SITE ASSESSMENT - Bentall Centre Car Parks A and B

Address: Bentall Centre Car Parks A and B, Steadfast Road, Kingston upon

Area: 0.77 **Ha**

Site Reference: KNK06

Current Use	Proposed Use
Commercial, business and service uses and car park	Residential-led mixed-use development, including commercial, business and service uses

Current Vulnerability Classification	Proposed Vulnerability Classification
Less Vulnerable	More Vulnerable

Current Risk Summary

Fluvial / Tidal			Groundwater		
FZ2	100	% of Site	<25	0	% of Site
FZ3a	13.38	% of Site	25-50	0	% of Site
FZ3b	0	% of Site	50-75	100	% of Site
Surface Water			>75	0	% of Site
1 in 30*	0	% of Site	**Artificial**		
1 in 100*+	0	% of Site	Reservoir	YES	At risk?
1 in 1000*	4.65	% of Site			
Sewer Flooding					
No. Incidents					74

* return periods for potential flood events + FZ3a (surface water)

Flood Defences

Site is not in an area benefitting from flood defences.

Flood Warning Area

The EA Flood Warning Service is available at this site.

FLUVIAL / TIDAL

Risk Assessment (Thames Defended)

Parameter	FZ3b	FZ3a	*FZ3a+CC	Units
Time of Onset	N/A	325.00	251.00	Hrs
Min. Depth	0	0.04	0.02	m
Max. Depth	0	0.8	1.88	m
Max. Velocity	0	0.22	0.32	m/s
Max Flood Level	0	7.06	8.1	m AOD
Max Ground Level	7.59	7.59	7.59	m AOD
Min Ground Level	5.43	5.43	5.43	m AOD
Max Flood Hazard	0	1.32	2.06	N/A
Duration of Flood	N/A	>14	>88	Hrs

* The +35% Climate Change Allowance event is reviewed

Risk Assessment (Thames Undefended)

Parameter	FZ3a	*FZ3a+CC	Units
Time of Onset	324.00	N/D	Hrs
Min. Depth	0.04	N/D	m
Max. Depth	0.8	N/D	m
Max. Velocity	0.22	N/D	m/s
Max. Hazard	1.32	N/D	N/A
Duration of Flood	>15	N/D	Hrs

Description of Flood Mechanism

- The site is at risk from fluvial flooding from the River Thames, along the western boundary of the site.
- The predicted flood risk extent for the climate change scenario for the River Thames covers all of the site area other than the small area in the centre of the site.
- The predicted flood risk extent for the climate change scenario for the River Hogsmill covers a small area of the south-eastern corrner of the site.
- Climate change is predicted to increase the maximum flood depth, hazard and flood level in the defended scenario only on the River Thames.
- The site will be partially flooded from the onset and will remain flooded for in excess of 88 hours.

Note: Risk Assessment Defended and Undefended data is for the worse case watercourse only, which is the River Thames.

Figure 1 - Fluvial Flood Depth Map

Site Access / Egress

Site access and egress routes should be directed to the north-eastern corner of the site towards Steadfast Road where is a lower risk of fluvial flooding.

Figure 2 - Fluvial Flood Hazard Map

Mitigation / FRA Requirements

- Only water compatible or essential uses (subject to the Exception Test) are permitted in FZ3b.
- Self-contained basement dwellings and bedrooms are not permitted in FZ3a (western side of the site). See SFRA Level 2 Report mitigation requirement numbers 4.8 and 4.9 for additional basement stipulations.
- A FRA must be submitted as part of a planning application.
- Include appropriate flood resistance or resilience measures to address predicted flood depths.
- See SFRA Level 2 Report mitigation requirement numbers 4.2 and 4.3 for further development stipulations.
- Develop a Flood Emergency and Evacuation Plan for the site.
- Site users should be signed up to the EA's Flood Warning Service.

