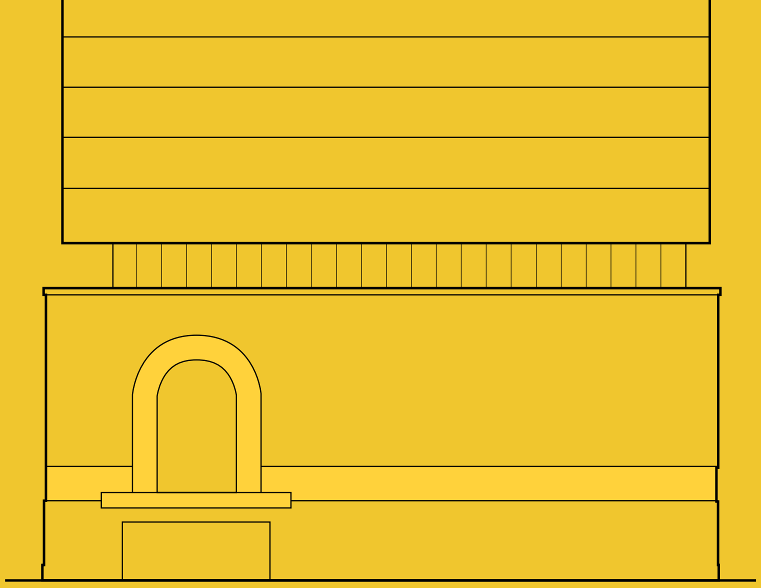

SAVILLE THEATRE

135 SHAFTESBURY AVENUE

SUSTAINABLE URBAN DRAINAGE

105465-PEF-ZZ-XX-DR-CD-000001-S2-P04_SDR

PELL FRISCHMANN

Report Ref.	105465-PEF-ZZ-XX-DR-CD-000001-S2-P04_SDR
File Path	https://pellf.sharepoint.com/sites/A1BuildingsStructuresandFire/Shared Documents/General/01 - WIP/Documents/Drainage/105465-PEF-ZZ-XX-DR-CD-000001-S2-P04_SDR.docx

Rev	Suit	Description	Date	Originator	Checker	Approver
S2	P01	Draft Issue	22/12/2023	H. McColl	D. Allum-Rooney	D. Allum-Rooney
S2	P02	Updated based on Comments	19/01/2024	T. Sturtridge	H. McColl	D. Allum-Rooney
S2	P03	Updated to Client/Team comments	29/01/2024	A Murray	H. McColl	D. Allum-Rooney
S2	P03	Updated to Client/Team comments	30/01/2024	A Murray	H. McColl	D. Allum-Rooney

Ref. reference. Rev revision. Suit suitability.

Prepared for

YC Saville Theatre Limited

2 Bentinck Street
London
W1U 2FA

Prepared by

Pell Frischmann

5th Floor
85 Strand
London
WC2R 0DW

Pell Frischmann

Contents

Figures

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Appendices

1 Introduction & Report Context

1.1 Context and Commission

1.1.1 Pell Frischmann has been commissioned to develop a Sustainable Drainage Strategy to support a planning application for the part demolition, restoration and refurbishment of the existing Grade II listed building, roof extension, and excavation of basement space, to provide a theatre at lower levels, with ancillary restaurant / bar space (Sui Generis) at ground floor level; and hotel (Class C1) at upper levels; provision of ancillary cycle parking, servicing and rooftop plant, and other associated works. This development shall hereafter be referred to as the Saville Theatre.

1.1.2 This Sustainable Drainage Report will (SDR) will set out the key principles of the proposed surface and foul water drainage strategies and demonstrate accordance with local and national guidance and best practice.

1.1.3 This includes justification of:

- Outfall locations;
- Discharge rates;
- Volume of attenuation required on site;
- Sustainable Drainage Systems to be included within proposals

1.2 Information Consulted

1.2.1 A review of relevant information has been consulted to develop an appropriate drainage strategy for the development as follows:

- National Planning Policy Framework (NPPF), December 2023;
- Planning Practice Guidance (PPG), August 2022;
- Non-statutory technical standards for sustainable drainage systems, March 2015;
- Sewerage Sector Guidance, October 2019;
- The SuDS Manual C753 Version 6, 2015;
- Camden & Greater London Authority Sustainable Drainage Proforma;
- Approved Document H, Building Regulations;
- Camden Borough Council Strategic Flood Risk Assessment, 2014,

1.2.2 Pell Frischmann have been commissioned by YC Saville Theatre Limited to develop a sustainable drainage strategy to support an outline application. This document should be read in tandem with Pell Frischmann Flood Risk Assessment reference *105465-PEF-ZZ-XX-RP-YE-000010*.

