

16. Water Resources and Flood Risk

16.1 Introduction

16.1.1 This chapter, prepared by BWB Consulting Limited, details the potential receptors and assesses the likely significant effects of the Proposed Development, known as Surrey Canal: London's Sporting Village, on the water environment, specifically in terms of hydrology, drainage and flood risk as well as surface and groundwater quality.

16.1.2 This chapter describes the assessment methodology, the baseline conditions currently existing at the Site and surroundings, the likely significant environmental effects, the mitigation measures required to prevent, reduce or offset any adverse likely significant effects and the likely significant residual effects after these measures have been employed.

16.1.3 The Proposed Development is for up to 250,000 sq m (gross external area [GEA]) of mixed use floorspace on the Application Site. The proposals incorporate employment uses, community uses, residential uses, leisure and retail uses, and publicly accessible open space. Full details of the Proposed Development are set out earlier in this ES and are specifically defined in the Development Specification and the Parameter Plans.

16.1.4 The Development Specification sets out Renewal's commitments to achieve this goal by introduction of extensive sustainable drainage (SuDS) techniques into the design of the development. SuDS seek to reduce the quantity and rate of runoff using natural drainage techniques, which also bring advantages in runoff quality improvement and ecological and amenity value of the drainage features.

16.1.5 In this case, the Site ultimately drains to combined sewers, so the emphasis of the SuDS should be on flow and volume reduction, ecological and amenity value. There is no significant value in expending resources to improve water quality given that the outflows ultimately mix with combined sewerage.

16.1.6 The techniques proposed in the Development Specification are as follows:

Extensive use of green and brown roofs

16.1.7 The use of green and brown roofs is the ultimate in source control, replicating the effects of rainfall falling on natural ground but at high level. The green and brown roofs will reduce both

the quantity and the volume of rainfall runoff from roof areas, whilst also providing the opportunity for rooftop gardens with their ecological and amenity benefits.

Permeable Paving

16.1.8 At surface level, permeable paving will be used where appropriate to collect runoff from paved areas instead of conventional gullies and channels. The paving will drain to a granular substrate that will provide attenuation storage and remove oils and hydrocarbons from the runoff. Where the ground conditions are suitable, runoff will be drained through the base of the substrate by infiltration into the underlying ground. In areas where ground conditions are not suitable for infiltration drainage, the permeable pavement structures will be wrapped in a sealed membrane and outflows collected through low capacity fin drains, which will then discharge to the piped drainage system and combined sewers.

Open Water Features

16.1.9 The design of the publicly accessible open space will accommodate open water features interconnected with the SUDS drainage system where appropriate reflecting the canal heritage of the Site. These features will be designed as SuDS systems, focused on providing attenuation storage and amenity value to the system. Ecological and water quality improvement features will be incorporated to the extent appropriate for the setting.

16.1.10 The combination of these SUDS measures will provide the Proposed Development with an effective drainage system that meets the planning policy requirements set out in the SFRA and adds significant value to the amenity and ecology of the publicly accessible open space and roofscape. This will contribute to the enhancement of the Proposed Development and is not necessarily a requirement to overcome the likely significant effects of the Proposed Development.

16.2 Policy context

16.2.1 Where relevant, this assessment takes into account the main legislative documents that govern the protection of the water environment in the UK including:

- PPS1 (Delivering Sustainable Development);
- PPS23 (Planning and Pollution Control);
- PPS25 (Development and Flood Risk);

- Water Resources Act 1991;
- Land Drainage Act 1991 as amended 1994;
- UK Water Supply Regulation 2001;
- Environment Act 1995;
- The EC Groundwater Directive 80/68/EC and Groundwater Regulations 1998;
- GP3 Groundwater Protection: Policy and Practice (Environment Agency), 2006; and
- Town and Country and Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999.

16.2.2 Alongside the main legislation there is a range of non-statutory guidance material including:

- Interim Code of Practice on SuDS (July 2004);
- C697 SuDS Design Manual;
- B014 Design of Flood Storage Reservoirs (1993);
- C624 Development and Flood Risk – Guidance for the Construction Industry (2004);
- C532 Control of Water Pollution from Construction Sites – A Guide to Good Practice (2001);
- Environment Agency’s Pollution Prevention Guidelines (2002 – 2004);
- Sewers for Adoption 6th Ed. (March 2006);
- BRE Digest 365 – Soakaways (1991); and
- Environmental Impact Assessment – A Guide to Procedures (2000).

National Policy

16.2.3 Planning Policy Statement 1 – Delivering Sustainable Development

PPS1 encourages environmental improvements to be considered and employed on all new development.

Planning Policy Statement 23 – Planning and Pollution Control

16.2.4 Planning Policy Statement 23 refers to the environmental effects of new development. The statement advises that:

“Any consideration of the quality of land, air or water and potential effects arising from development, possibly leading to effects on health is capable of being a material planning consideration, in so far as it arises or may arise from or may affect any land use”. (Paragraph 2)

“The effects of existing sources of pollution in and around the Site are not such that cumulative effects of pollution when the Proposed Development is added would make that development unacceptable”. (Paragraph 15)

16.2.5 Consultation may be required where there is the potential for pollution or concerns of possible cumulative effects, for example, polluting discharges to a still waterway such as canals or lakes.

