SURFACE WATER DRAINAGE ASSESSMENT

in connection with the proposed development

at

CROFTWAY HOUSE
298 FINCHLEY ROAD
CAMDEN

LBH4678SUDS

OCTOBER 2022

LBHGEO

DOCUMENT CONTROL				
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FOREWORD-GUIDANCE NOTES

GENERAL

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1. INTRODUCTION

1.1 BACKGROUND

It is proposed to replace the existing detached swimming pool structure with a two-storey residential building with a basement.

1.2 BRIEF

LBHGEO have been appointed to prepare a SuDS Assessment for the proposed development in to support a forthcoming planning application to the London Borough of Camden.

1.3 SUDS GUIDANCE

The government advice is that developers should seek opportunities to reduce the overall level of flood risk through the appropriate application of sustainable drainage systems.

Sustainable drainage 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.

The London Borough of Camden requires drainage solutions to incorporate SuDS principles as laid out in the Non-Statutory Technical Standards[1] for Sustainable Drainage Systems and the London Plan[2].

For redevelopment sites where there is a net increase in impermeable area, development must include at least one ‘source control’ SuDS measure. Examples of potential Source Control measures include:

- blue/green roof
- rainwater harvesting
- bio-retention
- rain garden
- permeable paving

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

Underground storage/attenuation tanks are not encouraged and are to be used only as a last resort.

The Camden Local Plan (2017) provides guidance for water and flooding under Policy CC3 Water and flooding, where the council will seek to ensure a development reduces the risk of flooding where possible and will require a development to utilise Sustainable Drainage Systems (SuDS) in line with the drainage hierarchy to achieve a greenfield run-off rate where feasible.

Additionally, the Water and Flooding Camden Planning Guidance (CPG) (March 2019) states the following:

> *"A drainage report is required for all major applications, basement development, and vulnerable development in areas identified as at risk of flooding (details of what this should include can be found in paragraph 8.67 of the Local Plan). 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 where feasible once SuDS have been installed.*
>
> *Greenfield run-off rates are defined as the run off rates from a site in its natural state prior to any development. Developers will be expected to show to the Council's satisfaction how all opportunities to reduce site run-off have been included"*

1.4 REPORT STRUCTURE

This report initially describes the site characteristics and the proposed development, following which consideration is given to the feasibility of different SuDS techniques for this site, in line with the SuDS hierarchy.

An analysis is then presented of surface water run-off and of the attenuation volume that will be required to achieve the required reduction in the predicted run-off rates, taking into account increased rainfall rates due to anticipated climatic change.

A SuDS strategy is then developed including information about the proposed SuDS components, with an aim to reduce the drainage discharge rates as far as can be reasonably achieved in the proposed post-development scenario.

The report is accompanied by detailed calculations and a summary sustainable drainage pro-forma.

1.5 DOCUMENTS CONSULTED

The following drawings of the existing site and the proposed development were used for this assessment.

- 2022 Sept Existing Plans Lefroy Architects
  Ref: 298.32, 298.36

- 2022 Sept Proposed Plans Lefroy Architects
  Ref: 298.01, 298.02, 298.03, 298.04, 298.05, 298.06, 298.07, 298.08, 298.10, 298.11, 298.12, 298.13, 298.41, 298.42

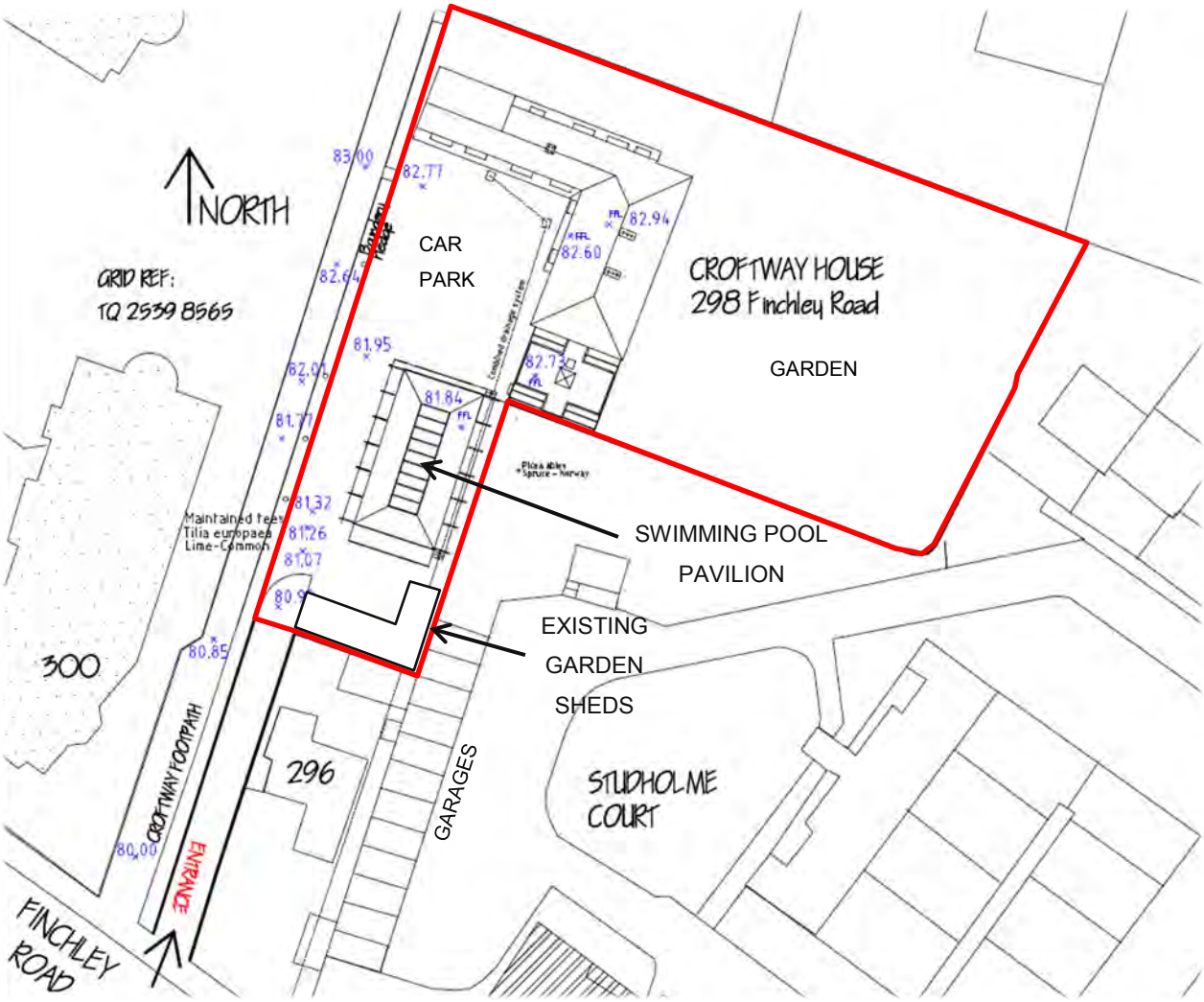
2. THE SITE

The site is located on the northern side of Finchley Road in West Hampstead, approximately 800m north of the West Hampstead railway station. The site may be approximately located by the postcode NW3 7AG or by National Grid Reference 525400, 185675.

SITE LOCATION PLAN

2.1 SITE DESCRIPTION

The site lies within the grounds of a larger property containing a two storey detached house with a sizable rear garden and a large a gravel-surfaced courtyard parking area. A detached pavilion building housing a swimming pool lies at present adjoining the eastern side of the driveway from Finchley Road.



PLAN OF EXISTING SITE FEATURES

The site surface falls southwards from a high point of approximately +83.0m OD at the main house to approximately +81.0m OD at the entrance gate to the driveway.

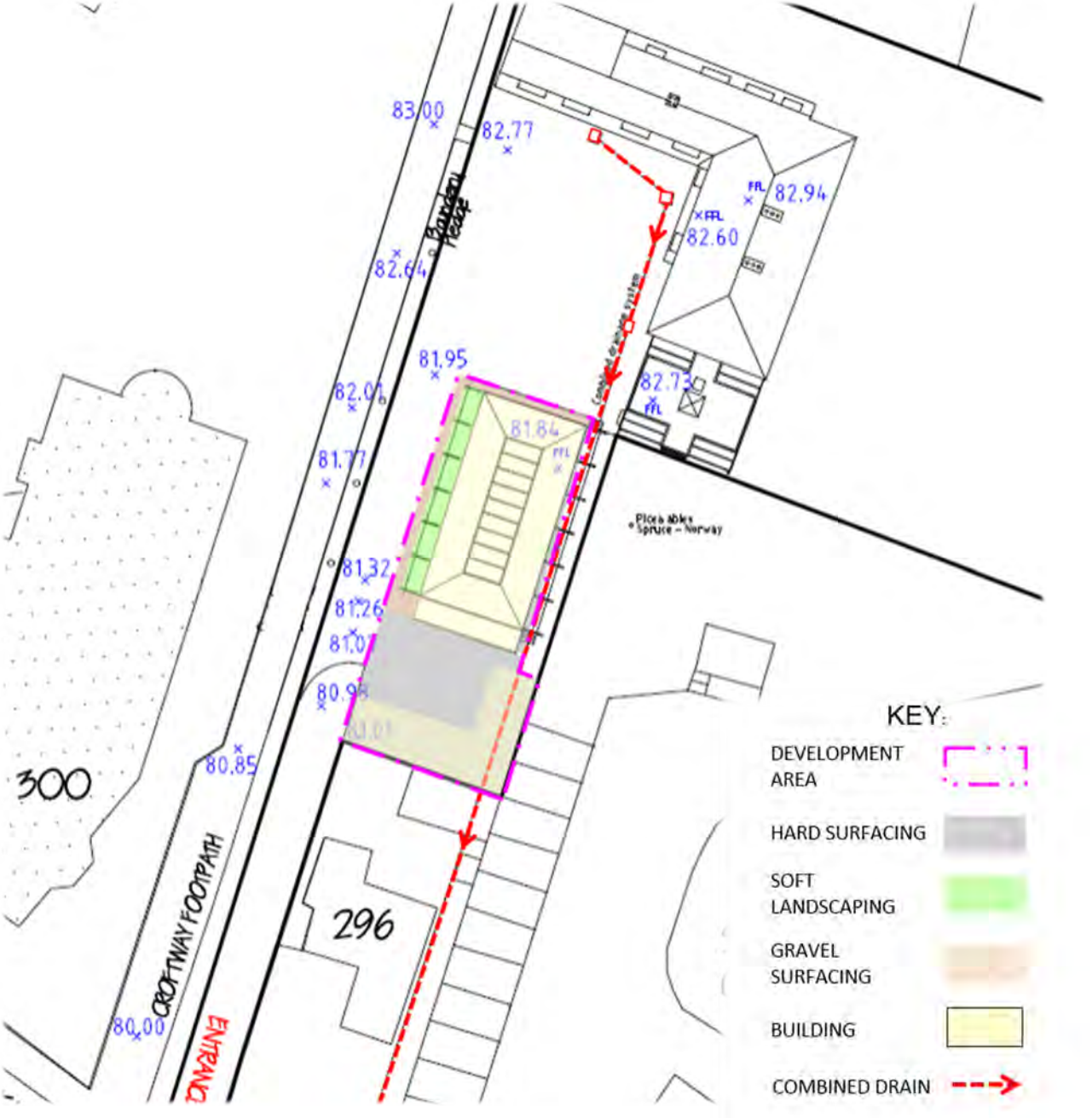
The existing pool building comprises a single storey with a pitched roof that is set into the slope at the northern end, by around 0.5m while the southern end emerges from the slope and is elevated by a similar amount.

