

FloodSmart Plus



Site Address

(Land at) Upper Nash
Lamphey
Pembrokeshire
SA73 5AF

Date

2022-11-30

Report Status

FINAL

Grid Reference

202081, 202517

Site Area

0.57 ha

Report Prepared for

BBP Property Ltd

Report Reference

78121R1



Flood Consequence Assessment

According to the NRW's Development Advice Map the Site is located within Zone A, an area considered to be at little or no risk of fluvial or costal/tidal flooding.

The Site is located within the NRW's fluvial Flood Zone (Low probability) with a Very Low risk of flooding from rivers and the sea.

There is a Very Low risk of surface water flooding and a Low-Moderate risk of groundwater flooding on Site.

There is a Negligible risk of flooding from artificial sources (i.e. canals, reservoirs and sewers).

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1. Executive summary



The Planning Policy Wales (PPW) 11th edition (2021) and Technical Advice Note 15 (TAN 15) (2004) requires Flood Consequence Assessments (FCA) to review flooding from all potential sources. A review has been undertaken of national environmental data sets to assess the potential flood risk to the Site. The review is provided within this concise interpretative report written by an experienced GeoSmart consultant.

It should be noted that the TAN15 (2004) is anticipated to be updated in June 2023 and a new Flood Map for Planning will be published at the same time to support this. The new Flood Map for Planning will supersede the NRW's Development Advice Map (DAM) and the conclusions of this report may change as a result.

Site analysis*

Source of Flood Risk	Baseline	After Analysis	After Mitigation
River (fluvial) flooding ¹	Very Low	Very Low	N/A
Sea (coastal/tidal) flooding	N/A	N/A	N/A
Surface water (pluvial) flooding	Very Low	Very Low	N/A
Groundwater flooding	Low-High	Low-Moderate	Low
Other flood risk factors present	No	No	N/A
Is any other further work recommended?	Yes	Yes	Yes

N/A = mitigation not required

¹ Model data was requested for the Site but was not provided within the time frame of this report. The National Hazard and Flood Risk Assessment Wales (FRAW) maps (2020) have been used to assess flood risk to the Site.

Summary of existing and proposed development

The Site was previously used in an agricultural capacity. Development proposals comprise the construction of 8 new dwellings with associated landscaping and access Site plans are included in Appendix A.

The proposed development is classed as Highly Vulnerable according to Table 9 (Summary of Policy Requirements) in TAN 15 (2004).

Summary of flood risks

The flood risks from all sources have been assessed as part of this report and are as follows:

River (fluvial) Flooding Risks

According to NRW's Flood Map for Planning Purposes, the Site is located within fluvial Flood Zone 1, but is in close proximity to fluvial Flood Zones 2 and 3. According to the NRW's Development Advice Map (DAM) the Site is located within Zone A.

According to NRW's Risk of Flooding from Rivers and Sea (RoFRaS) map, which considers the type, condition and crest height of flood defences, the Site has a Very Low risk of flooding from Rivers and the Sea.

In this instance due to the lack of detailed fluvial flood modelled data for the Site, the 1 in 1000-year scenario can be used as a proxy for the 1 in 100-year plus climate change scenario.

- During a 1 in 100 year plus climate change allowance event the nearest flood level to the Site would be 18.50 mAOD.
- During this event no flooding is anticipated to occur on Site.

Surface Water (Pluvial) Flooding Risk

According to NRW's Risk of Flooding from Surface Water (pluvial) flood map, the Site is at Very Low risk of pluvial flooding.

Groundwater Flooding Risk

GeoSmart's Groundwater Flood Risk (GW5) Map indicates a Low-High potential for groundwater flooding on Site during a 1 % annual probability (1 in 100 year) event. Based on a review of (limited) site specific data:

- Groundwater levels may rise in the bedrock aquifer in a seasonal response to prolonged rainfall recharge which may cause an unusually high peak in groundwater levels during some years.
- Groundwater levels may also rise in the bedrock, principal aquifer in response to high river events due to potential hydraulic continuity with the nearby drainage ditches.
- The nearest borehole to the Site (ref: SN00SW12) struck groundwater at 12mbgl, rising to 10.25mbgl. It is noted however, that whilst the borehole is situated upon the same geology as the Site it is located approximately 500m to the north east of the Site so may not accurately represent groundwater conditions on Site.

- It is noted that the Site is located on a steep slope, which mirrors the extent of the High groundwater risk extent in Figure 13. This change in elevation is considered to contribute to the High risk of flooding identified on Site.
- Despite the presence of an aquifer the Site would only be at risk of groundwater flooding if the water table reaches the base of the Site development or the ground surface when groundwater seepage could lead to overland flow and ponding.

Whilst the baseline groundwater flood risk rating is Low to High, on the basis of the site-specific assessment the groundwater flood risk is considered to be Low to Moderate.

Artificial Flooding Risk

The risk of flooding from artificial sources such as reservoirs, sewers and canals have been assessed:

- According to NRW's Risk of Flooding from Reservoir mapping, the Site is not at risk of Reservoir Flooding;
- According to Ordnance Survey (OS) mapping, there are no canals within the vicinity of the Site; and
- The SFCA does not indicate any reported incidence of sewer flooding.

On the basis of the above the risk of flooding from artificial sources is considered negligible.

The risk to the development has been assessed over its expected 100 year lifetime, including appropriate allowances for the impacts of climate change. More extreme weather events could increase the risk to the Site from increased river flows and fluvial flooding. Site specific assessment indicates risk to the Site will not increase significantly and appropriate mitigation measures are proposed.

Recommendations / Next Steps

Recommendations for mitigation are provided below, based upon the flood risk to the Site:

Groundwater mitigation

As a Low-Moderate risk of groundwater flooding has been identified on Site, the following mitigation measures are recommended:

- Finished floor levels of the proposed development should be set at least 0.3 m above the adjacent ground levels on Site.
- Waterproof tanking of the ground floor;
- Interceptor drains;
- Automatic sump to extract flood water; and
- Non-return flap valves on the proposed foul and surface water sewer lines.

If these mitigation measures are implemented this could reduce the flood risk to the development from Low-Moderate to Low.

Additional recommendations

A Sustainable Drainage Strategy (SuDS) should be developed for the Site, for the effective management of surface water runoff over the lifetime of the proposed development. A Sustainable Drainage Strategy (SuDS) should be developed for the Site, for the effective management of surface water runoff over the lifetime of the proposed development. SuDS features should include consideration of a potentially high groundwater table and should include sufficient landscaping to ensure any emerging groundwater flows around built development and does not increase flooding to third-parties.

The regular maintenance of any drains and culverts surrounding/on the Site under the riparian ownership of the developer should be undertaken to reduce the flood risk.

GeoSmart recommend the mitigation measures discussed within this report are considered as part of the proposed development where possible and evidence of this is provided to the Local Planning Authority as part of the planning application.

2. Introduction



Background and purpose

This assessment has been undertaken by firstly compiling information concerning the Site and the surrounding area. The information gathered was then used to construct a 'conceptual site model', including an understanding of the appropriateness of the development as defined in the PPW (2021) and the source(s) of any flood risk present. Finally, a preliminary assessment of the steps that can be taken to manage any flood risk to the development was undertaken.

This report has been prepared with reference to the TAN 15 (2004) which supplements the PPW (2021).

The general approach of PPW, supported by the TAN, is to advise caution in respect of new development in areas at high risk of flooding by setting out a precautionary framework to guide planning decisions. The overarching aim of the precautionary framework is, in order of preference, to:

- Direct new development away from those areas which are at high risk of flooding; and
- Where development is considered to be in high-risk areas (Zone C) only those developments which can be justified on the basis of the tests outlined in section 6 and section 7 are located within such areas.

The purpose of this report is to provide clear and pragmatic advice regarding the nature and potential significance of flood hazards which may be present at the Site.

Report scope

A thorough review of a commercially available flood risk report and NRW supplied data indicating potential sources of flood risk to the Site from rivers and coastal sources, surface run-off (pluvial), groundwater and reservoirs, including historical flood information and modelled flood extent. Appropriate measures are recommended to manage and mitigate the flood risk to the property.

Information obtained from NRW and a review of the Carmarthenshire and Pembrokeshire Stage 1 Strategic Flood Consequence Assessment (SFCA) (Atkins, 2019) has been used to ascertain local flooding issues and, where appropriate, identify information to support a Justification test and Assessment of Flood Consequences required as part of the PPW (2021).

Using available data, the existing and future flood risks to and from the Site from all flood sources will be assessed in line with current best practice.

An indication of potential flood risk from the Site to downstream receptors is provided where the proposed development increases run-off from the Site.

Report limitations

It is noted that the findings presented in this report are based on a desk study of information supplied by third parties. Whilst we assume that all information is representative of past and present conditions, we can offer no guarantee as to its validity and a proportionate programme of site investigations would be required to fully verify these findings.

This report excludes consideration of potential hazards arising from any activities at the Site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities.

Datasets

The following table shows the sources of information that have been consulted as part of this report:

Table 1. Datasets consulted to obtain confirmation of sources of flooding and risk

Source of flooding	Datasets consulted			
	Commercial Flood Maps	FRMP*	Natural Resources Wales (Appendices B and C)	OS Data
Historical	X	X	X	
River (Fluvial) / Sea (tidal)	X	X	X	
Surface water (pluvial)	X	X	X	
Groundwater	X	X		
Sewer		X		
Culvert/bridges		X		X
Reservoir		X	X	

*Carmarthenshire and Pembrokeshire Stage 1 Flood Consequence Assessment (SFCA) (Atkins, 2019).



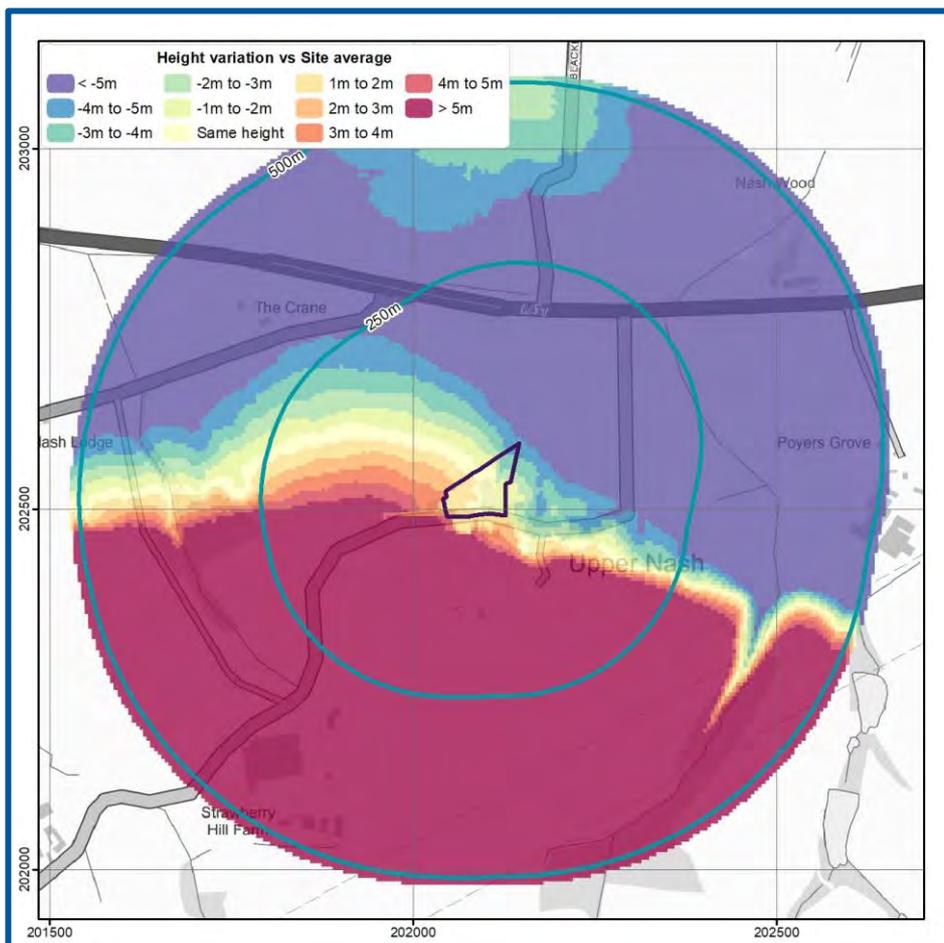
Site information

The Site is located in Upper Nash in a setting of commercial and residential land use at National Grid Reference SJ 29892 69371. Site plans and drawings are provided in Appendix A.

