Kilkenny County Council
Comhairle Chontae Chill Chainnigh

Kilkenny City & County Development Plan

Consolidated Strategic Flood Risk Assessment

2021-2027

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1 Introduction

The *Planning System and Flood Risk Management – Guidelines for Planning Authorities*[1] were published in November 2009. These Guidelines were issued under Section 28 of the Planning and Development Act 2000 as amended, and require Planning Authorities to introduce flood risk assessment as an integral and leading element of their development planning functions. This is achieved by ensuring that the various steps in the process of making a development plan, together with the associated Strategic Environmental Assessment (SEA), are supported by an appropriate Strategic Flood Risk Assessment (SFRA).

This SFRA forms Appendix 1 to the Environmental Report for the Kilkenny City & County Development Plan (DCCDP) and should be read in conjunction with that Environmental report. The purpose of this SFRA is to inform the Strategic Environmental Assessment (SEA) of the plan, and in this way inform the policies and objectives of the plan.

An SFRA was carried out as part of the Draft City and County Development Plan 2021 in December 2020. This was amended as part of the Proposed Material Alterations stage to the Draft City and County Development Plan in June 2021. The *Proposed Material Alterations, Volume 2: Strategic Environmental Assessment (including Strategic Flood Risk Assessment) and Natura Impact Report* should be read in conjunction with this SFRA.

1.1 City and County Development Plan

As set out in the Environmental Report, Kilkenny CCDP applies to the entire county. The CCDP is strategic in nature, and sets out broad strategies, including a settlement strategy, on a County-wide basis. The CCDP includes a development framework for a total of twenty-four settlements. The settlements of Kilkenny and New Ross Environs are dealt with in detail. In addition, twenty-two settlements (Ballyhale, Ballyragget, Bennettsbridge, Clogh-Chatsworth, Fiddown, Freshford, Goresbridge, Gowran, Inistioge, Johnstown, Kells, Kilmacow, Kilmoganny, Knocktopher, Moneenroe, Mooncoin, Mullinavat, Paulstown, Piltown, Slieverue, Stoneyford and Urlingford) are subject to a settlement boundary in the CCDP.

There are other Local Area Plans covering settlements in the county, which are not affected by this CCDP. These Plans are scheduled for review on a rolling six-year basis over the life of the CDP (Callan, Castlecomer, Ferrybank/Belview, Graiguenamanagh and Thomastown).

1.2 Disclaimer

The SFRA is a live document that is designed to be updated as further flood risk information becomes available and changes to the development plan are proposed under any variations.

Accordingly, all information in relation to flood risk is provided for general policy guidance only. It may be substantially altered in light of future data and analysis. As a result, all landowners and developers are advised that Kilkenny County Council and its agents can accept no responsibility for losses or damages arising due to assessments of the vulnerability to flooding of lands, uses and developments. Owners, users and developers are advised to take all reasonable measures to assess the vulnerability to flooding of lands in which they have an interest prior to making planning or development decisions.

[1] Department of Environment, *The Planning System and Flood Risk Management – Guidelines for Planning Authorities*, 2009

1.3 Structure of this report

Section 2 gives an overview of the principles of the Guidelines. Section 3 provides a review of data collection, flood history and predicted flood extent (including climate change impacts) in each of the settlements. Section 4 discusses how the sources are used in the generation of flood zones. Section 5 discusses the development frameworks proposed under this Plan. Section 6 provides policy guidance and suggested approaches to managing flood risk and development.

1.4 Purpose of Strategic Flood Risk Assessment

In line with the Guidelines, the purpose of this SFRA is to integrate an assessment of flood risk into the planning process, specifically to:

- Provide for an improved understanding of flood risk issues within the County Development Plan,
- Identify whether flood risk is an issue in the settlements for which the development management framework (e.g. zoning map or settlement boundary) is being altered.

More specifically the SFRA will complete the following tasks;

1. Undertake a flood risk assessment for the settlements,
2. Review the various sources of potential Flood Zone mapping,
3. Assist in the review of land use zoning objectives and the application of the sequential approach and justification test,
4. Prepare flood risk management objectives, development management standards and recommendations.

