Teddington Direct River Abstraction

Preliminary Environmental Information Report

Appendix 5.2 – Flood Risk Assessment

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Appendix 5.2 – Flood Risk Assessment

A.1 Introduction

A.1.1 This Flood Risk Assessment (FRA) has been prepared to support the Project Environmental Information (PEI) report (PEI Report). The PEI Report sets out the preliminary findings of the Environmental Impact Assessment process for the proposed Teddington Direct River Abstraction project (hereafter referred to as 'the Project'). The Project is aimed to enhance London's drought resilience by 2033 by abstracting up to 75 megalitres of water per day (Ml/d) from the River Thames during low flow conditions. Without the Project, London faces significant water shortages by 2050 due to population growth and climate-related drought risks.

A.1.2 The National Planning Policy Framework (NPPF) (MHCLG, 2024) states that a site-specific FRA will be required for all proposed developments with the following criteria:

a. Located in Flood Zones 2 and 3
b. Located in Flood Zone 1 with a site area greater than one hectare
c. Located in Flood Zone 1 on land which has been identified by the Environment Agency as having critical drainage problems
d. Located in Flood Zone 1 on land identified in a Strategic Flood Risk Assessment (SFRA) as being at increased flood risk in future
e. Located in Flood Zone 1 on land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use

A.1.3 The Project involves establishing a new abstraction intake on the River Thames approximately 350m upstream of Teddington Weir. The abstracted water would be transferred to Lockwood Pumping Station, part of Thames Water's Lee Valley reservoirs system in north-east London via the Thames Lee Tunnel (TLT). The replacement water would be recycled water from a new tertiary treatment plant (TTP) within the existing Mogden sewage treatment works (STW). This replacement water would then be discharged into the River Thames through a new outfall structure 180m upstream of Teddington Weir. The Project comprises the following principal components during operation:

a. A new TTP constructed on a platform above some of the existing storm tanks at Mogden STW to process a portion of the final effluent with an output of up to 75Ml/d of recycled water. During times when the Project is not operating for the benefit of water resources (i.e. the Project's intake on the River Thames is not in operation, in non-drought periods), the TTP would run at a reduced capacity of 15Ml/d in order to maintain its system. At these times, recycled water produced would be returned to Mogden STW's final effluent channel and discharged at Isleworth Ait, in the tidal River Thames.
b. A Tunnel Boring Machine (TBM) drive shaft and recycled water interception shaft at Mogden STW site.

a. A new recycled water conveyance tunnel with an approximate 3.5m internal diameter, between the Mogden STW and the Burnell Avenue sites, for the transfer of up to 75Ml/d of recycled water between the TTP and the outfall discharge infrastructure.

b. An intermediate shaft would provide access during construction at Ham Playing Fields site.

c. A recycled water conveyance tunnel reception shaft and connecting conveyance pipe to the outfall structure for the discharge, located on land to the south of Burnell Avenue site.

d. A new outfall structure for discharging up to 75Ml/d of recycled water, located either on or near the bankside in the River Thames upstream of Teddington Weir.

e. A new abstraction intake structure, which will take up to 75Ml/d of raw water from the River Thames. This is located on the bankside of the River Thames, approximately 180m upstream of the new outfall structure and will include fish and eel protection measures.

f. A new abstraction connection shaft and raw water conveyance pipeline connecting to the existing TLT. Two options, Burnell Avenue adit and Tudor Drive connection, are considered for the new TLT connection shaft.

A.1.4 Additional Project components include the potential use of cofferdams for construction works in the River Thames.

A.1.5 Three above ground sites have been identified to be located in areas where an FRA is required within the draft Order limits due to being located in Flood Zones 2 and 3; these are:

a. Mogden STW site

b. Ham Playing Fields site (Main Work Area and Support Work Area)

c. Burnell Avenue site

A.1.6 The Lee Valley Reservoirs have been scoped out as per Chapter 5: Water Resources and Flood Risk, under ‘Summary of scope of the EIA’ section. Below ground works were scoped out of the FRA and agreed with the Planning Inspectorate (PINS) on the basis of the tunnel design being resistant to groundwater flooding and considered within the hydrogeological assessment.

A.1.7 In addition to the Mogden STW, Ham Playing Fields and Burnell Avenue sites, the draft Order limits also include temporary works to facilitate vehicle movements and access to and from the public highway during the construction phase. Specifically, the above ground works have been extended in these areas to include areas of the following highway networks:

a. Oak Lane, Worton Road, Mogden Lane roundabout, Rugby Road and Chertsey Road (Mogden STW site)

b. Ham Street and Riverside Drive (Ham Playing Fields site)

c. Burnell Avenue, Beaufort Road, Dysart Avenue, Dukes Avenue, Richmond Road (A307) and Tudor Drive (Burnell Avenue site).

A.1.8 As previously agreed by PINS in the EIA Scoping Opinion (2024) (PINS, 2024)), the Tudor Drive site is scoped out of this FRA. Furthermore, the Northweald Lane TLT connection site is no longer part of the Project's design and so will not be assessed as part of this FRA.

A.1.9 In addition to the three above ground sites described above, the wider Project includes several elements below ground including the conveyance tunnel and TLT shaft connection. The conveyance tunnel is proposed to be built at a depth of 20m to 40m outside the Mogden STW site and would pass below the Rivers Thames and Crane and associated flood defences. This is in addition to passing beneath the Duke of Northumberland's River within the Mogden STW site. The proposed standard good practice construction techniques will avoid potential impacts to these features and will be demonstrated in the Environmental Statement (ES). On this basis, PINS agreed in the EIA Scoping Opinion (PINS, 2024)) that this matter can be scoped out for all sources of flooding at all stages.

A.1.10 In accordance with legislation, to support the PEI Report, this FRA outlines the baseline flood risks at each above ground site scoped in above, along with the need for additional mitigation strategies where this is deemed necessary. This FRA provides an assessment at a point in the Project planning process using the best available information at the time of writing. It is expected that as the Project develops, and where the new information is made available, this FRA will need to be refined later to support the ES and the consenting process.

A.1.11 The approach to the FRA for the PEI Report is detailed below:

a. Consult with the Environment Agency to obtain product data for detailed flow rates, flood levels and flood extents.
b. Review local authority plans, policies and strategies relevant to the Project.
c. Assess the flood risks presented to the three above ground sites and the Project from all sources, including rivers, tidal, surface water, groundwater, sewers, and artificial sources.
d. Assess if the Project has the potential to impact flood risks elsewhere.
e. Outline the approach for additional flood risk mitigation measures to manage the flood risks presented to the Project and elsewhere.

Review structure

A.1.12 This report consists of the following sections:

a. Section A.2 - A review of the three sites' characteristics, including the site location, topography, ground conditions, and the existing hydrology and drainage. This section also summarises the Project.
b. Section A.3 - A review of the national and local planning policies that are relevant to managing the flood risk sources for this project.
c. Section A.4 - An assessment of the flood risks presented to the site and the Project from all flood risk sources.

d. Section A.5 - Flood risk mitigation that is required to manage flood risk to the Project and elsewhere.

e. Section A.6 - Surface water drainage strategy requirements

f. Section A.7 - Summary of the flood risk sources and mitigation measures

A.2 Site characteristics and proposals

Site location

A.2.1 As part of the Project, three above ground sites have been identified where an FRA is required.

A.2.2 The first above ground site, named the Mogden STW site, is located off Mogden Lane, Isleworth TW7 7LW covering an area of approximately 59.64ha. The centre of this site has a grid reference of TQ 15371 75088. The site is occupied by roads, buildings, infrastructure and equipment to facilitate the existing sewage treatment plant. Areas of green space are located around the outside of the site containing trees and grass. The Duke of Northumberland's River runs through the centre of the site along the north-south axis.

A.2.3 The Mogden STW site is surrounded by residential areas. There are also two commercial areas, Fleming Way Trading Estate and Worton Hall Estate, to the north, with Redlees Park located to the north-east, and the Allianz Stadium Twickenham to the south. Site operators access the site by Mogden Lane to the south and, when needed, Oak Lane in the north. There is no public access to the Mogden STW site. Whitton Brook is located approximately 60m north-east from the draft Order limits along Rugby Road but flows away from Mogden STW site to the south and east before joining the River Crane over 1km downstream.

A.2.4 The second above ground site, named Ham Playing Fields site, is located north of Riverside Drive, Ham Street, London Borough of Richmond upon Thames, and is publicly accessible. The site is greenfield in nature with additional green space to the west. This site has a grid reference of TQ 16913 73061 for the centre of the Main Work Area and covers an area of approximately 2.05ha. The Main Work Area, where the shaft and proposed construction compound are to be located, would primarily occupy a grass playing field. Ham Street provides access to the site from the south-east, which in turn can be accessed from Riverside Drive.

A.2.5 Also included at the Ham Playing Fields site is the Support Work Area (grid reference: TQ 16914 73169) adjacent to the River Thames. This would be used in combination with the Main Work Area for construction purposes. The Support Work Area would include a corridor which extends 5m into the river for a surface water discharge connection, with an additional section to connect to the main worksite at the playing fields.

A.2.6 The third above ground site described in this FRA is the Burnell Avenue site, located to the south of Burnell Avenue, Dysart Avenue and Beaufort Road. This

includes the Main Work Area, Northern Work Area and Southern Work Area adjacent to the River Thames and extending into the River Thames channel to facilitate construction of the intake and outfall. The Burnell Avenue site has a central grid reference of TQ 17283 71379. The site is currently occupied by an area of green space consisting of grassland, scrub and trees in the north-east of the site. The River Thames abuts the site immediately to the south-west. Two paths run north-west to south-east in the centre of the site. Residential areas are located to the north-east of the site, with other areas of green space located to the south-east and north-west of the site. The above ground works also include temporary and remedial highway works and access at Dukes Avenue, Richmond Road (A307) and Tudor Drive but exclude the scoped out area of Tudor Drive site for the main shaft location, as detailed in Plate A.4.

A.2.7 Plate A.1 to Plate A.4 below illustrate the site locations, draft Order limits assessment boundaries and the nearby water features.

Plate A.1 Overview of site locations and nearby water features

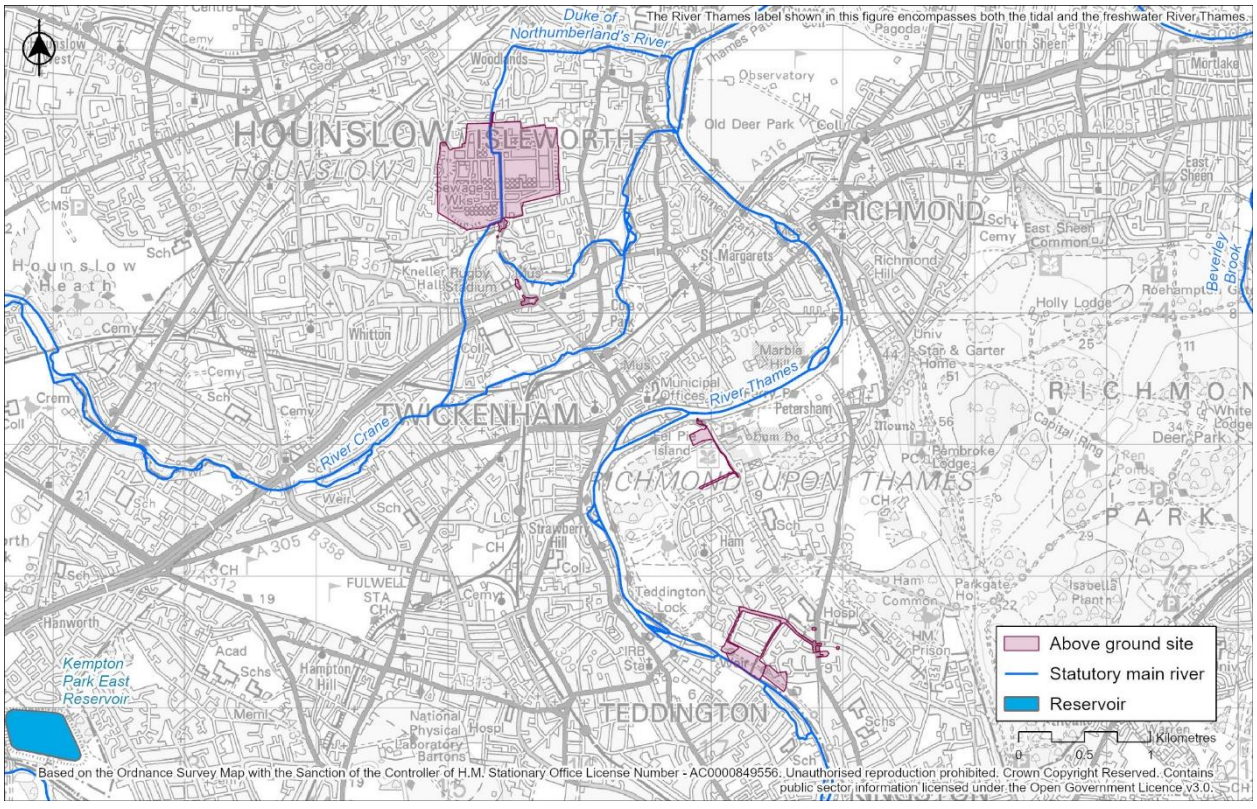


Plate A.2 Mogden STW site location and nearby water features

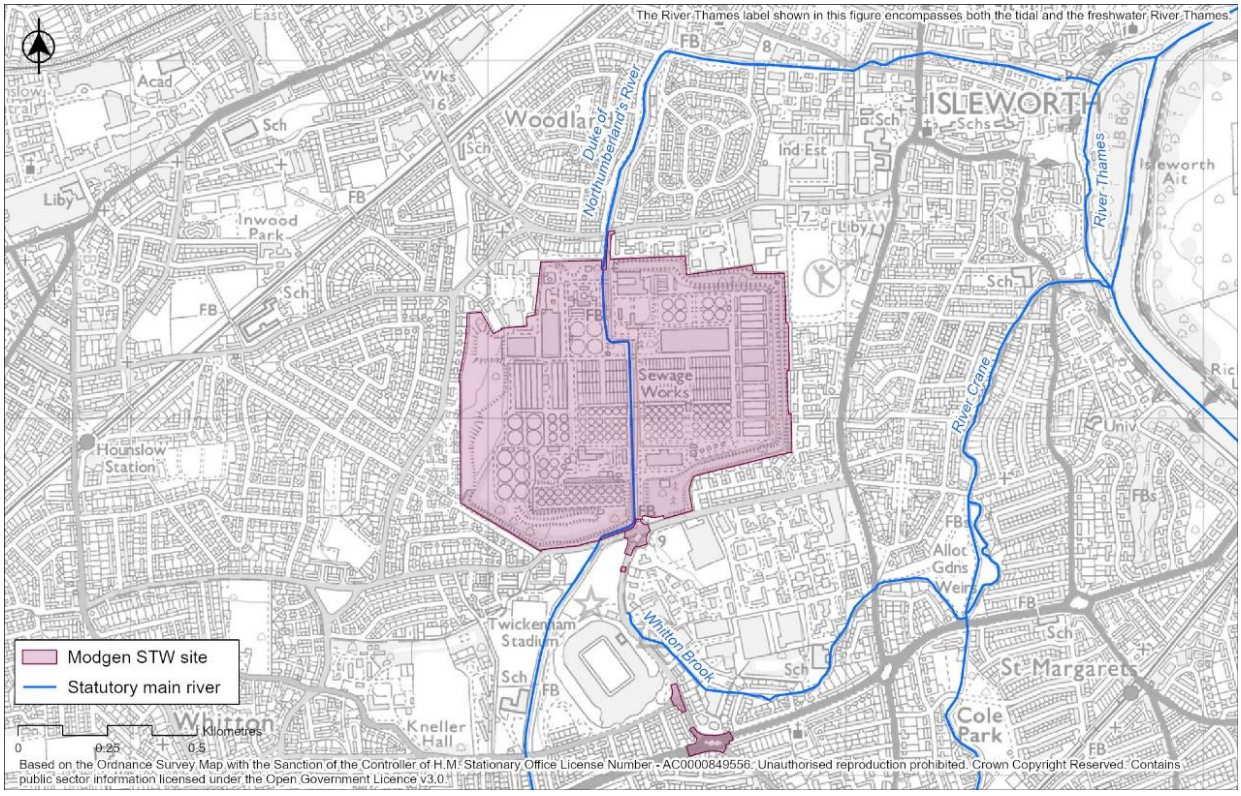


Plate A.3 Ham Playing Fields site location and nearby water features

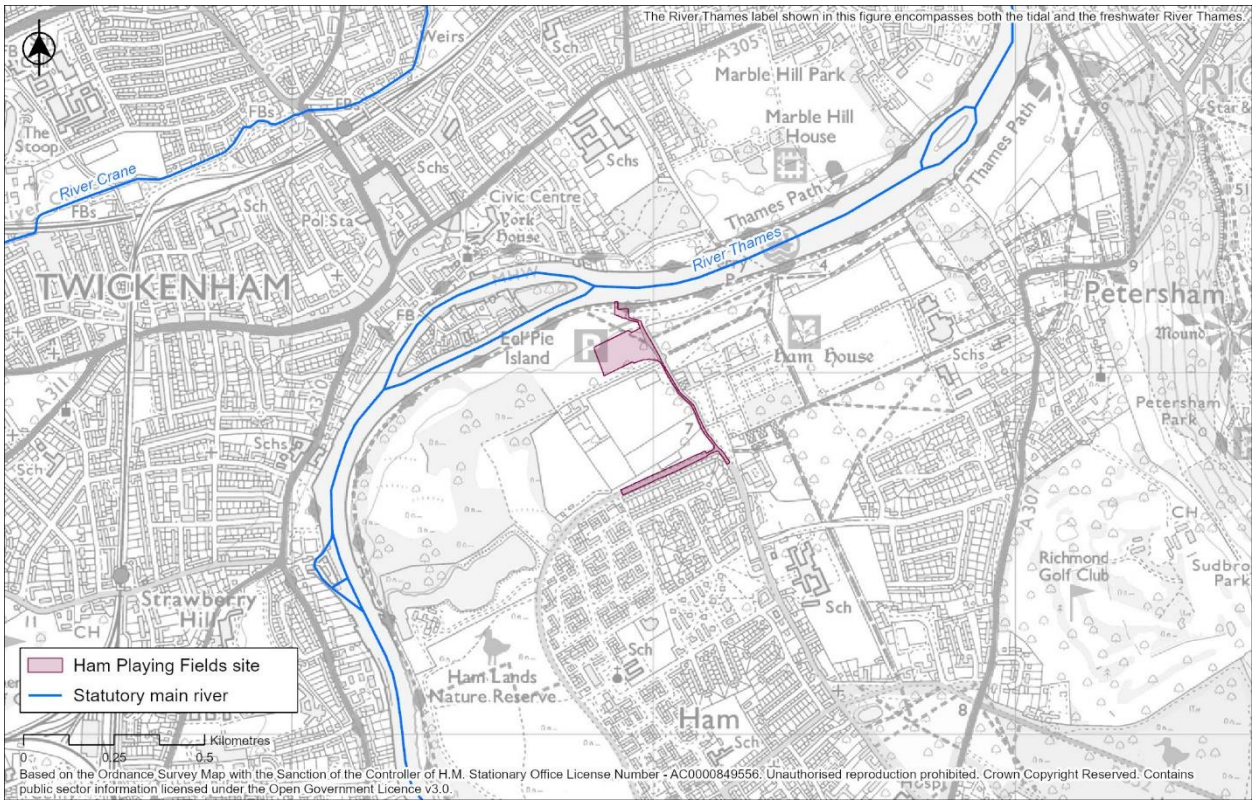
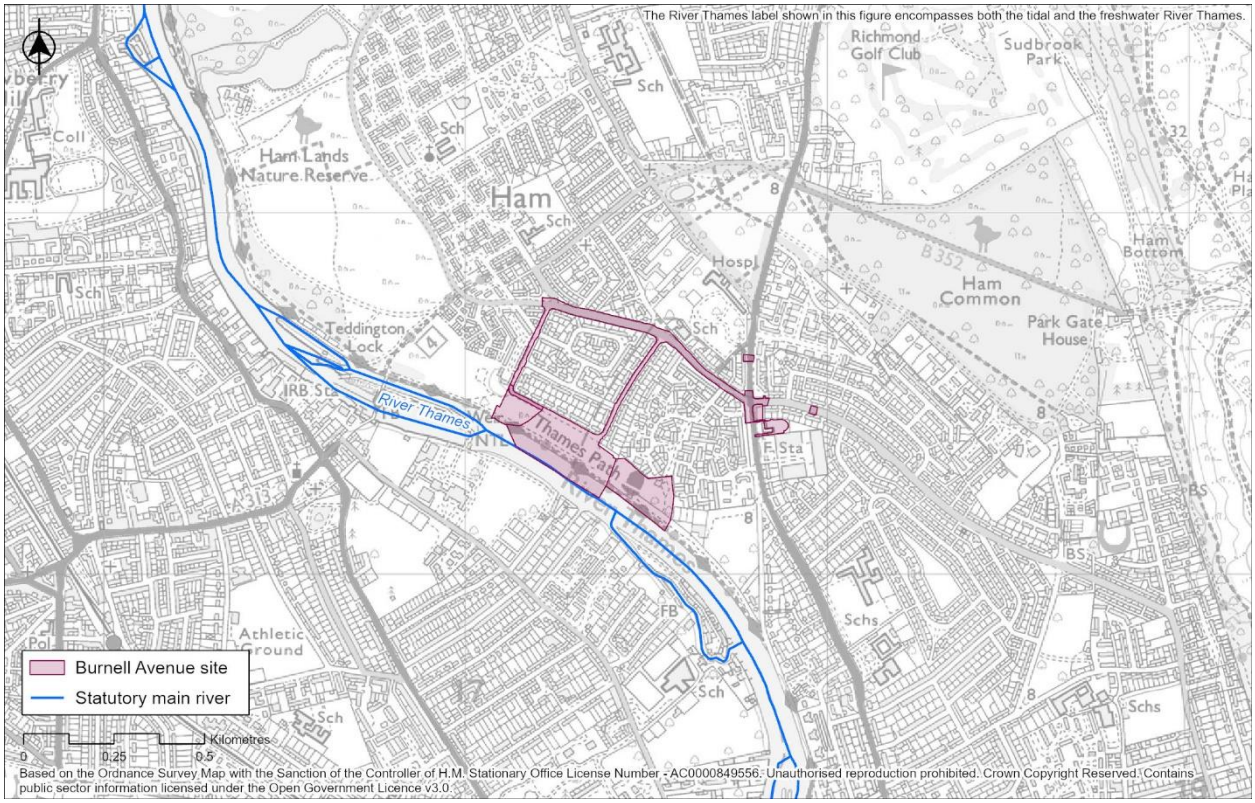


Plate A.4 Burnell Avenue site location and nearby water features



Topography

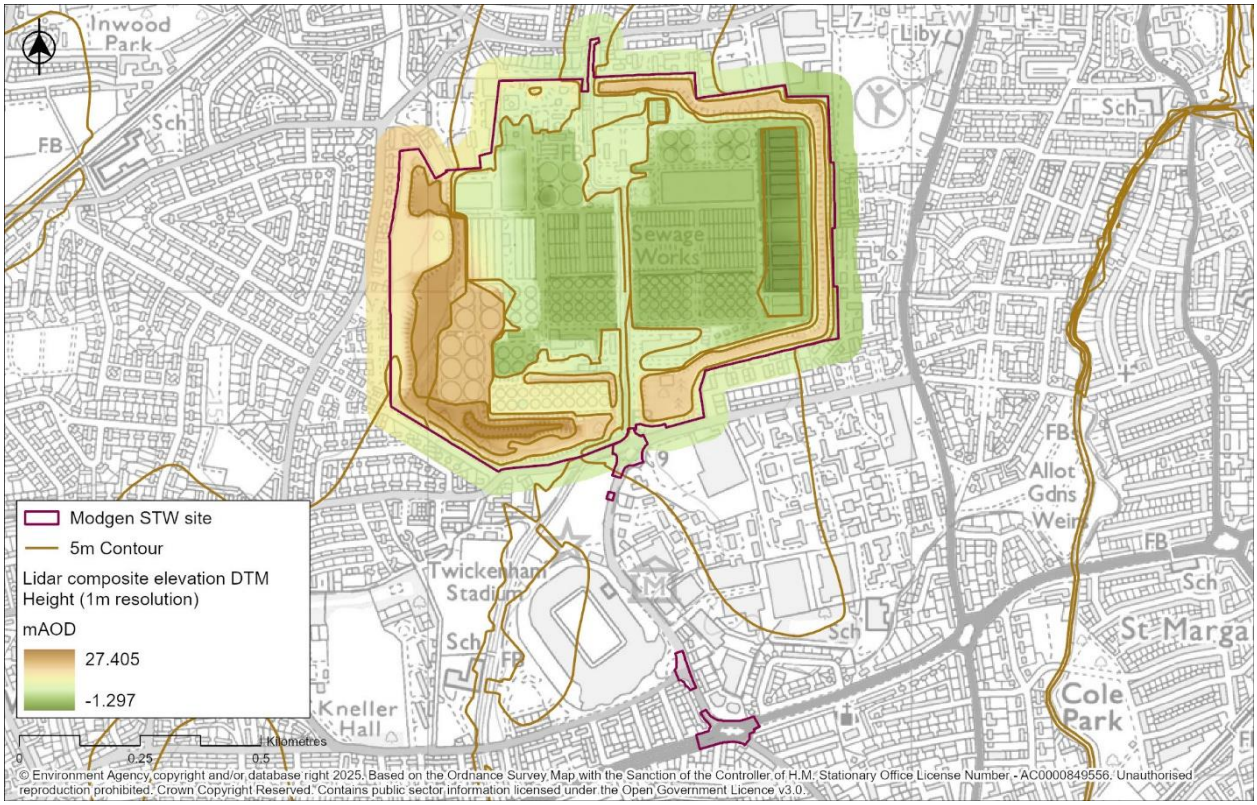
Mogden STW site

A.2.8 Topographical surveys were completed in November 2024. The surveys cover the west of the site from the south-west settlement tanks. The topography in this area generally falls from south-east (approximately 22 metres Above Ordnance Datum (m AOD) to north-west (17m AOD). The survey also covers the east of the Duke of Northumberland's River which generally falls from the east (approximately 13m AOD) to west (approximately 6m AOD).

