Chapter 12: Water Resources, Drainage and Flood Risk

Water Resources & Flood Risk	
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SUPPORTING APPENDIX	**ES Chapter 12: Appendix: Water Resources, Flood Risk and Drainage** **Annex 1**: Flood Risk Assessment; **Annex 2:** Drainage Strategy; **Annex 3:** Thames Water – Potable Water Supply Correspondence **Annex 4:** SuDS Proforma
KEY CONSIDERATIONS	This ES chapter considers the impact the Proposed Development will have on Water Resources in terms of impact on portable, foul and surface water infrastructure and water quality impacts on the local drainage network. This ES chapter also considers flood risk associated with the Proposed Development and the Site being located within a Critical Drainage Area. Key considerations include potential effects associated with demolition and construction works including: • Localised changes in surface water flow regime during rainfall events; • Deterioration of the quality of surface water run-off from the Site which may deteriorate the quality of downstream combined sewer system and groundwater through infiltration; • Accidental leaks and spillages of hazardous material which could adversely affect the quality of groundwater through infiltration; • Flood risk to construction workers and plant. Key considerations associated within the Proposed Development once it is completed and occupied include: • Increased potable water demand and foul water generation from Site; • Change of surface water flow regime across the Site; • Change to the quality of surface water run-off; and • The Proposed Development's vulnerability to flood risk. Both a Flood Risk Assessment and Drainage Strategy have been prepared in consultation with the Lead Local Flood Authority (LLFA) who in this case is London Borough of Tower Hamlets and the Environment Agency. Where relevant to the ES this chapter makes reference to each assessment.
CONSULTATION	A request for an EIA Scoping Opinion was submitted on 16th August 2021 (**ES Volume 3, Appendix EIA Methodology – Annex 1**. The EIA Scoping Opinion was received on 8th September (**ES Volume 3, Appendix EIA Methodology – Annex 2)**. The EIA Scoping Opinion requested Water Resources, Flood Risk and Drainage be scoped into the EIA and considered within an ES chapter. This addresses the comments in the scoping opinion including: • The Flood Risk Assessment and Drainage Strategy form part of the assessment, and mitigation measures are clearly defined in this ES Chapter. • LBTH's SuDS Proforma must be submitted as part of the application. This is included in **ES Volume 3, Appendix Water Resources, Flood Risk and Drainage – Annex 4**. • The site discharge at greenfield runoff rates in compliance with the London Plan as well as considering the sites location in a Critical Drainage Area (CDA). This is further detailed in **ES Volume 3, Appendix Water Resources, Flood Risk and Drainage – Annex 2.** • The ES chapter considers contaminated land assessments, as indicated when defining the baseline • Water Supply and Wastewater capacity are addressed in the ES Chapter, following consultation with Thames Water. Details are provided in **ES Volume 3, Appendix Water Resources, Flood Risk and Drainage – Annexes 2 and 3**. • Reference is made to the Integrated Water Management Plan (IWMP) in relation to the drainage strategy and water supply elements within this ES chapter. • Latest climate change allowances are considered as part of the FRA, this has been considered and further detailed in **ES Volume 3, Appendix Water Resources, Flood Risk and Drainage – Annex 1**. • Dewatering has not been considered, as detailed in **paragraph 12.14**, as its not envisaged based on groundwater levels that this will be required as part of the Sites redevelopment. As part of the Flood Risk Assessment, consultation has taken place with the EA to obtain relevant flood risk information to inform mitigation measures, details which have been provided within **ES Volume 3, Appendix Water Resources, Flood Risk and Drainage – Annex 1.** As part of the Drainage Strategy, consultation has taken place with LLFA to obtain relevant information on policy requirements. Surface and foul discharge rates have been agreed through consultation with Thames Water on as noted in the Drainage Strategy, which is included in **ES Volume 3, Appendix Water Resources, Flood Risk and Drainage – Annex 2.**

ASSESSMENT METHODOLOGY

Defining the Baseline

12.1 The baseline conditions have been defined by considering the following key elements:

- A Site visit (July 2021);
- A desk study to establish Site and surrounding geology, history and existing water regime (surface and groundwater);
- Phase 1 Preliminary Geo-Environmental and Geotechnical Risk Assessment;
- Site-specific Flood Risk Assessment (**ES Volume 3, Appendix Water Resources, Flood Risk and Drainage – Annex 1**); and
- A Site-Specific Drainage Strategy – Surface water drainage and foul drainage (**ES Volume 3, Appendix Water Resources, Flood Risk and Drainage – Annex 2**).
- Consultation with the relevant authorities (i.e. through pre-development enquiries with the Environment Agency (EA), London Borough of Tower Hamlets as the LLFA and Thames Water (TW).

12.2 The baseline considered is the existing condition, which has been informed by the baseline assessments undertaken as part of the Flood Risk Assessment (**ES Volume 3, Water Resources, Flood Risk and Drainage – Annex 1**) and Drainage Strategy (**ES Volume 3, Water Resources, Flood Risk and Drainage – Annex 2**).

12.3 The assessment approach adopts the conceptual 'source-pathway-receptor' model. The model identifies potential impacts resulting from the proposed activities on the environment and sensitive receptors within it. This process provides an easy-to-follow assessment route between impact sources and potentially sensitive receptors ensuring a transparent impact assessment. The parameters of this model are defined as follows:

- Source – the origin of a potential impact;
- Pathway – the means by which the effect of the activity could impact a receptor; and
- Receptor – the element of the receiving environment that is impacted.

12.4 In general, the impact assessment section for this ES chapter uses this source-pathway-receptor principle when considering the potential impacts arising during the construction, operation.

Evolution of the Baseline

12.5 The likely evolution of the baseline condition is based on professional judgement and includes a qualitative assessment of the baseline conditions in the future should the Proposed Development not come forward, but other developments around it (included within the Cumulative Effects Assessment) are delivered. Whilst it is reasonable to assume that the baseline situation will evolve in the future, this assessment assumes that the existing uses will remain on-Site. However, it is acknowledged that they would also be subject to climate change in the long-term. The future baseline assessment is discussed further in **paragraph 12.116**. The intensity of precipitation falling on the Site (and elsewhere) could increase due to climate change, which will have an impact on drainage systems in the future, as well as Sea Level rise which could impact on fluvial as well as tidal water levels, though this impact in part will be mitigated by London's flood defence systems (Thames barrier and defence walls)

12.6 With climate change (UKCP18) projections, there is increasing evidence to show that the supply and demand of potable water is likely to worsen within London as a result of climate change, this is further re-iterated as part of the Future Flows and Groundwater Levels work undertaken by UK Centre for Ecology & Hydrology (CEH) in partnership with the EA[1] and others. However, as with most climate change predictions there is significant amounts of variance depending on future government guidance.

[1] UK Centre of Ecology and Hydrology - Future Flows and Groundwater Levels – SC090016 (October 2012)

Impact Assessment Methodology

Demolition and Construction

12.7 Following the determination of the baseline conditions and sensitive receptors, the methodology for identifying the potential water resources related effects, as a result of the demolition and construction of the Proposed Development, has been implemented based on the following stages:

- Preparation of a conceptual site model, identifying feasible pollution sources and pathways during the demolition and construction works;
- Determination of the magnitude of change of the potential impacts of the Proposed Development on the sensitive receptors;
- Evaluation of the significance of the effects, relative to the receptor sensitivity;
- Identification of suitable and appropriate mitigation measures (over and above standard best practice mitigation measures already considered) for the demolition and construction phase of the Proposed Development; and
- Assessment of the significance of any residual effects.

12.8 Following this assessment, the following effects will be considered with regards to the following:

- Effects on flood risk on and off-Site as a consequence of the Proposed Development with reference to:
- Construction Workers;
- Residents / Users of surrounding area;
- New Residents given the phased nature of the Proposed Development;
- Effects on foul public drainage network with reference to water quantity (capacity);
- Effects on combined public drainage network with reference to water quality:
- Effects on Groundwater Quality; and
- Effects on potable water demand/water supply.

Phasing

12.9 As outlined in **ES Volume 1, Chapter 5: Demolition and Construction**, the Proposed Development is split into four phases, with there being a period where some phases will be complete and occupied, whilst other phases are still under construction.

12.10 A temporary drainage strategy will be put into place at the Construction Phase, as a secondary mitigation measure and will form part of the Construction Environmental Management Plan (CEMP). Therefore the phased nature of the works would not be expected to increase effects relating to flood risk or drainage. Likewise, the effects on water resources and on water quality will remain the same whether the Proposed Development is phased or not, as any measures required to mitigate any such effects (whether through embedded design measures for operational effects or Site management measures during construction) will be implemented irrespective of any phasing of works. Furthermore, the proposed drainage strategy has been developed based on the phasing of the Proposed Development to ensure there is no reliance for each phase in terms of ensuring the sites can be attenuated or drained.

