Flood Risk Assessment

To accompany a planning application for the re-development of the garage site at

South Worple Way, East Sheen

Prepared by

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Innervision Design Ltd

Outline SW strategy added May 2023

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1 Executive Summary

A The site lies within an existing developed domestic area and this is minor development;

B The site lies at the extreme limit of undefended tidal Flood Zone 2 and is at a Low risk from reservoir, groundwater and surface water flooding;

C The site is however robustly defended and not at risk from a tidal breach;

D Specific flood resilience and mitigation methods are not required;

E Safe access/egress routes are immediately available;

F New owners will be advised by the developer to sign up to flood warning schemes;

G There is no documented evidence of flood risk from any other sources;

H By utilising SuDS the proposed development will reduce overall run-off rates and volumes and hence reduce surface water flood risk elsewhere;

I Assuming the access/egress route can be maintained over the lifetime of the development, the proposed minor development to redevelop a brown field site to domestic, within a developed area, itself within a robustly defended Capital City, is considered acceptable.

2 Introduction

2.1 Site location

The project is at South Worple Way, Sheen (see Figure 1).

Figure 1: Site location plan, as indicated with North topmost. (source: EA flood mapping)

2.2 Development description

The proposal is for a re-development of a brownfield site to provide a block of 4 dwellings. The proposed work is classed as minor development. The existing and proposed layouts and proposed sections are to be submitted under separate cover.

2.3 Site geology

Geological mapping data from within the vicinity indicate Kempton Park Gravel Member - Sand And Gravel however this would require confirmation on site. If available on site, the superficial deposits may offer only medium permeability.

Given the site's physical constraints, soakaways may not be viable although pervious pavements may be.

3 Policies

In preparation for this Flood Risk Assessment (FRA), National Planning Policy Framework[2] and British Standards on Assessing and Managing Flood Risk[1] were reviewed, and their related policies are, where applicable, referred to in this report.

The Environment Agency has been consulted in order to establish the flood zone of the proposed site.

In addition, planning policies from the Local Authority were also reviewed including its Strategic Flood Risk Assessment.

4 Flood risk analysis

4.1 Sources of potential flooding

Flood risk from various sources at the site is analysed in this section.

4.1.1 Flood risk from sea and rivers

Flooding can also take place from flows that are not contained within the channel due to high levels of rainfall in the catchment.

The site is not at risk from fluvial flooding.

Flooding can occur from the sea due to a particularly high tide or surge, or combination of both.

With reference to the Environment Agency flood map, Figure 2, the site lies in part, in Flood Zone 2. This means that the rear of the site has a Low probability of tidal flooding (between a 1 in 200yr and 1 in 1000yr annual probability of flooding). This does not however take into account defences.

Figure 2: Flood mapping from the EA online data. The site falls within Flood Zone 3

4.1.2 Maximum Likely Water Level 2022

The MLWL for the Thames at the nearest EA model node (2.16) is 5.23m AOD

4.1.3 Maximum Likely Water Level 2100

The MLWL for the Thames at the nearest EA model node is 6.00m AOD

4.1.4 Defences

The site does however benefit from robust flood defences (Thames Barrier together with other defences ranging from 8 major barriers to 337km of tidal walls and embankments) as indicated by the hatched area in Figure 3.

Figure 3: Defended area as indicted by hatching.

The Thames defences are maintained under Statute and at this location have a current crest level (on both banks) of no less than 5.41m AOD raising to a minimum level, at 2100, of 6.35m AOD.

Given the robust and Statute maintained nature of the Thames defences the relative risk of flooding to the site is given by the EA as Very Low.

4.1.5 Tidal Breach

The site does not fall inside an area at risk from a tidal breach (epoch 2100) as shown in Figure 4.

Figure 4: Site location relative to the extents of a tidal breach

4.1.6 Historic tidal flood events

The site falls outside an area of previous flooding as shown in Figure 5.