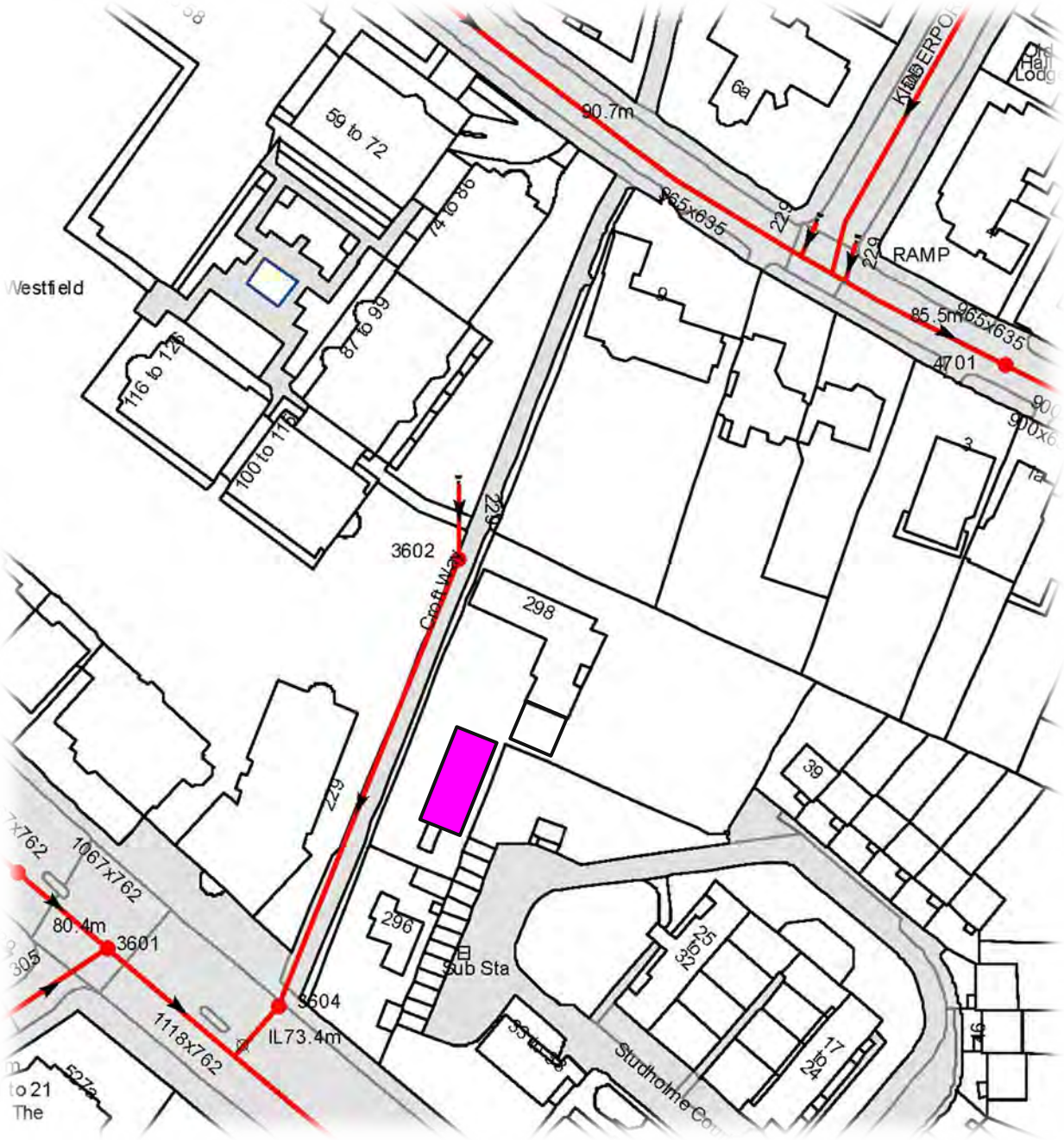
Some timber garden sheds are present to the south of the swimming pool.

2.2 EXISTING SURFACE WATER DRAINAGE

The existing drainage system features a main combined drain collecting foul and surface water drainage from Croftway House and continuing along the eastern sideof the existing swimming pool pavilion.

The drain continues towards the southwest within the No. 296 Finchley Road property and eventually connects to a public combined sewer running southwards below Finchley Road.



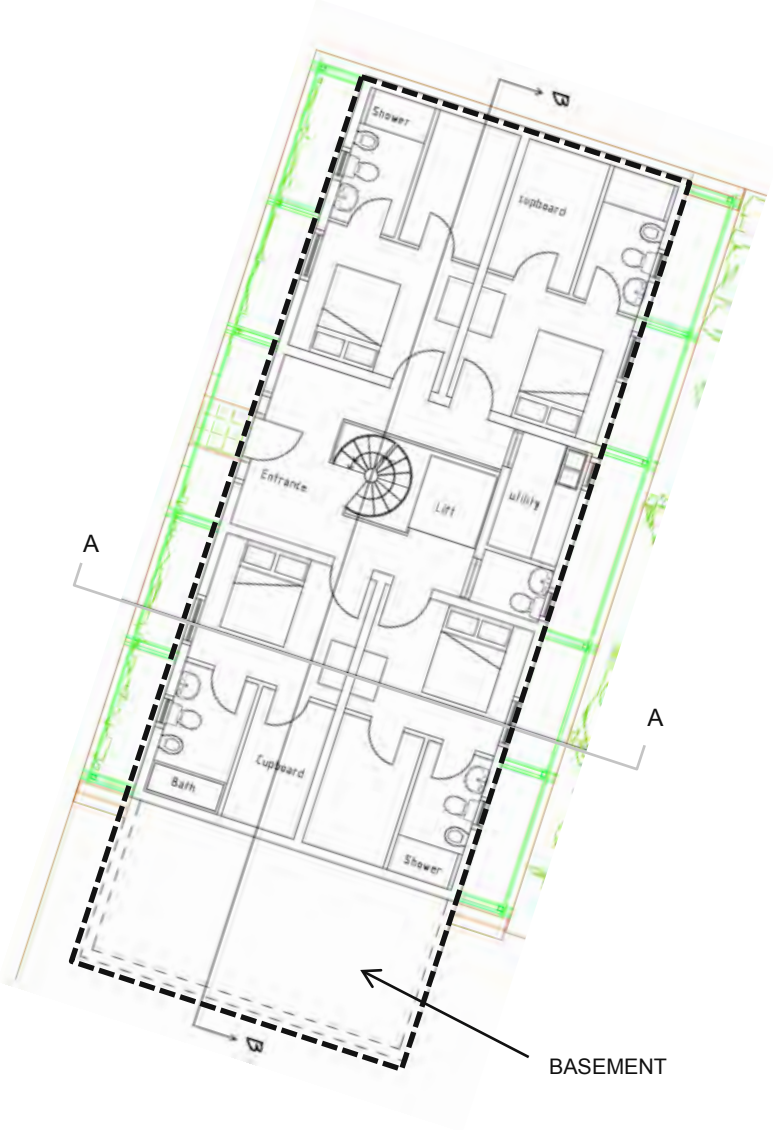


EXTRACT OF THAMES WATER PLAN SHOWING COMBINED SEWER

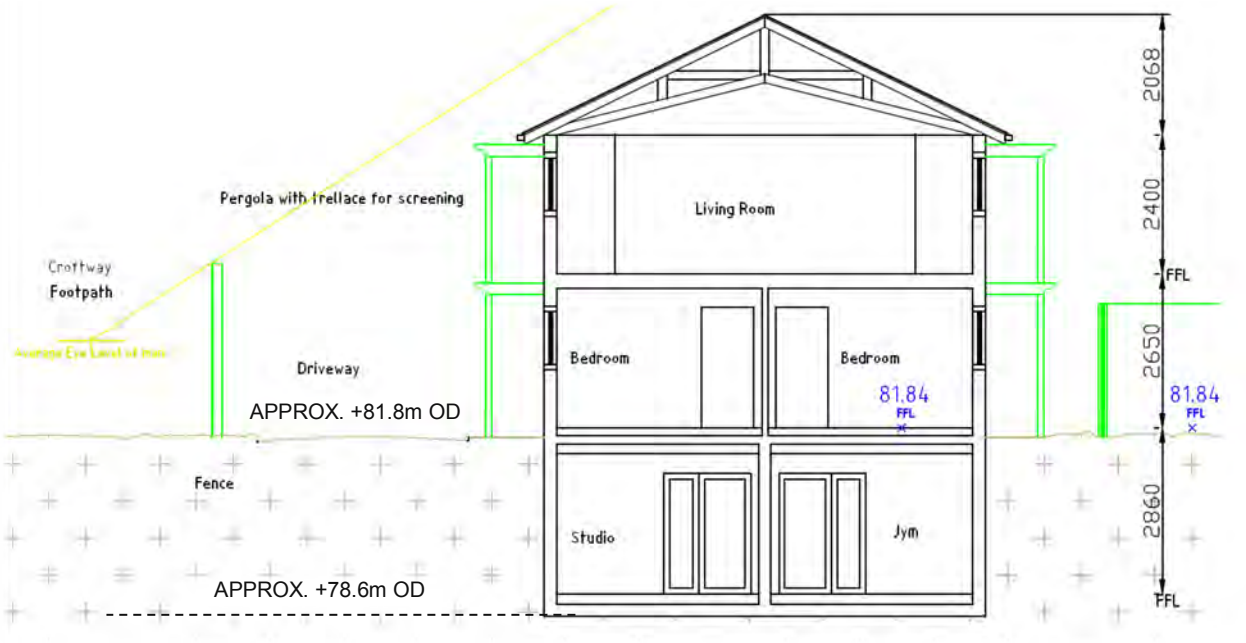
3. PROPOSED DEVELOPMENT

It is proposed to demolish the existing swimming pool building and replace this with a new, two storey building with a basement, on approximately the same footprint, but extending southwards approximately 4m beyond the building to create a glazed basement greenhouse area.