SURFACE WATER

Risk Assessment

Parameter	1 in 30	1 in 100	1 in 1000	Units
Min. Depth	N/A	N/A	N/A	m
Max. Depth	N/A	N/A	N/A	m
Max. Velocity	N/A	N/A	N/A	m/s
Max. Hazard	N/A	N/A	N/A	N/A

*The 1 in 1000 annual probability extent represents the potential climate change adjusted impact of current risk

Description of Flood Mechanism

N/A - surface water flood risk at the site is negligible

Figure 3 - RoFSW Flood Depth Map

Site Access / Egress

N/A - surface water flood risk at the site is negligible

Figure 4 - RoFSW Flood Hazard Map

Mitigation - Flood Risk Requirements

N/A - surface water flood risk at the site is negligible

Mitigation - Surface Water Drainage

N/A - surface water flood risk at the site is negligible

SITE ASSESSMENT - Bentall Centre Car Parks A and B

SEWER

Risk Assessment

• The site falls within a postcode area where there are 74 reported flood incidents from sewer flooding.
• The site is assumed to be served by separate surface water and foul sewer networks.

Figure 5 - Thames Water Sewer Flood Map

Mitigation Requirements

• Applicant must consult with TWUL to confirm if the development site has historically flooded. TWUL must agree to any proposed sewer connections.
• Where historic flooding has occurred, the applicant must show how this risk will be managed for the lifetime of the development.

GROUNDWATER

Risk Assessment

• The site is classified as having >=50% <75% susceptibility to groundwater flooding.
• The site is underlain by London Clay bedrock geology and superficial deposits of Langley Silt.

Figure 6 - Areas Susceptible to Groundwater Flooding Map

Mitigation Requirements

• Applicant should carry out a screening study (as a minimum) to establish if there are any subterranean flood risk issues that may require further investigation.
• If there is a potential level of impact, mitigation actions must be proposed.
• Must be prepared by a chartered professional or specialist.

ARTIFICIAL

Risk Assessment

• This site is risk of flooding from reservoirs based on the EA reservoir Wet Day Extent.

Figure 7 - Outline Reservoir Flood Map

Mitigation Requirements

• Propose appropriate and proportionate risk management measures.
• A suitable emergency response plan should be put in place, including an emergency warning system in the event of a reservoir flooding incident.
• Local Authority Emergency Planning Officers must be consulted to create a reservoir failure emergency and evacuation plan.

PLANNING CONSIDERATIONS

Safety of Development

A. Can the development be future proofed for climate change considerations?
• Yes. See SFRA - Level 2 Report Section 4 mitigation requirement number 4.2 for the required flood resistant / resilient building stipulations.

B. Can the development be designed safe throughout its lifetime without increasing flood risk elsewhere?
• Yes. The development must use surface water drainage techniques to manage surface water runoff onsite through above ground SuDS and / or below ground attenuation. Green drainage infrastructure should be prioritised to provide wider ecological / biodiversity benefits as per London Plan Policy SI 13.
• See SFRA - Level 2 Report Section 4 mitigation requirement number 4.5 for compensatory flood storage stipulations.

C. What is the cumulative impact of the development land use change and will flood risk increase?
• The development land use is changing from the 'Less Vulnerable' to the 'More Vulnerable' classification, as residential uses have been proposed.
• The site is currently a brownfield site with hardstanding areas only other than on the north-western boundary. This offers an opportunity to improve flood attenuation through the new development.

D. How can the development reduce risk overall?
• Direct development away from westen area of the site.
• Site access and egress routes should be directed towards the part the northern part of Steadfast Road which is at lowest risk of flooding.
• By complying with Policy DM4 from Kingston Local Plan through including SuDS to ensure that the development is not vulnerable to surface water, sewer and groundwater flooding and to reduce the overall level of flood risk in the borough and beyond.
• By complying with SFRA - Level 2 Report Section 4 mitigation requirement numbers 4.2, 4.3 and 4.5.

E. Will development require a flood risk permit/watercourse consent?
• No. The site is not located within 8m of a Main River or 5m of an Ordinary Watercourse.

F. Can the site pass the Exception Test?
• Yes. The Exception Test is required for this site as 13.38% of the site area in Flood Zone 3a (fluvial) and the proposed vulnerability classification is 'More Vulnerable'.
• This can be passed by making the site safe throughout its lifetime without increasing flood risk elsewhere (see questions A, B, and C). The site could also reduce flood risk overall with appropriate SuDS and flood storage compensation measures implemented (see 'Mitigation - Flood Risk Requirements' and 'Mitigation - Surface Water Drainage' boxes).