2 Existing Site

2.1 Site Location and Existing Use

2.1.1 The footprint of the site, and thus the site boundary is approximately 800m^2 in size and is currently in use as a cinema.

2.1.2 The site is bound to the southwest by Stacey Street, the south east by Shaftesbury Avenue, the Northeast by St Giles Passage, and the Northwest by New Compton Street.

2.1.3 The site location can be seen below in **Figure** 2-1.

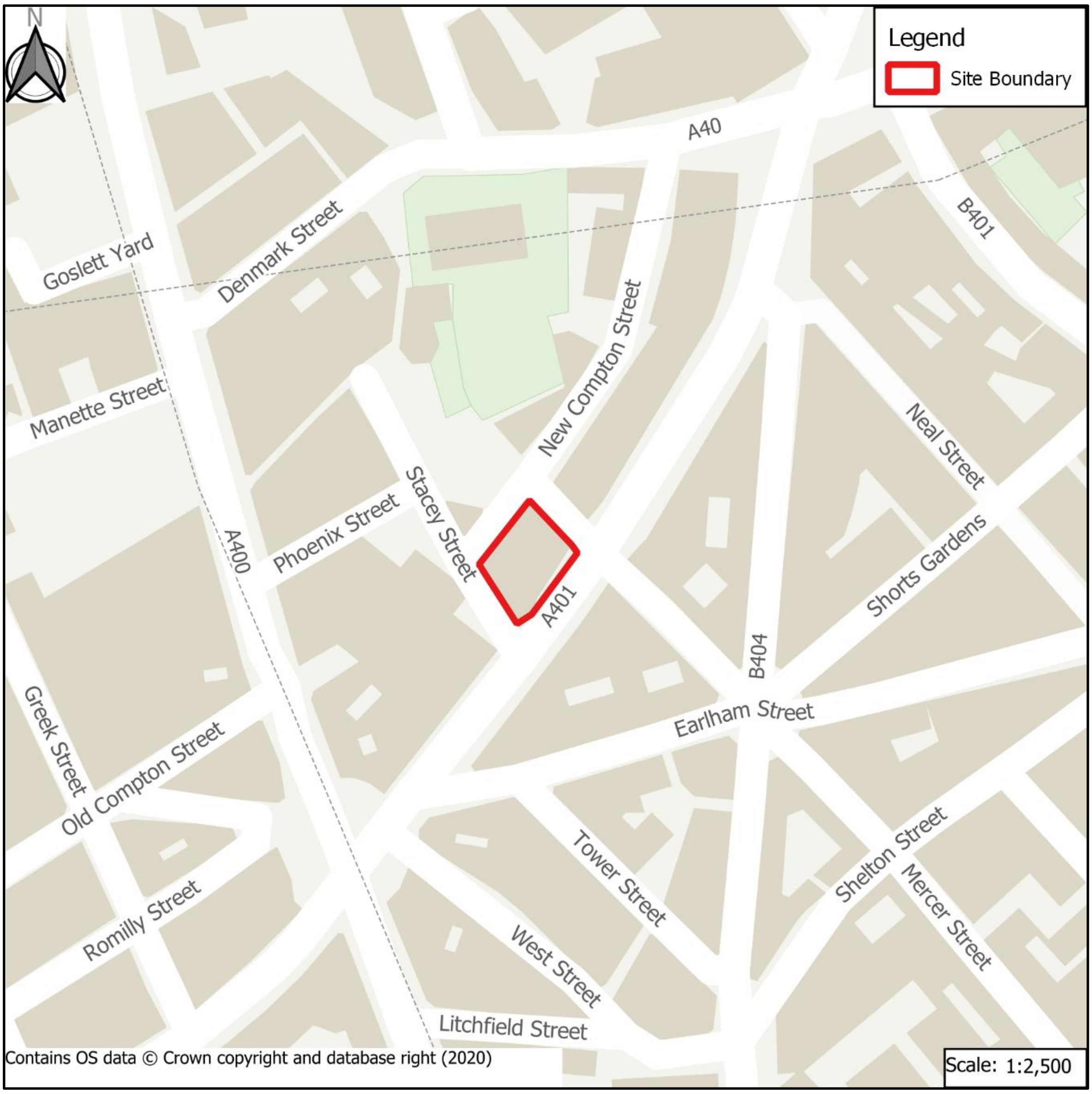

Figure 2-1 Site Location Plan

2.2 Topography

2.2.1 As previously mentioned, the application area is entirely occupied by an existing building. This building is accessed from various points at different levels (as can be seen from the stepped access at the front of the building.