2 Flood Risk Principles

2.1 Introduction

Prior to discussing the management of flood risk, it is helpful to understand what is meant by the term. It is also important to define the components of flood risk in order to apply the principles of the Guidelines in a consistent manner. The Guidelines describe flooding as a natural process that can occur at any time and in a wide variety of locations. Flooding can often be beneficial, and many habitats rely on periodic inundation. However, when flooding interacts with human development, it can threaten people, their property and the environment.

This Section will firstly outline the definitions of flood risk and the Flood Zones used as a planning tool; a discussion of the principles of the Guidelines and the management of flood risk in the planning system will follow.

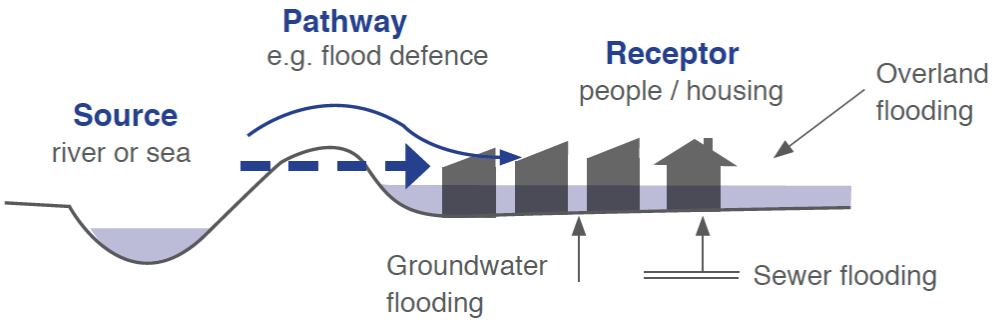
2.2 Definition of Flood Risk

Flood risk is generally accepted to be a combination of the likelihood (or probability) of flooding and the potential consequences arising. Flood risk can be expressed in terms of the following relationship:

Flood Risk = Probability of Flooding x Consequences of Flooding

The assessment of flood risk requires an understanding of the sources, the flow path of floodwater and the people and property that can be affected. The source - pathway - receptor model, shown below in Figure 2.1, illustrates this and is a widely used environmental model to assess and inform the management of risk.

Figure 2.1 Source Pathway Receptor Model (Fig. 2.2 of the Guidelines)



Principal sources of flooding are rainfall or higher than normal sea levels while the most common pathways are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets. Receptors can include people, their property and the environment. All three elements must be present for flood risk to arise. Mitigation measures, such as defences or flood resilient construction, have little or no effect on sources of flooding but they can block or impede pathways or remove receptors.

The planning process is primarily concerned with the location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk.

2.3 Likelihood of Flooding

Likelihood or probability of flooding of a particular flood event is classified by its annual exceedance probability (AEP) or return period (in years). A 1% AEP flood indicates the flood event that will occur or be exceeded on average once every 100 years and has a 1 in 100 chance of occurring in any given year.

Return period is often misunderstood to be the period between large flood events rather than an average recurrence interval. Annual exceedance probability is the inverse of return period as shown in Table 2.1.

Table 2.1 Probability of Flooding

Return Period (Years)	Annual Exceedance Probability (%)
2	50
100	1
200	0.5
1000	0.1

Considered over the lifetime of development, an apparently low-frequency or rare flood has a significant probability of occurring. For example:

• A 1% flood has a 22% (1 in 5) chance of occurring at least once in a 25-year period - the period of a typical residential mortgage;
• And a 53% (1 in 2) chance of occurring in a 75-year period - a typical human lifetime.

2.4 Consequences of Flooding

Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure of the population, presence and reliability of mitigation measures etc).

The Guidelines have categorised land uses into three vulnerability classes and have also specified which vulnerability class would be appropriate in each flood zone, or where the Justification Test would be required.

The table of vulnerability classes (Table 3.1 of the Guidelines) is as follows:

Table 2.2: Classification of vulnerability of different types of development	
Vulnerability Class	Land uses and types of development which include*:
Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).
*Uses not listed here should be considered on their own merits Source: Table 3.1 of the Flooding Guidelines	

2.5 Definition of Flood zones

In the Guidelines, Flood Zones are used to indicate the likelihood of a flood occurring. These Zones indicate a high, moderate or low probability of flooding from fluvial or tidal sources and are defined below.

