

SGN PLACE
SEVENOAKS GASHOLDER STATION
CRAMPTONS ROAD, SEVENOAKS, KENT, TN14 5ES
PLANNING APPLICATION - MARCH 2021





Sevenoaks Gasholder Site

Flood Risk Assessment

Project No: P450483

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PREFACE

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Sevenoaks Gas Holders Flood Risk Assessment

Project No.: 1020

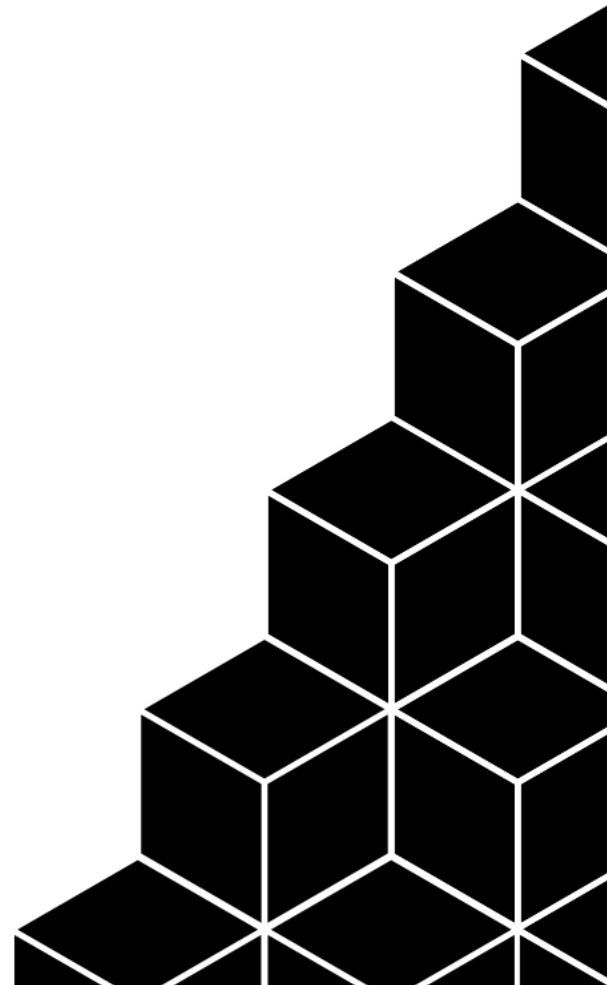
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Sevenoaks Gas Holders Flood Risk Assessment

QUALITY CONTROL

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EXECUTIVE SUMMARY

This report compiles and analyses information from numerous sources including flood risk maps and historical flood records to assess the risk that flooding poses to the proposed development and then suggests methods to mitigate these risks.

As part of the National Planning Policy, it is a requirement that Flood Risk associated with developments is assessed, considering the risk of flooding of development sites themselves and also any changes to the surrounding flood regime as a result of the development. The findings of this assessment are outlined in this site-specific Flood Risk Assessment report (FRA). This FRA is based on the requirements of the National Planning Policy Framework (NPPF) and the associated planning practice guidance, as well as any relevant local flood risk policies.

The EA flood map for planning shows that the site is located within Flood Zone 1,

Flood Zone 1 represents a likelihood of less than 1 in 1000 annual probability of river flooding and sea flooding. The risk of the development flooding from different flood sources is summarised below:

Flood Source	Risk Category			Comments
	High	Medium	Low	
Tidal/fluvial			X	Site Located wholly in Flood Zone 1
Surface Water Run-off from Heavy Storm Events			X	The site is classified as being at lower risk of flooding from surface water.
Groundwater			X	The risk of groundwater flooding is considered low due to the information stated in the Kent County Council Strategic Flood Risk Assessment.
Reservoirs			X	The proposed does not lie within an area affected by reservoir flooding. It is therefore deemed as low risk.

Table 1 - Summary of the Flood Risk to Sevenoaks Gas Holders Development

PLANNING POLICY AND RELEVANT GUIDANCE

INTRODUCTION

The purpose of this section is to give an overview of key flood risk and planning policy matters in England. There is a particular emphasis on the flood risk issues given in the National Planning Policy (NPPF) Framework document.

Consequently, this section of the report is not site-specific. Whilst some issues covered may not be directly relevant to the specific development, they do provide the overall context for assessing flood risks in England.

NATIONAL PLANNING POLICY FRAMEWORK

At a national level flood risk planning issues are detailed in the National Planning Policy Framework (NPPF), originally produced by the Department for Communities and Local Government in March 2012 and updated in February 2019. This provides a framework within which local communities can produce their own distinctive plans and determine what and how developments should proceed. The planning authorities and the EA take the NPPF into account when making planning decisions.

When determining applications planning authorities should ensure that there are no consequential increases in flood risk elsewhere.

In areas of flood risk, any proposed developments should be appropriate to the level of flood risk at the site and should be supported by a site-specific FRA. Such an FRA is required for proposals in high and medium flood risk areas and for sites of 1 hectare or more, including those in the lowest flood risk zones.

The impacts of climate change should be considered as part of the assessment process for developments. Potential climate change impacts on flood risks and drainage matters must be considered and impacts mitigated in the development proposals.

TECHNICAL GUIDANCE TO THE NPPF

Whilst much of the NPPF consists of high-level policies and principles the particular importance of flood risk is recognised, and additional guidance is provided. This was originally in the form of "Technical Guidance to the National Planning Policy Framework", published in March 2012 by the Department for Communities and Local Government and has been updated to the latest version published in February 2019.

As part of the guidance a site-specific FRA checklist has been included, stating that the following issues should be covered in a site-specific FRA:

- Development description and location – including flood vulnerability.
- Definition of the flood hazard – identifying the sources of flooding that could affect the site.
- Probability – covering Flood Zones, mapping, etc.
- Climate change – considering the possible effects on flood risks at the site.
- Detailed development proposals – including land uses and levels of flood risk.
- Flood risk management measures – to consider how the proposals minimise the on-site flood risks.
- Off-site impacts – ensuring that there are no increases in flood risks elsewhere.
- Residual risks – considering any remaining risks and how these might be managed.