2.2.2 The wider topography of the area shows levels fall from North to South.

2.2.3 The topography as discussed above can be seen for the site and surrounding area in **Figure** 2-2**.**

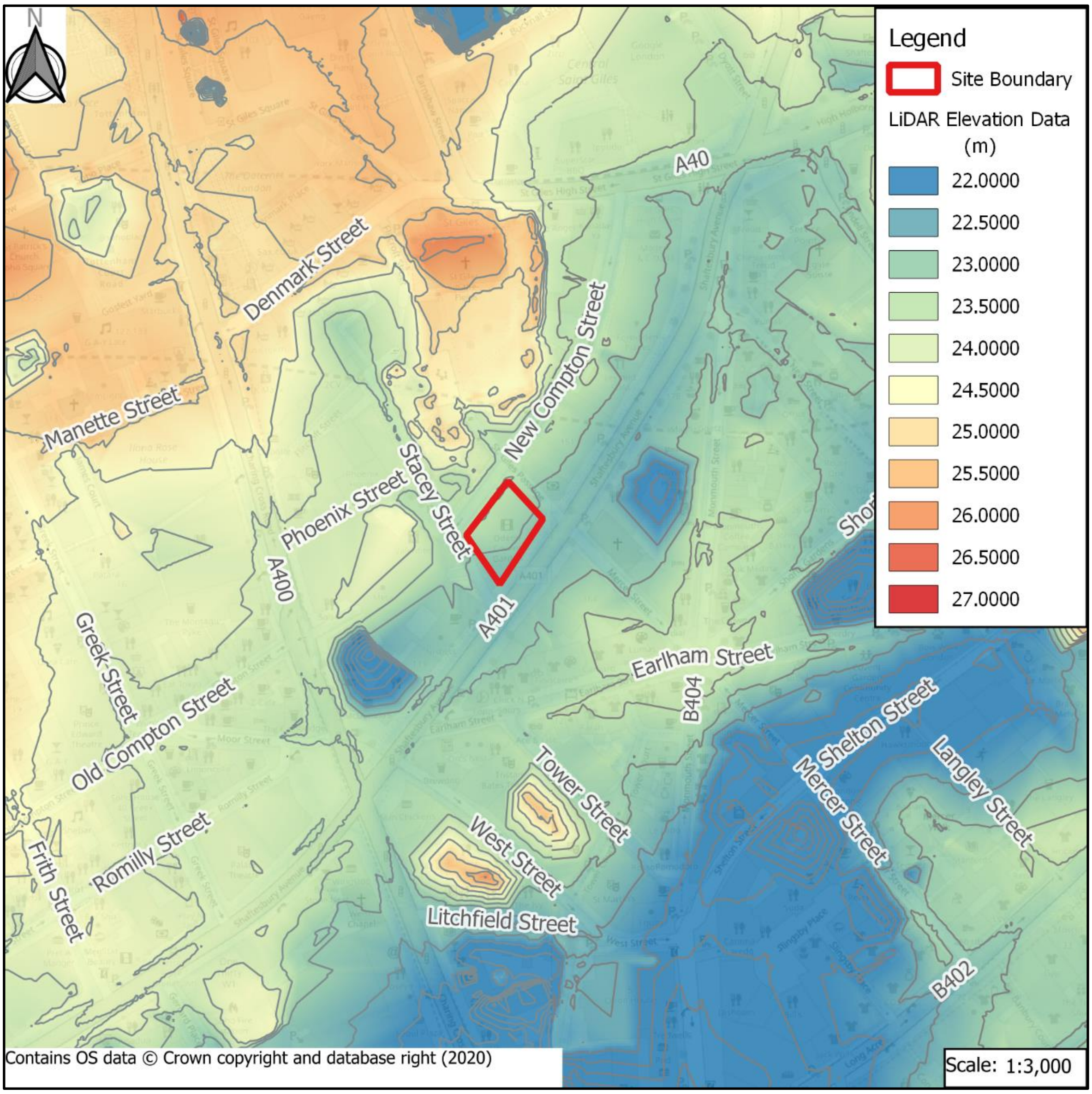

Figure 2-2 LiDAR Elevation Data

2.3 Existing Drainage Regime

Existing Surface Water Drainage Features

2.3.1 Given the existing use of the site as a cinema, it is assumed that the existing building is served by a traditional drainage system above ground – a system of gutters and down pipes convey roof runoff into the surrounding public sewerage network.