12.11 As such, it is not anticipated that there will be any significant effects relating to water resources, flood risk or drainage on residents of the occupied buildings as a result of the phased nature of the Proposed Development. As such, an assessment of effects associated with the phased nature of the Proposed Development have been scoped out of this ES Chapter.

Completed Development

12.12 Following the determination of the baseline conditions and sensitive receptors, the methodology for identifying the potential water resources related effects, as a result of the Completed Development has been implemented based on the following stages:

- Preparation of a conceptual site model, identifying feasible pollution sources and pathways during the demolition and construction works;
- Determination of the magnitude of change of the potential impacts of the Proposed Development on the sensitive receptors;
- Evaluation of the significance of the effects, relative to the receptor sensitivity;
- Identification of suitable and appropriate mitigation measures (over and above standard best practice mitigation measures already considered) for the demolition and construction phase of the Proposed Development; and
- Assessment of the significance of any residual effects.

12.13 Following this assessment, the following effects will be considered with regards to the following:

- Site Occupants (staff, residents and public);
- Residents and occupants of the surrounding area (staff and public);
- Effects on foul public drainage network with reference to water quantity (capacity);
- Effects on combined public drainage network with reference to water quality;
- Effects on Groundwater Quality; and
- Effects on potable water demand/water supply.

Assumptions and Limitations

12.14 There are a number of limitations and assumptions that have been made in this assessment, as listed below:

- It is assumed that all of the principal existing land uses adjoining the Site will remain, other than those detailed within the cumulative assessment;
- All construction work will be undertaken during normal working times;
- The Drainage Strategy which manages surface water up to and including a 1 in 100 year return period rainfall event with an allowance for 40% climate change, is adopted prior to the completion and occupation of each phase of the Proposed Development;
- The mitigation measures outlined in the Flood Risk Assessment, as well as the Drainage Strategy approach is deemed to be inherent mitigation, and the conclusions/strategies outlined in each report will be in place before Site occupancy takes place, in line with current planning policy requirements;
- It has been assumed that the Thames Estuary 2100 (TE2100) plan, will continue to be in effect for the lifetime of the Proposed Development whereby a strategy remains in place to manage tidal flood risk in the Thames Estuary whilst considering climate change; and
- Given groundwater levels as defined from Site Investigation (SI)[2] works indicate groundwater levels vary from 3.3m bgl to 5.00m bgl. It is not expected that any dewatering is required and therefore the ES Chapter does not consider the assessment to have the potential for effects on ground water flows.

Methodology for Defining Effects

Receptors and Receptor Sensitivity

12.15 Sensitivity of the affected receptor has been assessed on a scale of High, Medium, Low. For the purpose of this assessment, receptors assessed to be of a 'negligible' sensitivity have not been assessed as the effects will be considered to be not significant.

12.16 **Table 12.1** shows the general approach taken in assessing the sensitivity of water receptors as part of this assessment.

[2] 210421 R JER8921_Aberfeldy Village Master Plan Phase 1 Preliminary Risk Assessment V2 R0

Table 12.1 Receptor Sensitivity Descriptors

Sensitivity	Descriptor	Example receptors
High	An attribute with High quality and rarity, regional or national scale and limited potential for substitution.	Aquifer providing potable water to a large population (groundwater). Watercourse having a Water Framework Directive (WFD) classification shown in a River Basin Management Plan. Major river providing a potable water resource to a large population. Residents with sleeping accommodation at ground level. Public sewer with available capacity subject to major improvement works.
Medium	An attribute with Medium quality and rarity, regional or national scale and limited potential for substitution.	Aquifer providing abstraction water for agricultural or industrial use (ground water). Watercourse not having a WFD classification shown in a RBMP. Residents with sleeping accommodation above ground level. Minor river providing a water resource to a small population or industry. Commercial users/ construction workers. Public sewer with available capacity subject to upgrade works.
Low	An attribute with Low quality and rarity, regional or national scale and limited potential for substitution.	Watercourses not having a WFD classification shown in a (River Basin Management Plan (RBMP). Minor river or drain of low quality. Unproductive strata. Public sewer with available capacity.

Magnitude of Change/Effect

12.17 Magnitude of change' is used to describe the deviation from baseline conditions for existing receptors. 'Magnitude of effect' is used to define the likely scale of the effect but on future receptors only.

12.18 The TAG Unit A3[3] guidance provides classifications of magnitude of change in 'Large', 'Moderate', and 'Slight' quantities and the DMRB[4] guidance provides classification of magnitude of effect in 'Major', 'Moderate', 'Minor' and 'Negligible'. For the purposes of this assessment, the magnitude of change can be positive (beneficial) or negative (adverse) and is described on a scale of 'high', 'medium', 'low' and 'negligible'.

12.19 **Table 12.2** indicates the criteria used to determine the magnitude of change as part of this assessment.

Table 12.2 Classification of Magnitude of Change/Impact

Magnitude	Descriptor	Examples
High	Results in a major loss or gain of feature	Significant fluvial flooding affecting off-Site receptors caused by the Proposed Development is statistically possible or even likely (e.g. exceeding 1% annual probability) with potential high depth / velocity of water and risk to life and / or major financial effect. Significant flooding which could potentially cause major effect at the Site (e.g. loss of life) is possible or even likely. Major Pollution caused (e.g. by construction). Large increase or reduction of pollution discharged from the Site. Increase of a significant amount of flow entering controlled systems (Sufficient enough to cause a change in WFD classification). Major reduction in flooding extension / likelihood.
Medium	Results in a medium impact of integrity (beneficial or adverse) of feature or loss or gain of part of a feature.	Flooding of the Site which could cause financial impact and disruption (but no loss of life) is statistically possible or even likely. A significant increase in the likelihood of flooding off-Site is possible as a consequence of the Proposed Development with potential financial effect but no loss of life. Contribution of significant effluent towards receiving river, but insufficient to change WFD classification. Increase of amount of flow entering controlled systems (Sufficient enough to cause an increase in flooding). Some Pollution caused. Increase or reduction of pollution discharged from the Site.
Low	Results in a low impact of integrity of feature or minor loss of part of a feature.	Small increase / decrease in the likelihood of flooding. Increase of amount of flow entering controlled systems, but would not cause flooding. Measurable changes in feature, but of limited size and / or proportion.
Negligible	Results in a change but insufficient to affect attribute.	The Proposed Development is unlikely to affect the integrity of the water environment and the impact on flooding is not relevant. For example, the quantity is immeasurable or insignificant, when compared to the baseline condition. No increase of amount of flow entering controlled systems i.e. no effect when compared to baseline condition. No significant effect on the economic value of the feature.

Defining the Effect

12.20 The assessment of the likely significance of potential environmental effects arising from both the construction (including demolition) and operation of the Proposed Development requires consideration of the following:

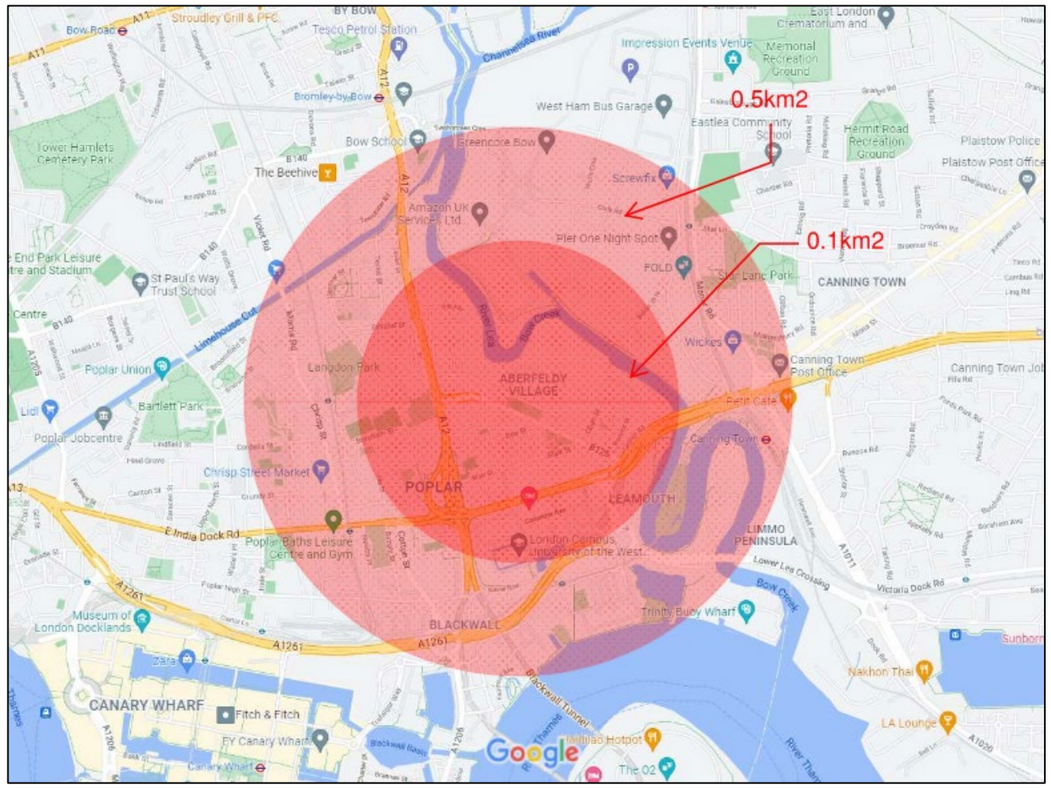
- Beneficial or adverse the effects:
  - Beneficial effects - those whereby by Proposed Development is likely to bring about an improvement to receptors in comparison to the baseline;
  - Adverse effects - those whereby the Proposed Development is likely to negatively affect receptors in comparison to the baseline; and
- Duration of the effect
  - Short – 1-5 years
  - Medium – 5-10 years
  - Long term effects – 10 years +.