A.2.9 A 1m LiDAR Digital Terrain Model (DTM) (2023c) has also been used to assess levels across the entirety of Mogden STW site. However, due to the presence of wastewater infrastructure and buildings, there are many artefacts contained within the LiDAR. Excluding artefacts, levels on-site range from approximately 6m AOD around the settlement tanks in the centre-south of the site to 22m AOD on the bank in the west of the site. The site is bounded by the raised embankment and higher ground around its perimeter resulting in all surface water runoff being contained on-site.

A.2.10 The LiDAR levels have been compared to the levels in the topographical survey where they overlap. This has found that the LiDAR levels are consistent with the topographical surveys, providing confidence in the LiDAR data where artefacts are not present. Plate A.5 shows the LiDAR DTM levels across Mogden STW site.

Plate A.5 LiDAR DTM of Mogden STW site



A.2.11 Flood defences are located along the banks of the Duke of Northumberland's River, as shown on the Environment Agency Asset Information and Maintenance Spatial Flood Defences database (Environment Agency, 2024a). The flood defence in the north of the site (Asset ID: 10074) has a length of 232m with an upstream crest level of 9.66m AOD and a downstream crest level of 10.46m AOD. The flood defence in the south of the site (Asset ID: 10709) is the lower of the two river banks and has a length of 501m with an upstream crest level of 9.77m AOD reducing to 9.66m AOD crest level at the downstream end. The proposed construction work area and operational TTP are located away from these flood defences (see paragraph A.4.68 for further information).

Ham Playing Fields site

A.2.12 The topographical survey (completed in November 2024) shows that the topography across Ham Playing Fields site is generally flat with a slight fall from south-east to north-west. Levels across this area range from a high point of 6.24m AOD in the east of the site to a low point of 4.84m AOD in the north-west of this area. The River Thames' total width adjacent to this location ranges from 77m to 95m.

A.2.13 There are no flood defences located on-site. Flood defences are located between 15m and 30m to the south-east of this area. The flood defence asset immediately south of Ham Playing Fields site is an embankment with a length of 321m and an upstream crest level and downstream crest level of 6.21m AOD (see paragraph A.4.68 for further information). These are expected to be raised in the future in line with the Thames Estuary 2100 (TE2100) Plan (Defra 2023).

Burnell Avenue site

A.2.14 The topographical survey (completed in November 2024) shows that the topography across Burnell Avenue site generally falls from north-east to south-west where the River Thames is located. Levels across this area range from a high point of 8.58m AOD on the grass in the east of the site to a low point of 3.40m AOD adjacent to the river channel located in the west of the site. Land also falls from the high ground at Burnell Avenue site (8.58m AOD) down to low points of 7m AOD along Dukes Avenue within the draft Order limits.

A.2.15 There are no flood defences located on-site. The nearest flood defences are located on the opposite bank of the River Thames at least 77m away from the River Thames bank within the site boundary. These flood defences are classified as natural high ground with the upstream flood defence (Asset ID: 12164) having a length of 22m while the downstream flood defence (Asset ID: 12244) has a length of 399m. No values have been provided for the upstream and downstream crest levels (see paragraph A.4.69 for further information).

A.2.16 The topographical surveys have been provided in Annex A1.

Ground conditions

A.2.17 The geological data held by the British Geological Survey (BGS) (BGS, 2025) show that the bedrock geology underlying each area comprises London Clay Formation (clay and silt). A Phase one and Phase two Ground Investigation are expected to be available in summer 2025 and will provide further information with regard to the below ground environmental and geological conditions.

Mogden STW site

A.2.18 The superficial deposits located below Mogden STW site are primarily Langley Silt Member (clay and silt) with a small area in the west of the site comprising River Terrace Deposits (sand and gravel). Mogden STW site has 20 confidential boreholes and one open source borehole. The open source borehole is TQ17SE28/C and shows that this site is underlain by made ground up to 0.6m below ground level (bgl), with sand and gravel located below this stratum up to 4.1mbgl and London Clay located below this level (Annex B1. . Magic.gov.uk mapping (Defra, 2025) shows that Mogden STW site is primarily located in an Unproductive Groundwater Vulnerability Zone, although a Medium-Low Groundwater Vulnerability Zone is located in the west of the site. This corresponds with less than 25% susceptibility to groundwater flooding in the West London SFRA (2018). However, further ground investigation and hydrogeological assessment looks to verify groundwater levels and vulnerability to flooding from groundwater as part of the ES.

Ham Playing Fields site

A.2.19 Ham Playing Fields site is underlain by superficial deposits of Kempton Park Gravel Member (sand and gravel). Ham Playing Fields site has one open source borehole located on-site called TQ17SE6/PP, which shows the topsoil is loamy sand up to 1.1mbgl, with sand below this topsoil (Annex B1.). Ham

Playing Fields site is located in Low Groundwater Vulnerability Zones and not located in a groundwater Source Protection Zone. According to the Richmond upon Thames SFRA (2021), the superficial deposits in Ham Playing Fields site have 50-75% susceptibility to groundwater flooding, subject to verification by the ground investigation and hydrogeological assessment in the ES.

Burnell Avenue site

A.2.20 Burnell Avenue site is also underlain by superficial deposits of Kempton Park Gravel Member (sand and gravel) in the north-east of the site, with Alluvium (clay, silt, sand and peat) located in the south-west of the site below the River Thames. No BGS boreholes are located in Burnell Avenue site. Burnell Avenue site is located in a Low Groundwater Vulnerability Zone and is not located in a groundwater Source Protection Zone. According to the Richmond upon Thames SFRA, the superficial deposits in Burnell Avenue site have 25-50% susceptibility to groundwater flooding.

Hydrological features and site drainage

A.2.21 Mogden STW, Ham Playing Fields and Burnell Avenue sites are all located in the London Water Resource Zone.

Mogden STW site

A.2.22 The Duke of Northumberland's River is an artificial Main River that runs through the centre of Mogden STW site. This river diverts water from the River Crane near a park called Kneller Gardens in Twickenham, to the north where it enters Mogden STW near Mogden Lane in the south of the site. This river then flows north through Mogden STW via a culvert to exit the site adjacent to Oak Lane. The river subsequently flows north and then east to discharge into both the ornamental ponds at Syon Park and the tidal River Thames near Isleworth Ait. The River Crane and River Thames are located approximately 520m and 860m to the east of the site respectively.

A.2.23 The Whitton Brook is located approximately 50m to 100m to the south and west of the draft Order limits on Rugby Road. This drains to the south and east and flows into the River Crane at the Cole Park Allotments. Since flows are directed away from Mogden STW site, it does not present a flood risk to the area.

A.2.24 The majority of sewers, pipes and channels located in Mogden STW site are linked to treating and transferring foul water around the existing Mogden STW site. Surface water from impermeable areas on-site is drained through road gullies and manholes. This is shown on the topographical surveys provided in Annex A1. for the areas of development on-site. The rest of the site is expected to drain according to its topography, with surface water runoff flowing in a general south-easterly direction, along with some infiltration of surface water in the areas of green space.

Ham Playing Fields site

A.2.25 The tidal River Thames is located approximately 130m north of the Main Work Area at Ham Playing Fields site and immediately north of the Support Work Area. The Thames flows north and then east after Teddington Weir through London before discharging into the North Sea. The River Thames flows in two channels around Eel Pie Island adjacent to the site, with the nearest channel having a width of 44m. When the channels converge after the island, the active river channel width is 111m, which reduces to 76m downstream by Ham Street Car Park. No other watercourses are located within the immediate vicinity of the site.

A.2.26 A 1.35m to 1.55m diameter foul water sewer runs across the site between the north-west site boundary and the south-west site boundary (Annex C1.). No other sewers are located on-site.

A.2.27 The area (excluding Ham Street Car Park) is predominantly greenfield playing fields, and so the site is expected to drain according to its topography towards the tidal River Thames, with some surface water also expected to infiltrate into the ground.

Burnell Avenue site

A.2.28 The River Thames is immediately south of the Burnell Avenue site and flows from south-east to north-west. The River Thames' total width in this location ranges from 77m to 95m. Teddington Weir is located approximately 40m downstream of the site. Teddington Weir marks the river's usual tidal limit and restricts most of the tidal events upstream. No other watercourses are located within the immediate vicinity of the site.

A.2.29 The existing stormwater and highways drainage systems manage surface water runoff along Burnell Avenue, Dysart Avenue, Beaufort Road and Dukes Avenue into the area's surface water sewer system. There is a 3.3m diameter surface water sewer that runs north-east to south-west across the site from a path to the south-east of Burnell Avenue site to the River Thames where it discharges through a flapped outfall (Annex C1.). No other sewers are located on-site, although it is unknown if the gullies on Burnell Avenue discharge into the 3.3m diameter surface water sewer or if there are any highway drains that run across the site. This would be investigated before construction is undertaken.

A.2.30 The Burnell Avenue site is greenfield, so the site is expected to drain according to its topography towards the River Thames, with some surface water also expected to infiltrate into the ground.

Project summary

Mogden STW site

A.2.31 The construction phase works at Mogden STW site would be located in both the east and the west of the site.

A.2.32 In the east of the site (Eastern Work Area), the proposed above ground development includes, but is not limited to, a new TTP in the south-eastern area of the site, alongside supporting infrastructure including an interception shaft and surrounding hardstanding, a supporting substation, an administration building, a wastewater returns pumping station, chemical storage tanks and associated ancillary infrastructure.

A.2.33 In the Western Work Area of the site, a drive shaft and tunnelling compound has been proposed. Below ground infrastructure includes the newly proposed recycled water conveyance tunnel, which leaves Mogden STW site in the east. Additionally, the Western Work Area is expected to include TBM gantries, a storage/laydown area, an area to hold TBM greases, tunnel walkways, brackets, ventilation ducting, cables, substation area, mechanical and electrical (M&E) plant (compressors, cooling water etc), electrical/mechanical workshops, material and waste stores, pipework storage area, a tally hut, tunnel sleepers, rails, a grout batching area, an office and welfare facilities. The construction layout is expected to be refined as the plans progress.

A.2.34 The draft Order limits likely include the southern entrance near the Mogden Lane roundabout as well as the exit via Oak Lane to the north of the site. This would enable Heavy Goods Vehicle (HGV) access during the construction phase and may require removal of some street furniture to allow passing of HGVs. South of Mogden STW site, additional temporary works have been proposed along Rugby Road and Whitton Road to Chertsey Road to manage access during the construction phase. All works would be restored to existing condition at the end of construction.

A.2.35 During operation, the permanent infrastructure would be limited to the Eastern Work Area and would comprise the operation and maintenance of the TTP and supporting infrastructure described in A.2.32.

Ham Playing Fields site

A.2.36 The proposed above ground development within the Main Work Area during the operational phase would comprise of concrete caps to cover the intermediate shaft. The caps would be positioned below ground surface where practicable to minimise impacts on current use of the land. Reinstatement would be done to match the existing site as far as practicable, with access hatches for future maintenance. The hatches serve as an access shaft during construction and a future inspection point for the new recycled water conveyance tunnel between the new TTP and the proposed outfall upstream of Teddington Weir. The dimensions of these will be approximately 2m by 2m each. The shaft is necessary to provide acceptable access spacing to the conveyance tunnel between Mogden STW site and the reception shaft when undertaking future inspections and maintenance.

A.2.37 Prior to achieving the above, the Ham Playing Fields site would feature a construction phase works site layout which, at the Main Work Area, would likely include a muck bay, segment storage, a laydown area, welfare facilities,

temporary public parking, site access, topsoil storage, waste and COSHH area, a sub-station, a compressor and M&E containers. The construction layout is expected to be refined as the plans progress.

A.2.38 The draft Order limits include a corridor 5m into the river for a surface water discharge connection at the Support Work Area as well as an additional section to connect to the Main Work Area (immediately south) during the construction phase.

A.2.39 South of the Main Work Area, the scope of above-ground works encompasses Riverside Drive to facilitate HGV access. It is proposed that some street furniture would be removed, and the road would be widened to accommodate HGVs during the construction period. All temporary works would be restored to existing conditions following the completion of the construction phase.

Burnell Avenue site

A.2.40 The proposed above ground development during the operational phase at the Burnell Avenue site in the north-west of the site would comprise an access cover (1.7m x 1.7m) above the connection shaft for the tunnels below. The recycled water conveyance tunnel enters the reception shaft before it discharges from the outfall into the River Thames.

A.2.41 There are two options for a proposed outfall: the bankside option located on the bank of the River Thames; and the near bankside in-river submerged discharge option, located slightly further into the River Thames. These would both be approximately 180m upstream of the Teddington Weir. The recycled water conveyance tunnel enters the reception shaft before it discharges from the outfall into the River Thames.

A.2.42 In the south-east of the site, the proposed above ground development during the operational phase would comprise infrastructure to abstract river water including:

a. An intake buried into the riverbank of the River Thames and associated infrastructure
b. An access route
c. An access cover (1.7m x 1.7m) above the connection shaft
d. A building housing the Burnell Avenue site control equipment
e. A footpath diverted around the intake

A.2.43 In the Southern Work Area of the Burnell Avenue site, a corridor has been proposed for diverting public rights of way around the main worksite. In the Western Work Area, a corridor for UK Power Networks diversion connection, as well as routes for cyclists and pedestrians, has been proposed. The construction layout is expected to be refined as the plans progress.

A.2.44 To achieve the above intake and outfall operation design, the construction phase proposed the following on-site features: a car park, a crawler crane, a muck bay, a pipe storage and laydown area, a power generator, a site cabin

office, a site cabin welfare unit, a slurry centrifuge process unit, a temporary access road, a TBM control cabin and a waste skip. Potential two cofferdams would likely also be located in the River Thames around the locations for the proposed outfall and intake.

A.2.45 The above ground works also extend to include the wider highways network in order to facilitate HGV access to the Burnell Avenue site during the construction phase. Specifically, the extent covers Beaufort Road, Burnell Avenue, Dysart Avenue, and limited areas of Dukes Avenue, Tudor Drive and Richmond Road (A307). The primary changes expected in this area involve modifications to street furniture to accommodate HGV routes which would be restored to existing conditions once construction is completed.

Below ground infrastructure

A.2.46 The below ground infrastructure includes the raw water pipeline intake to the TLT via a connection shaft.

A.2.47 Assessments undertaken in this PEI Report assume two potential options for the TLT connection:

a. Burnell Avenue adit – Connection to the TLT directly from the connection shaft via a sprayed concrete lining adit, excavated from the base of the shaft, extending for about 70m in a south-easterly direction. The adit would have an internal diameter of approximately 3.5m.

b. Tudor Drive connection – This is an alternative option for the TLT connection. This option would involve pipe jacking a conveyance pipeline approximately 500m in length with an internal diameter of 2.2m from the connection shaft at Burnell Avenue site to the Tudor Drive site. There is potential to connect either directly to the existing TLT shaft or via a new TLT connection shaft.

A.2.48 The proposed below ground infrastructure is expected to consist of a new recycled water conveyance tunnel that runs below each of the above ground sites for approximately 4.2km. The route would run from Mogden STW site to the south-east with the tunnel passing below the River Crane and the River Thames. There would be shafts connecting into the tunnel at each above ground site, with a drive shaft and interception shaft in Mogden STW site, an intermediate shaft at Ham Playing Fields site, a reception shaft and connection shaft at Burnell Avenue site and the alternative TLT connection shaft at Tudor Drive site.

A.2.49 Any structures located underground have been screened out of this FRA since they are not expected to affect flood risk. The exception to this is that the underground structures may have an impact on groundwater displacement or movement, and this could potentially affect groundwater flood risk. A Phase Two Ground Investigation is expected to be completed in summer 2025 and will provide further information with regard to the below ground environmental and geological conditions. This is expected to recommend any mitigation that would be required for managing the risks presented by groundwater, both to the proposed infrastructure through design, as well as managing any potential

groundwater effects elsewhere if groundwater is displaced or groundwater movement is altered.

A.2.50 The tunnel is not expected to affect any of the existing above ground structures such as flood defences. The mitigation for this is outside the scope of this FRA and will be considered in Chapter 10: Ground Conditions and Contaminated Land.

A.2.51 The proposed drawings are included in Annex D1.

A.3 Planning policy

National policy

National Planning Policy Framework (NPPF)

A.3.1 The NPPF (MHCLG,2024) sets out the planning policies for England and details how these are to be applied. This includes policies that enable the planning system to *'take full account of flood risk and climate change'*. All plans should apply a sequential, risk-based approach to the location of the development, including applying the Sequential Test and Exception Test where developments are located in areas with a higher flood risk. Where it is necessary for development to be located in areas at flood risk, the development should be accompanied by an FRA, which will need to demonstrate that:

a. Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location.

b. The development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment.

c. The development incorporates Sustainable Drainage Systems (SuDS), unless there is clear evidence that this would be inappropriate.

d. Any residual risk can be safely managed.

e. Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

A.3.2 In summary, this policy requires that development in areas of flood risk should be safe for the lifetime of the development without increasing flood risk elsewhere. Major developments should also incorporate SuDS unless there is clear evidence that this is unfeasible.

National Policy Statement for Water Resources Infrastructure

A.3.3 The National Policy Statement (NPS) for Water Resources Infrastructure (Defra, 2023a) will be used as the primary basis for examination by the Secretary of State when considering development consent applications for nationally significant water resource infrastructure projects. The NPS aims to:

a. Streamline the planning permission process for nationally significant water infrastructure projects

b. Enable new water supply infrastructure

c. Provide planning policy for applicants

A.3.4 The NPS outlines general assessment principles as well as the requirement for an Environmental Impact Assessment and accompanying ES. There are also specific flood risk assessment principles that are outlined within the NPS. Paragraph 4.7.4 of the NPS requires that a Flood Risk Assessment is prepared for applications in the following locations:

a. Flood Zones 2 and 3 (medium and high probability of river and sea flooding)

b. Flood Zone 1 (low probability of river and sea flooding) for projects of 1 hectare or greater (or where SFRAs identify land as being at increased flood risk in the future), or projects that may be subject to other sources of flooding (local watercourses, surface water, groundwater, canals or reservoirs), or where the Environment Agency has notified the local planning authority that there are critical drainage problems

A.3.5 As stated in paragraph 4.7.16 of the NPS, the Secretary of State will need to be satisfied that, where relevant:

a. The application is supported by an appropriate flood risk assessment.

b. The Sequential Test has been applied as part of site selection and, if required, the Exception Test.

A.3.6 Paragraph 4.7.17 of the NPS also outlines that the Secretary of State will also need to be satisfied that flood risk will not be increased elsewhere, and will only consider development appropriate in areas at risk of flooding where, informed by a flood risk assessment, following the Sequential Test and, if required, the Exception Test, it can be demonstrated that:

a. Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location.

b. The development is appropriately flood resistant and resilient.

c. The development incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate.

d. Any residual risk can be safely managed.

e. Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

A.3.7 For the Secretary of State to be satisfied as part of the decision-making process, section 4.7.9 of the NPS outlines that mitigation measures will be required to ensure that the development is safe from flooding and off-site receptors are not at increased risk across the proposed development's lifetime, taking into account climate change.

Planning Practice Guidance (PPG)

A.3.8 The PPG Flood Risk and Coastal Change (MHCLG, 2022) provides advice on '*how to take account of and address the risks associated with flooding and*

coastal change in the planning process'. This includes a matrix that confirms which development types are acceptable in different flood zones.

A.3.9 The proposed TTP and supporting infrastructure in Mogden STW site is located in the east of the site and is raised above ground level. This scheme component can be categorised as '*Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including* […] *water treatment works that need to be operational in times of flood'*. The flood risk vulnerability classification of this development type is 'Essential Infrastructure'.

A.3.10 The permanent infrastructure in Ham Playing Fields and Burnell Avenue sites can be categorised as 'Water transmission infrastructure and pumping stations'. The flood risk vulnerability classification of this development type is 'Water Compatible'.

A.3.11 The Project is located in Flood Zone 1 for Mogden STW site, and Flood Zones 2, 3a and 3b for Ham Playing Fields and Burnell Avenue sites. See Section A.4 Existing flood risk sources for further details. Table A.1 confirms that the essential infrastructure and water compatible development are compatible with the Flood Zones at each site.