These issues have been considered within this FRA.

SEQUENTIAL TEST

Definition

A key component of the NPPF is the Sequential Test. This is a mechanism for directing development vulnerable to the impacts of flooding to areas with a lower flood risk.

In the Planning Policy Guidance developments with commercial premises at ground floor are considered to be in the “less vulnerable” category with respect to flood risk. Under this vulnerability classification the Sequential Test advises the following:

- Flood Zone 1 (Does not flood in a 1,000 year fluvial event): Developments with any level of vulnerability are appropriate for this Flood Zone
- Flood Zone 2 (floods between a 100 year and a 1,000 year fluvial event): “More vulnerable” development is appropriate for this Flood Zone, with the general provision that it is to be located in the highest land available
- Flood Zone 3a (floods in a 100 year fluvial event or in a 200 year tidal event): The requirements of the Exception Test must be passed to allow any “more vulnerable” developments within Flood Zone 3a
- Flood Zone 3b (functional floodplain – normally considered to flood in a 20 year fluvial event): “more vulnerable” development is not allowed within Flood Zone 3b

EXCEPTION TEST

Definition

The exception test states that:

- It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk; and
- The development will be safe for its lifetime, without increasing flood risk elsewhere and where possible it will reduce flood risk overall. Table 2 of NPPF outlines the flood risk vulnerability and flood zone compatibility, below outlines the contents of Table 2 in NPPF.

Flood risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	✗	Exception Test Required	✓
	Zone 3b functional floodplain	Exception Test Required	✓	✗	✗	✗

Key: ✓ Development is appropriate.
 ✗ Development should not be permitted.

Table 2 - NPPF Technical Guidance

STRATEGIC FLOOD RISK ASSESSMENT

NPPF guidance refers to Strategic Flood Risk Assessments (SFRAs), which provide an assessment of all types of flood risk in a defined area, which is then used to inform land use planning decisions. They are the responsibility of the Local Planning Authority (LPA). An SFRA may cover part or all of an LPA's area or even an area that includes several LPAs. It should primarily be used to support the development of Local Plans, prepared in consultation with the EA. The SFRAs must consider the effects of climate change. In June 2013, an SFRA was produced on behalf of Kent County Council (KCC) covering the key flood risks in the county. The key recommendations from the SFRA include:

- The sequential approach to development and flood risk should be adopted, directing new developments to areas of lowest risk.
- Developers should consult with the LPA, LLFA, and the Environmental Agency at an early stage to discuss flood risk including requirements for site-specific FRAs, detailed hydraulic modelling and drainage assessment and design.
- It should be demonstrated through a surface water drainage strategy or as part of the FRA that the proposed drainage scheme, site layout, and design, will prevent properties from flooding from surface water. A detailed site-specific assessment of SuDS would be needed to incorporate SuDS successfully into the development proposals and where possible, seek to identify betterment. All development should adopt source control SuDS techniques to reduce the runoff risk of frequent low impact flooding due to post-development runoff.

CLIMATE CHANGE IMPACTS

In addition to considering the existing flood risk from all sources, an FRA must include an allowance for future climate change, as outlined in section 14 of the NPPF.

Specific details are outlined in Tables 4 and 5 of the document “Technical Guidance to the National Planning Policy Framework”, which was prepared by the Department of Communities and Local Government in March 2012 and updated in February 2019.

Recent supplementary guidance was released by the EA in February 2016 updating the predicted impacts to rainfall intensity caused by climate change. If a development is expected to have a lifetime anywhere between 2040 and 2069 an increase in the peak rainfall intensity of 20% should be considered, for developments with a lifetime between 2070 and 2115, an increase in the peak rainfall intensity of 40% should be considered. In addition, this guidance also amends the allowances for a potential change to the peak river flow by location.

SITE DESCRIPTION AND CONTEXT

SITE LOCATION

The proposed site can be found at the site of the former Gas Holders north of the town centre in Sevenoaks, Kent. The site area is approximately 1ha, historically it was occupied by 2no. gas holders (which have now been demolished), several existing buildings and hard paved car parks. The extent of the site boundary in red can be seen in the figure below.

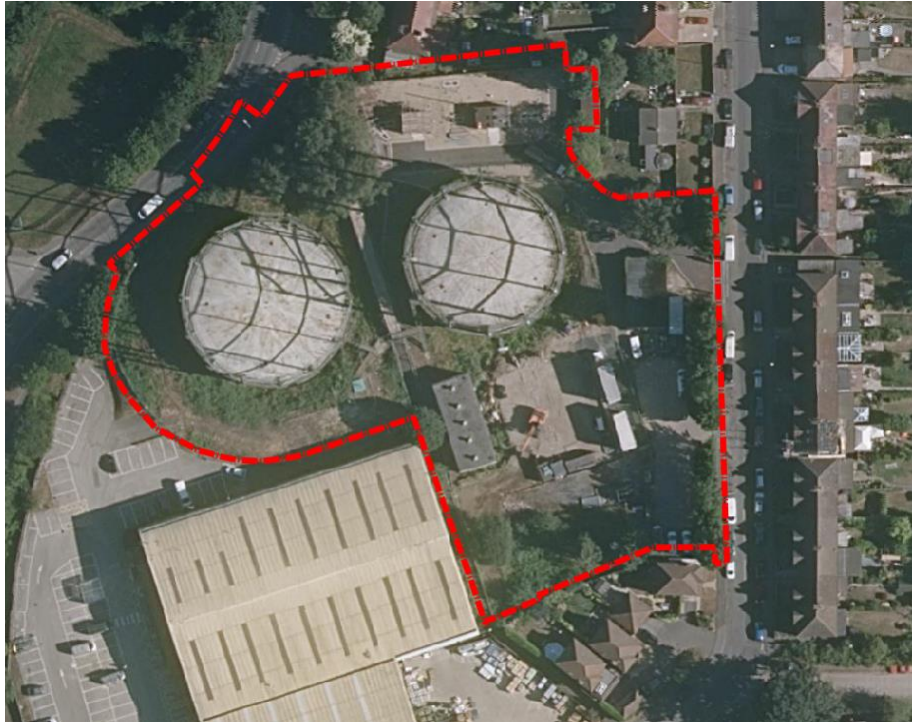


Figure 1 - Proposed Site

HYDROLOGICAL SETTING

The river Darent and an associated lake lie approximately 165m from the site boundary of the site. There are a series of manmade ponds associated with a quarry and mortar plant, the closest of which lies approximately 500m away from the site.

