



**WATER DESIGN ENGINEERS**

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## **DRAINAGE STRATEGY REPORT**

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## 0. Executive Summary

This Drainage Strategy has been prepared by Water Design Engineers (WDE) to support the proposed residential development at Stanwick, Northfields Lane, Westergate, Chichester. The purpose of the strategy is to demonstrate that surface water from the development can be managed safely, sustainably, and in full accordance with national policy, local planning requirements, and the standards of West Sussex County Council (LLFA).

### 0.1 Site Conditions and Flood Risk

The site lies in **Flood Zone 1**, indicating a low risk of fluvial and coastal flooding. Surface water flood risk on the site itself is negligible, with medium-risk areas occurring only within the wider 250m area. Historical flooding has been recorded in the locality, but no constraints prevent the safe drainage of the site. Overall, the development is considered suitable for residential use with respect to flood risk, subject to implementation of the proposed SuDS measures.

### 0.2 Drainage Strategy Overview

The scheme adopts a **SuDS-led approach**, prioritising source control, water-quality treatment, flow control, and safe conveyance. Runoff from the proposed roof area (300m<sup>2</sup>) is collected, treated and attenuated before being discharged in a controlled manner to the existing boundary ditch. Key components include:

- **Rainwater harvesting** via rainwater butts providing initial interception;
- **Bioretention shallow depressions** for both treatment and attenuation;
- **Localised pre-treatment** using sand, leaf and silt traps;
- **A Hydro-Brake flow control** to limit discharge to the allowable rate;
- **A bagwork headwall** forming a stable and maintainable outfall.

### 0.3 Hydraulic Performance

Surface water is attenuated on-site within shallow depressions, providing a total storage volume of 14.13m<sup>3</sup>, sized to accommodate the 1 in 100-year storm event plus a 45% climate-change allowance. This ensures that runoff leaving the site will not exceed greenfield-equivalent rates and will not increase flood risk on or off the property.

#### **0.4 Exceedance and Safety**

Exceedance flows are directed along safe, predefined overland routes shown on the block plan. Flow paths avoid building entrances and direct water towards the existing ditch, ensuring no increased flood risk to neighbouring properties.

#### **0.5 Management and Maintenance**

All SuDS elements will be privately owned and maintained by the site owner. Simple routine actions—such as clearing debris from traps, pruning vegetation within bioretention areas, and periodic inspection of the Hydro-Brake and headwall—ensure the system remains effective throughout its lifecycle.

#### **0.6 Conclusion**

The proposed development can be drained safely and sustainably. The strategy delivers a compliant SuDS solution that manages runoff volumes and peak flows, improves water quality, and aligns with LLFA requirements. There will be no increase in flood risk to the site or surrounding land.

## 1. Introduction

This report has been prepared by Water Design Engineers (WDE) to outline a sustainable drainage strategy for the proposed development at Stanwick, Northfields Lane, Westergate, Chichester PO20 3UH. The aim of this report is to outline a site-appropriate surface water drainage strategy to ensure there is no increase in flood risk or pollution on or off the site, in accordance with local planning policy and the Lead Local Flood Authority (LLFA) standards.

### 1.1 Purpose

The purpose of this report is to detail a compliant surface water drainage strategy for the site. This is achieved through the following primary objective:

**Surface Water (SuDS):** Define a SuDS-led approach to manage runoff from the new impermeable areas, utilizing bioretention and flow control devices to manage discharge into the existing watercourse.

### 1.2 Scope & Limitations

This strategy is based on the supplied engineering drawings (Refs: ENV24502-WDE-00-DR-1000 and ENV24502-WDE-00-DR-2000). Final attenuation volumes and outlet rates should be confirmed following detailed hydraulic modelling and infiltration testing.

Nominal surface water pipe diameters, pipe materials, and the proposed flow control device (including manufacturer, device type and design discharge rate) are shown on the drainage layout drawings. The drainage network has been checked to ensure adequate conveyance of the design flows associated with the 1 in 100-year storm event plus a 45% climate change allowance.

## 2. Site Location

Site Address: Stanwick, Northfields Lane, Westergate, Chichester, PO20 3UH

**Local Planning Authority (LPA):** Chichester District Council

**Lead Local Flood Authority (LLFA):** West Sussex County Council



### 3. Site Description

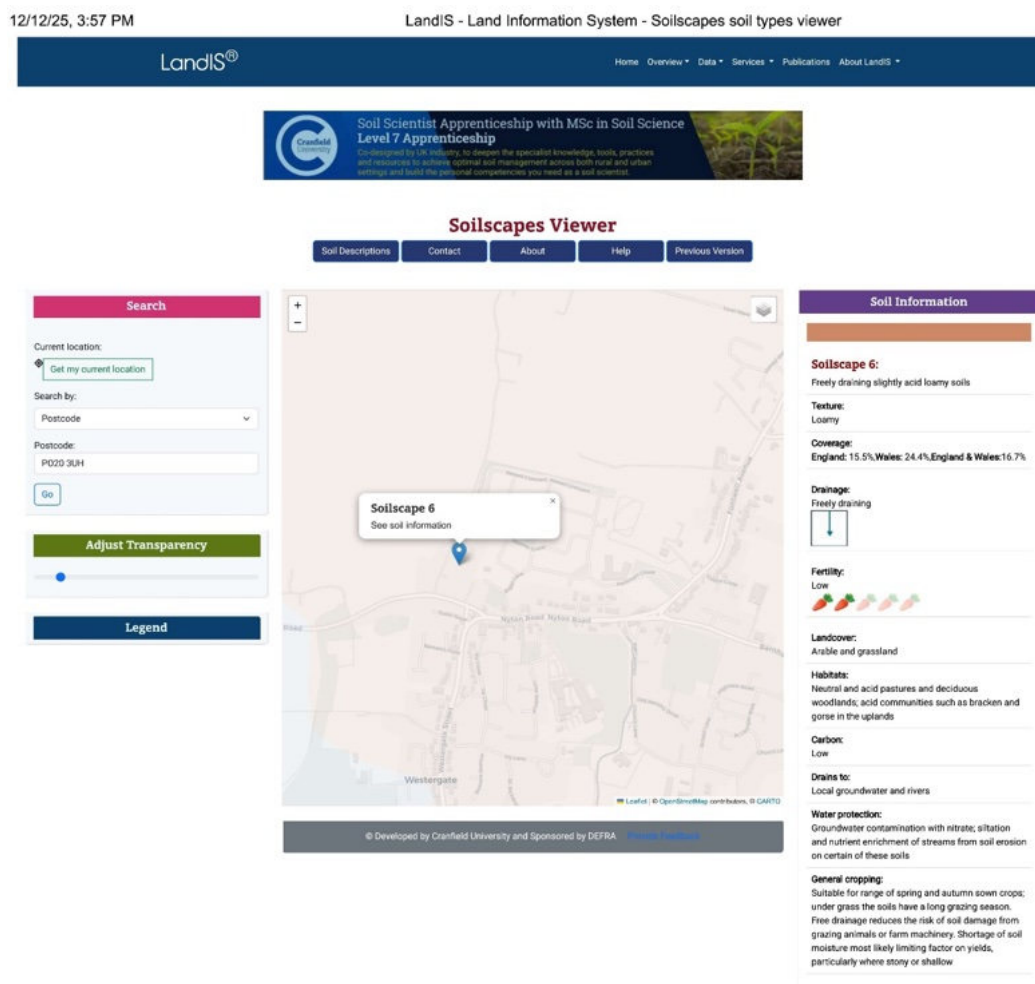
#### 3.1. Topography & Existing Features

The site is located at Stanwick, Northfields Lane, Westergate, Chichester. The existing topography is relatively flat, typical of the coastal plain area. The site boundaries are defined by existing vegetation and fencing. A key hydrological feature is the existing ditch/watercourse located along the site boundary, which currently serves as the natural drainage path for overland flow.

### 3.2. Ground Investigation

Ground investigation has yet to be formally conducted. However, a desk-based assessment using the Cranfield Soilscales mapping indicates the site is situated on Soilscape 6 (Freely draining slightly acid loamy soils).

Although Soilscape 6 is classified as "freely draining", which typically supports infiltration, the drainage strategy has adopted a precautionary approach. The design utilizes attenuation and controlled discharge to the existing ditch rather than solely relying on infiltration. This ensures robustness against potential local variations, provides robustness against local soil variability and supports the site's water-quality and flood-risk mitigation objectives.



### 3.3. Flood Risk Assessment

A detailed Flood Risk Assessment (Homecheck Professional Flood Report Ref: 65794798\_1) has been reviewed:

- **Overall Rating:** The site has an overall flood risk rating of Moderate, meaning it is in an area susceptible to some flooding, though it has "Passed" the assessment.
- **Fluvial & Coastal:** The site is located in Flood Zone 1 (Low Probability) for river and coastal flooding. However, it is noted that Flood Zone 3 areas exist within 250m of the site.
- **Surface Water:** The risk of surface water flooding on-site is Negligible for 1 in 75, 1 in 200, and 1 in 1000-year events, although medium-risk surface water zones exist within 250m of the property.
- **Historical Flooding:** Regulatory body records indicate that historical flooding has occurred at the site or within 250m.
- **Insurance:** The property is considered insurable at standard terms.

