 m3	9.5 m3	9.5 m3	9.5 m3	9.5 m3	9.5 m3	9.5 m3
24hr	1440min	24.00hr	22.8 m3	22.8 m3	22.8 m3	22.8 m3	22.8 m3	22.8 m3	22.8 m3	22.8 m3	22.8 m3
48hr	2880min	48.00hr	45.6 m3	45.6 m3	45.6 m3	45.6 m3	45.6 m3	45.6 m3	45.6 m3	45.6 m3	45.6 m3

			ATTENUATION STORAGE REQUIRED TO MEET PROPOSED DISCHARGE RATE								
D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.9 m3	1.2 m3	1.3 m3	1.4 m3	1.5 m3	1.8 m3	2.0 m3	2.1 m3	2.7 m3
10min	10min	0.17hr	1.2 m3	1.6 m3	1.9 m3	2.0 m3	2.2 m3	2.6 m3	3.0 m3	3.2 m3	4.2 m3
15min	15min	0.25hr	1.4 m3	1.9 m3	2.2 m3	2.4 m3	2.5 m3	3.0 m3	3.5 m3	3.7 m3	4.9 m3
30min	30min	0.50hr	1.4 m3	2.0 m3	2.3 m3	2.5 m3	2.7 m3	3.3 m3	4.0 m3	4.2 m3	5.7 m3
1hr	60min	1.00hr	1.7 m3	2.4 m3	2.7 m3	3.0 m3	3.3 m3	4.1 m3	5.0 m3	5.4 m3	7.4 m3
2hr	120min	2.00hr	1.3 m3	2.1 m3	2.5 m3	2.9 m3	3.2 m3	4.2 m3	5.2 m3	5.7 m3	8.1 m3
4hr	240min	4.00hr	0.0 m3	0.9 m3	1.4 m3	1.8 m3	2.1 m3	3.3 m3	4.5 m3	5.0 m3	7.8 m3
6hr	360min	6.00hr	-1.2 m3	-0.2 m3	0.3 m3	0.7 m3	1.1 m3	2.3 m3	3.6 m3	4.2 m3	7.2 m3
10hr	600min	10.00hr	-4.8 m3	-3.7 m3	-3.1 m3	-2.7 m3	-2.3 m3	-1.0 m3	0.4 m3	1.1 m3	4.3 m3
24hr	1440min	24.00hr	-16.5 m3	-15.2 m3	-14.5 m3	-14.0 m3	-13.6 m3	-12.1 m3	-10.3 m3	-9.6 m3	-5.7 m3
48hr	2880min	48.00hr	-38.2 m3	-36.9 m3	-36.1 m3	-35.5 m3	-35.1 m3	-33.6 m3	-31.9 m3	-31.0 m3	-27.0 m3

Approach 2 ATTENUATION STORAGE REQUIRED: 8.1 m3



SuDs CALCULATIONS

Project: 155-157 Reg Pk Rd

STORAGE REQUIREMENTS

Sheet 7 of 7

Project Reference: LBH 4540

Date: 19/07/2019 Rev: 0

Client: Uchaux Ltd

LBH WEMBLEY ENGINEERING

Sewer Flooding
History Enquiry

Property Searches

LBH Wembley Geotechnical & Environmental

Search address supplied	155-157 Regents Park Road London NW1 8BB
Your reference	LBH4540
Our reference	SFH/SFH Standard/2018_3836558
Received date	**16 July 2018**
Search date	**16 July 2018**

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

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

0845 070 9148

Sewer Flooding
History Enquiry

Property Searches

Search address supplied: 155-157,Regents Park Road,London,NW1 8BB

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

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

(i) any negligent or incorrect entry in the records searched;

(ii) any negligent or incorrect interpretation of the records searched;

(iii) and any negligent or incorrect recording of that interpretation in the search report

(iv) compensation payments

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

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

0845 070 9148

Sewer Flooding
History Enquiry

Thames Water Property Searches

History of Sewer Flooding

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

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

For your guidance:

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

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

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

0845 070 9148

Asset location search

Property Searches

Groundwise Searches Ltd
Suite 8 Chichester House
45Chichester Road
SOUTHEND ON SEA
SS1 2JU

Search address supplied At Regents Park Road
London
NW3 3QE

Your reference URO6218.1DM

Our reference ALS/ALS Standard/2018_3815781

Search date 14 June 2018

Keeping you up-to-date

Knowledge of features below the surface is essential in every development. The benefits of this not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility for any commercial or residential project.