Figure 1 - Fluvial Flood Depth Map

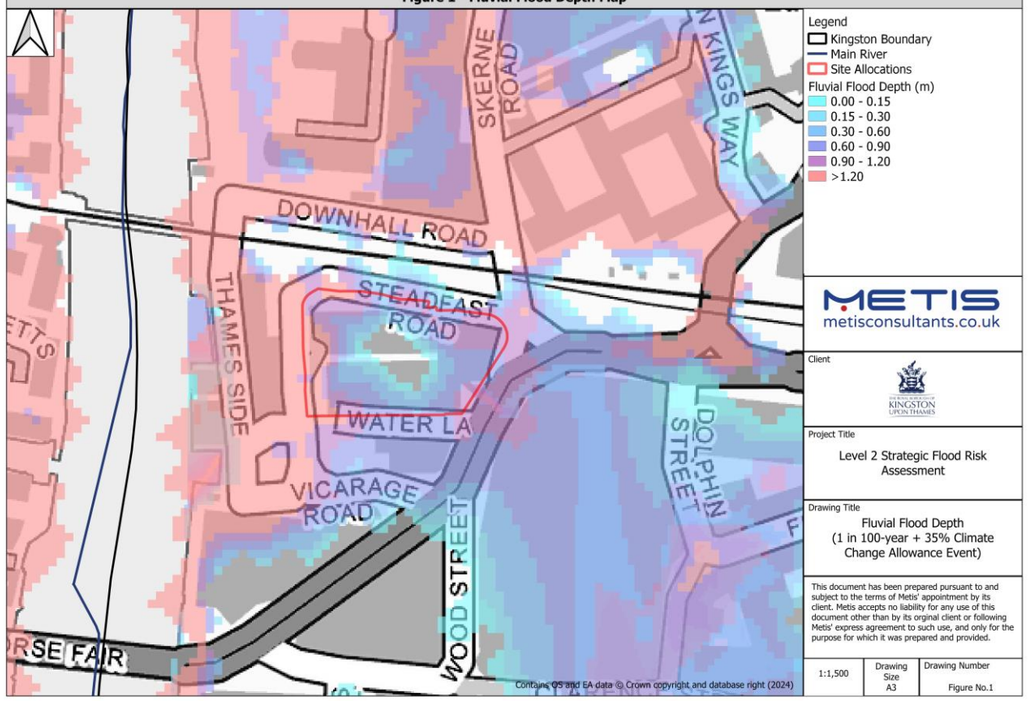


Figure 2 - Fluvial Flood Hazard Map

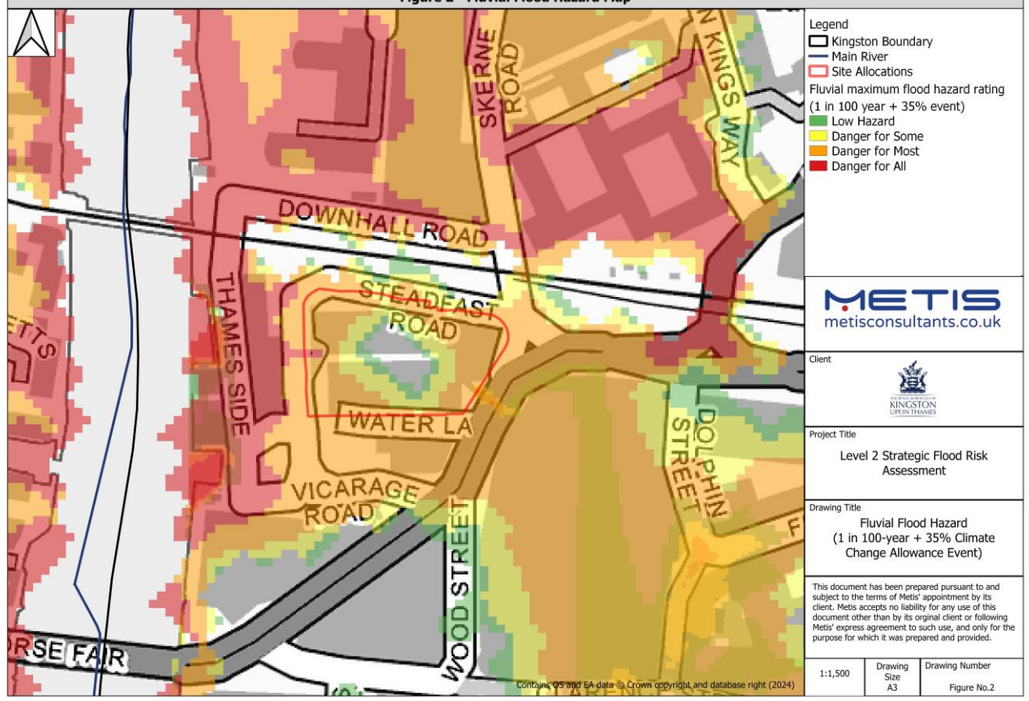


Figure 3 - RoFSW Flood Depth Map

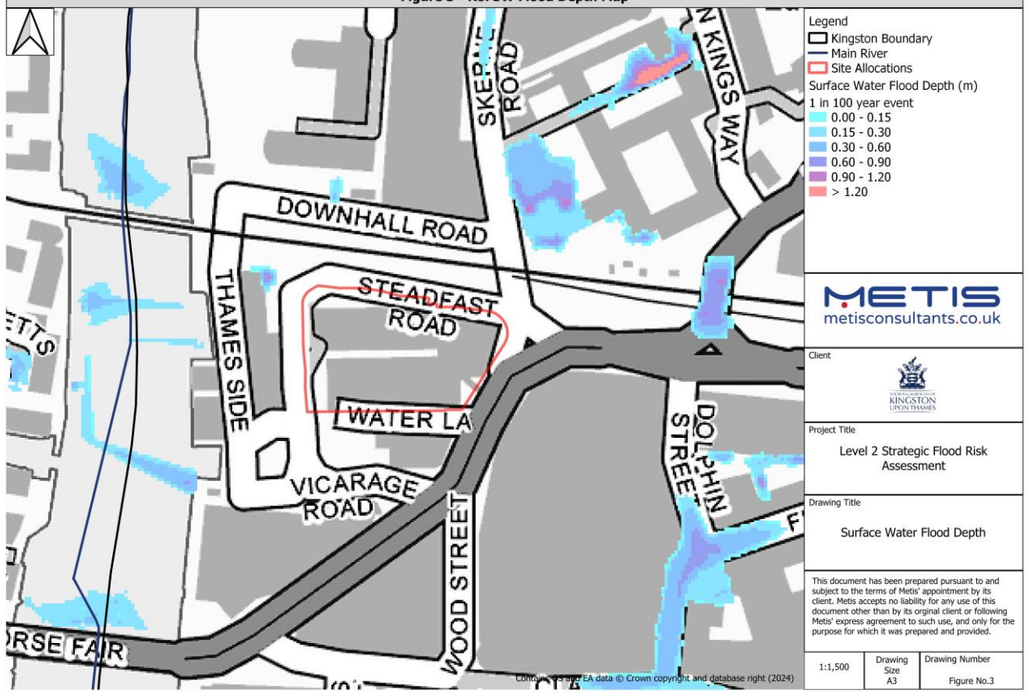