12.21 The study area will encompass direct surface water features up to approximately 0.1 km from the Site boundary (i.e. associated with overland migration of pollutants directly to surface features, pollutants conveyed in drainage systems). The study area will also encompass indirect surface water features typically up to 0.5 km, or further where appropriate, from the Site boundary i.e. for example the River Thames flood mapping extent. These features will be considered based on professional judgement of the assessor and current knowledge of the surface water features in the area that are in hydraulic connectivity (i.e. including surface water abstractions and downstream watercourses). Refer to **Figure 12.1** below.

[3] TAG Unit A3 EIA – Impacts on the Water Environment Chapter (2015)

[4] Design Manual for Roads and Bridges (DMRB): LA 113 Road drainage and the water environment (formerly HD 45/09) (2019)

Figure 12.1 Study Area



12.22 Each effect has been assessed against the magnitude of change and the sensitivity of the receptor as shown in **Table 12.3**.

Table 12.3 Matrix for Classifying Effects

Sensitivity of Receptor	Magnitude of Change/Impact			
	High	**Medium**	**Low**	**Negligible**
High	Major	Moderate to Major	Minor to Moderate	Minor
Medium	Moderate to Major	Moderate	Minor	Negligible
Low	Minor to Moderate	Minor	Negligible to Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

12.23 The following terms have been used to define the significance of the effects identified and apply to both beneficial and adverse effects:

- **Major effect**: where the Proposed Development could be expected to have a substantial improvement or deterioration on receptors;
- **Moderate effect**: where the Proposed Development could be expected to have a noticeable improvement or deterioration on receptors;
- **Minor effect**: where the Proposed Development could be expected to result in a perceptible improvement or deterioration on receptors; and
- **Negligible:** where no discernible improvement or deterioration is expected as a result of Proposed Development on receptors, including instances where no change is confirmed.

12.24 Effects that are classified as moderate or above are considered to be significant. Effects classified as minor or below are considered to be not significant.

12.25 Following identification of the significance of the likely effects, the requirement for any mitigation to either eliminate or reduce likely significant adverse effects is considered. Where relevant these are described within the 'Mitigation, Monitoring and Residual Effects' section below and summarised within **ES Volume 1, Chapter 17: Mitigation and Monitoring Schedule.**

BASELINE CONDITIONS

Topography

12.26 A topographical survey of the Site has been completed by Aworth Survey and indicates that the Site levels range between approximately 1.4 and 5.3 metres Above Ordnance Datum (m AOD), with the northern part of the Site adjacent to Lochnagar Street approximately 2 metres higher than the southern part of the Site. Parameter Plan 3663 - LB - ZZ - 00 - DR - A - 000004 - Parameter Plan - Existing Site Levels – R0 details the existing site levels across the Site.

Geology And Hydrogeology

12.27 British Geological Survey (BGS) mapping indicates that the superficial deposits at the Site comprise alluvium - clay, silt, sand and peat formed up to 2 million years ago in the Quaternary Period. The bedrock geology at the Site comprises clay, silt and sand of the London Clay formation - sedimentary bedrock formed approximately 48 to 56 million years ago in the Palaeogene Period. The National Geoscience Data Centre's Single Onshore Borehole Index holds five records of boreholes within the Site boundary. These indicate that made ground is present to a maximum depth of 2.5 m below ground level (bgl) underlain by silty sandy clay interlaid with gravel to a depth of 25.0 m bgl. According to the MAGIC[5] website the superficial deposits at the Site are classified as a Secondary (undifferentiated) aquifer whilst the underlying London Clay Formation bedrock is classified as an Unproductive aquifer. The Site is not shown to be located within a designated groundwater source protection zone.

12.28 Groundwater levels, based on site investigations undertaken to date[6] indicate ground water levels range from 3.30m -5.00m below ground level (bgl).

Existing Sewers / Drainage

12.29 A topographical survey of the Site has been completed by Aworth Survey in December 2009 and a utility survey was carried out for the Site by Sumo Services Survey in August 2020. Refer to **ES Volume 3, Appendix Water Resources, Flood Risk and Drainage – Annex 2** for Surveys.

12.30 Based on these surveys the existing private drainage network consists of surface water, foul water and combined water pipes and manholes. All of the existing private drainage has been shown to be draining to the closest Thames Water public sewer via multiple existing connections to the Thames Water surface and combined water sewers crossing through the Site.

12.31 Asset records obtained in November 2020 from Thames Water have revealed public surface and combined water sewers crossing through the Site. These vary from 225mm to 2250mm.

Existing Water Supply

12.32 Based on the Thames Water Asset Records, the following Thames Water potable water pipes are located within the Site and in the vicinity of the Site. These vary from 4" to 16" water mains.

12.33 Thames Water Management Plan (2020)[7], states that the Site is located in a "seriously water stressed area" but indicates a clear strategy to ensure water supply is maintained over the next 80 years. Thames Water propose using measures such as leakage management, water metering, water efficiency and developing new water supplies.

[5] https://magic.defra.gov.uk/
[6] 210421 R JER8921_Aberfeldy Village Master Plan Phase 1 Preliminary Risk Assessment V2 R0
[7] Thames Water – Water Resources Management Plan (WRMP) 2020-2100 (2020)

Existing Sources of Flood Risk

Surface Water Flood Risk

12.34 Pluvial flooding occurs when natural and engineered systems have insufficient capacity to deal with the volume of rainfall. Pluvial flooding can sometimes occur in urban areas during an extreme, high intensity, low duration summer rainfall event which overwhelms the local surface water drainage systems. This flood water would then be conveyed via overland flow routes dictated by the local topography.

12.35 Map 006 of the Strategic Flood Risk Assessment (SFRA) as well as Figure 15 of the Councils Local Plan indicates that the Site is located within a Critical Drainage Area. The Flood Risk from Surface Water map shows the majority of the Site to be at very low risk of flooding from surface water, with the Site access roads identified as being at increased risk.

12.36 Potential flood depths along the Site access roads for the low, medium and high risk events show depths to be approximately 300 mm, with the exception of the A12 underpass where flood depths are expected to exceed 900 mm.

12.37 It should be noted that the modelling approach used to generate the Flood Risk from Surface Water map generally underestimates the capacity of urban drainage networks. It is typically assumed that drainage networks provide a surface water removal rate of 12 mm per hour, equivalent to 33 litres per second per hectare of impermeable area. As such, it is likely that the Flood Risk from Surface Water map overstates the risk of flooding at the Site from this source.

12.38 Based on the available information, surface water flooding within the Site cannot be excluded and the probability of surface water flooding is considered as Low.

Ground Water Flood Risk

12.39 The British Geological Survey Groundwater Flooding Hazard map indicates that the majority of the Site is at a very low risk of flooding from this source, with the western most side of the Site is shown to be at significant risk of groundwater flooding.

12.40 However, based on site specific Site Investigation (SI) results the ground water levels of the Site varies between 3.30m to 5.00m bgl, therefore, the risk highlighted by the groundwater flooding Hazard is not fully representative based on actual site conditions. Therefore, based on the available information, ground water flooding within the Site cannot be excluded, however based on site specific groundwater observations the probability of ground water flooding is considered as Low.

Flood Risk from Reservoirs, Canals and Other Artificial Sources

12.41 The Flood Risk from Reservoirs map indicates that the Site may be at risk of flooding from reservoirs (Walthamstow Reservoirs located approximately 9km north of the Site). However, all large reservoirs are regularly inspected by reservoir panel engineers with essential safety work carried out as required. As detailed on the gov.uk website, reservoir flooding is therefore extremely unlikely to occur. There are no canals or other artificial sources located within the vicinity of the Site that are expected to present a risk of flooding.