Table A.1 PPG flood risk vulnerability and flood zone compatibility

Flood zones	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓ (Mogden STW site)	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓ (Ham Playing Fields and Burnell Avenue sites)
Zone 3a	Exception Test required	×	Exception Test required	✓	✓ (Ham Playing Fields and Burnell Avenue sites)
Zone 3b	Exception Test required	×	×	×	✓ (Ham Playing Fields and Burnell Avenue sites)

Key: ✓ - development is appropriate; × - development should not be permitted

Blue cells highlighted are related to the proposed development categories, as stated in text above.

Sequential Test

A.3.12 The Sequential Test aims to locate developments in areas at the lowest risk of flooding from any source. The proposed TTP and supporting infrastructure in Mogden STW site is deemed to be Essential Infrastructure. It is located in Flood Zone 1 in an area that is considered to be at low risk of flooding from all sources. As such, Mogden STW site is considered to satisfy the requirements of the Sequential Test to locate development in an area of low flood risk from any form of flooding for Essential Infrastructure, both now and in the future.

A.3.13 As detailed above, the proposed permanent infrastructure within Ham Playing Fields and Burnell Avenue sites is water compatible and therefore considered appropriate in Flood Zones 3a and 3b. The proposed infrastructure within Ham Playing Fields and Burnell Avenue sites cannot be located elsewhere as the objective of the Project is improvement to and upgrade of existing Thames Water abstraction, discharge, and transfer infrastructure that is connected to the River Thames and TLT. Therefore, Ham Playing Fields and Burnell Avenue sites are deemed to be compatible with the Flood Zones and the Sequential Test; and the Exception Test does not need to be applied.

Exception Test

A.3.14 The Exception Test may be required when a development cannot be located in areas at a lower risk of flooding. As described above, the Project is Essential or Water Compatible Infrastructure located in Flood Zone 1 or Flood Zone 3, so the Exception Test is not required.

Environment Agency climate change guidance

Fluvial peak flow allowances

A.3.15 The Environment Agency's climate change allowances guidance (Environment Agency, 2025a) provides information regarding the increases in peak flow rates for a range of vulnerability classifications. Mogden STW and Ham Playing Fields sites are located in the London Management Catchment, for which Table A.2 shows the anticipated changes in peak river flows. Burnell Avenue site is located in the Maidenhead and Sunbury Management Catchment, for which Table A.3 shows the anticipated changes in peak river flows. The Project has an assumed design life of 60 years and a proposed opening year of 2033, therefore climate change should be assessed up to the year 2093. The condition of the components would be reviewed at the end of their anticipated design life to determine if they can continue to operate after this time.

A.3.16 PINS '*advises that for construction phase fluvial flood risk, a sensitivity assessment is undertaken based on climate change allowances applied in the FRA for the 2020s epoch*' (PINS, 2024), which has been applied as a sensitivity test for the end of construction given that the baseline year for the underlying hydrology dates from 2017- 2023.

A.3.17 For Mogden STW site, the proposed TTP and supporting infrastructure is 'Essential Infrastructure' in Flood Zone 1 in the London Management

Catchment. Therefore, the higher central climate change allowance of 27% should be applied for the operational phase in the 2080s epoch and 14% should be applied for the construction phase in the 2020s epoch as a sensitivity assessment.

A.3.18 Appendix 2 of the Scoping Opinion (PINS, 2024) states:

'*If the development were to be classed as essential infrastructure, then the higher central climate change allowance should be used (70th percentile) as well as a sensitivity test for the credible maximum scenario which in this case would be the upper climate change allowance for fluvial (95th percentile) or the H++ scenario for tidal flood risk.*'

A.3.19 Therefore, the upper climate change allowance of 54% should be applied to Mogden STW site for the operational phase as a sensitivity test.

A.3.20 For Ham Playing Fields site, the proposed permanent infrastructure is 'Water Compatible' in Flood Zone 3 in the London Management Catchment. Therefore, the central climate change allowance of 17% should be applied for the operational phase in the 2080s epoch and 10% should be applied for the construction phase in the 2020s epoch as a sensitivity assessment.

A.3.21 For Burnell Avenue site, the proposed permanent infrastructure is 'Water Compatible' in Flood Zones 2 and 3 in the Maidenhead and Sunbury Management Catchment. Therefore, the central climate change allowance of 35% should be applied for the operational phase in the 2080s epoch and 14% should be applied for the construction phase in the 2020s epoch as a sensitivity assessment.

Table A.2 London Management Catchment peak river flow allowances

Year	Central	Higher central	Upper
2020s	10% (Ham Playing Fields site - construction sensitivity test)	14% (Mogden STW site - construction sensitivity test)	26%
2050s	7%	14%	30%
2080s	17% (Ham Playing Fields site - operation)	27% (Mogden STW site - operation)	54% (Mogden STW site - operation sensitivity test)

Blue cells highlighted are related to the proposed development categories, as stated in text above.

Table A.3 Maidenhead and Sunbury Management Catchment peak river flow allowances

Year	Central	Higher central	Upper
2020s	14% (Burnell Avenue site - construction sensitivity test)	19%	32%
2050s	17%	25%	45%
2080s	35% (Burnell Avenue site - operation)	47%	81%

Blue cells highlighted are related to the proposed development categories, as stated in text above.

Sea level rise

A.3.22 In addition to peak river flows, sea levels are also expected to increase with climate change. The climate change allowances guidance (Environment Agency, 2025a) provides information regarding the sea level rise expected in different areas of England. Table A.4 shows the anticipated changes in sea level for the South East of England. If the higher central allowances are applied, and if the upper end allowances are applied in sensitivity testing. This does not affect Mogden STW site due to the tidal flood defences along the River Crane (see flood defences section under Section A.4 and the Thames Estuary 2100 Plan (Defra and Environment Agency, 2023) in A.3.27).

Table A.4 South East sea level allowances

Year	Higher central annual sea level rise (mm)	Higher central total sea level rise for epoch (mm)	Upper end annual sea level rise (mm)	Upper end total sea level rise for epoch (mm)
2000 to 2035	5.7	200	6.9	242
2036 to 2065	8.7	261	11.3	339
2066 to 2095	11.6	348	15.8	474
2096 to 2125	13.1	393	18.2	546
2000 to 2125 (total)	-	1,200	-	1,600

Peak rainfall allowances

A.3.23 Increased rainfall levels must also be considered, in line with the climate change allowances guidance (Environment Agency, 2025a), to assess the potential for an increase in surface water runoff. Table A.5 shows the anticipated changes in peak rainfall intensity for Mogden STW and Ham Playing Fields sites in the London Management Catchment, while Table A.6 shows the anticipated changes in peak rainfall intensity for Burnell Avenue site in the Maidenhead and Sudbury Management Catchment.

A.3.24 The Project has a lifetime of 60 years so the upper end allowance in the 1% Annual Exceedance Probability (AEP) should be reviewed with the central allowance used for the 2070s. The 'upper end' climate change allowance of 35% should be used for the 3.3% annual exceedance rainfall events, while a climate change allowance of 40% should be used for the 1% annual exceedance rainfall events for all sites.

Table A.5 London Management Catchment peak rainfall allowances

Year	3.3% Annual exceedance rainfall event		1% Annual exceedance rainfall event	
	Central allowance	Upper end allowance	Central allowance	Upper end allowance
2050s	20%	35%	20%	40%
2070s	20%	35%	25%	40%

Blue cells highlighted are related to the proposed development categories, as stated in text above.

Table A.6 Maidenhead and Sunbury Management Catchment peak rainfall allowances

Year	3.3% Annual exceedance rainfall event		1% Annual exceedance rainfall event	
	Central allowance	Upper end allowance	Central allowance	Upper end allowance
2050s	20%	35%	20%	40%
2070s	25%	35%	25%	40%

Blue cells highlighted are related to the proposed development categories, as stated in text above.

Regional and local policies

A.3.25 All the sites are located within the regional area of London. Mogden STW site is located in the administrative area of the London Borough of Hounslow, Ham Playing Fields site is located in the London Borough of Richmond upon Thames, while Burnell Avenue site is located in the Royal Borough of Kingston upon Thames and the London Borough of Richmond upon Thames. The policies reviewed in this section have been used to assess the flood risk for the Project.

The London Plan

A.3.26 The London Plan (Greater London Authority, 2021) sets out the economic, environmental, transport and social framework for how London should be developed over the next 20 to 25 years. The policies set out in the plan should inform the planning application decisions across London with each borough's Local Plan being in 'general conformity' with the London Plan. The key policies relevant to this FRA are Policy SI 12 Flood risk management and Policy SI 13 Sustainable drainage.

TE 2100 Plan

A.3.27 The Thames Estuary 2100 or TE2100 (Defra and Environment Agency, 2023)is a strategic plan for adapting to rising sea levels in the estuary, with three main aims:

a. Take an adaptive approach to manage tidal flooding and create climate resilient communities

b. Protect and enhance the value of the Thames, its tidal tributaries and floodplain. Deliver social, cultural and commercial benefits for communities and support resilient growth

c. Tackle the climate and nature crises by putting sustainability at the heart of this plan. Restore ecosystems, reduce carbon emissions, and deliver environmental and biodiversity net gain

A.3.28 The TE2100 plan (Defra and Environment Agency, 2023) is being developed to set out how the Environment Agency and their partners can work together to manage tidal flood risk until 2100. This plan covers the Thames Estuary from Teddington to the mouth of the estuary at Shoeburyness and Sheerness. This plan will be used to ensure the current standards of protection are maintained or improved while accounting for the effects of climate change. The plan has three phases of activity:

a. Phase 1 (2010 – 2035): This phase will maintain defences and establish the visions for future adaptation

b. Phase 2 (2035 – 2050): This phase will reshape riversides and deliver wider benefits

c. Phase 3 (2050 – 2100): This phase will put in place the preferred option for the Thames Barrier by 2070 and look to make further upgrades to flood defences before the year 2100

A.3.29 There are currently seven end-of-century options being considered for the future flood defence system:

a. Upgrade the Thames Barrier only

b. Flood storage and upgrade the Thames Barrier

c. New barrier with a single set of gates in Gravesend Reach

d. New barrier with a single set of gates in Long Reach

e. New barrier with second set of gates and locks in Gravesend Reach

f. New barrier with second set of gates and locks in Long Reach

g. Convert existing Thames Barrier by adding second set of gates and locks

A.3.30 The decision on the options is expected to be made by 2040 (Defra and Environment Agency, 2023).

River Thames Scheme

A.3.31 The River Thames Scheme (Environment Agency, 2024b) would reduce the risk of flooding to thousands of homes, businesses and vital infrastructure while

unlocking the economic, health and environmental benefits of the river between Egham and Teddington and responding to the challenges of climate change and nature recovery.

A.3.32 The River Thames Scheme represents a new landscape-based approach to creating healthier, more resilient, and more sustainable communities. The scheme will create new areas of green and blue open space with recreational facilities and a nature recovery network and provide sustainable travel connections to link communities together. Consideration of the impacts of this scheme on the flood risk of these sites are provided in paragraph A.4.75.

Estuary Edges guidance

A.3.33 The Estuary Edges guidance (The Thames Estuary Partnership, 2023) '*outlines some methods and principles that have been used to reverse the impacts of encroachment and/or soften banks in urban estuaries through clever reconstruction or refurbishment techniques which add value to the development potential of the site*'. It does so through 17 'high level' design principles with an evidence base from 17 sites throughout the Thames Estuary. This can be used for developing sites adjacent to the Thames Estuary.

A.3.34 None of the project sites will encroach on the Thames Estuary since Mogden STW site is topographically removed from the River Thames, Ham Playing Fields site is located over 90m to the south of the Thames Estuary and Burnell Avenue site is located upstream of the Thames Estuary.

London river health guidance

A.3.35 This guidance (Greater London Authority, 2025) outlines the water quality impacts of rivers in London with an overview of the causes. This can be considered in the water quality and water quantity of surface water runoff for the Project.

London Borough of Hounslow (Mogden STW site)

London Borough of Hounslow Local Plan 2015-2030

A.3.36 The Local Plan for the London Borough of Hounslow was adopted on 15 September 2015 and sets out the planning framework for this borough until 2030. The key objective that is relevant to flood risk management for this Project is Policy EQ3 (Flood Risk and Surface Water Management) which sets out the borough's approach to reducing flood risk and managing surface water runoff sustainably. Also relevant to this Project is Policy GB5 (Blue Ribbon Network) which includes the Duke of Northumberland's River and aims to protect and enhance the borough's rivers and waterbodies, including the multifunctional roles the waterbodies provide for managing flood risk.

Draft Hounslow Plan 2020-2041 (Regulation 19)

A.3.37 The Draft Hounslow Plan Policy EQ3 (Flood Risk and Surface Water Management) outlines the approach of the London Borough of Hounslow to

managing flood risk. This specifies that developments will be located appropriately, incorporating any necessary flood resistance and resilience measures that may be deemed required for the lifetime of the development. Additionally, they will be designed so as to not increase flood risk elsewhere and surface water will be managed by an increased emphasis on sustainable drainage.

A.3.38 It is proposed that Policy EQ3 will be achieved by applying strategic recommendations of the West London SFRA (2018), or superseding document, when considering development proposals. This is in addition to applying the Sequential Test, the Exception Test, promoting opening up river corridors and increasing floodplain connectivity as well as working with partners and defence owners to ensure that flood defences are raised to meet the requirements of the TE2100 Plan (Defra and Environment Agency, 2023).

A.3.39 Policy GB5 (Blue Ribbon Network) outlines the London Borough of Hounslow's objective to protect and enhance the borough's Blue Ribbon Network, recognising the multifunctional role that rivers, canals and other waterbodies play and their potential to contribute to nature recovery and the borough's regeneration.

A.3.40 It is proposed that Policy GB5 will be achieved by assessing proposals for development within, over or adjacent to waterbodies for their impact on the waterbody, waterside environments and navigation. The London Borough of Hounslow aims to promote enhancement of the river environment and will protect and prioritise water-related uses and infrastructure that support the active use of the Blue Ribbon Network. Improved access and connectivity to and along waterways will be promoted and aquatic and riverside environments will be protected and enhanced. Through the naturalisation of rivers and other appropriate measures, the London Borough of Hounslow also aims to promote the improvement of water quality across the Blue Ribbon Network.

West London Strategic Flood Risk Assessment (2018) and West London Strategic Flood Risk Assessment Level 1 (2024 Hounslow Update) (2024)

A.3.41 The West London Boroughs, including Hounslow, produced a joint Level 1 SFRA in 2018 with an update in 2024. This SFRA provides a strategic overview of the risks of flooding from all sources throughout the West London administrative areas and steers developments away from areas with the highest flood risk, as well as recommending policies and appropriate levels of mitigation.

A.3.42 In addition to using the Environment Agency's published extents of Flood Zones 2 and 3, the West London Boroughs define Flood Zones 3a and 3b as per the below:

a. Flood Zone 3a is defined as:
    i. Land within Environment Agency modelled fluvial flood risk extents for up to and including 1% AEP event

ii. Land within Environment Agency modelled tidal flood risk extents for up to and including 0.5% AEP event

iii. Land within Environment Agency modelled surface water flood risk extents for up to and including 1% AEP event

b. Flood Zone 3b (functional floodplain) is defined as:

i. Land within the Environment Agency modelled fluvial and tidal flood risk extents for up to and including 3.3% AEP event, considering the impact of flood defences

ii. Land included in the Environment Agency's flood storage areas

iii. The Flood Zone 3b definition in this SFRA excludes surface water flood risk, but Section 5 of the SFRA suggests that boroughs should consider the implementation of further surface water flood risk mitigation requirements for developments proposed within Flood Zone 3a (surface water) and the 3.3% AEP risk of flooding from surface water mapped extent.

A.3.43 A site-specific FRA is required for the Project as per paragraph A.1.2 and consideration of London Borough of Hounslow's definition of Flood Zone 3b as per paragraph A.3.42b.

London Borough of Hounslow (2024a) SFRA Level 2 and London Borough of Hounslow (2024b) SFRA Level 2 – Fluvial and Surface Water Assessment

A.3.44 A Level 2 SFRA is a detailed assessment of all flood risk sources for specified sites requiring targeted assessment. These sites may have been designated by the local planning authority or identified following the Level 1 SFRA if the site is in a flood risk area. However, Mogden STW site in this FRA has not been assessed in this Level 2 assessment.

A.3.45 It is noted that the national flood risk assessment (NaFRA) (Environment Agency (2025d) was recently released in March 2025 with new surface water flood extents and other flood mapping relevant to planning. These recent data are still in consideration by the London Borough of Hounslow but are likely to supersede the risk of flooding from surface water data referred to in the Hounslow SFRA. No supplementary guidance to the SFRA has been released after the issue of NaFRA in March 2025. However, the recent NaFRA outputs have been considered to refer to the latest available data when completing this FRA as a precautionary approach

London Borough of Hounslow (2011) Preliminary Flood Risk Assessment

A.3.46 The Hounslow SFRA should be read in conjunction with the Preliminary Flood Risk Assessment (PFRA). The PFRA is a high level screening exercise to determine whether there is a local flood risk within the Lead Local Flood Authority (LLFA) area, based on historic and potential future flood risk. This document only reviews flood risk sources which are the responsibility of the LLFA, including surface water, groundwater and ordinary watercourses. A PFRA Addendum was produced by the London Borough of Hounslow Council in 2017 (London Borough of Hounslow, 2017) to update the PFRA report.

London Borough of Hounslow (2022) Local Flood Risk Management Strategy

A.3.47 The Local Flood Risk Management Strategy sets out how the Risk Management Authorities (RMAs), residents and businesses in Hounslow plan to work together to manage the risk of flooding, as well as detailing the borough's local flood risk objectives.

London Borough of Richmond upon Thames (Ham Playing Fields and Burnell Avenue sites)

London Borough of Richmond upon Thames (2018) Local Plan; and London Borough of Richmond upon Thames Publication Draft (Regulation 19) Local Plan (2023)

A.3.48 The Local Plan for the London Borough of Richmond upon Thames was adopted in July 2018 and sets out the planning framework for this borough until 2033, or until another plan supersedes it. The key objective that is relevant to flood risk management for the Project is Policy LP 21 (Flood Risk and Sustainable Drainage), which sets out the borough's approach to managing flood risk and surface water runoff sustainably. Also relevant to this Project is Policy LP 18 (River Corridors) due to the development's proximity to the River Thames and Policy LP 23 (Water Resources and Infrastructure) due to consideration of the surface water sewerage system's capacities.

A.3.49 London Borough of Richmond upon Thames has since produced a draft Local Plan (Regulation 19) which was submitted to the Secretary of State for independent examination in public by a Planning Inspector in January 2024. The key policy relevant to this FRA is Policy 8 (Flood Risk and Sustainable Drainage). Also relevant to the Project is Policy 40 (Rivers and River Corridors) due to the development's proximity to the River Thames and Policy 9 (Water Resources and Infrastructure) due to consideration of the surface water sewerage system's capacities.

London Borough of Richmond upon Thames (2021) Level 1 SFRA

A.3.50 The SFRA provides a strategic overview of the risks of flooding from all sources throughout the administrative area and steers developments away from areas with the highest flood risk, as well as recommending policies to be incorporated into the Local Plan.

London Borough of Richmond upon Thames (2011) PFRA

A.3.51 The SFRA should be read in conjunction with the PFRA. The PFRA is a high level screening exercise to determine whether there is a local flood risk within the LLFA area, based on historic and potential future flood risk. This document only reviews flood risk sources which are the responsibility of the LLFA, including surface water, groundwater and ordinary watercourses.

London Borough of Richmond upon Thames (2023) Local Flood Risk Management Strategy

A.3.52 The Local Flood Risk Management Strategy sets out a plan for how the LLFA and RMAs, residents and businesses will work together to manage the risk of

flooding within the Richmond borough, as well as setting out the strategic objectives for the LLFA.

Royal Borough of Kingston upon Thames (Burnell Avenue site)

Royal Borough of Kingston upon Thames Local Plan

A.3.53 A new Local Plan for the Royal Borough of Kingston upon Thames is currently being prepared. This will eventually replace the Core Strategy (Royal Borough of Kingston upon Thames, 2012), which was adopted in 2012 and provides a plan for the future of the borough.

A.3.54 The Core Strategy references Policy DM4 (Water Management and Flood Risk). This states that the council will require new development to be designed to take account of the projected impacts of climate change. There will also be a need to consider development proposals in accordance with national guidance, the SFRA and related studies including the surface water management plans. Flood Risk Assessments will be required for major development proposals in Flood Zone 1 of one hectare or more and all new developments in Flood Zones 2 and 3. Development proposals are also required to include SuDS to manage and reduce surface water runoff, unless it can be demonstrated that such measures are not feasible. Development proposals are also required to demonstrate that there will be no adverse impact on the quantity or quality of water resources, and where possible, seek to improve water quality. Efficient water re-use and water conservation measures are also to be encouraged in development proposals under Policy DM4.

A.3.55 Of relevance to flood risk management for the Project from the First draft of the Local Plan Consultation (Regulation 18) 28 November 2022 - 28 February 2023 (Royal Borough of Kingston upon Thames, 2023):

a. Policy KC3 (Flood Risk), which sets out the borough's approach to managing water and flood risk sustainably

b. Policy KC4 (Sustainable Drainage), which sets out the borough's approach to ensuring developments appropriately manage surface water flood risk

c. Policy KC5 (Sustainable Wastewater Drainage), which sets out the borough's approach to ensuring developments appropriately reduce water consumption, incorporate water-efficient fixings and incorporate water re-use features, where possible

Royal Borough of Kingston upon Thames Level 1 SFRA (Metis Consultants, 2021a)

A.3.56 The Royal Borough of Kingston upon Thames' definition of Flood Zones 3a and 3b is the same as the West London Boroughs' definition, as described in A.3.41. In addition to paragraph A.1.2, the Royal Borough of Kingston upon Thames mandates the production of an FRA where major or minor developments are planned within the Flood Zone 3a (surface water) areas, as indicated by the SFRA surface water mapping.

A.3.57 The Royal Borough of Kingston upon Thames SFRA provides a strategic overview of the risks of flooding from all sources and steers developments away

from areas with the highest flood risk. The SFRA recommends policies and appropriate levels of mitigation for new development subject to different sources of flooding and levels of flooding risk (based on depth).

Royal Borough of Kingston upon Thames (2011) PFRA

A.3.58 The SFRA should be read in conjunction with the PFRA. The PFRA is a high level screening exercise to determine whether there is a local flood risk within the LLFA area, based on historic and potential future flood risk. This document only reviews flood risk sources which are the responsibility of the LLFA, including surface water, groundwater and ordinary watercourses. A PFRA Addendum was produced by the Royal Borough of Kingston upon Thames in 2017 to update the PFRA report (Royal Borough of Kingston upon Thames 2011).

Royal Borough of Kingston upon Thames Local Flood Risk Management Strategy (Metis Consultants, 2023a)

A.3.59 The Local Flood Risk Management Strategy sets out a plan for how the LLFA and RMAs, residents and businesses will work together to manage the risk of flooding within the Kingston borough, as well as setting out the strategic objectives for the LLFA.