It is important to note that the definition of the Flood Zones is based on an undefended scenario and does not take into account the presence of flood protection structures such as flood walls or embankments. This is to allow for the fact that there is a residual risk of flooding behind the defences due to overtopping or breach and that there may be no guarantee that the defences will be maintained in perpetuity.

It is also important to note that the Flood Zones indicate flooding from fluvial and tidal sources and do not take other sources, such as groundwater or pluvial, into account, so an assessment of risk arising from such sources should also be made.

There are three types of flood zones defined:

Zone A High probability of flooding.	This zone defines areas with the highest risk of flooding from rivers (i.e. more than 1% probability or more than 1 in 100) and the coast (i.e. more than 0.5% probability or more than 1 in 200).
Zone B Moderate probability of flooding.	This zone defines areas with a moderate risk of flooding from rivers (i.e. 0.1% to 1% probability or between 1 in 100 and 1 in 1000) and the coast (i.e. 0.1% to 0.5% probability or between 1 in 200 and 1 in 1000).
Zone C Low probability of flooding.	This zone defines areas with a low risk of flooding from rivers and the coast (i.e. less than 0.1% probability or less than 1 in 1000). Flood Zone C covers all areas of the plan which are not in zones A or B.

2.6 The Sequential Approach

The sequential approach in terms of flood risk management is based on the following principles: AVOID - SUBSTITUTE - JUSTIFY - MITIGATE – PROCEED.

The primary objective of the sequential approach is that development is primarily directed towards land that is at low risk of flooding (Avoid). The next stage, and only where avoidance is not possible, is to ensure that the type of development proposed is not especially vulnerable to the adverse impacts of flooding (Substitution).

Where possible, development in areas identified as being at flood risk should be avoided; this may necessitate de-zoning lands within the development plan. If de-zoning is not possible, then rezoning from a higher vulnerability land use, such as residential, to a less vulnerable use, such as open space may be required.

Where rezoning is not possible, exceptions to the development restrictions are provided for through the application of the Justification Test. Many towns have central areas that are affected by flood risk and have been targeted for growth, such as Kilkenny city. To allow the sustainable and compact development of these urban centres, development in areas of flood risk may be considered necessary. For development in such areas to be allowed, the Justification Test must be passed.

The Justification Test has been designed to rigorously asses the appropriateness, or otherwise, of such developments. The test is comprised of two processes; the Plan-making Justification Test, and the Development Management Justification Test. The latter is used at the planning application stage where it is intended to develop land that is at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be considered inappropriate for that land, and where the Plan Making Justification Test has already been applied and passed as part of this SFRA process.

Table 2.3 shows which types of development, based on vulnerability to flood risk, are appropriate land uses for each of the Flood Zones. The aim of the SFRA is to guide development zonings to those which are 'appropriate' and thereby avoid the need to apply the Justification Test.

Table 2.3: Matrix of vulnerability classes and flood zones

Development	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable	Justification Test	Justification Test	Appropriate
Less vulnerable	Justification Test	Appropriate	Appropriate
Water-compatible	Appropriate	Appropriate	Appropriate

Source: Table 3.2 of the Flooding Guidelines

2.7 Plan Making Justification Test

Only the Plan-Making Justification Test is relevant to a Strategic Flood Risk Assessment for a Plan, and this is described as follows.

Justification Test for Development Plans (See p.37 of the Guidelines)

"Where, as part of the preparation and adoption or variation or amendment of a development/local area plan, a planning authority is considering the future development of areas in an urban settlement that are at moderate or high risk of flooding, for uses or development vulnerable to flooding that would generally be inappropriate as set out in Table 3.2 of the Guidelines, all of the following criteria must be satisfied:

1) The urban settlement is targeted for growth under the National Spatial Strategy, regional planning guidelines, statutory plans as defined above or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act 2000, as amended.
2) The zoning or designation of the lands for the particular use or development type is required to achieve the proper and sustainable planning of the urban settlement and in particular:

a. Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement
b. Comprises significant previously developed and/or under-utilised lands;
c. Is within or adjoining the core of an established or designated urban settlement;
d. Will be essential in achieving compact or sustainable urban growth;
e. There are no suitable alternative lands for the particular use or development type, in areas at lower risk of flooding within or adjoining the core of the urban settlement.