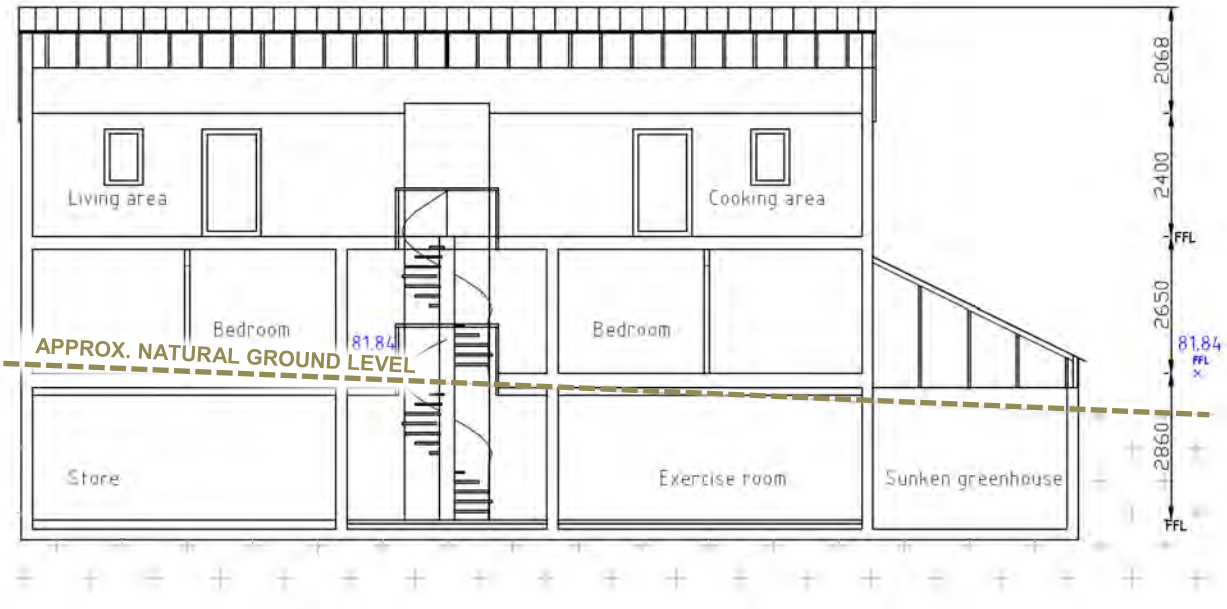
The new basement is to be set approximately 3m below the ground floor, which is to be in line with that of the existing building, at approximately +81.8m OD.



PROPOSED GROUND FLOOR



PROPOSED SECTION A - A



PROPOSED SECTION B - B

4. SURFACE WATER MANAGEMENT

4.1 SURFACE WATER MANAGEMENT (SWM) OBJECTIVES

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.

4.2 SUDS DISCHARGE HIERACHY

The surface water runoff should be managed using the following techniques in order of priority:

SuDS Drainage Hierarchy	Suitable for the site? (Y/N)	Comment
Store rainwater for later use	Y	Rainwater harvesting is proposed for the new building.
Use infiltration techniques	N	Infiltration will not be feasible due to the impermeability of the shallow geology.
Attenuate rainwater in ponds or open water features for gradual release	N	There is insufficient development space for open water features.
Attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Attenuation can be provided in an underground attenuation storage tank to the south of the new building.
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	The site currently discharges to a combined sewer running below Finchley Road.

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

4.3 FEASIBLE 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	A rainwater harvesting system is proposed to be incorporated at the development.
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.	N	The roof is to be a lightweight pitched structure and not suitable for a green roof
Blue roofs	Roof design intended to store water providing attenuation storage.	N	The lightweight roof structure will not allow incorporation of a blue roof.
Infiltration systems	Infiltration can contribute to reducing runoff rates and volumes while supporting base flow and groundwater recharge processes.	N	Infiltration will not be feasible due to the impermeability of the underlying London Clay.
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.	Y	Filter drains can potentially be introduced at the sides of the new building, discharging into the planned attenuation tank at the southern end.
Swales	Swales are shallow, flat bottomed, vegetated open channels designed to convey, treat, and attenuate surface water runoff.	N	There is insufficient space.

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.
Trees	Trees aid surface water management through transpiration, inception, infiltration and phytoremediation.	N	The site boundary planting will be preserved but there is insufficient space for additional planting.
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	Pervious pavement may be feasible to be introduced on site, albeit with an underlying cellular storage, due to the impermeability of the geology.
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	An underground attenuation storage tank can be constructed to the south of the proposed building.
Detention basins	Attenuation storage in the form of dry landscaped depressions.	N	There is insufficient space.
Ponds and wetlands	Permanent water filled ponds or wetlands that provide attenuation storage or treatment of surface water runoff.	N	There is insufficient space.

4.4 BENEFITS

The types of benefits that may be achieved by utilising SuDS are categorised by the design objectives outlined in the following section.

4.4.1 WATER QUANTITY

The proposed development is expected to reduce the proportion of impermeable cover on site by removing the existing sheds and promoting expansion of the existing permeable gravel cover or dedicated permeable paving.

The development additionally offers some scope to reduce the runoff rates and volumes through the inclusion of SuDS elements with the aim will be to reduce the runoff to the equivalent greenfield discharge rates.

4.4.2 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.

There is no scope to provide physical, biological or chemical treatment of the rainwater being delivered to the local drainage system.

4.4.3 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

The existing soft landscaping and planting present on the sides of the swimming pool pavilion will be retained and an amenity area will be presented to the south of the new building.

4.4.4 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.

A net biodiversity benefit will be provided through the introduction new planting with a variety of plant species in the area previously occupied by sheds.

4.4.5 SUDS CONSTRUCTION

The runoff from the roof of the main structure will be directed to discharge into a rainwater harvesting tank, with surplus water flowing into an adjacent large below ground attenuation storage tank .

The attenuated runoff will discharge via flow controls to the combined sewer.

4.4.6 RAINWATER HARVESTING

The rainwater harvesting tank will be designed to provide sufficient storage to account for the needs of water re-use by the occupants of the building. The rainwater harvesting tank itself will not provide

attenuation storage and any surplus water will be directed into the adjacent attenuation storage tank.

In line with the projected demand for 4 people presented on Figure 11.8 of CIRIA C753, it is expected that approx. 2.7m^3 (2,700l) of harvested rainwater storage should be provided to ensure enough water to satisfy re-use demands over 18 days of storage.

4.5 MAINTENANCE

There is a need to introduce clear arrangements in place for on-going maintenance over the lifetime of the development.

The SuDS features will require some regular inspection and maintenance to clear any accumulated sediment or debris which may reduce the storage capacity as well as to ensure the inlets and outlets are clear and do not impede the water flow.

Maintenance activities can be broadly categorised as:

- Regular maintenance consists of inspections and basic tasks carried out to a frequent schedule (more frequently than once per year) including inspections, silt, litter or debris removal and vegetation management.
  Regular maintenance inspections are to be undertaken at least monthly (and following significant storm events) during the first year of operation of all SuDS components to ensure the system is functioning as designed.

- Occasional maintenance comprises tasks that are required on a much less frequent and predictable basis (e.g. annual checks)

- Remedial maintenance describes the intermittent tasks that may be required to rectify faults associated with the system such as inlet and outlet repairs, infiltration surface rehabilitation, replacement of blocked filter materials/fabrics, system rehabilitation immediately following a pollution event.

The maintenance activities envisaged for the proposed SuDS components at the site are detailed in the table below:

Suds Component	Maintenance Category	Maintenance activity details and proposed frequency
Cellular attenuation storage	Regular (monthly)	• Inspect all components for proper operation • Inspect and check outfall flow controls. • Inspect drain inlets and outlets to ensure proper flow • Check the outer areas near the tanks for any signs of leaks
	Occasional / Remedial following inspection (at least annually)	• Brush and clear sand joints and inlets of any vegetation or moss. • Remove sediment from silt traps • Access the inspection chambers and check for internal obstructions or debris to be removed

Rainwater harvesting system	Regular (monthly)	• Inspect all components for proper operation • Inspect and check overflow controls. • Inspection of the pumps and filters leading from the tank to re-use areas within the building • Inspect drain inlets and outlets to ensure proper flow • Check the outer areas near the tanks for any signs of leaks
	Annual inspection	• Cleaning or replacement of any filters as needed • Remove sediment from silt traps • Inspection for and potential repair of any damage to the pump
Pervious pavement	Regular (monthly)	• Inspect for evidence of poor operation or build-up of sediment and litter– if required, take remedial action. • Remove litter and/or debris
	Annual inspection	• Brush and clear sand joints of any vegetation or moss • Vacuum, sweep and/or brush the pervious surfacing

5. INITIAL DESIGN CONSIDERATIONS

While the detailed drainage design will not be accomplished until the detailed development design is itself progressed, it is necessary to demonstrate at this concept stage that there exists suitable capacity on site to accommodate sufficient SuDS features to meet the flood risk reduction objective of reducing run-off to 50% of the existing rates.

5.1 SCHEDULE OF AREAS

The following areas have been estimated:

SCHEDULE OF ESTIMATED DRAINAGE AREAS						
	EXISTING			PROPOSED		
		Cv	%		Cv	%
SHEDS & HARD SURFACING	90 m^2	0.9	70.4 % IMP	0 m^2	0.9	66.7 % IMP
BUILDING	130 m^2	0.9		180 m^2	0.9	
GRAVEL OR PERMEABLE PAVING	35 m^2	0.6	29.7 % PER	75 m^2	0.6	33.3 % PER
SOFT LANDSCAPING	15 m^2	0.4		15 m^2	0.4	
TOTAL DEVELOPMENT AREA	270 m^2		100%	270 m^2		100%

Based on the above, 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.

5.2 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:	0.12 l/sec
1 in 1	0.10 l/sec
1 in 30	0.27 l/sec
1 in 100	0.38 l/sec
1 in 200	0.45 l/sec

5.3 EXISTING RUNOFF RATE

The development area of the site comprises a total area of approximately 270m^2 of which 81.5% is currently impermeably surfaced. No existing SuDS features are present at the site.

The existing peak storm runoff for the 1% (1 in 100 year) annual probability 15 min rainfall event on the site is estimated to be 7.8 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 99.3 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 17.9m^3.

5.4 PROPOSED DISCHARGE RATE

The proposed development will result in a small reduction in the amount of impermeable surfacing.

Calculations have been carried out in order to estimate the required attenuation storage to be provided on site in order to limit the peak storm run-off for the 1% (1 in 100) annual probability rainfall event plus 40% allowance for future climate change to the equivalent greenfield discharge rates. The calculations have been provided in the Appendix to this assessment.