A.3.60 Similarly to the Hounslow SFRA in A.3.46, the risk of flooding from surface water mapping referred to in the Royal Borough of Kingston upon Thames SFRAs has been suspended by the recent NaFRA outputs in March 2025. The NaFRA outputs have been considered to refer to the latest available data when completing this FRA as a precautionary approach.

A.4 Existing flood risk sources

Historic flooding

Mogden STW site

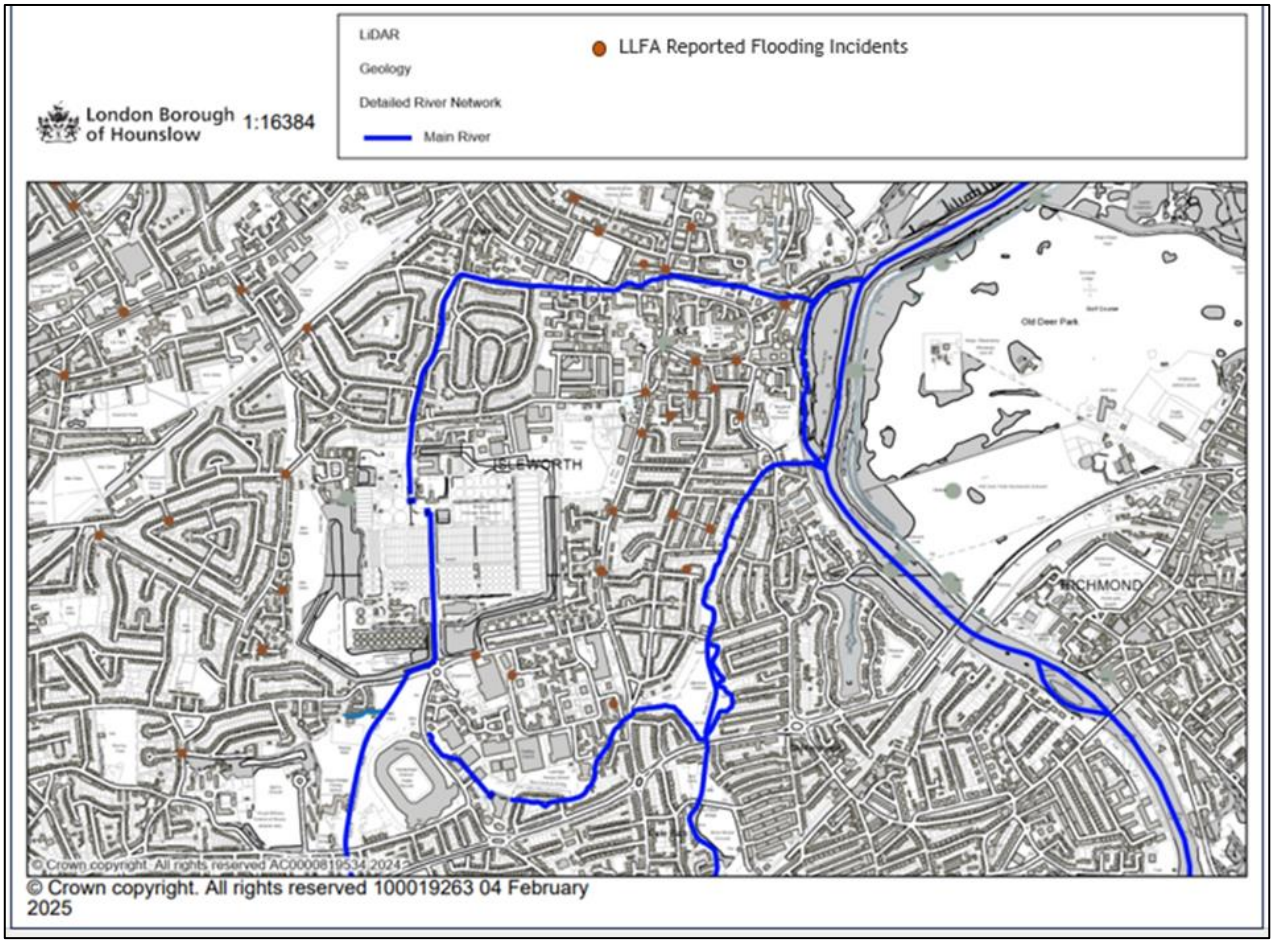
A.4.1 The Historic Flood Map (Environment Agency, 2025b) did not identify any historic flood events within Mogden STW site.

A.4.2 The London Borough of Hounslow conducted a Section 19 Flood Investigation for flash flooding in July 2021 which focused on flooding at Ferndale Avenue, 3km to the west of Mogden STW site. The Section 19 report (Metis Consultants, 2021b) indicates that Ferndale Avenue has experienced multiple flooding incidents since 2013 due to several factors, including a lack of surface water drainage. However, no surface water flooding was reported within the draft Order limits of Mogden STW site. The local planning authority has no Section 19 Flood Investigations which focus on the Mogden STW site specifically. The London Borough of Richmond upon Thames also conducted a Section 19 report (Metis Consultants, 2023b) into the same event but concluded that any flooding reported was located between Lincoln Avenue and Strawberry

Vale, and that no areas were flooded along Chertsey Road within Mogden STW site.

A.4.3 The London Borough of Hounslow Surface Water Management Plan (SWMP) (Metis Consultants 2021c) indicates that the LLFA collects flooding information and a register of historic incidents. This includes all sources of flooding and is not restricted to significant events. As per Plate A.6, the LLFA reports show no incidents in Mogden STW site.

Plate A.6 LLFA Reported flood incidents around Mogden STW site



Ham Playing Fields site

A.4.4 The Historic Flood Map (Environment Agency, 2025b) has not identified any historic flood events at the site as this only covers the freshwater reach of the River Thames. However, there is signage in the existing Ham Street Car Park and anecdotal reports indicate that the area to the north-east of the car park is liable to regular flooding on high tides.

A.4.5 The Richmond Section 19 Flood Investigation (Metis Consultants, 2023b) for a heavy rainfall event that occurred on 12 July 2021 has been reviewed following widespread flooding across the borough. The investigation focuses on 10 areas where a sufficient number of reports were received to satisfy the criteria for an investigation. No reference is made to flooding at Ham Playing Fields site.

However, this does not necessarily imply that no flood event occurred; rather, it signifies that insufficient reports were received by the borough at this location to justify investigation.

A.4.6 The London Borough of Richmond SWMP (Metis Consultants, 2021d) indicates that the London Borough of Richmond collects information on flood incidents and keeps a record of historic flood incidents. This information includes all sources of flooding and is not limited to significant incidents. The SWMP report indicates that there are no recorded flood incidents in Ham Playing Fields site. It is noted that the historic flood event in the SWMP only covers November 2020 to 30 July 2021.

A.4.7 The Thames (Datchet to Teddington) Model (Environment Agency, 2023b) predicted that the two floods inundated Ham Playing Fields site in January 2003 and February 2014, verified by local media reports at those dates. The flood extents from these events inundated parts of Ham Playing Fields site at the existing Ham Street Car Park and with a small area covering the north-westerly boundary of the Main Work Area. The rest of the site was not affected by this flood event.

Burnell Avenue site

A.4.8 The Historic Flood Map (Environment Agency, 2025b) has not identified any historic flood events at Burnell Avenue site. On the opposite bank of the River Thames from Burnell Avenue site, where proposed construction works may alter water levels, recorded flood outlines have been noted. Any flood extents recorded before the Thames Barrier became operational, such as The Great Flood of 1947 have not been considered further as they are not representative of current flood risk. As such and detailed in Table A.7, there is one historical outline recorded in 2002 which impacted one property on the opposite bank of the River Thames from Burnell Avenue site.

Table A.7 Recorded flood outlines (Environment Agency, 2025b)

Recorded flood outline ID	Start date	End date	Cause of flood
7683	23/12/2002	12/01/2003	Channel capacity exceeded (no raised defences)

A.4.9 The Thames (Datchet to Teddington) Model (Environment Agency, 2023b) shows that two flood events occurred in both January 2003 and February 2014. The flood extents from these events inundated parts of the Burnell Avenue site, including a small area along the River Thames footpath. The rest of the site was not affected by this flood event.

Fluvial and tidal flood risk

A.4.10 The Flood Zones refer to the probability of river and sea flooding, excluding the presence of defences. The risks presented by each flood zone are classified in Table A.8.

A.4.11 Paragraph 078 of the PPG 'Flood Risk and Coastal Change' (MHCLG, 2022) states that the functional floodplain is usually defined, as a minimum, as land which would naturally flood up to and including a 3.3% AEP or and that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events.

A.4.12 The PPG states that the extent of the functional floodplain, also known as Flood Zone 3b, should be defined by local planning authorities within their SFRAs. This allows for the incorporation of local circumstances and must be agreed with the Environment Agency and the boroughs' LLFAs. As such, the definition of Flood Zone 3b (functional floodplain – fluvial/tidal) for Mogden STW site provided in the West London SFRA and Ham Playing Fields site provided in London Borough of Richmond upon Thames SFRA is included in Table A.8.

A.4.13 The definition of Flood Zone 3b (functional floodplain – fluvial/tidal) for Burnell Avenue site provided in the Royal Borough of Kingston SFRA with the recommendations is included in Table A.8.

Table A.8 Environment Agency flood zone definitions (fluvial and tidal sources only) (MHCLG, 2022)

Flood Zones	Risk	Definition
Zone 1	Low	Land having a less than 0.1% Annual Exceedance Probability (AEP) of river or sea flooding.
Zone 2	Medium	Land having between 1% and 0.1% AEP of river flooding; or land having between a 0.5% and 0.1% AEP of sea flooding.
Zone 3a	High	Land having a 1% or greater AEP of river flooding; or land having a 0.5% or greater AEP of sea flooding.
Zone 3b	The Functional Floodplain	The definition of Flood Zone 3b varies for each local planning authority. Mogden STW site: Land within Environment Agency modelled fluvial and tidal risk extents predicted for up to and including 3.3% AEP, allowing for the impact of flood defences. It also includes land featured as part of the Environment Agency's flood storage areas. Ham Playing Fields site: Land within Environment Agency modelled fluvial and tidal flood risk extents predicted for up to and including 5% AEP, allowing for the impact of flood defences. It also includes land featured as part of the Environment Agency's flood storage areas. Burnell Avenue site: Land within Environment Agency modelled fluvial flood risk extents predicted for up to and including 3.3% AEP, allowing for the impact of flood defences. It also includes land featured as part of the Environment Agency's flood storage areas.

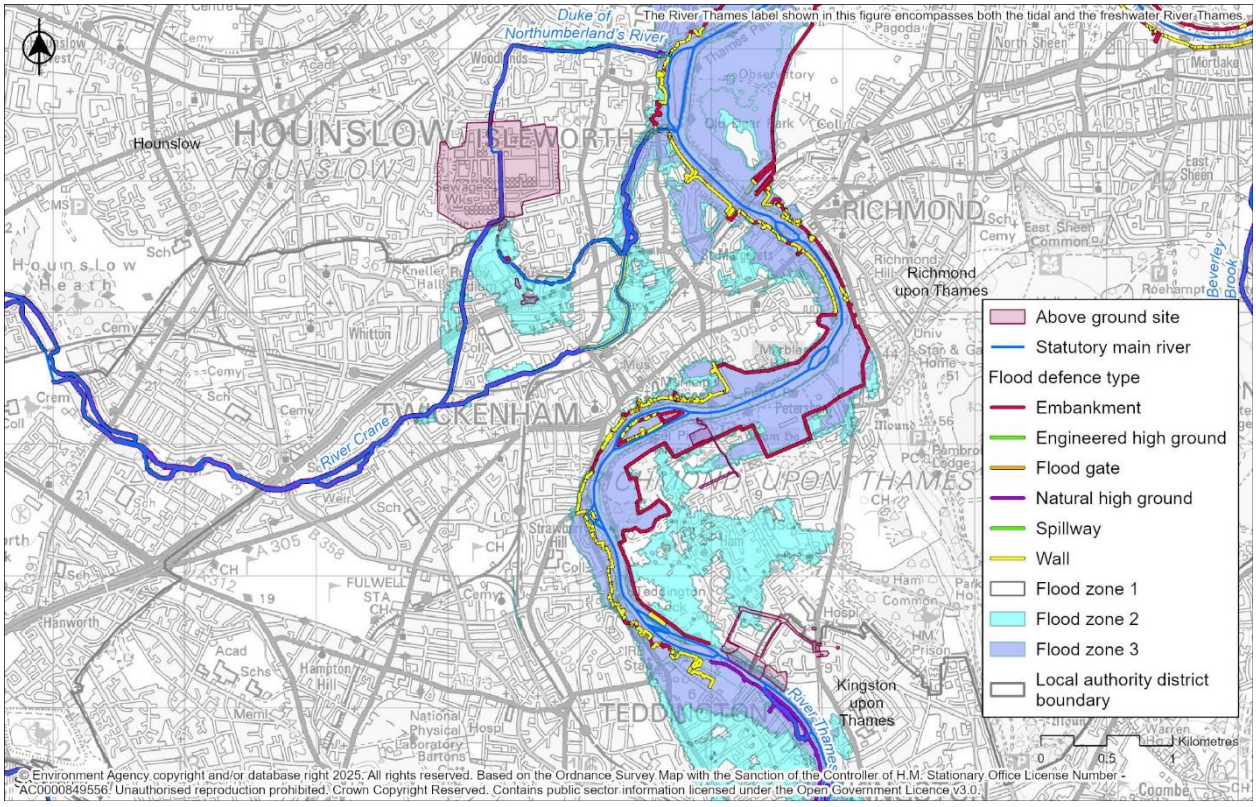
A.4.14 Outputs from the Flood Map for Planning (Environment Agency, 2025c) have been presented for each site in Plate A.7 below. A summary of the flood zone extents shown on the maps are provided below:

a. Mogden STW site is located primarily in Flood Zone 1, including the construction phase works area in the Western Work Area and the operational phase raised TTP in the Eastern Work Area. Flood Zone 3 is confined within the channel of the Duke of Northumberland's River. Flood Zone 2 is also largely confined to the channel except for a small portion of the Flood Zone 2 in the centre of Mogden STW which extends from the left bank site to affect a small area immediately adjacent to the river bank. The southern exit onto Mogden Lane roundabout and the associated construction phase highway works related to vehicle movements also fall within Flood Zone 2.

b. The Main Work Area and the Support Work Area at the Ham Playing Fields site are completely located in Flood Zone 3. South of the Main Work Area, some of Ham Street falls within Flood Zones 2 and 3, with remaining areas located in Flood Zone 1. The construction phase highway works proposed at Riverside Drive falls entirely in Flood Zone 1. The Flood Zone extents are derived from the tidal River Thames at this location.

c. The Burnell Avenue site is located in Flood Zones 1, 2 and 3. The construction phase highway works proposed at Burnell Avenue, Dysart Avenue, Beaufort Road, Dukes Avenue, Tudor Drive and Richmond Road (A307) are all in Flood Zone 1 except for the junction between Beaufort Road and Dukes Avenue. The Flood Zone extents are derived from the fluvial River Thames.

Plate A.7 Environment Agency Flood Map for Planning (2025c) showing Mogden STW site (top), Ham Playing Fields site (middle), and Burnell Avenue site (bottom)



A.4.15 A review of the hydraulic models provided from the Environment Agency Product 4 data for each site is shown in the sections below.

Mogden STW site

A.4.16 The proposed above ground development comprises the new TTP and supporting infrastructure. The infrastructure is considered 'Essential Infrastructure'.

A.4.17 The locations for the proposed infrastructure in Mogden STW site are shown on the Environment Agency Flood Map as located in Flood Zone 1. A small area of out of bank flooding in the south-central area of the site around the settlement tanks is classified as Flood Zone 2 however no development is proposed in this area. This out of bank flooding originates from the Duke of Northumberland's River.

A.4.18 The Environment Agency Product 4 data in Annex E1. have been obtained and reviewed to provide a more accurate assessment of the fluvial flood risk. Accompanying Environment Agency Product 5 and 6 data provided hydraulic model data taken from the River Crane Strategic Flood Risk Model (SFRM) (Halcrow Group Limited, 2008). For Mogden STW site, the modelled maximum water levels are based on the River Crane 2D TUFLOW model (Halcrow Group Limited, 2008).

A.4.19 The outputs in Plate A.8 shows that the Flood Zone 3 extents are contained within the Duke of Northumberland's River channel.

A.4.20 The extent of Flood Zone 2 is also primarily contained in the river channel, however, there is a small area extending out of the channel in the central south of the site, which corresponds with the Environment Agency Flood Zone 2 extents. This small area of out of bank flooding is not within the vicinity of either of the proposed work areas, as these are located in the west and east of Mogden STW site (See Annex E1.). Additionally, the small area of out of bank flooding is only estimated to reach a maximum depth of 0.01m above ground level in the River Crane SFRM (Halcrow Group Limited, 2008).

A.4.21 South of Mogden STW site, there is out of bank flooding from the Duke of Northumberland's River in the 0.1% AEP event which impacts the southern entrance for HGVs. The depth of flooding is approximately 0.35m above ground level along the roundabout in the River Crane SFRM.

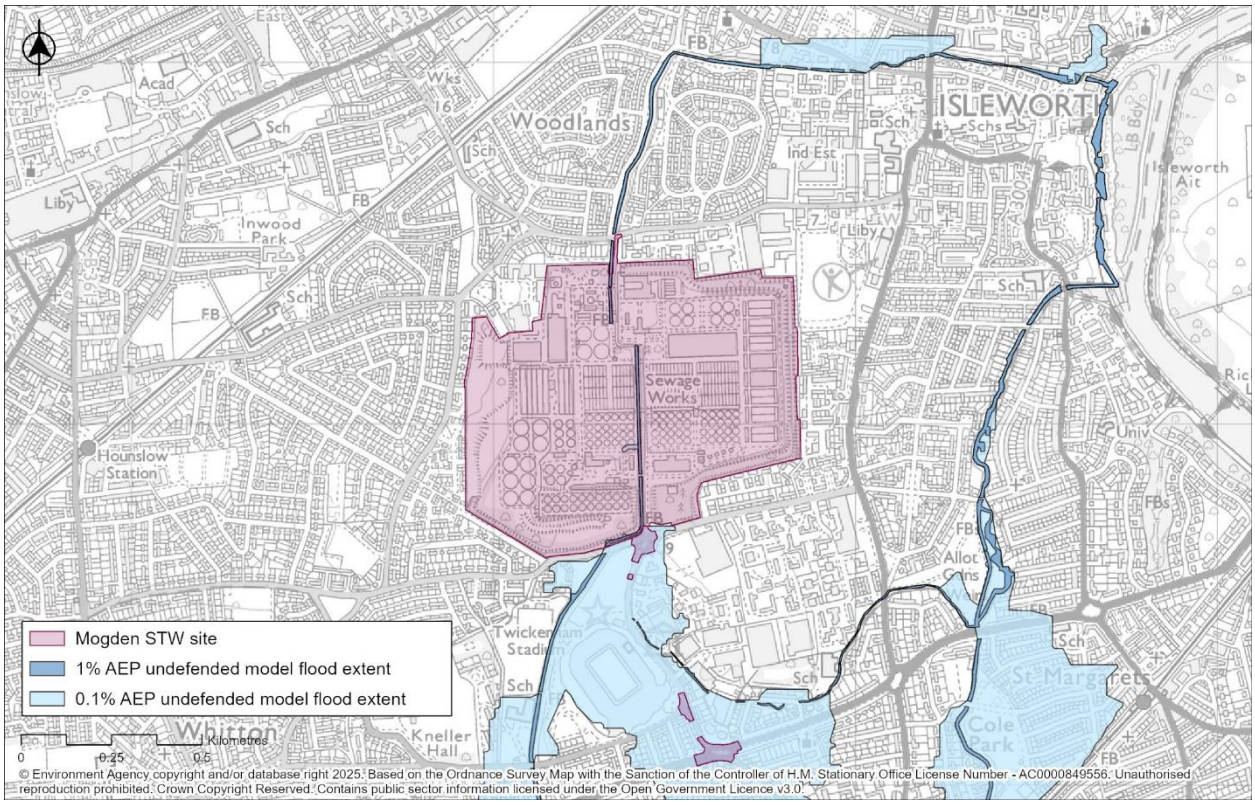
A.4.22 The Flood Zone 3 extents are contained within the Duke of Northumberland's River channel and do not impact the transport route for HGVs via the northern access to the site.

A.4.23 On the western side of the Mogden STW site, a drive shaft and construction phase works associated with a tunnelling compound has been proposed. The proposed works therefore fall under Flood Zone 1.

A.4.24 There are three additional highway works related to vehicle movements proposed as part of the construction phase to facilitate HGVs access. These

are all located between the Mogden STW site and Chertsey Road (A316). The proposed temporary works for access to Mogden STW site falls within the extent of Flood Zone 2. The River Crane SFRM (Halcrow Group Limited, 2008) has been used to determine the maximum flood depths in these areas. In the 0.1% AEP defended event, the first location, situated on Rugby Road before the Varsity Drive junction, shows flood depths of up to 0.35m. The second location, at the Rugby Road/Whitton Road junction, indicates flood depths of up to 0.52m. The final location, at the Whitton Road Roundabout, shows flood depths of up to 0.31m.

Plate A.8 Hydraulic Model Extents from the River Crane SFRM (Halcrow Group Limited, 2008) for Mogden STW site

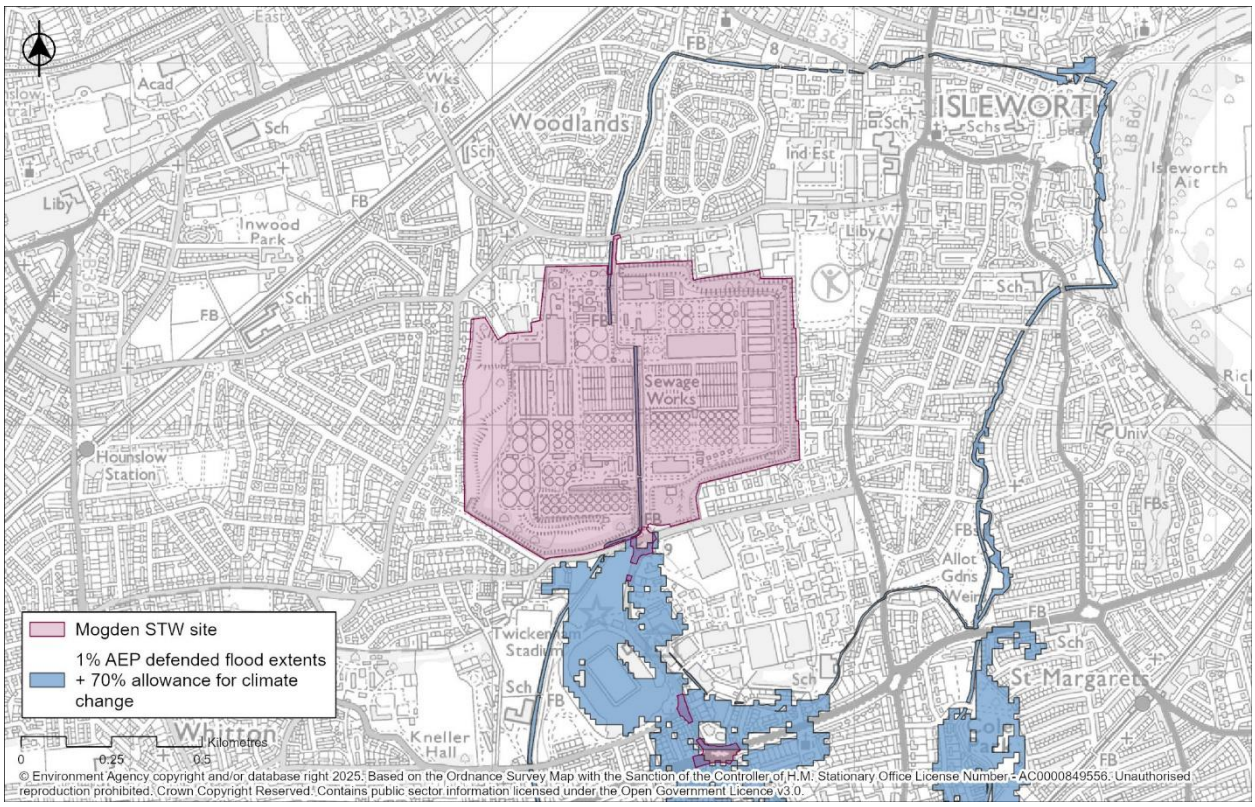


A.4.25 As described in ‘Environment Agency climate change guidance’ section under Section A.3 National Policies, the proposed TTP and supporting infrastructure is located in the ‘Essential Infrastructure’ classifications in Flood Zones 1 and 2 so the ‘central’ climate change allowance of 27% should be used, with 54% used as a sensitivity test.