3) A flood risk assessment to an appropriate level of detail has been carried out as part of the Strategic Environmental Assessment as part of the development plan preparation process, which demonstrates that flood risk to the development can be adequately managed and the use or development of the lands will not cause unacceptable adverse impacts elsewhere.

N.B. The acceptability or otherwise of levels of any residual risk should be made with consideration for the proposed development and the local context and should be described in the relevant flood risk assessment."

MITIGATION is the process where the flood risk is reduced to acceptable levels by means of land use strategies or by means of detailed proposals for the management of flood risk and surface water, all

as addressed in the Flood Risk Assessment. The decision to PROCEED should only be taken after the Justification Test has been passed.

2.8 Stages of a Flood Risk Assessment (FRA)

The Guidelines recommend that a staged approach is adopted when undertaking a Flood Risk Assessment (FRA). The recommended stages are briefly described below:

• Stage 1 ~ Flood Risk Identification
To identify whether there may be any flooding or surface water management issues that will require further investigation. This stage comprised a comprehensive desk study of available information to establish whether a flood risk issue exists or whether one may exist in the future. The sources consulted are described in detail in Section 3.

• Stage 2 ~ Initial Flood Risk Assessment
If a flood risk issue is deemed to exist arising from the Stage 1 Flood Risk Identification process, the assessment proceeds to Stage 2 which confirms the sources of flooding, appraises the adequacy of existing information and determines the extent of additional surveys and the degree of modelling that will be required. Stage 2 must be sufficiently detailed to allow the application of the sequential approach (as described in Section 2.6) within the flood risk zone. For the purposes of this SFRA, Stage 2 was carried out for all the identified settlements (See Section 1.1), and is detailed in Section 4 and 5.

• Stage 3 ~ Detailed Flood Risk Assessment
A detailed FRA is carried out where necessary to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk. No flood risk issues, which were significant enough to warrant Stage 3, were identified. The CFRAM study covered many of the settlements in detail.

2.9 Scales of Flood Risk Assessments

Flood Risk Assessments are undertaken at different scales by different organisations for many different purposes. The scales are as follows:

• Regional Flood Risk Appraisal (RFRA): A Regional Flood Risk Appraisal provides a broad overview of the source and significance of all types of flood risk across a region and highlights areas where more detailed study will be required. These appraisals are undertaken by regional authorities.

• Strategic Flood Risk Assessment (SFRA): A Strategic Flood Risk Assessment provides a broad (area-wide or county-wide) assessment of all types of flood risk to inform strategic land use planning decisions. The SFRA allows the Planning Authority to undertake the sequential approach (described below) and identify how flood risk can be reduced as part of the development plan process.

• Site Flood Risk Assessment (Site FRA): A Site FRA is undertaken to assess all types of flood risk for a new development. This requires identification of the sources of flood risk, the effects of climate change on the flood risk, the impact of the proposed development, the effectiveness of flood mitigation and management measures and the residual risks that then remain.

This assessment is for a Development Plan and therefore is at SFRA scale.

3 Data Collection and Review

The Strategic Flood Risk Assessment for the plan area is based on two stages:

- Stage 1 Flood Risk Identification
- Stage 2 Initial Flood Risk Assessment

This chapter sets out the process involved in Stage 1.

3.1 Stage 1 Flood Risk Identification

This purpose of this stage is to identify whether there are any flooding or surface water management issues relating to the plan area that may warrant further investigation.

This section reviews the data collection and the flood history for the settlements so that any additional information on flooding can be included within this SFRA. It will confirm the extent of extreme flooding (through the Flood Zone mapping) and key sources of flood risk.

There are a number of valuable sources of flood data for the county, including major projects such as the Suir and SouthEastern CFRAMs, and broadscale flood mapping such as the national PFRA study. The sources of information from the previous iterations of the SFRAs have been reviewed and relevant updates have been made using the CFRAM flood mapping.

3.1.1 Regional Flood Risk Appraisal

A Regional FRA (RFRA) was carried out and published as part of the Strategic Environmental Assessment of the *Southern Region's Regional Spatial and Economic Strategy*[2]. This document provided guidance on the issues to be addressed in any SFRA.