According to the EA modelling map, the development site lies outside any flooding catchment area for all modelled flood events. As can be seen in the figure below.

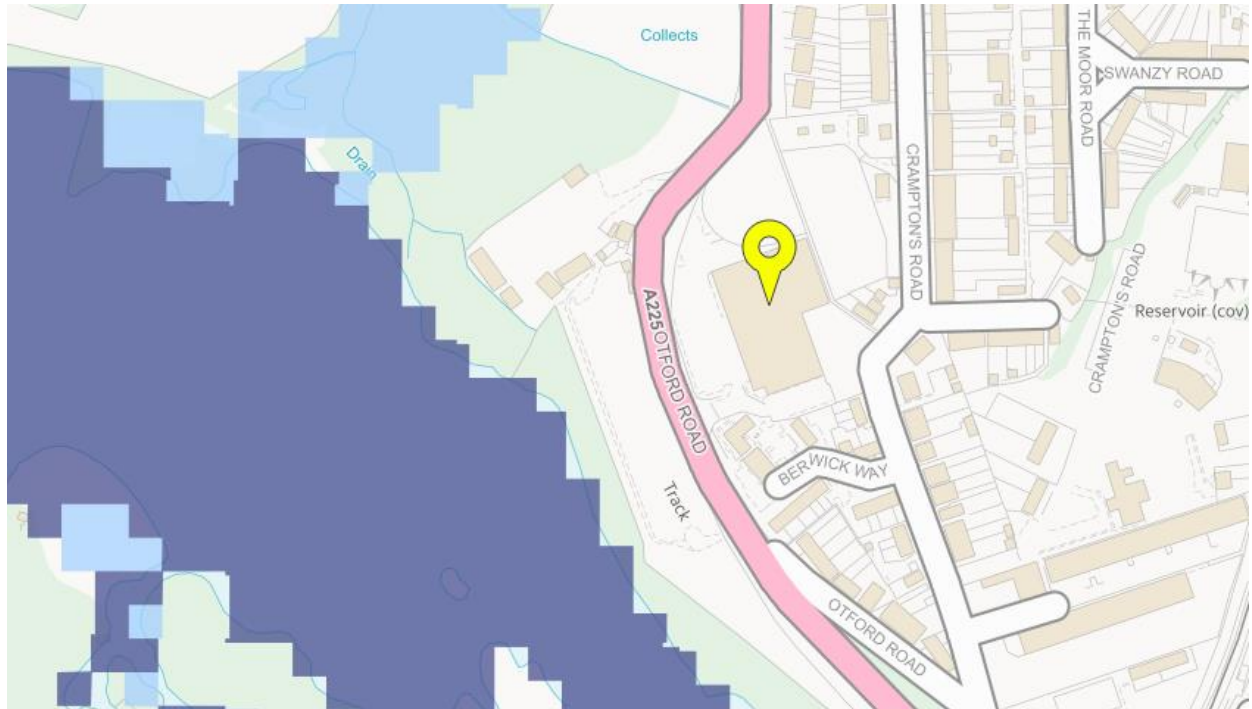


Figure 2 - OS Mapping of the site and surrounding area

HYDROGEOLOGICAL SETTING

The EA/Defra has developed Groundwater Source Protection Zones (SPZ) to assist in the assessment of risk to groundwater supplies taken from an abstraction point. Details of the zones are as follows:

- Inner zone (Zone 1) - Defined as the 50 day travel time from any point below the water table to the source. This zone has a minimum radius of 50 metres;
- Outer zone (Zone 2) - Defined by a 400-day travel time from a point below the water table. The previous methodology gave an option to define SPZ2 as the minimum recharge area required to support 25 percent of the protected yield. This option is no longer available in defining new SPZs and instead, this zone has a minimum radius of 250 or 500 metres around the source, depending on the size of the abstraction;
- Total catchment (Zone 3) - Defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. In confined aquifers, the source catchment may be displaced some distance from the source. For heavily exploited aquifers, the final Source Catchment Protection Zone can be defined as the whole aquifer recharge area where the ratio of groundwater abstraction to aquifer recharge (average recharge multiplied by outcrop area) is >0.75 . There is still the need to define individual source protection areas to assist operators in catchment management;
- Special interest (Zone 4) - A fourth zone SPZ4 or 'Zone of Special Interest' was previously defined for some sources. SPZ4 usually represented a surface water catchment that drains into the aquifer feeding the groundwater supply (i.e. catchment draining to a disappearing stream). In the future, this zone will be incorporated into one of the other zones, SPZ 1, 2 or 3, whichever is appropriate in the particular case or become a safeguard zone.

Figure 3 below identifies the proposed development is located in Zone 1 – Inner groundwater source protection zone.