A.4.26 Plate A.9 shows the Flood Zone 3 extents plus a 70% allowance for climate change, which is higher than the 54% allowance for climate change required for the sensitivity test from the upper end climate change allowance for the Operational Phase. For this climate change allowance, the Flood Zone extents are confined within the banks of the Duke of Northumberland’s River channel.

A.4.27 The River Crane SFRM (Halcrow Group Limited, 2008) hydraulic model report also states that there are automated tidal gates at the River Crane and River Thames confluence which prevent tidal inundation.

Plate A.9 Hydraulic Model Extents with a 70% allowance for climate change from the River Crane SFRM (Halcrow Group Limited, 2008) for Mogden STW site



A.4.28 The ‘upper end’ climate change allowance of 54% is also required to be reviewed to assess the flood risk to Mogden STW site from the River Thames as a sensitivity test.

A.4.29 The two nodes located at the River Crane confluence into the tidal River Thames are 2.9d and 2.9u, which both provide the same level. The modelled maximum water levels with climate change are shown in Table A.9, as extracted from the Thames (Datchet to Teddington) Model (Environment Agency, 2023b). The LiDAR levels along the Duke of Northumberland’s River channel are higher than the River Thames 1% AEP Water Level with an 84% allowance for climate change. This climate change allowance is greater than the sensitivity requirement, therefore Mogden STW site is located outside of the upper end tidal River Thames flood extents, both now and in the future.

Table A.9 Modelled maximum water levels from the Thames (Datchet to Teddington) Model

Model node	1% AEP maximum water level with an 84% allowance for climate change (m AOD)
2.9d and 2.9u	5.63

A.4.30 Therefore, the permanent proposed development within the Eastern Work Area of Mogden STW site is not expected to be affected by fluvial or tidal flooding both now and in the future.

Ham Playing Fields site

A.4.31 The locations for the proposed infrastructure in Ham Playing Fields site are shown on the Environment Agency Flood Map as located entirely in Flood Zone 3. The proposed above ground infrastructure comprises a shaft manhole and surrounding hardstanding during operation. The infrastructure is considered 'Water Compatible'. Due to the location in Flood Zone 3, Environment Agency Product 4 data have been obtained and reviewed to provide a more accurate assessment of the fluvial flood risk.

TE2100

A.4.32 The London Borough of Richmond on Thames SFRA (2021) suggested Flood Zone 3b to be defined by the tidal River Thames, River Crane and Beverley Brook 5% AEP extents. However, the 3.33% AEP flood event was taken to adopt a conservative and consistent approach with the assessment at Burnell Avenue site in this FRA.

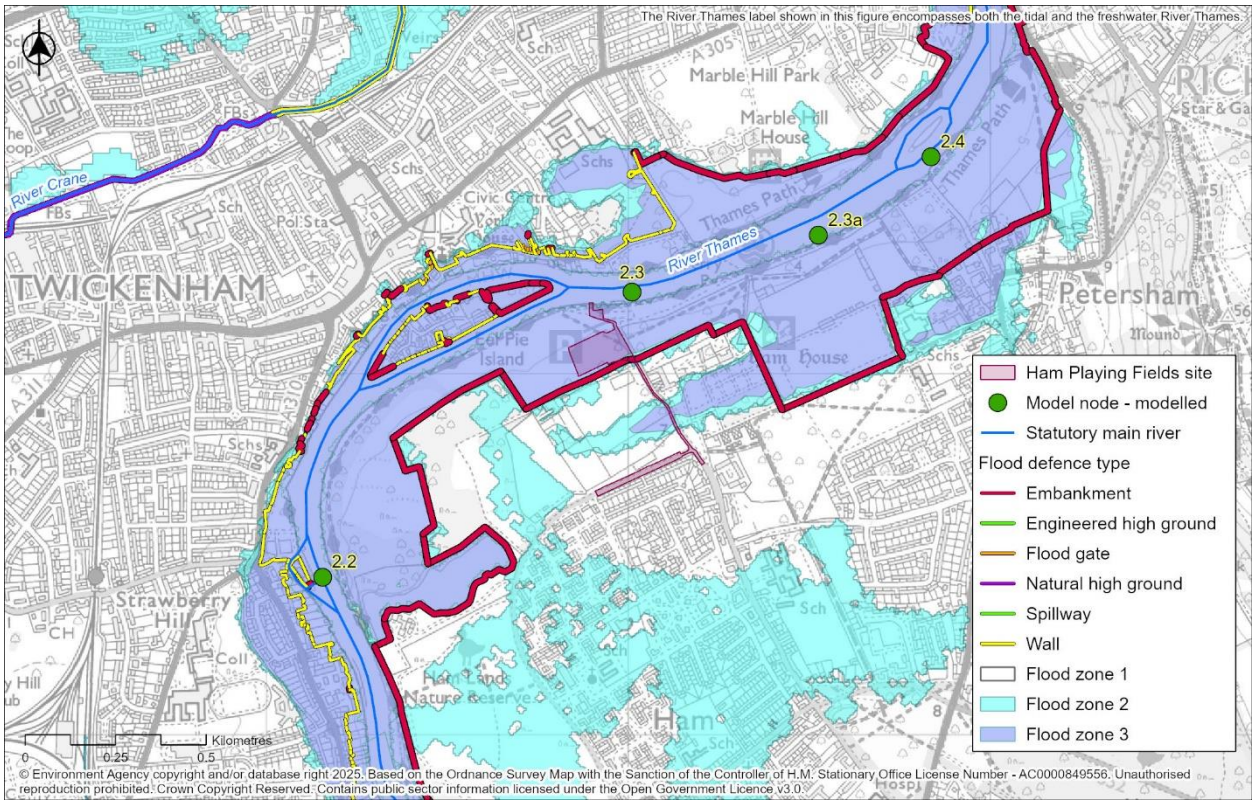
A.4.33 The flood levels shown in Plate A.10 and Table A.10 have been extracted from the TE2100 10-year review study completed in 2022 (Defra and Environment Agency, 2021). These data provide in-channel water levels that consider the operation of the Thames Barrier for future levels. The levels provide the highest water levels for the tidal River Thames that would be permitted by the operation of the Thames Barrier. If the levels are forecast to be higher, the Thames Barrier would close to block the tide and maintain the river levels to a lower level. The Thames Barrier and associated flood defences have a 0.1% AEP standard of protection.

Table A.10 Modelled maximum water levels for node 2.3 from the Thames Estuary 2100 10-year review study (Defra and Environment Agency, 2021).

Node	Modelled maximum likely water levels in 2022 (m AOD)	Modelled maximum likely water levels in 2065 (m AOD)	Modelled maximum likely water levels in 2100 (m AOD)
2.3	6.88	5.97	6.42

A.4.34 Node 2.3 was selected for assessing flood levels for this area as it is the closest node to the site. The node locations are shown in Plate A.10. The Environment Agency Product 4 data are included in Annex E1. , as well as confirmation from the Environment Agency that these defended levels should be used in the FRA.

Plate A.10 Node locations for Ham Playing Fields site from the Thames Estuary 2100 10-year review study (Defra and Environment Agency, 2021) (taken from Annex 5: Environment Agency Product 4 Data. Site location has been approximated by the Environment Agency)



A.4.35 At the Support Work Area, the existing ground slopes towards the River Thames. At this location, the topographical survey reports a minimum level of 3.73m AOD. Further south, away from the river, and towards the edge of the Support Work Area, the maximum ground level rises to 5.35m AOD. Based on the modelled maximum water levels shown in Table A.11, the Support Work Area will be flooded in all design years provided (including the present day, 2065 and 2100 scenarios).

A.4.36 At the Main Work Area, the topographical survey (Annex A1.) shows that the highest level on-site is 6.24m AOD, while the lowest level on-site is 4.84m AOD. Based on the modelled maximum water levels in Table A.11, the entire site's levels are below the modelled maximum water levels in the present day scenario and 2100 scenario, indicating that these parts of Ham Playing Fields site are susceptible to flooding during these epochs. The Support Work Area is at risk in all epochs, whilst the Main Work Area is entirely at risk in the present day scenario and 2100 scenario and largely at risk in the 2065 scenario. Ground levels rise to the south and as such, Riverside Drive is topographically removed from being at risk during all epochs. Discussions with the Environment Agency have been provided in Annex E1 to confirm the use of these defended levels and their underlying assumptions for flood risk management.

Thames (Datchet to Teddington) Model

A.4.37 The Thames (Datchet to Teddington) Model (Environment Agency, 2023b) has been considered for additional information on assessing the potential for fluvial and tidal flooding to affect Ham Playing Fields site during the construction and operational phases.

A.4.38 The Thames (Datchet to Teddington) Model maximum modelled flood extents have been presented in Plate A.11 against the Ham Playing Fields site above ground works boundary for events ranging from the 50% AEP to the 1% AEP +20% climate change allowance when it starts to bypass the flood defences to the east. The maximum modelled water levels for each event at model node 2.3 are presented in Plate A.10.

Plate A.11 Thames (Datchet to Teddington) Model defended flood extents

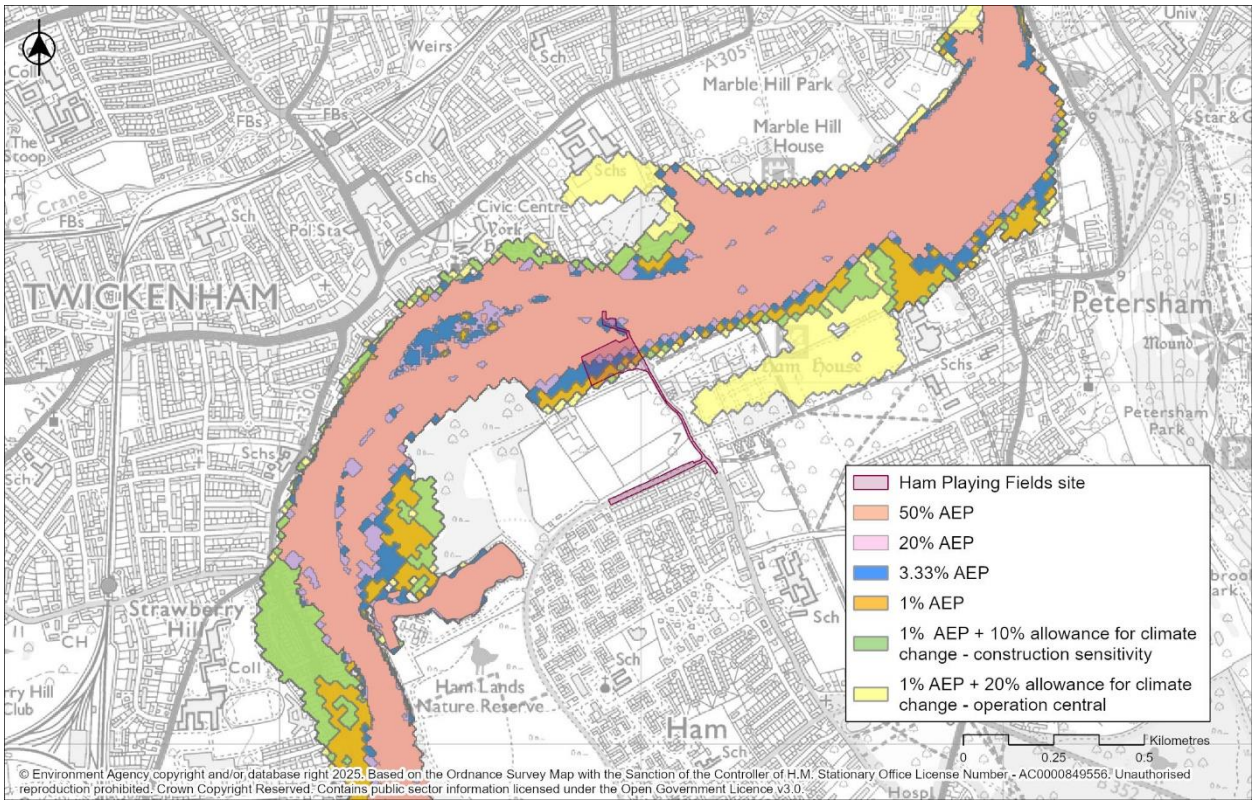


Table A.11 Defended maximum water levels for node 2.3 from the Thames (Datchet to Teddington) Model

Defended water levels (m AOD)	Modelled water levels for node 2.3
50% AEP	4.97
20% AEP	5.14
5% AEP	5.43
3.33% AEP	5.56
1% AEP	5.89
1% AEP + 10% climate change	6.04
1% AEP + 20% climate change	6.23
0.1% AEP	6.71

A.4.39 Water levels presented in Table A.12 should be considered together with at a 600mm freeboard to account for model uncertainty, subject to further refinement following more detailed flood modelling as the design develops.

A.4.40 Although Flood Zone 3b was determined as the 5% AEP for Ham Playing Fields site in Table A.8, the 3.3% AEP flood level has been used in this assessment to be consistent with Burnell Avenue site and to provide a more conservative approach to managing the flood risks for the construction phase.

A.4.41 Ground levels at the Support Work Area vary between 3.73m AOD and 5.35m AOD. As such, the Support Work Area is predicted to be partially affected during the 50% AEP, 20% AEP and 5% AEP events and entirely affected by the 3.3% AEP events and larger. Depths are predicted to range from between 0.21m and 1.83m during the 3.3% AEP event, to 0.69m and 2.31m during the 1% AEP +10% climate change event, which includes a climate change uplift allowance in line with the 2020s central allowance for the construction phase.

A.4.42 The topographical survey for Ham Playing Fields site (Annex A1.) shows that the highest level at the Main Work Area is 6.24m AOD, while the lowest level on-site is 4.84m AOD.

A.4.43 Based on the 3.33% AEP defended water levels in Table A.11, the site levels, in locations, are below the 3.33% AEP defended water level (5.55m AOD), thus indicating that the majority of the Main Work Area is susceptible to flooding with a maximum flood level of 0.71m. Consideration of the impacts of this flood risk on the Project are provided in paragraph A.5.8.

A.4.44 The Main Work Area is entirely affected in the 0.1% AEP event and almost entirely affected in the 1% AEP +10%CC and 1% AEP +20%CC events. Areas that are unaffected in the 3.3% AEP events and greater are limited to the site access area. As shown by Plate A.10, parts of Ham Street to the south of the Ham Playing Fields site are located in the 1% AEP, 1% AEP +10%CC,

1% AEP +20%CC and 0.1% AEP events. Riverside Drive remains completely unaffected during all events as topographic levels are greater than 7m AOD.

A.4.45 Whilst Ham Playing Fields site is located in Flood Zone 3 and the risk to the Main Work Area and Support Work Area is high, the permanent infrastructure is for a shaft manhole with surrounding hardstanding areas, making it a 'Water Compatible' development. Therefore, flood risk mitigation is not considered necessary.

Burnell Avenue site

A.4.46 The above ground works at Burnell Avenue site are shown as being located across Flood Zones 1, 2 and 3. Flood Zone 3 extends over the riverside footpath. Flood Zone 2 extends further into whole site, including near river areas of the Northern Work Area, the Main Work Area and the Southern Work Area. The northern limit of all the Work Areas is located in Flood Zone 1. Parts of Beaufort Road and Dukes Avenue are shown to be located in Flood Zone 2 while the wider highways network included in the above ground works extent is located in Flood Zone 1.

A.4.47 Given the location of the site in Flood Zones 2 and 3, Product 4 data have been requested and obtained from the Environment Agency (Annex E1.). These data have been reviewed to provide a more accurate assessment of the fluvial flood risk at this location.

A.4.48 The provided Product 4 data include model outputs from the Thames (Datchet to Teddington) model (Environment Agency, 2023b) for assessing fluvial flooding at Burnell Avenue site. This was developed using Flood Modeller-TUFLOW modelling software and has built on older flood models from 2019 and updated to include model improvements and the latest information of current conditions.

A.4.49 The Environment Agency Product 4 data provide both the defended and undefended modelled levels for a range of 1D nodes across the River Thames and 2D nodes across the whole site including the Northern Work Area, the Main Work Area and the Southern Work Area. The node locations are provided in Plate A.12 and Plate A.13.

A.4.50 The modelled maximum water levels are shown in Table A.12 and Table A.13. With respect to the 1D data, the largest maximum modelled flood levels will be considered from Nodes 8 and 9 to adopt a conservative approach to assessing risk at the site. Water levels presented in Table A.12 and Table A.13 should be considered together with a 600mm freeboard to account for model uncertainty, subject to further refinement following more detailed flood modelling as the design develops.

A.4.51 The outfall infrastructure is located approximately 180m downstream of the intake infrastructure. Therefore, different nodes have been used for each infrastructure group. With respect to the 2D data, node 4 has been used for the intake infrastructure since it is the nearest node that contains both the 1% AEP

and 0.1% AEP flood levels. Node 8 has been used for the outfall infrastructure since it is the nearest upstream node that contains both the 1% AEP and 0.1% AEP flood levels.

A.4.52 Since no defences are present on-site, the undefended scenario has been used (Environment Agency, 2023a).

A.4.53 As described in ‘Environment Agency climate change guidance’ section under Section A.3 National Policies, the proposed permanent infrastructure within Burnell Avenue site is located in the ‘water compatible’ classifications in Flood Zones 2 and 3 so the ‘central’ climate change allowance of 35% will be assessed for the operational phase. For sensitivity testing for the construction phase a 14% climate change allowance should be assessed.

A.4.54 Review of the Environment Agency model outputs showed they do not hold any data which include an allowance for climate change for their undefended scenario. As such, the defended levels have been reviewed and compared with the undefended levels. This shows that there is up to a 0.01m difference for the 1% AEP fluvial flood event,. Therefore, the modelled defended water levels are considered to be suitable when assessing the return periods with an uplift for climate change.

A.4.55 Flood Zone 3b is defined as a 3.3% AEP flood event, with the flood levels shown in Table A.12 and Table A.13.

Plate A.12 1D Hydraulic model node locations along the River Thames at Burnell Avenue site from the Thames (Datchet to Teddington) (Environment Agency, 2023b) Model (taken from Annex 5: Environment Agency Product 4 Data)

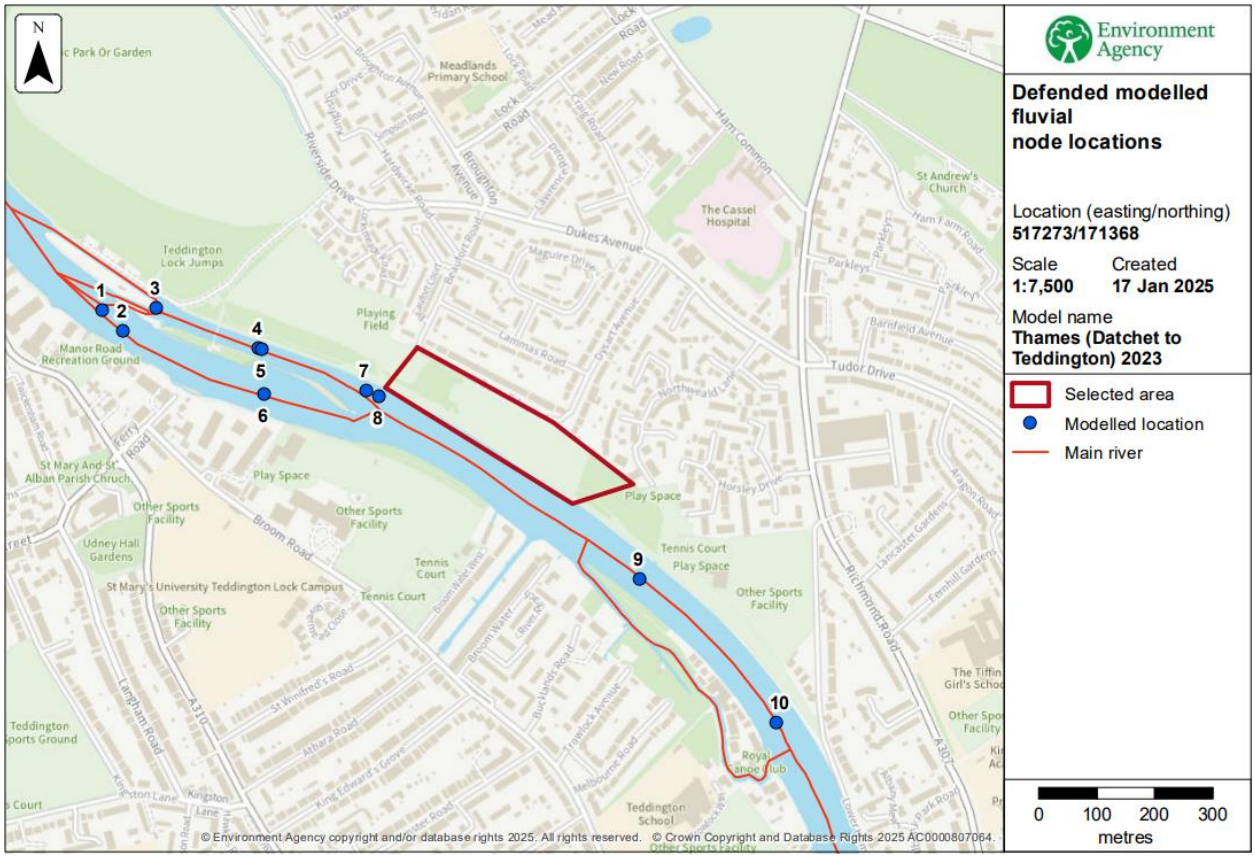


Table A.12 1D Modelled maximum water levels for Burnell Avenue site from the Thames (Datchet to Teddington) Model (Environment Agency, 2023b)