Figure 5: Site location relative to historic flood extents

4.1.7 Flood risk from groundwater

Groundwater flooding occurs when water levels in the ground rise above surface levels. It is most common in low-lying areas underlain by permeable rock (aquifers), usually due to extended periods of wet weather. This site is considered to be in an area at a Very High risk (greater than a 75% annual probability)

Since the proposed development does not involve any basement elements, the impact of groundwater flooding on the proposed site will be minimal. Hence, the relative risk of groundwater flooding on the proposed site can be considered to be Low.

4.1.8 Flood risk from sewer and highway drains

Flooding occurs when combined, foul or surface water sewers and highway drains are temporarily over-loaded due to excessive rainfall or due to blockage.

There are no indicators to Sewer flooding at the site. The SFRA interactive map shows the site is an area at the lowest risk.

Hence, the risk of sewer and highway flooding to the proposed site can be considered to be Low.

4.1.9 Flooding risk from surface water

Flooding occurs when rainfall fall on a surface (on or off the site) which acts as run-off which has not infiltrated into the ground or entered into a drainage system.

With reference to the E.A online mapping, Figure 6, the site is not at risk from surface water flooding for the design period, 1 in 100yr event but is within an area at risk from the more extreme 1 in 100yr to 1 in 1000yr event as shown in Figure 7.

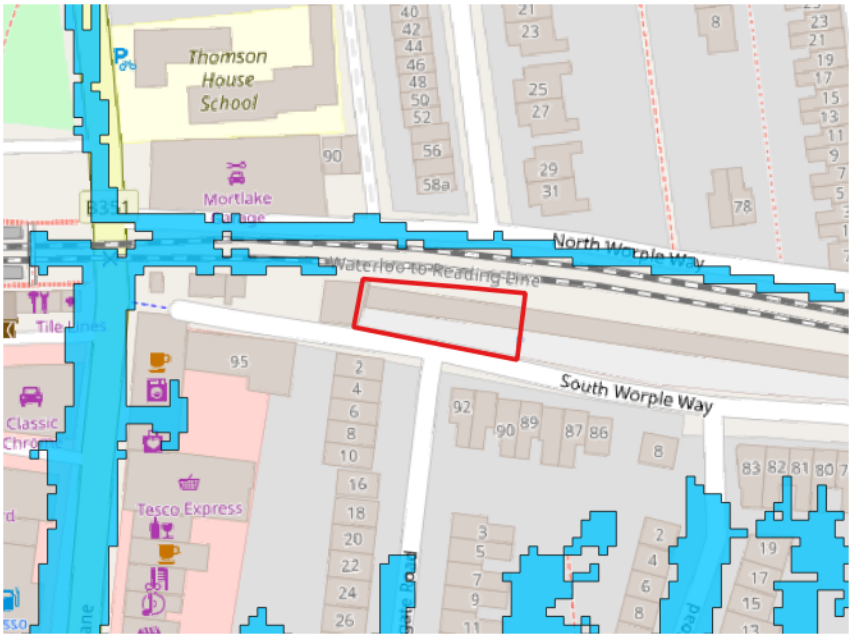

Figure 6: 1 in 100yr SW flood extent mapping. The site is not shown to be at risk from SW flooding.