Section 6.1 of the RFRA relates to Development Plans and states that the CFRAM FRMPs have the most up to date flood risk information available to help develop FRAs. Flood maps and the proposed flood risk management measures identified in the FRMPs should be reviewed for all development plans. They further state that "*Local Authorities should ensure that any FRAs they undertake or are assessing have considered flood zones as described in* ***Section 3.7*** *and climate change scenarios as described in* ***Section 3.8****. The CFRAM FRMP have developed climate change scenario mapping that can be used for such assessments*".

The RFRA examines Kilkenny as a Key Town and Ferrybank as part of the Waterford Metropolitan area. The RFRA recommends that planning authorities collaborate where relevant. The land use framework for Ferrybank is not under review at present, but Waterford City and County Council have commenced the review of their Development Plan 2022, and we are collaborating on a number of issues. It is more relevant at present that we collaborate with Wexford County Council in the flood risk assessment for New Ross and its environs. It is an objective of the Development Plan to review the zoning for the area of Rosbercon in County Kilkenny in a joint Local Area Plan for New Ross and Environs in conjunction with Wexford County Council.

[2] Southern Regional Authority, Southern Regional Spatial and Economic Strategy, 2020

3.1.2 OPW Publications

To comply with the 'Floods' Directive[3], the OPW commenced a CFRAM (Catchment Flood Risk Assessment and Management) programme in Ireland in 2011.

The first cycle of the CFRAM Programme comprised three phases:

1. The Preliminary Flood Risk Assessment (PFRA): 2011
2. The CFRAM Studies and parallel activities: 2011-2015
3. Implementation and Review: 2016 onwards

The Programme provides for three main consultative stages:

1. 2011 Preliminary Flood Risk Assessments
2. 2013 Flood Hazard Mapping
3. 2015 Flood Risk Management Plans

The OPW are now into cycle two of the CFRAM, which includes detailed design of specific flood relief schemes in various towns and cities. The settlements earmarked for flood relief schemes in Kilkenny are: Ballyhale, Freshford, Graiguenamanagh, Inistioge, Piltown and Thomastown. An update to the PFRA mapping, known as the National Indicative Flood Maps, or NIFM, is also being carried out to produce higher resolution broadscale mapping across the whole country and is due to be published imminently. This will be taken into account once available.

3.1.2.1 Preliminary Flood Risk Management

The 'Floods' Directive[4] required Member States to undertake a national preliminary flood risk assessment by 2011 to identify areas where significant flood risk existed or might be considered likely to occur. In August 2011, the OPW published the National Preliminary Flood Risk Assessment, Draft for Public Consultation[5] which comprised a Report and a set of broadscale maps.

This national screening exercise identified where there may be a significant risk associated with flooding, based on available and easily derivable information. The objective of the PFRA was to identify Areas for Further Assessment (AFAs) and this further assessment took place through Catchment Flood Risk Assessment and Management Studies (CFRAMS).

Maps of the County were published as part of the Draft PFRA. The OPW have stated that the maps, although draft and indicative, may be of use to the Local Authorities in a number of areas of activity, particularly in the performance of their planning function in relation to the implementation of the Flooding Guidelines. However, the OPW also note that they "*should not be used as the sole basis for defining Flood Zones*" and should be supported by local site investigations and the knowledge of staff familiar with the area.

These maps indicate flood extents – for fluvial flooding they indicate the 100 year event and the extreme event, or 1 in 1000 year event. They also indicate coastal, pluvial and groundwater flood extents.

[3] Directive 2007/ 60/ EC of the European Parliament and of the Council of 23rd October 2007 on the assessment and management of flood risk: Official Journal L288/ 27-34.

[4] Directive 2007/ 60/ EC of the European Parliament and of the Council of 23rd October 2007 on the assessment and management of flood risk: Official Journal L288/ 27-34.

[5] http://www.cfram.ie/pfra/

3.1.2.2 Catchment Based Management Plans

Phase 2 of the CFRAM programme was the production of CFRAM studies. The OPW in co-operation with various Local Authorities produced Catchment Flood Risk Assessment and Management Studies. These CFRAMS aim to map out current and possible future flood risk areas and develop risk assessment plans. They also identified possible structural and non-structural measures to improve the flood risk of the area.

The two CFRAMS that are of relevance for this Plan are the Suir and South Eastern CFRAMS.

Settlements included in the Suir CFRAMS are Waterford (Ferrybank), Fiddown, Mullinavat and Piltown.

