



Flood Risk and Drainage Assessment.

Proposed Residential Development
on Land East of Llewellyn House,
Main Road, Wigtoft, Boston. PE20 2NZ.

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Statement prepared for:
Mr & Mrs Stevens

By
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Contents

1.0 Introduction

- 1.1 Project Brief
- 1.2 Assessment Procedure
- 1.3 National Planning Policy Framework (NPPF)
- 1.4 Requirements of National Planning Policy Framework

2.0 Site Details

- 2.1 Site Overview
- 2.2 Site Description
- 2.3 Surrounding Area
- 2.4 Development Proposals

3.0 Scoping Study

- 3.1 Indicative Floodplain Map
- 3.2 Historical Flooding
- 3.3 Strategic Flood Risk Assessment
- 3.4 National Planning Policy Framework – The Sequential Test
- 3.5 Mechanisms of Flooding

4.0 Flood Risk Assessment

- 4.1 Introduction
- 4.2 Fluvial (Rivers)
- 4.3 Pluvial (Drainage Systems)
- 4.4 Surface Run-off
- 4.5 Ponding
- 4.6 Groundwater
- 4.7 Residual Risk

5.0 Recommended Flood Mitigation

- 5.1 Introduction
- 5.2 Design Levels
- 5.3 Site Topography and Flood Routing
- 5.4 Sustainable Drainage Systems
- 5.5 Flood Resistance & Resilience

6.0 Drainage Strategy

- 6.1 Introduction
- 6.2 Existing Surface Water Drainage
- 6.3 Existing Foul Water Drainage
- 6.4 Proposed Surface Water Drainage
- 6.5 Proposed Foul Water Drainage
- 6.6 Maintenance/Adoption
- 6.7 Sustainable Drainage Techniques

7.0 Conclusions & Recommendations

- 7.1 Review of NPPF Objectives
- 7.2 Review of Drainage Strategy

Executive Summary

Woodsyde Developments Ltd has been commissioned by Mr & Mrs Stevens to undertake a Flood Risk Assessment (FRA) to support a planning application for a Residential Development on Land at East of Llewellyn House, Main Road Wigtoft PE20 2NZ. The proposed development will be accessed direct from a new bellmouth served from the existing gateway to the application land along Main Road.

The site is approximately 0.2248 hectares (0.555 acres) in size. The site like much of the country falls within an area that may be at risk of flooding and as such requires the submission of a Flood Risk Assessment as designated by National Planning Policy Framework (NPPF). According to the Environment Agency Flood Maps the application site is located part within Flood Zone 3.

As part of the site appraisal process it has been necessary to demonstrate that the proposed development can be achieved with an acceptable risk of flooding and without increasing flood risk to third parties. This report describes the methods used and the results of this study. The report takes into account the recommendations of National Planning Policy Framework (NPPF)

This report will demonstrate that there will be no flood risk to the site or any other properties as a result of this development. Appropriate suds drainage will be provided within the development, with the discharge reduced to Greenfield run-off rates. The proposals will include the use of an attenuation system for the disposal of the surface water drainage and areas of no dig construction.

1.0 Introduction

1.1 Project Brief.

Woodsyde Developments Limited has been commissioned to carry out a Flood Risk Assessment to satisfy the Boston Borough Council and Environment Agency's (EA) requirements for a Flood Risk Assessment (FRA) for a planning application for a residential development on Land East of Llewellyn House, Main Road Wigtoft on behalf of Mr & Mrs Stevens.

The FRA is prepared in full accordance with the National Planning Policy Framework (NPPF). The FRA is required to identify the 1% (1 in 100 year) and 1%+ allowance for climate change flood extents and levels for the site and ensure that all aspects of development are clear of the 1%+ allowance for climate change floodplain.