### 3.4. Existing Surface Water Drainage

The site currently utilises an existing ditch/creek for drainage. The proposed strategy seeks to formalise the discharge into this watercourse using controlled outlets.

### 3.5. Greenfield Runoff Estimation

The existing site consists of a mixture of permeable and impermeable surfaces. Greenfield runoff rates are adopted as the discharge control criterion in accordance with LLFA guidance. Impermeable area (67m<sup>2</sup>), permeable area (372.30m<sup>2</sup>).

The tables below show the flow and volume of surface runoff for different storm events, based upon the existing site characteristics and current rainfall data.

| 3a. Proposed Development Runoff - 1 in 100 year return period + 45% CC |        |         |         |                                |                                    |
|------------------------------------------------------------------------|--------|---------|---------|--------------------------------|------------------------------------|
| D (h)                                                                  | d (mm) | i (m/h) | Q (l/s) | Event Volume (m <sup>3</sup> ) | Attenuation Vol. (m <sup>3</sup> ) |
| 0.083                                                                  | 21     | 0.247   | 46.8    | 14.05                          | 13.96                              |
| 0.167                                                                  | 28     | 0.169   | 32.1    | 19.23                          | 19.05                              |
| 0.250                                                                  | 37     | 0.149   | 28.2    | 25.37                          | 25.10                              |
| 0.500                                                                  | 50     | 0.100   | 19.0    | 34.12                          | 33.58                              |
| 1.000                                                                  | 64     | 0.064   | 12.2    | 43.78                          | 42.70                              |
| 2.000                                                                  | 77     | 0.039   | 7.3     | 52.60                          | 50.44                              |
| 4.000                                                                  | 91     | 0.023   | 4.3     | 62.08                          | 57.76                              |
| 6.000                                                                  | 99     | 0.017   | 3.1     | 67.75                          | 61.27                              |
| 10.000                                                                 | 110    | 0.011   | 2.1     | 74.75                          | 63.95                              |
| 24.000                                                                 | 127    | 0.005   | 1.0     | 86.95                          | 61.03                              |

| <b>3b. Proposed Development Runoff - 1 in 1 year return period</b> |               |                |                |                                     |                                         |
|--------------------------------------------------------------------|---------------|----------------|----------------|-------------------------------------|-----------------------------------------|
| <b>D (h)</b>                                                       | <b>d (mm)</b> | <b>i (m/h)</b> | <b>Q (l/s)</b> | <b>Event Volume (m<sup>3</sup>)</b> | <b>Attenuation Vol. (m<sup>3</sup>)</b> |
| <b>0.083</b>                                                       | 4             | 0.043          | 8.2            | 2.46                                | 2.37                                    |
| <b>0.167</b>                                                       | 5             | 0.030          | 5.7            | 3.40                                | 3.22                                    |
| <b>0.250</b>                                                       | 7             | 0.027          | 5.1            | 4.60                                | 4.33                                    |
| <b>0.500</b>                                                       | 9             | 0.018          | 3.3            | 6.02                                | 5.48                                    |
| <b>1.000</b>                                                       | 11            | 0.011          | 2.1            | 7.66                                | 6.58                                    |
| <b>2.000</b>                                                       | 16            | 0.008          | 1.5            | 11.09                               | 8.93                                    |
| <b>4.000</b>                                                       | 21            | 0.005          | 1.0            | 14.64                               | 10.32                                   |
| <b>6.000</b>                                                       | 24            | 0.004          | 0.8            | 16.65                               | 10.17                                   |
| <b>10.000</b>                                                      | 28            | 0.003          | 0.5            | 19.08                               | 8.28                                    |
| <b>24.000</b>                                                      | 35            | 0.001          | 0.3            | 23.59                               | 0.00                                    |

#### 4. Proposed Development

The proposed development consists of the construction of a new residential dwelling and associated infrastructure at Stanwick, Northfields Lane.

##### 4.1. Key Technical Parameters:

- **Total Site Area:** 1,533 m<sup>2</sup>.
- **Impermeable Catchment Area:** 300 m<sup>2</sup> (proposed building roof area).
- **Excluded Areas:** The driveway design is not included in the primary site attenuation calculations.

##### 4.2. Drainage Strategy Features:

- **Attenuation Capacity:** A proposed attenuation tank/pond with a capacity of 14.13 m<sup>3</sup> has been modelled.
- **Climate Change Allowance:** The design includes a 45% allowance for climate change (CC) to ensure long-term resilience.
- **Headwall Construction:** The outfall to the ditch will be secured by a Typical Bagwork Headwall. This structure is detailed to be constructed of Hessian or canvas bags filled three-quarters full with dry mix concrete (STA), laid in a modified Flemish bond to create a stable, rectangular block.

## 5. Proposed Surface Water Drainage (SuDS-led approach)

The surface water drainage system is designed using 150mm diameter pipes and focuses on Source Control and attenuation.

### 5.1. Surface Water Strategy Overview

The strategy implements a treatment train approach to improve water quality and control flow rates before discharge.

#### Key Components:

- **Rainwater Harvesting:** Rainwater butts are proposed on downpipes (RWDP) to collect roof runoff for garden use, providing initial interception.
- **Bioretention (Shallow Depressions):** The design includes shallow depressions designated as bioretention zones. These features are designed with a gravel surround to prevent soil scouring and provide water quality treatment via filtration through vegetation.
- **Pre-Treatment:** Sand and leaf traps are installed upstream of the bioretention zones and overflow points to prevent silt accumulation and blockages.
- **Silt Traps:** Dedicated silt traps are located within the network to capture sediment.

### 5.2. Flow Control & Attenuation

To ensure the discharge rate does not exceed the capacity of the receiving watercourse, the system utilizes a flow control device.

- **Hydro-Brake:** A stormwater manhole (MHA) is fitted with a Hydro-Brake flow-control unit. This device restricts the discharge rate to the allowable limit before water leaves the site.
- **Attenuation Storage:** The shallow depressions function as attenuation storage, holding water during peak storm events and allowing it to drain slowly. The cross-sections detail a typical depth profile to accommodate this volume.

### 5.3. Outfall Strategy

The system discharges into the existing ditch located at the site boundary.

- **Headwall:** The outfall is secured by a proposed typical bagwork headwall.
- **Construction:** The headwall consists of concrete bagwork (Hessian or Canvas) filled with STA concrete, placed in a modified Flemish bond arrangement suitable for bagwork headwalls.
- **Pipe Diameter:** The outlet pipe is specified as 150mm diameter.

#### 5.4. Exceedance Strategy

Exceedance flows defined as flows exceeding the capacity of the internal SuDS features are directed along safe overland flow routes. The block plan indicates specific flow directions for shallow depressions to ensure water moves away from structures and towards the safe discharge points.

### 6. Management & Maintenance

The drainage assets, including the bioretention areas, catchpits, and flow control devices, will be privately owned and maintained by the site owner.

#### 6.1. SuDS Maintenance Schedule (Summary)

| Asset                              | Maintenance Action                                                                                 | Frequency                     |
|------------------------------------|----------------------------------------------------------------------------------------------------|-------------------------------|
| Sand & Leaf Traps / Silt Traps     | Inspect and remove debris/silt to ensure unrestricted flow.                                        | Monthly & after storms        |
| Bioretention (Shallow Depressions) | Prune vegetation, remove trash/debris, and check for sediment accumulation in the gravel surround. | Monthly / Seasonally          |
| Hydro-Brake Flow Control           | Inspect manhole (MHA) and clear any blockages from the intake.                                     | Annually & after major storms |
| Bagwork Headwall                   | Inspect for structural stability and scour around the outfall pipe.                                | Annually                      |
| Rainwater Butts                    | Clean and check for leaks.                                                                         | Annually                      |

#### 6.2. Runoff disposal hierarchy & initial assumptions

The primary disposal method is controlled discharge to an existing watercourse. This is supported by source control measures, including rainwater harvesting and bioretention.

#### 6.3. Greenfield runoff & flow control outline approach

For a preliminary, planning-stage control, the allowable discharge is limited to meet Lead Local Flood Authority (LLFA) policy standards. To ensure compliance, a Hydro-Brake flow control device is proposed within the stormwater manhole (MHA). This device restricts the discharge rate before water enters the existing ditch, ensuring post-development discharge does not exceed the allowable greenfield runoff rate.

#### 6.4. Indicative attenuation storage (preliminary)

Preliminary surface water attenuation is provided through shallow depression bioretention areas. These features are designed to hold water during peak events. The system includes gravel surrounds to prevent soil scouring and utilises sand and leaf traps as overflow mechanisms.

Separately, silt traps and inspection chambers are integrated into the network to manage debris and sediment before the water reaches the flow control device. These distinct storage and treatment components ensure proper system function and compliance with water quality requirements.

#### 6.5. Proposed SuDS layout (concept)

The concept layout includes:

- **Shallow Depression Bioretention Areas:** Utilized for attenuation and treatment.
- **Rainwater Butts:** Proposed at dwellings for rainwater harvesting.
- **Flow Control Device:** A Hydro-Brake is installed on the piped outfall to restrict discharge to the existing ditch.
- **Sand and Leaf Traps:** Installed to filter runoff before it enters the bioretention zones or overflow pipes.

#### 6.6. Exceedance strategy

Exceedance flows defined as flows exceeding the capacity of the internal SuDS features (such as the pipes and bioretention depressions) are directed along shallow depression flow directions to safe routes. These flows are managed within the site boundary to ensure zero increase in off-site flood risk. The Block Plan (Appendix A) details the dedicated flow path arrows (labelled as "Exceedance Flow Direction" and "Shallow Depression Flow Direction") to demonstrate the safe, on-site routing of extreme events.

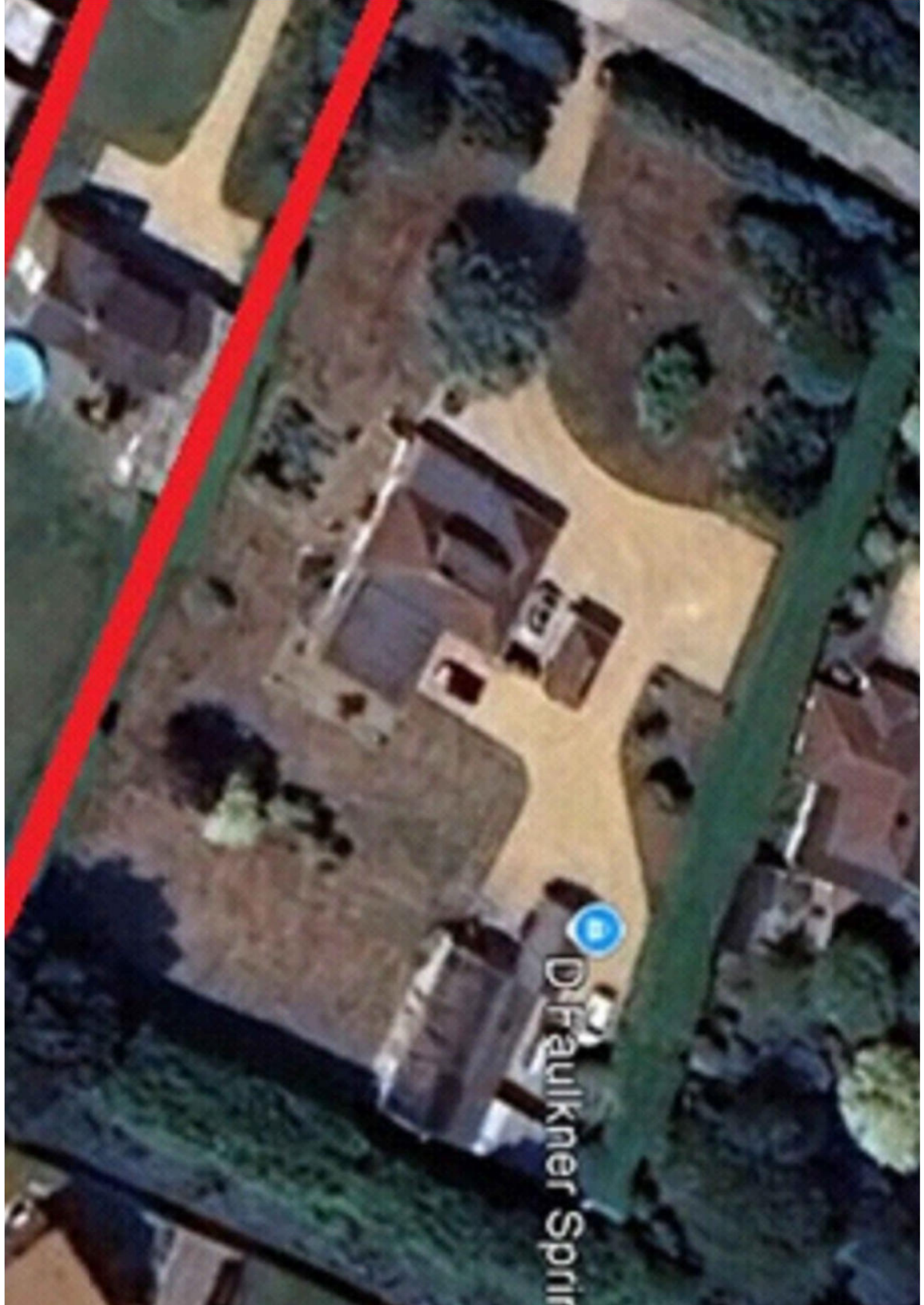
#### 6.7. SuDS maintenance schedule (summary)

- **Bioretention vegetation:** Prune and remove invasive species seasonally.
- **Sand & Leaf Traps / Inlet inspection:** Monthly inspection to remove debris and silt.
- **Hydro-Brake flow control:** Inspect manhole (MHA) and clear debris annually and after major storms.
- **Bagwork Headwall:** Inspect annually for stability and scour at the discharge point.
- **Drainage record keeping:** Ongoing records of inspections, maintenance, and incidents.



## Appendix A

### Site Location Plan



Dihaulkner Sprin



## **Appendix B**

### Cranfield Soils Map



### Soil Scientist Apprenticeship with MSc in Soil Science Level 7 Apprenticeship

Co-designed by UK industry, to deepen the specialist knowledge, tools, practices and resources to achieve optimal soil management across both rural and urban settings and build the personal competencies you need as a soil scientist.



## Soilscape Viewer

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### Search

Current location:

[Get my current location](#)

Search by:

Postcode

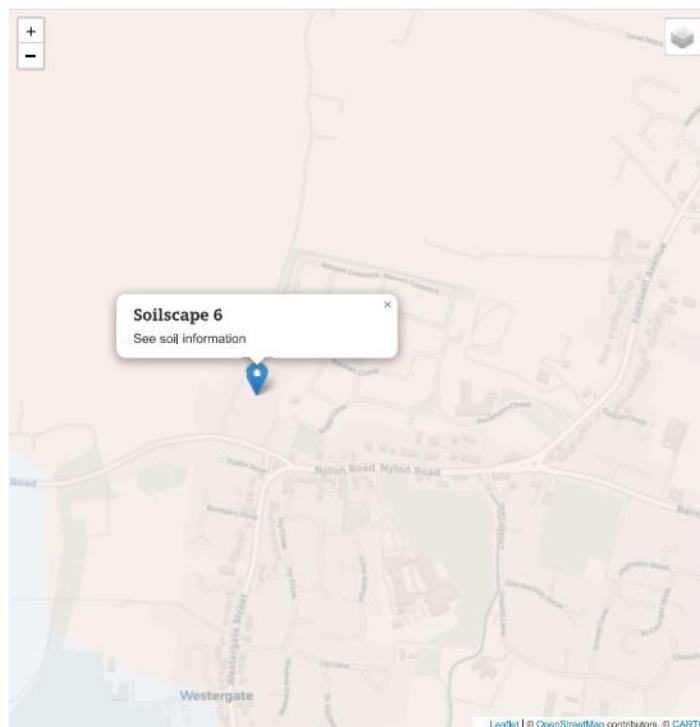
Postcode:

PO20 3UH

[Go](#)

### Adjust Transparency

### Legend

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### Soil Information

#### Soilscape 6:

Freely draining slightly acid loamy soils

#### Texture:

Loamy

#### Coverage:

England: 15.5%, Wales: 24.4%, England &amp; Wales: 16.7%

#### Drainage:

Freely draining



#### Fertility:

Low



#### Landcover:

Arable and grassland

#### Habitats:

Neutral and acid pastures and deciduous woodlands; acid communities such as bracken and gorse in the uplands

#### Carbon:

Low

#### Drains to:

Local groundwater and rivers

#### Water protection:

Groundwater contamination with nitrate; siltation and nutrient enrichment of streams from soil erosion on certain of these soils

#### General cropping:

Suitable for range of spring and autumn sown crops; under grass the soils have a long grazing season. Free drainage reduces the risk of soil damage from grazing animals or farm machinery. Shortage of soil moisture most likely limiting factor on yields, particularly where stony or shallow

### About Us

LandIS, or the Land Information System is one of the offerings of the Cranfield Environment Centre (CEC). Incorporating the National Soil Resources Institute, we are the largest UK national and international centre for research and development, consultancy and training in soils and their interaction with the atmosphere, land use, geology and water resources.

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## Appendix C

### Environment Agency Flood Risk Maps

# Flood Report



# Flood Risk Assessment PASSED

## Professional Opinion

The overall flood risk rating for the property has been assessed as being 'Moderate'. This means that the site is in an area which is susceptible to some flooding. General flood risk guidance and recommendations are on page 2 and information about flood resistance and resilience measures is on page 4.

This report is issued for the property described as:

Stanwick Northfields Lane,  
Westergate,  
CHICHESTER,  
West Sussex,  
PO20 3UH

Report Reference:  
**65794798\_1**

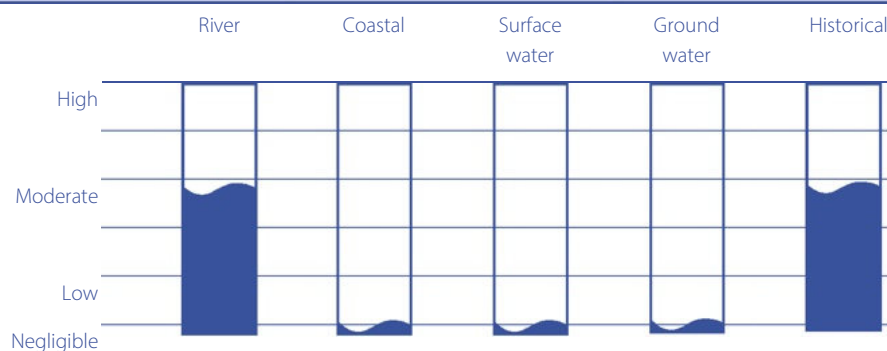
National Grid Reference:  
**493886E, 105712N**

Client Reference:  
GilesVos\_HCF

Report Date:  
**25 March 2015**



## Overall Flood Risk



Insurance: Yes

The flood risk identified is unlikely to affect obtaining insurance at standard terms

### Contact Details

If you require any assistance please contact our customer services team

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# Flood Risk Assessment

## Professional Opinion



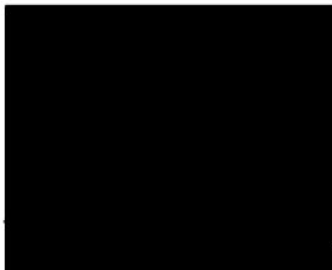
# Passed

The property has been identified as being in an area susceptible to flooding from one or more sources following an assessment of all the data contained within this report. It would be prudent to consider the following recommendations and advice in order to further clarify the risk of flooding at the property and to take practical steps in reducing the consequences of any potential flood event.

## RECOMMENDATIONS

1. A prudent purchaser may wish to consider further assessment of the property to identify appropriate flood protection measures. Such measures, including flood guards, gates, temporary barriers and tanking systems, may assist in reducing the effects of flooding on the property (if defences are absent or fail) and could help to obtain property insurance (if not already available). The regulatory body supports the use of kitemarked flood products, which have been independently tested and meet the required standards. An initial survey of the property can be conducted for around £300-400 plus VAT and most providers will deduct this from the costs of any recommended products. More information on flood protection measures is presented on page 4 along with additional advice on reducing the impacts of flooding. Details of providers are available from the Flood Protection Association (contact details can be found at the end of this report). Landmark would be happy to arrange a survey by an approved supplier. Please contact us for further information.
2. It would be prudent to ask the vendor to confirm whether or not they are aware of any previous flooding at the property. In addition, we would draw your attention to the additional advice on page 4.
3. You may wish to obtain insurance terms prior to exchange of contracts and completion of this transaction.

### Approved by



**Christopher S. Taylor BSc (Hons), MSc, AIEMA**  
Chartered Water and Environmental Manager  
Technical Director, Argyll Environmental Ltd

## Summary of Findings

A '-' indicates no data found. Those factors with a 'Yes' will offer further explanation in Sections A-D.

### Section A.1 – River, Coastal, and Surface Water Flood Risk: 1 in 75 Year – From JBA

|               | On-site | 1-250m |
|---------------|---------|--------|
| River         | -       | -      |
| Coastal       | -       | -      |
| Surface Water | -       | YES    |

### Section A.2 – River, Coastal, and Surface Water Flood Risk: 1 in 200 Year – From JBA

|               | On-site | 1-250m |
|---------------|---------|--------|
| River         | -       | -      |
| Coastal       | -       | -      |
| Surface Water | -       | YES    |

### Section A.3 – River, Coastal and Surface Water Flood Risk: 1 in 1000 Year – From JBA

|               | On-site | 1-250m |
|---------------|---------|--------|
| River         | -       | -      |
| Coastal       | -       | -      |
| Surface Water | -       | YES    |

### Section B – Floodplains, Flood Defences, and Flood Risk – From regulatory body

|                                      | On-site | 1-250m |
|--------------------------------------|---------|--------|
| Rivers and coastal (zone 2)          | YES     | YES    |
| Rivers and coastal (zone 3)          | YES     | YES    |
| Flood defended area                  | -       | -      |
| Flood defences                       | -       | YES    |
| Risk of Flooding from Rivers and Sea | YES     | YES    |

### Section C – Groundwater

|                              | On-site | 1-250m |
|------------------------------|---------|--------|
| Risk of groundwater flooding | -       | -      |

### Section D – Historical

|                              | On-site | 1-250m |
|------------------------------|---------|--------|
| Historical flooding          | YES     | YES    |
| Flood insurance claim rating | YES     | YES    |

## Flood Resistance and Resilience Measures

Flooding can usually be managed by the installation of flood protection measures either on or within the building(s) or across the property. Flood protection measures can be divided into two categories; flood resistance and flood resilience.

Flood resistance measures aim to prevent flood water from entering a property (i.e. barriers and baffles) while flood resilience measures aim to reduce the impact of flood water once it enters a property. Both flood resistance and flood resilience solutions can be integrated into design proposals for new developments or be retro-fitted to existing properties. A total solution may often include both resistance and resilience measures and will depend on a number of factors including flood source, likely flood depths, property design and age.

Most properties can be protected against shallow flash flooding from between £2000 and £6000, although significantly more may be required for high risk properties. Details of providers are available from the Flood Protection Association (contact details can be found at the end of this report). For further information about flood resistance measures or to be put in touch with one of our partners in this field please contact customer services on 0844 844 9966 or email [helpdesk@landmark.co.uk](mailto:helpdesk@landmark.co.uk)

### Guideline Costs for Resistance Measures

| Building feature                     | Cost estimate including installation (excluding VAT) |
|--------------------------------------|------------------------------------------------------|
| Standard single door                 | £500-£995                                            |
| Standard garage door                 | £700-£1500                                           |
| Standard window                      | £350-£600                                            |
| Single air brick                     | £40-£100                                             |
| Patio doors                          | £500-£1500                                           |
| Simple non-return valve              | £20-£50                                              |
| Large non-return valve               | £300-£800                                            |
| Tanking a basement, walls, or floors | £25 per metre <sup>2</sup>                           |

## Additional Advice

In purchasing this report you have taken the first step in understanding the risk of flooding at your property. In addition to the installation of flood protection measures, such as those outlined above, there are a number of further practical steps you may wish to consider in order to ensure you are fully prepared in the event of a flood:

- **Understand your flood risk:** Take time to understand the sources of flooding affecting your property. Additional information on flooding in your area may be available from the Local Authority if they have completed a Strategic Flood Risk Assessment examining flood risk in the wider area. Alternatively, you may wish to consider a further strategic appraisal of flooding at your property to more closely examine available data and provide a more accurate estimate of anticipated flood depths. Further assessment can be undertaken starting from £500 plus VAT please contact customer services on [REDACTED] or email [REDACTED] for more details.
- **Sign up to flood warnings:** The Environment Agency operates a free flood warning service providing alerts by phone, text or email when flooding is anticipated providing an opportunity for home owners to take necessary precautions.
- **Make a flood plan:** Prepare a flood plan outlining the precautions and actions you should take when a flood event is anticipated to help reduce the impact and damage flooding may cause. Sensible precautions would include raising electrical items, irreplaceable items and sentimental items off the ground or where possible moving them to a higher floor, rolling up carpets and rugs and turning off utilities. In addition, consider what actions you would take should the property need to be evacuated including access and egress routes and preparing a flood kit in advance containing warm clothing, medication, a torch, food and wellingtons.

Further information is available from The Environment Agency on how to prepare and what to do in the event of a flood at their website or by calling their Floodline on [REDACTED]

## Property Location



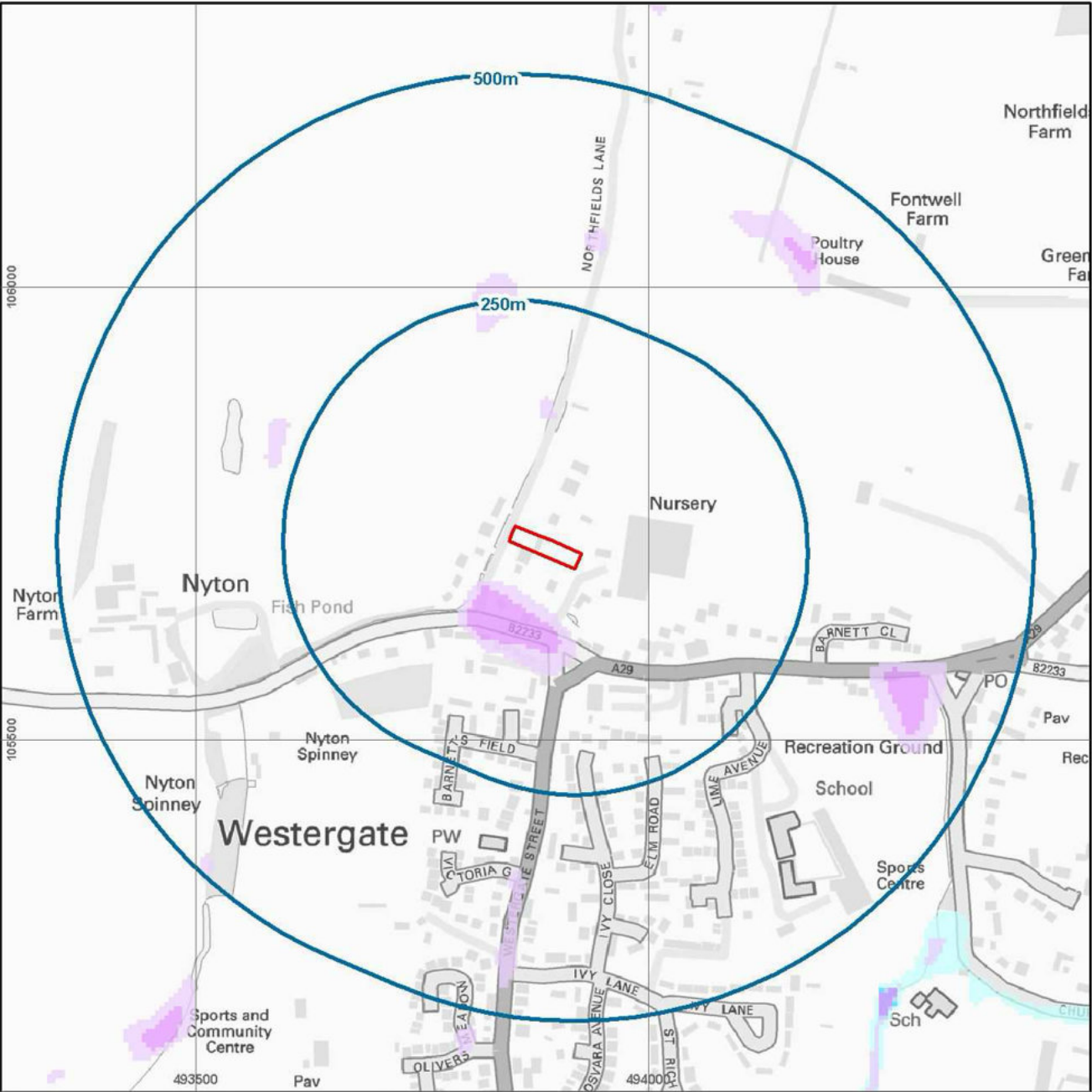
## Section A.1 – River, Coastal and Surface Water Flood Risk: 1 in 75 Year – From JBA

| Enquiry                                                             | Distance          | Result                   | Note                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------|-------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>River</b><br>What is the risk of river water flooding?           | On-site<br>1-250m | Negligible<br>Negligible | Information regarding the risk of river (fluvial) flooding has been modelled by JBA Consulting in this instance using the anticipated water volumes expected during a 1 in 75 return period. This data has been modelled assuming an 'undefended' scenario where no defences are present. However, where flood defences are identified in this report this will be reflected in our overall risk assessment. The risk is classified by JBA into four categories, negligible, low (more than 0.1m), medium (more than 0.3m) and high (more than 1m) which reflect varying depths of river flooding. |
| <b>Coastal</b><br>What is the risk of coastal flooding?             | On-site<br>1-250m | Negligible<br>Negligible | Information regarding the risk of coastal (tidal) flooding has been modelled by JBA Consulting in this instance using the anticipated water volumes expected during a 1 in 75 return period. This data has been modelled assuming an 'undefended' scenario where no defences are present. However, where flood defences are identified in this report this will be reflected in our overall risk assessment. The risk is classified by JBA into four categories, negligible, low (more than 0.1m), medium (more than 0.3m) and high (more than 1m) which reflect varying depths of river flooding. |
| <b>Surface Water</b><br>What is the risk of surface water flooding? | On-site<br>1-250m | Negligible<br>Medium     | Information regarding the risk of natural surface water or pluvial flooding has been modelled by JBA Consulting in this instance using the anticipated water volumes expected during a 1 in 75 return period. The risk is classified by JBA into four categories, negligible, low (more than 0.1m), medium (more than 0.3m) and high (more than 1m) which reflect varying depths of potential surface water flooding.                                                                                                                                                                              |

### Comment

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Section A.1 – River, Coastal and Surface Water Flood Risk: 1 in 75 Year – From JBA



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**75yr Flood Risk**



**Client Site**

**Surface Water Depth**

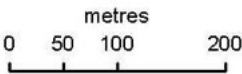
**River Depth**

**Coastal Depth**

- 10cm - 30cm
- 30cm - 1m
- > 1m

- 10cm - 30cm
- 30cm - 1m
- > 1m

- 10cm - 30cm
- 30cm - 1m
- > 1m



\* - Not all features in legend may be present in above map

Nominal scale at A4 paper size - 1:7,000

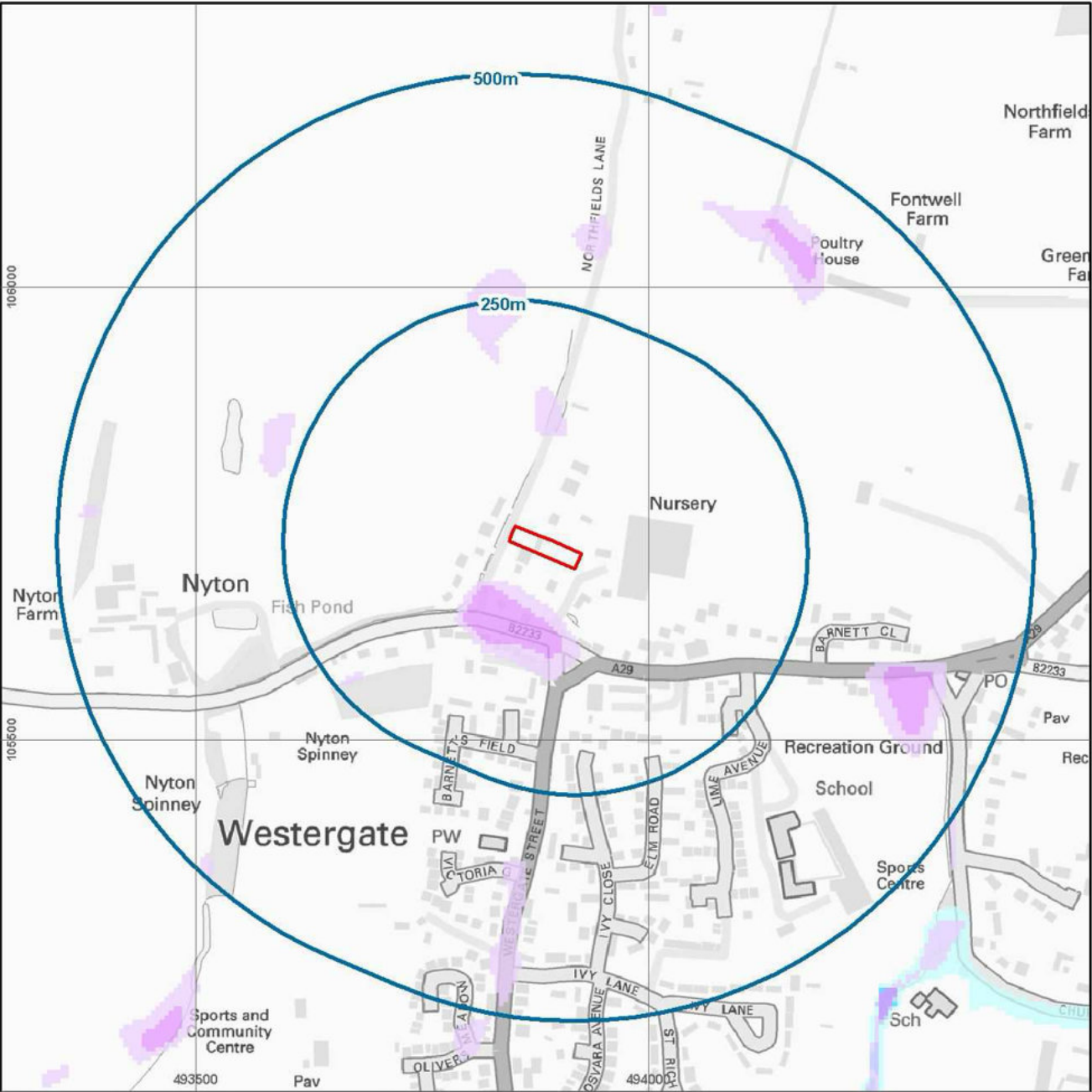
## Section A.2 – River, Coastal, and Surface Water Flood Risk: 1 in 200 Year – From JBA

| Enquiry                                     | Distance | Result     | Note                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------|----------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>River</b>                                | On-site  | Negligible | Information regarding the risk of river flooding has been modelled by JBA Consulting in this instance using the anticipated water volumes expected during a 1 in 200 return period. This data has been modelled assuming an 'undefended' scenario where no defences are present. However, where flood defences are identified in this report this will be reflected in our overall risk assessment. The risk is classified by JBA into four categories, negligible, low (more than 0.1m), medium (more than 0.3m) and high (more than 1m) which reflect varying depths of river flooding.   |
| What is the risk of river water flooding?   | 1-250m   | Negligible |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Coastal</b>                              | On-site  | Negligible | Information regarding the risk of coastal flooding has been modelled by JBA Consulting in this instance using the anticipated water volumes expected during a 1 in 200 return period. This data has been modelled assuming an 'undefended' scenario where no defences are present. However, where flood defences are identified in this report this will be reflected in our overall risk assessment. The risk is classified by JBA into four categories, negligible, low (more than 0.1m), medium (more than 0.3m) and high (more than 1m) which reflect varying depths of river flooding. |
| What is the risk of coastal flooding?       | 1-250m   | Negligible |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Surface Water</b>                        | On-site  | Negligible | Information regarding the risk of natural surface water flooding has been modelled by JBA Consulting in this instance using the anticipated water volumes expected during a 1 in 200 return period. The risk is classified by JBA into four categories, negligible, low (more than 0.1m), medium (more than 0.3m) and high (more than 1m) which reflect varying depths of potential surface water flooding.                                                                                                                                                                                 |
| What is the risk of surface water flooding? | 1-250m   | Medium     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

### Comment

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Section A.2 – River, Coastal, and Surface Water Flood Risk: 1 in 200 Year – From JBA



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200yr Flood Risk



Client Site

Surface Water Depth

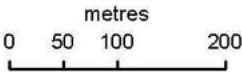
River Depth

Coastal Depth

- 10cm - 30cm
- 30cm - 1m
- > 1m

- 10cm - 30cm
- 30cm - 1m
- > 1m

- 10cm - 30cm
- 30cm - 1m
- > 1m



\* - Not all features in legend may be present in above map

Nominal scale at A4 paper size - 1:7,000

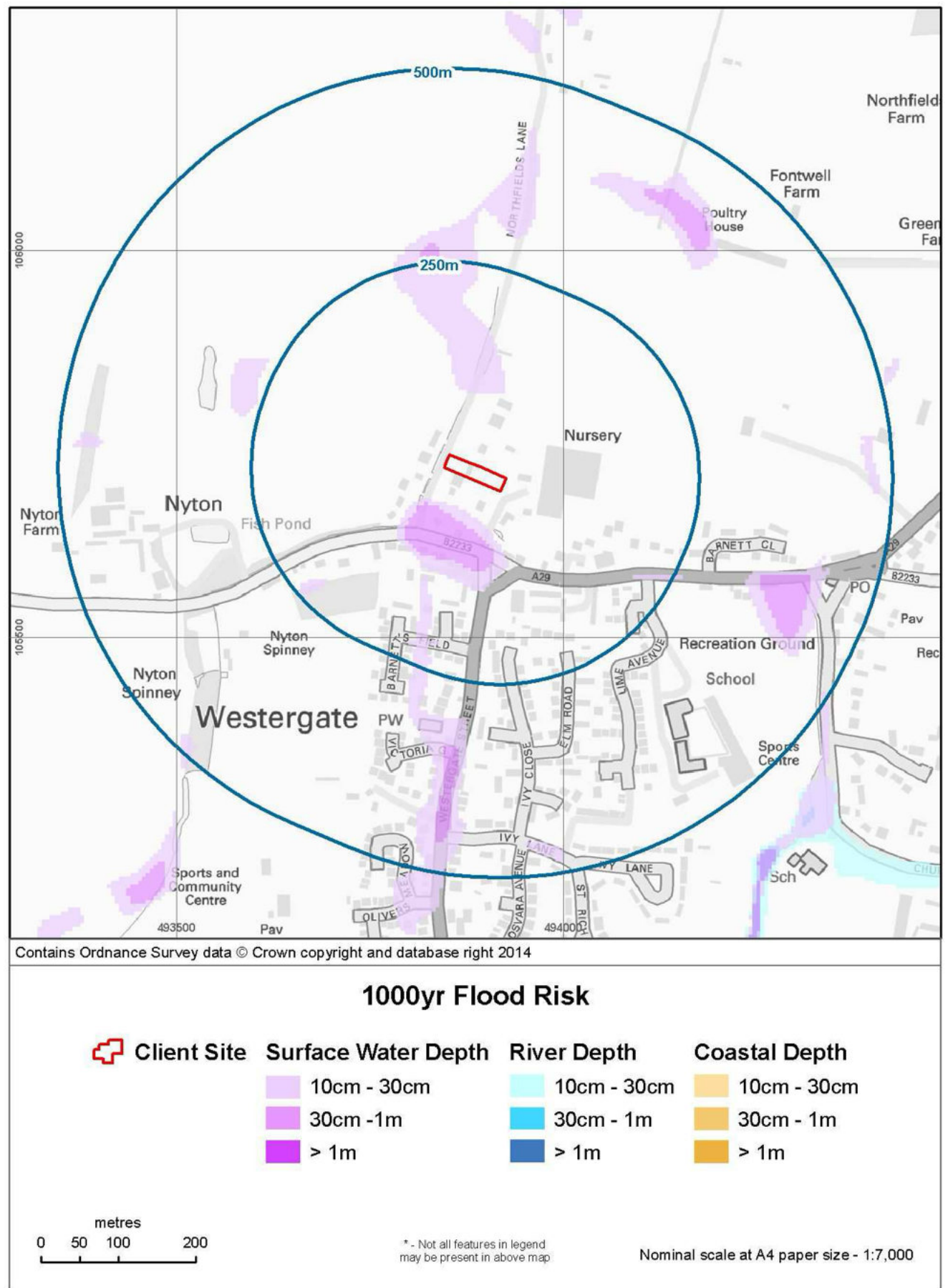
## Section A.3 – River, Coastal and Surface Water Flood Risk: 1 in 1000 Year – From JBA

| Enquiry                                     | Distance | Result     | Note                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------|----------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>River</b>                                | On-site  | Negligible | Information regarding the risk of river (fluvial) flooding has been modelled by JBA Consulting in this instance using the anticipated water volumes expected during a 1 in 1000 return period. This data has been modelled assuming an 'undefended' scenario where no defences are present. However, where flood defences are identified in this report this will be reflected in our overall risk assessment. The risk is classified by JBA into four categories, negligible, low (more than 0.1m), medium (more than 0.3m) and high (more than 1m) which reflect varying depths of river flooding. |
| What is the risk of river water flooding?   | 1-250m   | Negligible |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Coastal</b>                              | On-site  | Negligible | Information regarding the risk of coastal (tidal) flooding has been modelled by JBA Consulting in this instance using the anticipated water volumes expected during a 1 in 1000 return period. This data has been modelled assuming an 'undefended' scenario where no defences are present. However, where flood defences are identified in this report this will be reflected in our overall risk assessment. The risk is classified by JBA into four categories, negligible, low (more than 0.1m), medium (more than 0.3m) and high (more than 1m) which reflect varying depths of river flooding. |
| What is the risk of coastal flooding?       | 1-250m   | Negligible |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Surface Water</b>                        | On-site  | Negligible | Information regarding the risk of natural surface water or pluvial flooding has been modelled by JBA Consulting in this instance using the anticipated water volumes expected during a 1 in 1000 return period. The risk is classified by JBA into four categories, negligible, low (more than 0.1m), medium (more than 0.3m) and high (more than 1m) which reflect varying depths of potential surface water flooding.                                                                                                                                                                              |
| What is the risk of surface water flooding? | 1-250m   | Medium     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

### Comment

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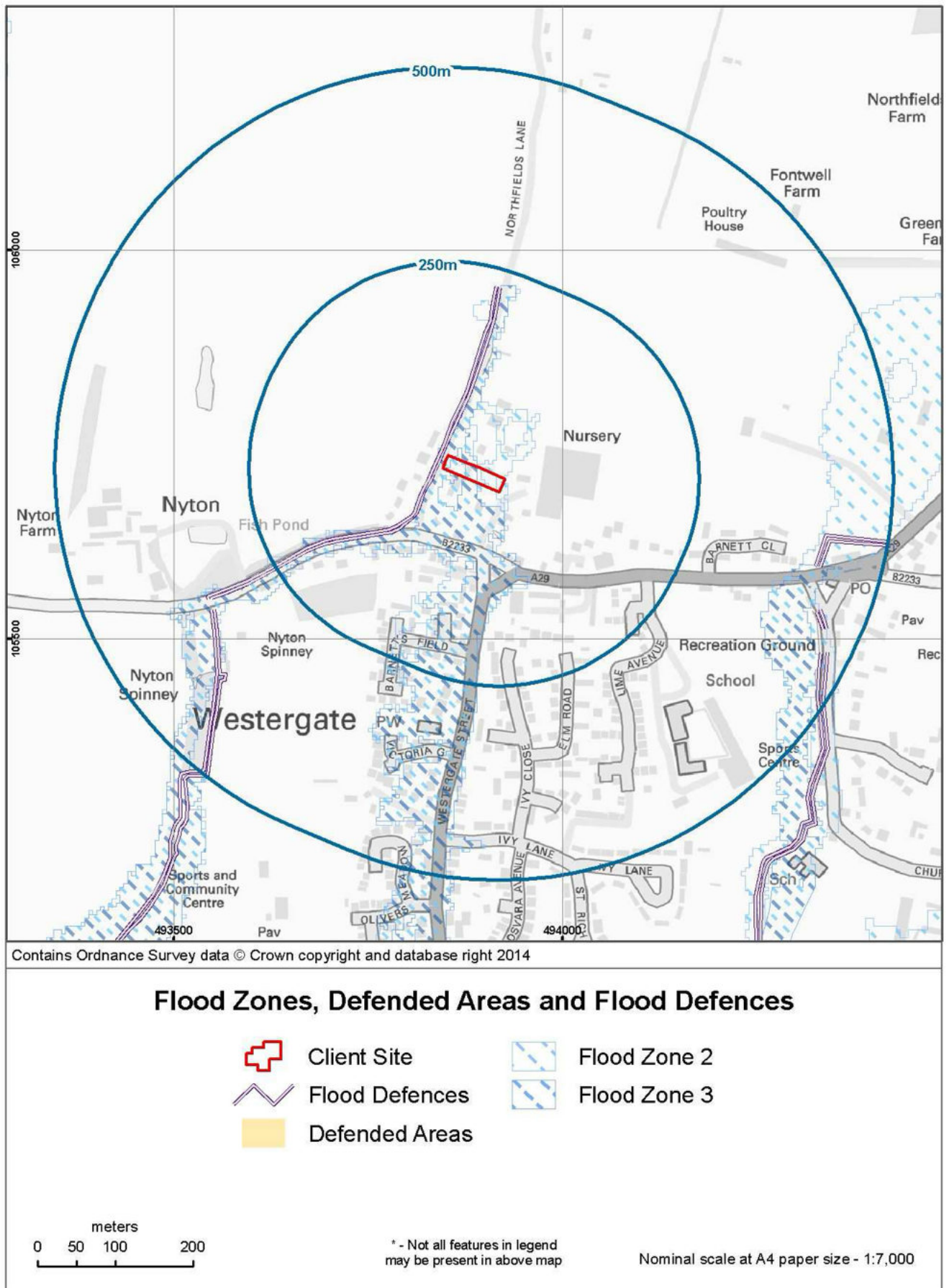
Section A.3 – River, Coastal and Surface Water Flood Risk: 1 in 1000 Year – From JBA



## Section B – Floodplains, Flood Defences, and Flood Risk – From regulatory body

| Enquiry                                                                                                                         | Distance          | Result     | Note                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------|-------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Rivers and coastal</b><br>Is the property in an area affected by flooding (Flood Zone 3) or extreme flooding (Flood Zone 2)? | On-site<br>1-250m | YES<br>YES | <p>The site has been identified as being on or within 25m of Flood zone 3 according to the regulatory body Flood Map and is at a high risk of river or coastal flooding. The annual probability of flooding is either greater than 1% from rivers or greater than 0.5% from the sea. Properties within Flood Zone 3 may have difficulty obtaining flood insurance. In addition, all proposed developments would need to be accompanied by a full Flood Risk Assessment, in accordance with the National Planning Policy Framework. It is recommended further assessment is undertaken to further quantify the flood risk and suggest appropriate flood protection measures.</p>                                                                                                                                                                                                                                                                                                                      |
| <b>Flood defended area</b><br>Is the property in an area benefiting from flood defences ?                                       | On-site           | NO         | <p>The site is not situated within 250m of an area benefiting from flood defences according to the regulatory body Flood Map.</p> <p>The Environment Agency defines areas benefiting from flood defences which should be afforded protection by existing flood defences during flood events with an annual probability of 1% from rivers and 0.5% from the sea. However, not all areas have been mapped and the property may still benefit from some flood defences.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Flood defences</b><br>Are there any flood defences within 250m?                                                              | On-site<br>1-250m | NO<br>YES  | <p>Flood defences were identified within 250m of the site which should afford it some level of flood protection. However, there may be a residual risk of flooding should the protection standard of those defences be exceeded (and the defences over-topped) or should the defences fail.</p> <p>The Environment Agency data regarding the presence and location of flood defences includes linear flood defences (such as walls and embankments). Not all flood defences may yet be registered and as a result not all flood defences may be shown.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Risk of Flooding from Rivers and Sea</b><br>What is the flood likelihood category for the property?                          | On-site           | Medium     | <p>The site is classified as being at a moderate risk of flooding. This classification relates to the locality as a whole, rather than the individual site and solely considers river and coastal flooding. Flood insurance should be widely available at standard terms for properties in this locality as the annual probability of flooding is less than 1.3%. However, it would be prudent to consider further assessment or the installation of flood protection measures.</p> <p>The data in the Risk of Flooding from Rivers and Sea dataset is sourced from The Environment Agency's National Property Dataset (NPD2). The information provided includes the flood likelihood category low, moderate, or significant according to the flood risk analysis. Some areas may be classified as having no result. This occurs where there is no output data from the analysis, but the area falls within the extreme flood outline (with a 0.1% or 1 in 1000 chance of flooding in any year).</p> |

## Section B – Floodplains, Flood Defences, and Flood Risk – From regulatory body



## Section C – Groundwater

| Enquiry                                                                                                                  | Result     | Note                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Groundwater Flood Risk</b><br>What is the risk of groundwater flooding based on the underlying geological conditions? | Negligible | <p>ESI provides data to Argyll in relation to groundwater flooding. Through research and development, building on their expertise in addressing groundwater flooding issues for The Environment Agency and other clients in the UK, ESI has developed algorithms and calibrated predictions of the risk of groundwater flooding occurring. This differs from other suppliers of data regarding groundwater flooding which only report on the susceptibility of groundwater flooding. Susceptibility merely has to be identified, whereas risk must be quantified. The resulting map is a 50x50m classification of groundwater flooding risk into four categories (Negligible, Low, Moderate and High). ESI's classifications are based on the level of risk, combining severity and uncertainty that a site will suffer groundwater flooding within a return period of about 200 years.</p> <p>The map is a general purpose indicative screening tool, and is intended to provide a useful initial view for a wide variety of applications. However, it does not provide an alternative to a site specific assessment, and a detailed risk assessment should be used for any site where the impact of groundwater flooding would have significant adverse consequences.</p> |

### What is groundwater flooding?

Groundwater flooding occurs when groundwater levels are sufficiently raised to exceed ground level. This can occur in two main ways:

1. Clearwater Flooding. This type of groundwater flooding occurs when the water table within a bedrock aquifer rises above ground level. This is dependent upon local geology.
2. Permeable Superficial Deposits (PSD) Flooding. This type of groundwater flooding is often associated with river flooding. It occurs when river levels are swollen and the water table rises in response, within the superficial deposits associated with the watercourse, and rises above ground level.

### How is groundwater flood risk identified?

ESI are a consultancy specialising in groundwater flood risk. ESI have produced a national groundwater flood risk map, which considers a number of factors to determine the likelihood and severity of groundwater flooding in a 1 in 200 year return period (i.e. an extreme event). The key components considered are:

1. Bedrock geology
2. Superficial permeable deposits
3. Topography
4. Proximity to nearby watercourses

### How accurate is the groundwater data?

Although it is the most comprehensive groundwater dataset available, the ESI groundwater risk map has a 50m resolution. Therefore, it should not be considered a property-specific flood risk assessment, but rather a risk screening tool of the potential for groundwater flooding based on local factors identified.

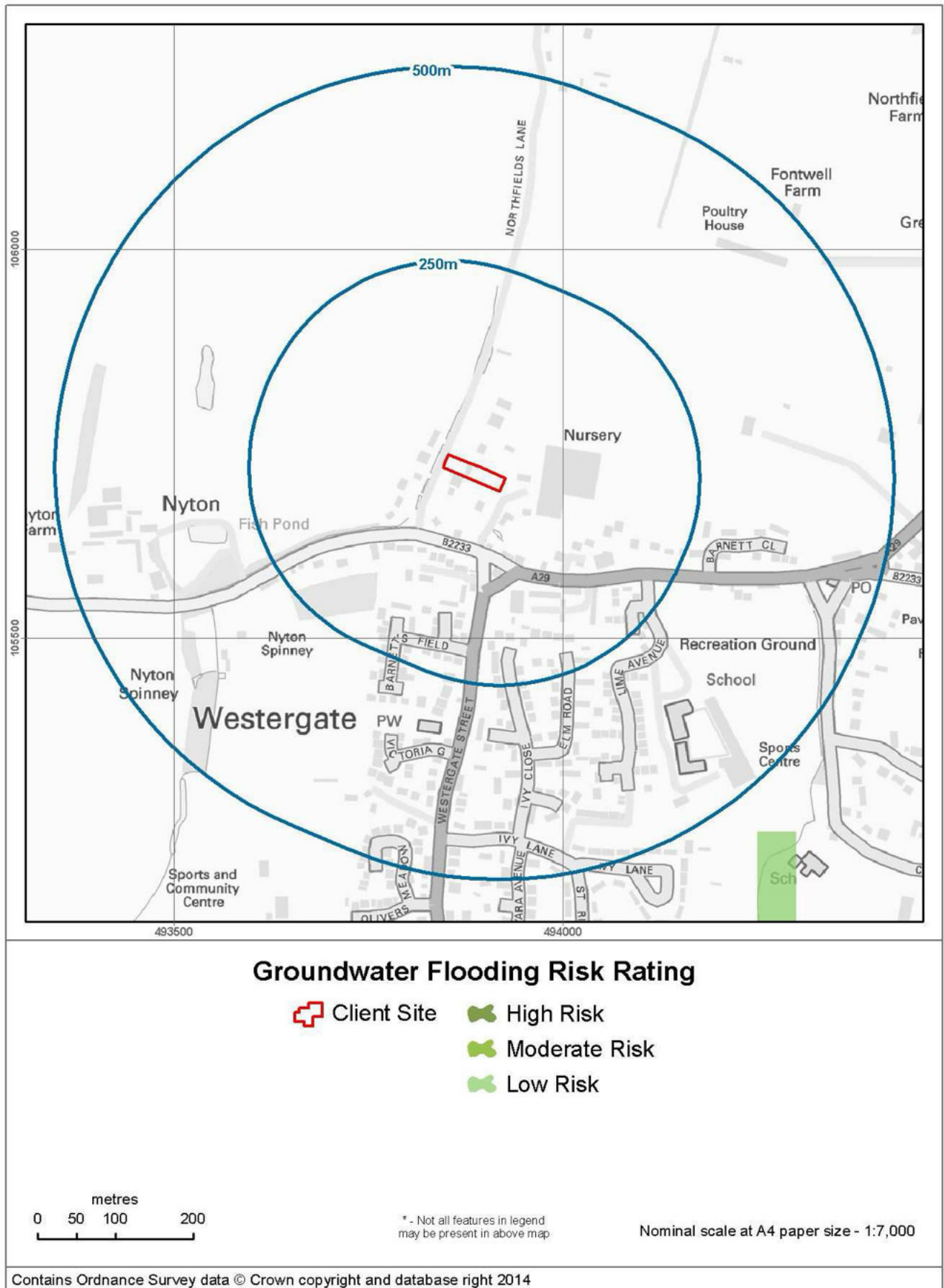
### My property has been identified as being at risk of groundwater flooding, what should I do now?

There are some factors you can identify to establish if groundwater flooding is likely to be an issue. A property will be more susceptible to groundwater flooding if:

1. It has a basement or cellar
2. It is in a depression
3. It is located on a floodplain (i.e. within a Flood Zone 2 or Flood Zone 3)
4. It is located on a spring line or within an intermittent river valley such as a winterbourne (a stream that is dry through the summer months).

If any of the above apply to your property, you may wish to have a more detailed and property specific groundwater assessment report undertaken, to clarify if groundwater flooding is likely to be an issue. Please contact us for a quote.

## Section C – Groundwater



## Section D – Historical

| Enquiry                                                                                             | Result | Note                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Historical Flooding</b><br>Have any historical flood events occurred at the site or within 250m? | YES    | <p>The regulatory body's records indicate the site has flooded in the past. It would be prudent to ask the property owner whether they are aware of any previous flooding at the property or in the surrounding area. It would be possible to ask the regulatory body for more details of the recorded incident of past flooding.</p> <p>The Environment Agency has collated extensive records (including outlines) of flooding from rivers, the sea, or groundwater which have occurred since c.1950 in order to map the outlines of recorded historical flood events. This information comes from various sources including maps, aerial photographs and private records. It is not necessarily comprehensive.</p>                     |
| <b>Flood Insurance Claim Rating</b><br>How do Crawford's rate the area for insurance claims?        | Low    | <p>Less than 2 claims Per 1000 households</p> <p>Crawford &amp; Co is the world's largest independent provider of claims management solutions to the risk management and insurance industries. Crawford have compiled information in over 9,000 postcode sectors regarding the number of insurance claims made as a result of flooding. The risk has been classified by Crawford into five categories, too few, very low (no claims), low (less than 2 claims per 1000 households), moderate (between 2 and 5 claims per 1000 households) and high (more than 5 claims per 1000 households). This information is not necessarily comprehensive and excludes flood claims arising as a result of burst pipes and domestic appliances.</p> |

# Flood Risk Screening Methodology

The Homecheck Professional® report is a desktop flood risk screening report, designed to enable home buyers and property professionals to assess the risk of flooding at residential sites. It examines two key areas; the overall risk of flooding at a site taking into account any flood defences present (where these are identified) and how flood risk affects the availability of insurance for a site. The report considers current Government guidance including the National Planning Policy Framework (NPPF) and the current agreement between insurance companies and central Government. The report has been designed and produced by qualified flood risk specialists using the data available in this report.

## Flood Risk Rating

An overall flood risk rating is provided based on an assessment of the data provided within this report. The overall risk rating in the report takes into account the effect of flood defences, where these are identified, based on the presence of flood defences registered by The Environment Agency within the vicinity of the property. It should be noted that a residual risk of flooding may remain if such defences were to fail owing to extreme weather conditions, over-topping or poor maintenance. In addition, it should be noted that flood defences do not generally offer protection against groundwater or surface water flooding.

Where no flood defences are present in the vicinity of the property the overall risk rating provides a worst case scenario which may be alleviated by smaller scale local flood defences or recently constructed flood defences not currently registered by The Environment Agency. Replies in Scotland will always present the worst case scenario where there are no flood defences in the area benefiting the site or assuming any flood defences will fail or be over-topped. This is because data regarding flood defences in Scotland is currently unavailable from the Scottish Environment Protection Agency and Local Lead Flood Authorities.

The overall risk of flooding will be answered by one of four standard responses:

| Response   | Meaning                                                                                                                                                                                                                                                                                                                                                                   |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Negligible | The overall flood risk rating for the property is assessed to be 'Negligible'. Existing datasets do not indicate any risk at the property itself, or any feature within the locality of the property, which would be expected to pose a threat of flooding. It is not considered that any further investigations are necessary in regard to flood risk.                   |
| Low        | The overall flood risk rating for the property is assessed to be 'Low'. Although large sites (over 1 ha) would require a Flood Risk Assessment examining the impact the development would have on local drainage to accompany any planning application, it is not considered necessary to undertake any other further investigations into the flood risk at the property. |
| Moderate   | The overall flood risk rating for the property is assessed to be 'Moderate'. Information from existing datasets suggests that there are certain features which may present a risk to the property and its occupants. Further assessment would normally be suggested as a prudent measure to clarify the risk of flooding at the property.                                 |
| High       | The overall flood risk rating for property is assessed to be 'High', with a consequent risk to life and property. This means that existing datasets reveal significant flood risk issues which need to be addressed. Further assessment is usually recommended in order to clarify the risk of flooding at the property.                                                  |

## Flood Risk Gauges

The flood risk gauges provide a more detailed analysis of the risk from each of the four main types of flooding – river, coastal, groundwater and surface water. In addition, a fifth gauge provides an analysis of other factors (i.e. historic flood events) that may affect the overall flood risk. For undefended fluvial and tidal flood risk and surface water flood risk data provided by JBA, only the risk rating generated during the modelled the 1:200 year return event is considered in the overall risk assessment. The data on 1:75 year and 1:1000 year return events are provided for information only. For further information on each of these types of flooding, please refer to the Homecheck Professional® User Guide.

This analysis takes into account any existing flood defences, where these are identified, that are intended to protect the property and assumes that these work as designed. The analysis also takes into account the other information contained in those data sections of the report which are relevant to that particular type of flooding. The assessment of the risk as shown in the flood gauges should therefore take priority over the information in the individual data sections of the report.