



FLOOD RISK ASSESSMENT
OF
THE PINES, FARADAY CLOSE, WORTHING, BN13 3RB
FOR
WEST SUSSEX COUNTY COUNCIL

August 2023

Job No: 1861



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Project Number:	1861 Flood Risk Assessment		
	Engineer	Signature	Date
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For and on behalf of Wills Design Partnership Ltd.			

Rev 1	Preliminary issue for comment
Rev 2	Vulnerability classification revised from 'less vulnerable' to 'more vulnerable'



1.0 TABLE OF CONTENTS

2.0 INTRODUCTION

2.1 TERMS OF REFERENCE

2.2 SCOPE OF WORK

2.3 THIRD PARTY RIGHTS

2.4 LIMITATIONS

3.0 SITE DESCRIPTION

3.1 LOCATION

3.2 TOPOGRAPHY

3.3 VEGETATION

3.4 GEOLOGY

3.5 HYDROLOGY

3.6 HYDROGEOLOGY

3.7 HISTORICAL FLOODING

3.8 FLOOD DEFENSES

4.0 FLOOD ZONES & VULNERABILITY CLASSIFICATION

4.1 EA FLOOD ZONES

4.2 FLOOD VULNERABILITY

5.0 CLIMATE CHANGE

5.1 PEAK RIVER FLOW ALLOWANCES

5.2 PEAK RAINFALL INTENSITY ALLOWANCES

5.3 SEA LEVEL ALLOWANCES

6.0 FLOOD RISK ASSESSMENT

6.1 ASSESSMENT APPROACH

6.2 TIDAL FLOOD RISK

6.3 FLUVIAL FLOOD RISK

6.4 SURFACE WATER (PLUVIAL) FLOOD RISK

6.5 GROUNDWATER FLOOD RISK

6.6 SEWER FLOOD RISK

6.7 RESERVOIR, CANALS OR OTHER ARTIFICIAL FLOOD RISK SOURCES

6.8 EFFECTS OF THE DEVELOPMENT ON FLOOD RISK IN OTHER AREAS

7.0 FLOOD RISK MANAGEMENT

7.1 INTRODUCTION

7.2 FLOOD MITIGATION MEASURES

7.3 FLOOD WARNING

7.4 SAFE ACCESS AND EGRESS

8.0 SEQUENTIAL AND EXCEPTION TEST

9.0 CONCLUSIONS



APPENDIX A DRAWINGS

APPENDIX B EA PRODUCT 4 DATA



2.0 INTRODUCTION

2.1 Terms of Reference

Acting on instructions received from Jack Bannister (Faithful & Gould), Wills Design Partnership Ltd has carried out a Flood Risk Assessment for The Pines, Faraday Close, Worthing, BN13 3RB.

Site Name and Address	The Pines, Faraday Close, Worthing, BN13 3RB
what3words	///panels.noting.potato
Google Map	Link
Area of Site	3,545m ²
Development Type	Commercial
Local Planning Authority	West Sussex County Council
Environment Agency Area	Solent and South Downs

2.2 Scope of Work

The site is located at The Pines, Faraday Close, Worthing, BN13 3RB. Previously the site was used as an Adult Training Centre, and classed as a 'more vulnerable' under NPPF

The site consists of an existing building, along with an external hardstandings.

It is proposed to keep the building and use the space as a SEND Satellite facility for Oak Grove Collage.

The purpose of this report is to:

- identify potential sources of flooding
- identify probability of flooding
- identify location and extent of flooding within the vicinity of the site

2.3 Third Party Rights

This report is issued to client and does not confer or purport to confer on any third party any benefit or any right pursuant to the Contracts (Rights of Third Parties) Act 1999.



2.4 Limitations

This report is confidential to the Client. It may be disclosed to advisors assisting in this matter but may not be disclosed to any other party without the prior written approval of Wills Design Partnership Ltd.