Figure 4 - RoFSW Flood Hazard Map

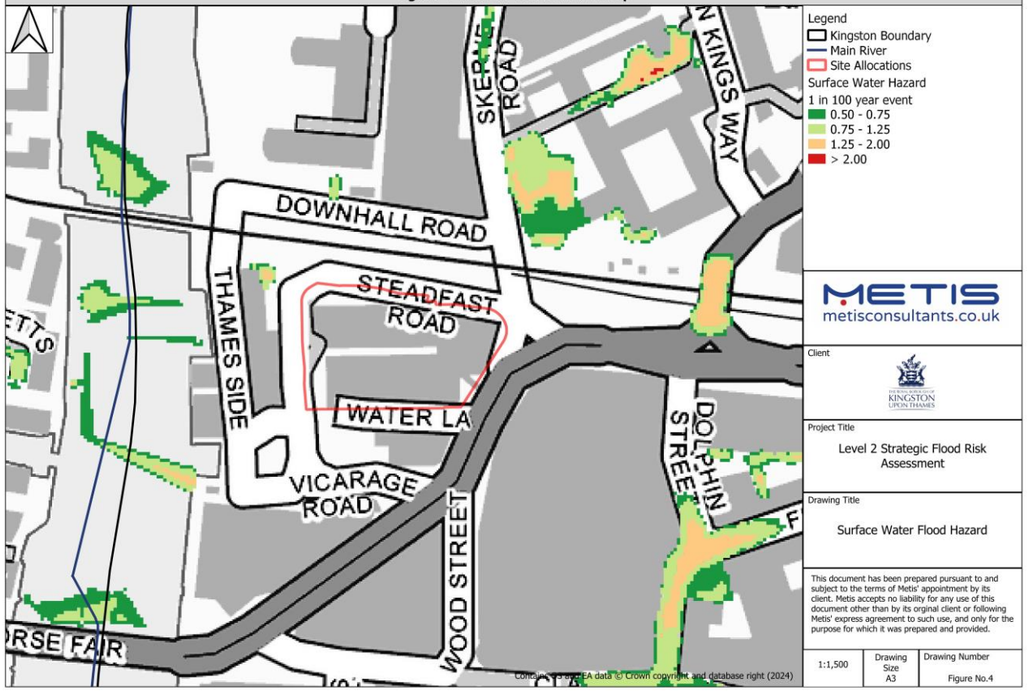
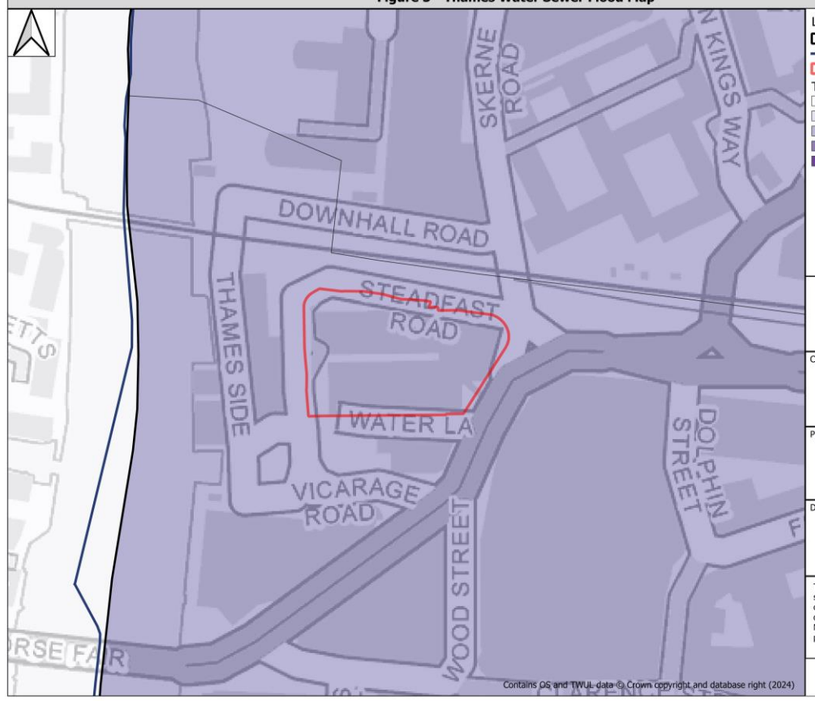


Figure 5 - Thames Water Sewer Flood Map



Legend
- Kingston Boundary
- Main River
- Site Allocations

Thames Water Sewer Flood Records
- 0 to 20 incidents reports
- 20 to 50 incidents reported
- 50 to 100 incidents reports
- 100 to 200 incidents reported
- More than 200 incidents reported