12.42 Based on the available information, the risk from artificial sources is deemed Negligible.

Fluvial/Tidal Flood Risk

12.43 The River Lea is located a minimum of approximately 160 m east of the Site and flows in a generally southerly direction to its confluence with the River Thames. The Environment Agency (EA) has confirmed that the flood defences along the River Lea prevent flooding in up to the 1 in 1,000 Annual Exceedance Probability (AEP) event and that the planning application should be informed by an assessment of flood risk from the River Thames **(Figure 12.2).**

12.44 The River Thames is located approximately 550 m south of the Site and flows in an easterly direction towards the Thames Estuary **(Figure 12.2).**

12.45 The extent of flooding presented by the Flood Map for Planning[8] does not take into account the presence of flood defences. However, the Site is located in an area benefitting from formal defences, including the Thames Barrier. The Thames Barrier and the raised defences along the banks of the River Thames and are designed to provide a 1 in 1,000 annual probability Standard of Protection (SoP) and therefore mitigate the risk of flooding from the River Thames in up to the present day 1 in 1,000 annual probability event.

12.46 The crest level of the defences situated adjacent to the Site is currently 5.23 m AOD. It is expected that the crest level of the defences will be raised to 6.20 m AOD in accordance with the TE2100 Plan in order to maintain the current SoP up to the year 2100.

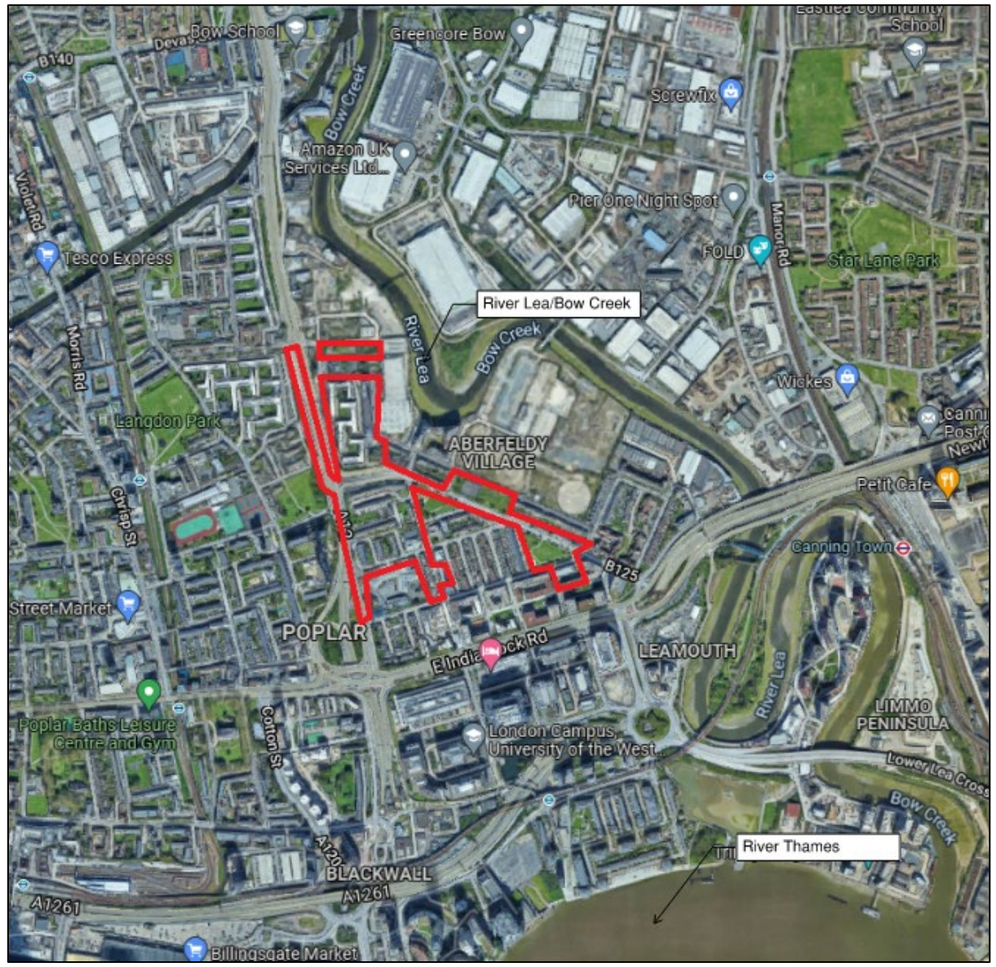
12.47 Based upon the above, the Site is assessed to be at a low risk of flooding form the River Thames. However, a residual risk of flooding exists due to potential overtopping of the defences for events exceeding the SoP, due to a structural failure of the flood defence walls, or due to a failure of Thames Barrier to operate as intended.

12.48 The EA has provided outputs from its 2017 Thames Tidal Upriver Breach Inundation Modelling Study (Refer to **ES Volume 3, Appendix Water Resources, Flood Risk and Drainage – Annex 1**). The extent of flooding resulting from a breach of the River Thames flood defences for the present day and 2100 climate change scenarios. The model results indicate that peak flood levels across the southern Site parcel for the present day and 2100 climate change scenarios are 2.79 m AOD and 3.68 m AOD respectively. Peak flood levels within the northern Site parcel are shown to range from 3.18 – 3.55 m AOD in the present day scenario and 3.65 – 5.10 m AOD in the 2100 climate change scenario.

12.49 The flood hazard at the Site is generally shown to be significant (i.e. dangerous for most people), with areas of extreme hazard (i.e. dangerous for all) identified along the Site access roads in the 2100 climate change scenario.

12.50 Based on the available information, the risk from Fluvial/Tidal is deemed Low as the inherent risk is associated with an extreme breach scenario.

Figure 12.2 Site Location and Nearest Water Bodies



[8] https://flood-map-for-planning.service.gov.uk/

RECEPTORS AND RECEPTOR SENSITIVITY

12.51 The following sensitive receptors have been assessed and included in **Table 12.4**.

Table 12.4 Sensitive Receptors

Sensitive receptors	Sensitivity	Description (refer to 'Potential Effects section below for further details)
Demolition and Construction workers	High	Flooding may affect construction workers when on site during working hours in teams, and though they may have some form of H&S training, this would unlikely cover specific flood training/working near water qualifications.
Residents / Users of the surrounding area	High	Residents/users of the surrounding areas might have limited or no awareness of flood risk; sensitivity of residents is the highest due to their presence overnight (sleeping accommodation).
Site Residents/ Users	High	Residents during the construction stage and after might have limited or no awareness of flood risk.
Thames Water Drainage Network	Low (in relation to surface water quality)	The Site is served by a foul and combined sewerage network therefore the water quality of the drainage network is anticipated to have a low sensitivity.
Thames Water Drainage Network	Low (in relation to surface and foul water quantity)	The Site is served by a combined sewerage network. During consultation TW advised that there was sufficient capacity to accommodate the proposed foul water discharge rates from the Proposed Development. Please refer to correspondence within the **ES Volume 3, Appendix Water Resources, Flood Risk and Drainage – Annex 2.**. TW advised that they would be able to accommodate the surface water discharged from the Proposed Development as well.
Thames Water Potable Water Network	Medium	The Site is located in an area that is a "seriously water stressed area" however based on the TW draft WRMP (2019) (Ref.14.41), TW have a strategy to ensure that there is sufficient water supply for their region over the next 80 years. A capacity check has been submitted to TW in which they state that though some existing capacity exists to cater for 99 units, there is not enough capacity to accommodate the entire site without on site/off site upgrade works.
Groundwater	Low	The Site is not located in a source protection zone or designated aquifer that provides potable supply and as such is anticipated to have a low sensitivity.

Inherent Design Measures

12.52 A number of environmental design and management measures have been embedded into the design of the Proposed Development to reduce flood risk which have been informed by and detailed within the FRA and Drainage Strategy.

Flood Risk Assessment

12.53 A short summary of these design measures are listed below, with further details provided within the FRA:

- Finished floor levels of the residential units set a minimum of 0.15 m above adjacent ground levels, where possible;
- Finished floor levels of the residential units raised above the peak flood levels in the 2100 climate change breach scenario, or sleeping accommodation to be provided at first floor level;
- Finished floor levels of the proposed retail units set a minimum of 0.15 m above adjacent ground levels;
- The latest best practice flood resistant and resilient construction techniques to be incorporated into the design of the building where appropriate; and
- Flood Evacuation Plan to be developed in consultation with London Borough of Tower Hamlets (LBTH).