2.3.2 The interaction with the system serving the foul water generated by the building is unknown including the point at which the foul and surface water systems converge. This is discussed in **Section 4.**

2.3.3 An extract of the sewer records for the area can be seen below in **Figure** 2-3.

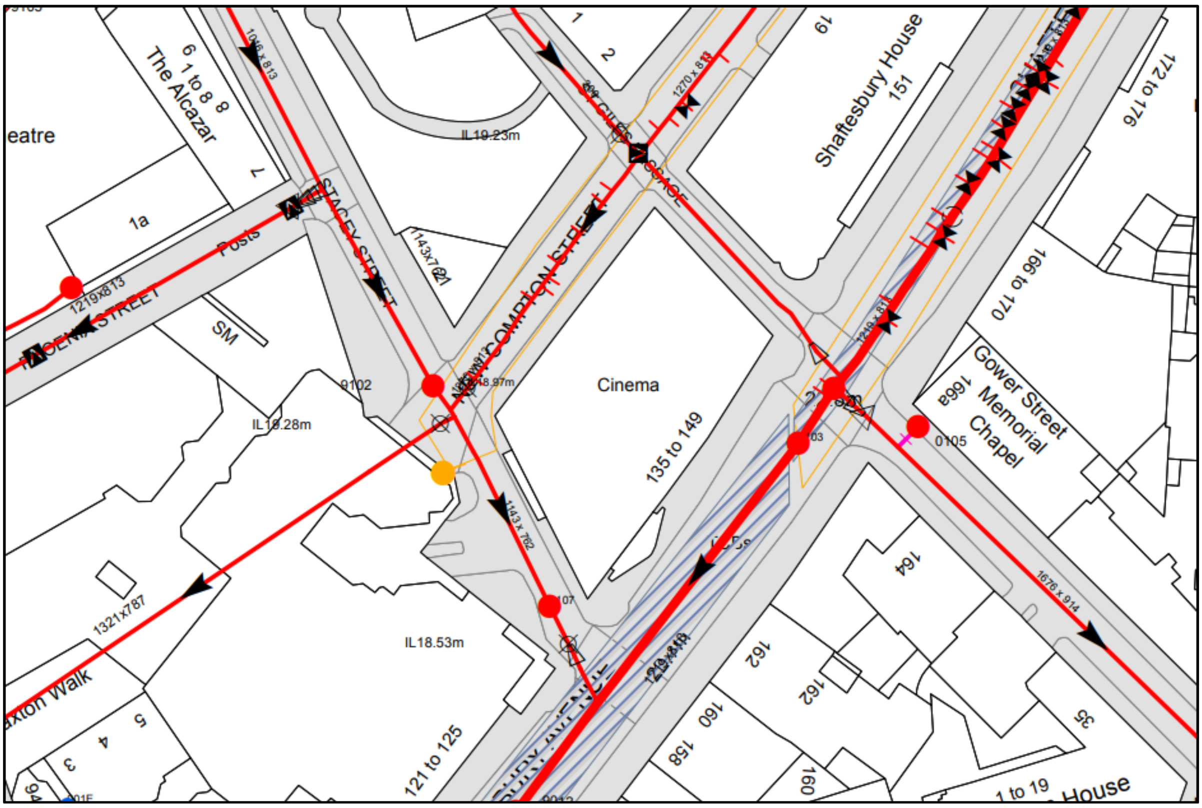

Figure 2-3 **Extract of Local Thames Water Sewer Network**

Existing runoff rate

2.3.4 The existing runoff rate has been assessed using a notional network model to calculate the peak runoff generated by a 15-minute event on the footprint of the building for several key return periods.