These indicate that some 16.3 m^3 of attenuation storage will be required.

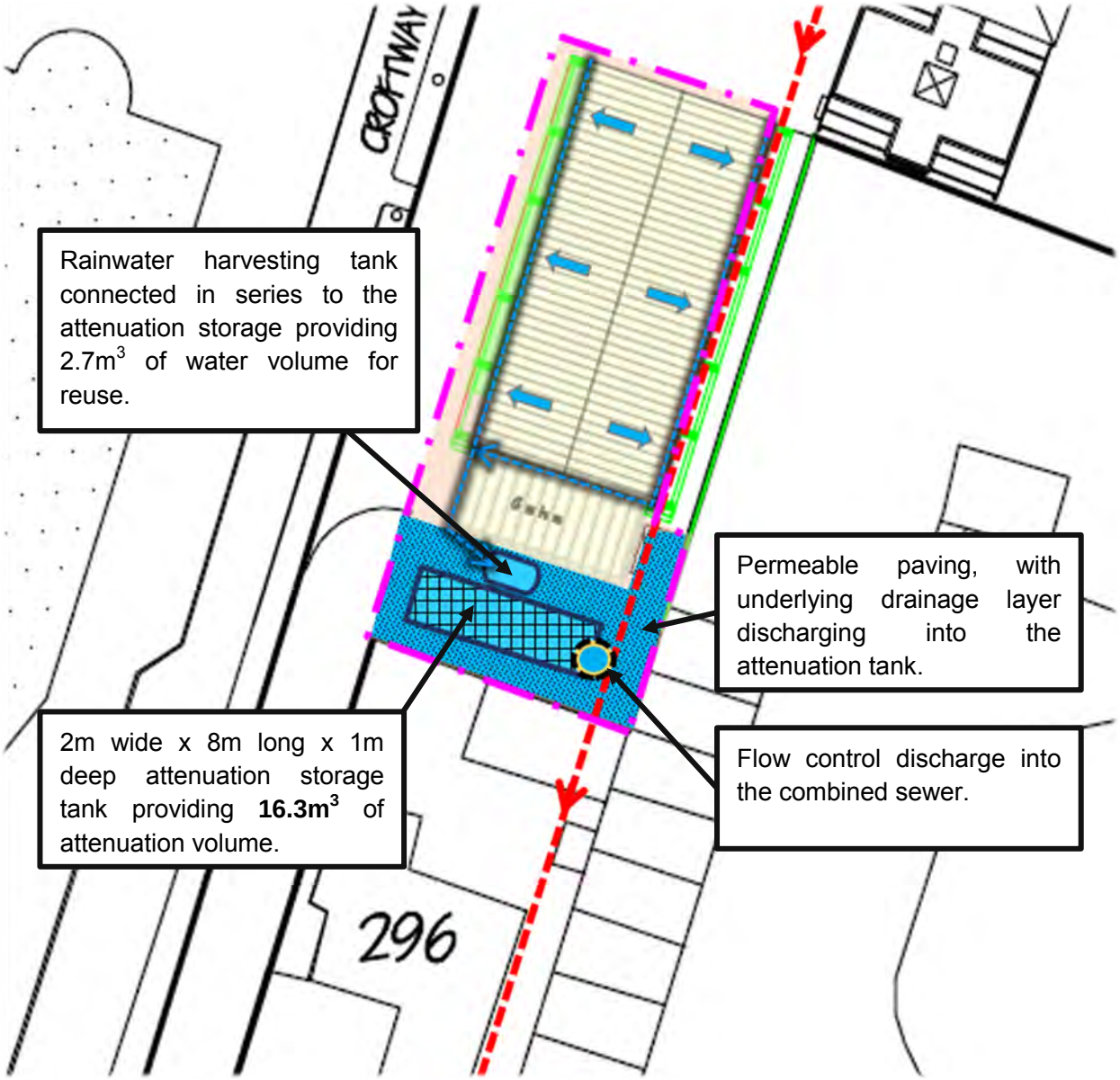
6. PROPOSED SUDS ELEMENTS

Calculations indicate that approximately **16.3m^3** of attenuation storage will be required for the 1 in 100 year rainfall event, in consideration of up to 40% climate change allowance, in order to reduce the proposed discharge rate to the equivalent greenfield discharge rates for the development area.

It is envisaged that this could potentially be provided as follows:

- Attenuation storage tank **16.3 m^3**

A schematic plan of potential SuDS features on site is presented overleaf.



SUDS KEY :

BUILDING

FLOW CONTROL

GRAVEL SURFACING

SOFT LANDSCAPING

SW DRAINAGE PIPE

ATTENUATION TANK

PERMEABLE PAVING UNDERLAIN BY SHALLOW DRAINAGE LAYER

7. CONCLUSION

This assessment has demonstrated that the householder has sought opportunities to reduce the overall level of flood risk through the appropriate application of sustainable drainage systems.

This assessment demonstrates that there is scope for the incorporation of SuDS features that can restrain run-off, in accordance with Policy CC3 of the Camden Local Plan, to mitigate the risk of future surface water flooding, taking into account potential climate change.

APPENDIX

SUSTAINABLE DRAINAGE PRO-FORMA

PRELIMINARY DRAINAGE CALCULATIONS

1. Project & Site Details	Project / Site Name (including sub-catchment / stage / phase where appropriate)	Croftway House Pavilion
	Address & post code	298 Finchley Road NW3 7AG
	OS Grid ref. (Easting, Northing)	E 525400
		N 185675
	LPA reference (if applicable)	
	Brief description of proposed work	Replacement of the existing detached swimming pool structure with a two-storey residential building with a basement.
	Total site Area for Attenuation	270 m^2
	Total existing impervious area	220 m^2
	Total proposed impervious area	180 m^2
	Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
	Existing drainage connection type and location	Combined sewer below Finchley Road
	Designer Name	S R L B
	Designer Position	Principal
	Designer Company	LBHGEO

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	N/A
Bedrock geology classification	London Clay Formation
Site infiltration rate	N/A m/s
Depth to groundwater level	N/A
Is infiltration feasible?	No

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	Y	Y
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	N	N
7 discharge rainwater to the combined sewer.	Y	Y

2c. Proposed Discharge Details

Proposed discharge location	Combined sewer beneath Finchley Road
Has the owner/regulator of the discharge location been consulted?	No

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	0.12			
1 in 1	0.10	2.50	3.84	0.10
1 in 30	0.27	6.10	8.20	0.27
1 in 100	0.38	7.82	10.76	0.38
1 in 100 + CC			16.34	0.38
Climate change allowance used		40%		
3b. Principal Method of Flow Control		Orifice		

3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	(180)		0
Infiltration systems	0		0
Green roofs	0	0	0
Blue roofs	0	0	0
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	270		16.3
Total	270	0	16.3

4. Supporting Information	4a. Discharge & Drainage Strategy	*Page/section of drainage report*
	Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Appendix to the SuDS Assessment
	Drainage hierarchy (2b)	Section 4.2
	Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Section 4.45
	Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Appendix to the SuDS Assessment
	Proposed SuDS measures & specifications (3b)	Section 5 & Section 6
	4b. Other Supporting Details	*Page/section of drainage report*
	Detailed Development Layout	Section 6
	Detailed drainage design drawings, including exceedance flow routes	Section 6
	Detailed landscaping plans	Section 6
	Maintenance strategy	Section 4.6
	Demonstration of how the proposed SuDS measures improve:	SuDS Assessment report
	a) water quality of the runoff?	Section 4.4
	b) biodiversity?	
	c) amenity?	

GREENFIELD RUNOFF

Catchment Area: 270sqm 0.027ha

PO Code : NW3 7AG

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

SAAR: 650mm *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: 221.34 *Calculated from SPR and SAAR*

Greenfield Peak Run-off Rate:		*Growth curve Factor*
1 in 1	*188.1 l/sec*	*0.85*
1 in 30	*509.1 l/sec*	*2.30*
1 in 100	*706.1 l/sec*	*3.19*
1 in 200	*827.8 l/sec*	*3.74*

Qbar: 0.12 l/sec

Greenfield Peak Run-off Rate:

1 in 1	**0.10 l/sec**
1 in 30	**0.27 l/sec**
1 in 100	**0.38 l/sec**
1 in 200	**0.45 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: Croftway Pavilion	
GREENFIELD RUNOFF	
Sheet 1 of 7	
Project Reference: LBH4678	
Date: 11/10/2022	Rev: 1
Client: rclb	

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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: 102 LEE HIGH ROAD	
RAINFALL PEAK INTENSITY	
Sheet 2 of 7	
Project Reference: LBH4669	
Date: 11/10/2022	Rev: 1
Client: rclb	

LBHGEO

GREENFIELD PEAK RUNOFF

Hydrological Region: 6 *From Wallingford on-line tool* **Qbar:** **0.12 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	0.10 l/sec	0.11 l/sec	0.12 l/sec	0.14 l/sec	0.15 l/sec	0.19 l/sec	0.24 l/sec	0.29 l/sec	0.38 l/sec
10min	10min	0.17hr	0.10 l/sec	0.11 l/sec	0.12 l/sec	0.14 l/sec	0.15 l/sec	0.19 l/sec	0.24 l/sec	0.29 l/sec	0.38 l/sec
15min	15min	0.25hr	0.10 l/sec	0.11 l/sec	0.12 l/sec	0.14 l/sec	0.15 l/sec	0.19 l/sec	0.24 l/sec	0.29 l/sec	0.38 l/sec
30min	30min	0.50hr	0.10 l/sec	0.11 l/sec	0.12 l/sec	0.14 l/sec	0.15 l/sec	0.19 l/sec	0.24 l/sec	0.29 l/sec	0.38 l/sec
1hr	60min	1.00hr	0.10 l/sec	0.11 l/sec	0.12 l/sec	0.14 l/sec	0.15 l/sec	0.19 l/sec	0.24 l/sec	0.29 l/sec	0.38 l/sec
2hr	120min	2.00hr	0.10 l/sec	0.11 l/sec	0.12 l/sec	0.14 l/sec	0.15 l/sec	0.19 l/sec	0.24 l/sec	0.29 l/sec	0.38 l/sec
4hr	240min	4.00hr	0.10 l/sec	0.11 l/sec	0.12 l/sec	0.14 l/sec	0.15 l/sec	0.19 l/sec	0.24 l/sec	0.29 l/sec	0.38 l/sec
6hr	360min	6.00hr	0.10 l/sec	0.11 l/sec	0.12 l/sec	0.14 l/sec	0.15 l/sec	0.19 l/sec	0.24 l/sec	0.29 l/sec	0.38 l/sec
10hr	600min	10.00hr	0.10 l/sec	0.11 l/sec	0.12 l/sec	0.14 l/sec	0.15 l/sec	0.19 l/sec	0.24 l/sec	0.29 l/sec	0.38 l/sec
24hr	1440min	24.00hr	0.10 l/sec	0.11 l/sec	0.12 l/sec	0.14 l/sec	0.15 l/sec	0.19 l/sec	0.24 l/sec	0.29 l/sec	0.38 l/sec
48hr	2880min	48.00hr	0.10 l/sec	0.11 l/sec	0.12 l/sec	0.14 l/sec	0.15 l/sec	0.19 l/sec	0.24 l/sec	0.29 l/sec	0.38 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	0.1 m3	0.1 m3	0.1 m3	0.1 m3
10min	10min	0.17hr	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.2 m3	0.2 m3
15min	15min	0.25hr	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.2 m3	0.2 m3	0.3 m3	0.3 m3
30min	30min	0.50hr	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.3 m3	0.3 m3	0.4 m3	0.5 m3	0.7 m3
1hr	60min	1.00hr	0.4 m3	0.4 m3	0.4 m3	0.5 m3	0.6 m3	0.7 m3	0.8 m3	1.0 m3	1.4 m3
2hr	120min	2.00hr	0.7 m3	0.8 m3	0.9 m3	1.0 m3	1.1 m3	1.4 m3	1.7 m3	2.1 m3	2.7 m3
4hr	240min	4.00hr	1.5 m3	1.5 m3	1.7 m3	2.0 m3	2.2 m3	2.8 m3	3.4 m3	4.1 m3	5.5 m3
6hr	360min	6.00hr	2.2 m3	2.3 m3	2.6 m3	3.0 m3	3.3 m3	4.2 m3	5.1 m3	6.2 m3	8.2 m3
10hr	600min	10.00hr	3.7 m3	3.8 m3	4.4 m3	4.9 m3	5.5 m3	7.0 m3	8.5 m3	10.3 m3	13.7 m3
24hr	1440min	24.00hr	8.8 m3	9.1 m3	10.5 m3	11.8 m3	13.2 m3	16.7 m3	20.3 m3	24.8 m3	32.9 m3
48hr	2880min	48.00hr	17.6 m3	18.2 m3	20.9 m3	23.7 m3	26.4 m3	33.5 m3	40.6 m3	49.6 m3	65.9 m3