Node (model node reference)	Defended or undefended levels	3.33% AEP fluvial water level (m AOD)	1% AEP fluvial water level (m AOD)	1% AEP fluvial water level with a 20% allowance for climate change (m AOD)	1% AEP fluvial water level with a 35% allowance for climate change (m AOD)	0.1% AEP fluvial water level (m AOD)
8 (16.028)	Undefended		6.69	-	-	7.66
8 (16.028)	Defended	6.13	6.68	7.20	7.98	8.03
9 (a1.15)	Undefended		6.74	-	-	7.62
9 (a1.15)	Defended	6.20	6.73	7.22	7.89	7.94

Plate A.13 2D Hydraulic model node locations for Burnell Avenue site from the Thames (Datchet to Teddington) (Environment Agency, 2023b) Model (taken from Annex 5: Environment Agency Product 4 Data)

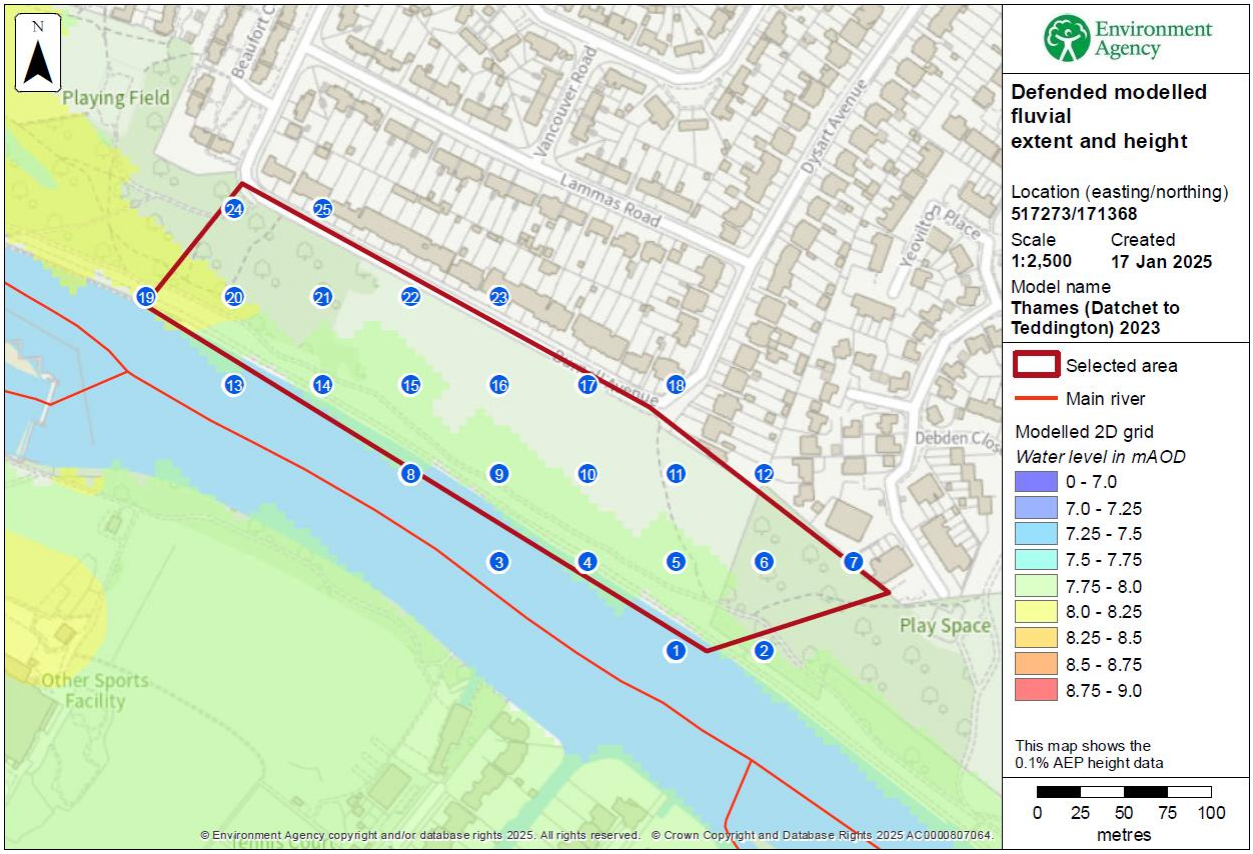


Table A.13 2D Modelled maximum water levels for Burnell Avenue site from the Thames (Datchet to Teddington) Model (Environment Agency, 2023b)

Node	Defended or undefended levels	3.33% AEP fluvial water level (m AOD)	1% AEP fluvial water level (m AOD)	1% AEP fluvial water level with a 20% allowance for climate change (m AOD)	1% AEP fluvial water level with a 35% allowance for climate change (m AOD)	0.1% AEP fluvial water level (m AOD)
4	Undefended		6.72	-	-	7.81
4	Defended	6.17	6.71	7.21	7.72	7.78
8	Undefended		6.71	-	-	7.86
8	Defended	6.15	6.70	7.21	7.78	7.84

Blue cells highlighted show selected modelled flood level used.

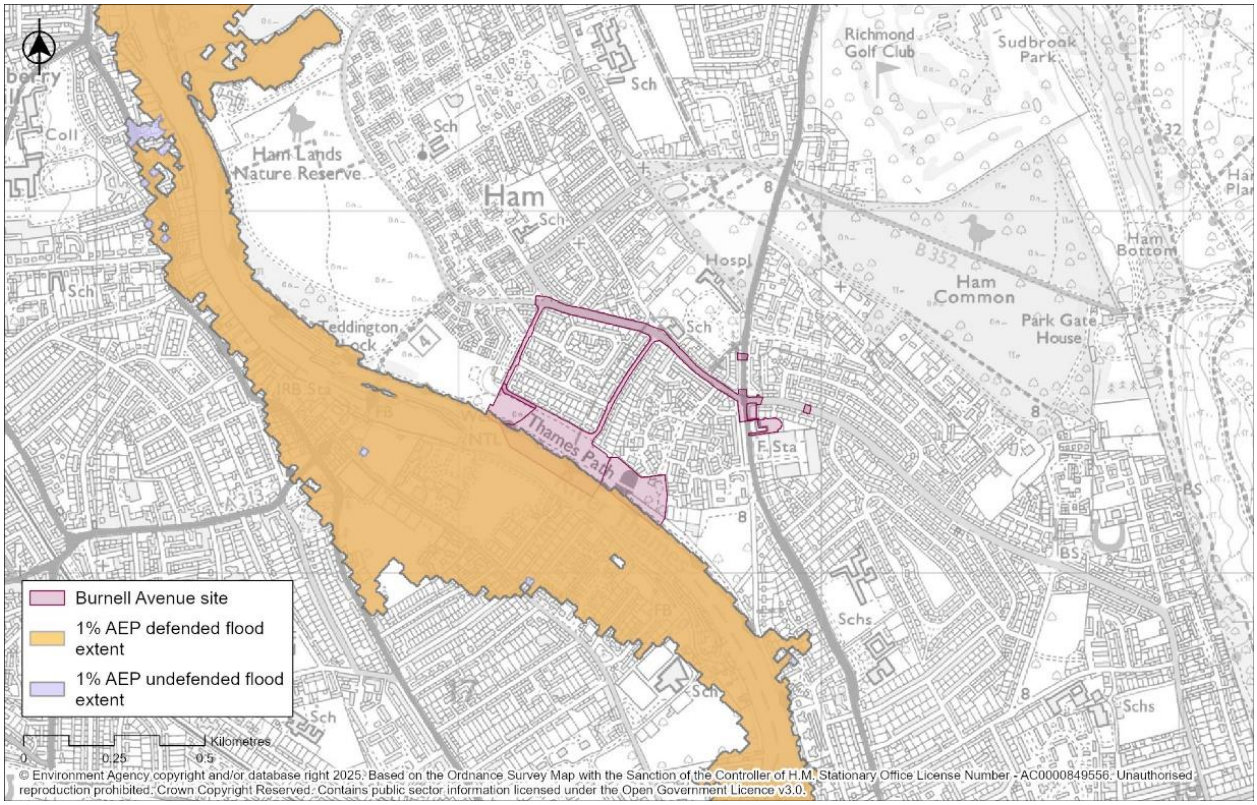
A.4.56 The 1D maximum flood level data at node 8 in Table A.12 are greater for the 1% AEP +35%CC event than the 2D maximum flood level data at nodes 4 and

8, as reported in Table A.13. Therefore, the maximum 1D flood level of 7.98m AOD will be considered when informing mitigation measures in Section A.5 Flood Risk Mitigation but should be considered together with a 600mm freeboard for model uncertainty until further assessment is undertaken as the design develops.

A.4.57 The Flood Zone outputs have been overlaid on top of the above ground boundary, defined in Plate A.1616. This shows that as part of the proposed temporary works, the crawler crane, TBM control cabin, slurry centrifuge process unit, waste skip, power generator, muck bay and some of the temporary access roads are located within the 0.1% AEP event (Flood Zone 2). The rest of the infrastructure is in Flood Zone 1.

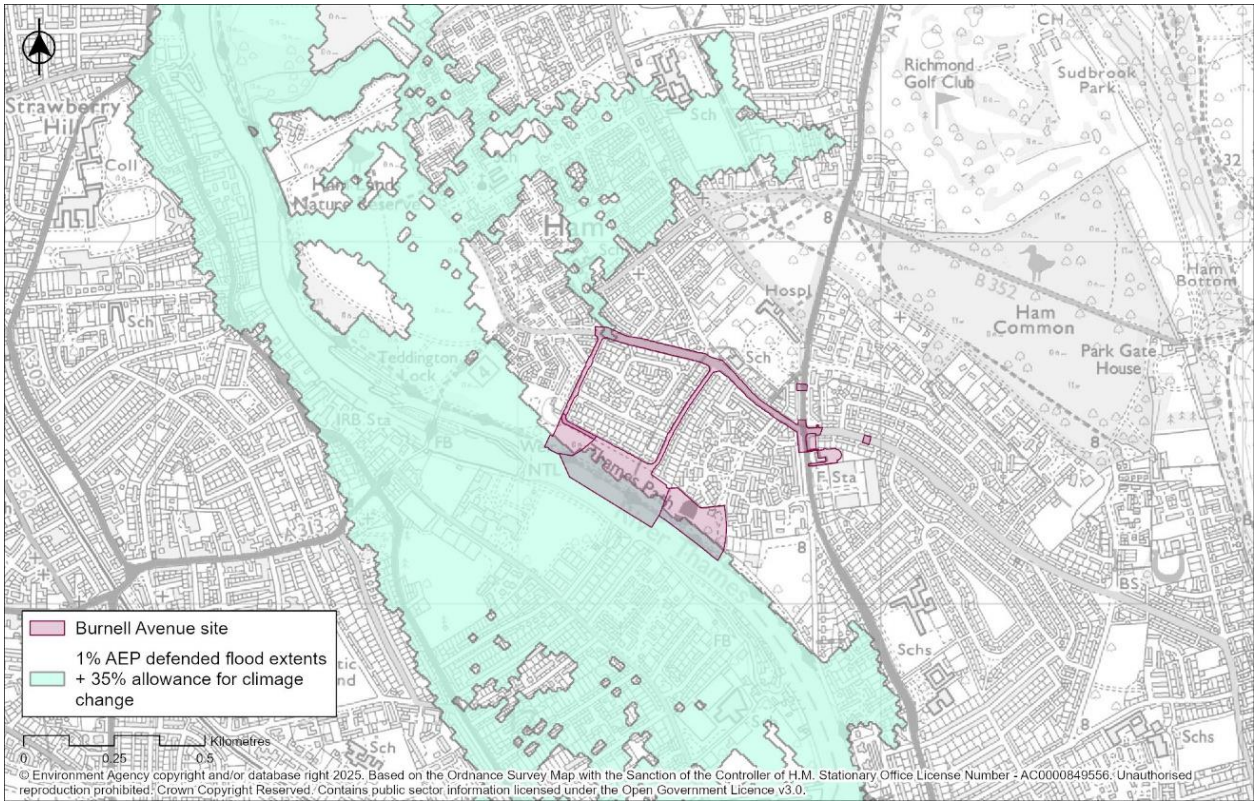
A.4.58 The 1% AEP extents in the defended and undefended scenario is shown in Plate A.14

Plate A.14 Burnell Avenue 1% AEP defended and undefended flood extents



A.4.59 The modelled maximum defended water levels with a climate change allowance from nodes 4 and 8 of the Thames (Datchet to Teddington) Model (Environment Agency, 2023b) were used to produce the 1% AEP extents with climate change for the intake infrastructure and the outfall infrastructure respectively, shown in Plate A.15.

Plate A.15 Burnell Avenue 1% AEP with 35% climate change defended flood extent



A.4.60 The proposed outfall, intake, diverted path, muck storage, the associated control infrastructure and the south-western part of the access road are located within the 1% AEP +35%CC extent which is used to assess the operational phase.

A.4.61 Construction will occur in the 1% AEP extent from the River Thames. The initial work site plans indicate that there would potentially be two cofferdams located within the river which will temporarily reduce the cross-sectional area of the channel.

A.4.62 One cofferdam would likely be located around the outfall location and would likely extend 20m into the river channel. The river channel is approximately 80m wide at this location during non-flood conditions and so this cofferdam would reduce the flow width by approximately 25%.

A.4.63 The other cofferdam would likely be located around the intake location and would be likely to extend 15m into the river. This cofferdam would reduce the flow width by approximately 19%. It is anticipated the cofferdams would be in place for a limited period yet to be determined, but the maximum time would be 18 months.

A.4.64 The cofferdams may cause an increase in water level and/or velocity within a reach of the river that is constricted, as well as localised impacts upstream of the cofferdams. In a fluvial flood event, this has potential to increase flood levels and extents, although the increase in water levels is unknown until more detailed cofferdam design and construction information is available. Water level

and velocity changes are expected to dissipate downstream after Teddington Weir. Therefore, any impacts on flood risk will be confined to the short reach of the River Thames from slightly upstream of the intake cofferdam to Teddington Weir. Additional hydraulic assessment is required to fully quantify the flood level changes once the outfall option has been selected to refine assessment of flood risk impacts.

A.4.65 The above ground works at Burnell Avenue site include the road network to the north to accommodate temporary or remedial highway works related to vehicle movements which are proposed as part of the construction phase. Part of Beaufort Road and Dukes Avenue lie in Flood Zone 2, however any proposed works in this area would be limited to the removal of street furniture or kerb dropping and thus would not be expected to increase flood risk to off-site receptors.

Flood defences

A.4.66 There are several flood defences providing protection to the sites (see also paragraphs A.2.8 to A.2.16 for topography). The Environment Agency Asset Information and Maintenance Spatial Flood Defences database (Environment Agency, 2024a) has been used to provide information on these defences at each site.

A.4.67 Mogden STW site contains flood defences on either bank of the Duke of Northumberland's River in both the north and the south of the site. Both these defences are classified as natural high ground. The flood defence in the north of the site (Asset ID: 10074) has a length of 232m with an upstream crest level of 9.66m AOD and a downstream crest level of 10.46m AOD. The flood defence in the south of the site (Asset ID: 10709) has a length of 501m with an upstream crest level of 9.77m AOD and a downstream crest level of 9.66m AOD. The proposed infrastructure is located away from these flood defences and therefore will have no impact on the flood defences. The model data for this site also stated that there are automated tidal gates at the River Crane and River Thames confluence which prevent tidal inundation.

A.4.68 Ham Playing Fields site does not contain any flood defences on-site. However, a flood defence embankment (Asset ID: 16808) is located to the south of the site and protects the land to the south of the site up to the 1% AEP event. The flood defence has a length of 321m with an upstream crest level and downstream crest level of 6.21m AOD. This embankment is connected to other embankments to protect the wider area. The proposed infrastructure in Ham Playing Fields site is located away from these flood defences and therefore will have no impact on the flood defences.

A.4.69 Burnell Avenue site does not contain any flood defences on-site. There are two connected flood defences located on the opposite bank of the River Thames to the south-west of the site. These flood defences do not provide flood protection for the site itself but protection for the land on the opposite bank. Both flood defences are classified as natural high ground with the upstream flood defence

(Asset ID: 12164) having a length of 22m while the downstream flood defence (Asset ID: 12244) has a length of 399m. No values have been provided for the upstream and downstream crest levels. The proposed infrastructure in Burnell Avenue site is located away from these flood defences and would include mitigation, so it does not increase fluvial flood risks elsewhere. It will therefore have no impact on the flood defences.

A.4.70 The Thames (Datchet to Teddington) Model (Environment Agency, 2023b) includes the following climate change scenarios for the Maidenhead and Sunbury Thames catchment under the following future epochs: 2020s, 2050s: and 2080s. This can be used to determine any future flood levels at the site and whether flood defences need to be raised.

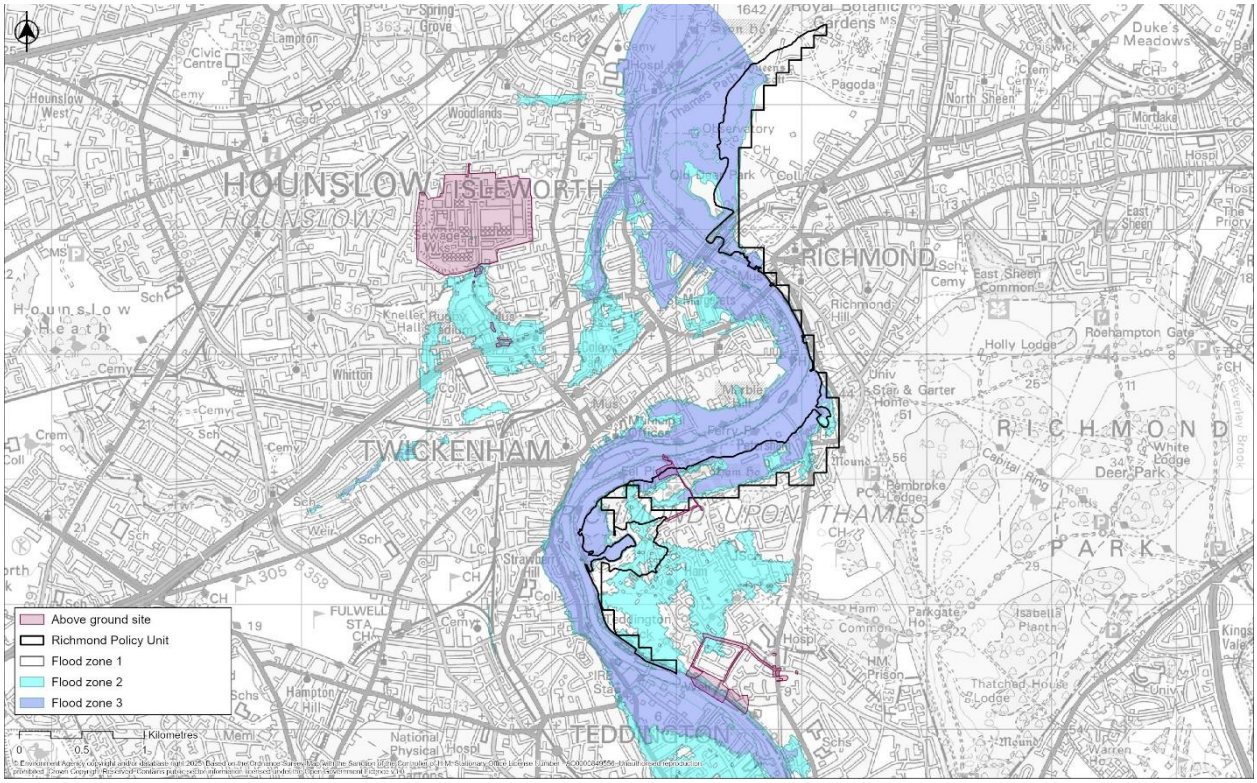
A.4.71 The Project sites are located upstream of the Thames Barrier. Consequently, the walls and embankments would protect the sites against daily high tides, while the Thames Barrier protects against storm tides. The Environment Agency currently closes the Thames Barrier when water levels are forecast to overtop the walls or embankments upstream due to high tides or storm tides (Defra, 2023).

A.4.72 While the network of flood defences was designed in the 20th century, they have been upgraded to provide the standard of protection for flood risk today. However, they need to be upgraded further to protect against sea level rises expected later in the 21st century, which require the strategic TE2100 Plan (see ‘Thames Estuary 2100 Plan (2021)’ section under Section A.3 Planning Policy) (Defra and Environment Agency, 2023).

A.4.73 The TE2100 Plan (Defra and Environment Agency, 2023) divides the Thames Estuary into 23 areas called policy units. Ham Playing Fields site is located in the Richmond Policy Unit, while Mogden STW and Burnell Avenue sites are not located in any policy unit areas. In the Richmond Policy Unit, the P5 policy applies for tidal flooding which means further action will be taken to reduce the risk of flooding. The current flood defences have a crest level of 6.21m AOD, while the TE2100 maximum likely water levels for the year 2100 are projected to be 6.42m AOD. Therefore, the flood defences are expected to be raised to manage the flood risks associated with this modelled water level. However, this will be determined as the TE2100 plan progresses.

A.4.74 The P3 policy applies to fluvial flooding where flood defences will be maintained at their current level and flood risk may increase. Since the proposed development in Ham Playing Fields site is a manhole surrounded by hardstanding and this is not protected by flood defences, this is not expected to have a noticeable impact on the Project.

Plate A.16 Richmond Policy Unit location (Defra, 2023b)



A.4.75 The River Thames Scheme (Environment Agency, 2024b) is a nationally significant flood and climate mitigation project that will reduce the risk of flooding from the River Thames between Egham and Teddington. This will include the construction of a new weir structure complex with radial gates through Teddington Lock Island to increase the flow capacity at Teddington Weir. It is currently expected to reduce the flood levels upstream of Teddington Lock by almost 0.2m (Plate A.17) (Environment Agency, 2024b). This could reduce the flood risks presented to Burnell Avenue site following completion of the River Thames Scheme upstream.

Plate A.17 The Impact of River Thames Scheme on reduction in flood level (m) at locations along the River Thames (Romney Lock to Teddington Lock)

The Project operation

A.4.76 When the Project is operational, 75Ml/d (0.87m³/s) would be abstracted at the intake at Burnell Avenue site from the River Thames, while 75Ml/d (0.87m³/s) of recycled water would be discharged from the outfall from Burnell Avenue site into the River Thames. This would result in no net increase or decrease in river flows in the River Thames while it is operational. Additionally, the Project would only be operational during low flow periods.

A.4.77 During higher flows when the Project is not operational for water supplies, a reduced sweetening flow of 15Ml/d (0.17m³/s) would be taken from the existing discharge volume, treated within the TTP and then discharged out of the existing Mogden STW outfall at the Isleworth Ait and not the proposed new

outfall. This does not increase the amount of water discharged out of the existing Mogden STW outfall as the 15Ml/d is already included in the discharge permit.

A.4.78 Therefore, the operation of the Project would have no impact on flood risk with regard to discharging into rivers as it will not change the net flow during higher flows.