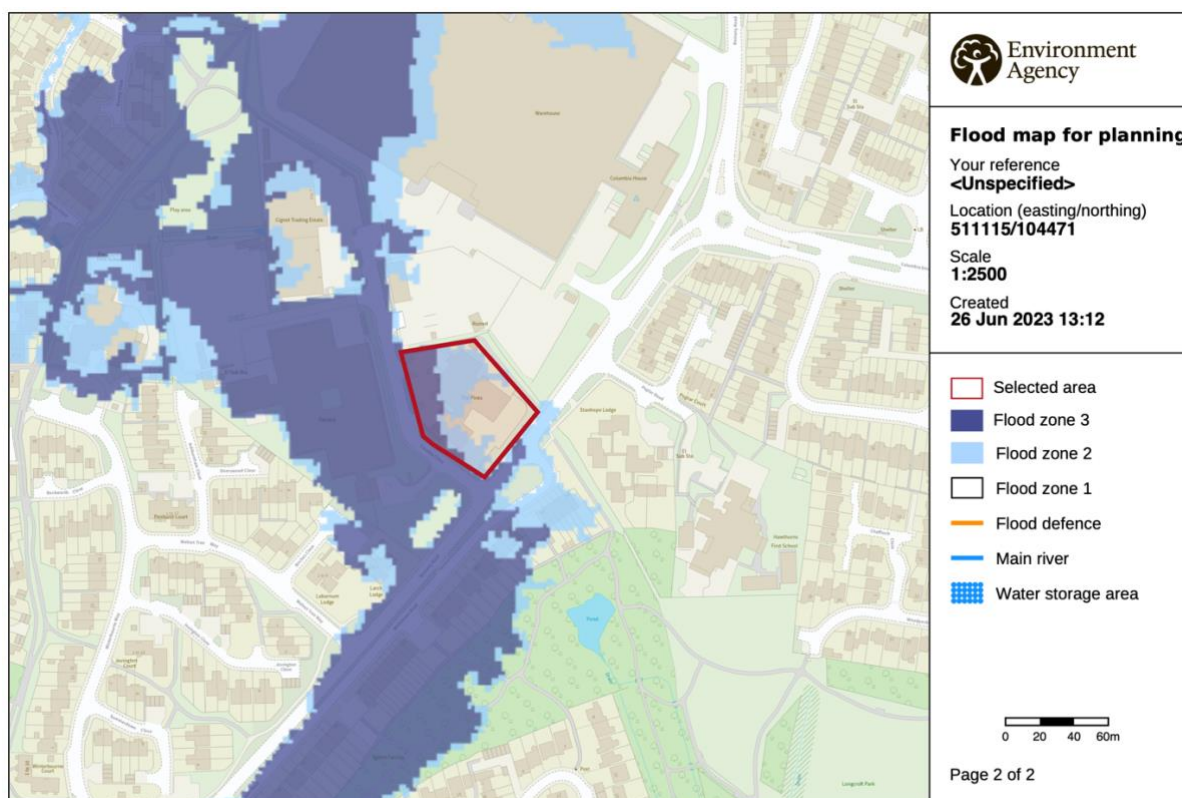
This report is not intended for the actual carrying out of construction works. Properly detailed drawings and calculations should be compiled to specify any such works.



3.0 SITE DESCRIPTION

3.1 Location

The site is located partially within a Flood Zone 3¹, partially within a Flood Zone 2², and partially within a Flood Zone 1³.



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Figure 1 - EA Flood Maps for Planning – Flood Zones

The site is not within a critical drainage area⁴

¹ Flood zone 3 comprises land assessed as having a 1 in 100 or greater annual probability of river (>1%) or a 1 in 200 or greater annual probability of sea flooding (>0.5%) in any year.

² Flood Zone 2 comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (0.1% to 1%) or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.05% to 0.5%) in any year.

³ Flood Zone 1 comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%) in any year..

⁴ The Town and Country Planning (General Development Procedure Amendment No.2, England) Order 2006 introduces the concept of Critical Drainage Areas as 'an area within Flood Zone 1 which has critical drainage problems, and which has been notified to the local planning authority by the Environment Agency'.



3.2 Topography

The area of the site is 3,545m².

Generally, the site is flat, with known site levels range from approximately 9.40m AoD to 10.00m AoD. The level of the existing building is approximately 10.00m AoD, typically some 150 - 250mm above adjacent areas.