Drainage Strategy

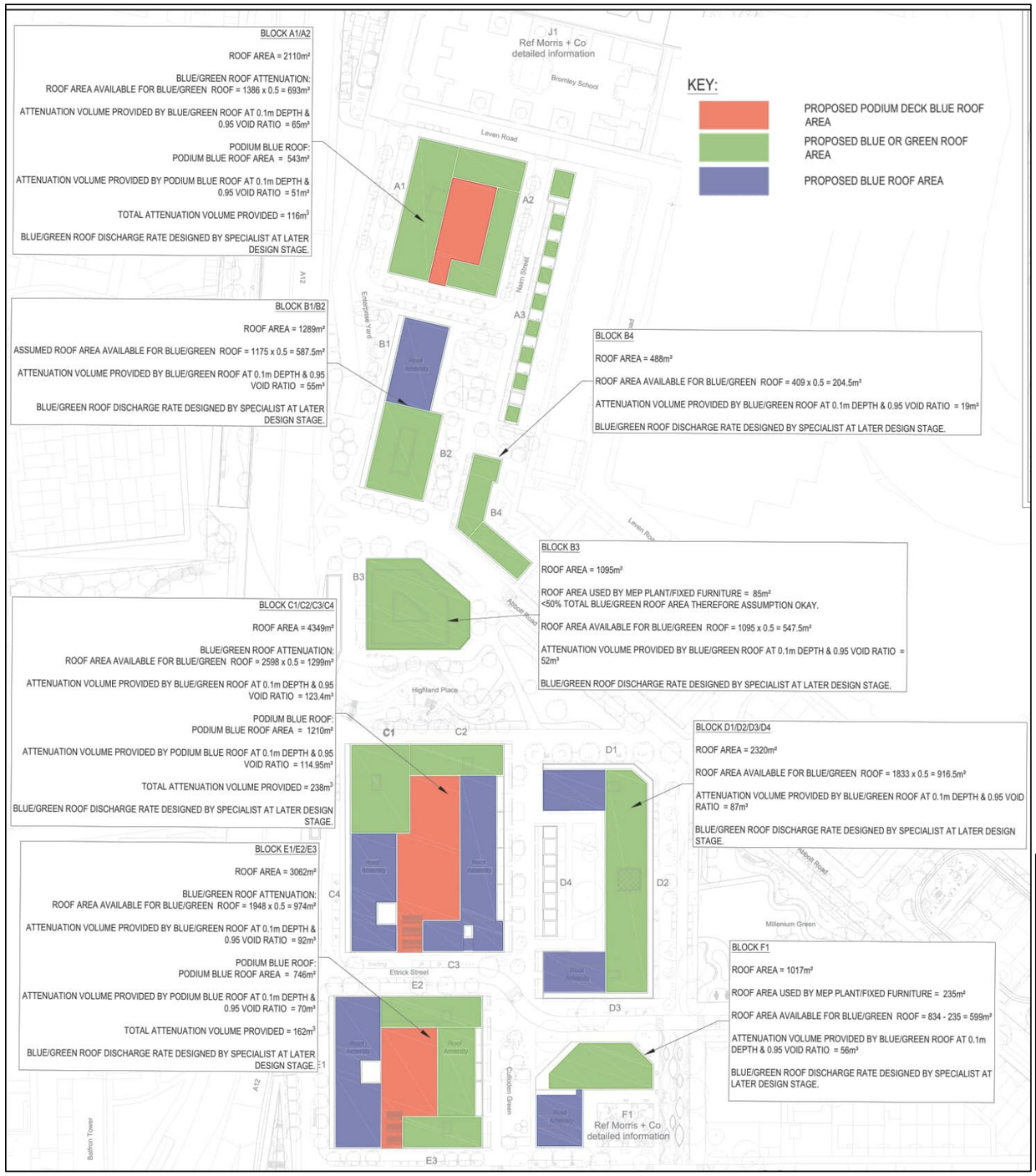
12.54 A short summary of the principles of the Drainage Strategy has been indicated below:

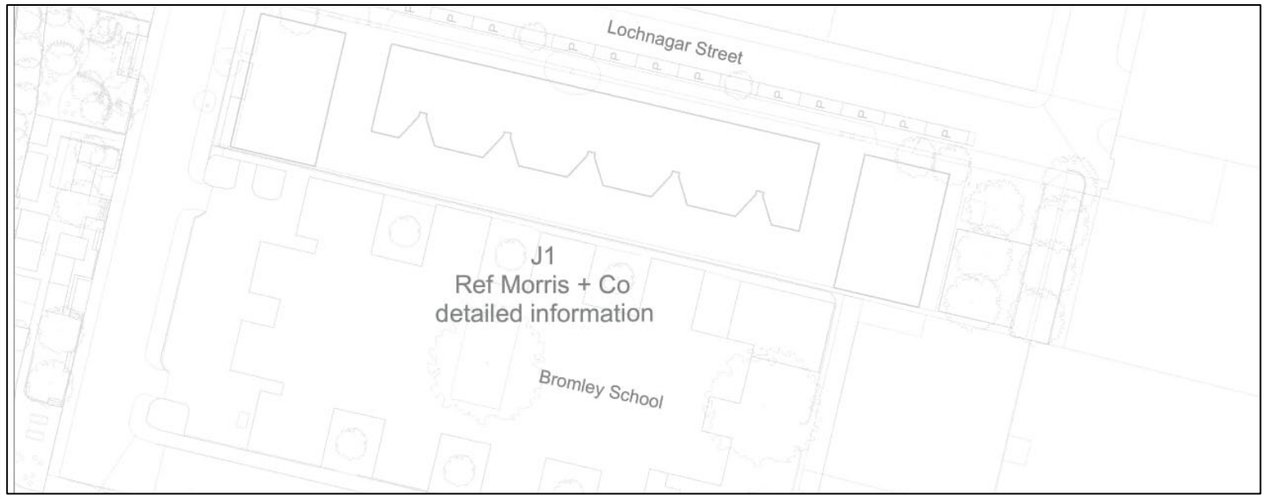
- The proposed surface water drainage strategy has been developed to utilise Sustainable Drainage Systems (SuDS) to attenuate surface water at source and reduce the risk of downstream flooding of the Thames Water sewer network in the local area. The Proposed Development utilises blue, green and podium deck/roof attenuation roof structures along with below ground cellular attenuation tanks designed for the 1:100 year plus 40% climate change storm event. Refer to **Figure 12.3** below.
- The Proposed Development QBAR greenfield runoff rate has been calculated to be 18.8l/s. QBAR is the mean annual flood flow from a rural catchment (m^3/s). It is proposed that the entire Site will discharge at this rate as agreed with the LBTH who are the LLFA. Each building and associated hardstanding being proposed to discharge at a proportion of this flow rate, this has been split between 12 separate connections across the Site receiving the total 18.8l/s. Each building's associated storm water drainage is conveyed by a traditional gravity run system to the nearest Thames Water Asset, with all connections discharging into the Thames Water combined water Sewer network.
- In line with the IWMP[9], the Proposed Development aims to utilise SuDS measures and restricts discharge rates to greenfield rate.

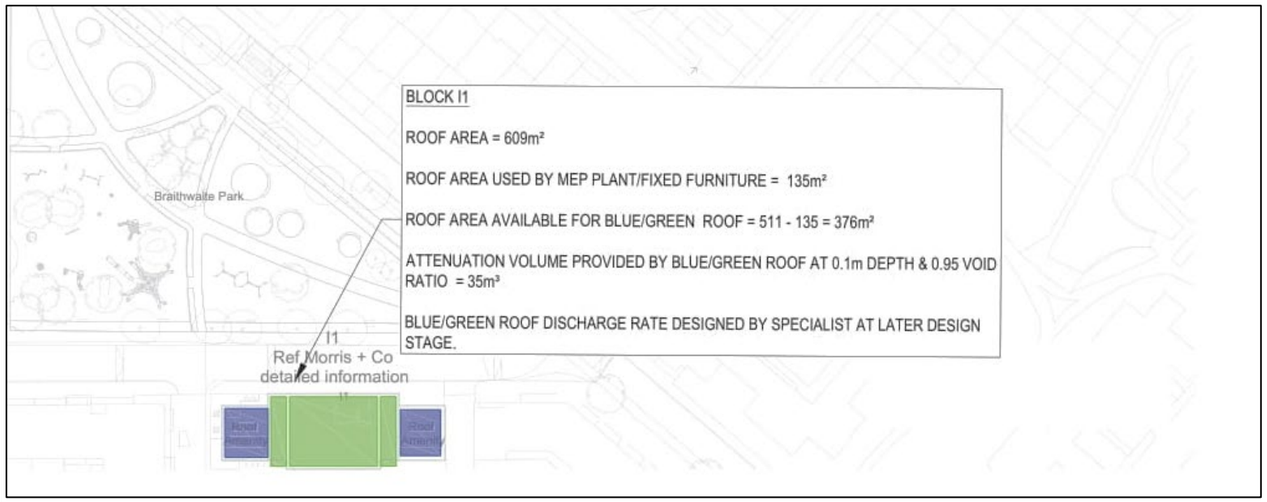
12.55 A pre planning enquiry has been submitted to Thames Water stating the proposed foul and surface water discharge rates from the Proposed Development. Thames Water responded with their approval (24 March 2021) for both without the need for off-Site or on-Site sewer improvement works provided within **ES Volume 3, Water Resources, Flood Risk and Drainage – Annex 2**.