Planning Policy Statement 25 – Development and Flood Risk

16.2.6 PPS25 sets out the Government's national policy on land use planning in England in relation to development and flood risk.

16.2.7 PPS25 encourages the development of Strategic Flood Risk Assessments (at Local Authority level) and the use of sequential tests to identify the appropriateness of a development with regards its existing land use, proposed land use and its Flood Zone classification.

16.2.8 Development proposals should be reviewed considering flood risk to the development itself as well as the effect of the development on flood risk in the wider catchment area. Climate change scenarios, a 20% increase on the 100-year river flows and a 10 to 30% increase in design rainfall (PPS25 Table B.2), should be taken into account when designing drainage infrastructure and in setting requirements to prevent the increase in flood risk off site as a result of a development. This is achieved through floodplain compensation (where appropriate) and surface water drainage strategies. The latter of these applies to all sites larger than 1ha regardless of their flood zone classification.

16.2.9 PPS25 (Annex F) provides statutory requirements for the drainage of new development sites, whereby:

"Surface water arising from a developed Site should, as far as is practicable, be managed in a sustainable manner to imitate the surface water flows arising from the Site prior to the Proposed Development, while reducing the flood risk to the Site itself and elsewhere, taking climate change into account. This should be demonstrated as part of the Flood Risk Assessment". (Paragraph F6. Annex F, PPS25)

16.2.10 PPS25 also promotes the provision of betterment for development of brownfield Sites and advocates the use of Sustainable Drainage Systems (SuDS) on all new developments. SuDS is a term that covers a wide range of sustainable approaches to surface water drainage management including (Paragraph F7):

- source control (preventative measures e.g. rainwater harvesting);
- infiltration devices to allow soakaway to the ground;
- filter strips and swales – vegetated features that hold and drain water down hill mimicking natural drainage patterns;
- filter drains and porous pavements– infiltration and/or attenuation storage;
- basins and ponds – attenuation storage and treatment; and

- wetlands and reedbeds – to provide further treatment of surface water runoff.

16.2.11 PPS25 (paragraph F8) encourages local planning authorities (LPAs) to ensure:

“That their policies and decisions on applications support and complement Building Regulations (2000) on sustainable rainwater drainage. These give priority to the use of infiltration drainage systems over first watercourses and then sewers”.

Regional Policy

London Plan Draft Replacement 2004

16.2.12 The London Plan Draft Replacement has several policies regarding to the water environment.

Policy 5.11 – Green roofs and development site environs suggests that:

“Major development proposals should be designed to include roof, wall and site planting, especially green roofs and walls where feasible, to deliver as many of the following objectives as possible:

- (a) adaption to climate change (i.e. aiding cooling);*
- (b) sustainable urban drainage;*
- (c) mitigation of climate change (i.e. aiding energy efficiency);*
- (d) enhancement of biodiversity;*
- (e) accessible roof space;*
- (f) improvements to appearance and resilience of the building; and*
- (g) growing food.”*

16.2.13 Green roofs are essential sustainable design consideration and can take many forms in order to maximise their benefits in a given location.

16.2.14 Policy 5.12 – Flood risk management states that:

“The Mayor will work with all relevant agencies including the Environment Agency to address current and future flood issues and minimise risks in a sustainable and cost effective way. Development proposals must comply with the flood risk assessment and management requirements set out in PPS25 over the life time of the development and have regard to measures proposed in TE2100 and Catchment Flood Management Plans.

Developments which are required to pass the PPS25 Exception Test will need to address flood resilient design and emergency planning by demonstrating that:

- (a) the development will remain safe and operational under flood conditions;*
- (b) a strategy of either safe evacuation and / or safely remaining in the building is followed under flood conditions;*
- (c) key utilities including electricity, water, lifts etc will continue to be operational under flood conditions; and*

(d) *buildings are designed for quick recovery following a flood.*

Development adjacent to flood defences will be required to protect the integrity of existing flood defences and wherever possible be set back from those defences to allow their management, maintenance and upgrading to be undertaken in a sustainable and cost effective way.”

16.2.15 Policy 5.13 – sustainable drainage states that:

“Development should utilise sustainable urban drainage systems (SuDS) unless there are practical reasons for not doing so and should aim to achieve greenfield runoff rates and ensure that surface water runoff is managed as close to its source as possible in line with the following drainage hierarchy:

(a) store rainwater for later use;

(b) use infiltration techniques, such as porous surfaces in non-clay areas;

(c) attenuate rainwater in ponds or open water features for gradual release;

(d) attenuate rainwater by storing in tanks or sealed water features for gradual release;

(e) discharge rainwater direct to a watercourse;

(f) discharge rainwater to a surface water sewer / drain; and

(g) discharge rainwater to a combined sewer.”