Fluvial and tidal flood risk summary

Mogden STW site

A.4.79 Based on the Project in Mogden STW site being located in Flood Zone 1, the fluvial and tidal flood risk presented to the proposed infrastructure is considered to be Negligible during both the construction and operational phases. Mitigation measures for fluvial and tidal flood risk are therefore not deemed necessary.

Ham Playing Fields site

A.4.80 As Ham Playing Fields site is being located in Flood Zone 3, the fluvial and tidal flood risk presented to the proposed infrastructure is considered to be High during both the construction and operational phases. Therefore, mitigation measures to manage the fluvial and tidal flood risks are proposed in Section A.5 Flood Risk Mitigation.

Burnell Avenue site

A.4.81 Based on the Project in Burnell Avenue site being located in Flood Zones 1, 2 and 3, the fluvial flood risk presented to the Project is considered to be Low to High during both the construction and operational phases. This would present a fluvial flood risk to some of the riverside operational and construction components. Therefore, mitigation measures to manage the fluvial flood risks are proposed in Section A.5 Flood Risk Mitigation. The risk of tidal flooding to the proposed infrastructure at Burnell Avenue site is considered to be Low risk given that the site is located upstream of Teddington Weir which is the tidal limit.

Surface water flood risk

A.4.82 The proposed infrastructure at Mogden STW, Ham Playing Fields and Burnell Avenue sites cover three boroughs. Across the three boroughs there are differences in how the Environment Agency’s surface water mapping is used to inform planning decisions. Specifically, the London Borough of Hounslow and the Royal Borough of Kingston upon Thames use the 1% AEP risk of flooding from surface water extent to define additional extents of Flood Zone 3a. The difference in approach is summarised in Table A.14.

Table A.14 Flood Zone 3a (surface water) definition by relevant local planning authority

Local planning authority	Area covered	Flood Zone 3a definition for surface water
Hounslow	Mogden STW site	Land within Environment Agency modelled surface water flood risk extents predicted for up to and including 1% AEP event
Richmond	Ham Playing Fields and Burnell Avenue sites	Not applicable
Kingston	Burnell Avenue site	Land within Environment Agency modelled surface water flood risk extents predicted for up to and including 1% AEP event

A.4.83 A summary of what this means for the operational phase at the three areas is provided below:

a. Mogden STW site: The proposed TTP is not located in Flood Zone 3a (surface water) given that it is raised above ground levels.

b. Ham Playing Fields site: No change as the London Borough of Richmond upon Thames does not use surface water extents to define Flood Zones.

c. Burnell Avenue site: The proposed intake and outfall are not located in Flood Zone 3a (surface water).

A.4.84 The Environment Agency's risk of flooding from surface water pluvial flood mapping provides surface water flood extents and depth outputs for a range of modelled storm events. These translate to classifications of probability which are detailed below in Table A.15.

Table A.15 Environment Agency surface water flood risk definitions

Classification	Description
Very Low	Land having less than 0.1% AEP of surface water flooding
Low	Land having between 0.1% and 1% AEP of surface water flooding
Medium	Land having between 1% and 3.3% AEP of surface water flooding
High	Land having greater than a 3.3% AEP of surface water flooding

A.4.85 Outputs from the Environment Agency NaFRA 28 January 2025 dataset (Environment Agency (2025d) have been presented for each site in Plate A.18 for the present-day event and in Figure A.19 with climate change considered. The climate change allowances provided by the Environment Agency represent the 2050s epoch (central allowance).

A.4.86 Further assessment of surface water which includes an assessment of climate change over the lifetime of the proposed development will be considered for the 2070s for the 40% climate change allowance.

Plate A.18 Environment Agency Present-day risk of flooding from surface water map showing Mogden STW, Ham Playing Fields and Burnell Avenue sites

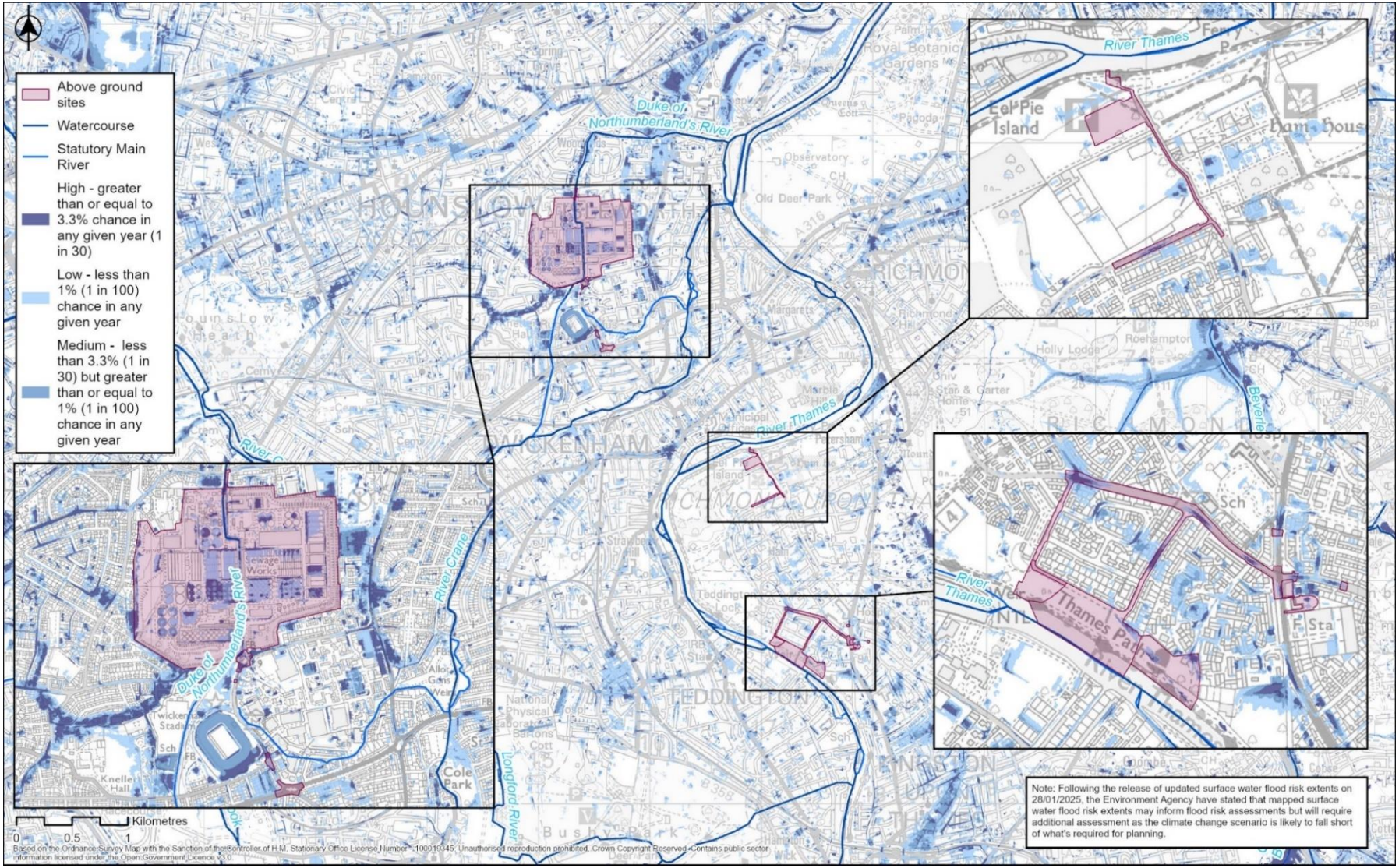
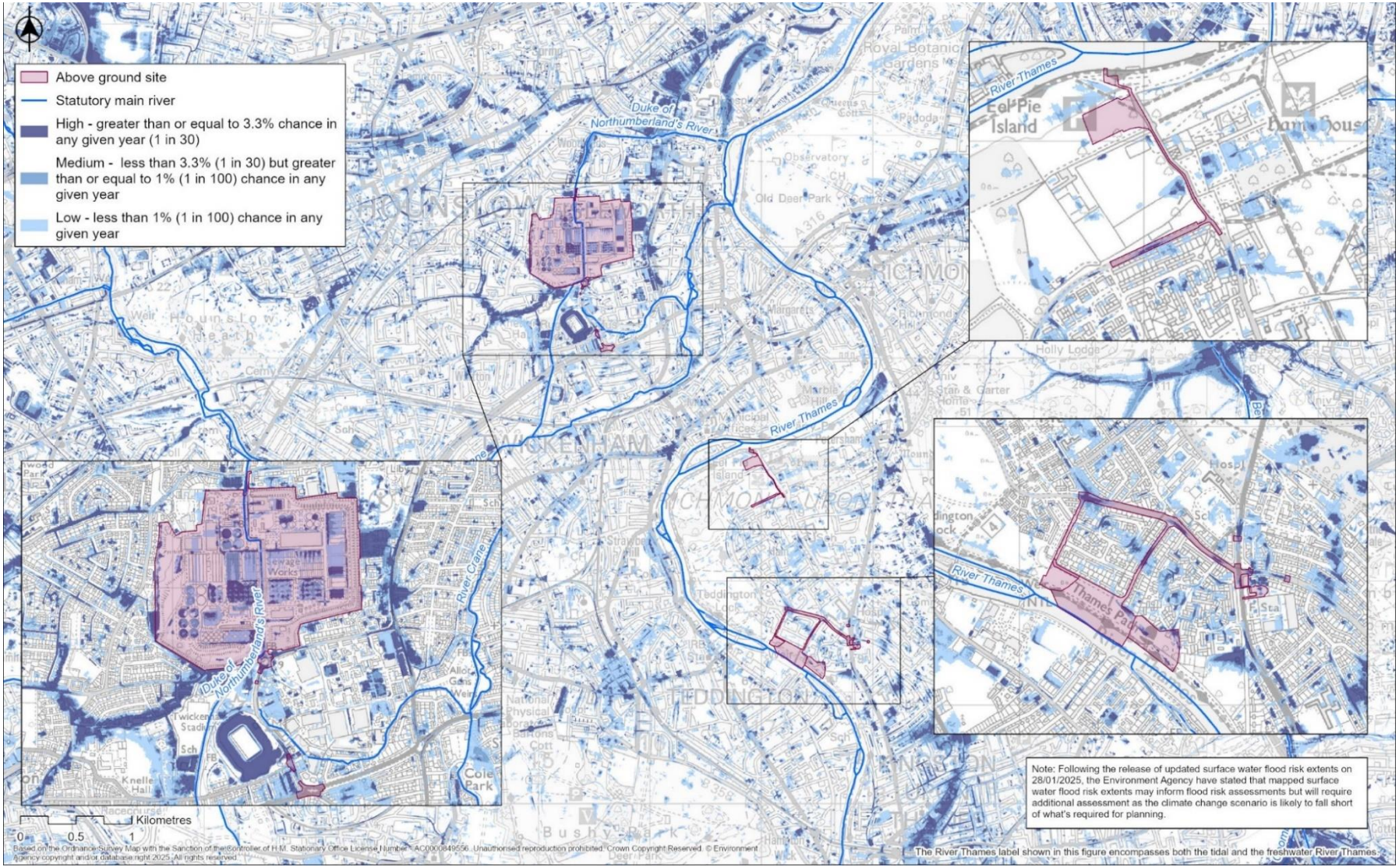


Plate A.19 Environment Agency risk of flooding from surface water map with climate change (2050s epoch central allowance) showing Mogden STW, Ham Playing Fields and Burnell Avenue sites



Mogden STW site

A.4.87 The Environment Agency present-day NaFRA surface water map (Environment Agency (2025d) indicates that Mogden STW is entirely located in areas of very low to high risk of surface water flooding. The majority of the site is at very low risk (<0.1% AEP); however, surface water ponding is predicted to occur at localised depressions, some road networks and contained areas within the Mogden STW site such as slurry and digester tanks, storm tanks and cake pads, etc. Some of these areas report a high risk of surface water flooding (and are predicted to flood during the 3.3% AEP and more frequent events), whilst other areas are at Medium (1% AEP) and Low (0.1% AEP) risk of surface water flooding.

A.4.88 The proposed TTP units are expected to be located on a platform above the existing tanks in the south-east of the Mogden STW site. Therefore, whilst the storm tanks are shown to be at high to low risk of surface water flooding in the surface water mapping, with depths of up to 0.9m predicted in the 0.1% AEP scenario, the proposed infrastructure will be located above ground level. The risk of flooding to the TPP units during the operational phase can therefore be considered Low. The proposed infrastructure on the ground in the south-east of the site is expected to be located within the eastern embankment where the surface water flood risk is shown on the surface water map as very low risk (unaffected in all modelled events).

A.4.89 During the construction phase, a drive shaft and tunnelling compound is proposed in the south-west of the Mogden STW site. It is proposed that additional temporary equipment will also be present during the construction phase which includes, but is not limited to, a TBM, a storage/laydown area, a substation area, M&E Plant (compressors, cooling water etc), electrical/ mechanical workshops and stores, waste and COSHH, pipework storage area, a tally hut and an office and welfare facilities. A review of the proposed construction layout against the surface water present-day map shows that the proposals are located entirely outside of the predicted surface water extents for the modelled high (3.3% AEP), medium (1% AEP) and low (0.1% AEP) risk scenarios. As such, the risk of surface water flooding to the Western Work Area can be considered Low.

A.4.90 The above ground works at Mogden STW also includes temporary and remedial highway works to facilitate HGV access to the Mogden STW site. Access to the site from the south (Mogden Lane roundabout) and short sections of Rugby Road to the south are predicted to be affected by surface water flooding in the High (3.3% AEP) to Low (0.1% AEP) scenario events. Depths are predicted to be up to 0.3m during the Medium (1% AEP) and Low (0.1% AEP) risk events at Mogden Lane roundabout and up to 0.2m during the High (3.3% AEP) risk event. Depths along Rugby Road are shallow (<0.2m) for the High and Medium risk events and up to 0.3m during the Low (0.1% AEP) risk events.

A.4.91 It should be noted that whilst the surface water maps do apply an ongoing loss to the applied rainfall inputs to crudely represent subsurface drainage systems in urban areas (Environment Agency, 2025), this does not represent the on-site surface water drainage systems in detail to identify all areas at risk of surcharging in more extreme storms . Therefore, the Environment Agency's pluvial flood map may provide an over-estimate of the risk to the site since the area has a suitable drainage network to manage surface water runoff. There are no surface water flow paths entering the site from elsewhere and therefore any surface water flooding within the site is expected to be manageable through the site's existing drainage system.

A.4.92 The Environment Agency surface water map with climate change (2050s central allowance) (Environment Agency, 2025d) has been reviewed to understand the impact that this has on depths and extents in comparison to the present-day event. Extents are shown to be similar at the Western Work Area and the Eastern Work Area, with both areas remaining at Low risk of surface water flooding. Similarly, the risk along the road network remains similar to that during the present-day event. There is a slight difference in depths along Rugby Road where depths of up to 0.3m are now predicted during the 3.3% AEP and 1% AEP events with climate change considered.

A.4.93 Consequently, the proposed infrastructure in the Western Work Area and Eastern Work Area are considered to be at Low risk of flooding from surface water.

Ham Playing Fields site

A.4.94 The London Borough of Richmond does not require a Flood Zone assessment for surface water flooding.

A.4.95 The present-day surface water flood map (Environment Agency, 2025d) indicates that the Main Work Area, Support Work Area and Ham Street are located outside any surface water flood extents, with no flow paths flowing through the site. Consequently, the proposed construction phase developments in these areas are considered to be at Low risk of flooding from surface water.

A.4.96 Riverside Drive, which is proposed to be widened, with removal of some street furniture to accommodate HGVs access during the construction phase, is predicted to be at High (3.3% AEP) to Low (0.1% AEP) risk from surface water flooding during the present-day event. Depths of <0.2m are predicted in the High risk scenario, with depths of up to 0.3m predicted in the Medium (1% AEP) and Low (0.1% AEP) risk scenarios. A Drainage Strategy is required to manage surface water runoff and volumes to manage runoff to offsite areas.

A.4.97 The surface water flood map with climate change (2050s central allowance) has been reviewed to understand the impact that this has on depths and extents in comparison to the present-day event. The Main Work Area and Support Work Area remain unaffected. Access along Ham Street is largely unaffected with a small area located in the 0.1% AEP surface water climate change flood extent. At this location, depths of <0.2m are predicted. At Riverside Drive, depths of up

to 0.3m are predicted in the High (3.3% AEP) and Medium (1% AEP) risk scenarios. In the Low (0.1% AEP) risk scenario, the largest depths exceed 0.3m but do not reach as high as 0.6m.

Burnell Avenue site

A.4.98 Within the Burnell Avenue site, the pipe storage and laydown area located within the Main Work Area, is shown to be partly located in areas defined by the surface water mapping as High (3.3% AEP) to Low (0.1% AEP) surface water flood risk. Flood depths of <0.2m are predicted in High (3.3% AEP) risk events and up to 0.3m in Medium (1% AEP) and Low (0.1% AEP) risk events. A temporary access road has been proposed west of Royal Park Gate Playground, where flood depths up to 0.2m are predicted in the High (3.3% AEP) and Medium (1% AEP) risk scenarios, and a depth of up to 0.3m predicted in the Low (0.1% AEP) risk scenario. The remainder of the Burnell Avenue site Northern Work Area, the Main Work Area and the Southern Work Area is at very low risk and is unaffected by the present-day surface water extents.

A.4.99 The road network along parts of Beaufort Road, Dukes Avenue, Dysart Avenue, Tudor Drive and Upper Ham Street (A307) are shown to be at High (3.3% AEP) to Low (0.1% AEP) risk of surface water flooding. Depths of up to 0.2m are predicted in the High (3.3% AEP) risk scenario and depths of up to 0.3m are predicted in the Medium (1% AEP) and Low (0.1% AEP) risk scenarios.

A.4.100 The Environment Agency surface water map with climate change (2050s central allowance) has been reviewed to understand the impact that this has on depths and extents in comparison to the present-day event. Similar depths remain predicted at the Burnell Avenue site during the climate change scenario, except for along the temporary access road proposed west of Royal Park Gate Playground where depths of up to 0.3m are predicted in the High (3.3% AEP) as well as the Medium (1% AEP) risk scenarios. The largest depths in the Low (0.1% AEP) risk scenario exceed 0.3m but do not reach as high as 0.6m.

A.4.101 Consequently, the development is considered to be at Medium to Low risk of flooding from surface water.

Groundwater flood risk

A.4.102 This section assesses the flood risk presented by groundwater to the proposed above ground infrastructure at each site. As explained in ‘Below ground infrastructure’ section under Section A.2 Site Characteristics and Proposals, the groundwater flood risks linked to the below ground infrastructure would be assessed and mitigated in a Phase Two Geotechnical and Geo-Environmental Assessment. The below ground infrastructure is therefore not assessed in this section and the assessment will be presented in the FRA which supports the ES.

Mogden STW site

A.4.103 The BGS maps show that Mogden STW is underlain by superficial deposits of clay and silt, with some sand and gravel in the west, and bedrock composed of London Clay. Magic mapping (Defra, 2025) shows that the superficial deposits are designated as a 'Principal' aquifer in the west of the site, while the remaining superficial deposits and the bedrock underlying the site is designated as an 'Unproductive' aquifer. This indicates that there is potential for groundwater permeability in the superficial deposits in the west of the site, while the bedrock and superficial deposit strata in the rest of the site is not expected to facilitate groundwater movement to the surface.

A.4.104 The West London SFRA (2018) has made available a 'Groundwater Flood Risk' map based on 1km^2 grid squares. Mogden STW site crosses two grid squares whereby between 25% and 75% of the area within the squares is deemed to be susceptible to groundwater flooding. It should be noted that this map is based on broad geological classifications and does not include the influence of impermeable made ground and/or other site-specific parameters that may influence groundwater flooding. The SFRA also shows areas with an increased potential for elevated groundwater. A small area in the north-west of the site is shown to be at an increased potential for elevated groundwater from the superficial deposits, while the rest of the site does not have an increased risk from elevated groundwater.

A.4.105 The proposed above ground infrastructure is expected to be located on a hardstanding surface or above existing storm tanks in the eastern part of the site where minimal groundwater movement is expected. Therefore, the risk of groundwater flooding affecting the proposed development is considered to be Low and mitigation is not deemed necessary.

Ham Playing Fields site

A.4.106 The BGS maps show that Ham Playing Fields site is underlain by superficial deposits of sand and gravel and bedrock composed of London Clay. Magic mapping (Defra, 2025) shows that the superficial deposits are designated as a 'Secondary A' aquifer, while the bedrock underlying the site is designated as an 'Unproductive' aquifer. This indicates that there is potential for groundwater permeability in the superficial deposits, while the bedrock is not expected to facilitate groundwater movement to the surface.

A.4.107 The London Borough of Richmond Upon Thames SFRA (2021) has made available a 'Groundwater Flood Risk' map based on 1km^2 grid squares. Ham Playing Fields site is located in a square where less than 25% of the area is deemed to be susceptible to groundwater flooding. The SFRA also shows the site is located in an area with an increased potential for elevated groundwater from the superficial deposits.

A.4.108 The superficial deposits are expected to be in hydraulic continuity with the River Thames near to the site. When water levels in the River Thames are high, water may flow from the river through the superficial deposits. However, it is unlikely

that the groundwater levels would be higher than the fluvial flood levels from the river, indicating that there is a low risk of groundwater emergence. The proposed above ground infrastructure comprises a shaft manhole which is 'Water Compatible' so the groundwater flood risk to the proposed development is Negligible and no mitigation is required.

Burnell Avenue site

A.4.109 The BGS maps show that that Burnell Avenue site is underlain by superficial deposits of sand and gravel in the north-east and alluvium in the south-west, with the bedrock composed of London Clay. Magic mapping (Defra, 2025) shows that the superficial deposits in the north-east are designated as a 'Secondary A' aquifer, while the superficial deposits in the south-east are designated as a 'Secondary (undifferentiated)' aquifer. The bedrock underlying the site is designated as an 'Unproductive' aquifer. This indicates that there is potential for groundwater permeability in the superficial deposits, while the bedrock is not expected to facilitate groundwater movement to the surface.

A.4.110 The London Borough of Richmond Upon Thames SFRA (2021) and the Royal Borough of Kingston upon Thames SFRA (2021) have made available a 'Groundwater Flood Risk' map based on 1km^2 grid squares. Burnell Avenue site is located in one grid square, 25% to 50% of whose area is deemed to be susceptible to groundwater flooding.

A.4.111 The superficial deposits are expected to be in hydraulic continuity with the adjacent River Thames and when water levels in the River Thames are high, water may flow from the river through the superficial deposits. However, it is unlikely that the groundwater levels would be higher than the fluvial flood levels from the river.

Sewers flood risk

Mogden STW site

A.4.112 The West London SFRA indicates that the site is situated in an area with no recorded instances of sewer flooding, according to Thames Water data.

A.4.113 The site is a STW, so the majority of the sewers located on-site are foul water sewers, overflows and final effluent sewers linked to treating foul water. There would also be surface water sewers to drain surface water runoff. It is the responsibility of Thames Water to maintain on-site sewers to prevent flooding; this is expected to be carried out as part of the routine maintenance of the Mogden STW. Therefore, there is a Low risk of sewer flooding to the site.