SuDs CALCULATIONS

Project: Croftway Pavilion

GREENFIELD PEAK RUNOFF

Sheet 3 of 7

Project Reference: LBH4678

Date: 11/10/2022 Rev: 1

Client: rclb

LBHGEO

EXISTING PEAK RUNOFF

C_V:	0.81	*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	4.5 l/sec	5.7 l/sec	6.4 l/sec	7.0 l/sec	7.3 l/sec	8.6 l/sec	9.8 l/sec	10.3 l/sec	12.9 l/sec
10min	10min	0.17hr	3.2 l/sec	4.1 l/sec	4.7 l/sec	5.0 l/sec	5.4 l/sec	6.3 l/sec	7.3 l/sec	7.7 l/sec	9.9 l/sec
15min	15min	0.25hr	2.5 l/sec	3.2 l/sec	3.7 l/sec	4.0 l/sec	4.2 l/sec	5.0 l/sec	5.8 l/sec	6.1 l/sec	7.8 l/sec
30min	30min	0.50hr	1.5 l/sec	1.9 l/sec	2.1 l/sec	2.3 l/sec	2.4 l/sec	2.9 l/sec	3.4 l/sec	3.6 l/sec	4.7 l/sec
1hr	60min	1.00hr	1.0 l/sec	1.3 l/sec	1.4 l/sec	1.5 l/sec	1.6 l/sec	2.0 l/sec	2.3 l/sec	2.4 l/sec	3.2 l/sec
2hr	120min	2.00hr	0.6 l/sec	0.8 l/sec	0.9 l/sec	0.9 l/sec	1.0 l/sec	1.2 l/sec	1.4 l/sec	1.5 l/sec	1.9 l/sec
4hr	240min	4.00hr	0.4 l/sec	0.5 l/sec	0.5 l/sec	0.5 l/sec	0.6 l/sec	0.7 l/sec	0.8 l/sec	0.8 l/sec	1.1 l/sec
6hr	360min	6.00hr	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
10hr	600min	10.00hr	0.2 l/sec	0.2 l/sec	0.2 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
24hr	1440min	24.00hr	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.3 l/sec
48hr	2880min	48.00hr	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	0.1 l/sec	0.1 l/sec

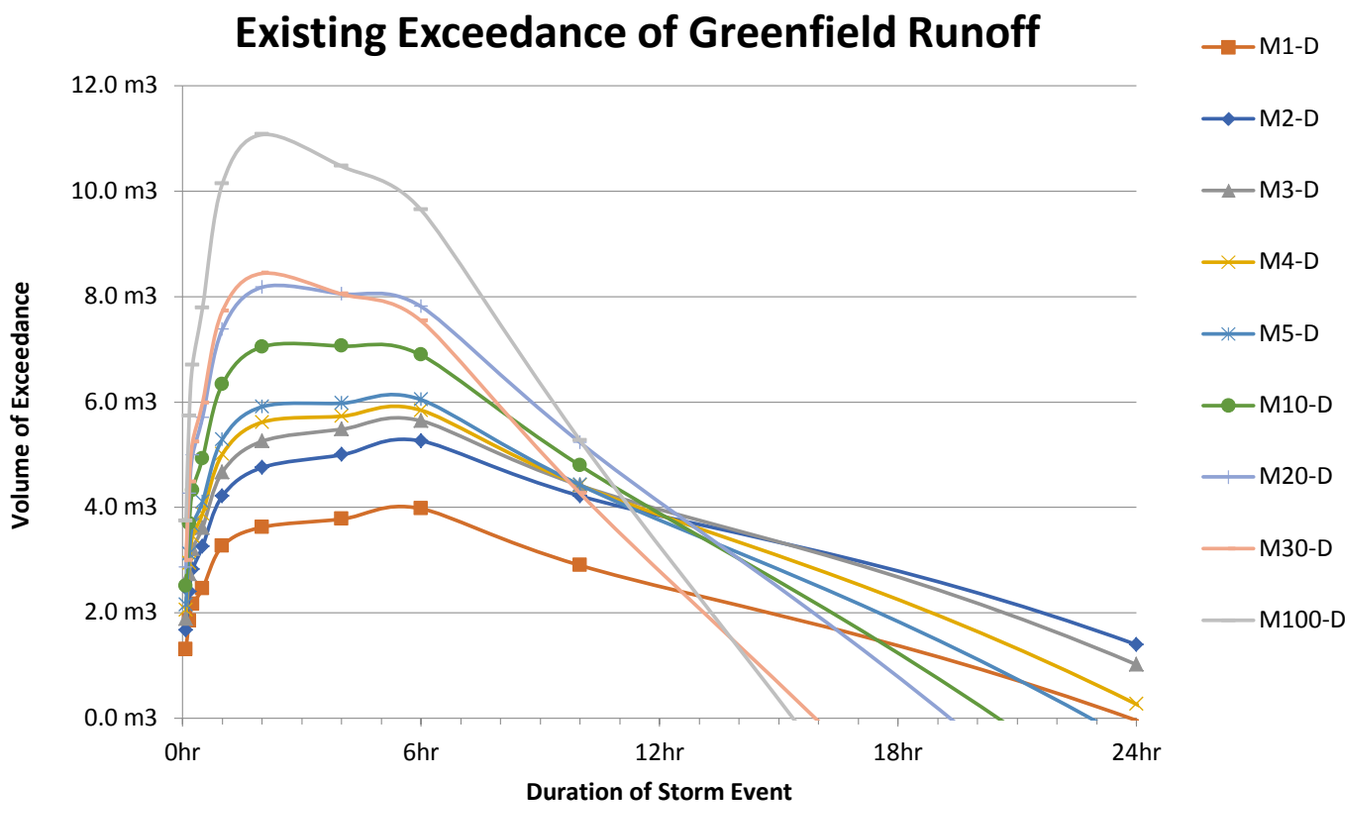
Run-Off Volume

D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	1.3 m3	1.7 m3	1.9 m3	2.1 m3	2.2 m3	2.6 m3	2.9 m3	3.1 m3	3.9 m3
10min	10min	0.17hr	1.9 m3	2.5 m3	2.8 m3	3.0 m3	3.2 m3	3.8 m3	4.4 m3	4.6 m3	6.0 m3
15min	15min	0.25hr	2.2 m3	2.9 m3	3.3 m3	3.6 m3	3.8 m3	4.5 m3	5.2 m3	5.5 m3	7.0 m3
30min	30min	0.50hr	2.6 m3	3.4 m3	3.8 m3	4.1 m3	4.4 m3	5.3 m3	6.1 m3	6.5 m3	8.5 m3
1hr	60min	1.00hr	3.6 m3	4.6 m3	5.1 m3	5.5 m3	5.8 m3	7.0 m3	8.2 m3	8.8 m3	11.5 m3
2hr	120min	2.00hr	4.4 m3	5.5 m3	6.1 m3	6.6 m3	7.0 m3	8.4 m3	9.9 m3	10.5 m3	13.8 m3
4hr	240min	4.00hr	5.2 m3	6.5 m3	7.2 m3	7.7 m3	8.2 m3	9.8 m3	11.4 m3	12.2 m3	16.0 m3
6hr	360min	6.00hr	6.2 m3	7.5 m3	8.3 m3	8.8 m3	9.3 m3	11.1 m3	12.9 m3	13.7 m3	17.9 m3
10hr	600min	10.00hr	6.6 m3	8.0 m3	8.8 m3	9.4 m3	9.9 m3	11.8 m3	13.7 m3	14.6 m3	19.0 m3
24hr	1440min	24.00hr	8.7 m3	10.5 m3	11.5 m3	12.1 m3	12.7 m3	14.9 m3	17.2 m3	18.3 m3	23.6 m3
48hr	2880min	48.00hr	10.2 m3	12.1 m3	13.2 m3	13.9 m3	14.5 m3	16.6 m3	19.0 m3	20.1 m3	25.7 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	1.3 m3	1.7 m3	1.9 m3	2.0 m3	2.2 m3	2.5 m3	2.9 m3	3.0 m3	3.7 m3
10min	10min	0.17hr	1.8 m3	2.4 m3	2.7 m3	2.9 m3	3.1 m3	3.7 m3	4.3 m3	4.5 m3	5.7 m3
15min	15min	0.25hr	2.2 m3	2.8 m3	3.2 m3	3.5 m3	3.7 m3	4.3 m3	5.0 m3	5.2 m3	6.7 m3
30min	30min	0.50hr	2.5 m3	3.3 m3	3.6 m3	3.9 m3	4.1 m3	4.9 m3	5.7 m3	6.0 m3	7.8 m3
1hr	60min	1.00hr	3.3 m3	4.2 m3	4.7 m3	5.0 m3	5.3 m3	6.3 m3	7.4 m3	7.7 m3	10.1 m3
2hr	120min	2.00hr	3.6 m3	4.8 m3	5.3 m3	5.6 m3	5.9 m3	7.0 m3	8.2 m3	8.4 m3	11.1 m3
4hr	240min	4.00hr	3.8 m3	5.0 m3	5.5 m3	5.7 m3	6.0 m3	7.1 m3	8.1 m3	8.0 m3	10.5 m3
6hr	360min	6.00hr	4.0 m3	5.3 m3	5.6 m3	5.8 m3	6.0 m3	6.9 m3	7.8 m3	7.5 m3	9.6 m3
10hr	600min	10.00hr	2.9 m3	4.2 m3	4.4 m3	4.4 m3	4.4 m3	4.8 m3	5.2 m3	4.3 m3	5.3 m3
24hr	1440min	24.00hr	0.0 m3	1.4 m3	1.0 m3	0.3 m3	-0.5 m3	-1.9 m3	-3.1 m3	-6.5 m3	-9.4 m3
48hr	2880min	48.00hr	-7.3 m3	-6.1 m3	-7.7 m3	-9.8 m3	-12.0 m3	-16.9 m3	-21.6 m3	-29.4 m3	-40.2 m3