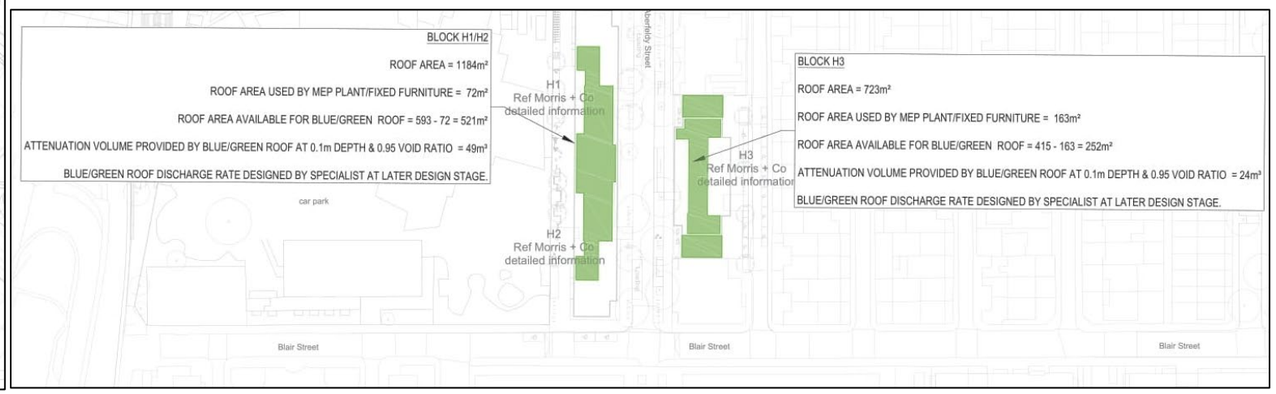
[9] Integrated Water Management Plan (IWMP) for the Isle of Dogs and South Poplar (October 2020)

Figure 12.3 SuDS Strategy – Roof Plan (not to scale)









POTENTIAL EFFECTS

Demolition and Construction

Effect of Flood Risk on Construction Workers from Demolition and Construction Activities

12.56 The sensitivity of construction workers to the risk of flooding is High as a result of a level of competence attained by construction workers and presence only during working hours in teams.

12.57 The Site has a low probability of tidal and fluvial flooding due to the high standard of protection available in the area from flood defences; fluvial/tidal flooding could happen only in the extreme event of a breach happening in proximity to the Site.

12.58 The majority of the Site is currently impermeable and as a consequence of the proposed Construction Works there will be a reduction in impermeable areas given the removal of hardstanding areas; therefore, the volumetric surface water runoff will decrease.

12.59 During demolition and construction works, rates of runoff are not expected to change significantly, however altering ground levels may cause surface water to naturally convey towards temporary low spots within the Site area, which may cause an alteration of the drainage regime and lead to surface water flooding. Overall, the magnitude of flood impact can therefore be considered to be Low.

12.60 The magnitude of flood impact is assessed as Low and the sensitivity of Construction Workers as High. Therefore, there is considered to be a direct, temporary, medium-term **Minor to Moderate Adverse (Significant)** effect locally on Construction Workers without mitigation.

Effect of Flood Risk on Local Residents of the Surrounding Area from Demolition and Construction Activities

12.61 The sensitivity of local residents of the surrounding area to flooding is considered high as the residents of the surrounding area live and sleep within their properties, and generally lack the awareness of the activities undertaken at nearby sites during construction works.

12.62 As the existing Site is not located within an active floodplain, the construction activities associated with the Proposed Development will not have an effect on fluvial or tidal flooding off Site through reducing floodplain storage capacity. During demolition and construction works, rates of runoff are not expected to change significantly, however altering ground levels may cause surface water to naturally convey towards temporary low spots within the Site area, which may cause an alteration of the drainage regime and lead to surface water flooding. Overall, the magnitude of flood impact can therefore be considered to be Low.

12.63 The magnitude of flood impact is assessed as Low and the sensitivity of local residents of the surrounding area as High. Therefore, there is considered to be direct, temporary, medium-term **Minor to Moderate Adverse (Significant)** effect on local residents.

Effect of Flood Risk on New Site Occupants from Demolition and Construction Activities

12.64 The sensitivity of new site occupants of the surrounding area to flooding is considered high as the residents of the surrounding area live and sleep within their properties, and generally lack the awareness of the activities undertaken at nearby sites during construction works.

12.65 As the existing Site is not located within an active floodplain, the construction activities associated with the Proposed Development will not have an effect on fluvial or tidal flooding off Site through reducing floodplain storage capacity. During demolition and construction works, rates of runoff are not expected to change significantly, however altering ground levels may cause surface water to naturally convey towards temporary low spots within the Site area, which may cause an alteration of the drainage regime and lead to surface water flooding. Overall, the magnitude of flood impact can therefore be considered to be Low.

12.66 The magnitude of flood impact is assessed as Low and the sensitivity of local residents of the surrounding area as High. Therefore, there is considered to be direct, temporary, medium-term **Minor to Moderate Adverse (Significant)** effect on Site Occupants.

Effect of water demand on the of water supply network capacity from Demolition and Construction Activities

12.67 The Site is currently served by TW's clean water supply network. The demand for water will vary throughout the demolition and construction programme and will be dependent on the specific activities on Site, however until a time of full occupancy the expected demand is not envisaged to be beyond the current demand.

12.68 The magnitude of impact is assessed as Negligible, and the sensitivity of the existing water supply network is Medium. Therefore, there is considered to be a local **Negligible (Not Significant)** effect on the existing water network. No further mitigation is required.

Effect of Drainage Quality on the TW Drainage Network Capacity from Demolition and Construction Activities

12.69 As discussed in the baseline conditions, the only relevant sensitive receptor in relation to surface water is the local Thames Water combined sewerage network.

12.70 During the construction stage there would be a number of activities, which could reduce surface water quality with respect to physical contaminants. These include: Site clearance; excavations; localised ground remediation (if required); and materials handling, storage, stockpiling, spillage and disposal. In addition, during periods of heavy rainfall, vehicle movements associated with construction activities resulting in damage to soil structure may generate increased sedimentation within surface runoff.

12.71 The sensitivity of the drainage network is considered to be low, and the magnitude of change prior to mitigation, is considered to be Medium adverse. Therefore, there is likely to be a direct, temporary, medium-term **Minor Adverse (Not Significant)** effect on the drainage network prior to the implementation of mitigation measures.

Effect of Groundwater Quality from Demolition and Construction Activities

12.72 As discussed in the baseline conditions, groundwater sensitivity is deemed Low given that the Site is not within a source protection zone.

12.73 During the construction stage there would be a number of activities, which could impact on groundwater quality with respect to physical contaminants. These include: Site clearance; excavations; localised ground remediation (if required); and materials handling, storage, stockpiling, spillage and disposal.

12.74 The sensitivity of groundwater is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Medium adverse. Therefore, there is likely to be a direct, temporary, medium-term **Minor Adverse (Not Significant)** effect on groundwater prior to the implementation of mitigation measures.

Effect of Drainage Quantity on the TW Drainage Network Capacity from Demolition and Construction Activities

12.75 Based on the pre-development consultation with TW for foul and surface water, the sensitivity of the combined drainage network is understood to be low. TW have confirmed that there is sufficient capacity for the foul and surface water for the Proposed Development.

12.76 All surface water and foul water is proposed to be discharged to the TW sewer network. The discharge into the combined sewer will vary depending on the construction activities being carried out and the number of complete phases with future Site occupants. It is understood from TW that the occupied aspects of the Proposed Development can be accommodated based on the existing available capacity and significant reduction in surface water discharge rates and it is anticipated that demand will not be exceeded during construction.

12.77 The sensitivity of the drainage network is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Low. Therefore, there is likely to be a direct, temporary, medium-term **Negligible/Minor Adverse (Not Significant) effect** on the drainage network. No additional mitigation is required.

Completed Development

Effect of Flood Risk on Local Residents of the Surrounding Area once occupied

12.78 The sensitivity of 'local residents of the surrounding area' to flooding is considered high as described within the 'Effect of Flood Risk on Local Residents from Demolition and Construction Activities' Section.

12.79 The Site Drainage Strategy has been designed to manage a rainfall event up to a 1:100year return period including a 40% allowance for the effects of climate change as detailed within the FRA **(ES Volume 3, Appendix Water Resources, Flood Risk and Drainage – Annex 1)** which will help in reducing the risk of surface water flooding in the local surrounding areas. Surface water runoff discharged into the public drainage network will reduce both in terms of volume and of peak, which will have a medium positive magnitude of impact on the public combined sewer capacity resulting in potentially less flooding in the wider area. When considered against the increase in foul discharge, the Proposed Development will still result in an overall reduction in combined discharge rates from the Site; this will have an overall low beneficial magnitude of impact when considering the impact of flooding within the surrounding area on local residents.