Ham Playing Fields site

A.4.114 Richmond upon Thames SFRA reports that the site is located in a postal region with between 0 to 10 reported incidents of sewer flooding (Thames Water DG5 data). There is a foul water public sewer located on-site with no manholes. It is the responsibility of Thames Water to maintain on-site sewers to prevent

flooding; this is expected to be carried out as part of routine maintenance. Therefore, there is a Low risk of sewer flooding to the site.

Burnell Avenue site

A.4.115 Richmond upon Thames SFRA reports that the site is located in a postal region with 0 to 10 reported incidents of sewer flooding (Thames Water DG5 data). There is a surface water public sewer located on-site, although it is unknown if there are any other surface water sewers connected to highway gullies. It is the responsibility of either Thames Water or the London Borough of Richmond Highways Team to maintain on-site sewers to prevent flooding; this is expected to be carried out as part of routine maintenance. Therefore, there is a Low risk of sewer flooding to the site.

Artificial sources flood risk

A.4.116 An impounded reservoir or large waterbody can potentially present a residual risk to a site in the unlikely event that a breach of the retaining structure occurs. This could result in the downstream floodplain becoming rapidly inundated.

A.4.117 The Environment Agency has prepared national reservoir failure flood risk mapping to identify areas that may flood if a reservoir were to fail and release the water that is held above existing ground levels. The mapping displays two flooding scenarios; the ‘dry-day’ and ‘wet-day’ events:

a. The ‘dry-day’ scenario predicts the flooding that would occur if the reservoir/waterbody failed when rivers are flowing at normal conditions.

b. The ‘wet-day’ scenario predicts the flooding that would occur if the reservoir/waterbody failed when rivers are already experiencing an extreme flood.

A.4.118 The Environment Agency Reservoir Flood Maps (Environment Agency, 2021) have been reviewed with relation to Mogden STW, Ham Playing Fields and Burnell Avenue sites. At these locations, the reservoir flood extents are based on the maximum flood extents of approximately 10 upstream reservoirs.

A.4.119 Mogden STW site is located entirely outside the ‘dry-day’ scenario reservoir breach extent. The ‘wet-day’ scenario reservoir breach extent partially affects the centre of the Mogden STW site as it exceeds the capacity of the Duke of Northumberland’s River and results in some localised flooding around the road network and some storage tanks. The Western Work Area and Eastern Work Area, where proposed infrastructure is located, remain entirely unaffected. Whilst access from the north at Oak Lane remains wholly unaffected during the ‘wet-day’ scenario, the access from the south (Mogden Lane) and wider areas of the associated highways network along Rugby Road and Chertsey Road are located entirely within the ‘wet day’ scenario reservoir breach extent.

A.4.120 At Ham Playing Fields site, the entirety of the Support Work Area and the majority of the Main Work Area are shown to be located within the ‘dry-day’ scenario reservoir breach extent. This is to be expected given that these areas are located inside the Thames flood defences. All of Ham Playing Fields site,

including access along Ham Street and Riverside Drive, is shown to be located in the ‘wet-day’ scenario reservoir breach extent.

A.4.121 At Burnell Avenue site, the immediate bank of the worksite and existing footpaths along here, are shown to be located within the ‘dry-day’ scenario reservoir breach extent. The majority of the Burnell Avenue worksite and the associated highways network are located outside the ‘dry-day’ scenario reservoir breach extent. The entirety of the Burnell Avenue site, including the associated highways network, is shown to be located in the ‘wet-day’ scenario reservoir breach extent.

A.4.122 With reference to the Preliminary Flood Risk Assessment for England (Environment Agency, 2018), the Environment Agency state that reservoir flooding is extremely unlikely to happen. All large reservoirs must be inspected and supervised by reservoir panel engineers. As the enforcement authority for the Reservoirs Act 1975 in England, the Environment Agency ensure that reservoirs are inspected regularly, and essential safety work is carried out.

A.4.123 Given the safety legislation in place and the maintenance responsibilities of the asset owner under the Reservoirs Act 1975, the actual probability of a significant failure event occurring is considered to be Low to Extremely Low.

A.4.124 The closest canal to the sites is the Grand Union Canal which is located approximately 4km north of Mogden STW at its closest proximity. Mogden STW site is topographically removed from being at flood risk from this canal, should it breach and fail due to intervening high ground. There are no other canals or man-made waterways nearby to Mogden STW, Ham Playing Fields or Burnell Avenue sites that could pose a risk to the sites.

A.4.125 There are also no other artificial water bodies in the area that present a flood risk to the sites. Therefore, the Project is considered to be at Low risk of flooding from artificial sources at each site.

Summary

A.4.126 Table A.16 summarises the flood risk to each site from each potential flood source. Fluvial and tidal sources are expected to present a high flood risk to Ham Playing Fields site, whilst only fluvial sources are expected to present a risk to the intake and outfall structures at Burnell Avenue site. Mitigation measures to manage the fluvial and tidal flood risks are presented in Section A.5 of this FRA.

A.4.127 Mogden STW and Ham Playing Fields sites have generally low surface water risk, except along roads. Burnell Avenue site has medium surface water risk, particularly where the pipe storage, laydown area, and temporary access road are planned. A Drainage Strategy will manage the surface water flood risk sustainably.

Table A.16 A Summary of the baseline flood risks presented to each site

Location	Flood source	High	Moderate	Low	Negligible
Mogden STW site	Fluvial			✓	
	Tidal/sea				✓
	Surface water		✓		
	Groundwater			✓	
	Sewer			✓	
	Artificial			✓	
Ham Playing Fields site	Fluvial	✓			
	Tidal/sea	✓			
	Surface water			✓	
	Groundwater				✓
	Sewer			✓	
	Artificial			✓	
Burnell Avenue site	Fluvial	✓			
	Tidal/sea			✓	
	Surface water		✓		
	Groundwater			✓	
	Sewer			✓	
	Artificial			✓	

A.5 Flood risk mitigation

Mogden STW site

A.5.1 The flood risk is Low to Negligible for the operational phase from all sources, so no mitigation is required.

A.5.2 Flood risk to the Western Work Area within Mogden STW site is moderate for surface water but Low from all other sources during the construction phase. The flood risk to the HGV access routes within the draft Order limits is Moderate for surface water flooding.

A.5.3 A proposed Drainage Strategy will be required to manage surface water during the construction phase (see Section A.6 Surface Water Drainage).

Ham Playing Fields site

Flood resistance and resilience

A.5.4 Since the site is located in Flood Zone 3, it is recommended that the proposed shaft and manhole is resistant and/or resilient to tidal flooding. There is an

option to seal the manhole to prevent floodwater ingress into the shaft and recycled water conveyance tunnel. This would prevent silt and other sediments from entering the tunnel during a flood event, reducing the need for tunnel maintenance following a flood event.

A.5.5 With these mitigation measures in place, enhanced flood defences would not be required for the operational phase.

A.5.6 In the operational phase, the shaft concrete caps will be buried but hatches will remain at grade and be impermeable. Therefore, surface water runoff will be limited in the operational scenario as only the access cover will be impermeable.

Flood warning and evacuation

A.5.7 Since the site is partially located in Flood Zone 3, the flood risks to staff associated with the Project have been reviewed. The site is expected to be attended only by Thames Water staff and their contractor for maintenance work during the operational phase. It will be the responsibility of their managers to ensure that staff are kept safe from flooding. A flood plan for maintenance should be prepared, including the actions to be taken before, during and after a flood.

A.5.8 The site is located in an Environment Agency Flood Warning Area (tidal River Thames riverside from Putney Bridge to Teddington Weir) where the Environment Agency provides a free flood warning service. Therefore, it is recommended that operatives sign up to this service to obtain prior warning of any flood events from the River Thames.

A.5.9 While the detailed actions would need to be defined in a detailed flood plan, no maintenance should occur in Ham Playing Fields site in the event of a nearby flood warning or if there is a flood on-site. If Ham Playing Fields site needs to be evacuated due to flooding, it is recommended that the evacuation route occurs along Ham Street to the south and into Flood Zone 1 where the ground levels are higher. Staff should not enter into any floodwaters. After the flood, any infrastructure that could be affected by flooding should be inspected and repaired.

A.5.10 For the construction phase, the flood plan will need to provide additional measures to safeguard construction workers, given that construction is expected to last up to 18 months on-site. This will need to include access to safe shelter, as well as clearly defined access and egress routes.

Construction works

A.5.11 The construction compound is located entirely in Flood Zone 3 and will require mitigation to manage the flood risks presented to the construction works, including the plant, equipment and materials. It is assumed that it would not be viable to move everything out of the Main Work Area into Flood Zone 1 within the lead time available from a flood warning. It would also cause considerable

disruption and could increase the flood risks to construction workers during this process.

A.5.12 Given that the construction site is in Flood Zone 3b and there is no nearby space in Flood Zone 1 to relocate the plant, equipment, and materials, it might not be feasible to move them within the lead time provided by a flood warning. Therefore, it is recommended that additional flood mitigation is considered in the development of the construction compound design and methodology to ensure flood resilience of the site over the construction period for the range of flood events set out in the FRA.

A.5.13 Additional hydraulic assessment will be required to confirm any residual flood risk from the design including flood resilience measures within the compound and consider their impact offsite to receptors at the Ham Playing Fields site.

Burnell Avenue site

Flood resistance and resilience

A.5.14 For the operational phase, the design flood is the 1% AEP flood event plus a 35% allowance for climate change. Based on the model nodes in Table A.12 (from the 1D Thames (Datchet to Teddington) model (Environment Agency, 2023b)), the design flood level is 7.98m AOD. A 600mm freeboard is assumed on top of flood levels based on typical recommended values by the Environment Agency. However more detailed hydraulics modelling will be used to review this value and justify a more site-specific value as design develops.

A.5.15 No changes are expected to reduce the fluvial flood risk from the River Thames to the site. Therefore, all development, including any electrical cables and connections, would need to be resistant and/or resilient to flooding considering up to 600mm above the design flood level for the intake and outfall infrastructure. This includes the end of the access track and the kiosk.

A.5.16 To prevent floodwater ingress into the raw water pipeline, it is recommended that, if appropriate, a specialist Contractor seals access covers located on-site. This would prevent silt and other sediments from entering the pipeline during a flood event, reducing the need for tunnel maintenance following a flood event. The tunnel will be designed to prevent floodwater entering into it from the River Thames.

A.5.17 For the construction phase, flood resistance will need to be determined for the potential cofferdam as the cofferdam arrangement and design evolves to ensure flood resistance and consideration of 600mm freeboard or other freeboard justified by detailed hydraulic modelling outputs.

A.5.18 The construction layout in the Main Work Area should locate flood-sensitive equipment, plant and materials in the areas of lowest flood risk. When a flood warning is in place, all equipment, plant, materials and chemicals should be located in Flood Zone 1 to prevent them being mobilised in a flood event. The proposed development in Flood Zone 3 should be protected from flooding when a flood warning is in place.

A.5.19 With these mitigation measures in place, enhanced flood defences would not be required.

Flood warning and evacuation

A.5.20 Since the site is partially located in Flood Zone 3, the flood risks to staff associated with the Project have been reviewed. The site is expected to be attended only by Thames Water staff and their contractor for maintenance work during the operational phase. It will be the responsibility of their managers to ensure that staff are kept safe from flooding. A flood plan for maintenance should be prepared, which should include the actions to be taken before, during and after a flood. The site is located in an Environment Agency Flood Warning Area (River Thames from Hampton and Thames Ditton to Teddington) where the Environment Agency provides a free flood warning service. Therefore, it is recommended that operatives sign up to this service to obtain prior warning of any flood events from the River Thames. While the detailed actions would need to be defined in a detailed flood plan, no maintenance should occur in Burnell Avenue site in the event of a flood warning nearby or if there is a flood on-site. After a flood, any infrastructure that could be affected by flooding should be inspected and repaired.

A.5.21 If Burnell Avenue site needs to be evacuated due to flooding, it is recommended that the evacuation route occurs to the north-east of the site and into Flood Zone 1 where the ground levels are higher, enabling staff to evacuate the area from Dysart Avenue as it is located in Flood Zone 1. Staff should not enter into any floodwaters. After the flood, any infrastructure that could be affected by flooding should be inspected and repaired.

A.5.22 For the construction phase, the flood plan will need to provide additional measures to safeguard construction workers given that construction is expected to extend up to 27 months. This will need to include access to safe shelter, as well as clearly defined access and egress routes.

Floodplain mitigation

A.5.23 The proposed outfall, intake and kiosk each have above ground volume located within the 1% AEP flood event plus a 35% allowance for climate change. This is designated as the floodplain and reduces the volume available for storing water, which has the potential to increase flood risk elsewhere. Therefore, level-for-level floodplain compensation is required to mitigate the increase in flood risk elsewhere. This would remove an equivalent amount of volume from the ground on the site for each floodplain level where the floodplain volume is lost. For each level, the amount of ground volume to be removed must be greater than or equal to the amount of floodplain volume lost and must be hydraulically connected to the floodplain for each level, where feasible with below ground infrastructure. This would mitigate the flood risk presented by the proposed infrastructure and is expected to provide a net reduction in flood risk by increasing the floodplain volume. If below ground infrastructure prevents

level-for-level floodplain compensation from being provided, other flood mitigation options will need to be investigated.

A.5.24 Floodplain compensation would be based on the undefended modelled scenario from the Thames (Datchet to Teddington) model (Environment Agency, 2023b). This would need to be undertaken when the final layout designs have been confirmed.

A.5.25 It is recommended that the access road and access cover located in the 1% AEP flood event plus a 35% allowance for climate change are set no higher than ground level to prevent the loss of floodplain storage.

A.5.26 The potential cofferdams will reduce the river volume and could displace floodwater elsewhere during the construction phase. However, further details are required to enable this impact to be accurately assessed and mitigated. This includes confirming a site layout with the exact sizes, heights and location of the cofferdams, as well as confirmation on the periods when the cofferdams are expected to be installed and actively in place within the river. The hydraulic model of the River Thames would subsequently be used to determine if the water levels of the River Thames would change with the cofferdams in place for the design flood events. Following this assessment, mitigation can be provided to manage any increase in water levels, with the model rerun to confirm the expected design flood water levels with mitigation in place.

Floodplain flows

A.5.27 The proposed above ground structures in Flood Zone 3 plus a 35% allowance for climate change are not expected to inhibit floodwater flows. Floodwater is expected to flow around the proposed outfall, intake and kiosk, and over the access road, diverted path and access chambers. This will not divert any flood flows to overtop higher ground and present a flood risk to residential areas adjacent to Burnell Avenue site. Therefore, no mitigation is required to manage floodplain flows.

A.5.28 With suitable mitigation provided at Burnell Avenue site, the flood risks are not expected to be increased off-site. This includes cumulative flood risk impacts affecting the River Thames Scheme (Environment Agency, 2024b).

Groundwater

A.5.29 A Phase Two Geotechnical and Geo-Environmental Assessment would assess the depth of groundwater at each site and provide recommendations for any required mitigation for groundwater if deemed necessary.

A.5.30 During operation, below ground infrastructure would be mitigated from groundwater flood risks through the use of proper design following the appropriate guidance. Mitigation measures are expected to include using flood-resilient materials where there is a groundwater flood risk and having all pipes fully sealed to prevent groundwater ingress.

A.6 Surface water drainage

A.6.1 For the construction phase, standard good practice includes a sustainable drainage strategy and design to manage surface water runoff for any temporary changes in impermeable area. This will include surface water storage to prevent the construction phase from increasing surface water runoff rates off-site and increasing surface water flood risk. It will also be used to manage the water quality of surface water runoff from the sites, which could include using silt traps to manage sediment load in the surface water runoff.

A.6.2 The NPPF (MHCLG, 2024) requires that all developments should incorporate SuDS unless there is clear evidence that this would be inappropriate. The drainage system should:

a. Take account of advice from the LLFA
b. Have appropriate proposed minimum operational standards
c. Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development
d. Where possible, provide multifunctional benefits

A.6.3 Since an increase in impermeable area will increase surface water runoff rates and volumes, it is recommended to minimise the impermeable areas in the development where this is feasible.

A.6.4 Where an increase in impermeable area is expected to lead to a significant increase in surface water runoff rates and volumes, a surface water drainage strategy would be required. The surface water drainage strategy would be based on the policies outlined in Section A.3. SuDS would be required in any proposed drainage strategy, and this would be expected to adhere to the four pillars of SuDS:

a. Water quantity
b. Water quality
c. Amenity
d. Biodiversity

A.6.5 As per the SuDS Manual C753, (Construction Industry Research and Information Association (CIRIA), 2015) the SuDS hierarchy will need to be followed. This requires that surface water runoff should be disposed of as high up the following list as practically possible:

a. Infiltration into the ground
b. Discharge to a surface water body
c. Discharge to a surface water sewer, highway drain or another drainage system
d. Discharge to a combined sewer

A.6.6 Infiltration into the ground will require the ground conditions to be suitable for this method of surface water disposal. This will include undertaking infiltration tests to confirm the infiltration rate is suitable.

A.6.7 If the existing drains and sewers are to be used, the sewer and drainage networks will need to be confirmed with surveys. These surveys will need to confirm the connections into the wider drainage network or river system and to determine if there are any on-site drainage issues that need to be accounted for within a proposed drainage strategy.

A.6.8 The surface water drainage strategy will be submitted as a separate document alongside this FRA as part of the Development Consent Order application. However, it will use the flood risk information provided within this FRA.

A.6.9 The existing site drainage has been described under 'Hydrological features and site drainage' section in Section A.2 Site Characteristics and Proposals.

A.7 Summary

A.7.1 This FRA has been undertaken to support the Project Environmental Information (PEI). The PEI Report is to be submitted as part of the Development Consent Order application for the proposed above ground infrastructure for the Project located across three sites (Mogden STW, Ham Playing Fields and Burnell Avenue sites) in the London Borough of Hounslow, the London Borough of Richmond upon Thames, and the Royal Borough of Kingston upon Thames. This assessment has reviewed the risks of flooding presented to each area, the development, and the surrounding area, with mitigation proposed to manage any potentially significant flood risks. A summary of the assessment findings and recommendations is provided below.

A.7.2 Whilst the Duke of Northumberland's River flows through the centre of Mogden STW, the site and proposed infrastructure in both the Western Work Area and Eastern Work Area is located in Flood Zone 1. The embanked river channel of the Duke of Northumberland's River is greater than the 1% AEP +70%CC maximum modelled flood levels from the River Crane SFRM (Halcrow Group Limited, 2008) within the site, as well as the 1% AEP +83%CC maximum modelled flood levels from the Thames (Datchet to Teddington) model (Environment Agency, 2023b). Therefore, the Western Work Area and Eastern Work Area remain at low risk of fluvial and tidal flooding for the lifetime of the construction and operational phases.

A.7.3 The main fluvial and tidal flood risk presented to Ham Playing Fields site is from the tidal River Thames to the north. The flood zone extents have been assessed using hydraulic model nodes taken from the Thames Estuary 2100 10-year review study (Defra and Environment Agency, 2021), as well as a topographical survey. This shows that the proposed manhole cover and hardstanding is located in Flood Zone 3 at a high fluvial and tidal flood risk. This is acceptable for water compatible developments based on the NPPF (MHCLG, 2024).

A.7.4 Mitigation measures have been recommended for Ham Playing Fields site to minimise the effects of tidal and fluvial flooding on the proposed infrastructure by sealing the manhole to prevent floodwater ingress. A detailed flood plan should be prepared for managing the flood risks on-site during the construction phase and for future maintenance.

A.7.5 For the construction phase in Ham Playing Fields site, the construction compound is located entirely in Flood Zone 3 and will require flood resilience measures to manage the flood risks presented to the construction works and additional hydraulic assessment to quantify any residual risks and need for mitigation to receptors on the Ham Playing Fields site.

A.7.6 The main fluvial flood risk presented to Burnell Avenue site is from the River Thames to the south-west. The flood zone extents have been assessed using hydraulic model nodes taken from the Thames (Datchet to Teddington) model (Environment Agency, 2023b), as well as a topographical survey. This shows that some of the proposed infrastructure is located in Flood Zone 3 with an allowance for climate change at a high fluvial flood risk. This is acceptable for water compatible developments based on the NPPF (MHCLG, 2024).

A.7.7 Mitigation measures have been recommended for Burnell Avenue site to minimise the effects of fluvial flooding on the proposed infrastructure. This includes making all infrastructure flood resistant and/or resilient up to 600mm above the 1% AEP fluvial flood level, plus a 35% allowance for climate change and sealing the access cover with a non-return valve on the outfall to prevent floodwater ingress. A detailed flood plan should be prepared for managing the flood risks on-site.

A.7.8 For the operational phase, level-for-level floodplain compensation would be required for all proposed infrastructure within the 1% AEP fluvial flood level, plus a 35% allowance for climate change. This will prevent flood risks increasing and is expected to provide a net gain in floodplain volume.

A.7.9 For the construction phase in Burnell Avenue site, the construction layout should locate flood-sensitive equipment, plant and materials in Flood Zone 1, and no equipment, plant, materials and chemicals should be stored in Flood Zone 3 extents plus a 20% allowance for climate change where feasible. When a flood warning is in place, all equipment, plant, materials and chemicals should be located in Flood Zone 1 to prevent them from being mobilised in a flood event. The proposed infrastructure in Flood Zone 3 should be protected from flooding when a flood warning is in place.

A.7.10 Flood resistance will need to be determined for the potential cofferdam as the cofferdam arrangement and design evolves in Burnell Avenue site. The impact of the cofferdam on offsite areas during the construction phase will need to be assessed using the Thames (Datchet to Teddington) model (Environment Agency, 2023b). Further mitigation to manage flood risk elsewhere may be required if the hydraulic model indicated the proposed flood defences would increase the risk to offsite areas sensitive to flooding.

A.7.11 For the construction phase in Ham Playing Fields and Burnell Avenue sites, the flood plan will need to provide additional measures to safeguard construction workers including access to safe shelter, as well as clearly defined access and egress routes.

A.7.12 Surface water flood risks presented to the proposed infrastructure are primarily low or very low, apart from the proposed pipe storage and laydown area at Burnell Avenue site and associated highways access for all areas. A surface water drainage strategy is required to identify the sustainable management approaches for surface water flood risks to both the Project and surrounding area during both the construction and operational phases. Where it is feasible, this will use SuDS. Following an assessment of the latest surface water mapping climate change outputs, the impact of climate change (up to 2060, assessing the central allowance), is not expected to bring further development areas into being at risk during the construction or operational phases, however depths are predicted to be marginally greater on the whole.

A.7.13 The flood risk to each area from groundwater is considered to be low. A Phase Two Geotechnical and Geo-Environmental Assessment would assess the depth of groundwater at each site and for the proposed underground infrastructure. This would provide recommendations for mitigation for groundwater if this were deemed necessary.

A.7.14 Flood risk from all other flood risk sources to Ham Playing Fields and Burnell Avenue sites are considered low to negligible and requires no additional mitigation. Also, the flood risk to Mogden STW site from all sources as considered to be low to negligible and requires no additional mitigation

A.7.15 Implementation of the mitigation proposed within this FRA would likely reduce potential sources of flooding to a low or negligible flood risk for the Project and surrounding areas**.**

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