2.3.5 The calculated existing runoff rates pertaining to the site are summarised below in **Table** 2-1. The calculations for the below can be seen in **Appendix A.**

2.3.6 The 100 year + 40% Climate Change event peak runoff rate of 81.3l/s can be conveyed by a 300mm pipe laid at 1:100. It is likely that the existing building has multiple connections to the public sewer network.

Table 2-1 **Runoff Rates for existing site**

Return Period	Peak Runoff Rate (l/s)
2	16.8
30	43.9
100 (+40% Climate Change)	81.3

Existing Runoff Volume

2.3.7 In accordance with clause **S5** in *Non-statutory technical standards for sustainable drainage systems*;

S5 *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.*

2.3.8 The greenfield runoff volume for the 360-minute, 100-year return period event is calculated at 12.1m^3. The calculations for this event can be seen in **Appendix B**.

2.3.9 The runoff volume for the existing site for 360-minute, 100-year return period event calculated at 70m^3. Calculations for this can be seen in **Appendix C**.

2.3.10 Detailed designs should therefore adhere to the requirements outlined above.

Existing Surface Water Runoff Routing

2.3.11 The existing runoff generated by the site will be naturally directed toward local low points should the drainage infrastructure fail or exceed inherent capacity. This will result in general direction of flow towards the low point within the A401 to the east of the site in accordance with Surface Water Flood Routing. This can be seen in **Figure** 2-4 below.