Using a 500 m around the Site, the area is on a gentle slope. (Figure 1). It is noted that to the north land falls to c. 0.3m above Ordnance Datum (AOD). To the west land rises to 20.7 mAOD, to the east land falls to c. 4.5 mAOD and to the south rises to 17.1 mAOD.

According to OS data, the general level of the Site is between 27.3 and 35.0 mAOD with the Site falling steeply in a north easterly direction. This is based on NRW elevation data obtained for the Site to a 1 m resolution with a vertical accuracy of ± 150 mm (Appendix C).

Figure 1. Site Location and Relative Elevations (GeoSmart, 2022).



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Development

The Site was previously used in an agricultural capacity. Development proposals comprise the construction of 8 new dwellings with associated landscaping and access Site plans are included in Appendix A.

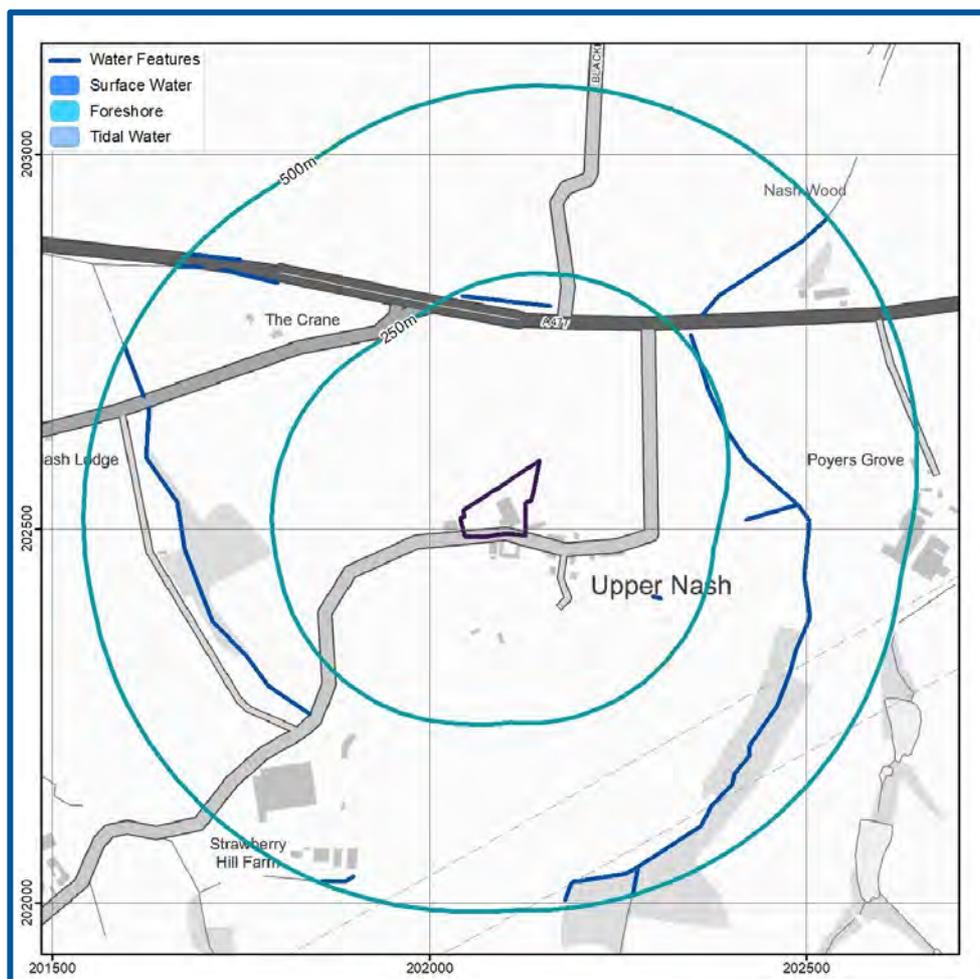
The effect of the overall development will result in an increase in number of occupants and/or users of the Site and will result in the change of use, nature or times of occupation. The estimated lifespan of the development is 100 years.

The proposed development is classed as Highly Vulnerable according to Table 9 (Summary of Policy Requirements) in TAN 15 (2004).

Hydrological features

According to Ordnance Survey (OS) mapping included in the following figure, there are numerous surface water features within 500 m of the Site.

Figure 2. Surface water features (NRW, 2022)



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A drainage ditch is located approximately 230m to the north of the Site at a lower elevation.

A tributary of the Ford Pill is located approximately 250 to the north east of the Site at a lower elevation.

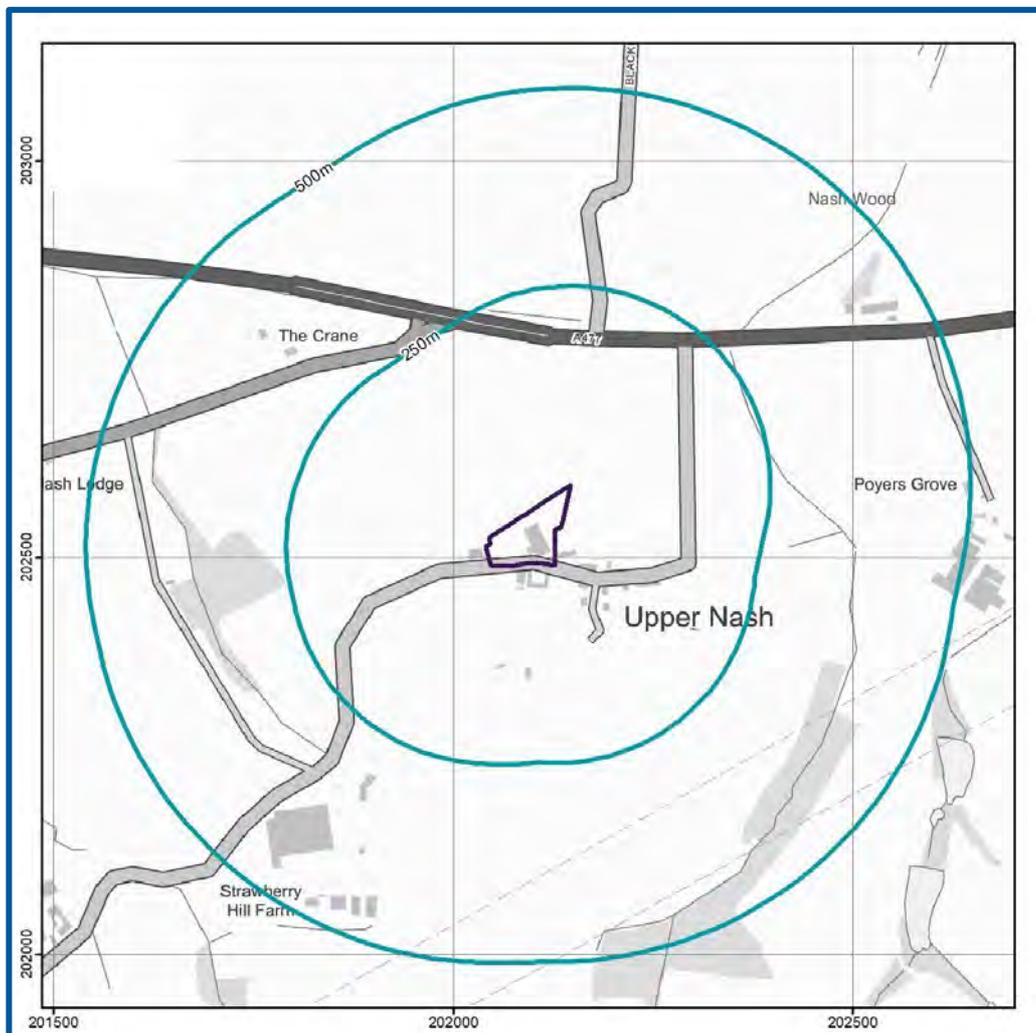
A second drainage ditch is located approximately 330m to the south west of the Site at a higher elevation.

A third drainage ditch is located approximately 490m to the south west of the Site at a higher elevation.

Hydrogeological features

British Geological Survey (BGS) mapping indicates that there are no underlying superficial deposits (BGS, 2022).

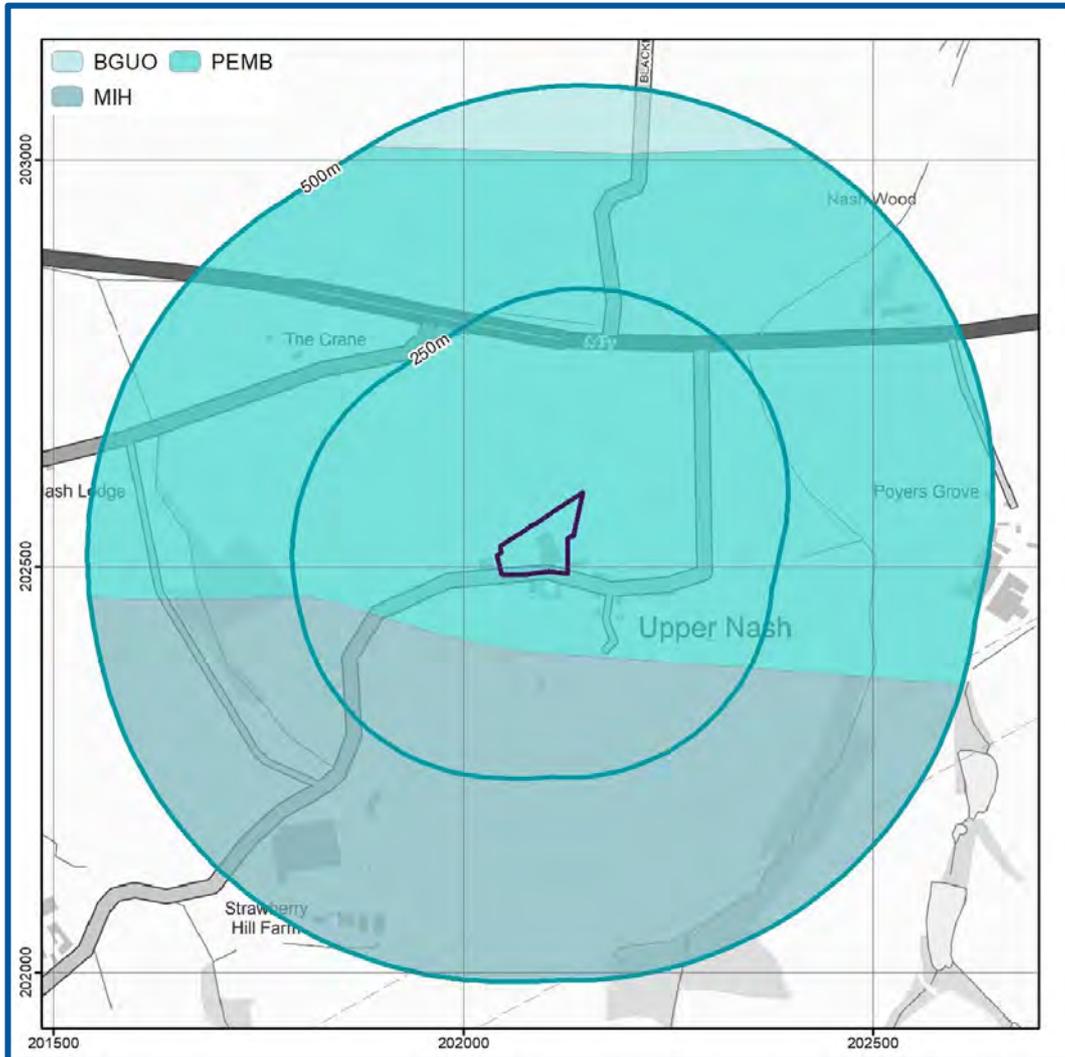
Figure 3. Superficial Geology (BGS, 2022)



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BGS mapping indicates that the underlying bedrock geology consists of the Pembroke Limestone Group (BGS, 2018) and is classified as a Principal Aquifer (EA, 2022).

Figure 4. Bedrock Geology (BGS, 2022)



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The Site is located within a groundwater Source Protection Zone 1 (NRW, 2022).

A review of the BGS borehole database (BGS, 2022) indicates that there are no relevant boreholes in a 250m vicinity of the Site from which geology can be confirmed. However, a borehole is located approximately 500m to the north east of the Site at an elevation of 24.7mAOD and has the same underlying geology as the Site.

The borehole (ref: SN00SW12) indicates 33m of limestone overlying 17m of limestone and shale at which point the borehole ended. Groundwater was first struck at 21mbgl and rose to 10.25mbgl on completion.