			C_V:
Catchment Area:	270sqm	100%	
Permeable:	50sqm	19%	0.40
Impermeable:	220sqm	81%	0.90
			0.81



SuDs CALCULATIONS

Project: Croftway Pavilion

EXISTING PEAK RUNOFF

Sheet 4 of 7

Project Reference: LBH4678

Date: 11/10/2022 | Rev: 1

Client: rclb

LBHGEO

POST- DEVELOPMENT PEAK RUNOFF

C_V: 0.79 *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	4.4 l/sec	5.5 l/sec	6.2 l/sec	6.8 l/sec	7.2 l/sec	8.4 l/sec	9.5 l/sec	10.0 l/sec	12.6 l/sec
10min	10min	0.17hr	3.1 l/sec	4.0 l/sec	4.6 l/sec	4.9 l/sec	5.2 l/sec	6.2 l/sec	7.2 l/sec	7.6 l/sec	9.7 l/sec
15min	15min	0.25hr	2.4 l/sec	3.2 l/sec	3.6 l/sec	3.9 l/sec	4.1 l/sec	4.9 l/sec	5.6 l/sec	6.0 l/sec	7.6 l/sec
30min	30min	0.50hr	1.4 l/sec	1.9 l/sec	2.1 l/sec	2.2 l/sec	2.4 l/sec	2.9 l/sec	3.3 l/sec	3.5 l/sec	4.6 l/sec
1hr	60min	1.00hr	1.0 l/sec	1.2 l/sec	1.4 l/sec	1.5 l/sec	1.6 l/sec	1.9 l/sec	2.2 l/sec	2.4 l/sec	3.1 l/sec
2hr	120min	2.00hr	0.6 l/sec	0.7 l/sec	0.8 l/sec	0.9 l/sec	1.0 l/sec	1.1 l/sec	1.3 l/sec	1.4 l/sec	1.9 l/sec
4hr	240min	4.00hr	0.4 l/sec	0.4 l/sec	0.5 l/sec	0.5 l/sec	0.6 l/sec	0.7 l/sec	0.8 l/sec	0.8 l/sec	1.1 l/sec
6hr	360min	6.00hr	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
10hr	600min	10.00hr	0.2 l/sec	0.2 l/sec	0.2 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
24hr	1440min	24.00hr	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec	0.3 l/sec
48hr	2880min	48.00hr	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	0.1 l/sec	0.1 l/sec

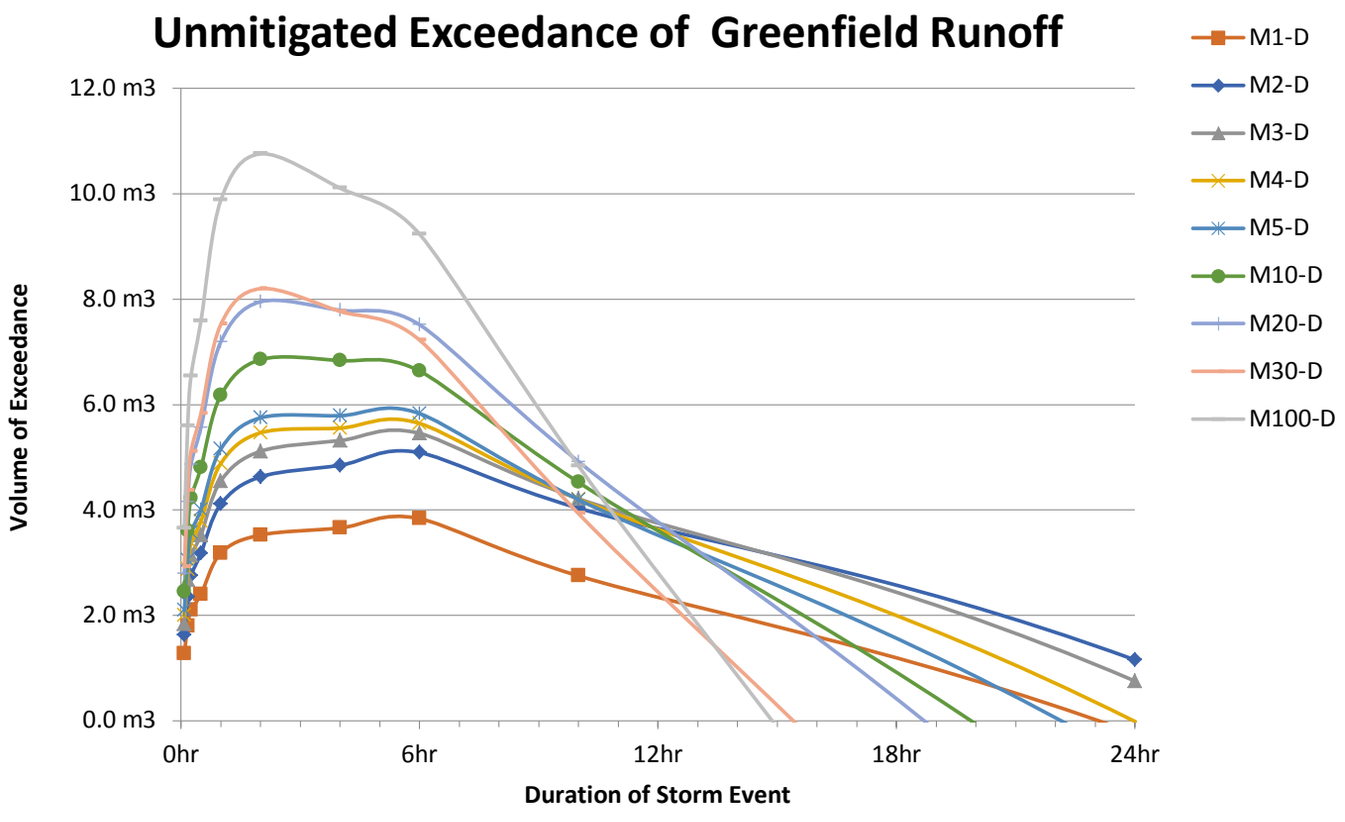
Run-Off Volume

D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	1.3 m3	1.7 m3	1.9 m3	2.0 m3	2.1 m3	2.5 m3	2.9 m3	3.0 m3	3.8 m3
10min	10min	0.17hr	1.9 m3	2.4 m3	2.7 m3	3.0 m3	3.1 m3	3.7 m3	4.3 m3	4.5 m3	5.8 m3
15min	15min	0.25hr	2.2 m3	2.8 m3	3.2 m3	3.5 m3	3.7 m3	4.4 m3	5.1 m3	5.4 m3	6.9 m3
30min	30min	0.50hr	2.6 m3	3.4 m3	3.7 m3	4.0 m3	4.3 m3	5.2 m3	6.0 m3	6.3 m3	8.3 m3
1hr	60min	1.00hr	3.5 m3	4.5 m3	5.0 m3	5.4 m3	5.7 m3	6.9 m3	8.0 m3	8.6 m3	11.3 m3
2hr	120min	2.00hr	4.3 m3	5.4 m3	6.0 m3	6.5 m3	6.9 m3	8.2 m3	9.6 m3	10.3 m3	13.5 m3
4hr	240min	4.00hr	5.1 m3	6.4 m3	7.1 m3	7.5 m3	8.0 m3	9.6 m3	11.2 m3	11.9 m3	15.6 m3
6hr	360min	6.00hr	6.0 m3	7.4 m3	8.1 m3	8.6 m3	9.1 m3	10.8 m3	12.6 m3	13.4 m3	17.5 m3
10hr	600min	10.00hr	6.4 m3	7.8 m3	8.6 m3	9.1 m3	9.7 m3	11.5 m3	13.4 m3	14.3 m3	18.6 m3
24hr	1440min	24.00hr	8.5 m3	10.2 m3	11.2 m3	11.8 m3	12.4 m3	14.5 m3	16.8 m3	17.9 m3	23.0 m3
48hr	2880min	48.00hr	10.0 m3	11.8 m3	12.9 m3	13.6 m3	14.1 m3	16.2 m3	18.6 m3	19.7 m3	25.1 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	1.3 m3	1.6 m3	1.8 m3	2.0 m3	2.1 m3	2.4 m3	2.8 m3	2.9 m3	3.7 m3
10min	10min	0.17hr	1.8 m3	2.3 m3	2.7 m3	2.9 m3	3.0 m3	3.6 m3	4.2 m3	4.4 m3	5.6 m3
15min	15min	0.25hr	2.1 m3	2.8 m3	3.1 m3	3.4 m3	3.6 m3	4.2 m3	4.9 m3	5.1 m3	6.5 m3
30min	30min	0.50hr	2.4 m3	3.2 m3	3.5 m3	3.8 m3	4.0 m3	4.8 m3	5.6 m3	5.8 m3	7.6 m3
1hr	60min	1.00hr	3.2 m3	4.1 m3	4.6 m3	4.9 m3	5.2 m3	6.2 m3	7.2 m3	7.5 m3	9.9 m3
2hr	120min	2.00hr	3.5 m3	4.6 m3	5.1 m3	5.5 m3	5.7 m3	6.9 m3	8.0 m3	8.2 m3	10.8 m3
4hr	240min	4.00hr	3.7 m3	4.8 m3	5.3 m3	5.6 m3	5.8 m3	6.8 m3	7.8 m3	7.8 m3	10.1 m3
6hr	360min	6.00hr	3.8 m3	5.1 m3	5.5 m3	5.6 m3	5.8 m3	6.6 m3	7.5 m3	7.2 m3	9.2 m3
10hr	600min	10.00hr	2.7 m3	4.0 m3	4.2 m3	4.2 m3	4.2 m3	4.5 m3	4.9 m3	3.9 m3	4.8 m3
24hr	1440min	24.00hr	-0.2 m3	1.2 m3	0.8 m3	0.0 m3	-0.8 m3	-2.2 m3	-3.5 m3	-6.9 m3	-9.9 m3
48hr	2880min	48.00hr	-7.6 m3	-6.4 m3	-8.0 m3	-10.1 m3	-12.3 m3	-17.2 m3	-22.1 m3	-29.9 m3	-40.8 m3
			3.8 m3							**8.2 m3**	**10.8 m3**