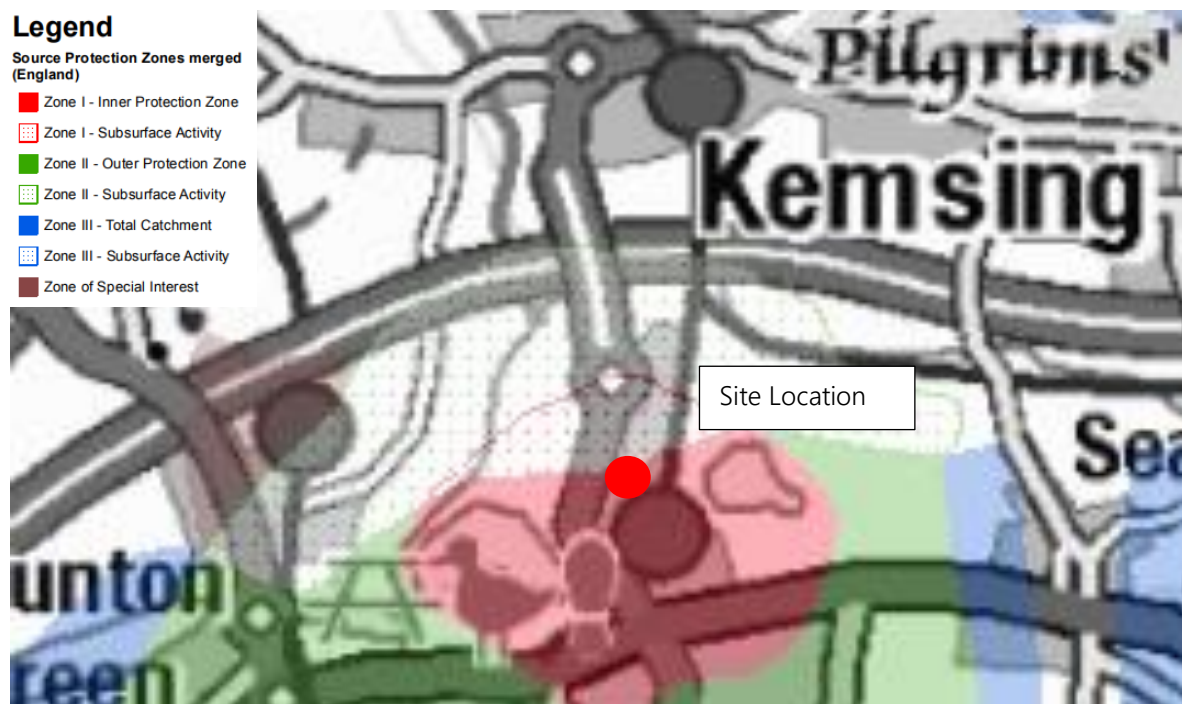


Figure 3 - Extract from EA/Defra Source Protection Zone Maps

The EA/Defra has developed aquifer designations which are in line with the Water Framework Directive and are based on maps produced by the British Geological Survey (BGS). Definitions for the aquifer types are provided below based on the EA website:

- Principal Aquifer: "These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as a major aquifer."
- Secondary A aquifer: "permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers."
- Secondary B aquifer: "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. These are generally the water-bearing parts of the former non-aquifers."
- Secondary 'undifferentiated' aquifer: "it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type."

It can be seen from the maps in Figure 4, Figure 5 and Figure 6, that the site potentially overlays a Principle Aquifer, one which is capable of supporting water supplies at either local or strategic level. Infiltration is not proposed for this site, which is discussed in the section below.

The surface water drainage strategy for the site is to discharge surface water to the public sewer within the surrounding roads via the existing sewer connections. As the site is on a former gas works a high level of hydrocarbon contamination is anticipated, therefore, infiltration will not be proposed as a drainage solution for the site and no pollutant pathways will be introduced by the development that could possibly pose a threat to the groundwater below the site.

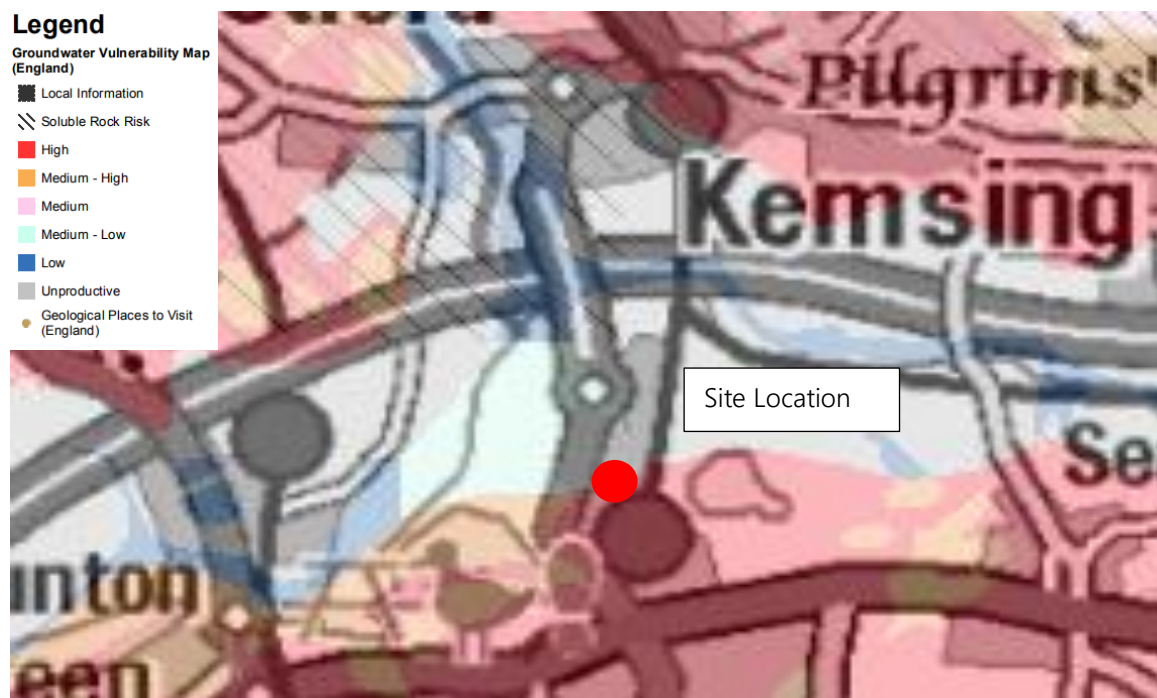


Figure 4 - Extract from EA/Defra Hydrogeological Map (Ground Water Vulnerability Map)