The hydrogeological characteristics suggest that there is potential for a high groundwater table below the Site. Whilst the closest borehole (ref: SN00SW12) did not identify a high groundwater table it is noted that the borehole is approximately 500m from the Site at a lower elevation and may not be representative of conditions on Site.

Groundwater levels may rise in the bedrock aquifer in response to high river events subject to hydraulic continuity between the driving water level, the groundwater system and the Site.

Groundwater levels may also rise in the bedrock aquifer in response to prolonged rainfall recharge which may cause an unusually high peak in groundwater levels during some years, subject to hydraulic continuity between the groundwater system and the Site.

4. Flood risk to the development

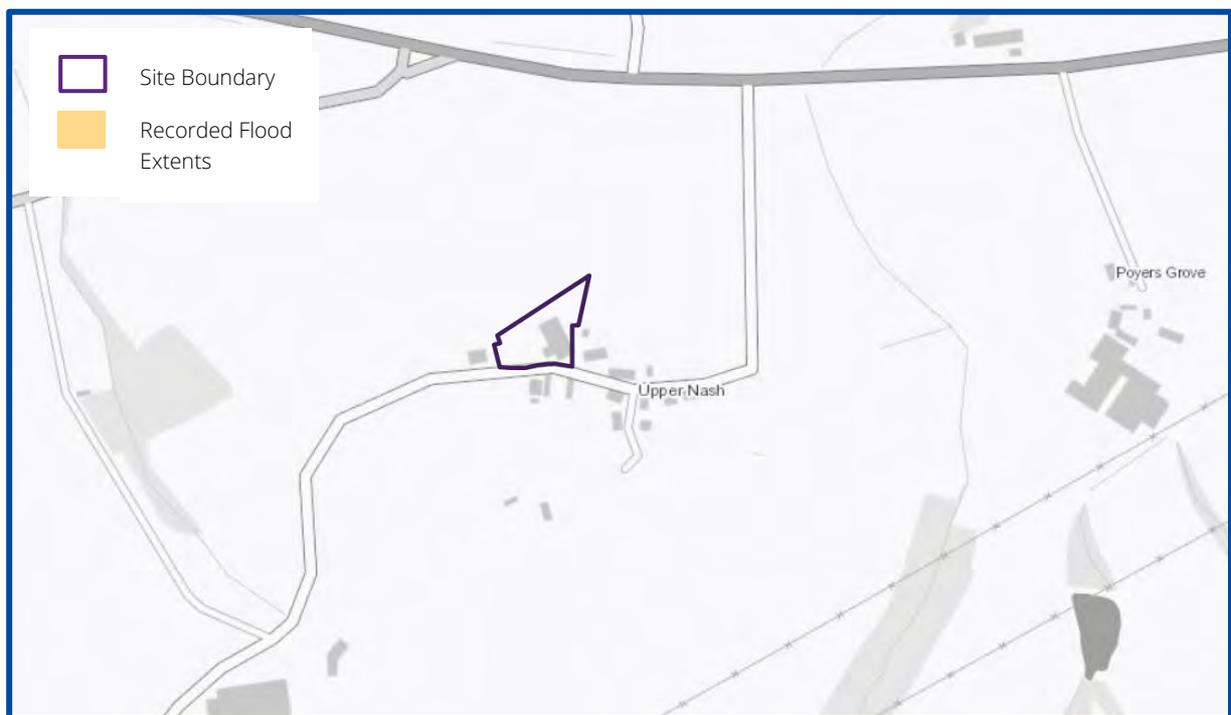


Historical flood events

According to the NRW's Recorded Flood Extents Map (Figure 5), historical flood events have not been recorded at the Site (NRW, 2022).

The purpose of historical flood data is to provide information on where and why flooding may have occurred in the past. The absence of any recorded events does not mean flooding has never occurred on-Site or that flooding will never occur at the Site.

Figure 5. Historic Flood Event Outline (NRW, 2022)



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Rivers (fluvial) / Sea (coastal/tidal) flooding

The predominant risk at the Site is from flooding from rivers, termed as fluvial flooding. The Site is located in an inland location and the risk of flooding from coastal and tidal processes are therefore considered to be Negligible.

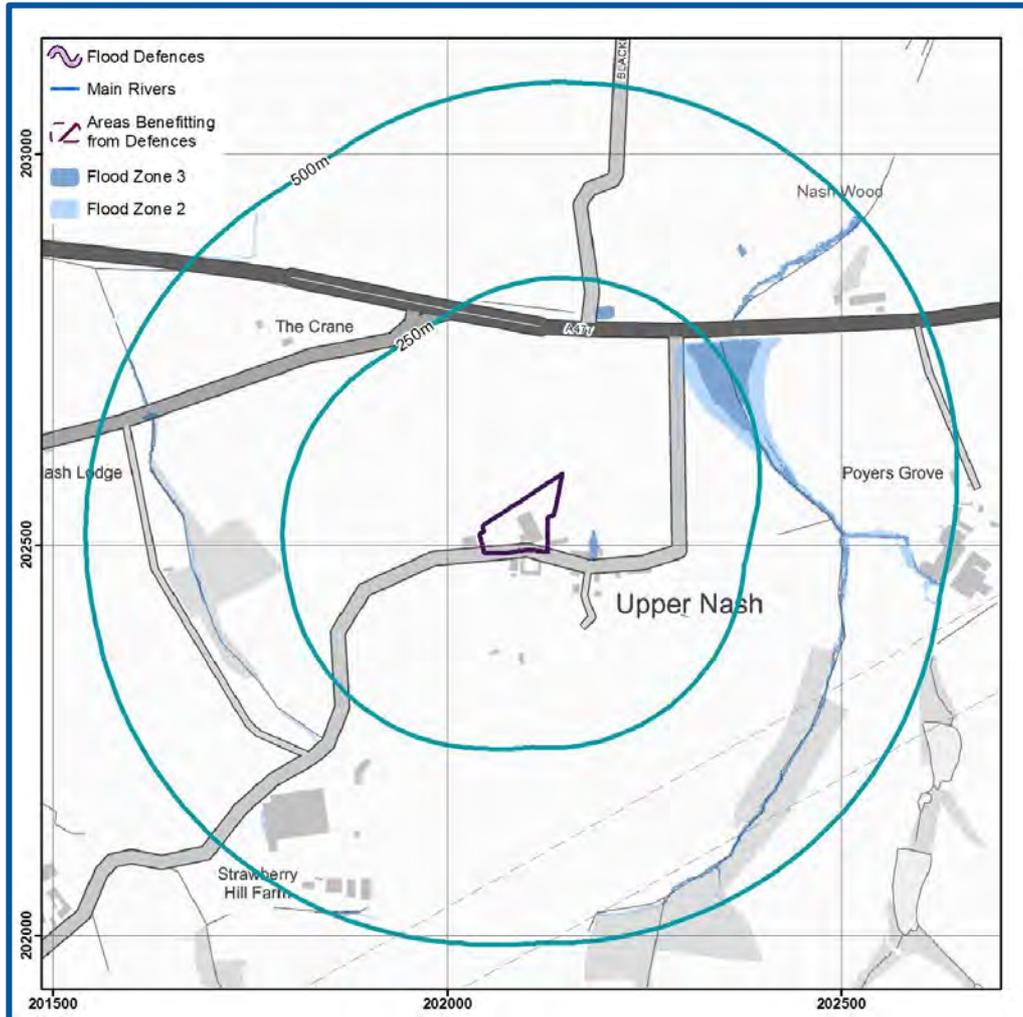
Flood Zones Map

According to the NRW's Flood Map (Figure 6, the Site is located in Fluvial Flood Zone 1.

The Site is located approximately 195m to the west of the nearest land within a Flood Zone 2/3. However, it is noted that the Flood Zones illustrated in Figure 6 are representative of flood risk from small watercourses *and* surface water flooding. Therefore, the extent of Flood

Zone 2 and 3 located approximately 195m to the west of the Site is not considered to be a true reflection of the fluvial risk in the vicinity of the Site, but rather surface water (pluvial) risk. After analysis, it is therefore considered that the closest extent of a fluvial Flood Zone 2 or 3 is located approximately 220m to the north east of the Site.

Figure 6. Flood Map for Planning Purposes (NRW 2022)



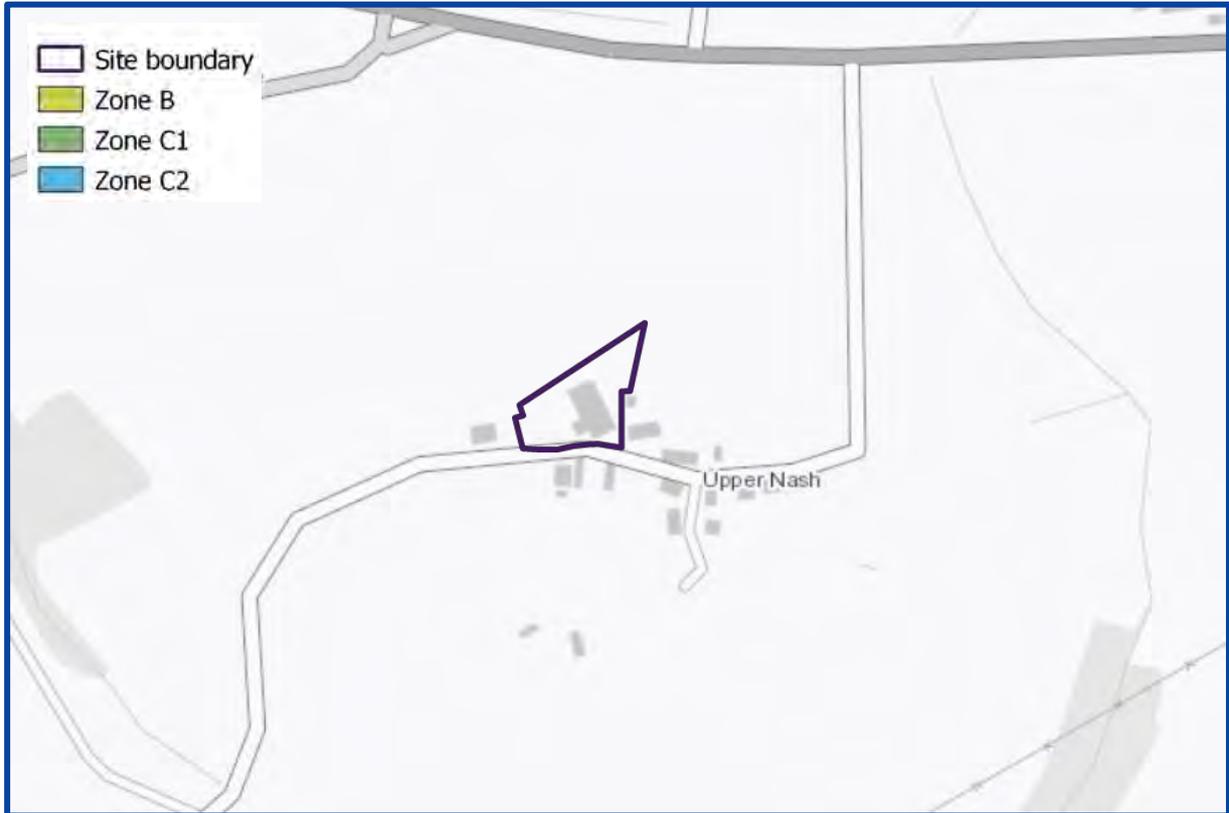
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Please note these Flood Zones are no longer used for planning purposes, but instead provide an indicative extent for the 1 in 100 year and 1 in 1000 year fluvial events, respectively.

Development Advice Map

According to the NRW's Development Advice Map (DAM) the Site is located within Zone A which is an area considered to be at little or no risk of fluvial or coastal/tidal flooding (TAN15, 2004).

Figure 7. Development Advice Map (NRW, 2022)



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Table 2. Development Advice Map Classification

Description of Zone	Zone
Considered to be at little or no risk of fluvial or tidal/coastal flooding.	A
Areas known to have been flooded in the past evidenced by sedimentary deposits.	B
Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.	C1
Areas of the floodplain without significant flood defence infrastructure.	C2

Flood defences

- The Site is not in an area that benefits from flood defences (NRW, 2022).

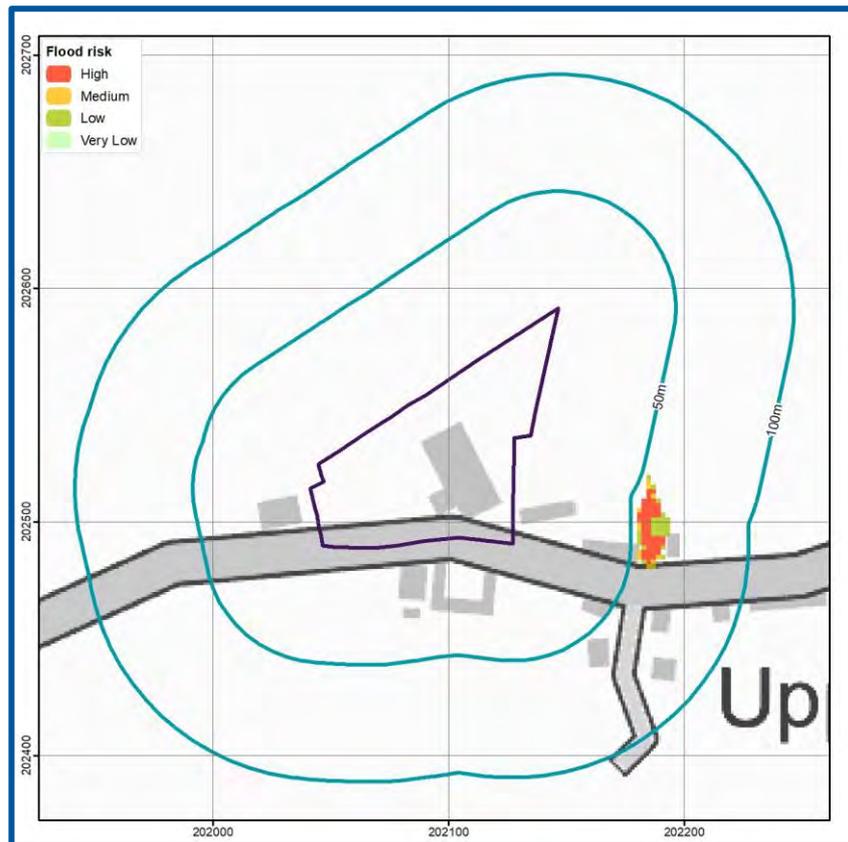
Guidance

Sites that are located close to flood defences are likely to be zones where rapid inundation will occur in the event of the flood defences being overtopped or breached. A Site located close to flood defences (within 250 m) may require a more detailed FRA subject to local topography.

Flood Risk including the benefit of defences

According to the NRW's Risk of Flooding from Rivers and the Sea (RoFRS) mapping (Figure 8), which considers the crest height, standard of protection and condition of defences, the flood risk from Rivers and the Sea at the Site is Very Low.

Figure 8. Risk of Flooding from Rivers and Sea map (NRW 2022)



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National Flood Hazard Maps

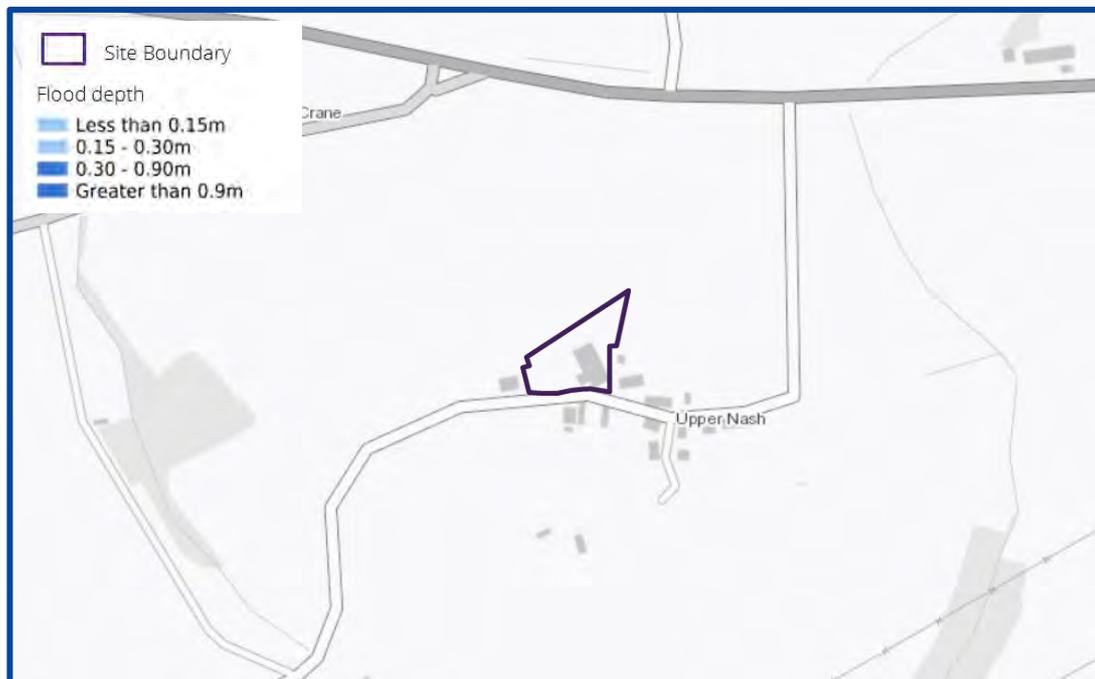
The National Flood Hazard (NFH) and Flood Risk Assessment Wales (FRAW) maps were published in the Summer of 2020, these show results for an undefended scenario which means the modelling and mapping process explicitly excluded any flood defences.

The maps do not currently have an official status for setting planning policy, as set out in TAN15 (2004). NFH maps have been included in order to understand the risk of flooding in a worst-case undefended scenario.

The fluvial flood risk maps (Figures 9-11 below) demonstrate that the Site will not be affected by fluvial flooding in any of the risk events.

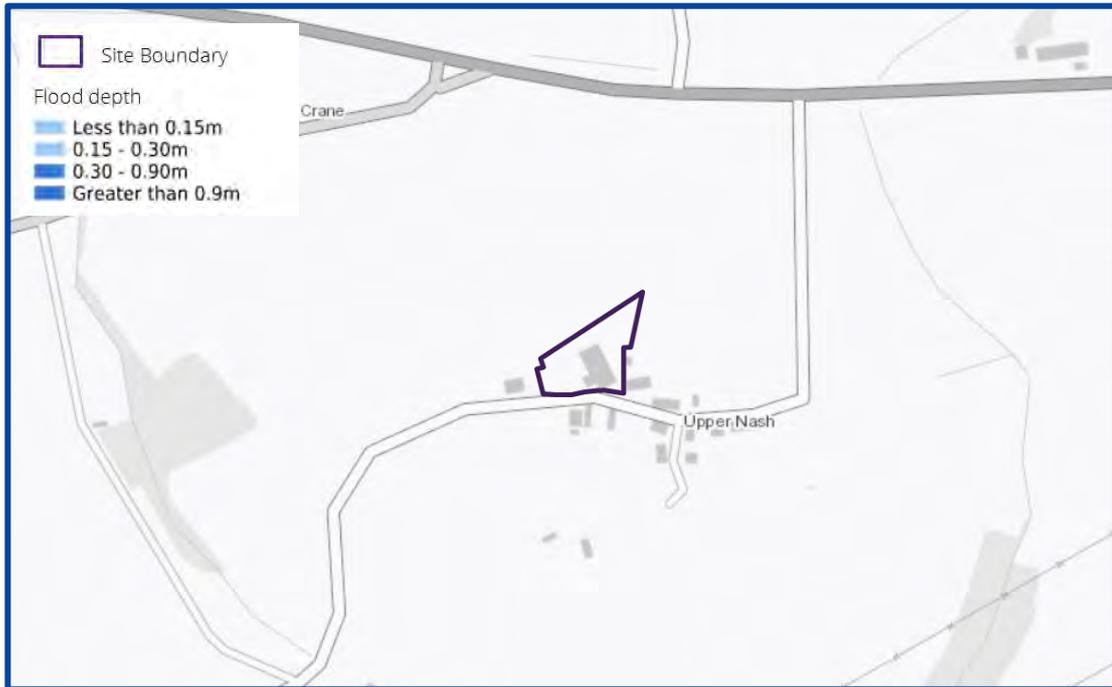
National Flood Hazard – Fluvial Flood Risk

Figure 9. 1 in 30 year (High risk) map for river flooding



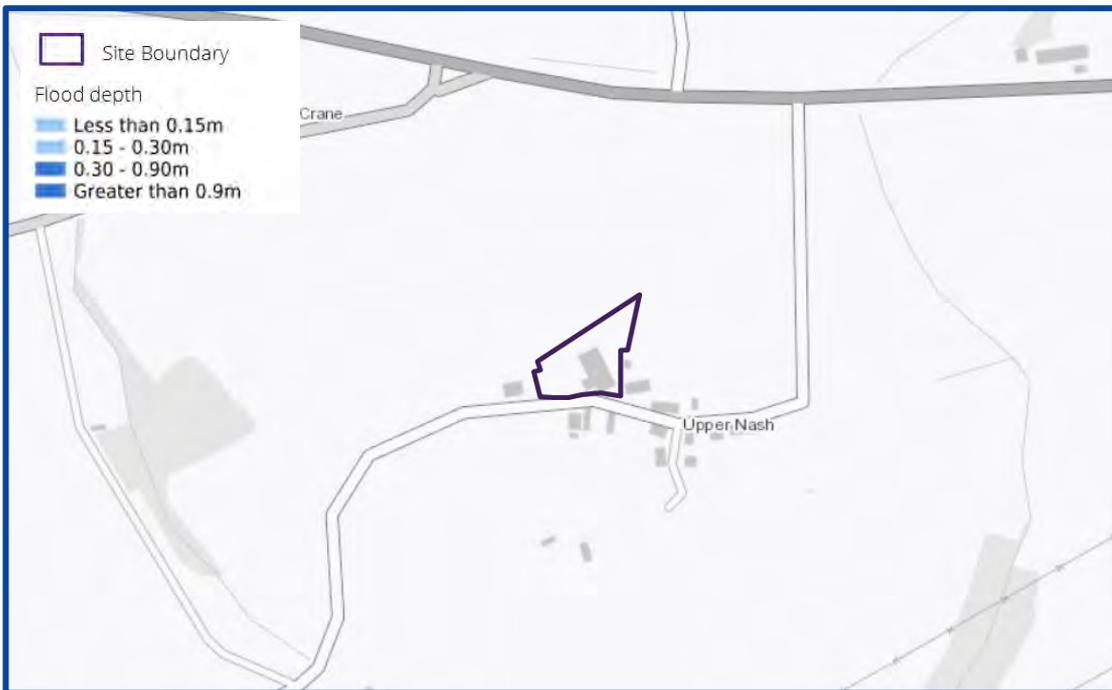
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Figure 10. 1 in 100 year (Medium risk) map for river flooding



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Figure 11. 1 in 1000 year (Low risk) map for river flooding



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Model data

Modelled flood data was requested from NRW and Pembrokeshire County Council but was not made available.

The NRW provided the following response:

“Unfortunately, this site lies outside of our flood outlines and is not in the flood map therefore we have no data for this site. It may be worth contacting the Local Authority to see if they hold any data for this site.” (NRW, 2022).

Pembrokeshire County Council provided the following response:

“We do not carry out any flood modelling since the information we use is supplied by Natural Resources Wales who are responsible for the supply of this information” (Pembrokeshire County Council, 2022).

JFLOW Modelling

In the absence of modelled data, the modelled fluvial flood depth data was created for the 1% and 0.1% annual chance of flooding situations and was produced as a by-product from the 2004 generalised modelling project in 2004, using JFLOW modelling. The purpose of the generalised modelling project was to fill the gaps where there was no detailed local modelled data in 2004, in order to define the extents of Flood Zones for spatial planning. A two-dimensional hydrodynamic model called JFLOW was used to produce this modelled fluvial flood depth data on a 5x5m grid.

Since 2004, local detailed modelling has been used to replace this generalised modelling in many areas to define the extents of Flood Zones. However, the JFLOW dataset in this location has not been updated.

JFLOW was used to produce flood maps for the whole of England and Wales for all catchments greater than 3 sq km in a consistent manner. The method is therefore very generalised and therefore cannot take account of information that may be very significant locally. This might include:

1. Effects of bridges and other structures including flood defences are not taken into account.
2. Errors in the DTM, caused by trees and buildings for example.
3. The effect of reservoirs and urban drainage and other man made influences on the flow regime can only be taken into account in a very general sense in JFLOW.
4. The channel is assumed to be able to take the 2 year flow. This may not be true especially in those modified by man.
5. Hydraulic roughness is assumed to be the same everywhere in JFLOW, but of course it is not.

In light of this and as there is no detailed modelling included within the SFRA, to estimate flood levels at the Site, the NRW's 1m LiDAR data has been compared with the NRW's surface water and small watercourses flood map.

The 1m LiDAR data has been classified and the highest elevation on the extent of the Flood Zone 3 and 2 has been used to form the basis for the 1 in 100 year and 1 in 1000 year flood events respectively (Figure 8)¹. The following flood levels have been estimated for the Site, using the method described above:

Table 3. NRW modelled flood level data

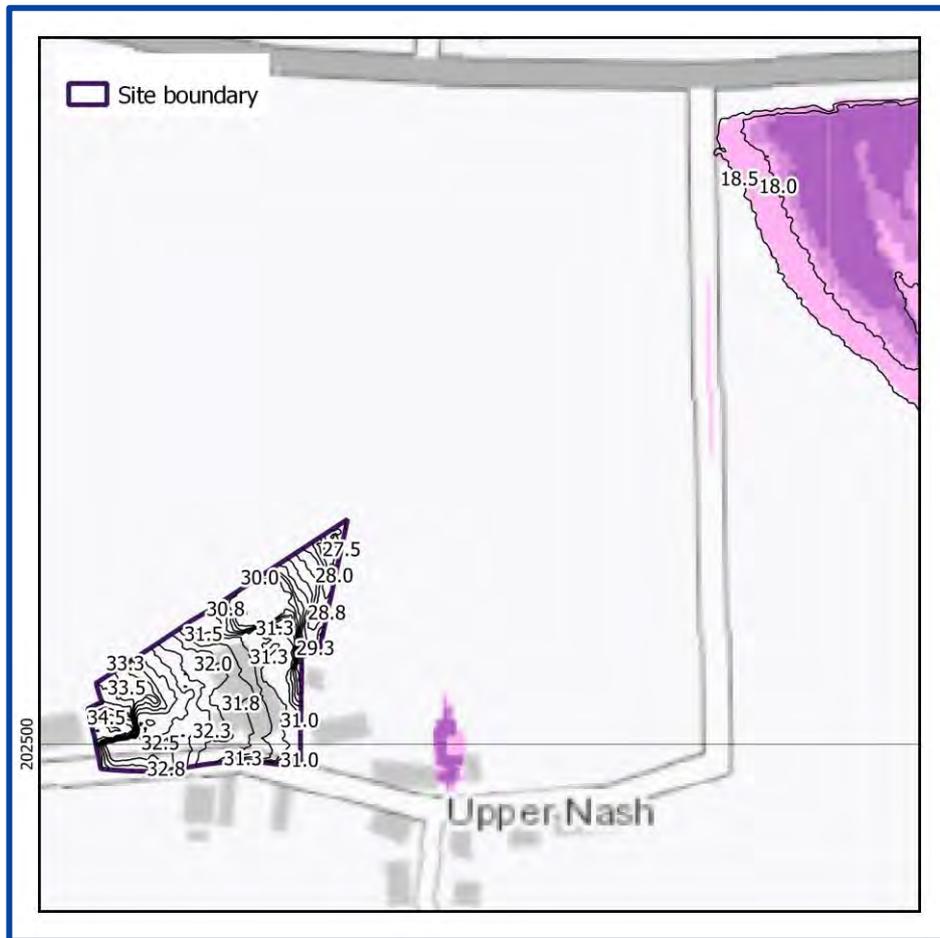
Ground levels on Site (mAOD)	Modelled Flood Levels (mAOD)	
	1 in 100 year	1 in 1000 year
27.3 – 35.0	18.0	18.5
Flood depths (m)	No flooding	No flooding

Figure 12 and Table 3 confirm that the Site would not be affected by flooding during a 1 in 100 year or 1 in 1000 year flooding event.

Analysis of local surface water features confirms that flooding located approximately 100m to the east of the Site is as a result of surface water flooding and is not expected to extend to the Site.

¹ As the calculated flood elevation is based on LiDAR the accuracy of the calculated level is +/- 0.15m.

Figure 12. Indicative fluvial Flood Zone 2 and 3 extents (GeoSmart, 2022)



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Climate Change factors

In accordance with the Welsh Governments Climate change allowances for planning purposes, CL-03-16 guidance (2016), allowances should be made for increased river levels and flows to proposed development, where applicable.

In this instance due to the lack of detailed fluvial flood modelled data for the Site, the 1 in 1000-year scenario can be used as a proxy for the 1 in 100-year plus climate change scenario. Therefore, due to this the following flood levels at the Site apply to the areas which are currently developed.

Table 4. NRW modelled flood level data- with climate change

Ground levels on Site (mAOD)	Modelled Flood Levels (mAOD)
	27.3 – 35.0
Flood depths (m)	18.5
	No flooding

Surface water (pluvial) and small watercourse flooding

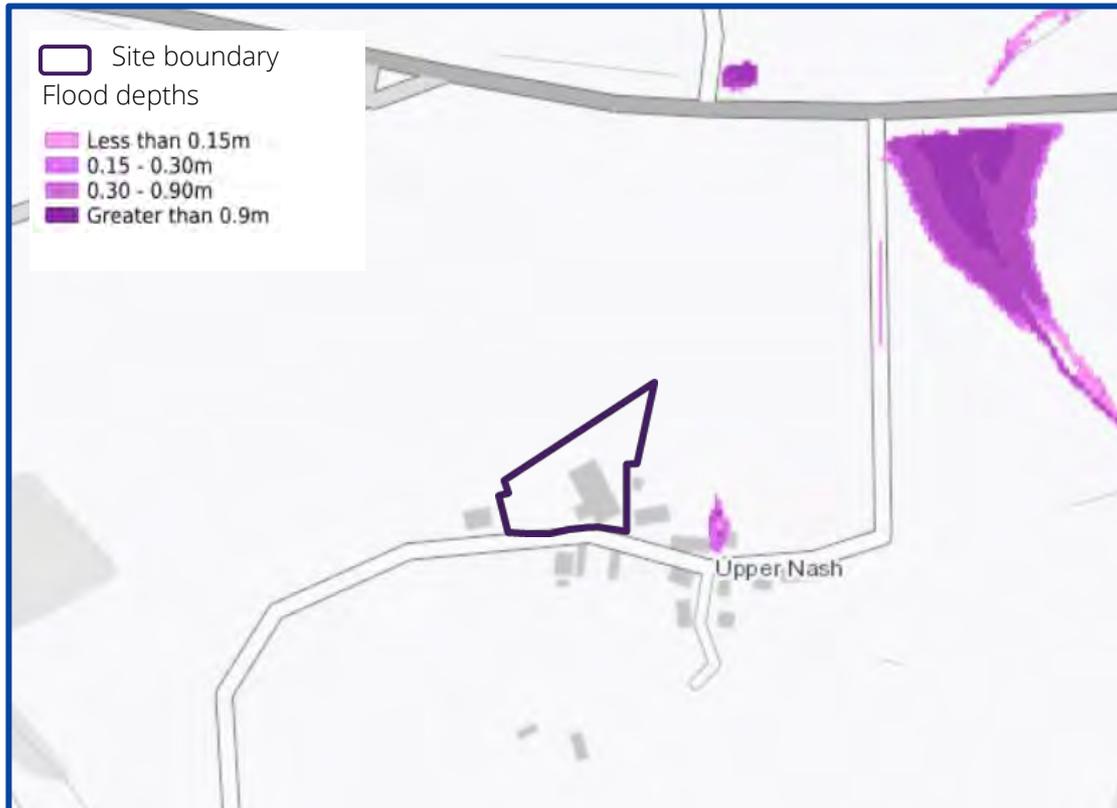
Surface water flooding occurs when intense rainfall exceeds the infiltration capacity of the ground and overwhelms the drainage systems. It can occur in most locations even at higher elevations and at significant distances from river and coastal floodplains.

According to NRW's Risk of Flooding from Surface Water (pluvial) and small watercourses mapping the Site would not be affected by flooding in all events up to the 1 in 1000 year

(Low risk) flooding event, therefore can be considered to be at a Very Low risk of flooding from surface water flooding and small watercourses (Figure 13).

An area of land at a High risk of flooding is located approximately 50m to the south east of the Site. A wider area of land at High risk of flooding is also located approximately 190m to the north east of the Site, however flooding is not anticipated to extent to the Site.

Figure 13. NRW Low surface water risk Hazard map (NRW, 2022)



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Guidance

According to NRW's surface water flood risk map the Site is at:

- According to NRW's surface water flood risk map, a site at Very Low risk has a chance of flooding of less than 1 in 1000 (0.1%)

Climate change may lead to an increase in rainfall intensity which affects river levels, land and urban drainage systems. Rainfall intensity for small and urban catchments may increase from 5 to 20% (central estimate) or 10 % to 40% (Upper estimate) over the period to 2115 (EA, 2021).

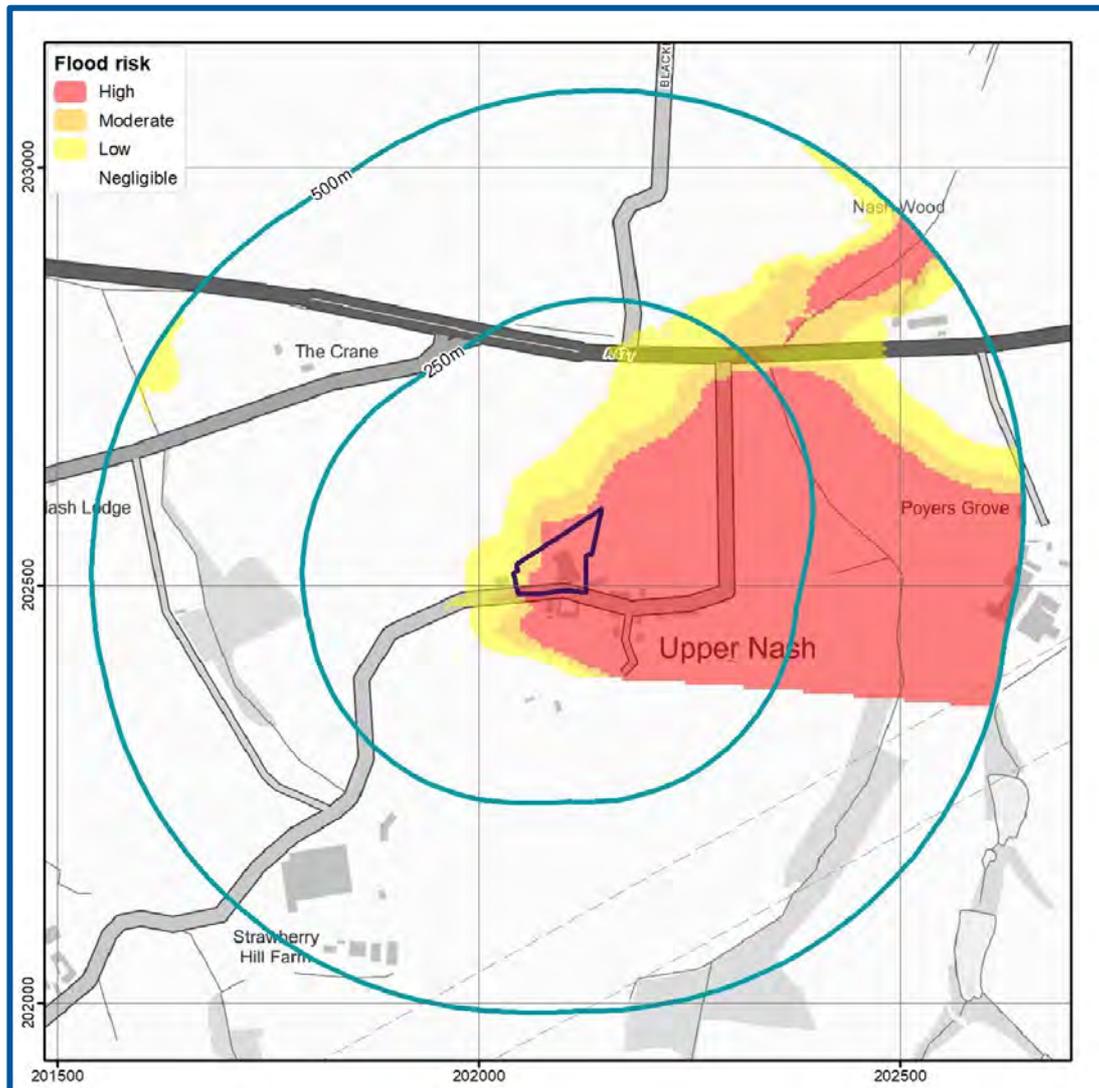
On-Site surface water drainage systems should be designed and maintained appropriately to manage the run-off.

Groundwater flooding

Groundwater flooding occurs when sub-surface water emerges from the ground at the surface or into Made Ground and structures. This may be as a result of persistent rainfall that recharges aquifers until they are full; or may be as a result of high river levels, or tides, driving water through near-surface deposits. Flooding may last a long time compared to surface water flooding, from weeks to months. Hence the amount of damage that is caused to property may be substantially higher.

GeoSmart's Groundwater Flood Risk (GW5) Map (Figure 14) confirms the Site is considered to be at Low-High risk of groundwater flooding. The map confirms the risk of groundwater emergence at the surface during a 1% annual probability (1 in 100 year) event.

Figure 14. GeoSmart GW5 Groundwater Flood Risk Map (GeoSmart, 2022)



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- Approximately 85% of the Site in the centre and east is at a High risk of groundwater flooding. The area proposed for development is at a High risk of groundwater flooding, according to the national-scale screening map.
- Approximately 13% of the Site in the west is at a Moderate risk of groundwater flooding
- A further area in the west of the Site, covering approximately 2% of the Site is at a Low risk of groundwater flooding

Mapped classes combine likelihood, possible severity and the uncertainty associated with predicting the subsurface system. The map is a national scale screening tool to prompt site-specific assessment where the impact of groundwater flooding would have significant adverse consequences. Mapping limitations and a number of local factors may reduce groundwater flood risk to land and property even where it lies within mapped groundwater flood risk zones, which do not mean that groundwater floods will occur across the whole of the risk area.

A site-specific assessment has been undertaken to refine the groundwater risk screening information on the basis of site-specific datasets (see Section 3) including the NRW's fluvial and tidal floodplain data (where available) to develop a conceptual groundwater model. The risk rating is refined further using the vulnerability of receptors including occupants and the existing and proposed Site layout, including the presence of basements and buried infrastructure. The presence of any nearby or on-Site surface water features such as drainage ditches, which could intercept groundwater have also been considered.

According to a review of the hydrogeology (Section 3), the Site is underlain by permeable bedrock. Groundwater levels may rise in the bedrock aquifer in a seasonal response to prolonged rainfall recharge which may cause an unusually high peak in groundwater levels during some years.

Groundwater levels may also rise in the bedrock aquifer in response to high river events due to potential hydraulic continuity within nearby drainage ditches.

It is noted that the Site is located on a steep slope, which slopes in an easterly direction (with lowest ground levels in the east of the Site). The change in ground elevation mirrors the extent of the High groundwater risk extent in Figure 13, with the highest risks associated with the areas at lowest topography.

The local topography and drainage is such that areas of the development in the centre and east of the Site are likely to be lower than the area where groundwater emerges in adjacent low points.

The design of the property should consider the groundwater pathway through permeable formations.

Despite the presence of an aquifer the Site would only be at risk of groundwater flooding if the water table reaches the base of the Site development or the ground surface when groundwater seepage could lead to overland flow and ponding.

The nearest borehole to the Site (ref: SN00SW12) struck groundwater at 12mbgl, rising to 10.25mbgl. This indicates a groundwater level in the vicinity of the Site of 14.45mAOD.

It is noted however, that whilst the borehole is situated upon the same geology as the Site it is located approximately 500m to the north east of the Site so may not accurately represent groundwater conditions on Site.

The SFCA does not provide any detail on the historic incidences of groundwater flooding in the wider Pembrokeshire area (ATKINS, 2019).

The baseline groundwater flood risk rating is Low to High, but on the basis of the site-specific assessment the groundwater flood risk is considered to be Low to Moderate.

Due to the steepness of the catchment, any groundwater flows which do emerge above the ground surface are likely to flow away from the Site in an easterly direction, on-site landscaping should be considered in areas at high to medium risk to encourage groundwater flows to avoid areas of built development on the Site.

Moderate Risk - There will be a significant possibility that incidence of groundwater flooding could lead to damage to property or harm to other sensitive receptors at, or near, this location.

Low Risk - There will be a remote possibility that incidence of groundwater flooding could lead to damage to property or harm to other sensitive receptors at, or near, this location.

Climate change predictions suggest an increase in the frequency and intensity of extremes in groundwater levels. Rainfall recharge patterns will vary regionally resulting in changes to average groundwater levels. A rise in peak river levels will lead to a response of increased groundwater levels in adjacent aquifers subject to the predicted climate change increases in peak river level for the local catchment.

The impact of climate change on groundwater levels beneath the Site is linked to the predicted risk in both peak river and the variation in rainfall recharge which is uncertain.

Based on the available evidence the resulting increase to groundwater flood risk will be mitigated by the proposed measures.

Flooding from artificial sources

Artificial sources of flood risk include waterbodies or watercourses that have been amended by means of human intervention rather than natural processes. Examples include reservoirs (and associated water supply infrastructure), docks, sewers and canals. The flooding mechanism associated with flood risk from artificial sources is primarily related to breach or failure of structures (reservoir, lake, sewer, canal, flood storage areas, etc.)

Sewer flooding

The SFCA does not provide any detail on the historic incidences of sewer flooding in the vicinity of the Site and the local water company (Dwr Cymru Welsh Water) did not respond within the timescales of this report. It is advisable to contact the local water company to obtain more recent flooding events that may have occurred at or in close proximity to the Site.

Guidance

Properties classified as “at risk” are those that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system either once or twice in the ten year reference period. Records held by the sewage utility company provide information relating to reported incidents, the absence of any records does not mean that the Site is not at risk of flooding.

Culverts and bridges

The blockage of watercourses or structures by debris (that is, any material moved by a flowing stream including vegetation, sediment and man-made materials or refuse) reduces flow capacity and raises water levels, potentially increasing the risk of flooding. High water levels can cause saturation, seepage and percolation leading to failure of earth embankments or other structures. Debris accumulations can change flow patterns, leading to scour, sedimentation or structural failure.

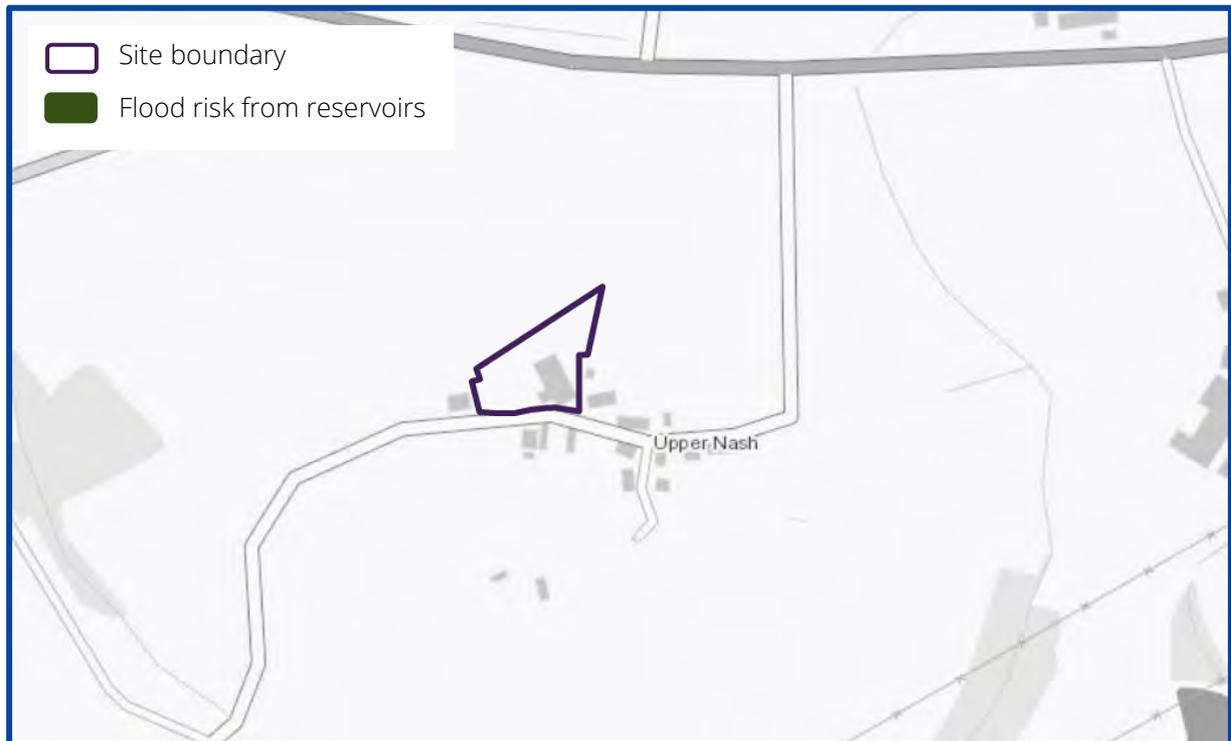
A culvert has been identified approximately 265m to the north west of the Site, at a lower elevation. The culvert continues a watercourse below the highway of the A477.

The structures are a significant distance downstream from the Site and are unlikely to represent a flood risk to the Site in the event of a blockage.

Reservoir flooding

According to the NRW's Risk of Flooding from Reservoir mapping the Site is not at risk of flooding from reservoirs (NRW, 2021).

Figure 15. NRW Risk of Reservoir Flooding (NRW, 2022)



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Guidance

The risk of reservoir flooding is related to the failure of a large reservoir (holding over 25,000 m³ of water) and is based on the worst-case scenario. Reservoir flooding is extremely unlikely to occur (NRW, 2022).

Water supply infrastructure

Water supply infrastructure is comprised of a piped network to distribute water to private houses or industrial, commercial or institution establishments and other usage points. In urban areas, this represents a particular risk of flooding due to the large amount of water supply infrastructure, its condition and the density of buildings. The risks of flooding to properties from burst water mains cannot be readily assessed.

If more information regarding the condition and history of the water supply infrastructure within the vicinity of the Site is required, then it is advisable to contact the local water supplier (Dwr Cymru Welsh Water).

Canal failure

According to Ordnance Survey (OS) mapping, there are no canals within 500 m of the Site.

5. Flood risk from the development



Floodplain storage

The development is located within Zone A, therefore there would be no displacement of flood water and compensatory flood storage is not required.

Drainage and run-off

The proposed development involves an increase of impermeable surfaces at the Site. An estimation of run-off is therefore required to permit effective Site water management and prevent any increase in flood risk to off-Site receptors from the Site.

The potential surface water run-off generated from the Site during a 1 in 100 year return period should be calculated, using FEH 2013 rainfall data from the online Flood Estimation Handbook (FEH), developed by NERC (2009) and CEH (2016).

The PPW (2021) recommends the effects of climate change are incorporated into FRA's and the recently updated climate change guidance (published in 2016 and updated in 2021) confirms the requirements for inclusion within FRA's.

As the proposed development is being changed to residential, the lifespan of the development and requirements for climate change should allow up to the 2115 scenario.

Table 1. Climate change rainfall allowances

Applies across all of Wales	Total potential change anticipated by the 2020s	Total potential change anticipated by the 2050s	Total potential change anticipated by the 2080s
Upper end	10%	20%	40%
Central	5%	10%	20%

A separate assessment of surface water runoff may be required, as the Statutory requirements in Wales are to include a SuDS strategy, where development proposals are greater than 100m² in size. This is to ensure surface water runoff is managed in accordance with the Welsh Statutory requirements over the lifetime of the proposed development

Sustainable Drainage Systems (SuDS)

It is recommended that attenuation of run-off is undertaken on-Site to compensate for proposed increases in impermeable surface areas. Attenuation may comprise the provision of storage within a Sustainable Drainage System (SuDS). SuDS can deliver benefits from improving the management of water quantity, water quality, biodiversity and amenity. Potential SuDS options are presented in the table below, subject to further investigation:

Table 2. SuDS features which may be feasible for the Site

Option	Description
Rainwater harvesting	Rainwater harvesting can collect run-off from the roofs for use in non-potable situations, using water butts for example.
Green roof	<p>Having part/all of the roof as a green roof covered in vegetation can intercept and store a proportion of the rainfall to result in an overall reduction in the amount of surface water run-off generated from a building structure.</p> <p>They comprise a substrate (growth medium) layer which can be seeded with specially selected plants suitable for the local climatic conditions. Beneath the growth medium is a geotextile filter layer which filters out the substrate from entering the aggregate/geo-composite drainage layer below. At the very bottom of the green roofing, a waterproof membrane protects the roof structure below.</p>
Permeable paving	Permeable pavements can be used for driveways, footpaths and parking areas to increase the amount of permeable land cover. Suitable aggregate materials (angular gravels with suitable grading as per CIRIA, 2007) will improve water quality due to their filtration capacity. Plastic geocellular systems beneath these surfaces can increase the void space and therefore storage but do not allow filtration unless they are combined with aggregate material and/or permeable geotextiles.
Swales	Shallow, wide and vegetated channels that can store excess run-off whilst removing any pollutants.
Soakaways	An excavation filled with gravel within the Site. Surface water run-off is piped to the soakaway.
Attenuation basins/pond	Dry basin or a permanent pond that is designed to hold excess water during a rainfall event.

It is assumed that any changes to the existing drainage system will be undertaken in accordance with best practice and that care will be taken to ensure the new development does not overload/block any existing drainage or flow pathways to/from the Site.

6. Suitability of the proposed development



The information below outlines the suitability of proposed development in relation to national and local planning policy.

National policy and guidance

The aims of the national planning policies TAN15 (2004) and PPW (2021) are achieved through application of the Justification Test and by assessing Flood Consequences. The key requirements of these are outlined below:

Guidance

Justification Test: New developments should be directed away from Zone C and towards suitable land in Zone A, otherwise Zone B, where river or coastal flooding will be less of an issue. In Zone C the tests outlined in sections 6 and 7 of TAN15 will be applied, recognizing, however, that highly vulnerable development and Emergency Services in Zone C2 should not be permitted. All other new development should only be permitted within Zones C1 and C2 if determined by the planning authority to be justified in that location.

Assessing Flood Consequences: If a development proposal in Zone C1, or in C2 and if it is defined as being of low vulnerability, it would meet the test outlines in section 6, however it should be noted that those developments would be more likely to flood and appropriate mitigation would need to be planned accordingly. This section applies to Zone C, and those parts of Zone B where flooding has been identified as a material consideration to allow for localised problems.

Assessing whether a development should proceed or not will depend upon whether the consequences of flooding of that development can be managed and reduced to a level which is acceptable for the nature/type of proposed development, including its effects on existing development.

The proposed Site use is residential, classified as “Highly Vulnerable” development. The Site is located with the Development Advice Map (DAM) Zone A.

Table 3. Flood risk vulnerability and flood zone compatibility (taken from TAN15, 2004)

DAM Zone	Development Type	Planning Requirements	Acceptability Criteria	Development Advice
A	Emergency Services, highly vulnerable development, less vulnerable development, other	<ul style="list-style-type: none"> Justification test not applicable Refer to surface water requirements 	No increase in flooding elsewhere	No constraints relating to river or coastal flooding, other than to avoid increasing risk elsewhere
B	Emergency services & Highly vulnerable development	<ul style="list-style-type: none"> If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further Refer to surface water requirements 	<ul style="list-style-type: none"> Acceptable consequences for nature of use Occupiers aware of flood risk Escape/Evacuation routes present Effective flood warning provided Flood emergency plans and procedures Flood resistant design No increase in flooding elsewhere 	Generally suitable for most forms of development. Assessments where required, are unlikely to identify consequences that cannot be overcome or managed to an acceptable level. It is unlikely, therefore, that these would result in a refusal of planning consent on the grounds of flooding.
	Less vulnerable development		<ul style="list-style-type: none"> Occupiers aware of flood risk No increase in flooding elsewhere 	
	Other	Refer to surface water requirements	No increase in flooding elsewhere	
C1	Emergency services, highly vulnerable development, less vulnerable development	<ul style="list-style-type: none"> Application of justification test including acceptability of consequences Refer to surface water requirements 	<ul style="list-style-type: none"> Acceptable consequences for nature of use Flood defences adequate Agreement for construction and maintenance costs secured Occupiers aware of flood risk 	Plan allocations and applications for all development can only proceed subject to justification in accordance to section 6 of TAN 15 and acceptability of consequences in

			<ul style="list-style-type: none"> • Escape/evacuation routes present • Effective flood warning provided • Flood emergency plans and procedures • Flood resistant design • No increase in flooding elsewhere 	accordance to section 7 and Appendix 1 of TAN 15
	Other	<ul style="list-style-type: none"> • Application of acceptability of consequences (TAN 15 section 7 and Appendix 1) • Refer to surface water requirements 	<ul style="list-style-type: none"> • Acceptable consequences for nature of use • Occupiers aware of flood risk • Desirable if effective flood warning and evacuation routes/procedure provided depending on nature of proposal • No increase in flooding elsewhere 	Plan allocations and applications for development should only be made if considered acceptable in accordance with section 7 and Appendix 1 of TAN 15
C2	Emergency services, highly vulnerable development	The flooding consequences associated with Emergency Services and highly vulnerable developments are not considered to be acceptable. Plan allocations should not be made for such developments and planning applications not proposed		
	Less vulnerable development	<ul style="list-style-type: none"> • Application of justification test (section 6 of TAN 15), including acceptability of consequences (section 7 and Appendix 1 of TAN 15) • Refer to surface water requirements 	<ul style="list-style-type: none"> • Acceptable consequences for nature of use • Flood defences adequate • Agreement for construction and maintenance costs secured • Occupiers aware of flood risk • Escape/evacuation routes present • Effective flood warning provided • Flood emergency plans and procedures 	Plan allocations or applications for less vulnerable development can only proceed subject to justification in accordance with section 6 of TAN 15 and acceptability of consequences in accordance with section 7 and Appendix 1 of TAN 15

	Other	<ul style="list-style-type: none"> • Application of acceptability of consequences (section 7 and Appendix 1 of TAN 15) • Refer to surface water requirements 	<ul style="list-style-type: none"> • Flood resistant design • No increase in flooding elsewhere • Acceptable consequences for nature of use • Occupiers aware of flood risk • Effective flood warning provided • No increase in flooding elsewhere 	<p>Plan allocations and applications for development should only be made if considered acceptable in accordance with section 7 and Appendix 1 of TAN 15.</p>
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7. Resilience and mitigation



Based on the flood risk identified at the Site, the national and local policies and guidance and proposed development, the mitigation measures outlined within this section of the report are likely to help protect the development from flooding.

Sea (coastal/tidal) flood mitigation measures

As the Site is not identified as being at risk of flooding from the sea, mitigation measures are not required.

Rivers (fluvial) flood mitigation measures

Whilst the Site is in close proximity to an area which is affected by flooding from small watercourses, the Site itself will not be affected by flooding in all flooding events up to and including the 1 in 100 year (+ climate change allowance) fluvial flooding event.

In this instance due to the lack of detailed fluvial flood modelled data for the Site, the 1 in 1000-year scenario has been used as a proxy for the 1 in 100-year plus climate change scenario. Therefore, the following flood levels at the Site apply.

Table 4. Flood levels compared to ground levels on Site

Ground levels on Site (mAOD)	Modelled Flood Levels (mAOD)	
	1 in 100 year	1 in 100 year (+ climate change allowance)
27.3 – 35.0	18.0	18.5
Flood depths (m)	No flooding	No flooding

As the Site is not anticipated to experience flooding in all events up to and including the 1 in 100 year (+ climate change allowance) fluvial flooding event mitigation measures are not required.

Surface water (pluvial) flood mitigation measures

As the Site is not identified as being at risk of pluvial flooding, mitigation measures are not required.

A Sustainable Drainage Strategy (SuDS) should be developed for the Site, for effective management of surface water runoff over the lifetime of the proposed development.

In addition, the regular maintenance of any drains and culverts surrounding/on the Site under the riparian ownership of the developer should be undertaken to reduce the flood risk.

Groundwater flood mitigation measures

After analysis, a Low-Moderate risk of groundwater flooding has been identified on Site. In order to ensure the development includes sufficient flood mitigation measures to reduce the risk of groundwater flooding over its lifetime, the following mitigation measures are recommended:

- Finished floor levels of the proposed development should be set at least 0.3 m above the adjacent ground levels on Site.
- Waterproof tanking of the ground floor;
- Interceptor drains;
- Consideration of groundwater emergence flow routes within the proposed SuDS strategy to ensure routes of groundwater flow do not interact with proposed buildings;
- Automatic sump to extract flood water; and
- Non-return flap valves on the proposed foul and surface water sewer lines.

If these mitigation measures are implemented this could reduce the flood risk to the development from Low-Moderate to Low.

Reservoir flood mitigation measures

The Site is not a risk of flooding from reservoirs; therefore, mitigation measures are not required.

Other flood risk mitigation measures

As the Site is not identified as at risk from other sources, mitigation measures are not required.

Residual flood risk mitigation measures

The risk to the Site has been assessed from all sources of flooding and appropriate mitigation and management measures proposed to keep the users of the development safe over its lifetime. There is however a residual risk of flooding associated with the potential for failure of mitigation measures if regular maintenance and upkeep isn't undertaken. If mitigation measures are not implemented or maintained, the risk to the development will remain as the baseline risk.

Further flood mitigation information

More information on flood resistance, resilience and water entry can be found here: http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf

www.knowyourfloodrisk.co.uk

Emergency evacuation - safe access / egress and safe refuge

Emergency evacuation to land outside of the floodplain should be provided if feasible. Where this is not possible, 'Highly Vulnerable' developments and, where possible, development in general, should have internal stair access to an area of safe refuge within the building to a level higher than the maximum likely water level. An area of safe refuge should be sufficient in size for all potential users and be reasonably accessible to the emergency services.

Emergency evacuation from the development and the Site should only be undertaken in strict accordance with any evacuation plans produced for the Site, with an understanding of the flood risks at the Site including available mitigation, the vulnerability of occupants and preferred evacuation routes.

Flood warnings

The NRW operates a flood warning service in all areas at risk of flooding; this is available on their website: <https://www.gov.uk/check-flood-risk>. The Site is not located within an NRW Flood Alerts and Warning coverage area so is able to receive alerts and warnings (Figure 16). All warnings are also available through the NRW's 24 hour Floodline Service 0345 988 1188.

The NRW aims to issue Flood Warnings 2 hours in advance of a flood event. Flood Warnings can provide adequate time to enable protection of property and evacuation from a Site, reducing risk to life and property.

Emergency evacuation

Where possible, a safe access and egress route with a 'Very Low' hazard rating from areas within the floodplain to an area wholly outside the 1 in 100 year flood event including an allowance for climate change should be demonstrated. As the Site is not anticipated to be at risk of fluvial flooding during a 1 in 100 year (+ climate change allowance) flooding event evacuation from the Site is not considered to be required.

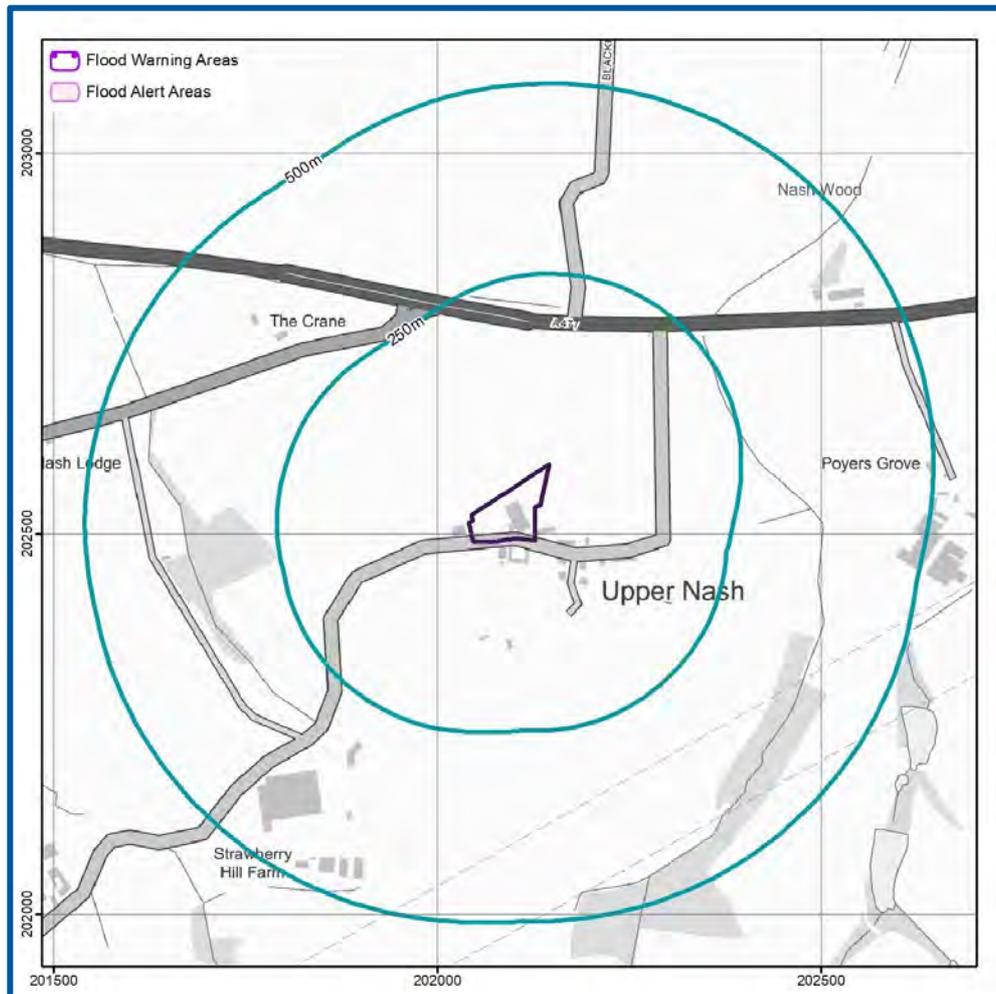
On-Site refuge

Whilst evacuation is not considered to be required from the Site, in a worst case scenario, safe refuge could be sought at first floor level in the proposed dwellings.

Other relevant information

It is recommended that main communication lines required for contacting the emergency services, electricity sockets/meters, water supply and first aid stations and supplies are not compromised by flood waters.

Figure 16. NRW Flood Warning Coverage for the local area (NRW, 2022).



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8. Conclusions and Recommendations



Site analysis

Source of Flood Risk	Baseline	After Analysis	After Mitigation
River (fluvial) flooding ¹	Very Low	Very Low	N/A
Sea (coastal/tidal) flooding	N/A	N/A	N/A
Surface water (pluvial) and small watercourses flooding	Very Low	Very Low	N/A
Groundwater flooding	Low-High	Low-Moderate	Low
Other flood risk factors present	No	No	N/A
Is any other further work recommended?	Yes	Yes	Yes

N/A = mitigation not required

¹ Model data was requested for the Site but was not provided within the time frame of this report. The National Hazard and Flood Risk Assessment Wales (FRAW) maps (2020) have been used to assess flood risk to the Site.

Providing the recommended mitigation measures are put in place (see previous sections) it is likely that flood risk to this Site will be reduced to an acceptable level.

The table below provides a summary of where the responses to key questions are discussed in this report.

Summary of responses to key questions in the report

Key sources of flood risks identified	Groundwater (see Section 4).
Are standard mitigation measures likely to provide protection from flooding to/from the Site?	Yes (see Section 7).
Is the development likely to satisfy the requirements of the Justification Test?	N/A (see Section 6)

Is any further work recommended?	Yes
<p>Recommendations for mitigation are provided below, based upon the flood risk to the Site:</p> <p>As a Low-Moderate risk of groundwater flooding has been identified on Site, the following mitigation measures are recommended:</p> <ul style="list-style-type: none"> • Finished floor levels of the proposed development should be set at least 0.3 m above the adjacent ground levels on Site. • Waterproof tanking of the ground floor; • Interceptor drains; • Automatic sump to extract flood water; and • Non-return flap valves on the proposed foul and surface water sewer lines. <p>If these mitigation measures are implemented this could reduce the flood risk to the development from Low-Moderate to Low.</p> <p>A Sustainable Drainage Strategy (SuDS) should be developed for the Site, for the effective management of surface water runoff over the lifetime of the proposed development. SuDS features should include consideration of a potentially high groundwater table and should include sufficient landscaping to ensure any emerging groundwater flows around built development and does not increase flooding to third-parties.</p> <p>In addition, the regular maintenance of any drains and culverts surrounding/on the Site under the riparian ownership of the developer should be undertaken to reduce the flood risk.</p> <p>GeoSmart recommend the mitigation measures discussed within this report are considered as part of the proposed development where possible and evidence of this is provided to the Local Planning Authority as part of the planning application.</p>	

9. References and glossary



References

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Glossary

General terms

BGS	British Geological Survey
NRW	National Resource Wales
GeoSmart groundwater flood risk model	GeoSmart's national groundwater flood risk model takes advantage of all the available data and provides a preliminary indication of groundwater flood risk on a 50m grid covering England and Wales. The model indicates the risk of the water table coming within 1 m of the ground surface for an indicative 1 in 100 year return period scenario.
Dry-Island	An area considered at low risk of flooding (e.g. In a Flood Zone 1) that is entirely surrounded by areas at higher risk of flooding (e.g. Flood Zone 2 and 3)
Flood resilience	Flood resilience or wet-proofing accepts that water will enter the building, but through careful design will minimise damage and allow the re-occupancy of the building quickly. Mitigation measures that reduce the damage to a property caused by flooding can include water entry strategies, raising electrical sockets off the floor, hard flooring.
Flood resistance	Flood resistance, or dry-proofing, stops water entering a building. Mitigation measures that prevent or reduce the likelihood of water entering a property can include raising flood levels or installation of sandbags.
Flood Zone 1	This zone has less than a 0.1% annual probability of river flooding
Flood Zone 2	This zone has between 0.1 and 1% annual probability of river flooding and between 0.1% and 0.5 % annual probability sea flooding
Flood Zone 3	This zone has more than a 1% annual probability of river flooding and 0.5% annual probability of sea flooding
Functional Flood Plain	An area of land where water has to flow or be stored in times of flood.
Hydrologic model	A computer model that simulates surface run-off or fluvial flow. The typical accuracy of hydrologic models such as this is $\pm 0.25\text{m}$ for estimating flood levels at particular locations.
OS	Ordnance Survey
Residual Flood Risk	The flood risk remaining after taking mitigating actions.
SFCA	Strategic Flood Consequence Assessment. This is a brief flood risk assessment provided by the local council

SuDS

A Sustainable drainage system (SuDS) is designed to replicate, as closely as possible, the natural drainage from the Site (before development) to ensure that the flood risk downstream of the Site does not increase as a result of the land being developed. SuDS also significantly improve the quality of water leaving the Site and can also improve the amenity and biodiversity that a Site has to offer. There are a range of SuDS options available to provide effective surface water management that intercept and store excess run-off. Sites over 1 Ha will usually require a sustainable drainage assessment if planning permission is required. The current proposal is that from April 2014 for more than a single dwelling the drainage system will require approval from the SuDS Approval Board (SABs).

Aquifer Types

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.

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.

Secondary undifferentiated

Has been assigned in cases where it has not been possible to attribute either category A or B to a rock type due to the variable characteristics of the rock type.

Unproductive Strata

These are rock layers or drift deposits with low permeability that has negligible significance for water supply or river base flow.

Data Sources

Aerial Photography	Contains Ordnance Survey data © Crown copyright and database right 2022 BlueSky copyright and database rights 2022
Bedrock & Superficial Geology	Contains British Geological Survey materials © NERC 2022 Ordnance Survey data © Crown copyright and database right 2022
Flood Risk (Flood Zone/RoFRS/Historic Flooding/Pluvial/Surface Water)	Natural Resource Wales copyright and database rights 2022

Features/Reservoir/ Flood Alert & Warning)	Ordnance Survey data © Crown copyright and database right 2022
Flood Risk (Groundwater)	GeoSmart, BGS & OS GW5 (v2.4) Map (GeoSmart, 2022) Contains British Geological Survey materials © NERC 2022 Ordnance Survey data © Crown copyright and database right 2022
Location Plan	Contains Ordnance Survey data © Crown copyright and database right 2022
Topographic Data	OS LiDAR/EA Contains Ordnance Survey data © Crown copyright and database right 2022 Natural Resource Wales copyright and database rights 2022

10. Appendices



Appendix A



Site plans

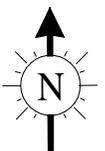


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Title Number -

OS Reference Number - SN 020 025

Administrative Area - Pembrokeshire





NRW and Pembrokeshire County Council correspondence

Good Morning,

Unfortunately, this site lies outside of our flood outlines and is not in the flood map therefore we have no data for this site. It may be worth contacting the Local Authority to see if they hold any data for this site.

Kind Regards

Owen Jones

Cymorth Technegol Cyswllt Cyfoeth / Customer Hub Technical Support

Cwsmer, Cyfarthrebu a Masnach / Customer Communications and Commercial

Cyfoeth Naturiol Cymru/Natural Resources Wales

Ffôn/Tel: 0300 065 3000

E-bost/E-mail: owen.jones@cyfoethnaturiolcymru.gov.uk / owen.jones@naturalresourceswales.gov.uk

Gwefan/Website: <http://www.cyfoethnaturiolcymru.gov.uk/> / www.naturalresourceswales.gov.uk

Hi Rebecca

In response to your recent enquiry I can confirm the following.

We do not carry out any flood modelling since the information we use is supplied by Natural Resources Wales who are responsible for the supply of this information.

https://maps.cyfoethnaturiolcymru.gov.uk/Html5Viewer/Index.html?configBase=https://maps.cyfoethnaturiolcymru.gov.uk/Geocortex/Essentials/REST/sites/Flood_Risk/viewers/Flood_Risk/virtualdirectory/Resources/Config/Default

Kind Regards

Tony

Tony Lewis

Land Drainage and Flooding Officer /
Swyddog Llifogydd a Draenio Tir

Pembrokeshire County Council / Cyngor Sir Penfro

3D County Hall / 3D Neuadd Y Sir

Haverfordwest / Hwlfordd

Pembrokeshire / Sir Benfro

SA61 1TP



Natural Resource Wales LiDAR ground elevation data

Disclaimer

This report has been prepared by GeoSmart in its professional capacity as soil, groundwater, flood risk and drainage specialists, with reasonable skill, care and diligence within the agreed scope and terms of contract and taking account of the manpower and resources devoted to it by agreement with its client and is provided by GeoSmart solely for the internal use of its client.

The advice and opinions in this report should be read and relied on only in the context of the report as a whole, taking account of the terms of reference agreed with the client. The findings are based on the information made available to GeoSmart at the date of the report (and will have been assumed to be correct) and on current UK standards, codes, technology and practices as at that time. They do not purport to include any manner of legal advice or opinion. New information or changes in conditions and regulatory requirements may occur in future, which will change the conclusions presented here.

This report is confidential to the client. The client may submit the report to regulatory bodies, where appropriate. Should the client wish to release this report to any other third party for that party's reliance, GeoSmart may, by prior written agreement, agree to such release, provided that it is acknowledged that GeoSmart accepts no responsibility of any nature to any third party to whom this report or any part thereof is made known. GeoSmart accepts no responsibility for any loss or damage incurred as a result, and the third party does not acquire any rights whatsoever, contractual or otherwise, against GeoSmart except as expressly agreed with GeoSmart in writing.

For full T&Cs see <http://geosmartinfo.co.uk/terms-conditions>

Important consumer protection information

This search has been produced by GeoSmart Information Limited, Suite 9-11, 1st Floor, Old Bank Buildings, Bellstone, Shrewsbury, SY1 1HU.

Tel: 01743 298 100

Email: info@geosmartinfo.co.uk

GeoSmart Information Limited is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom.
- sets out minimum standards which firms compiling and selling search reports have to meet.
- promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals.
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.
- By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports.
- act with integrity and carry out work with due skill, care and diligence.
- at all times maintain adequate and appropriate insurance to protect consumers.
- conduct business in an honest, fair and professional manner.
- handle complaints speedily and fairly.
- ensure that products and services comply with industry registration rules and standards and relevant laws.
- monitor their compliance with the Code.

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs contact details:

The Property Ombudsman scheme

Milford House

43-55 Milford Street

Salisbury

Wiltshire SP1 2BP

Tel: 01722 333306

Fax: 01722 332296

Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk.

Please ask your search provider if you would like a copy of the search code.

Complaints procedure

GeoSmart Information Limited is registered with the Property Codes Compliance Board as a subscriber to the Search Code. A key commitment under the Code is that firms will handle any complaints both speedily and fairly. If you want to make a complaint, we will:

- Acknowledge it within 5 working days of receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk.

We will co-operate fully with the Ombudsman during an investigation and comply with his final decision. Complaints should be sent to:

Martin Lucass

Commercial Director

GeoSmart Information Limited

Suite 9-11, 1st Floor,

Old Bank Buildings,

Bellstone, Shrewsbury, SY1 1HU

Tel: 01743 298 100

alanwhite@geosmartinfo.co.uk

11. Terms and conditions, CDM regulations and data limitations



Terms and conditions can be found on our website:

<http://geosmartinfo.co.uk/terms-conditions/>

CDM regulations can be found on our website:

<http://geosmartinfo.co.uk/knowledge-hub/cdm-2015/>

Data use and limitations can be found on our website:

<http://geosmartinfo.co.uk/data-limitations/>