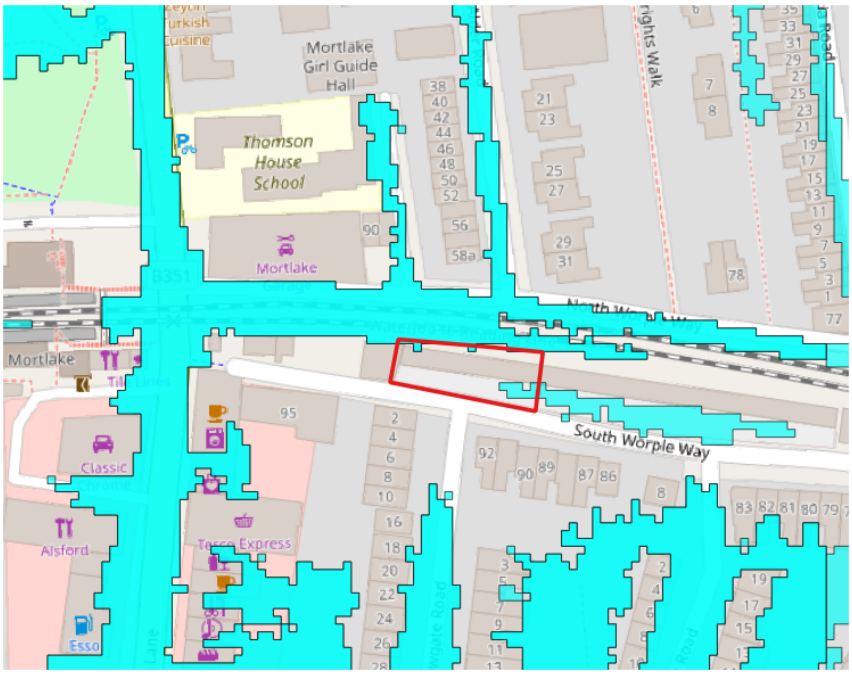

Figure 7: 1 in 1000yr SW flood extent mapping.

4.1.10 Flood risk from infrastructure failure

Flooding occurs because of canals, reservoirs, industrial processes, burst water mains or failed pumping stations.

The site is shown to be at flood risk due to reservoir failure in the event that it was to coincide with a tidal flood event, as indicated by the hatched areas in Figure 8.

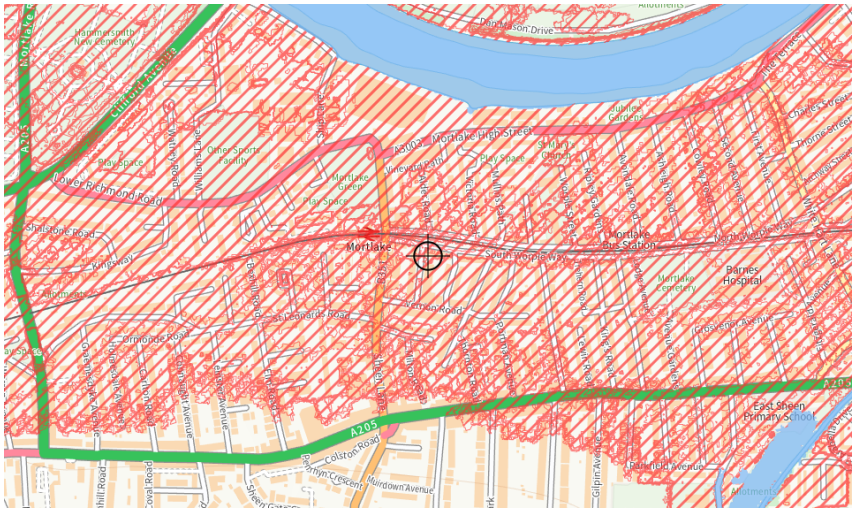

Figure 8: Flood risk from reservoir flooding. The site is shown to be at risk in the event that reservoir failure coincides with a tidal breach (Source: EA flood mapping)

However the EA have previously stated that:

> "Reservoir flooding is extremely unlikely to happen. There has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by reservoir panel engineers. As the enforcement authority for the Reservoirs Act 1975 in England, we ensure that reservoirs are inspected regularly and essential safety work is carried out."

Hence the flood risk to the site from reservoir failure is considered to be Low.

4.2 On-site surface water analysis and management

4.2.1 Generation of Run-off

The post-development surface water run-off volume will not increase when compared to the pre-development level because there is no overall reduction in permeable areas.