The Environment Agency Flood Maps indicate that the site to be wholly located in Flood Zone 3 and is potentially liable to any flood risk from Rivers and the Sea. The area of land the subject of the planning application comprises a rectangular shaped area bordered primarily by residential development to the east and west. Access to the development will be via a new bellmouth located over the existing gated access.

The existing ground levels across the site vary from a high of approximately 2.8 – 2.9m across the site, with a lower level of approximately 2.659m in the south eastern corner and high of approximately 3.091m adjacent to the existing field gate.

The proposed dwellings will be protected from any potential pluvial, fluvial or groundwater flooding risk by raising the and by setting the finished floor levels typically 500mm above the surrounding ground. It is proposed to capture any possible pluvial overland flows at source and direct them to the proposed drainage system. Cut-off drains will be utilised where appropriate to capture any possible exceedance flows.

1.2 Assessment Procedure

This report has been prepared in accordance with the requirements of NPPF.

An assessment of the flood risk to the proposed development has been considered on the basis of the best information available at the date of this report. The assessment herein is deemed appropriate to the requirements of the Environment Agency, the scale and nature of the development, and the available data. The key elements of this assessment are as follows:

- Desk study scoping exercise;
- Site visit;
- Consultation with relevant authorities;
- Review of site topography and development proposals;
- Identification of data corresponding to appropriate design flood events;
- Consideration of climate change;
- Consideration of flood risks to and from the development;
- Calculation of the impact of the development on surface water run-off, and;
- Recommended attenuation measures.

1.3 National Planning Policy Framework

- NPPF was published by Communities and Local Government, March 2012 and supersedes the Planning Policy Guidance Note 25
- NPPF has been developed to provide additional guidance to local planning authorities to ensure the effective implementation of the planning policy set out in the NPPF on development in areas at risk of flooding.
- The guidance retains the key elements of Planning Policy Statement 25.
- The Environment Agency is a statutory consultee for all planning applications and will give comment and recommendations to the planning authority for any proposed developments affecting a watercourse.
- NPPF and PPS25 states that a Strategic Flood Risk Assessment (SFRA) should be carried out by the local planning authority to inform the preparation of Local Development Documents (LDDs), having regard to catchment wide flooding issues which affect the area. The SFRA will provide the information needed to apply the sequential approach.

1.4 Requirements of NPPF.

For a FRA proportionate to the risk and appropriate to the scale, nature and location of the development the following will need to be considered;

- the risk of flooding arising from the development in addition to the risk of flooding to the development; take the impacts of climate change into account;
- the potential adverse and beneficial effects of flood risk management infrastructure including raised defences, flow channels, flood storage areas and other artificial features together with the consequences of their failure;
- the vulnerability of those that could occupy and use the development, taking account of the Sequential and Exception Tests and the vulnerability classification, including arrangements for safe access;
- quantify the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and identify flood risk reduction measures, so that assessments are fit for the purpose of the decisions being made;
- the effects of a range of flooding events including extreme events on people, property, the natural and historic environment and river and coastal processes; include the assessment of the remaining (known as 'residual') risk after risk reduction measures have been taken into account and demonstrate that this is acceptable for the particular development or land use;
- how the ability of water to soak into the ground may change with development, along with how the proposed layout of the development may affect drainage systems;
- and be supported by appropriate data and information, including historical information on previous events.

2.0 Site Details

2.1 Site Overview

The site is located to the eastern fringe of the village of Wigtoft and will be served by upgrading the existing gated field entrance from Main Road. The development will be for 4 dwellings only, with the whole of the land fronting Main Road and sits between existing residential development either side of the application site. (NGR 381339 303940).

Figure 2.1 below shows the location of the application site.



OS NGR	TF 526934 335983
Local Planning Authority	Boston Borough Council
Environment Agency Office	Lincoln Region
Water Utility Company	Anglian Water

2.2 Site Description

The application site lies on the eastern fringes of the village of Wigtoft to the west of the site and larger village of Sutterton approximately 1000m to the east. The site forms a paddock type area adjacent to the property known as Llewellyn House. The site is approximately 0.2248 hectares and typically falls from north to south. The site sits at a level of approximately 2.9m AOD central to the site.

The site is fairly rectangular in shape and access will be derived from an improvement of the existing gated field access from Main Road. The proposals are for 4 dwellings only with all properties having frontage to Main Road.

The site is bounded by residential development to the east and west, with typically agricultural lands and open fields to the immediate north and south.

2.3 Surrounding Area

To the northern and southern boundary lies agricultural fields with existing residential development to the west and east. The village of Wigtoft is only a short distance to the west and larger village of Sutterton approximately 1 kilometre to the east. An open ditch/watercourse bounds the eastern and southern boundaries. All boundaries appear to have mature hedging.

2.4 Development Proposals

The proposed development will be a residential development of 4 detached chalet type dwelling units. A Drainage Layout Plan has been provided to support the planning application. (see Appendix A).

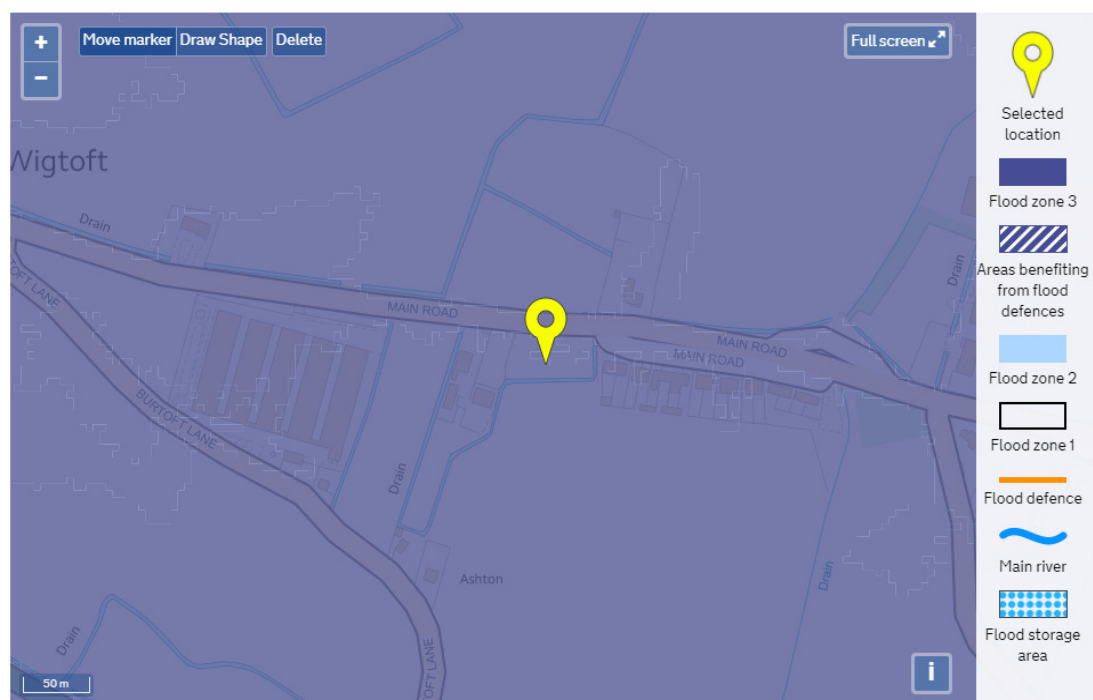
The development proposals will not result in an increase in surface water with the design of the surface water drainage system limited to existing Greenfield run-off rates.

3.0 Scoping Report

3.1 Indicative Floodplain Map

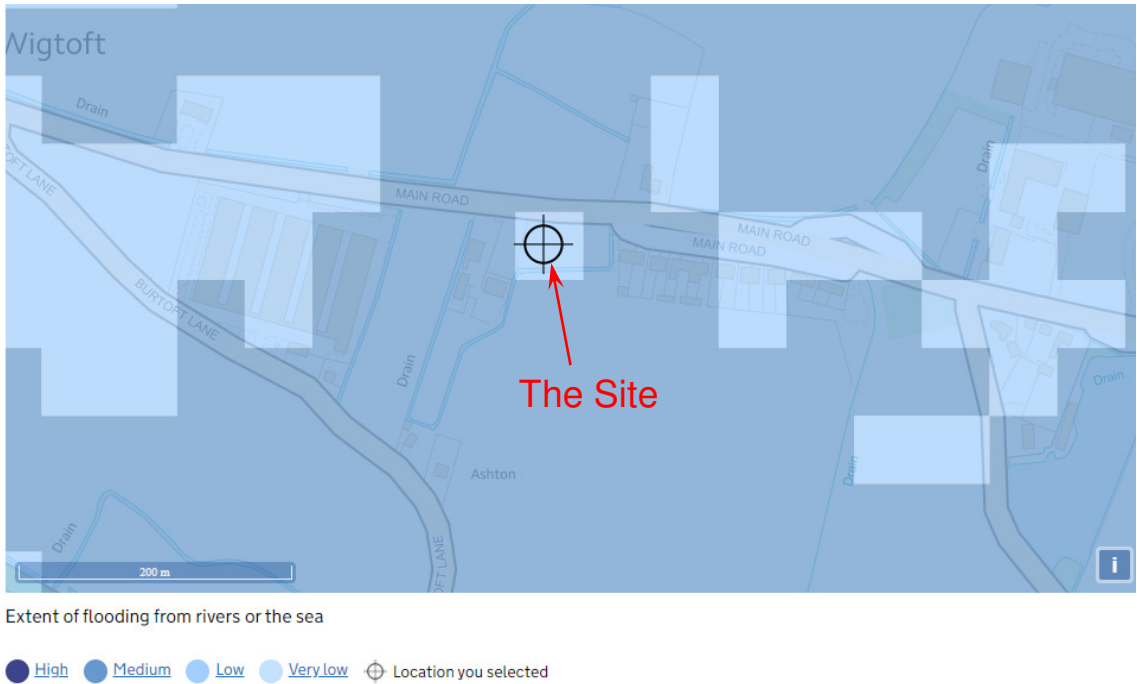
The Environment Agency is responsible for the provision of information pertaining to flood risk from tidal and main watercourses throughout England and Wales. The EA provides online information service through its Flood Map data. This data is not intended to provide detailed flood information for individual properties but does provide a useful resource at scoping stage. An extract from the Flood Maps is given in Figure 3.1 and 3.3 below.

Figure 3.1: Extract from EA Flood Map – Planning (downloaded on 21.12.20) Flood Risk



It can be seen from the above that the site and general area is at risk of flooding and is located within Flood Zone 3. Flooding here will likely occur if the large coastal raised flood defences are breached and flood waters surge along the many watercourses and ditches that serve this low-lying area of east Anglia.

Figure 3.2: Extract from EA Flood Map – Planning (downloaded on 21.12.20) Flood Risk from Rivers



It can be seen that the site lies within area of Low to Medium risk of flooding from rivers and the sea.

Figure 3.3: Extract from EA Flood Map – Planning (downloaded on 21.12.20) Flood Risk from Surface Water



From the above map it can be seen that the site is not at risk of flooding from surface water run-off.

Flood Zone 3 areas have the highest risk of flooding and as such it is recommended that development is typically restricted in these areas to essential development only.

From the Environment Agency Flood Maps the risk of flooding from surface water is also detailed and it can be seen from the map below that the site has no residual risk

3.2 Historical Flooding

Following discussion with the landowner who has lived adjacent to the site for the last 14 years there have been no reported incidents of flooding from any source at the application site.

We are fully aware of the risk of flooding from rivers and seas, particularly the rivers that are potentially tidal and are related to the sea. The main river locally is the River Welland that potentially could affect the site, but this is around 7-7.5km south and indeed would mean there had been a breach of the tidal defences along the river. Tidal flooding unlike fluvial flooding is predictable well in advance of the event and the site can be prepared to evacuate if advised by the Environment Agency's Flood Warning Procedures.

Coastal flooding may be caused by seasonal high tides, where increasing water level above the astronomical tide level is created by strong onshore winds and/or by storm driven wave action and a deep atmospheric low pressure. Extreme conditions leading to coastal flooding are most commonly a result of combination of two or more of these mechanisms.

According to the Environment Agency Tidal Hazard Mapping, if there was a breach of tidal defences the depth of flow would be between 0.25-0.5m. Ordinarily therefore the Environment Agency would typically recommend that appropriate mitigation methods/flood resilience techniques are incorporated into the design of development and recommend that the finished floor level should be determined by the predicted breach flood depth map and for depths of 0.25-0.5m with finished floor levels should be set half a metre above the ground level and flood resilience construction to be used to a height of 0.3m above the predicted flood level. The proposed finished floor level of the dwellings are suggested to be 3.4m ODN which is approximately 0.5m above the existing average ground level which would be in accordance with the Environment Agency's typical recommendations.

3.3 Strategic Flood Risk Assessment

The Boston Council Local Plan advises that development should be well located and preferably on previously developed land. Here it is expected that preference should be given to locating development in Flood Zone 1. However, consideration must be given to the risk of alternative sources of flooding (e.g. surface water, sewage, and/or groundwater). Sustainable urban drainage techniques should be employed to ensure that any existing flooding problems elsewhere within the area are not exacerbated.

3.4 NPPF– The Sequential Test

The sequential test should demonstrate that there are no reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed.

NPPF suggests that where an SFRA is not available, the sequential test will be based on the EA Flood Zones. The EA maps confirm that the site sits part within Medium and part in Low probability of flood risk from rivers and seas. From the maps above it can be seen there is no risk of surface water run-off.

When applying the sequential approach for flood risk and an overview of the EA maps, the site sits within Flood Zone 3, high probability, as the site is shown to be within the tidal floodplain, without defences in place. The proposed use for residential use is classified as ‘more vulnerable’ uses of land, Table 3.0 Flood Risk Vulnerability and Classification shows that development of this nature are permitted in Zone 3 and is restricted of Table 3.0 shown below.

Table 3.0: NPPF: Flood Risk Vulnerability and Flood Zone ‘Compatibility’

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	X	Exception Test required	✓
	Zone 3b ‘Functional Floodplain’	Exception Test required	✓	X	X	X

Key:

✓ Development is appropriate. x Development should not be permitted

NPPF requires development within high areas of risk to be determined using a sequential risk-based approach to the location of the development to avoid where possible flood risk to people and property and manage any residual risk, taking into account impacts of planet change.

3.5 Mechanisms of Flooding

To understand the risk of flooding to a site, it is imperative that potential sources of flooding be clearly defined. The likelihood and severity of flooding depends on the characteristics of the flood sources and the degree to which the site is currently, or

can potentially, be protected against flooding from these sources. Table 3.2 reviews the potential risk of flooding at the proposed site from different sources.

Table 3.2 Potential Risk of Flooding to the Proposed Development

Source of Flooding	Potential			Comments
	High	Med	Low	
Fluvial (Rivers)	X			The site is located within Flood Zone 3 (High Probability)
Tidal/Coastal		X		The site is located in a position where there may be risk of tidal flooding.
Pluvial (drainage system)			X	Possibility of Pluvial flooding in an intense rainfall event due to insufficient sewer capacity
Surface Run-off			X	Increased areas of impermeable material
Ponding			X	Proposed drainage must prevent Ponding
Groundwater			X	No apparent Groundwater flood risk. No basements proposed at this site.

4.0 Flood Risk Assessment

4.1 Introduction

Following the scoping exercise, the primary flood risks are identified to be from Fluvial and Tidal. These sources of flooding have been investigated in greater detail, to ascertain whether the risks are acceptable to the nature of the proposed development. Opportunities to mitigate these risks are discussed in Section 5 of this report.

4.2 Fluvial (Rivers)

The site is located within Flood Zone 2/3 (medium/high probability), which means that the likelihood of flooding from fluvial or tidal sources in Flood Zone 1 is less than a 1 in 1000-year probability of flooding or <0.1% and potentially greater than 1 in 100-year probability of flooding.

We are aware that the surrounding rivers in the locality are potentially at risk from tidal sources. However these have been mitigated with flood defences which effectively ensures the site is unaffected. Nonetheless, should the defences be breached resilient measures will be required whereby the properties are raised 500mm above existing average ground levels. Most likely a beam and block type floor will be used where the finished floor level is raised above existing ground levels. If this is used then the underfloor voids must be drained.

There are small ditches to the east and south of the application land with the ground falling slightly from north to south. By in large the ditches remain fairly dry through much of the year.

The issue regarding potential tidal flood risk, the property finished floor level will be 500mm above average ground level. External doors will not be susceptible to moisture and any airbricks or wall vents will be fitted where they shut under flood conditions, treated and sealed skirting and architraves would be used and where practical sockets and electrics will be at least minimum 0.5m above the raised ground floor level. Each property owner would sign up to the Environment Agency's Flood Line.

4.3 Pluvial (Drainage Systems)

There is no reported evidence of pluvial flooding at the application site. The proposed drainage system for the site will utilise Sustainable Drainage Systems (SUDS) where possible. This will include the provision of an attenuation feature with controlled discharge to the existing watercourse to the south of the site.

Currently there is no identifiable surface water drainage system to the site, save the two ditches which run along the eastern and southern boundary.

The new and proposed drainage will feature a positive piped system to collect the surface water run-off from the properties, driveways and the access road. The drainage proposals will collect any potential pluvial flooding and direct it away from the proposed properties. The drainage system will be designed for 1 in 100-year events including 40% climate change. French drainage will be provided to any boundary where ground continues to rise above the development.

Further details of the Drainage Strategy for the site are presented in Section 6 of this report.

4.4 Surface Run-off

Currently the surface water simply discharges to ground.

The surface water drainage for the proposed development will utilise an attenuation feature within the site. The drainage systems will be designed to accommodate the worst event 1 in 100-year storm + 40% for climate change.

Further details of the Drainage Strategy for this site are presented in Section 6 of this report. Appropriate cut-off drains will be provided to boundaries to capture any flows from adjacent land. The site drainage will capture any exceedance flows and potential urban creep.

4.5 Ponding

Ponding may occur if drainage is not adequately designed. Ponding will most likely occur after periods of heavy rainfall, although this will drain in part to topsoil's and in part across grounds and lands to be collected in the positive drainage systems that will be provided to the development as a part of the overall surface water drainage. The new development will have to implement an adequate drainage system as discussed in Section 5 and 6 of this report.

4.6 Groundwater

There is no apparent flooding threat posed from the ground water level at this site. There are currently no basements to be constructed in the development and therefore no seepage into these structures will occur. Suitable cut-off drainage and French drainage will be incorporated to ensure there are no issues from this source.

4.7 Residual Risk

It is considered that there will be no residual risk as a result of the proposed development.

5.0 Recommended Flood Mitigation

5.1 Introduction

This section discusses mitigation options that should be considered in order to reduce the severity of the flood risk and to minimise the potential hazards associated with any residual flood risk.

5.2 Design Levels

The proposed built form of the development lies within a potential fluvial floodplain which is protected from existing defences that are properly maintained to protect from flooding by the Environment Agency. However as a matter of course; it is recommended that all floor levels are at least 500mm above existing ground levels.

5.3 Site Topography and Flood Routing

Where achievable there should be a differential level of at least 500mm between the threshold and surrounding ground levels. Where possible, levels should also fall away from buildings, and areas where water could dam up against structures should be avoided, even if drainage is provided. The site is gently undulating and has a predominant fall from north to south.

The existing ground levels across the site vary from a high of approximately 2.98m AOD in the north easterly corner and a lower level of approximately 2.66m AOD in the south eastern corner. Centrally the site sits at an approximate level of 2.80m AOD.

There is a small ditch course to the eastern and southern boundary of the development which then continues in a southerly direction to connect to further watercourses and drains.

5.4 Sustainable Drainage Systems

It is now commonly a planning requirement to consider utilising sustainable drainage systems (SUDS), if it is appropriate to the specific site conditions. These systems are diverse, but generally aim to provide drainage systems that may facilitate flood and/or pollution control, related to run-off. Such systems are generally 'soft engineering' and as a result can be financially, as well as environmentally, attractive engineering solutions.

From discussion with the vendor the ground is heavy clay and as such porosity will not be available. However an attenuation feature will be used for the site surface water drainage with controlled outfall to the existing ditch course along the southern boundary of the site.

5.5 Flood Resistance & Resilience

A basic level of flood resistance and resilience can be achieved by following good building practice and complying with the requirements of the Building regulations 2000 published by the Office of the Deputy Prime Minister (ODPM). The incorporation of flood proofing measures should be considered as part of the design and construction of the development. These will include lifting and raising electrical socks/outlets/boilers etc to at least minimum 0.5m above the raised ground floor level,

avoiding the use of absorbent cavity insulation including the ground floor which ordinarily should be provided as concrete. External doors to be of construction not susceptible to moisture, treated and sealed timber skirting and architraves. In addition, the site is in an area that can receive flood warning from the EA, flood line warning direct system and as a matter of course each property will be registered on the EA's flood line system in order that they may receive advance warning of flooding by telephone, mobile, fax, SMS, email or other.

6.0 Drainage Strategy

6.1 Introduction

In order to demonstrate that all forms of flooding have been considered as required by NPPF a drainage strategy is being developed. The aim of including this strategy as part of the flood risk assessment is so that it can easily be seen that the proposed development will not adversely affect the surface water regime in the area and that overall the current situation will be improved. A site layout can be found in Appendix A.

6.2 Existing Surface Water Drainage

The site currently has no clear identifiable surface water drainage, save the existing ditch along the eastern and southern boundary. We understand that there is no porosity within this ground.

6.3 Existing Foul Water Drainage

We understand that the property known as Lewellan House to the west of the site drains to the public sewer which runs along the main road.

It is understood that the existing foul water system are maintained by Anglian Water Ltd.

6.4 Proposed Surface Water Drainage

It is proposed to use suitably designed piped drainage system for the roads, dwellings and driveways, with this discharging to an attenuation feature designed for the worst event 1 in 100-year storm including 40% climate change.

SuDS techniques will be utilised within the development with the possible use of water butts and rainwater harvesting where appropriate.

The proposed development falls within the high probability Flood Zone 2/3 as identified on the Environment Agency Flood Maps, however we are aware of the flood defences to prevent issues with potential tidal flooding of the closest rivers and the Environment Agency's recommendations that the properties are raised at least 0.5m above existing ground levels which has been recommended for this particular scheme and therefore is suitable for the predicted flood level following a breach to the tidal defences. The surface water will be collected at source and will be suitably designed for the 1 in 100-year event plus 40% climate change. This will provide betterment to the existing arrangements and better protect adjacent dwellings.

6.5 Proposed Foul Water Drainage

It is proposed that the foul water to the proposed dwellings shall outfall via gravity to the existing foul network within the main road fronting the development.

All sewers will be designed in accordance with Codes for Adoption.

6.6 Maintenance/Adoption.

Surface water will discharge to an attenuation feature, the ongoing maintenance of which will be placed with a suitable Management Company. The foul water will be offered for adoption by the Water Authority under the terms of a Section 104 Agreement. The access roads will remain private within a management company.

6.7 Sustainable Drainage Techniques

It is now commonly a planning requirement to consider utilising sustainable drainage systems (SUDS), if it is appropriate to the specific site conditions. These systems are diverse, but generally aim to provide drainage systems that may facilitate flood control, related to run-off. Such systems are generally 'soft engineering' and as a result can be financially, as well as environmentally, attractive engineering solutions.

The ground has insufficient porosity to allow the use of soakaways, nonetheless the water will be collected and direction to an attenuation feature. This will discharge at Greenfield rates. The controlled discharge will drain to the existing ditch course to the south of the site.

Where possible the use of water butts and some rainwater harvesting may be used, otherwise all surface water will drain to a new attenuation feature.

7.0 Conclusions & Recommendations

The proposed residential development on Land adjacent Lewellan House, Main Road, Wigtoft has been assessed with regards to flood risk. The site falls partially within Flood Zone 2/3; however the site does benefit from the protection from tidal flooding by the existing defences which are properly maintained and subject to satisfactory surface water drainage to the site proposals there will be no flood risk to the site or any other properties. Applying the Flood Risk Vulnerability Classification of NPPF the residential use falls within the more vulnerable use and given the defences and recommendations for finished floor levels and differential between floor levels and existing ground, we consider that the sequential and exceptions tests are satisfied.

7.1 Review of NPPF Objectives

The proposed development will not be affected by current or future flooding from any source, given the protection provided by the existing flood defences from any tidal flooding. Appropriate additional cut-off and French/land drains will be provided to receive any potential surface water run-off.

The site is situated at an approximate level of 2.80m AOD, with a high of approximately 2.98m AOD along the north eastern boundary and a low of approximately 2.66m AOD in the south eastern corner of the site.

The development will not increase flood risk elsewhere, with the restriction of surface water run-off at Greenfield rates.

The measures proposed to deal with the effects and risks are appropriate, for example using attenuation features, permeable paving and cut-off/land/ditch course drainage where possible.

It is considered that the exception test has been met whereby finished floor levels will be raised minimum 0.5m above existing ground levels in accordance with the EA recommendations and that the minimum floor level is at 3.40m ODN which is suitable for the predicted floor levels following the breach to the tidal defences in a 1 in 1000-year event.

The site will benefit from the use of a positive drainage system for the surface water drainage.

Other origins of flooding have also been assessed and it has been found that there will be no increase in risk of flooding from land, groundwater or sewers as a result of this development.

Proposed mitigation by relatively simple design and construction techniques will be employed and used whereby materials shall typically be flood resilient construction as outlined above.

There are no anticipated negative social, economic or environmental impacts which would result from the development of the site provided mitigation measures outlined in Section 6.4 are adhered to.

Review of Drainage Strategy

The proposed development will ensure that the 1 in 100 year + 40% climate change flows will be included within the design.

The surface water drainage will drain to suitably designed attenuation feature which will then outfall to the existing ditch course that runs to the south of the site.

Permeable paving, rainwater butts, rainwater harvesting, cut-off drains and land drainage will be provided where necessary to ensure Sustainable Drainage Techniques.

The foul water for the dwellings will outfall into Main Road.

New foul water sewers will be constructed in line with Codes for adoption and applications for a Section 104 and Section 106 Agreements will be made where applicable.

Sustainable Drainage Systems will be utilised as where appropriate in the form of an attenuation pond and this will be incorporated at the detailed design stage.

Appendices

Appendix A: LH-GA-400 Rev A – General Arrangements Plan