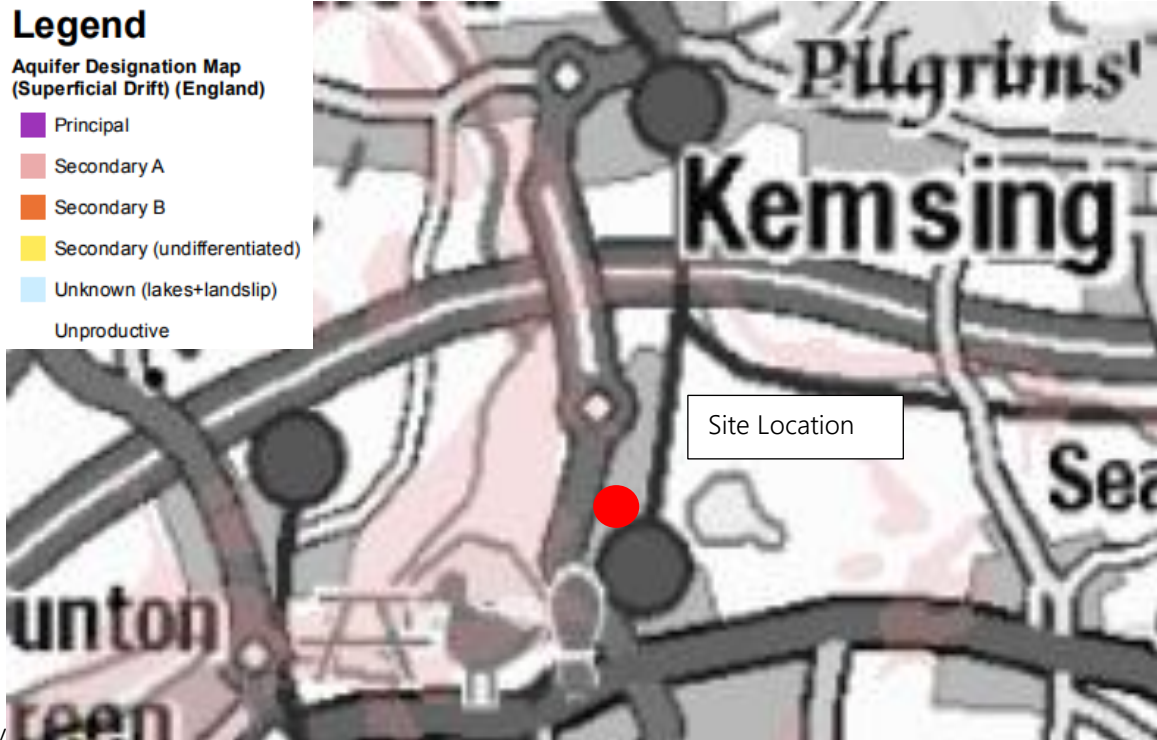


Figure 5 - EA/Defra Hydrogeological Map Aquifer Designation Map (Superficial Drift)



Figure 6 - EA/Defra Hydrogeological Map Aquifer Designation Map (Bedrock)

FLOOD RISK ANALYSIS

FLOOD RISK SOURCES

Upon review of the site characteristics, development proposals, and available information, the potential sources of flooding that could pose a risk to the site are presented in Table 3 below.

FLOOD SOURCE	MECHANISM	SITE IMPACT
Tidal/fluvial	Extreme flood water levels from the river or sea sources.	Floodwaters entering buildings via thresholds or other openings. Flooding of external areas etc.
Land and Surface water Flooding	Surcharging/inundating of existing drainage networks with overland flows to the site.	Flood water entering the site from adjacent highways/properties. Affecting external areas and proposed building.
Groundwater	Rising groundwater within underlying aquifers.	Rising groundwater levels could affect the site if the pathway is available.
Drainage/infrastructure systems	Blockages/failure of drainage or water distribution systems on or adjacent to the site.	Backing up into the site of surface/foul water flows. The risk is to property and low-lying areas.
Reservoirs, Canals and Artificial Sources	Over topping of canals or reservoir failure	This site does not have a canal in any proximity and lies outside the flood area of reservoir based on EA mapping.

Table 3 - Flood Risk Sources

TIDAL AND FLUVIAL

The site is located in Flood Zone 1 based on the Environmental Agency Flood mapping which means that the probability of flooding from tidal and fluvial sources is less than 1 in 1000 years, therefore the risk of flooding is deemed to be low.