Local Policy

Lewisham Unitary Development Plan (UDP) (2004)

16.2.16 The Lewisham UDP, published in 2004, has several policies with regard to the water environment. Policy ENV.PRO 14 – Controlling Development in the Floodplain, states that

“development will not normally be permitted for new residential or non-residential development including extensions, unless it can be demonstrated to the satisfaction of the Borough that the proposal would not, itself or cumulatively with other development:

(e) Impede the flow of water, or;

(f) Reduce the capacity of the floodplain to store flood water, or;

(g) Increase the number of people or properties at risk from flooding”.

16.2.17 This is because the natural floodplain of a river is vital in limiting flood risk, both by storing water and providing flood flow routes in times of flood. Consequently, any development located in the floodplain is likely to be at risk of flooding. In addition, development in the floodplain may increase the risk of flooding elsewhere, by reducing the storage capacity of the floodplain and by impeding the flow of flood water.

16.2.18 Where it is decided that development in such areas should be permitted for social or economic reasons, the appropriate flood protection and mitigation measures, including

measures to restore the floodplains or provide adequate compensatory storage, should be required to mitigate the impact of development.

16.2.19 Policy ENV.PRO 15 – Sustainable Surface Water Drainage in New Development, highlights that

“Where appropriate surface water should be disposed of as close to source as possible, or be attenuated before discharge to a watercourse or surface water sewer”.

16.2.20 Sustainable surface water drainage methods include water butts, soakaways, porous pavements, storm water wetlands and balancing ponds. The methods adopted will need to have regard to the hydrological setting of individual Sites and the use of appropriate pollution prevention measures.

16.2.21 ENV.PRO 16 – Protection of Tidal and Fluvial Defences:

“Development will not be permitted which would adversely affect the integrity of London’s tidal or fluvial defences”.

16.2.22 Areas within the borough are protected from flooding by tidal and fluvial defences. It is crucial that development within these areas is not permitted where it would harm the effectiveness and continuity of tidal or fluvial defences in Lewisham. Access to structures must also be retained, and where appropriate improved, for maintenance and emergency purposes.

16.2.23 ENV.PRO 17 – Management of Water Supply, states that:

“New development should incorporate measures to prevent the depletion or reduction in quality of groundwater or surface water that can jeopardise future supplies. The Council will encourage techniques which improve water efficiency and minimise adverse impacts on water resources, on the quality, regime and ecology of rivers and on groundwater. The Council will approve applications for development only where adequate foul and surface water drainage capacity, works for which would be environmentally acceptable, would be available to meet the requirements of those developments prior to their occupation”.

16.2.24 The supply of water and the disposal of waste is essential to any human settlement. It is important that new development is planned so as not to run ahead of the necessary provision of water supply and sewerage infrastructure.

London Borough of Lewisham Local Development Framework (LDF) – Core Strategy Submission Document (Oct 2010)

16.2.25 The Local Development Framework identified that community consultation was undertaken as part of their LDF. It was established that residents were aware of the potential risk from river

and tidal flooding in Lewisham and thought that the Council should take a proactive approach in preparing for the risks associated with climate change. A majority of the respondents thought that London Borough of Lewisham had proposed the best options to deal with flood hazards and climate change.

16.2.26 The main implications in Lewisham relate to development within the Thames Gateway area, where significant areas are shown to be within an area at risk from flooding.

16.2.27 The Core Strategy policy relates to implementing:

- Strategic objective 5 by addressing climate change;
- Strategic objective 6 by contributing to flood risk reduction and water management.

16.2.28 The Core Strategy policy appraises, manages and reduces flood risk in accordance with PPS25 to ensure that flood risk is taken into account through all stages in the planning process:

- To avoid inappropriate development in areas at risk of flooding;
- To direct development away from areas at high risk of flooding;
- Where new development is exceptionally necessary in such areas, make it safe without increasing flood risk elsewhere and, where possible, to reduce risk overall.

16.2.29 Core Strategy Policy 10 – Managing and reducing the risk of flooding highlights that:

“The Council will use the requirements detailed in PPS25 and the London Plan while at the same time implementing the spatial planning and development control recommendations of the Strategic Flood Risk Assessment and the Sequential Test in order to:

- Sequentially allocate land to guide development into areas least at risk from flooding;*
- Prevent new development from adding to the risk of localised flooding;*
- Reduce the flood risk to people and the built environment and to the development itself and elsewhere by ensuring the highest design standards contributing to flood reduction and mitigation;*
- Demonstrate that the most sustainable drainage system that is reasonably practical is being incorporated to reduce flood risk, improve water quality and achieve amenity and habitat benefits;*
- Conserve water resources by using water saving devices and rainwater harvesting systems.*

Applicants will need to demonstrate that their proposal will deliver a positive reduction in flood risk to the borough, whether that be by reducing the frequency or severity of flooding, or by reducing the impact that flooding may have on the community.”

16.2.30 Core Strategy Policy 11 – River and waterways network states that:

Development adjacent to rivers and the waterway network should contribute to their special character by improving the urban design and vitality of the river frontages, improve access to the foreshore and naturalise flood defences, where appropriate.”