			C_V:
Catchment Area:	270sqm	100%	
Permeable Garden	15sqm	6%	0.40
Gravel & perm. paving	75sqm	28%	0.60
Impermeable:	180sqm	67%	0.90
			0.79



SuDs CALCULATIONS

Project: Croftway Pavilion

POST-DEV. PEAK RUNOFF

Sheet 5 of 7

Project Reference: LBH4678

Date: 11/10/2022 Rev: 1

Client: rclb

LBHGEO

POST- DEVELOPMENT PEAK RUNOFF + CC

C_V: 0.79 *Volumetric Run-Off Coefficient* Climate Change Allowance: 40%

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	6.1 l/sec	7.8 l/sec	8.7 l/sec	9.5 l/sec	10.0 l/sec	11.7 l/sec	13.4 l/sec	14.0 l/sec	17.6 l/sec
10min	10min	0.17hr	4.3 l/sec	5.6 l/sec	6.4 l/sec	6.9 l/sec	7.3 l/sec	8.7 l/sec	10.0 l/sec	10.6 l/sec	13.6 l/sec
15min	15min	0.25hr	3.4 l/sec	4.4 l/sec	5.0 l/sec	5.4 l/sec	5.8 l/sec	6.8 l/sec	7.9 l/sec	8.3 l/sec	10.7 l/sec
30min	30min	0.50hr	2.0 l/sec	2.6 l/sec	2.9 l/sec	3.1 l/sec	3.3 l/sec	4.0 l/sec	4.7 l/sec	4.9 l/sec	6.4 l/sec
1hr	60min	1.00hr	1.4 l/sec	1.7 l/sec	1.9 l/sec	2.1 l/sec	2.2 l/sec	2.7 l/sec	3.1 l/sec	3.3 l/sec	4.4 l/sec
2hr	120min	2.00hr	0.8 l/sec	1.0 l/sec	1.2 l/sec	1.3 l/sec	1.3 l/sec	1.6 l/sec	1.9 l/sec	2.0 l/sec	2.6 l/sec
4hr	240min	4.00hr	0.5 l/sec	0.6 l/sec	0.7 l/sec	0.7 l/sec	0.8 l/sec	0.9 l/sec	1.1 l/sec	1.2 l/sec	1.5 l/sec
6hr	360min	6.00hr	0.4 l/sec	0.5 l/sec	0.5 l/sec	0.6 l/sec	0.6 l/sec	0.7 l/sec	0.8 l/sec	0.9 l/sec	1.1 l/sec
10hr	600min	10.00hr	0.2 l/sec	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	0.7 l/sec
24hr	1440min	24.00hr	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
48hr	2880min	48.00hr	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.1 l/sec	0.2 l/sec	0.2 l/sec	0.2 l/sec

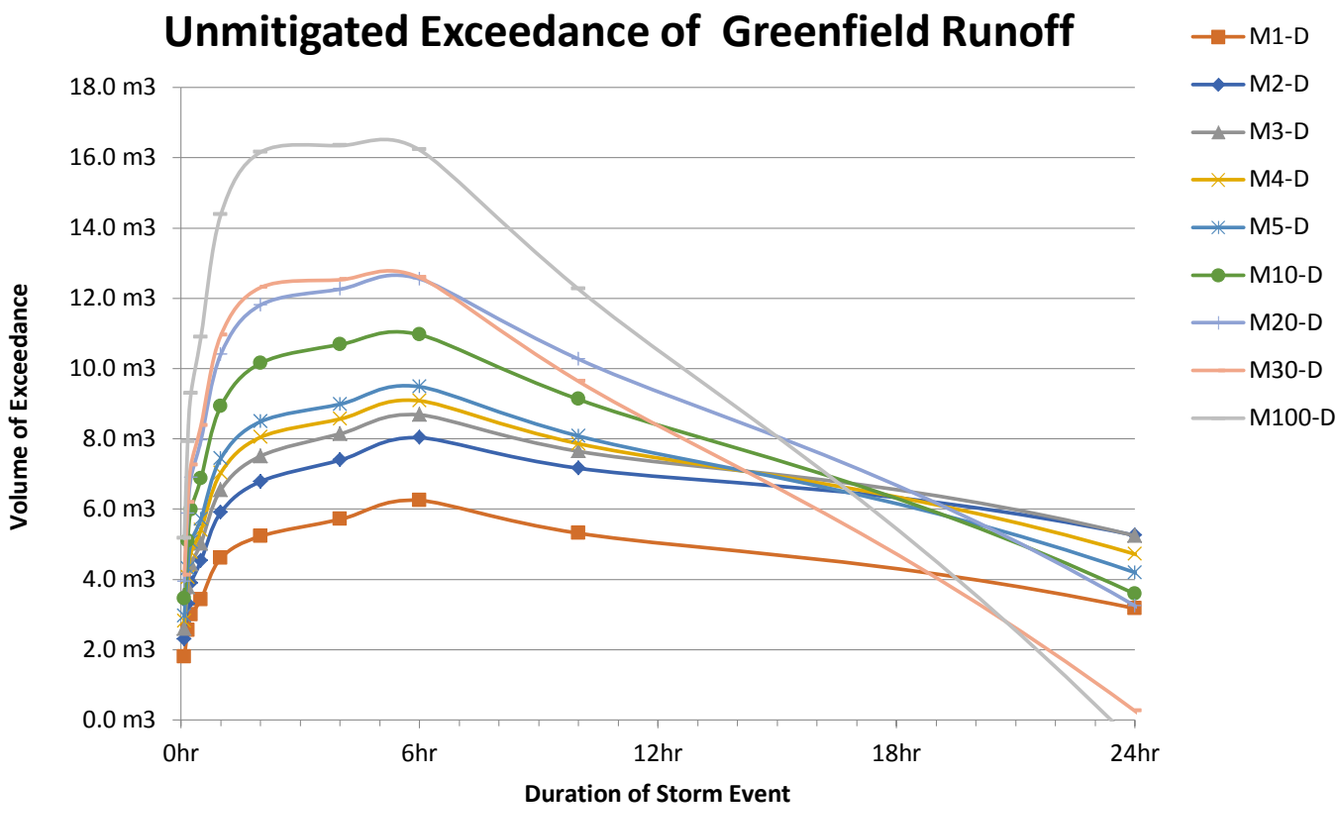
Run-Off Volume

D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	1.8 m3	2.3 m3	2.6 m3	2.9 m3	3.0 m3	3.5 m3	4.0 m3	4.2 m3	5.3 m3
10min	10min	0.17hr	2.6 m3	3.4 m3	3.8 m3	4.1 m3	4.4 m3	5.2 m3	6.0 m3	6.4 m3	8.2 m3
15min	15min	0.25hr	3.1 m3	4.0 m3	4.5 m3	4.9 m3	5.2 m3	6.2 m3	7.1 m3	7.5 m3	9.6 m3
30min	30min	0.50hr	3.6 m3	4.7 m3	5.2 m3	5.6 m3	6.0 m3	7.2 m3	8.4 m3	8.9 m3	11.6 m3
1hr	60min	1.00hr	5.0 m3	6.3 m3	7.0 m3	7.5 m3	8.0 m3	9.6 m3	11.3 m3	12.0 m3	15.8 m3
2hr	120min	2.00hr	6.0 m3	7.5 m3	8.4 m3	9.0 m3	9.6 m3	11.5 m3	13.5 m3	14.4 m3	18.9 m3
4hr	240min	4.00hr	7.2 m3	8.9 m3	9.9 m3	10.5 m3	11.2 m3	13.5 m3	15.6 m3	16.7 m3	21.8 m3
6hr	360min	6.00hr	8.4 m3	10.3 m3	11.3 m3	12.0 m3	12.8 m3	15.1 m3	17.6 m3	18.8 m3	24.5 m3
10hr	600min	10.00hr	9.0 m3	10.9 m3	12.0 m3	12.8 m3	13.6 m3	16.1 m3	18.7 m3	20.0 m3	26.0 m3
24hr	1440min	24.00hr	11.9 m3	14.3 m3	15.7 m3	16.6 m3	17.4 m3	20.3 m3	23.6 m3	25.0 m3	32.3 m3
48hr	2880min	48.00hr	14.0 m3	16.5 m3	18.0 m3	19.0 m3	19.8 m3	22.7 m3	26.0 m3	27.5 m3	35.1 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	1.8 m3	2.3 m3	2.6 m3	2.8 m3	3.0 m3	3.5 m3	3.9 m3	4.1 m3	5.2 m3
10min	10min	0.17hr	2.5 m3	3.3 m3	3.8 m3	4.1 m3	4.3 m3	5.1 m3	5.9 m3	6.2 m3	7.9 m3
15min	15min	0.25hr	3.0 m3	3.9 m3	4.4 m3	4.8 m3	5.1 m3	6.0 m3	6.9 m3	7.3 m3	9.3 m3
30min	30min	0.50hr	3.4 m3	4.5 m3	5.0 m3	5.4 m3	5.7 m3	6.9 m3	8.0 m3	8.4 m3	10.9 m3
1hr	60min	1.00hr	4.6 m3	5.9 m3	6.5 m3	7.0 m3	7.4 m3	8.9 m3	10.4 m3	10.9 m3	14.4 m3
2hr	120min	2.00hr	5.2 m3	6.8 m3	7.5 m3	8.0 m3	8.5 m3	10.2 m3	11.8 m3	12.3 m3	16.2 m3
4hr	240min	4.00hr	5.7 m3	7.4 m3	8.1 m3	8.6 m3	9.0 m3	10.7 m3	12.3 m3	12.5 m3	16.3 m3
6hr	360min	6.00hr	6.2 m3	8.0 m3	8.7 m3	9.1 m3	9.5 m3	11.0 m3	12.6 m3	12.6 m3	16.2 m3
10hr	600min	10.00hr	5.3 m3	7.2 m3	7.6 m3	7.9 m3	8.1 m3	9.1 m3	10.3 m3	9.6 m3	12.3 m3
24hr	1440min	24.00hr	3.2 m3	5.3 m3	5.2 m3	4.7 m3	4.2 m3	3.6 m3	3.2 m3	0.3 m3	-0.7 m3
48hr	2880min	48.00hr	-3.6 m3	-1.7 m3	-2.9 m3	-4.7 m3	-6.7 m3	-10.8 m3	-14.6 m3	-22.0 m3	-30.8 m3
											16.3 m3