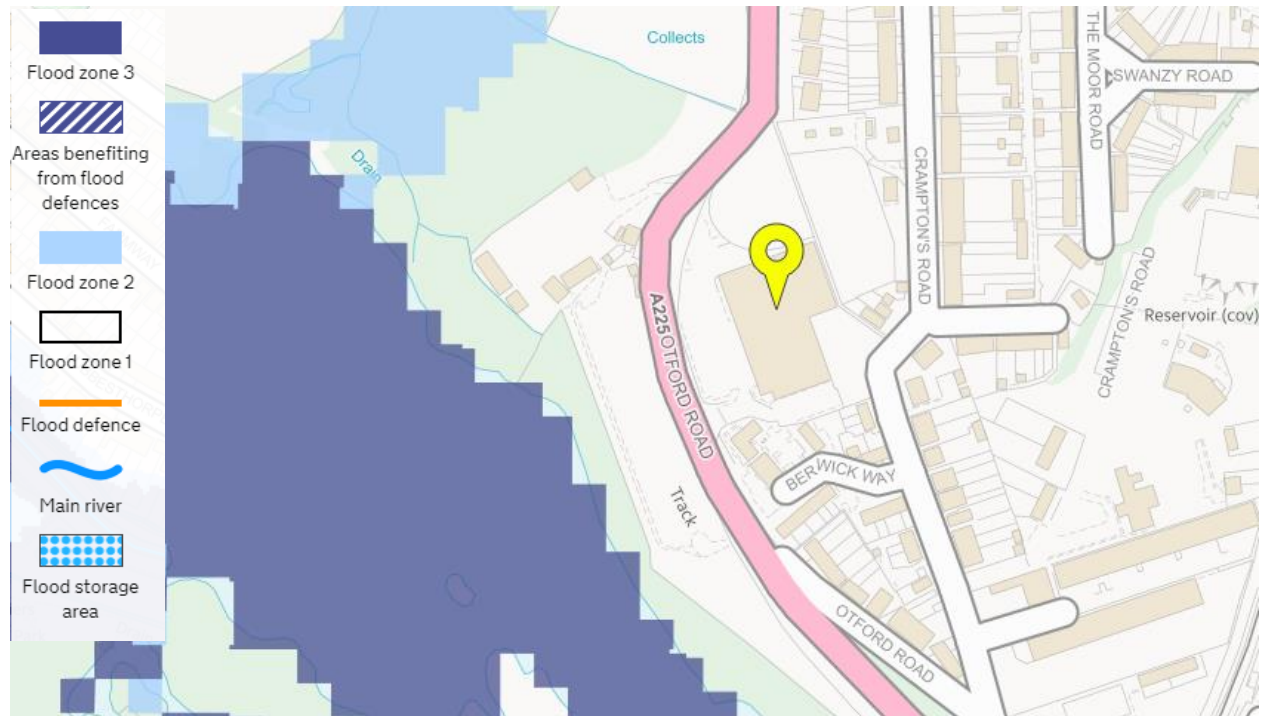


Figure 7 - Extract from EA Flood Maps - Flood Map for Planning (Tidal and Fluvial)

SURFACE WATER FLOODING

Surface water flooding can occur during intense rainfall events where the rainwater is unable to soak into the ground or enter the drainage system. This type of flooding is usually associated with a short duration storm with heavy downpours or a failure or blockage within the drainage system.

The Environment Agency has produced surface water flood mapping which can be used to gain an understanding of the risk, depth, and velocity of flooding. The site has been identified as having a low risk of surface water flooding however, the majority of areas surrounding the site are classified as having a low or very low chance of surface water flooding.