16.2.31 This policy helps to reduce flood risk through the appropriate location, design and construction of development and the sustainable management of surface water runoff. The policy seeks to ensure that new development should be seen as an opportunity to reduce the causes and impacts of flooding by measures such as provision of flood storage, use of SUDS, and re-creating the functional floodplain.

Summary of planning policy

16.2.32 In summary, the UDP has stated that a site specific Flood Risk Assessment be prepared for the site to assess the potential likely significant effects of flood risk. The London Plan also highlights the requirement for green roofs at this location to be used to attenuated surface water runoff and associated within this the UDP to discharge surface water runoff as close to source as possible.

16.2.33 The Core Strategy sets out the requirement to undertake a Sequential Test in order to place development in areas at less risk of flooding, reducing the risk to people, although the Surrey Canal Application Site is identified as a Strategic Site Allocation for development within the same LDF Core Strategy.

16.3 Methodology and assessment criteria

16.3.1 The methodology for the EIA was based upon the procedure outlined in Department for Communities and Local Government’s Environmental Impact Assessment: A guide to procedures (2000).

16.2.2 The assessment will identify the potential likely significant effects of the Proposed Development on the water environment, specifically the effects on water quality, hydrology and drainage (receptors) in the study area, and will determine the significance of the identified

likely significant effects for both the construction and operation phases. A sensitivity assessment is applied to each of the receiving receptors as low, medium or high.

Definition of significance

16.2.3 The significance of each impact is measured through a qualitative assessment using a technique which considers the significance of the likely significant effect. The extent of the potential likely significant effects of the Application Site have been assessed using criteria such as magnitude, frequency and extent of the likely significant impact and the sensitivity of the receiving parameter. The assessment of significance for each likely significant effect will consider the relative components in the assessment and measure the value based upon the following scale:

Table 16.1: Scale of likely significant effects used in the assessment

Magnitude	Criteria
Major Adverse	Results in loss of life or attribute due to flooding or water pollution
Moderate Adverse	Results in impact of integrity of attributes or loss of part of attribute such as damage to a building or the health of a person
Minor Adverse	Results in minor flooding to properties or life which is rectifiable
Negligible	Results in an likely significant effect on the potential attribute, but is not in sufficient magnitude to affect the use / integrity of the attribute
Minor Beneficial	Results in a minor positive impacts to the wider catchment with regards to flood risk elsewhere in the Borough
Moderate Beneficial	Results in a positive impact on a quality of water or life
Major Beneficial	Results in a significant positive impact on the attribute and surrounding area

16.3.4 Within this assessment the significance of effect has been assessed as the product of the magnitude of the impact and the value and sensitivity of the receptor.

16.3.5 Within the context of this assessment the defined receptors which will be assessed include:

- People (Local Residents)– in order to quantify and qualify ‘people’ as a receptor an assessment will be made into the risk and vulnerability posed in accordance with PPS25;
- Groundwater – this will involve consideration of potential construction and operational phase likely significant effects on the quality of groundwater underlying the Site and to what scale this likely significant effect will be felt. Attributes such as water supply and vulnerability will be assessed and the

Environment Agency's source protection zone classification will quantify the likely significant effect.

- River / Stream – attributes such as water quality, conveyance of flow and biodiversity will need to be assessed. The indicator of quality will include Environment Agency water quality testing, the presence of surface water discharges and the presence of any watercourses.
- Floodplain – the Application Site is identified as being within floodplain to assess the likely significant effects of this receptor the conveyance of flow will identify the quantity and quality of such a likely significant effect.

Study Area

16.3.6 Data from the Environment Agency's website (www.environment-agency.gov.uk) has been used in the assessment of water resources. The use of the Environment Agency's maps has assisted in identifying the Flood Zone in which the Application Site lies. The assessment of water quality for nearby watercourses and the risk to any groundwater or aquifers in the area has also been examined on the Environment Agency's maps.

16.3.7 Using Ordnance Survey mapping the study area has been defined by the limited number of sources of flood risk within close proximity to the Site. The River Thames is located approximately 1.5km which poses a potential likely significant effect to the Site and as such has been included within our study area. No other significant sources of flood risk were identified within a 1km radius.

Consultations

16.3.8 The Environment Agency were consulted on 1st October 2009 with regard to flood risk on Site and they have confirmed that the Site falls within Flood Zone 3a of the River Thames tidal floodplain, although in an area shown to be benefiting from existing flood defences. Flood Zone 3 is classified as comprising land with a 1 in 100 or greater annual probability of fluvial flooding in any year (>0.1%) in accordance with Planning Policy Statement 25 – Development and Flood Risk (PPS25).

16.3.9 Environment Agency correspondence is attached as Appendix B of The Flood Risk Assessment (Technical Appendix 16.1).

16.3.10 The EIA Scoping Response (reference: 10/74106) received on 14th July 2010 (Technical Appendix 1.2) made reference to the water resources chapter. It was suggested that a Flood Risk Assessment was included as an appendix to the Environment Statement to ensure that

flood risk issues are properly considered. Within the Flood Risk Assessment the following should be addressed:

- Sequential and Exception Test PPS25;
- Sources of flooding;
- Breach and overtopping; and
- Land contamination and groundwater protection.

16.3.11 These have all been addressed within the Flood Risk Assessment, Technical Appendix 16.1, and Phase 1 Desk Study, Technical Appendix 15.1.

Uncertainty/Assumptions

16.3.12 At this stage percolation and intrusive contamination tests have not been undertaken to assess whether the underlying strata at the Site would be suitable for infiltration features / soakaways. As such, the use of such devices in the drainage strategy is unknown and should be pursued as an option for surface water disposal at detailed design stage. It not considered likely that these tests will affect the conclusions of this assessment as the selection of SuDS will be undertaken based on the prevailing ground conditions found at detailed design stage. In the worst case scenario, it is assumed that contamination of surface soils will prevent use of infiltration drainage and all flows will have to be connected to the public sewer system. This 'worst case' method of drainage has used been the basis of assessment.

16.3.13 As the detailed design for the Proposed Development is not available at this time, the proposed runoff rates and potential attenuation volumes have not been quantified within the Flood Risk Assessment and are considered estimates. This will not affect the outcome of the assessment as it is known that a volume of storage will be required and a 50% reduction in runoff rates will be provided through a combination of green roofs and permeable paving in order to afford attenuation on site. The actual volume and detailed design of SuDS will be defined at a later stage.

16.4 Aspects of the Proposed Development of relevance to the assessment

16.4.1 The aspects of the Proposed Development which are of relevance to the water resources assessment include the following:

- Green / Brown roofs which will be used to provide attenuation;
- Location of residential development;
- Basement car parks;
- Construction techniques;
- The extent of hardstanding on Site; and
- Other SuDS features, such as permeable paving and soakaways.

Worst case scenario

16.2.4 The assessment of potential likely significant effects on the water resources within the Application Site and surrounding area have been based upon a worse case scenario prior to proposed mitigation measures. This includes potential likely significant effects should no attenuation be provided on Site to accommodate the 50% reduction in runoff rates stated in the Lewisham and Thames Strategic Flood Risk Assessment. The worst case scenario also assumes that the Proposed Development will not be mitigating against the likely significant effect of water pollution of surface water runoff during the construction phase.

16.5 Baseline situation

Existing Site

16.5.1 The existing Site baseline has already been established in Chapter 3 of this ES. The baseline situation with regard to water resources is referred to below.

Watercourses

16.5.2 The River Thames is located approximately 1.5km north and east of the Site which is tidally influenced at this location and flows in an easterly direction.

16.5.3 The Flood Zone maps published on the Environment Agency website (www.environment-agency.gov.uk), on the 3rd December 2010, shows the Site to fall within Flood Zone 3a of the

River Thames within land that would be in the tidal / fluvial floodplain of the river, although in an area shown to be benefiting from existing flood defences.

Geology and Hydrology

16.5.4 Geological information within the Lewisham SFRA (www.lewisham.gov.uk) shows that the underlying bedrock is chalk overlain by alluvium deposits.

16.5.5 A Phase 1 Desk Top Study, Technical Appendix 15.1, has identified that the Application Site is anticipated to be underlain by a significant thickness of made ground overlying drift deposits of alluvium and Kempton Park Gravel to depths between 6m and 8m bgl. The underlying bedrock is anticipated to consist of chalk with bands of flint of the Upper Chalk Formation.

Groundwater

16.5.6 The Kempton Park Gravel and alluvium have been classified by the Environment Agency (www.environment-agency.gov.uk), as Secondary A and undifferentiated Aquifers whilst the Upper Chalk is classified as a Principle Aquifer. The Site is not located with a Source Protection Zone (SPZ) and groundwater flow is anticipated to be towards the River Thames to the North West.

Surface Water Drainage

16.5.7 The Application Site is previously developed and is in an urbanised area. Examination of sewer records shows an extensive network of combined sewers in and around the Site, namely in Bolina Road and Rollins Street, and surface water runoff from the existing Site connects to the combined sewer network.

Foul Water Drainage

16.5.8 Thames Water Sewer Records show public combined sewers in Bolina Road and Rollins Street adjacent to the Site with a trunk sewer in Ilderton Road to the west. Foul sewerage from existing buildings and the Football Stadium connects to this network of sewers.

16.6 Identification and assessment of effects

Construction effects

Sources of Water Pollution

- 16.6.1 The likely potential significant effects associated with the construction phase are short term or medium term likely significant effects. Common instances of water pollution during the construction phase can occur from suspended solids, oils and hydrocarbons, concrete and cement products, metals, sewage and other pollutants and hazardous materials generated during the construction process. Situations in which such substances could enter the water environment range from routine operations such as tyre-washing to accidents and vandalism.
- 16.6.2 Pollutants can enter the water environment from construction Sites through runoff from the Application Site, dewatering operations and infiltration.
- 16.6.3 According to the CIRIA guidance (C532) on Control of Water Pollution from Construction Sites, 2001, the most common instance of water pollution from construction sites is from suspended solids. Possible sources of suspended solids from the construction of the Proposed Development include:
- Excavations;
 - Exposed ground or stock piles;
 - Plant and wheel washing;
 - Build up of dust and mud on Site roads; and
 - Pumping of contaminated surface waters or groundwaters accumulated on the Application Site.
- 16.6.4 Suspended solids from construction work will adversely impact extensive reaches of surface watercourses during significant / heavy rainfall events.

Oils and Fuels

- 16.6.5 Oils, diesel and petrol are also common pollutants from construction sites. The consequences of a large spillage or leakage from construction traffic or machinery will have a likely significant effect on the nearby watercourses should overland runoff carry these hydrocarbons towards these watercourses.
- 16.6.6 Oils and fuels entering a watercourse can lead to the build up of a film on the surface water. This has the potential to reduce the oxygen content in the water and could pose a likely significant effect on aquatic ecosystems.

Other Pollutants and Hazardous Materials

16.6.7 Further pollution hazards may come from the uncontrolled release of substances such as rubbish, solvents, clearing agents, paints and other chemicals. Bulk quantities of these substances would not be present on the Application Site, thus reducing the likely significant effect of their release. However, toxicity of such substances could be higher, thus increasing any potential likely significant effects.

Concrete and Cement Products

16.6.8 Where any concrete production is to take place on the construction Site or brought onto the Application Site by ready mix lorries, a large volume of waste could be generated either from the washing out of the batching plant or through the washing down of lorries before their departure from the Site.

Runoff Volume and Flows

16.6.9 During the construction phase machinery has the potential to remove topsoil. Surface water runoff could erode this and transport the sediment to the nearest watercourse. Surface water runoff could also transport contaminated water into the local watercourses.

Water Quality

16.6.10 The quality of water will be impacted in the short term during the construction phase by the introduction of silts from eroded subsoil into the watercourse or from any spillages or leakages of pollutants.

16.6.11 The water quality of the groundwater on the Site can be significantly affected during construction. Activities identified previously which are undertaken on the Site have the potential to infiltrate into the groundwater and have a likely significant effect on the environment.

Foul Drainage

16.6.12 There will be a heavy presence of construction staff on Site and these will have to be served by welfare facilities which will require disposal. This will create a temporary increase in demand for foul drainage.

Assessment of Significance

16.6.13 In accordance with the methodology guidance set out in Chapter 2 the likely significant construction effects have been identified and assessed against the criteria.

Identification of Effects	Nature	Sensitivity of Receiving Parameter	Magnitude	Frequency	Extent	Timescale	Overall
Suspended Solids	Direct	High	Medium	Continuous	Local	Short Term	Moderate Adverse
Oils and Fuels	Direct	High	Medium	Infrequent	Local	Short Term	Minor Adverse
Hazardous Materials	Direct	High	Medium	Infrequent	Local	Short Term	Minor Adverse
Concrete and Cements	Direct	High	Medium	Infrequent	Local	Short Term	Minor Adverse
Runoff Volumes and Flows	Indirect	Medium	Low	Continuous	Local	Short Term	Minor Adverse
Water Quality	Direct	High	Medium	Frequent	Regional	Short Term	Minor Adverse
Foul Drainage	Indirect	Low	Low	Continuous	Local	Short Term	Minor Adverse

16.6.14 In view of the long duration of the construction phase an assessment has been undertaken of an environmental snapshot when the development is partly occupied but construction works are ongoing to identify whether this gives rise to any additional environmental effects. In terms of flood risk and water resources there will be no additional impacts at this time other than the general construction likely significant effects identified above.

Operational effects

Flood Risk

16.6.15 The Flood Risk Assessment (Technical Appendix 16.1) has confirmed that the Site falls within Flood Zone 3a of the River Thames tidal floodplain. The likely significant effects to the Proposed Development prior to mitigation include rapid inundation, with contingent risks to peoples' lives.

Water Quality

16.6.16 The creation of soft landscaping and introduction of infiltration drainage on a Site that is currently fully hard paved, positively drained previously developed land presents the risk of groundwater pollution by mobilisation of leachable contaminants from surface soils. A full intrusive investigation of the Site has not yet been undertaken however it is known that there have been a variety of historical uses that could give rise to sub-surface contamination. These

are considered further in the Ground Conditions Section (Chapter 15). This will lead to a likely significant effect of groundwater pollution unless mitigated.

16.6.17 Risks to water quality of surface waters are not present as there is no direct connectivity to surface watercourses from the current or Proposed Development. Drainage is currently provided by combined sewers.

16.6.18 Further in line with the principles of PPS1 – Delivering Sustainable Development, other likely significant effects on the water environment need to be considered. In this case the quality of runoff from the Proposed Development in relation to resources needs to be addressed. There is the potential for spills or leakages of oils or petrol – associated with heavy goods vehicles (HGV), normal vehicular usage and general activities on the Site. The potential for such incidents is limited to roads and car parks. In the event of such a spillage, hydrocarbons could drain into the development drainage network and enter a watercourse or the ground prior to mitigation measures.

Foul Drainage

16.6.19 The increase in the number of people on the Application Site as part of the Proposed Development, will cause an increase in the foul water volumes from the Site. This will increase discharges of effluent to the water environment and cause water quality issues causing a minor adverse impact.

Assessment of Significance

16.6.20 In accordance with the methodology guidance set out in Chapter 2 the likely significant operational effects have been identified and assessed against the criteria.

Identification of Effects	Nature	Sensitivity of Receiving Parameter	Magnitude	Frequency	Extent	Timescale	Overall
Flood Risk	Direct	High	Medium	Continuous	Regional	Long Term	Moderate Adverse
Water Quality	Indirect	High	Low	Infrequent	Local	Long Term	Minor Adverse
Hazardous Materials	Direct	Low	Low	Continuous	Local	Long Term	Minor Adverse

16.7 Opportunities for further mitigation measures

Construction effects

16.7.1 The following construction mitigation measures are specific to flood risk and are additional to those identified in the Development Specification, submitted as part of the Planning Application.

Suspended Solids

16.7.1 As one of the main sources of suspended solids is from the erosion of exposed soil (including the erosion of stockpiled material) any large areas of exposed soil will be kept covered or contained where possible.

16.7.2 The build up of dust and mud deposits on service roads will be prevented by the covering of exposed areas of soils where possible and by frequent sweeping / washing down of the surfaces.

Oils and Fuels

16.7.3 In order to prevent the leakage of oils and fuel from plant and machinery, machines will be checked for signs of wear and tear on a regular basis. Vehicle washdown areas will be bunded and runoff routed through interceptors. If oils or fuels are to be stored in bulk quantities on the Proposed Development Site, the storage facilities will comply with the Environment Agency's Pollution Prevention Guidance Note 2 (Above Ground Oil Storage Tanks 2004). Refuelling facilities will comply with Pollution Prevention Guidance Note 7 (Refuelling Facilities 2004) by regular testing of the storage tanks and pipes and all refuelling activities taking place over an impermeable area which will drain off through an oil separator.

16.7.4 Another mitigation measure during the construction phase is the use of drip trays under vehicles to allow oil to be collected and contained.

Concrete and Cement Products

16.7.5 Any wastewater from the washing down of ready-mix lorries or from the production of concrete on Site will be carried on in a designated area where wastewater is unable to enter the groundwater and surface water environment without being treated first.

Other Pollutants and hazardous Materials

16.7.6 Disposal of other hazardous materials such as paints and detergents will be carried out in bunded / contained designated areas. Subject to the approval from Thames Water, some of these areas may drain to the foul sewer. Other substances not acceptable for disposal via the

sewerage system will be stored in compliance with relevant guidelines and removed by a registered waste disposal operator.

Site Runoff

- 16.7.7 As there are no local watercourses it is proposed that the construction runoff will be connected to combined sewers under temporary licence arrangements with Thames Water. Consequently the likely significant effect of surface water quality due to the construction is neutral.
- 16.7.8 Pollution of surface water can be restricted at its source by the prevention of contamination through suitable delivery, storage and usage procedures. Runoff from this area should also be treated using sediment and oil interceptors, for example, before being discharged into the surface water sewer or to a watercourse, subject to the approval of the Environment Agency.
- 16.7.9 Connections to the public sewers from welfare facilities will be made where possible. Where this is not possible hygienic portable facilities will be used until a connection can be made available. Welfare facilities will only be used for the disposal of domestic wastewater having no impact on the local water quality.

Operational effects

Runoff Volumes and Flows

- 16.7.10 Planning Policy set out in the Strategic Flood Risk Assessment identifies a requirement to reduce the peak rainfall rate of runoff arising from the Proposed Development by 50% when compared to that arising from the Site in its existing condition.
- 16.7.11 As identified within the Development Specification and within the introduction of this chapter, brown and green roofs, permeable paving and open water features are being proposed within the Application Site and as such forms part of the Proposed Development. Therefore no additional mitigation is required with regards to runoff volumes and flows.

Water Quality

- 16.7.12 The use of infiltration drainage will be carefully considered, located and designed following full Intrusive Site Investigation and Risk Assessment to ensure that no infiltration drainage is used in ground where leachable contaminants are present. In the event that infiltration drainage cannot be used anywhere on the Site, potential exists to connect surface water drainage to the combined sewer system.

16.7.13 Surface water runoff has the potential to pick up pollutants during the operational phase. Sustainable Drainage Systems (SuDS) described above will be incorporated into the detailed drainage design to remove any pollutants and maintain water quality on Site, reducing any potential effects to receiving waters.

Drainage Systems Maintenance

16.7.14 The SuDS incorporated into the Proposed Development will require maintenance to ensure they continue to work effectively. The facilities will also need to be adequately maintained at all times and kept in a clean tidy and operative condition so as to ensure that it permits the discharge of water with or without other matter from or to the pipe.

16.7.15 SuDS management will also require a clear understanding as to who is responsible for maintenance.

Flood Risk

16.7.16 Staff and residents within the Proposed Development should register with the Environment Agency Floodline Warnings Direct scheme to inform of flood warnings in the area. This is a free service which can be set up to produce automated flood warnings direct to telephone, mobile, e-mail or fax.

16.7.17 Mitigation measures, particularly flood warning, evacuation management plans and provision of safe refuge will be incorporated to address the residual risk of flooding from a failure of flood defences.

16.7.18 As the Proposed Development may be affected by floodwater if the existing flood defences are breached or overtopped, flood resilient construction will be considered in accordance with the DCLG document *“Improving the Flood Performance of New Buildings: Flood Resilient Construction”*.

16.7.19 The above measures provide mitigation against the likely significant effect of flooding from the River Thames and whilst there will always be a risk to the Proposed Development these steps reduce the significance of the likely significant effect.

Foul Drainage

16.7.20 Foul drainage will be connected to Thames Water main sewers. Consultations will be undertaken with Thames Water at detailed design stage to establish the most appropriate points of connection and the likely significant effect of increased flows will be mitigated by implementing sewer system improvements where necessary.

16.8 Summary of residual effects

- 16.8.1 Once the mitigation for the construction phase of the Proposed Development, identified above, has been put in place the likely significant residual effects are likely to be short term and infrequent in nature with the sensitivity of the receiving receptor (watercourse, groundwater) being low. Therefore the overall assessment of significance would conclude the likely significant effects as minor adverse.
- 16.8.2 Operational phase mitigation includes the use of green and brown roofs to provide on Site attenuation. Once these have been implemented on Site, the likely significant residual effects would be long term and continuous in nature with the overall assessment providing a moderate beneficial effect to the Site and wider catchment. Mitigation to provide maintenance to the SuDS features will also ensure that the beneficial effects are retained.
- 16.8.3 With regard to flood risk, once the Proposed Development is complete and staff and residents have adhered to the mitigation identified above, the likely significant residual effect will be long term and the frequency would be continuous as there will always be a risk of flooding. However, after mitigation the sensitivity to local residents and staff has been assessed as low with an overall negligible effect.

16.9 Assessment of cumulative effects

- 16.9.1 The Proposed Development will not increase flood risk elsewhere in the catchment and therefore there are no cumulative effects with regard to flood risk.
- 16.9.2 Water quality has the potential to have likely significant cumulative effects during the construction phase of the Proposed Development. However, mitigation has been recommended to reduce the impact and any possible effects to the wider area.
- 16.9.3 In general there are unlikely to be any likely significant cumulative effects, with regard to water resources, as a result of the Proposed Development together with the other committed development in the locality as listed in Chapter 2 of this ES, as each development has been subject to the same national guidance and Environment Agency requirements. Should the mitigation measures detailed above be put in to place then, as any nearby proposed developments will be to the same standard, there should be no need for any cumulative

mitigation measures and likely significant residual effects of this development and other local developments will be negligible.

16.9.4 As the surrounding area is brownfield in nature and therefore entirely impermeable, any future developments in this area will not increase the impermeable area around the location of the site. As such the risk of increased surface water runoff is unlikely and therefore no further mitigation will be required. The reduction being provided as part of this Proposed Development will afford a significant beneficial likely significant effect to not only the Site but the wider catchment.

16.10 References

16.10.1 PPS25(Development and Flood Risk)

16.10.2 PPS1 (Delivering Sustainable Development)

16.10.3 PPS12 (Local Development Frameworks)

16.10.4 PPS23 (Planning and Pollution Control)

16.10.5 Water Recourses Act 1991

16.10.6 Water Act 2003

16.10.7 Land Drainage Act 1991 as amended 1994

16.10.8 UK Water Supply Regulation 2001

16.10.9 Environment Act 1995

16.10.10 The EC Groundwater Directive 80/68/EC and Groundwater Regulations 1998

16.10.11 GP3 Groundwater Protection: Policy and Practice (Environment Agency), 2006

16.10.12 Interim Code of Practice on SuDS (July 2004)

16.10.13 C569 SuDS Design Manual – Hydraulic Structural Guidance (2002)

- 16.10.14 B014 Design of Flood Storage Reservoirs (1993)
- 16.10.15 C624 Development and Flood Risk – Guidance for the Construction Industry (2004)
- 16.10.16 C532 Control of Water Pollution from Construction Sites – A Guide to Good Practice (2001)
- 16.10.17 Environment Agency’s Pollution Prevention Guidelines (2002-04)
- 16.10.18 Sewers for Adoption 6th Ed. (March 2006)
- 16.10.19 BRE Digest 365 - Soakaways (1991)
- 16.10.20 Environmental Impact Assessment, A Guide to procedures (2000) by the new Communities and Local Government (CLG)
- 16.10.21 Lewisham Borough Council Strategic Flood Risk Assessment
- 16.10.22 www.environment-agency.gov.uk
- 16.10.23 www.lewisham.gov.uk