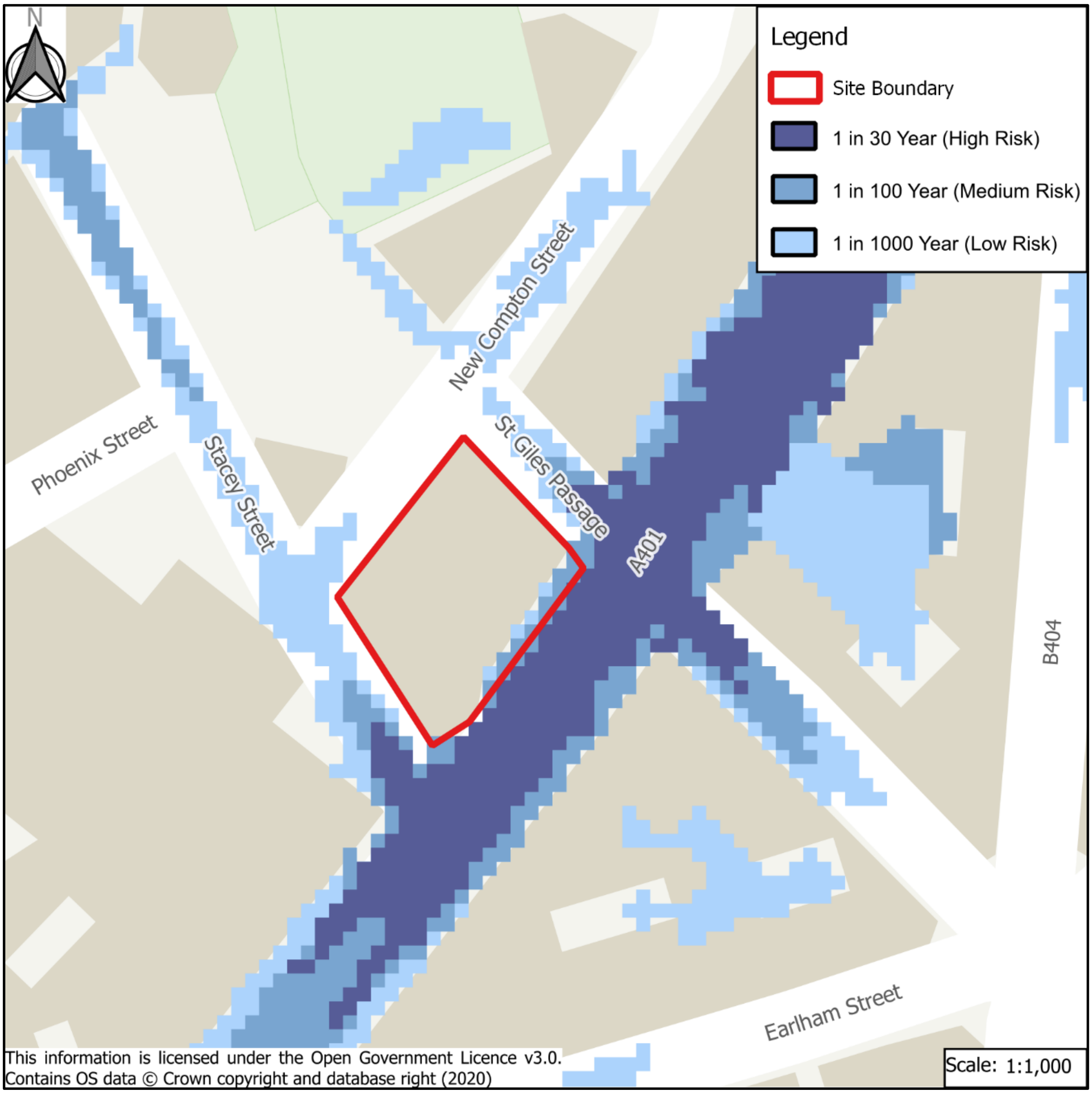

Figure 2-4 Risk of Flooding From Surface Water Mapping

2.4 Groundwater

2.4.1 As discussed in the aforementioned Pell Frischmann Flood Risk Assessment, the overall risk of groundwater flooding to the site is classified as low due to the Camden Borough Council's SFRA suggesting that it lies within an area of deep groundwater.

2.4.2 This suggests that changes in the level of water table within the site have little impact on the current drainage of the site in its undeveloped state.

3 Proposed Surface Water Drainage Strategy

3.1 Drainage Hierarchy Assessment

3.1.1 Prevailing local and national guidance (including being prescribed in Approved Document H of Building Regulations) dictates that surface water runoff from a development should be disposed of as high up the following hierarchy as reasonably practicable;

- Water reuse, where a need is identified;
- Into the ground (infiltration), where ground conditions permit;
- To a surface water body or watercourse;
- To a surface water sewer, highway drain, or another drainage system;
- To a combined water sewer;

3.1.2 The overall aim of the drainage hierarchy is to manage surface water runoff close to where it falls and to mimic pre-existing drainage regimes.

3.1.3 A development-wide water reuse system should be considered within proposals to make use of runoff generated by the footprint of the building. This could include storage and greywater repurposing for e.g. irrigation for planting, laundry services etc.

3.1.4 It is likely to be unfeasible to manage the entire runoff via reuse, ergo an offsite discharge will be required.

3.1.5 The site is underlain by London Clay Formations, thus the potential use of infiltration as a means of surface water disposal is to be unlikely.

3.1.6 The next preferrable method for surface water disposal is a local waterbody or watercourse. The site's location, being far removed from any open watercourses, precludes this from being a feasible option.

3.1.7 The next most appropriate receptor for surface water should therefore be the public sewerage network. **Figure** 2-3 shows that a comprehensive combined sewer network serves the local area and therefore represents a feasible method of surface water disposal.

3.1.8 As discussed earlier in this report, it is assumed that surface water currently drains from the site into the public sewerage network and therefore the methodology outlined in this section follows existing drainage patterns.

3.2 Outfall assessment

3.2.1 In order to prove the existing surface water sewer has capacity, Thames Water have been consulted on impacts of the development on the existing sewerage network. Results of this assessment for surface water are yet to be provided however it is considered that no impact will be made on the existing network due to the continuity of total impermeable area.

3.2.2 It is recommended that a survey is commissioned to better understand the existing drainage connections from the cinema into the public network.

3.3 Runoff rate control

3.3.1 It is proposed that, because there are no external areas or possible locations for attenuation within the development, that there is no opportunity for runoff rate control within the drainage network serving the site.

3.3.2 Due to the continuity of an overall impermeable area, it is considered that the peak runoff rate and volume will not be altered and thus there will be no overall impact on the public sewerage network.

3.4 Impermeable areas

3.4.1 The building footprint is approximately 800m^2, representing no net change to existing conditions.

3.5 Principles of Maintenance and Adoption

3.5.1 For the proposed surface water drainage system to function correctly, it will need to be appropriately maintained. It is proposed that the drainage features on site are to be maintained by the operators of the building in its developed state.