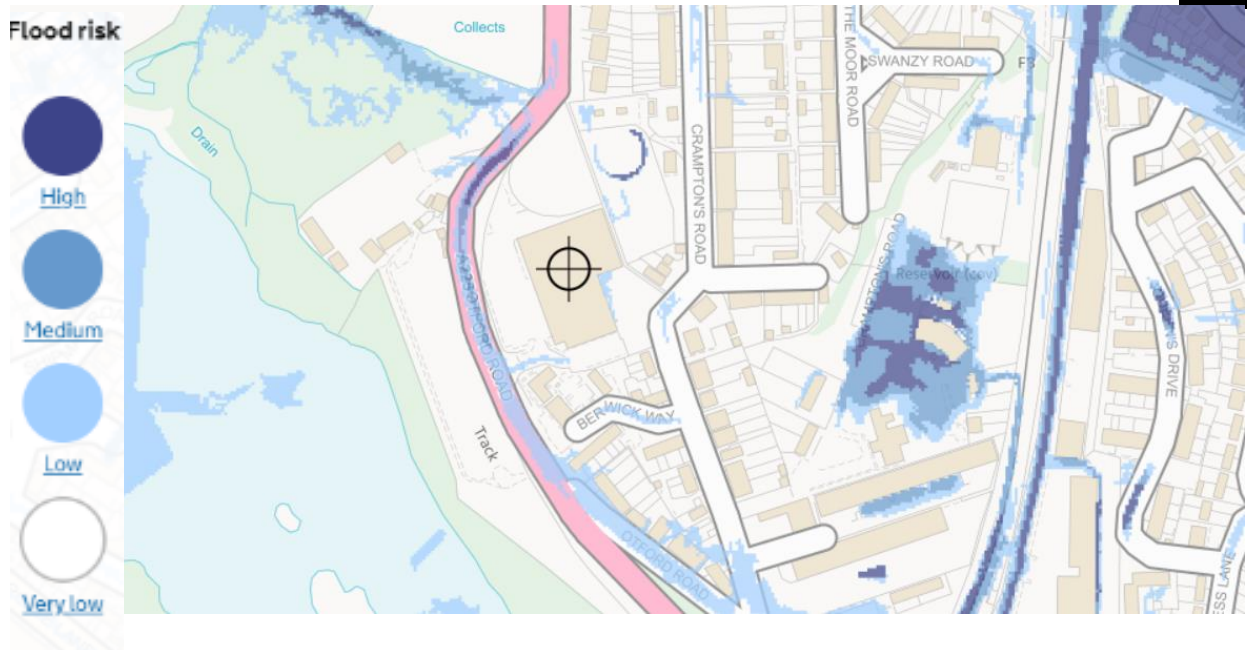


Figure 8 - Extract from EA Flood Maps - Flood Map for Surface Water Runoff

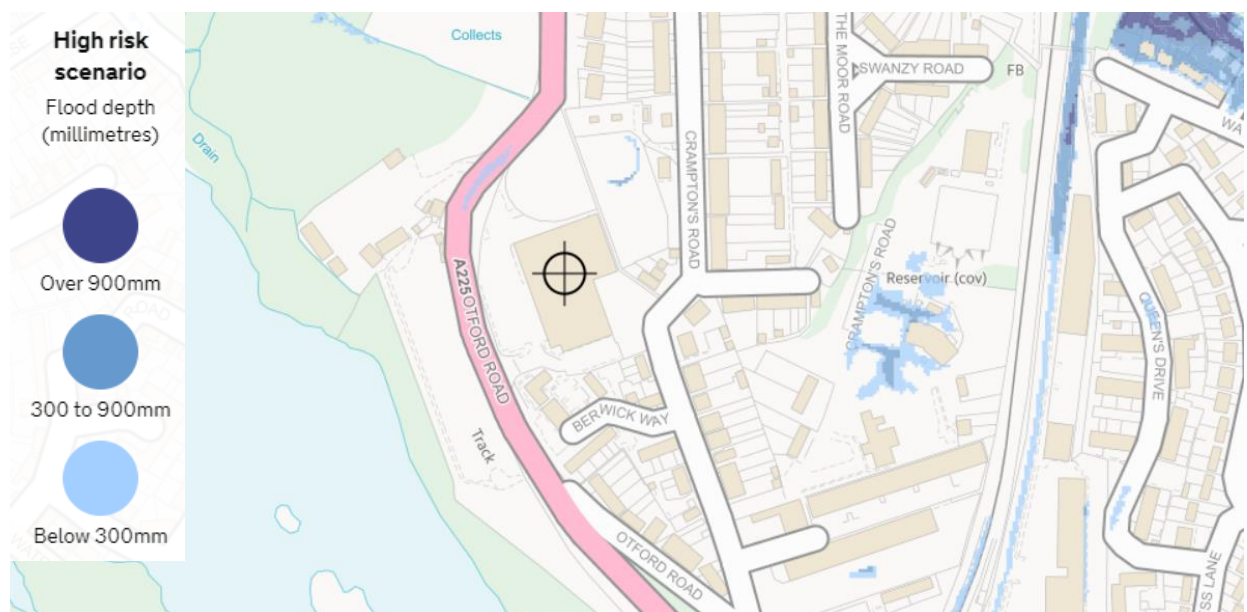


Figure 9 - Extract from EA Flood Maps - Flood Map for Surface Water Runoff Depth

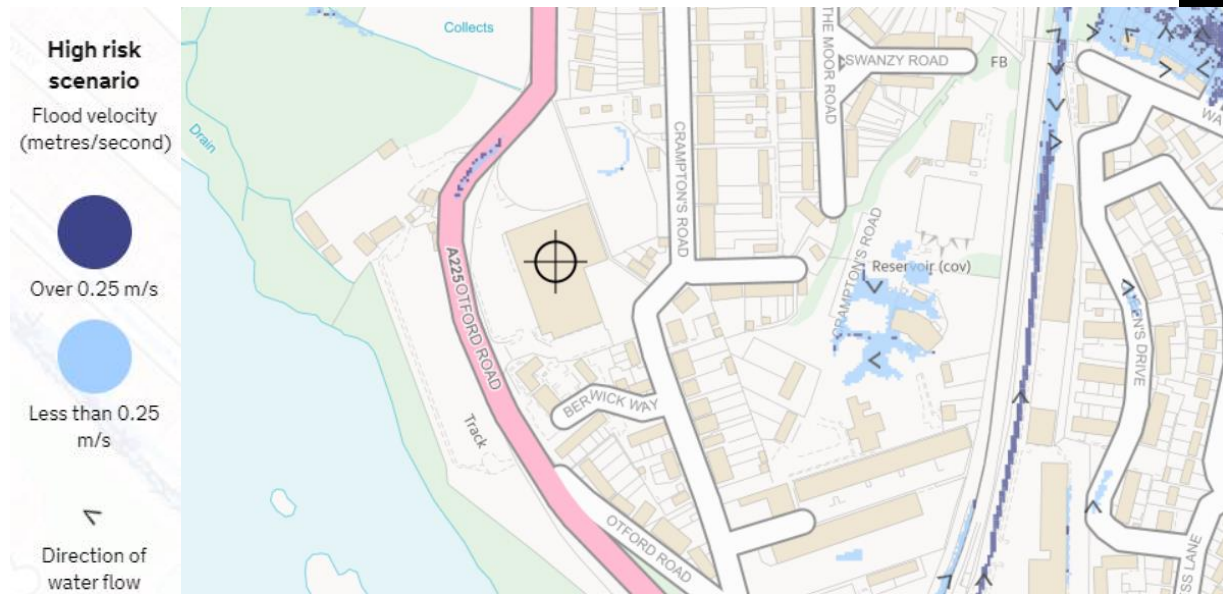


Figure 10 - Extract from EA Flood Maps - Flood Map for Surface Water Runoff Velocity

All surface water runoff that falls on the site and the surrounding areas shown, is understood to be drained by an existing surface water drainage system, prior to discharging to the Thames Water foul water public sewer system. This understanding is based on the GPR survey provided by Intersect surveys dated September 2020. The proposed below ground surface water drainage will be designed to accommodate a 1 in 100-year storm event + 40% climate change and therefore will protect the proposed development from the risk of surface water flooding. All surface water runoff will be managed onsite and stored in attenuation before being discharged into an adjacent surface water drainage ditch identified to the west of Otford road at a restricted rate. Therefore, the risk of surface water flooding will be managed onsite and should be considered to be low risk.

GROUNDWATER

There are no records of recorded groundwater flooding incidents in Sevenoaks Level 1 SFRA. However, there is an unknown origin flood event registered on the Historical Flood Records Map Appendix H of the Level 1 SFRA.

The ground water susceptibility mapping provided in the Sevenoaks Level 1 SFRA indicates that the development is located in an area at $\Rightarrow 25\% < 50\%$ risk level. This is a medium risk level identified and however, the topography of the site is higher than the surrounding area therefore it is likely any ground water flooding will flow away from the site towards the River Darent and low-lying areas, therefore the ground water flood risk has been assessed as low.

RESERVOIR FLOOD RISK

The Environment Agency mapping in Figure 11 shows that the site lies outside the area affected by reservoir flooding. Flooding from reservoirs is not considered to pose a risk to the site.