The South Eastern River Basin District (SERBD) CFRAMS covered the rest of County Kilkenny. The South Eastern district is one of Ireland's largest river basin districts covering about one fifth of the country with an area of nearly 13,000km^2.

The CFRAMS coverage is divided into two categories; the High Priority Watercourses (HPWs), and Medium Priority watercourses (MPWs). The HPWs were modelled to a greater degree than the MPWs, and therefore offer a greater degree of accuracy. Settlements covered by the HPWs in Co. Kilkenny are; Ballyhale, Ballyragget, Callan, Freshford, Graiguenamanagh, Inistioge, Kilkenny, New Ross and Thomastown.

Settlements covered by the MPW modelling are: Bennettsbridge, Goresbridge, Kells and Kilmacow.

3.1.3 Alternative available sources

The data listed below is available for the county and provides information on the historical occurrence of flooding. Flooding and surface water issues in the county were also identified through consultation with the Area Engineers and from any other relevant sources. This information is summarised in Table 3.1 below.

i) OPW Flood Events Mapping

As part of the National Flood Risk Management Policy, the OPW developed the www.floodmaps.ie web-based data set, which contains information concerning historical flood data, displays related mapped information and provides tools to search for and display information about selected flood events.

ii) OPW Benefitting Lands mapping

These maps were prepared to identify areas that would benefit from land drainage schemes, and typically indicate low-lying land near rivers and streams that might be expected to be prone to flooding.

It should be noted that some of this data is historically derived, not prescriptive in relation to flood return periods and not yet predictive or inclusive for climate change analysis. Many of these maps were based on survey work carried out from 1833-1844 with many updated in the 1930s and 1940s. Therefore, they do not show or take account of recent changes in surface drainage, such as development in floodplains, road realignments or drainage works for forestry or agriculture. Thus, there is significant potential that flood risk in some areas may have changed since they were prepared.

3.1.3.1 Flood Studies, Reports and Flood Relief Schemes

Flood reports have been completed for a number of areas within the county. Studies have been undertaken in respect of Callan, Graiguenamanagh and Thomastown. These three towns are subject to separate Local Area Plans and are not addressed in the CCDP.

Flood relief schemes are proposed in Ballyhale, Freshford, Graiguenamanagh, Inistioge, Piltown and Thomastown.

3.1.3.2 New Ross

A Strategic Flood Risk Assessment was carried out for the Wexford Draft County Development Plan 2021 by JBA Consulting, and this examined the flood defence schemes in the town. Flood defence schemes were carried out in the last 15 years in New Ross to help reduce damage to properties and roads. An interim flood defence scheme was completed in 2009 and has now been incorporated into a much larger defence scheme which is not yet completed. The new defence extends 2.2km, runs along both banks of the River Barrow and includes demountable barriers, concrete walls and embankments. This flood defence scheme was undertaken post the CFRAM study and therefore, is not represented in the final flood extent mapping.

3.1.3.3 Kilkenny City Flood Relief Scheme

A flood relief scheme was completed in Kilkenny city in 2005 to provide defence against the 100 year flood from the Nore.

A report entitled *Kilkenny City Flooding Study* was published in 1986 by M.C. O'Sullivan. A subsequent report was published by the OPW in 1999, entitled *Kilkenny City Flood Relief Scheme Engineering Report – Protecting against the 100 year flood*. The benefiting lands map for the Kilkenny Scheme Design was obtained from the OPW.

The Benefiting land outline generally equates to the 100 year flood outline or Flood Zone A. This map covers the centre of Kilkenny City, mainly around the Nore, but also with some coverage of the Breagagh.

3.1.3.4 Local Authority Personnel

The Area Engineers were consulted regarding historical flooding and flood relief works in the areas under consideration.

3.2 Dataset summary

A summary of the datasets reviewed, and their usefulness to the study, are detailed in the following table.