4.2.2 SuDS Statement:

Surface water will be managed in full alignment with the SuDS hierarchy as required under provisions made under the Town and Country Planning Act 1990.

While not required for Planning permission consent it can be confirmed that all SW on site will be also be designed, installed and tested in full accordance with Part H of the Building Regulations 2010 (as amended 2013), Requirement H3, as made under the Building Act 1984.

It is unlikely that soakaways will be viable given the physical constraints of the site hence the recommendation of this report would be to adopt the use of a attenuation and hydraulic control, water butts and permeable paving as a viable and proportionate SuDS solution with the reduced outfall from these taken to the existing SW drainage provision on site.

4.2.3 Overview of strategy

The curtilage of the entire site encloses an area of approximately 500m^2 of which, pre-development, 500m^2 is classed as being impermeable (250m^2 roofs, 250m^2 impermeable hard-standing and paths). The new development decreases the impermeable area from 500m^2 to 200m^2 (200m^2 roof area).

The site benefits from direct access to a Thames Water surface water asset (IC 5717) as shown in the extract form the ALS at Figure 9.

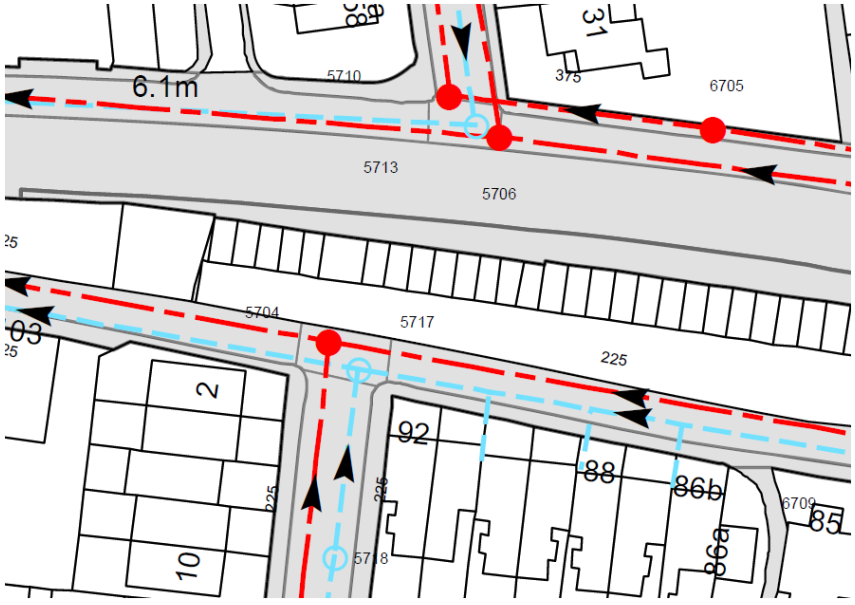

Figure 9: Extract from Thames Water ALS

The site is too constrained to allow soakaways.

All areas of hardstanding will be formed as a pervious surface.

Water butts will be used to reduce potable water demand.

All roof areas will drain to the TW asset under hydraulic control and attenuation to manage the balance.

Flows will be controlled down to at least 50% of the existing rate and, where feasible, as low as is technically possible within site constraints.

4.2.4 Existing run off rates

Existing runff rates from the impermeable areas of the site are calculated as 6.30ls^{-1} (based on 50.4mm hr^{-1}, 1 in 1 yr summer storm).

4.2.5 Proposed run off rates

The proposed run-off rates will therefore not exceed 3.0ls^{-1} for all events. This being a 50% reduction on the current run-off from the 1 in 1yr event.

4.2.6 Method of control

Flow control will be achieved by a commercial "off the shelf" orifice flow control chamber (Polypipe protected orifice chamber) and likewise with the attenuation cells (sub-base replacement cells - Polypipe permavoid).

An estimation of storage volumes is in Appendix A.