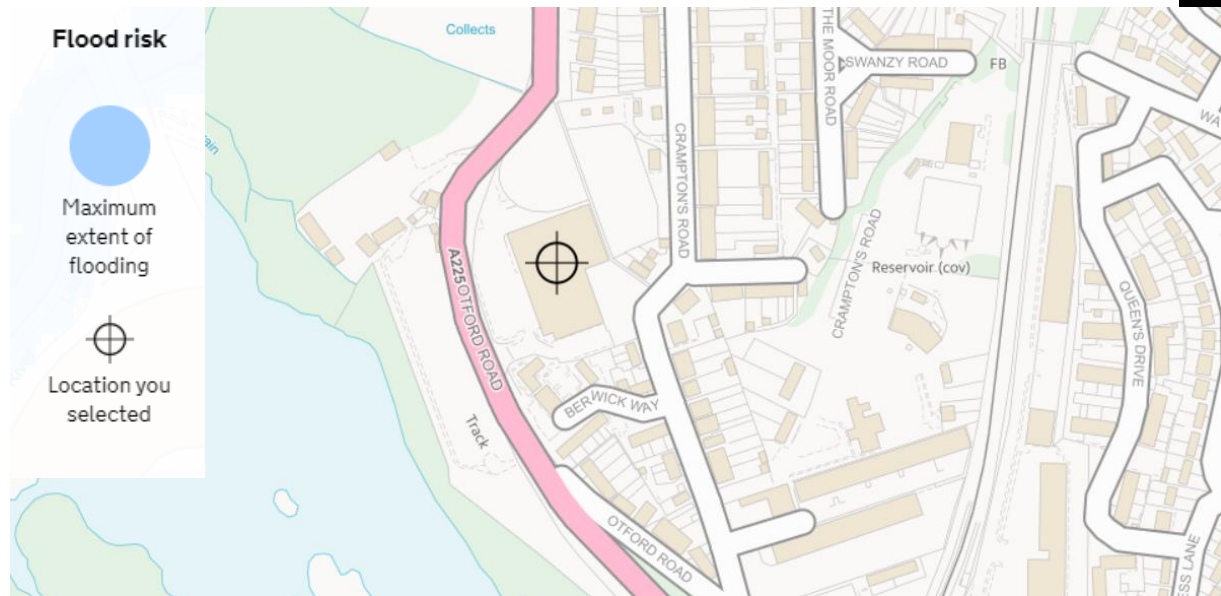


Figure 11 - Extract from EA Flood Maps - Flood Map for Reservoir Flooding

IMPACT ON LOCAL FLOODING REGIME

In addition to assessing the sources of flooding to the development, the NPPF requires that an FRA also considers the potential for a development to increase flood risk to the surrounding area.

As detailed above, the site of the proposed development is located within Flood Zone 1 and therefore is outside of the designated flood plain. Therefore, it is considered that the development will not have any impact on the surrounding areas so there is no requirement to provide floodplain compensation storage.

CRITICAL DRAINAGE AREA

As stated in Section 2.2 of the Kent County Council DRAFT Drainage and Planning Policy Statement Local flood risk management strategy guidance, there have been no Critical Drainage Areas identified within Kent therefore no further consultation is required.

On this basis, it has been assumed that there are no critical drainage areas in the area, and they do not need to be considered by this Flood Risk Assessment.

APPLICATION OF NATIONAL PLANNING POLICY

The purpose of the sequential approach is to demonstrate that there are no reasonable available sites in areas with a lower probability of flooding that would be appropriate to the development being proposed.

As the site is in Flood Zone 1, it automatically satisfies the requirements of the sequential test and therefore the exception test is not required.

FLOOD RISK SUMMARY

Flood Source	Risk Category			Comments
	High	Medium	Low	
Tidal/fluvial			X	The site is designated Flood Zone 1 therefore the risk of flooding to is deemed a very low.
Surface Water Run-off from Heavy Storm Events			X	There is some very minor surface water flooding in the public realm around the site. It is not determined what is causing the flooding however the proposed surface water drainage network will be designed to accommodate the surface water runoff for this catchment for a storm event up to a 1 in 100 year + 40% climate change. The surface water runoff will be stored and discharged at a reduced rate to the public sewer. Therefore, the risk of surface water flooding onsite can be considered as low.
Groundwater			X	The risk of groundwater flooding is considered low due to the information stated in Sevenoaks Level 1 SFRA. The site is also higher than the surrounding area therefore any ground water will naturally flow away from the site towards the River Darent.
Reservoirs			X	The site is in an area not at risk from reservoir flooding. Therefore, the risk is deemed to be low.

Table 4 - Flood Risk Summary for Development

FLOOD RISK MANAGEMENT RECOMMENDATIONS

On Site Flood Management

This report has demonstrated that there is very low flood risk posed to the development from fluvial, tidal, or pluvial sources or from infrastructure failure. As part of the development new foul and surface water drainage network shall be provided managing storms up to an including 100year storm events with a 40% allowance for climate change. For details of the proposed surface water drainage strategy, refer to the Drainage Strategy report 1020-C-RP-0100.

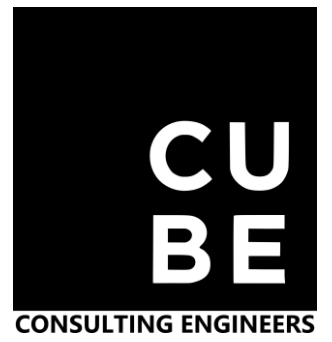
Off Site Flood Management

The proposed development is unlikely to increase the risk of flooding offsite by restricting the surface water runoff rate and controlling surface water runoff from storms up to including 100year plus climate change events providing a betterment on the existing surface water discharge rate. For details of the proposed surface water drainage strategy, refer to the Drainage Strategy report 1020-C-RP-0100.

Surface and Ground Water Pollution during Construction

The Construction Environment Management Plan (CEMP) for the proposed development should follow the guidance provided within the EA Pollution Prevention Guidance 6. The guidance sets out best practice for producing an incident response plan to deal with an environmental incident on the site. It can also help to prevent environmental damage if an incident does occur.

Sevenoaks Gas Holders



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