Table 3.1 Summary of available datasets

Dataset	Description / coverage	Robustness	Comment on usefulness
Suir CFRAM study	Areas for further assessment (AFAs), or settlements falling along modelled lengths, in County Kilkenny are: Waterford City (Ferrybank) Fiddown Mullinavat Piltown	Flood Zones and flood extents for current and future scenarios provided by OPW. Depth, velocity and risk to life, and defended areas are also available. Modelling is 'best of breed' and outputs will allow informed decisions to be made on zoning objectives. Design water levels will inform decisions relating to raising land and setting finished floor levels.	Very useful – it is considered unlikely that additional assessment will be needed to inform the SFRA as all information needed to carry out the JT for Plan Making will be provided. Site specific FRAs will still be required for planning applications, but information on water levels can form the basis of decision in relation to finished floor levels. However, it is important to note that CFRAM outputs should not be relied upon without review and consideration of appropriateness to the site in question, particularly for Medium Priority Watercourses (MPW).
South Eastern CFRAM Study	Areas for further assessment (AFAs), or settlements along HPWs, in County Kilkenny are: Ballyhale Ballyragget Callan Freshford Graiguenamanagh Inistioge Kilkenny[6] New Ross Thomastown Settlements along MPWs are: Bennettsbridge Goresbridge Kells Kilmacow		
County Development Plan Flood Map (2014-2020)	Based on the PFRA and other sources	Low-Moderate	See Fluvial PFRA
OPW Preliminary Flood Risk Assessment (PFRA) flood maps – Fluvial	The PFRA was a national screening exercise that was undertaken by OPW to identify areas at potential risk of flooding. Fluvial,	Low	Covers all rivers (including non-CFRAM) so useful extent. Cannot be used without validation through site visit, and where

[6] Flood mapping along the Breagagh River in Kilkenny city is currently under review by the OPW.

	coastal, pluvial and groundwater risks were identified at an indicative scale		site visit is inconclusive modelling may be needed. Had been used to inform the 2014-2020 Development Plan.
PFRA Maps – Pluvial and groundwater		Low	Used to add to commentary in the risk table and to identify potentially at risk areas of the county but should not be used to develop screening map or to inform zoning decisions without further analysis.
Historical event outlines and point observations and reports	Various, taken from www.floodinfo.ie	Indicative	Can be indirectly used to validate flood zones and identify non-fluvial and tidal flooding. Useful background information for site specific FRAs, but note the database is not exhaustive, absence of a record does not necessarily mean absence of flood risk.
Land Commission Benefiting land maps	Show land which would (or have) benefited from a drainage scheme. This is not based on a 'design flood' (i.e. the events do not have a return period), but indicate low-lying, poorly drained land. It is not the same as lands which are protected by a flood relief scheme	Low	Superseded by the data sources listed above, although may be used to cross check Flood Zones.
Flood relief scheme details, including locations and lengths, standard	Defences in Ballyhale, Freshford, Graiguenamanagh, Inistioge, Kilkenny City, Piltown, Thomastown	High (outputs from the CFRAM and /or detailed scheme design documents provide this	Flood Zones are defined without the benefit of defences, but the benefits should be

of protection and areas which are protected	and Waterford, have all been included in the CFRAM modelling.	information).	considered when establishing the specific risk to a site, and in informing the site specific FRA. It is essential that the analysis of the defended area is carried out by someone who fully understands the approach taken in the CFRAM, as it is not straightforward.

3.3 Main causes of Flooding

As can be seen in Table 3.1 above, the main sources of flooding in Kilkenny are fluvial. Other sources are pluvial and groundwater flooding.

3.3.1 Pluvial Flooding

Flooding of land from surface water runoff is usually caused by intense rainfall that may only last a few hours. The resulting water follows along natural valley lines, creating flow paths along roads and through and around developments and ponding in low spots, which often coincide with fluvial floodplains. Any areas at risk from fluvial flooding will almost certainly be at risk from surface water flooding.

The PFRA study considered pluvial flood risk and produced a national set of pluvial flood maps. This dataset was reviewed and used to identify development areas at particular risk of surface water and pluvial flooding. However, the level of detail contained in the PFRA map, and the widespread distribution of areas at risk did not allow a commentary relating to pluvial flood risk to be developed, or for particularly high risk areas to be identified. Instead, an overall strategy for the management of pluvial risk is presented and should be implemented across all development proposals. This, and recommendations for the assessment of surface water risks, are provided in Section 6.

3.3.2 Groundwater Flooding

Groundwater flooding is caused by the emergence of water originating from underground and is particularly common in karst landscapes. This can emerge from either point or diffuse locations. The occurrence of groundwater flooding is usually very local and unlike flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can cause significant damage to property, especially in urban areas and pose further risks to the environment and ground stability.