12.80 Therefore, the magnitude of impact is assessed as Low beneficial and the sensitivity of local residents of the surrounding area as High. This is considered to be a direct, permanent, long-term **Minor to Moderate Beneficial (Significant) effect** on local residents of the surrounding area of when considering the mitigation measures as defined in the Flood Risk Assessment and Drainage Strategy.

Effect of Flood Risk on Future Site Occupants once Occupied

12.81 The sensitivity of future 'Site Occupants' to flooding is considered High.

12.82 The Proposed Development will not impact on the floodplain storage capacity as the Site is located within the defended tidal floodplain and not an active floodplain, as such the Proposed Development will not increase any flooding risk off Site.

12.83 As detailed in the FRA, there are inherent mitigation measures that form part of the Proposed Development design (i.e. raised Final Flood Level and Flood Evacuation Plans) that will be placed to ensure residents and Site occupants remain safe for the lifetime of the Proposed Development.

12.84 The Drainage Strategy has been designed to manage a rainfall event up to a 1:100 year return period including a climate change allowance which will help in reducing the risk of flooding within the Proposed Development Site. Surface water runoff discharged into the public drainage network will reduce both in terms of volume and of peak, through the appropriate use of SuDS and attenuation on-Site, which will have a medium beneficial magnitude of impact on the probability of flooding within the Site.

12.85 The magnitude of impact is assessed Medium beneficial and the sensitivity of future Site Occupants as High. Therefore, this is considered to result in a direct, permanent long-term effect locally on-Site Occupants of **Moderate to Major Beneficial (Significant)** when considering the environmental design and management measures which will be adopted as part of the standard practice.

Effect of Drainage Quality on the TW Drainage Network Capacity Once Occupied.

12.86 As discussed in the baseline conditions, the only relevant sensitive receptor in relation to surface water is the local Thames Water combined sewerage network.

12.87 The Drainage Strategy has been designed for the inclusion of SuDS (blue/green roofs) as well as traditional SuDS features. All drainage will be designed to minimise pollution, and if required adequate petrol interceptors/treatment devices will be incorporated in accordance with best practice to reduce any risk of pollution.

12.88 The sensitivity of the drainage network is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Medium beneficial. Therefore, there is likely to be a direct, permanent, long-term **Minor Beneficial (Not Significant)** on the drainage network. No additional mitigation is required.

Effect of Groundwater Quality once Occupied.

12.89 Following completion on Site, all hardstanding areas will drain to the local combined sewer system in line with the implemented and approved drainage strategy. No surface water will drain via infiltration and therefore there is no inherent pollution risk that could take place on Site that would lead to a detriment to the groundwater regime.

12.90 The sensitivity of groundwater is considered to be Low, and the magnitude of change prior to mitigation, is considered to be Negligible. Therefore, there is likely to be a direct, permanent, long-term **Negligible (Not Significant)** effect on the groundwater regime. No further mitigation is required.

Effect of Water Demand on the Water Supply Network Capacity Once Occupied

12.91 The Site is currently served by TW's clean water supply network. The Proposed Development will increase the water demand above the existing baseline.

12.92 Based on consultation with TW, there is availability for 99 residential units from initial loading calculations conducted by TW. However, there is the requirement for more detailed modelling to be undertaken to determine if the Proposed Development as a whole can be accommodated within the clean water network. Modelling analysis will be undertaken by TW post planning to confirm any potential improvement works that may be required within the surrounding area to increase water supply within the network to directly meet the demand requirements of the Proposed Development. Based on the information available the water supply network is considered to have a medium sensitivity.

12.93 The Proposed Development will include water efficient fixtures and fittings where appropriate, to minimise and reduce water usage.

12.94 The magnitude of impact is assessed as Medium and the sensitivity of water supply network capacity as Medium. Therefore, this is considered to result in a local **Moderate Adverse (Significant)** effect on water supply network capacity from the demand for water resulting from the Proposed Development prior to the implementation of mitigation measures.

MITIGATION, MONITORING AND RESIDUAL EFFECTS

Demolition and Construction Mitigation and Completed Development.

12.95 The main mitigation required is the implementation of a Construction Environmental Management Plan (CEMP) secured via a planning condition. The implementation of standard construction management controls through a Construction Environmental Management Plan (CEMP) or similar during the demolition and construction activities will aid in minimising the potential for significant environmental effects resulting from contamination of water resources and potential for flooding, and is likely to include standard best practice measures such as:

- Implementation of bunding and sediment traps to act as pollution prevention measures;
- Agreement of allowable water demand with TW during the construction activities;
- Agreement of allowable foul and surface water drainage with TW during the construction activities;
- Implementation of a Piling Risk Assessment; and
- Implementation of a Contamination Remediation Strategy.

Demolition and Construction

Effect of Flood Risk on Construction Workers from Demolition and Construction Activities

12.96 Prior to mitigation, the magnitude of flood impact is assessed as Low and the sensitivity of Construction Workers as High. Therefore, there is considered to be a direct, temporary, medium-term **Moderate Adverse (Significant)** effect locally on Construction Workers without mitigation.

12.97 A temporary drainage strategy will be implemented during the construction stage as part of the Construction Environmental Management Plan (CEMP),and will ensure that water quality/groundwater quality is managed on site. The temporary drainage strategy will include temporary pumping arrangements in the case that groundwater emergence occurs in the excavations. The proposed temporary drainage strategy for the construction stage will be developed by the contractor prior to enabling works and approved by the LBTH.

12.98 The sensitivity of construction workers is considered to be High, and the magnitude of effect following mitigation, is considered to be Low following mitigation. Therefore, there is likely to be a direct, temporary, medium-term **Minor Adverse (Not Significant)** effect on the construction workers following the implementation of mitigation measures.

Effect of Flood Risk on Local Residents of the Surrounding Area from Demolition and Construction Activities

12.99 Prior to mitigation, the sensitivity of local residents of the surrounding area to flooding is considered High as the residents of the surrounding area live and sleep within their properties, and generally lack the awareness of the activities undertaken at nearby sites during construction works.

12.100 A temporary drainage strategy will be implemented during the construction stage as part of the Construction Environmental Management Plan (CEMP),and will ensure that water quality/groundwater quality is managed on site. The temporary drainage strategy will include temporary pumping arrangements in the case that

groundwater emergence occurs in the excavations. The proposed temporary drainage strategy for the construction stage will be developed by the contractor prior to enabling works and approved by the LBTH.

12.101 The sensitivity of Local Residents is considered to be High, and the magnitude of effect following mitigation, is considered to be Low following mitigation. Therefore, there is likely to be a direct, temporary, medium-term **Minor Adverse (Not Significant)**.

Effect of Flood Risk on New Site Occupants from Demolition and Construction Activities

12.102 Prior to mitigation, the magnitude of flood impact is assessed as Low and the sensitivity of new site occupants of the surrounding area as High. Therefore, there is considered to be direct, temporary, medium-term **Moderate Adverse (Significant)** effect on Site Occupants.

12.103 A temporary drainage strategy will be implemented during the construction stage as part of the Construction Environmental Management Plan (CEMP) and will ensure that water quality/groundwater quality is managed on site. The temporary drainage strategy will include temporary pumping arrangements in the case that groundwater emergence occurs in the excavations. The proposed temporary drainage strategy for the construction stage will be developed by the contractor prior to enabling works and approved by the LBTH.

12.104 The magnitude of flood impact is assessed as Negligible following mitigation and the sensitivity of new site occupants of the surrounding area as High. Therefore, there is considered to be direct, temporary, medium-term **Minor Adverse (Not Significant)** effect on Site Occupants.

Effect of Drainage Quality on the TW Drainage Network Capacity from Demolition and Construction Activities

12.105 Prior to mitigation, the sensitivity of the drainage network is considered to be low, and the magnitude of change is considered to be medium adverse. Therefore, there is likely to be a direct, temporary, medium-term minor adverse (not significant) effect on the drainage network.

12.106 A temporary drainage strategy will be implemented during the construction stage as part of the Construction Environmental Management Plan (CEMP),and will ensure that water quality/groundwater quality is managed on site. The temporary drainage strategy will include temporary pumping arrangements in the case that groundwater emergence occurs in the excavations. The proposed temporary drainage strategy for the construction stage will be developed by the contractor prior to enabling works and approved by the LBTH.

12.107 The sensitivity of the drainage network is considered to be Low following mitigation, and the magnitude of change is considered to be Low. Therefore, there is likely to be a direct, temporary, medium-term **Negligible/Minor Adverse (Not Significant)** effect on the drainage network.

Effect of Groundwater Quality from Demolition and Construction Activities

12.108 Prior to mitigation the sensitivity of groundwater is considered to be Low, and the magnitude of change is considered to be medium adverse. Therefore, there is likely to be a direct, temporary, medium-term minor adverse effect on groundwater.