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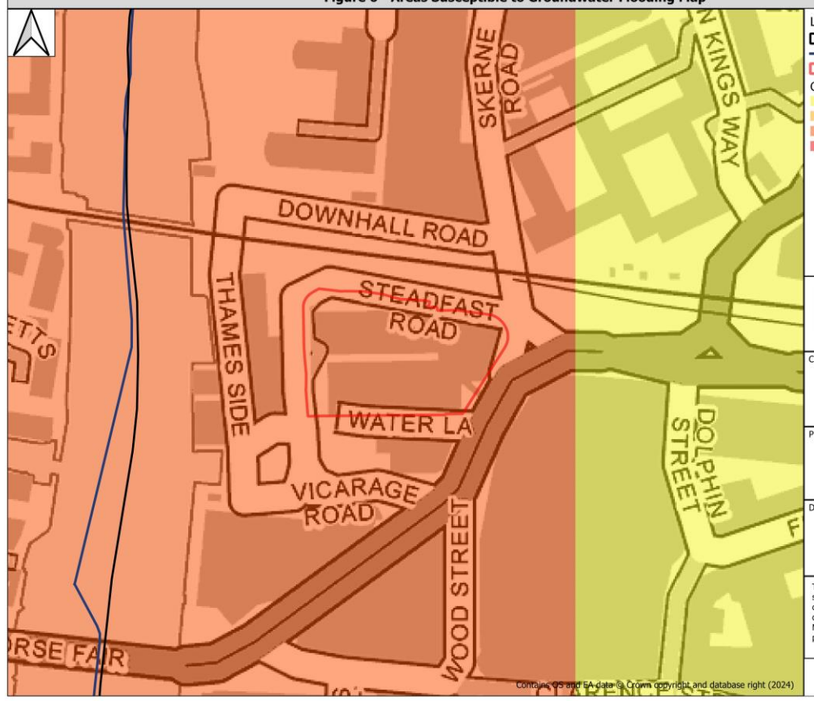
Client: The Royal Borough of Kingston upon Thames

Project Title: Level 2 Strategic Flood Risk Assessment

Drawing Title: Thames Water Sewer Flooding Records

1:1,500	Drawing Size A3	Drawing Number Figure No.5

Figure 6 - Areas Susceptible to Groundwater Flooding Map



Legend
- Kingston Boundary
- Main River
- Site Allocations

Groundwater Flood Risk
- < 25%
- >= 25% <50%
- >= 50% <75%
- >= 75%

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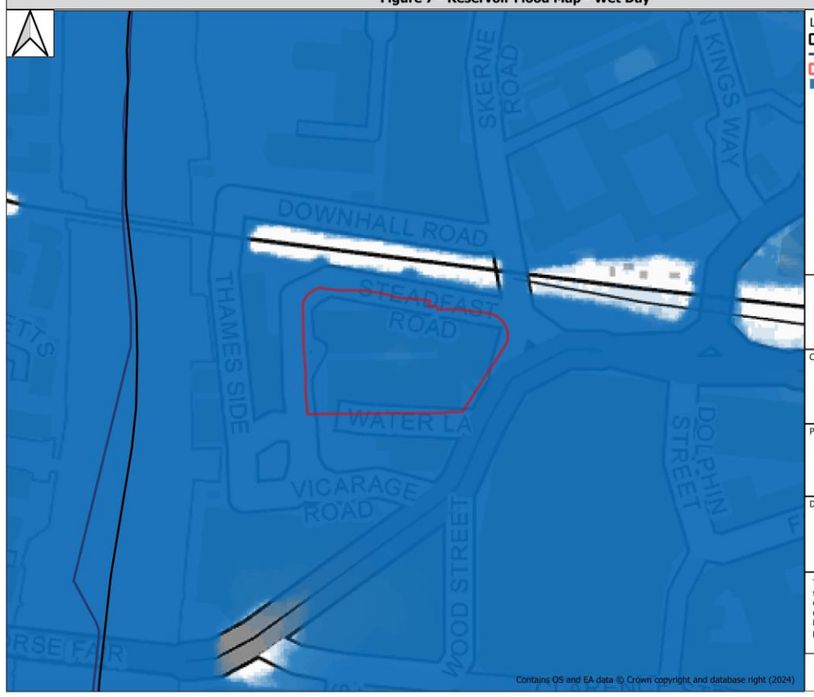
Project Title: Level 2 Strategic Flood Risk Assessment

Drawing Title: Areas Susceptible to Groundwater Flooding

1:1,500	Drawing Size A3	Drawing Number Figure No.6

Figure 7 - Reservoir Flood Map - Wet Day



Legend
- Kingston Boundary
- Main River
- Site Allocations
- Reservoir Flood Extents (Wet Day)

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Project Title: Level 2 Strategic Flood Risk Assessment

Drawing Title: Reservoir Flood Extents (Wet Day)

1:1,500	Drawing Size A3	Drawing Number Figure No.7