An asset location search provides information on the location of known Thames Water clean and/or wastewater assets, including details of pipe sizes, direction of flow and depth. Please note that information on cover and invert levels will only be provided where the data is available.

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

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

0845 070 9148

searchcode

Asset location search

Thames Water Property Searches

Search address supplied: At Regents Park Road, London, NW3 3QE

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This searchprovides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an ‘as constructed’ record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

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

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

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

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

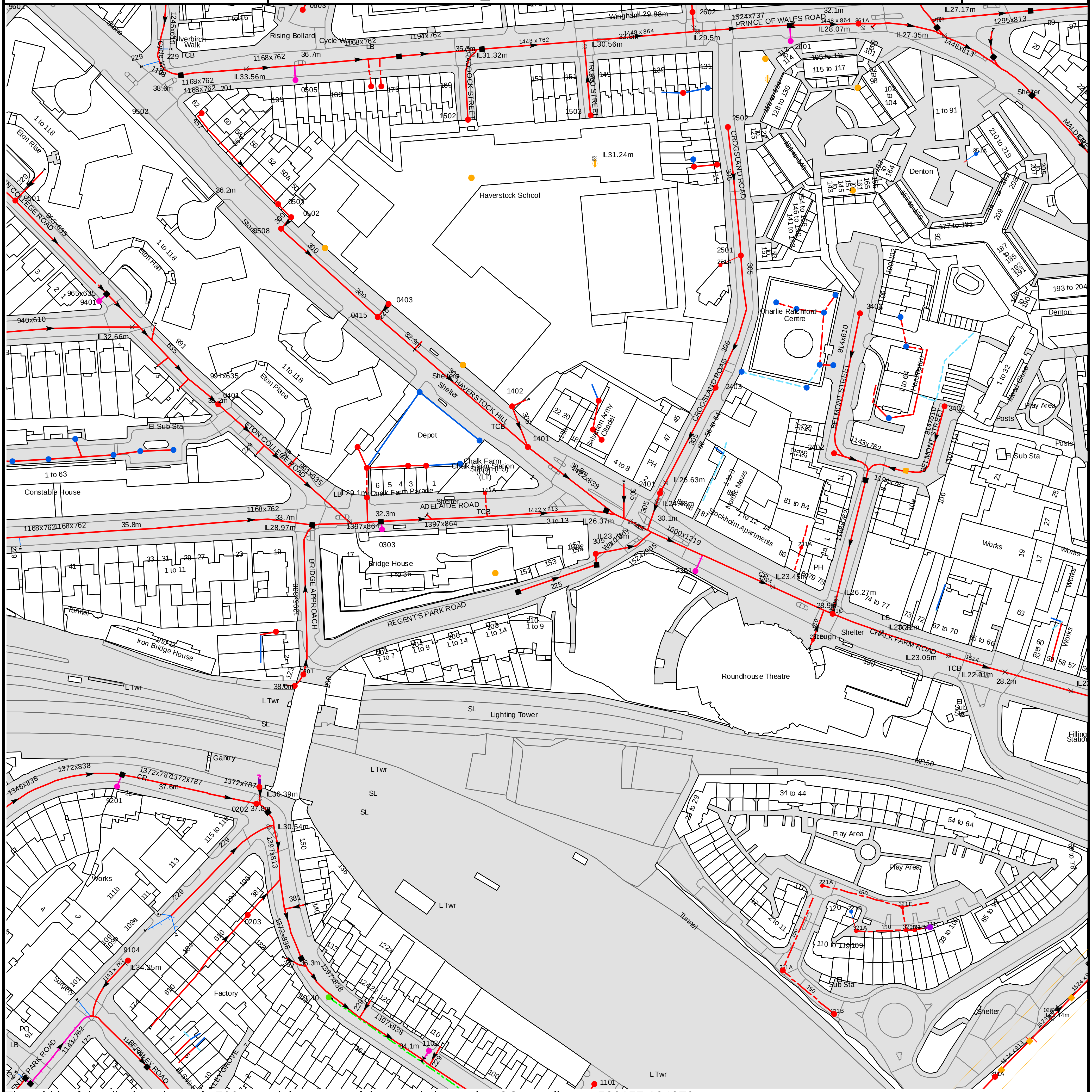
Clean Water queries

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

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

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2018_3815781



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 528157,184379

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