3.3 Vegetation

Generally the site is impermeable, with small pockets of vegetation.

3.4 Geology

According to the British Geological Survey, the site is underlain by Lambeth Group – clay, silt and sand. This is overlain by River Terrace Deposits - sand, silt and clay - Sedimentary superficial deposit.

Soil maps, provided by LandIS, categorise the underlain soil as Soilscape class 6. This is characterised as freely draining slightly acid loamy soils.

3.5 Hydrology

Ferring Rife is located approximately 600m to the southwest of the site and runs west then south, to discharge at the coast, some 3km away.

It should be noted that the site is within the [‘Ferring on the Ferring Rife’ flood warning area](#).

3.6 Hydrogeology

The underlying bedrock is classified as Secondary A aquifer⁵

The underlying superficial deposits are classified as Secondary B aquifer⁶.

The site is located within a medium groundwater vulnerability zone.

The nearest groundwater source protection zones (SPZ) are located circa. 850m to the north and north-east.

⁵ secondary A aquifers comprise permeable layers that can support local water supplies, and may form an important source of base flow to rivers

⁶ secondary B aquifers are mainly lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin cracks (called fissures) and openings or eroded layers



3.7 Historical flooding

Referring to information provided by the EA, the site has never flooded. However, areas adjacent to the site experienced flooding in September 1980 and again in June 1981. These events were caused by local drainage and overtopping of the defences respectively.