3.5.2 The maintenance schedule adhered to for the network must be comprehensive and detail the specific maintenance requirements for each element of the drainage system.

3.5.3 For pipes, manholes and gullies, both general best practice and specific manufacturer maintenance protocols should be followed.

4 Proposed Foul Water Drainage Strategy

4.1.1 In its undeveloped state, the site has existing connection into the Thames Water sewer network.

4.1.2 It is proposed to reuse existing connections into the sewer network for the proposed site.

4.1.3 The peak flow rate to be generated by the development will be confirmed with Thames Water pending a detailed schedule of accommodation and commercial use within the building.

5 Summary

5.1.1 This report and supporting appendices demonstrate that an appropriate surface water drainage strategy has been developed for the site based on sustainable drainage principles in line with the relevant local and national policy and standards.

5.1.2 This Sustainable Drainage Report is intended to support a detailed planning application and as such the level of detail included is commensurate with the nature of the proposals. **Table** 5-1 provides a summary of key information.

Table 5-1 Summary of Key Information

Topic	Existing Site		Proposed Development
Site Area (m^2)	800		800
Impermeable Area (m^2)	800		800
Number of Sub-Catchments	1		1
Outfall Location(s)	Combined Sewer Network		Combined Sewer Network
Peak Runoff Rate (l/s)	1 in 2-year	16.8	As Existing
	1 in 30-year	43.9	
	1 in 100-year	81.3	
Proposed Storage Volume (m^3)	-		-
SuDS Features	-		**Improvement on planning submission strategy to be developed**
Maintenance Responsibilities	Landowner		Landowner Operators

Appendix A Existing Runoff Rate Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 528304 184308 TQ 28304 84308
Data Type	Point
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	1.000
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	**Length (m)**	**Fall (m)**	**Slope (1:X)**	**I.Area (ha)**	**T.E. (mins)**	**Base Flow (l/s)**	**k (mm)**	**HYD SECT**	**DIA (mm)**	**Section Type**	**Auto Design**
S1.000	11.458	0.196	58.5	0.079	5.00	0.0	0.600	o	450	Pipe/Conduit	🔒
S1.001	2.578	0.006	407.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	🔓

Network Results Table

PN	**Rain (mm/hr)**	**T.C. (mins)**	**US/IL (m)**	**Σ I.Area (ha)**	**Σ Base Flow (l/s)**	**Foul (l/s)**	**Add Flow (l/s)**	**Vel (m/s)**	**Cap (l/s)**	**Flow (l/s)**
S1.000	50.00	5.07	0.000	0.079	0.0	0.0	0.0	2.66	423.5	14.3
S1.001	50.00	5.11	-0.196	0.079	0.0	0.0	0.0	1.00	159.3	14.3

Free Flowing Outfall Details for Storm

Outfall Pipe Number	**Outfall Name**	**C. Level (m)**	**I. Level (m)**	**Min I. Level (m)**	**D,L (mm)**	**W (mm)**
S1.001	S	48.000	-0.202	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 528304 184308 TQ 28304 84308
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	0.840
Storm Duration (mins)	30

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 528304 184308 TQ 28304 84308
Data Type	Point
Cv (Summer)	1.000
Cv (Winter)	1.000

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	360
Return Period(s) (years)	100
Climate Change (%)	0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	360 Summer	100	+0%					0.064
S1.001	S2	360 Summer	100	+0%					-0.102

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.386	0.000	0.05			12.3	OK	
S1.001	S2	-0.356	0.000	0.10			12.3	OK	

Appendix B Greenfield Runoff Volume Calculations

Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	20.600
Ratio R	0.437
Areal Reduction Factor	1.00
Area (ha)	0.080
SAAR (mm)	600
CWI	87.000
Urban	0.000
SPR	30.000

Results

Percentage Runoff (%)	24.41
Greenfield Runoff Volume (m^3)	12.092

Appendix C Existing Site Runoff Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

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Return Period (years)	100
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Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	1.000
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
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Min Vel for Auto Design only (m/s)	1.00
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PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
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Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
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Foul Sewage per hectare (l/s)	0.000		

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Return Period(s) (years)	100
Climate Change (%)	0

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S1.001	S2	-0.356	0.000	0.10			12.3	OK	