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

Manhole Reference	Manhole Cover Level	Manhole Invert Level
2501	31.9	29.5
351A	n/a	n/a
2502	32.8	30.44
2601	n/a	n/a
361A	n/a	n/a
2402	29.91	26.52
34BF	n/a	n/a
3402	29.85	26.86
24BJ	n/a	n/a
24BI	n/a	n/a
24CA	n/a	n/a
24CE	n/a	n/a
34BC	n/a	n/a
34BB	n/a	n/a
3403	30.31	27.29
24CD	n/a	n/a
24CC	n/a	n/a
24CB	n/a	n/a
24CH	n/a	n/a
251A	n/a	n/a
211A	n/a	n/a
231A	n/a	n/a
231B	n/a	n/a
221A	n/a	n/a
211B	n/a	n/a
221B	n/a	n/a
321A	n/a	n/a
321E	n/a	n/a
321B	n/a	n/a
311A	33.13	25.37
04BJ	n/a	n/a
04BH	n/a	n/a
041A	n/a	n/a
0415	33.15	30.98
0403	n/a	n/a
04BG	n/a	n/a
04BI	n/a	n/a
04BF	n/a	n/a
14BF	n/a	n/a
14BG	n/a	n/a
141A	n/a	n/a
1402	n/a	n/a
1401	31.06	27.24
14BB	n/a	n/a
14BA	n/a	n/a
14BC	n/a	n/a
2401	30.19	n/a
2403	30.82	28.25
0508	34.63	32.85
0502	34.89	33.53
0503	n/a	n/a
25BA	n/a	n/a
25BB	n/a	n/a
25AJ	n/a	n/a
1502	n/a	n/a
1503	n/a	n/a
25CC	n/a	n/a
25CB	n/a	n/a
0506	n/a	n/a
0507	n/a	n/a
0505	n/a	n/a
2602	n/a	n/a
0603	36.8	35.2
03BI	n/a	n/a
031A	n/a	n/a
0301	37.57	29.57
0110	34.34	22.82
0303	n/a	n/a
1102	n/a	n/a
1101	n/a	n/a
1302	30.77	26.84
2301	n/a	n/a
231C	n/a	n/a
321D	n/a	n/a
321C	n/a	n/a
94BB	n/a	n/a
94BG	n/a	n/a
9201	n/a	n/a
9104	n/a	n/a
0203	n/a	n/a
0202	37.99	30.25
021A	n/a	n/a
94BI	n/a	n/a
94BJ	n/a	n/a
94CA	n/a	n/a
94CB	n/a	n/a
0401	35	31.73
9401	n/a	n/a
9501	40.21	36.45
9502	37.1	35.88