4.3 Impact on flood risk elsewhere

SW arising: Since the proposal is intending to manage any additional surface water at source the impact on flood risk elsewhere is Low.

Furthermore, by utilising SuDS the proposed development will reduce overall run-off rates and volumes and hence reduce local surface water flood risk.

5 Levels

5.1 Flood depth data

Flood level data as extracted from the wider EA "Tidal Thames upper" flood model.

Predicted flood depth in the event of a tidal breach = Nil flooding depth at epoch 2100.

5.2 Floor level data

Given there are no design period (1 in 200yr) tidal flood depths on site, the internal floor levels need only meet standard Building Regulation requirements.

6 Management of flood risk

6.1 Flood risk resilience measures

No specific measures are considered to be necessary given the very low risk.

6.1.1 Management of residual risk

Any residual risk can be safely managed by not impairing access and evacuation routes and signing residents up to flood warning schemes.

6.1.2 Safe access and egress routes

The NPPF stipulates that, where required, safe access and escape routes should be available to/from new developments in flood risk areas. Access routes should be such that occupants can safely access and exit buildings in design flood conditions. The site has immediate safe and dry access and egress routes (ref Figure 10).

While the tidal flood risk is considered to be very low, it should also be noted that tidal flood events are generally more predictable than fluvial events due to the cyclic nature of the tides and hence (given this is the Capital City) early warning is expected to be widely broadcast.

It is therefore a recommendation that the occupiers gain early warning of any likely flood events.

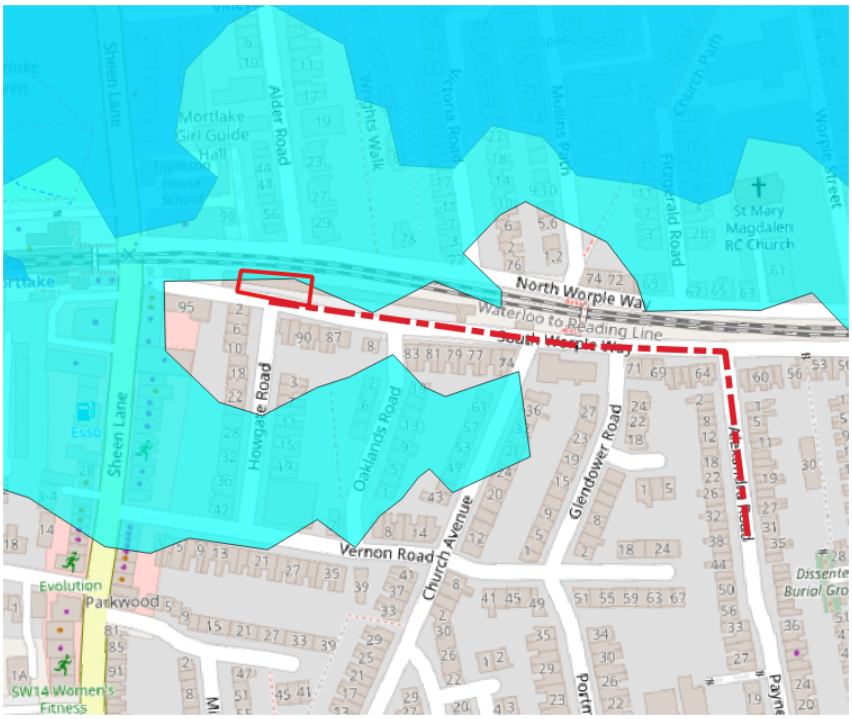

Figure 10: Access and Egress routes are safe and immediately available.

6.1.3 Flood warning schemes

Since it has been established that the site is sited in an area with a possibility of flooding the developers will recommend the new owners of the dwellings to sign up to the E.A. "Flood Warnings Direct" which is a free service providing flood warnings by phone, text or email. See `https://www.fws.environment-agency.gov.uk/app/olr/register`, or call the E.A. on 0345 988 1188 for full information.