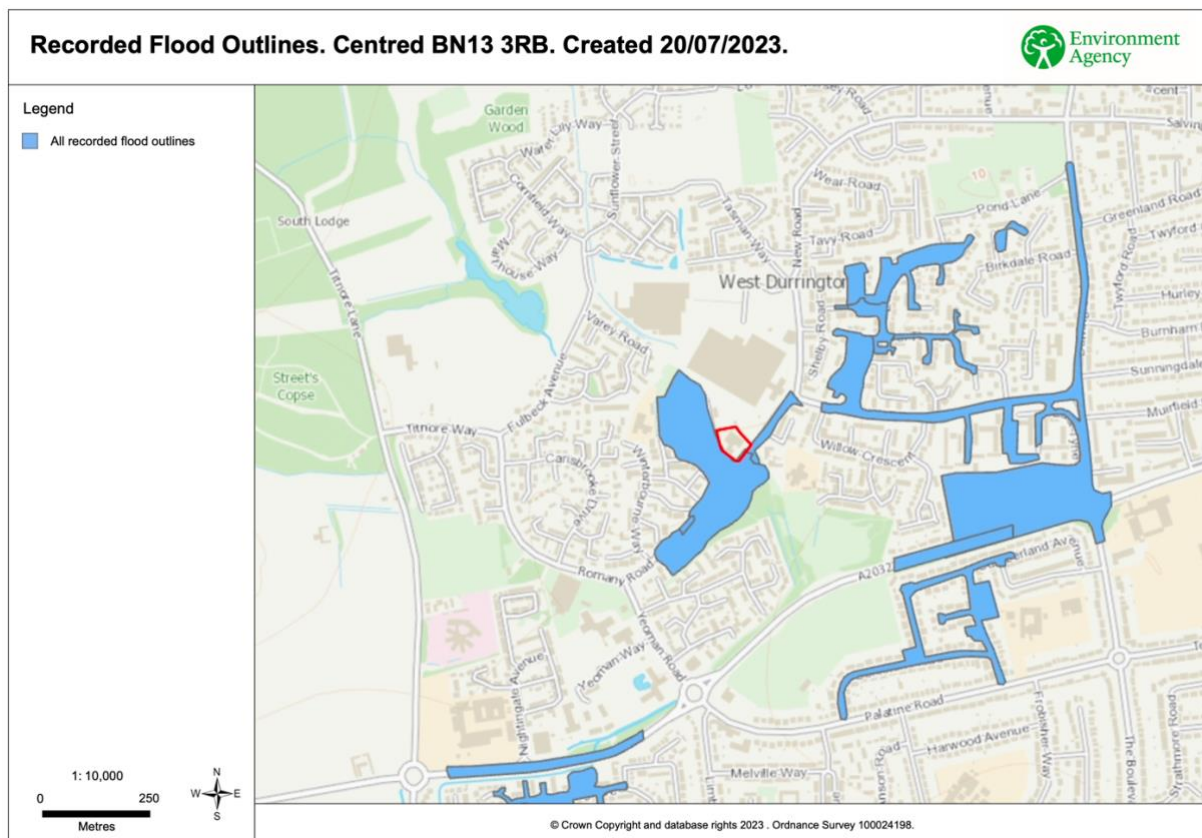


Figure 2 – Extract from Product 4 information

3.8 Flood Defences

The site does not benefit from flood defences.

The closest flood defences are located downstream of site, along the Ferring Rife.

4.0 FLOOD ZONES & VULNERABILITY CLASSIFICATION

4.1 EA Flood Zones

As discussed above, much of the development is within a Flood Zone 3, and therefore has a 'high probability' of river/tidal flooding.

The Environment Agency Flood Zones and acceptable development types are explained within Table 1 of the Technical Guidance to the National Planning Policy Framework, summarised below.

Table 1 – Flood Zones

Flood Zone	Probability	Definition	Appropriate Uses
1	Low	less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).	All uses of land are appropriate
2	Medium	between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.	Most uses of land are appropriate, including essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses
3a	High	1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.	The water-compatible and less vulnerable uses of land are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone.
3b	Functional Floodplain	Land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood.	Only the water-compatible uses and the essential infrastructure

Rationalisation of [Technical Guidance to NPPF – Table 1](#)



4.2 Flood Vulnerability

Table 2 of the Technical Guidance to NPPF, provide guidance on development types and their vulnerability classification.

Table 2 – Flood vulnerability classification

Vulnerability Classification	Permitted Development types
Essential Infrastructure	• 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	• 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.
More Vulnerable	• 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.
Less Vulnerable	• 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 developments	• 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 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.
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Rationalisation of [Technical Guidance to NPPF – Table 2](#)

Table 3 of the Technical Guidance to NPPF, shows appropriate uses for different Flood Zones.

Table 3 – Flood risk vulnerability and flood zone ‘compatibility’

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	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.				

Extract from [Technical Guidance to NPPF – Table 3](#)

Applying the above rational, the proposed development is classed as ‘more vulnerable’ and compatible with Flood Zone 3, provided Exception Testing is passed.



5.0 CLIMATE CHANGE

5.1 Peak River Flow Allowances

Peak river flow allowances provide guidance on climate change percentages for given river basin districts and development lifespans.

Table 4

River Basin District	Allowance Category	2020s	2050s	2080s
Adur and Ouse Management Catchment	Upper	40%	57%	107%
	Higher	23%	28%	55%
	Central	16%	18%	37%

Extract from [Peak River Flow Map](#)

Guidance recommends that, for 'more vulnerable' uses in Flood Zone 3a, [the central allowances](#) are used to assess climate change.

Therefore, the design fluvial flood level for this site is the 1 in 100 year (+55%) event.

5.2 Peak Rainfall Intensity Allowances

Peak Rainfall Intensity allowances provide guidance on climate change percentages for given river basin districts and development lifespans.

Table 5

River Basin District	Allowance Category	2020s	2050s	2070s
Adur and Ouse Management Catchment	Upper end (1%)	-	45%	45%
	Central (1%)	-	20%	25%
	Upper End (3.3%)	-	35%	40%
	Central (3.3%)	-	20%	20%

Extract from [Peak Rainfall Allowances](#)

For flood risk assessments, [the upper end allowances should be assessed](#).

Therefore, the design rainfall intensity for this site is the 1 in 100 year (+45%) event.



5.3 Sea Level Allowances

The development is not considered to be at risk of tidal flooding.

The development is situated approximately 2.7km from the coast.



6.0 FLOOD RISK ASSESSMENT

6.1 Assessment Approach

This assessment aims to minimise any impact of the development on flood risk through adequate consideration of flooding issues and the inclusion of appropriate mitigation.