Manhole Reference	Manhole Cover Level	Manhole Invert Level

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

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

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

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

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

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

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

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

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

Control Valve

Drop Pipe

Ancillary

Weir

End Items

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

Outfall

Undefined End

Inlet

Other Symbols

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

Public/Private Pumping Station

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

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

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

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

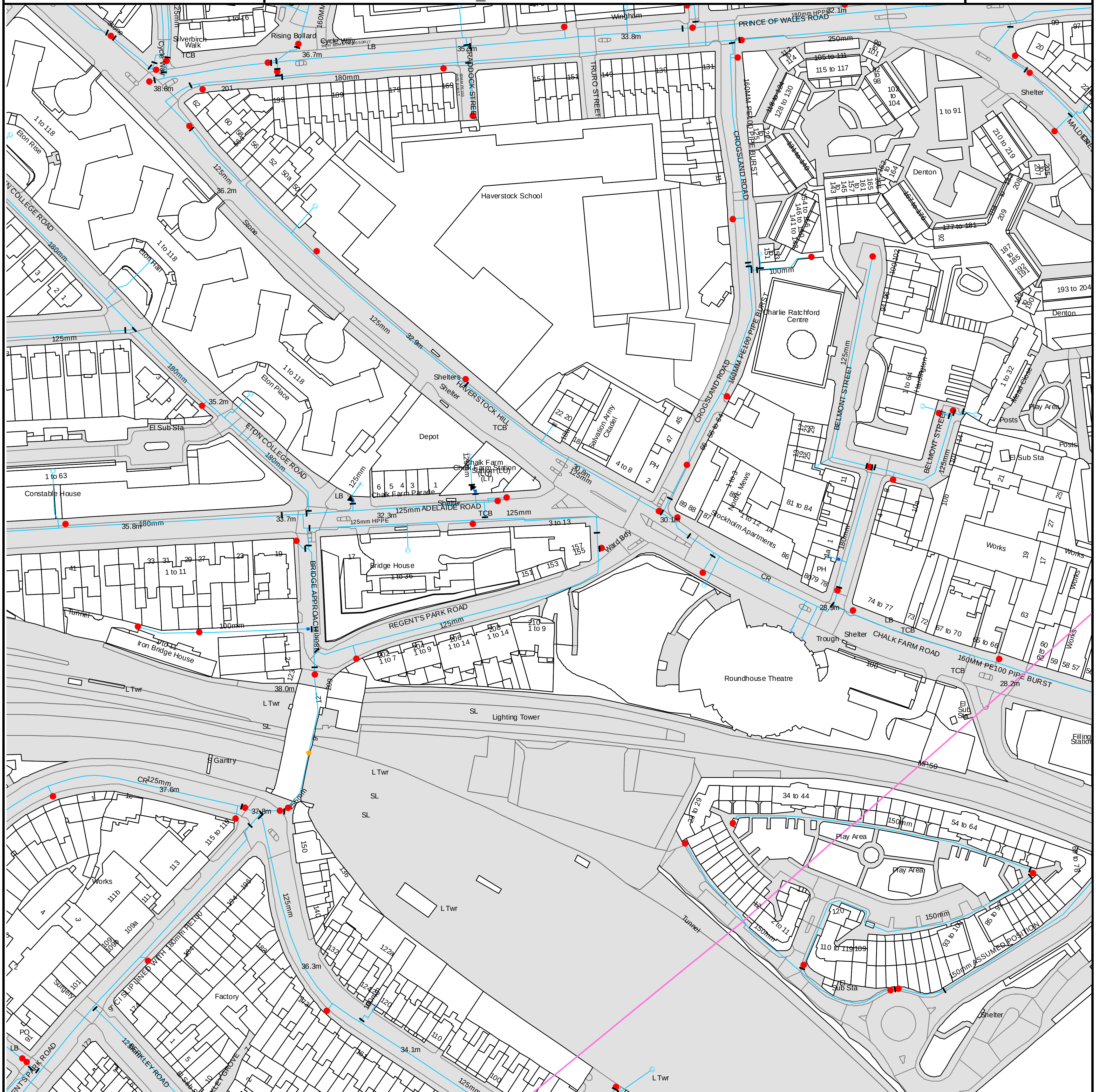
Proposed

Abandoned Sewer

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plans are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
5) 'na' or '0' on a manhole level indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2018_3815781



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 528157, 184379.

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

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Valves

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

Hydrants

- Single Hydrant

Meters

- Meter

End Items

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

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

Operational Sites

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

Other Symbols

- Data Logger

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

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

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0845 070 9148** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
- act with integrity and carry out work with due skill, care and diligence
- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE