

FLOOD RISK ASSESSMENT

Hertfordshire Constabulary, Headquarters Redevelopment

Project number: 60600329
HCHQ-ACM-XX-XX-RP-CE-000001

06 July 2021

Quality information

<u>Prepared by</u>	<u>Checked by</u>	<u>Verified by</u>	<u>Approved by</u>
Ryan Abell Graduate Engineer	Alistair Goodfellow Graduate Engineer		

Revision History

<u>Revision</u>	<u>Revision date</u>	<u>Details</u>	<u>Authorized</u>	<u>Name</u>	<u>Position</u>
01	June 2021	Planning issue		Dave Brown	Project Manager

Distribution List

<u># Hard Copies</u>	<u>PDF Required</u>	<u>Association / Company Name</u>

Prepared for:

Hertfordshire Constabulary

Prepared by:

AECOM Limited
AECOM House
63-77 Victoria Street
St Albans
Hertfordshire AL1 3ER
United Kingdom

T: 
aecom.com

© 2021 AECOM Limited. All Rights Reserved.

This document has been prepared by AECOM Limited ("AECOM") for sole use of our client (the "Client") in accordance with generally accepted consultancy principles, the budget for fees and the terms of reference agreed between AECOM and the Client. Any information provided by third parties and referred to herein has not been checked or verified by AECOM, unless otherwise expressly stated in the document. No third party may rely upon this document without the prior and express written agreement of AECOM.

Table of Contents

1.	Executive Summary	5
2.	Introduction	6
3.	Existing Legislation and Policy	9
4.	Supporting Information	15
5.	Assessment of Flood Risk	17
6.	Residual Risks and Mitigation	21
7.	Conclusion and Recommendations	22
	APPENDICES	23
	Appendix A – Existing Site Topographical Survey	24
	Appendix B – Development Proposals	25
	Appendix C – LLFA Product Data / Correspondence	26

Figures

Figure 1– Site Location	7
Figure 2 - Flood map for planning - Fluvial Risk (Gov.uk, June 2021)	18
Figure 3 - Surface Water Flood extents (Gov.uk, June 2021)	18

Tables

Table 1: Contributing Areas	7
Table 2: Flood Zones	10
Table 3: Flood Risk Vulnerability Classification	11
Table 4: Flood Risk Vulnerability and Flood Zone Compatibility	13
Table 5: Contributing Areas	15
Table 6: Flood Risk Summary	20
Table 7: Flood Risk Summary	22

1. Executive Summary

AECOM Limited has been commissioned to prepare a site-specific Flood Risk Assessment (FRA) for the proposed redevelopment of an operational police headquarters, located at Stanborough Road, Welwyn Garden City, Herts, AL8 6XF.

This FRA has been prepared to the requirements of the National Planning Policy Framework, 2012 (NPPF), updated 2019.

The site is located to the south of the Gosling Sports Centre, with an application boundary of approximately 11.5 hectares. At present the site is used as an operational police headquarters.

The source of the nearest fluvial flood risk is the River Lea which flows 100m to the west of the site at its nearest point. The online Gov.uk Flood Map for Planning indicates the site to be in Flood Zone 1 (land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%)) and is therefore considered to be at low risk of flooding from the rivers.

The site geology suggests groundwater has potential to affect the site. The variability of chalk itself means no certain conclusion can be drawn. However, the LFRMS 2 suggests the likelihood of groundwater susceptibility is <25%. According to the draft Factual Report on Ground Investigation, found in Appendix A – Existing Site Topographical Survey, no water was found in the bore holes or trial pits, prior to use of flush. A separate Ground Investigation will be required to confirm this understanding of the geology and groundwater conditions at site.

An assessment of other potential sources of flood risk has been carried out including flooding from tidal, fluvial, pluvial, groundwater, sewer and artificial sources. Risk from tidal, artificial and sewer sources is considered to be low. The risk from groundwater, however, is considered a low to medium risk. There are areas within the site that are at low to high risk of pluvial flooding, though the majority is considered to be at a very low risk. Further geological input and testing would be required to fully understand the implications.

At present, the proposed development is at the planning stage, so this report will inform the future proposals and be updated as and when proposals are submitted for the site. The most likely sources of flood risk come from a surface water source; the applicant should focus on flood resistance and resilience measures to be included in the proposed refurbishment, to mitigate residual risks to enable the development to withstand the effect of flooding and climate change. Refer to the associated Drainage Technical Note (HCHQ-ACM-XX-XX-RP-CE-000002) for a comprehensive overview of the surface water drainage strategy and mitigation measures that have been proposed.

For the basis of the drainage assessment for the site, impermeable areas of 46% and 28% have been used for the pre-development and post-development respectively, with the total site area being taken as 11.5ha.

The drainage review indicates storage will be required to deliver greenfield discharge rates from the site. Attenuation will be achieved using a variety of methods. Car parks will attenuate residual volumes, atriums and kennel areas will collect and drain flows into an existing attenuation pond and runoff captured on the surface will be redirected to rain gardens wherever possible. Refer to Appendix B – Development Proposals for the initial outline drainage strategy review. It has been proposed that ~ 1.4ha is disposed via infiltration and roof drainage, in addition to areas that aren't utilising infiltration, will drain to a sewer. It will need to be confirmed with Thames Water whether additional discharge will be accepted into their asset.

The outline drainage strategy should be read in conjunction with the accompanying Drainage Technical Note (HCHQ-ACM-XX-XX-RP-CE-000002).

In summary, the flood risk to the site is considered appropriate for the type of development proposed. In addition, it is considered that the proposed development will not result in an increase in flood risk to the site itself, or to neighbouring sites. For an overview of how the flood risk drainage strategy that will manage this flood risk refer to the accompanying Drainage Technical Note (HCHQ-ACM-XX-XX-RP-CE-000002).

2. Introduction

2.1 Introduction

2.1.1 AECOM Ltd has been commissioned to undertake a Flood Risk Assessment (FRA) for the proposed development at Stanborough Road, Welwyn Garden City, Herts, AL8 6XF, with a National Grid Reference (NGR) of TL 230 113.

2.2 FRA Objectives

2.2.1 The principle objectives of the FRA are to:

- Identify potential forms of flooding including rivers, watercourses, surface water flooding, groundwater flooding, flooding from sewer systems and other forms of flooding;
- Establish the risk of flooding;
- Determine the effects of the development on flooding elsewhere either through displacement of floodwaters or increased runoff;
- Suggest appropriate flood mitigation measures, including a strategy for disposal of surface water runoff following the principles of SuDS.

2.2.2 The detail included in the FRA and the accompanying drainage strategy will be sufficient to support a planning application for the development.

2.3 Scope of Work

2.3.1 In preparing the FRA, AECOM has:

- Obtained relevant data and information from statutory and other authorities;
- Considered the potential sources of flooding;
- Assessed the risk of flooding to the site;
- Assessed the impact of off-site flooding (displaced water) on third parties;
- Considered the impact of climate change;
- Considered likely mitigation requirements and any residual risk;

2.4 Site Description

2.4.1 The site is located on the existing on the existing Hertfordshire Constabulary HQ site on Stanborough Road, Welwyn Garden City, AL8 6X.

2.4.2 This site is currently an operational police HQ with a positive drainage system and is considered a brownfield site for drainage purposes. The works will involve the redevelopment of an operational police headquarters. The site generally falls in a south-westerly direction from around 81.5mAOD to 73.0mAOD, though levels within the Decant development area site fall from around 82.4mAOD to 79.0mAOD.

2.5 Study Area



Figure 1– Site Location

2.6 Existing Land Use

The site is currently an operational police headquarters. It is constrained by:

- Stanborough Road along the western boundary
- A golf driving range and Gosling sports centre to the North
- Fields followed by a train line to the East
- Stanborough Park to the South.

2.6.1 The site red line boundary is approximately 11.5 ha in area.

2.6.2 Table 1 below provides the existing site permeable and impermeable areas:

Table 1: Contributing Areas

	Total Area (ha)	Permeable Area (ha)	Impermeable Areas (ha)	Percentage Impermeable
Development Site	11.5	6.16	5.34	46

2.7 Development Proposals

2.7.1 The proposed development comprises:

- The redevelopment of the Hertfordshire Constabulary estate including building refurbishment and drainage design including Sustainable Drainage System (SuDS) features.

2.8 Parties Involved

2.8.1 Correspondence has been undertaken with the following Risk Management Authorities when undertaking this FRA:

- Lead Local Flood Authority – **Hertfordshire County Council**
- **The Environment Agency**
- The sewerage undertaker – **Thames Water**

3. Existing Legislation and Policy

NATIONAL POLICY

3.1 National Planning Policy Framework (NPPF)

3.1.1 The NPPF was first adopted in March 2012, superseding national planning policy statements and guidance. One of the overarching objectives of the NPPF (Amended 2019) is the encouragement of growth and acknowledgement that decision-makers should adopt a presumption in favour of sustainable development. Paragraph 10 of the document states:

3.1.2 “At the heart of the Framework is a presumption in favour of sustainable development”

3.1.3 Paragraph 11 states for parts c and d, “For decision-making this means:

- approving development proposals that accord with an up-to-date development plan without delay; or
- where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date, granting permission unless:
 - i. the application of policies in this Framework that protect areas or assets of particular importance provides a clear reason for refusing the development proposed; or
 - ii. any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole.

3.1.4 The Government expects the planning system to deliver the homes, business, infrastructure and thriving local places that the country needs, while protecting and enhancing the natural and historic environment.

3.1.5 Chapter 2, Paragraphs 7 to 14 set out the aims for achieving sustainable development.

3.1.6 Chapter 14: Meeting the Challenge of Climate Change, Flooding and Coastal Change (paragraphs. 148-169) sets out the requirements to assess flood risk and climate change for developments.

3.1.7 The assessment of flood risk is based on the definitions in Table 2 below, extracted from the NPPF:

Table 2: Flood Zones

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

3.1.8 The NPPF classifies the Flood Risk Vulnerability of various land uses in Table 3 below. The More Vulnerable classification encompasses usages such as hospitals and buildings used for dwellings. Less Vulnerable applies to buildings used for general industry, storage and distribution.

Table 3: Flood Risk Vulnerability Classification

Development Type	Classifications
Essential infrastructure	<ul style="list-style-type: none"> • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly vulnerable	<ul style="list-style-type: none"> • Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as “essential infrastructure”)
More vulnerable	<ul style="list-style-type: none"> • Hospitals. • Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non–residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan

Less vulnerable	<ul style="list-style-type: none"> • Police, ambulance and fire stations which are not required to be operational during flooding. • Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in “more vulnerable”, and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do not need to remain operational during times of flood. • Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).
Water-compatible development	<ul style="list-style-type: none"> • Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

3.1.9 The overall aim is to steer new development to the lowest flood zone, i.e. Flood Zone 1 (Sequential Test). Where there are no reasonably available sites within Flood Zone 1, LPAs allocating land in local plans or determining planning applications for development at any particular location should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required (see Table 4 below).

Table 4: Flood Risk Vulnerability and Flood Zone Compatibility

	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test Required	✓	✓	✓
Zone 3a	Exception Test Required	x	Exception Test Required	✓	✓
Zone 3b functional floodplain	Exception Test Required	x	x	✓	x

✓ Development is appropriate

x Development should not be permitted

3.2 The Sequential Test and Exception Test

3.2.1 The Sequential Test is a risk-based test at should be applied at all stages of development and aims to steer new development to areas with the lowest probability of flooding (Zone 1). This is applied by the Local Authority by means of a Strategic Flood Risk Assessment (SFRA).

3.2.2 Furthermore, large sites partially affected by Flood Zones 2 and 3 should be developed sequentially, placing the most vulnerable land uses in the areas with lowest risk of flooding.

3.2.3 The SFRA may require the Exception Test to be applied to certain forms of new development. The test considers the vulnerability of the new development to flood risk and, to be passed, must demonstrate:

3.2.4 If it is not possible for development to be located in zones with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in national planning guidance.

3.2.5 For the exception test to be passed it should be demonstrated that:

- a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and
- b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

3.2.6 Both elements of the exception test should be satisfied for development to be allocated or permitted.

LOCAL PLANNING POLICY

3.2.7 Hertfordshire County Council is the Lead Local Flood Authority (LLFA) and will adjudge the FRA (through consultation with the Environment Agency as necessary) for the site.

3.2.8 The following key planning documents and salient policies have been consulted to inform this FRA.

- LFRMS 2; Local Flood Risk Management Strategy 2019 – 2029
- Hertfordshire Council LLFA Summary Guidance for Developers

- Hertfordshire Council LLFA Climate Change allowance note
- South West Hertfordshire Level 1 Strategic Flood Risk Assessment March 2019

4. Supporting Information

4.1 Contributing Areas

4.1.1 The area contributing to surface discharge from the site was estimated for both the proposed and existing site area. The contributing areas for the existing and proposed sites are shown in Table 5 below:

Table 5: Contributing Areas

	Total Area (ha)	Pre-Development PIMP*	Post-Development PIMP	Pre-Development Contributing Area (ha)	Post-Development Contributing Area (ha)
Development Site	11.5	46%	28%	5.34	3.26

*- Percentage Impermeable (PIMP)

4.2 Site and Surrounding Levels

4.2.1 Survey levels show the site to generally fall from northeast (81.5mAOD) to southwest (73.0mAOD) with car parking at the lowest part of the site. Within the Decant development area site levels fall from around 82.4mAOD to 79.0mAOD.

4.2.2 Refer to Appendix A – Existing Site Topographical Survey for the existing site topography.

4.3 Flood Risk Mapping

4.3.1 In accordance with the Online Flood Maps for Planning, the site sits within Flood Zone 1 and therefore has a less than 1 in 1,000 annual probability of river or sea flooding.

4.3.2 Refer to Appendix A – Existing Site Topographical Survey for the flood risk maps.

4.4 Watercourses

MAIN RIVER

4.4.1 As shown on the EA Main River Map, a main river - the River Lea - flows 100m west of the site, before turning in an eastern direction, passing approximately 200m south of the site. WFD Surface Water Classifications shows that the watercourse is at Moderate status.

ORDINARY WATERCOURSE

4.4.2 There are no ordinary watercourses running through, or within the vicinity of the site.

4.5 Geology and Hydrogeology

4.5.1 According to the published records, the bedrock geology of the site comprises Cretaceous age Lewes Nodular Chalk and Seaford Chalk Formations (undifferentiated) which are then overlain by Quaternary sediments of the Kesgrave Catchment Subgroup.

4.5.2 The Kesgrave Catchment Subgroup is characterised by quartz and quartzite gravels from the Triassic, Carboniferous and Devonian rocks. The members within this Subgroup comprise bodies of cross-bedded and massive, moderately sorted sand and gravel. This formation varies between 5 and 12m thick.

4.5.3 The two chalk formations are considered as firm to very hard nodular chalks with flints. The typical thickness of these formations varies between 38m and 80m thick.

4.5.4 Based on the site's development history, Made Ground is also anticipated on site, the composition of this Made Ground is unknown and could be highly variable in nature.

4.5.5 With regards to structural geology, published records do not indicate any significant structural features across the site.

- 4.5.6 Refer to Appendix A – Existing Site Topographical Survey for the Draft Factual Report on Ground Investigation (including bore hole and trial pit logs), EA flood mapping and bedrock geology.

4.6 Groundwater Susceptibility

- 4.6.1** The Kesgrave Catchment Subgroup is classified a Secondary A aquifer. These are predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. The Lewes Nodular Chalk Formation and Seaford Chalk Formation are classified as a Principal Aquifer. These are layers of rock or drift deposits that have intergranular and/or fracture permeability and can provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
- 4.6.2** With regards to when a pollutant is discharged at ground level the vulnerability of groundwater within each of the strata have been designated the following:
- The Kesgrave Catchment Subgroup, Lewes Nodular Chalk Formation and the Seaford Chalk Formation are all rated as having a medium to high groundwater vulnerability.
 - The closest available published historical exploratory hole logs provided evidence of groundwater being present in the Kesgrave Catchment Subgroup at 10m below ground level, however due to the logs distance from the site itself (475m southeast), it is not considered representative. Therefore, groundwater levels below the site are currently unknown and would need to be clarified following a ground investigation on the site. The regional direction of groundwater flow is expected to be to the South.
 - It is possible that localised perched water or confined groundwater may also be present in Made Ground anticipated on site. Therefore, groundwater could be encountered at shallow depths on site locally.
- 4.6.3 DEFRA's MAGIC maps show that the site is situated within medium-high groundwater vulnerability, situated on a Secondary A superficial Drift aquifer and a Principal Bedrock aquifer.
- 4.6.4 According to the draft Factual Report on Ground Investigation, found in Appendix A – Existing Site Topographical Survey no water was found in the bore holes or trial pits, prior to use of flush. A separate Ground Investigation will be required to confirm this understanding of the geology and groundwater conditions at site.

4.7 Risk Management Authority (RMA) Consultation

- 4.7.1 The Environment Agency has been contacted for flood risk data and historic flooding
- 4.7.2 The Lead local Flood Authority has been contacted to discuss pre-application advice. Further liaison will be undertaken to discuss and agree the drainage strategy for the development.

5. Assessment of Flood Risk

5.1 Flood Risk from all Sources

5.1.1 This section assesses the flood risk from the following sources:

- Fluvial (Rivers and the Sea);
- Surface Water;
- Sewers;
- Groundwater;
- Artificial waterbodies.

5.1.2 Refer to Appendix A – Existing Site Topographical Survey and Appendix C – LLFA Product Data / Correspondence for reference and further information.

Tidal Flooding

5.1.3 Due to the distance from the coast and lack of tidal influence on the identified watercourses, there is considered to be no risk of tidal flooding and is not discussed further within this report.

Fluvial Flooding

5.1.4 The online Gov.uk Flood Map for Planning indicates the site to be in Flood Zone 1 (land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%)). This is shown in figure 2 below.



Figure 2 - Flood map for planning - Fluvial Risk (Gov.uk, June 2021)

5.1.5 The Hertfordshire County Council LFRMS 2 reiterates that the site is not located within flood zone 3, but has no indication of flood zone 1 and 2 extents.

Surface Water Flooding

5.1.6 Overland flow routes form when rainfall fails to infiltrate the surface and travels over ground; this is exacerbated where the permeability of the ground is low due to the type of soil/geology (such as clayey soils) or urban development. Surface water flooding is also common in areas of steep topography which can rapidly convey water that has failed to penetrate the surface.

5.1.7 According to the EA's Surface Water Flood Risk map, areas at "low", "medium" and "high" risk of flooding can be identified within the site. The majority of the site is at very low risk (less than 0.1% AEP), The main Flood Risk formed by surface water appears to the south of the site along the low, semi-circular edge of the car park and adjacent to this, to the east, where the existing attenuation pond lies. This can be seen below on figure 3.



Figure 3 - Surface Water Flood extents (Gov.uk, June 2021)

5.1.8 Minor areas of flooding are shown around buildings, this may be a result of the interpreted LiDAR data between tall buildings however, upon review of the topographical survey, ground levels fall consistently towards the car parks so overland flow routes are away from buildings and would not appear to encourage ponding.

5.1.9 The Hertfordshire County Council LFRMS 2 reiterates the likelihood of some surface water flooding on site.

Flooding from Drains, Sewers and Water Mains

5.1.10 There is no sewer flooding indicated onsite using Thames Water flood risk register.

- 5.1.11 The site currently has 2 x 225mm diameter surface water outfalls to the Thames Water sewer in Stanborough Road. It is thought that the proposed drainage strategy is acceptable for this outfall and won't cause future sewer flooding, though this will need to be confirmed with Thames Water.

Groundwater Flooding

- 5.1.12 Groundwater flooding is caused by the emergence of water from sub-surface permeable strata. Fluctuations in the groundwater table can cause flooding should the table rise above the existing ground level. Groundwater flooding events tend to have long durations, lasting days or weeks.
- 5.1.13 Geology under the site using the British Geological Survey online mapping tool shows the site is comprised of superficial sands and gravels (Kesgrave Catchment Subgroup), which are underlain by Lewes Nodular Chalk Formation.
- 5.1.14 LFRMS 2 shows the site sitting on a 1km by 1 km region which has a susceptibility of up to 25% to groundwater flooding.
- 5.1.15 DEFRA's MAGIC maps show that the site is situated within medium-high groundwater vulnerability, situated on a Secondary A superficial Drift aquifer and a Principal Bedrock aquifer.

Canals, Reservoirs and other Artificial Sources

- 5.1.16 The entire site is not considered to be susceptible to reservoir flooding, or from other sources of flood risk ; therefore, the residual risk remains very low.

Flood Risk Summary

5.1.17 Following review of the site, and based on current information available, the following conclusions are presented in Table 6 below:

Table 6: Flood Risk Summary

Flood Risk Source	Pre-Development Risk	Post Development Risk	Comments
Fluvial	Low	Low	The site lies approximately 100m away from the River Lea at the closest point. The river won't impact the site and as the site is brownfield and connecting to a Thames Valley sewer it won't affect the river immediately.
Tidal	Low	Low	Not in a Tidal area.
Pluvial (Surface Water)	Low to High	Low to High	The majority of the site is considered to be at very low risk. The proposed drainage incorporates SuDS features around the site which will further reduce run off. One of the 2 worst affected surface water areas on the existing map is an attenuation feature so the risk is considered low.
Groundwater	Low to medium	Low to medium	The site geology suggests groundwater has potential to affect the site. Further geological input and testing would be required to fully understand the implications. The variability of chalk itself means no certain conclusion can be drawn. However, the LFRMS 2 suggests the likelihood of groundwater susceptibility is <25%.
Sewers	Low	Low	There are no records of sewer flooding on the existing site.
Artificial Sources	Low (residual)	Low (residual)	Statutory Reservoirs (large raised reservoirs with volumes above ground of 25,000m ³ or over) are regularly inspected and maintained as set out in the Reservoirs Act 1975. On that basis they are deemed to pose a low (residual) risk. Other artificial sources such as canals and waterways are considered to be regularly maintained and therefore only deemed to pose a low (residual) risk to the proposed development

5.2 The Sequential Test

5.2.1 The site is situated within flood zone 1 and therefore doesn't require a sequential test.

5.3 The Exception Test

5.3.1 The site is situated within flood zone 1 and therefore doesn't require an exception test.

6. Residual Risks and Mitigation

6.1 Residual Risks to Site

6.2 Resilience and Resistance Measures

6.2.1 Based off flood mapping data, no specific flood resilience is required beyond the surface water drainage strategy.

6.2.2 The development is situated on an existing brownfield site and as such, the flows discharged from site will achieve a reduction in peak flow from the development, equating to a 30% betterment in comparison to existing site discharge rates. This will reduce any downstream effects of runoff produced from the site.

7. Conclusion and Recommendations

7.1.1 This Flood Risk Assessment has been prepared to support the development of the Hertfordshire Constabulary Headquarters redevelopment.

7.1.2 Following review of the site, and based on current information available, the following conclusions are presented:

- The development is situated on an existing brownfield site and as such, the flows discharged from site will achieve a reduction in peak flow from the development, equating to a 30% betterment in comparison to existing site discharge rates.
- A series of raingardens and cellular storage tanks will be provided on site for the attenuation of surface water runoff.

7.1.3 Following review of the site, and based on current information available, the following conclusions are presented in Table 7 below:

Table 7: Flood Risk Summary

Flood Risk Source	Pre-Development Risk	Post Development Risk	Comments
Fluvial	Low	Low	The site lies approximately 100m away from the River Lea at the closest point. The river won't impact the site and as the site is brownfield and connecting to a Thames Valley sewer it won't affect the river immediately.
Tidal	Low	Low	Not in a Tidal area.
Pluvial (Surface Water)	Low to High	Low to High	The majority of the site is considered to be at very low risk. The proposed drainage incorporates SuDS features around the site which will further reduce run off. One of the 2 worst affected surface water areas on the existing map is an attenuation feature so the risk is considered low.
Groundwater	Low to medium	Low to medium	The site geology suggests groundwater has potential to affect the site. Further geological input and testing would be required to fully understand the implications. The variability of chalk itself means no certain conclusion can be drawn. However, the LFRMS 2 suggests the likelihood of groundwater susceptibility is <25%.
Sewers	Low	Low	There are no records of sewer flooding on the existing site.
Artificial Sources	Low (residual)	Low (residual)	Statutory Reservoirs (large raised reservoirs with volumes above ground of 25,000m ³ or over) are regularly inspected and maintained as set out in the Reservoirs Act 1975. On that basis they are deemed to pose a low (residual) risk. Other artificial sources such as canals and waterways are considered to be regularly maintained and therefore only deemed to pose a low (residual) risk to the proposed development

7.1.4 However, as the site is still within an area of flood risk, most likely from a surface water source; the applicant should focus on flood resistance and resilience measures to be included in the proposed redevelopment, to mitigate residual risks to enable the development to withstand the effect of flooding and climate change.

7.1.5 It is considered, following due diligence in the assessment of flood risk that there are no reasonably anticipated flood risk grounds on which to refuse the application for planning permission.

APPENDICES

Appendix A – Existing Site Topographical Survey

Appendix B – Development Proposals

Appendix C – LLFA Product Data / Correspondence

AECOM
Tom Royal
Principal Engineer, Development Infrastructure

T [REDACTED]
E [REDACTED]

VINCENT + GORBING

Mark Chandler
Architect Director

T [REDACTED]
E [REDACTED]

AECOM
Dave Brown
Senior Project Manager

T [REDACTED]
E [REDACTED]