12.109 A temporary drainage strategy will be implemented during the construction stage as part of the Construction Environmental Management Plan (CEMP) and will ensure that water quality/groundwater quality is managed on site. The temporary drainage strategy will include temporary pumping arrangements in the case that groundwater emergence occurs in the excavations. The proposed temporary drainage strategy for the construction stage will be developed by the contractor prior to enabling works and approved by the LBTH.

12.110 The sensitivity of groundwater is considered to be Low, and the magnitude of change prior following mitigation is considered to be Low adverse. Therefore, there is likely to be a direct, temporary, medium-term **Negligible/Minor (Not Significant)** adverse effect on the groundwater following the implementation of mitigation measures.

Completed Development

Effect of Water Demand on the Water Supply Network Capacity Once Occupied

12.111 The magnitude of impact is assessed as medium and the sensitivity of water supply network capacity as Medium. Therefore, this is considered to result in a local moderate adverse effect on water supply network capacity from the demand for water resulting from the Proposed Development prior to the implementation of mitigation measures. The requirement for reasonable upgrade works that are directly related to the Proposed Development will be further established post planning during appropriate detailed design from a specialist consultant in consultation with TW for implementation as part of the Proposed Development. Such improvement works will be implemented prior to occupancy of the Proposed Development, which results in a magnitude of impact of negligible significance. This will be secured by a planning condition from Thames Water.

12.112 Therefore, following the upgrade works (mitigation) taking place before occupancy, the magnitude of impact is assessed as Negligible and the sensitivity of water supply network capacity as Medium. Therefore, there is likely to be a direct, permanent long-term **Negligible (Not Significant)** adverse effect on water supply network.

12.113 No additional mitigation and monitoring measures are required during both the demolition and construction and once the Proposed Development is complete and occupied over the embedded mitigation measures set out within this ES Chapter which will be adopted as part of the standard practice.

12.114 The mitigation measures as outlined in the Flood Risk Assessment and Drainage Strategy are deemed to be inherent/embedded design requirements, and the conclusions/strategies outlined in each report will be in place before Site occupancy takes place, in line with current planning policy requirements.

Residual Effects

12.115 Likely significant effects of the Proposed Development have been assessed in relation to Water Resources, Drainage and Flood risk. A summary of the residual effects during both the 'Demolition and Construction' stage and 'Completed Development' stage for the Proposed Development can be seen below in **Table 12.5.**

Table 12.5 Sensitive Receptors

Receptor	Description of the Residual Effect	Scale and Nature	Significant / Not Significant	Geo	D I	P T	St Mt Lt
Demolition and Construction							
Construction Workers	Flood Risk on Construction Workers	Minor Adverse	Not Significant	L	D	T	Mt
Local Residents	Flood Risk on Local Residents of the surrounding area	Minor Adverse	Not Significant	L	D	T	Mt
Site Occupants	Flood Risk on Site Occupants	Minor Adverse	Not Significant	L	D	T	Mt
TW Water Supply Network	Water demand on the of water supply network capacity	Negligible	Not Significant	N/A			
TW Drainage Network	Drainage quantity and quantity on the drainage network capacity	Negligible/Min or Adverse	Not Significant	L	D	T	Mt
Groundwater	Quality of groundwater	Negligible/Min or Adverse	Not Significant	L	D	T	Mt
Completed Development							
Local Residents	Flood Risk on Local Residents of the surrounding area	Moderate Beneficial	Not Significant	L	D	P	LT
Site Occupants	Flood Risk on Site Occupants	Moderate Beneficial	Not Significant	L	D	P	LT
TW Water Supply Network	Water demand on the of water supply network capacity	Negligible	Not Significant	L	D	P	LT
TW Drainage Network	Drainage quantity on the drainage network capacity	Negligible	Not Significant	N/A			
TW Drainage Network	Drainage quality on the drainage network capacity	Minor Beneficial	Not Significant	L	D	P	LT
Groundwater	Quality of groundwater	Negligible	Not Significant	L	D	P	LT

Residual Effect
- Scale = Negligible / Minor / Moderate / Major
- Nature = Beneficial or Adverse

Geo (Geographic Extent) = Local (L), Borough (B), Regional (R), National (N)

D = Direct / I = Indirect
P = Permanent / T = Temporary
St = Short Term / Mt = Medium Term / Lt = Long Term
N/A = not applicable / not assessed

ASSESSMENT OF THE FUTURE ENVIRONMENT

Evolution of the Baseline Scenario

12.116 In the absence of the Proposed Development, it is likely that similar applications would come forward on the Site. Should no development take place at the Site, it is considered that in the future baseline, the conditions in relation to Water Resources, Drainage and Flood Risk at the Site would remain relatively unchanged over the short / medium term. However, they would also be subject to climate change in the long-term. The intensity of precipitation falling on the Site (and elsewhere) could increase due to climate change, as well as potentially increased risk from tidal/fluvial flooding if the TE2100 strategy is not implemented.

12.117 With climate change (UKCP18) projections, there is increasing evidence to show that the supply and demand of potable water is likely to worsen within London as a result of climate change due to drier summers in the future and longer periods of drought not recharging the potable water supply within the groundwater, this is further re-iterated as part of the Future Flows and Groundwater Levels work undertaken by CEH in partnership with the EA and others.

12.118 The need to manage surface water in the future scenario will depend on government guidance on climate change rainfall prediction, as the moment all surface water drainage strategy takes into account climate change predictions and ensure that sites do not flood for all events up to the 1:100 year plus climate change event. This approach is unlikely to change going forward.

12.119 The management of groundwater quality will remain relatively unchanged in the long term, given the need to ensure the protection of potable water abstraction sites. The EA who police potential pollution incidents will in the long terms continue to enforce their requirements for any possible risks that could take place which all development should adhere too or otherwise face prosecution/penalties.

12.120 However, as with most climate change predictions there is significant amounts of variance depending on future government guidance.

Cumulative Effects Assessment

Demolition and Construction

12.121 Cumulative effects to water resources, drainage and flood risk during demolition and construction processes are associated with the generation of sediments and the release into the sewer drainage network; spillage and leakage of oils and fuels; disturbance of contaminated land; and disturbance to groundwater and foul drainage.

12.122 Measures exist to manage and control these effects and reduce the magnitude and significance of effects to a minimum as outlined for the Proposed Development in the Environmental Design and Management section above, as well as mitigation as outlined. These measures are anticipated to be adopted as part of all surrounding committed developments as a matter of standard construction management and best practice. Therefore, as a result of these control measures, and the fact that not all committed developments in the area will discharge into receiving surface waters or groundwater at exactly the same time, the cumulative effect on water resources, drainage and flood risk is considered to be **Negligible (Not Significant).**

12.123 The flood risk effect on construction workers, local residents during construction projects is effectively managed as part of temporary drainage solutions in line with industry best practice, and well as implemented CEMP which will ensure that there is no adverse flooding risk associated with construction projects, regardless on the number of projects locally in an area.

12.124 Water supply demand would be managed by Thames Water as part of any construction project, to ensure that no increased risk or supply issues for any committed development schemes taking place, and if required improvement works are undertaken to ensure capacity exists for all within the local area.

Completed Development

12.125 In general, there will be a beneficial effect on surface water flood risk and residual tidal and fluvial flood risk once the Proposed Development is completed and operational, and taking account of surrounding committed developments. It is acknowledged that most new urban developments within London aim to reduce the surface water runoff in accordance with best practice and national/local policy (e.g. London Plan) and implement appropriate mitigation measures to manage the residual risks of a breach event. In addition, the now mainstream use of SuDS will also help in terms of water quality and wider sustainability criteria.

12.126 From a fluvial/tidal flooding perspective, the Site is located in a defended floodplain and hence there will be no impact on floodplain storage capacity even when considering the combined effect of various committed developments.

12.127 Water demand is expected to increase as a result of committed developments and hence TW are consistently looking to improve the water resources available in the short term and long term, to cater for urban development as part of their long-term water resources management strategies to manage the increased demand from the committed developments also located within areas considered to be sensitive to water supply.

12.128 The public foul drainage network demand will cumulatively increase as a result of surrounding committed developments; however, TW are constantly assessing the available capacity within their network and ensure suitable strengthening works are conducted where required.

12.129 Overall when taking into consideration the committed developments, there will be a negligible effect to the TW water supply and drainage capacity due to the ongoing improvements works being undertaken by TW. There will also be a potential beneficial effect on surface water flooding within the local area due to the inherent environmental design and management measures which will be adopted as part of the standard practice.

LIKELY SIGNIFICANT EFFECTS

12.130 There are no likely significant effects anticipated for the Proposed Development associated with Water Resources, Flood Risk and Drainage once inherent design measures and supplementary mitigation measures are taken into account.