All sources of flooding have been considered, these are; fluvial (river) flooding, tidal (coastal) flooding, groundwater flooding, surface water (pluvial) flooding, sewer flooding and flooding from artificial drainage systems/infrastructure failure

6.2 Tidal Flood Risk

The development is not considered to be at risk of tidal flooding.

6.3 Fluvial Flood Risk

Data node points have been provided by the EA and are summarised below.

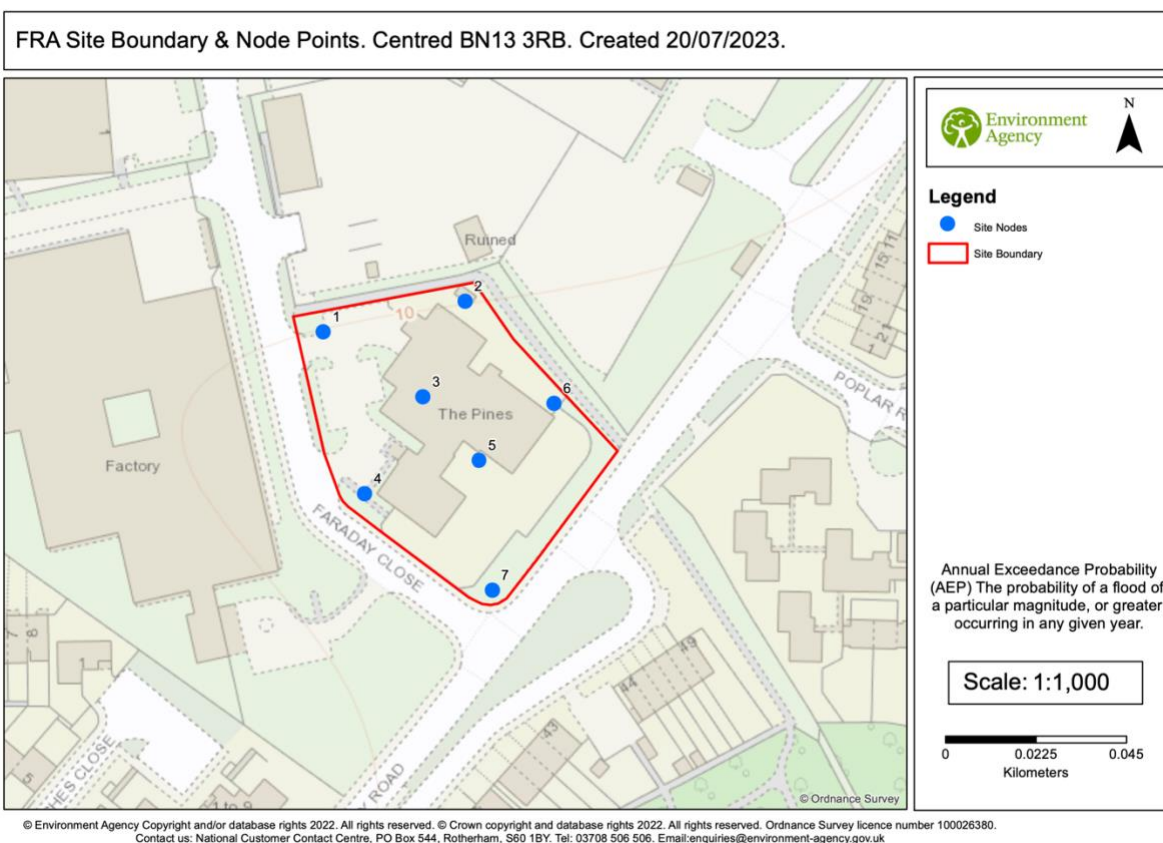


Figure 3 - FRA Site Boundary & Node Points.