6.1.4 Flood Plan

Given the very low risk a specific flood plan is not considered necessary. A suitable proforma is however freely available on line.

7 Conclusions

Given that:

- The site lies within an existing developed domestic area and this is minor development;
- The site lies at the extreme limit of undefended tidal Flood Zone 2 and is at a Low risk from reservoir, groundwater and surface water flooding;
- The site is however robustly defended and not at risk from a tidal breach;
- Specific flood resilience and mitigation methods are not required;
- Safe access/egress routes are immediately available;
- New owners will be advised by the developer to sign up to flood warning schemes;
- There is no documented evidence of flood risk from any other sources;
- By utilising SuDS the proposed development will reduce overall run-off rates and volumes and hence reduce surface water flood risk elsewhere;

and assuming the access/egress route can be maintained over the lifetime of the development, the proposed minor development to redevelop a brown field site to domestic, within a developed area, itself within a robustly defended Capital City, is considered acceptable.

Signed: 

Dr Robin Saunders CEng, C. Build E, MCABE, BEng(Hons), PhD

Date: 24th May, 2023

References

[1] BSI. BS 8533:2011. Technical report, 2011.

[2] Ministry of Housing, Communities and Local Government. National planning policy framework. 2021.

A SW storage volumes - estimate

HR Wallingford
Working with water

Surface water storage requirements for sites

www.uksuds.com | Storage estimation tool

Calculated by:	Rob Saunders
Site name:	S Worple Way
Site location:	

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management
for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate
volume requirements and design details before finalising the design of the drainage scheme.

Site Details

Latitude:	51.46794° N
Longitude:	0.26548° W
Reference:	401477752
Date:	Feb 16 2023 20:14

Site characteristics	
Total site area (ha):	0.05
Significant public open space (ha):	0
Area positively drained (ha):	0.05
Impermeable area (ha):	0.035
Percentage of drained area that is impermeable (%):	70
Impervious area drained via infiltration (ha):	0
Return period for infiltration system design (year):	10
Impervious area drained to rainwater harvesting (ha):	0
Return period for rainwater harvesting system (year):	10
Compliance factor for rainwater harvesting system (%):	66
Net site area for storage volume design (ha):	0.05
Net impermable area for storage volume design (ha):	0.04
Pervious area contribution to runoff (%):	30

* where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50% of the 'area positively drained', the 'net site area' and the estimates of Q_{BAR} and other flow rates will have been reduced accordingly.

Design criteria	
Climate change allowance factor:	1.4
Urban creep allowance factor:	1.1
Volume control approach	Use long term storage
Interception rainfall depth (mm):	5
Minimum flow rate (l/s):	2

Methodology	
esti	IH124
Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	2	2
SPR:	0.3	0.3

Hydrological characteristics	Default	Edited
Rainfall 100 yrs 6 hrs:	--	63
Rainfall 100 yrs 12 hrs:	--	100.1
FEH / FSR conversion factor:	1.3	1.3
SAAR (mm):	597	597
M5-60 Rainfall Depth (mm):	20	20
'r' Ratio M5-60/M5-2 day:	0.4	0.4
Hydological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 10 year:	1.62	1.62
Growth curve factor 30 year:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Q_{BAR} for total site area (l/s):	0.08	0.08
Q_{BAR} for net site area (l/s):	0.08	0.08

Site discharge rates	Default	Edited
1 in 1 year (l/s):	2	2
1 in 30 years (l/s):	2	2
1 in 100 year (l/s):	2	2

Estimated storage volumes	Default	Edited
Attenuation storage 1/100 years (m³):	13	13
Long term storage 1/100 years (m³):	0	0
Total storage 1/100 years (m³):	13	13

This report was produced using the storage estimation tool developed by HRWallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at http://uksuds.com/terms-and-conditions.htm. The outputs from this tool have been used to estimate storage volume requirements. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.