			C_V:
Catchment Area:	270sqm	100%	
Permeable Garden	15sqm	6%	0.40
Gravel & perm. paving	75sqm	28%	0.60
Impermeable:	180sqm	67%	0.90
			0.79



SuDs CALCULATIONS

Project: Croftway Pavilion

POST-DEV. PEAK RUNOFF+CC

Sheet 6 of 7

Project Reference: LBH4678

Date: 11/10/2022 Rev: 1

Client: rclb

LBHGEO

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

Proposed Discharge Rates: Greenfield x 1

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	1.8 m3	2.3 m3	2.6 m3	2.9 m3	3.0 m3	3.5 m3	4.0 m3	4.2 m3	5.3 m3
10min	10min	0.17hr	2.6 m3	3.4 m3	3.8 m3	4.1 m3	4.4 m3	5.2 m3	6.0 m3	6.4 m3	8.2 m3
15min	15min	0.25hr	3.1 m3	4.0 m3	4.5 m3	4.9 m3	5.2 m3	6.2 m3	7.1 m3	7.5 m3	9.6 m3
30min	30min	0.50hr	3.6 m3	4.7 m3	5.2 m3	5.6 m3	6.0 m3	7.2 m3	8.4 m3	8.9 m3	11.6 m3
1hr	60min	1.00hr	5.0 m3	6.3 m3	7.0 m3	7.5 m3	8.0 m3	9.6 m3	11.3 m3	12.0 m3	15.8 m3
2hr	120min	2.00hr	6.0 m3	7.5 m3	8.4 m3	9.0 m3	9.6 m3	11.5 m3	13.5 m3	14.4 m3	18.9 m3
4hr	240min	4.00hr	7.2 m3	8.9 m3	9.9 m3	10.5 m3	11.2 m3	13.5 m3	15.6 m3	16.7 m3	21.8 m3
6hr	360min	6.00hr	8.4 m3	10.3 m3	11.3 m3	12.0 m3	12.8 m3	15.1 m3	17.6 m3	18.8 m3	24.5 m3
10hr	600min	10.00hr	9.0 m3	10.9 m3	12.0 m3	12.8 m3	13.6 m3	16.1 m3	18.7 m3	20.0 m3	26.0 m3
24hr	1440min	24.00hr	11.9 m3	14.3 m3	15.7 m3	16.6 m3	17.4 m3	20.3 m3	23.6 m3	25.0 m3	32.3 m3
48hr	2880min	48.00hr	14.0 m3	16.5 m3	18.0 m3	19.0 m3	19.8 m3	22.7 m3	26.0 m3	27.5 m3	35.1 m3

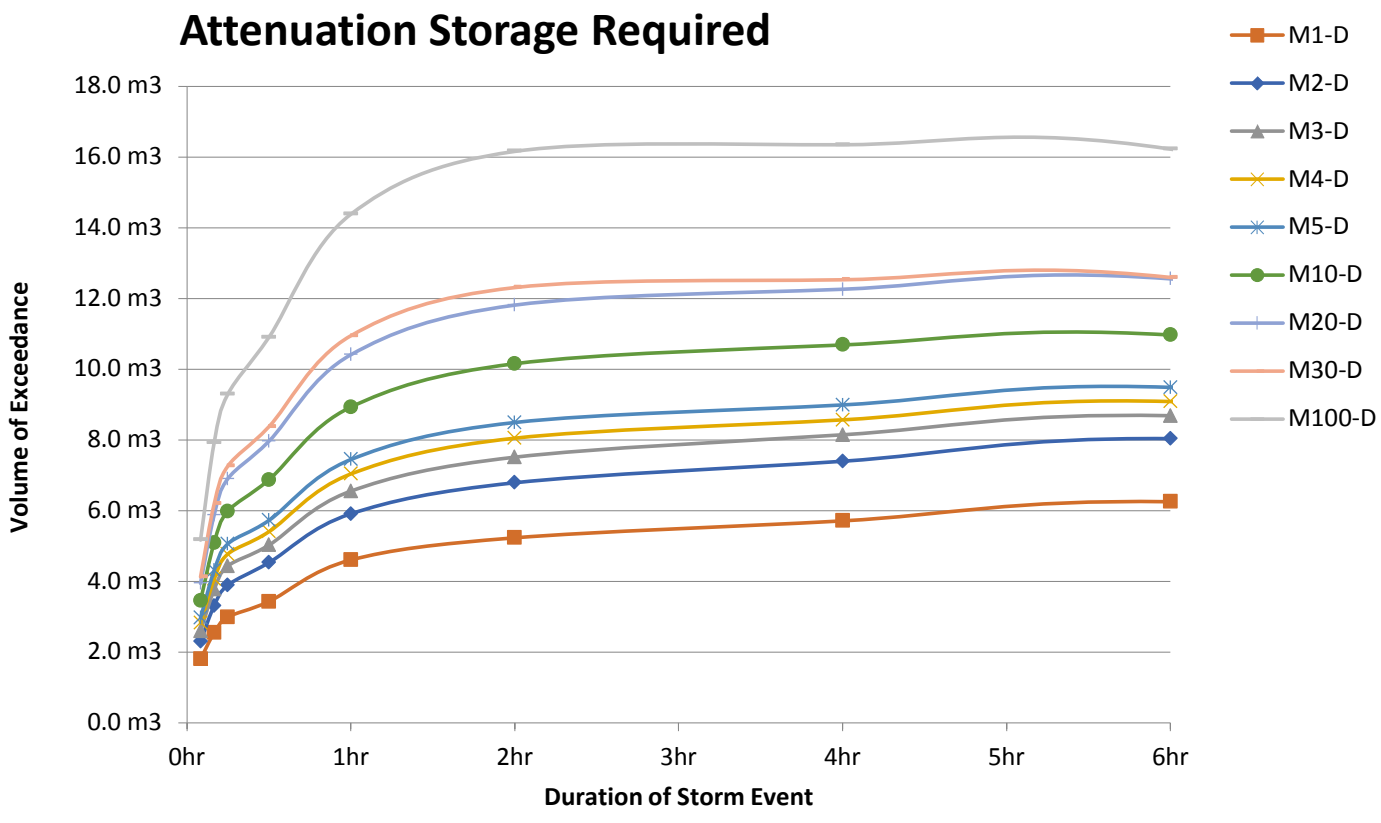
OUTFLOW

D Duration			M1-D	M2-D	M3-D	M4-D	M5-D	M10-D	M20-D	M30-D	M100-D
5min	5min	0.08hr	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.0 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3
10min	10min	0.17hr	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.2 m3	0.2 m3
15min	15min	0.25hr	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.1 m3	0.2 m3	0.2 m3	0.3 m3	0.3 m3
30min	30min	0.50hr	0.2 m3	0.2 m3	0.2 m3	0.2 m3	0.3 m3	0.3 m3	0.4 m3	0.5 m3	0.7 m3
1hr	60min	1.00hr	0.4 m3	0.4 m3	0.4 m3	0.5 m3	0.6 m3	0.7 m3	0.8 m3	1.0 m3	1.4 m3
2hr	120min	2.00hr	0.7 m3	0.8 m3	0.9 m3	1.0 m3	1.1 m3	1.4 m3	1.7 m3	2.1 m3	2.7 m3
4hr	240min	4.00hr	1.5 m3	1.5 m3	1.7 m3	2.0 m3	2.2 m3	2.8 m3	3.4 m3	4.1 m3	5.5 m3
6hr	360min	6.00hr	2.2 m3	2.3 m3	2.6 m3	3.0 m3	3.3 m3	4.2 m3	5.1 m3	6.2 m3	8.2 m3
10hr	600min	10.00hr	3.7 m3	3.8 m3	4.4 m3	4.9 m3	5.5 m3	7.0 m3	8.5 m3	10.3 m3	13.7 m3
24hr	1440min	24.00hr	8.8 m3	9.1 m3	10.5 m3	11.8 m3	13.2 m3	16.7 m3	20.3 m3	24.8 m3	32.9 m3
48hr	2880min	48.00hr	17.6 m3	18.2 m3	20.9 m3	23.7 m3	26.4 m3	33.5 m3	40.6 m3	49.6 m3	65.9 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	1.8 m3	2.3 m3	2.6 m3	2.8 m3	3.0 m3	3.5 m3	3.9 m3	4.1 m3	5.2 m3
10min	10min	0.17hr	2.5 m3	3.3 m3	3.8 m3	4.1 m3	4.3 m3	5.1 m3	5.9 m3	6.2 m3	7.9 m3
15min	15min	0.25hr	3.0 m3	3.9 m3	4.4 m3	4.8 m3	5.1 m3	6.0 m3	6.9 m3	7.3 m3	9.3 m3
30min	30min	0.50hr	3.4 m3	4.5 m3	5.0 m3	5.4 m3	5.7 m3	6.9 m3	8.0 m3	8.4 m3	10.9 m3
1hr	60min	1.00hr	4.6 m3	5.9 m3	6.5 m3	7.0 m3	7.4 m3	8.9 m3	10.4 m3	10.9 m3	14.4 m3
2hr	120min	2.00hr	5.2 m3	6.8 m3	7.5 m3	8.0 m3	8.5 m3	10.2 m3	11.8 m3	12.3 m3	16.2 m3
4hr	240min	4.00hr	5.7 m3	7.4 m3	8.1 m3	8.6 m3	9.0 m3	10.7 m3	12.3 m3	12.5 m3	16.3 m3
6hr	360min	6.00hr	6.2 m3	8.0 m3	8.7 m3	9.1 m3	9.5 m3	11.0 m3	12.6 m3	12.6 m3	16.2 m3
10hr	600min	10.00hr	5.3 m3	7.2 m3	7.6 m3	7.9 m3	8.1 m3	9.1 m3	10.3 m3	9.6 m3	12.3 m3
24hr	1440min	24.00hr	3.2 m3	5.3 m3	5.2 m3	4.7 m3	4.2 m3	3.6 m3	3.2 m3	0.3 m3	-0.7 m3
48hr	2880min	48.00hr	-3.6 m3	-1.7 m3	-2.9 m3	-4.7 m3	-6.7 m3	-10.8 m3	-14.6 m3	-22.0 m3	-30.8 m3

ATTENUATION STORAGE REQUIRED:			6.2 m3	8.0 m3	8.7 m3	9.1 m3	9.5 m3	11.0 m3	12.6 m3	12.6 m3	**16.3 m3**



SuDs CALCULATIONS

Project: Croftway Pavilion

STORAGE REQUIREMENTS

Sheet 7 of 7

Project Reference: LBH4678

Date: 11/10/2022 | Rev: 1

Client: rclb

LBHGEO