Node Ref	NGR		Modelled Flood Levels in Metres AOD					
			Undefended Annual Exceedance Probability					
			5%	1%	1% +CC (35%)	1% +CC (45%)	1% +CC (105%)	0.1%
1	511082	104499	9.74	9.82	9.89	9.91	9.98	9.93
2	511117	104506	-	-	-	-	-	-
3	511107	104482	-	-	9.88	9.90	9.97	9.93
4	511092	104458	9.73	9.81	9.87	9.88	9.95	9.91
5	511121	104467	-	-	-	-	-	-
6	511139	104481	-	-	-	-	9.95	-
7	511124	104434	-	-	9.84	9.85	9.91	9.88

Table 6 – Flood water level undefended

Node Ref	NGR		Modelled Flood Depths in Metres					
			Undefended Annual Exceedance Probability					
			5%	1%	1% +CC (35%)	1% +CC (45%)	1% +CC (105%)	0.1%
1	511082	104499	0.10	0.17	0.24	0.25	0.33	0.28
2	511117	104506	-	-	-	-	-	-
3	511107	104482	-	-	0.01	0.03	0.10	0.05
4	511092	104458	0.09	0.16	0.22	0.24	0.30	0.26
5	511121	104467	-	-	-	-	-	-
6	511139	104481	-	-	-	-	0.06	-
7	511124	104434	-	-	0.15	0.16	0.21	0.18

Table 7 – Flood water depth undefended

As information was not provided for the 55% climate change scenario, data will be used for the 105% climate change scenario (this climate change allowance is closer to upper end allowances described in 5.1).

Reviewing table 1, all flood depths are circa 20mm below the finished floor level and circa 580mm above the lowest known level on site (9.4m AoD).

Reviewing table 2, flood depths do not correlate with known levels from the topographical survey, however node point 3 suggests slight internal flooding.



6.4 Surface Water (Pluvial) Flood Risk

Figure 4 shows areas at risk of surface water flooding.

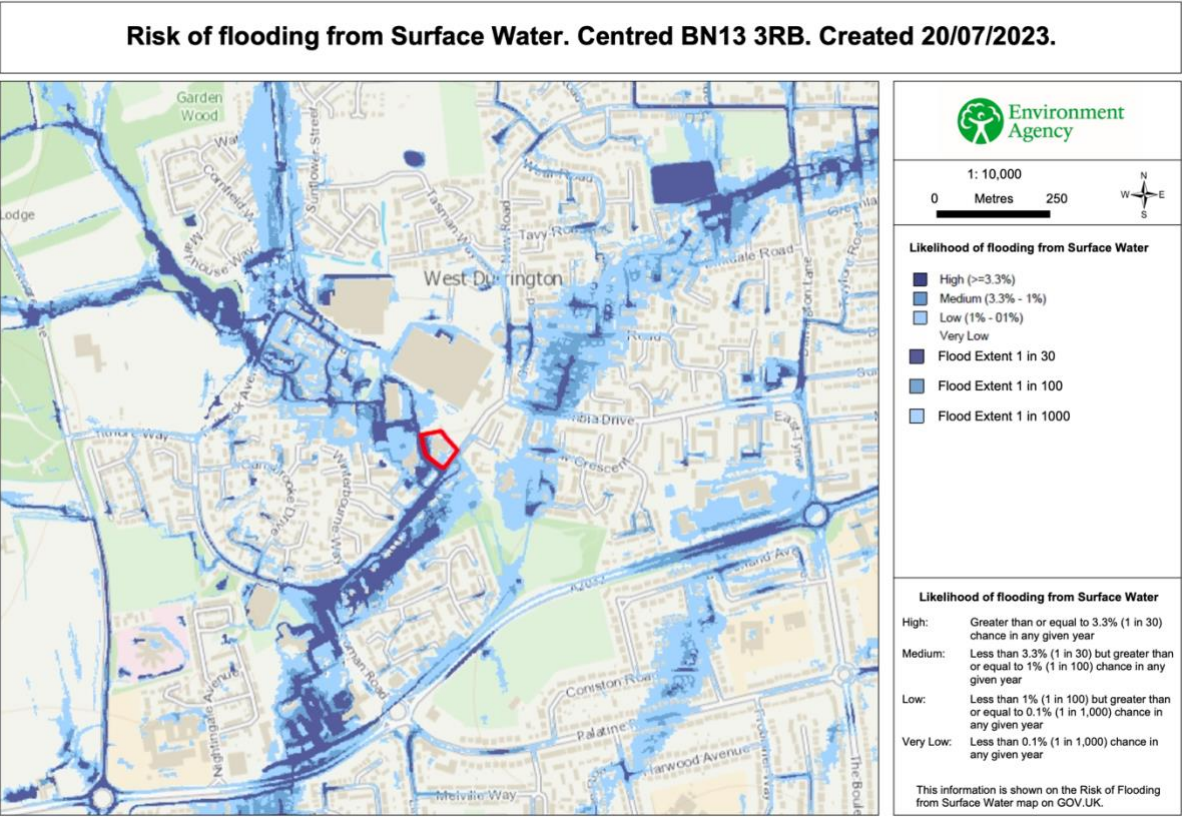


Figure 4 – Extract from Flood Maps for Planning



Figure 5 shows predicted flooding depths. The maps do not take account of climate change, however through discussion with the EA it is understood that the 1 in 1000yr level is approximately comparable to the 1 in 100 year (+CC) event. Therefore we have used the depth maps for the 1 in 1000yr event.

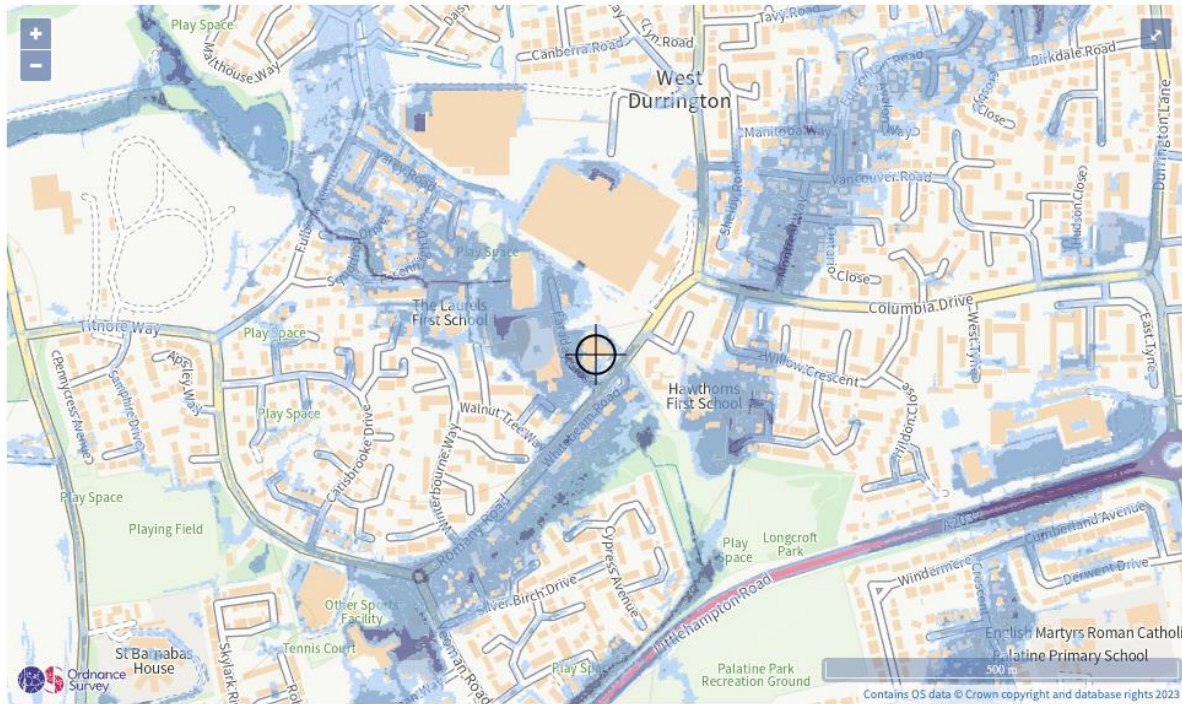


Figure 5 – Extract from Flood Maps for Planning – Flood Depths (1in1000yr)

Therefore, the design flood level for surface water flooding would likely be similar to the Fluvial flood levels.

6.5 Groundwater Flood Risk

The development area is not considered to be at risk from groundwater flooding. According to EA data 'Flooding from ground water is unlikely in this area'.

6.6 Sewer Flood Risk

The development area is not considered to be at risk from sewers flooding. Furthermore, the change of use of this site would not exert additional load of the surrounding infrastructure.

6.7 Reservoir, Canals or Other Artificial Flood Risk Sources

The development area is not considered to be at risk of flooding from reservoirs. According to EA data 'Flooding from reservoirs is unlikely in this area'.

6.8 Effects of the development on flood risk in other areas

Assuming any redevelopment did not increase the building size, there would be no effect on flood risk to other areas.



7.0 FLOOD RISK MANAGEMENT

7.1 Introduction

The flood risk at this location is considered suitable for 'less vulnerable' developments within the NPPF. In this flood zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development and the use of flood mitigation measures.

A number of techniques and mitigation strategies to manage and reduce the overall flood risk in the area could be used. This will ensure the development will be safe and there is:

- Minimal risk to life;
- Minimal disruption to people living and working in the area;
- Minimal potential damage to property;
- Minimal impact of the proposed development on flood risk generally; and;
- Minimal disruption to natural heritage.

The flood risk at the site will be reduced by property level protection measures these are discussed in more detail below.

7.2 Flood Mitigation Measures

As described above, while the finished floor level is above the design flood level, it could still potentially be at risk of flooding.

[EA guidance](#) states, 'Design your building or development to keep water out as much as possible. Do this by using materials that have low permeability (ie materials that water cannot pass through such as impermeable concrete).'

7.3 Flood Warning

The site is located within the ['Ferring on the Ferring Rife' flood warning area](#).

The Environment Agency operate a free flood warning service providing alerts when flooding is anticipated providing an opportunity for owners to take necessary precautions, giving enough time for the building to be safely evacuated and mitigation measures to be put in place.

All occupants of the site should be made aware of the Environment Agency Floodline telephone number and the Flood Warning Codes and their meaning.



The owner of the properties should carry out the role of Flood Warden for the site and ensure they have an understanding of the flood mechanisms of the site and should ensure that the safety of the occupants and visitors will not be compromised.

7.4 Safe Access and Egress

Generally safe access and egress routes, including emergency access can be maintained via the existing site entrance. However, during an exceptional storms event, water levels in Faraday Close could reach 500 – 600mm.

It is likely the building would be evacuated prior to any flooding, due to the flood warning discussed above. The property also benefits from a first floor, which could be used as a safe refuge until emergency services arrive or flood levels decrease.



8.0 SEQUENTIAL AND EXCEPTION TEST

According to the EA guidance, this development does not need to pass the requirements of a sequential test or an exception test. The proposed development is classes as minor and only involves a change of use.



9.0 CONCLUSIONS

The report describes the site and presents information on flood risk, surface water and foul water drainage systems for the proposed development.

- The site is located partially within a Flood Zone 3, partially within a Flood Zone 2, and partially within a Flood Zone 1.
- The proposed development is not within a Flood Zone 3b (functional flood plain)
- The site is not at risk of Tidal Flooding
- The site is at risk of Fluvial Flooding.
- The site is at risk of Pluvial Flooding
- The site is not at risk of Groundwater Flooding.
- The site is not at risk of Sewer Flooding
- The site is not at risk of flooding from reservoirs, canals or other artificial sources
- The flood level for a 1in100yr event (+c/c) is approximately 9.98m AoD
- Due nature of this development, it does not need to pass the Sequential Test and Exception Test.
- The Proposed development is classified as 'more vulnerable'. This is deemed as an appropriate development within Table 3 'Flood Risk Vulnerability and flood zone compatibility'.
- Potential Flood Mitigation & Warning Measures have been described.
- Safe Access & Egress routes have been discussed.

This Flood Risk Assessment concludes that, while EA information indicates the site is at risk of flooding, this risk is likely to be relatively small. Mitigation and/or flood resilient building techniques can be employed to manage any risk.



APPENDIX A
DRAWINGS



RECORD DRAWING LIST		
Reference No	Rev	Title/Description
47691_T	R0	Topographical Survey
1861-200	R1	Site Location
1861-201	R1	Existing Site Layout



APPENDIX B
[EA PRODUCT 4 DATA](#)