The OPW PFRA carried out a national scale Groundwater Flooding Report which concludes that ground water flooding is largely confined to the West Coast of Ireland due to the hydrogeology of the area. A total of four locations were identified as being at risk of groundwater flooding in Kilkenny; at Loughmacask; between the railway line and the M9 south of Mullinavat; just north of the N24 between Piltown and Carrick on Suir, and in northwest Kilkenny, east of Urlingford[7].

[7] GSI Groundwater Flooding Viewer accessed on the 24/9/2020: https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc

3.3.3 Flood Risk Indicators

Having regard to all of the information sources as outlined above, the occurrence of flood risk indicators for each settlement included in the CCDP is identified in a Flood Risk Indicator Matrix. Of the 24 settlements included, Johnstown, Kilmaganny, Moneenroe, Paulstown Stoneyford and Slieverue show no fluvial Flood Risk indicators. However, as most of the settlements could be subject to a potential flood risk issue, the assessment proceeds to Stage 2.

Table 3.2 Flood Risk Indicator Matrix

Settlement /Town/ village	Available Data by source					
	CFRAM (HPW or MPW)	**PFRAM**	**www.floodinfo.ie**	**Local Authority information**	**Benefitting lands**	**Flood relief scheme details**
Ballyhale	HPW - Identified as Area for further assessment in SE CFRAM study		Recurring Flood Points recorded at Main Street. Road liable to flooding and properties affected	Flooding experienced to the rear of properties on Main St in the past – bridge on Station road replaced approx. 2003 – this has helped to alleviate the flooding. Collapsed walls in the area of the church replaced and river banks in area of church cleared in 2010 by church.	Benefitting lands mapped in village	
Ballyragget	HPW - Identified as Area for further assessment in SE CFRAM study		Recurring Flood Points recorded at River Nore	Flooding has occurred on several occasions in 2008, 2009 and 2010 during spell of prolonged heavy rain, affecting a commercial property at the bridge.	Benefitting lands mapped along River Nore	
Bennetts-bridge	MPW- Possible Area for Further Assessment in SE CFRAM – not selected as AFA.		Recurring Flood points recorded at Ennisnag Road	In severe events Annamult/Ennisnag road (LP4201) can become impassable as area is part of flood plain of River Nore. Worst affected from Mosses Mill to road leading to	Benefitting lands mapped along River Nore	

Settlement /Town/ village	Available Data by source					
	CFRAM (HPW or MPW)	**PFRAM**	**www.floodinfo.ie**	**Local Authority information**	**Benefitting lands**	**Flood relief scheme details**
				Danesfort (LP4200) Frequency/severity of events increasing.		
Clogh-Chatsworth		Yes, in centre of village along River Clogh.	No events recorded.	TBC	Benefitting lands mapped along River Clogh to the east of the village.	
Freshford	HPW - Identified as Area for further assessment in SE CFRAM study		Recurring flood points recorded at New Bridge Street, damage to shops and dwellings. Flood event in December 2015 and March 2018 (From OPW info, but currently not available on the OPW flood portal; www.floodinfo.ie.)	Severe flooding occurred on the 29th October 2010 at Creel Street from the junction with Old Bridge Street to the junction with Bohergloss Street, on the lower part of New Bridge Street and at Bohergloss Street. Flooding caused by a tributary of the Nuenna River.	Benefitting lands mapped along Nuenna River through most of the town	

Settlement /Town/ village	Available Data by source					
	CFRAM (HPW or MPW)	**PFRAM**	**www.floodinfo.ie**	**Local Authority information**	**Benefitting lands**	**Flood relief scheme details**
Fiddown	HPW - Identified as Area for further assessment in Suir CFRAM Study		No events recorded.		No benefitting lands mapped in village.	
Gores-bridge	MPW	Yes, along Gowran river to the north of village.	No flood incident points recorded.	No knowledge of properties being flooded.	No benefitting lands mapped in village.	
Gowran		Yes, to south of village centre along Gowran River.	No events recorded.		No benefitting lands mapped in village.	
Inistioge	HPW - Identified as Area for further assessment in SE CFRAM study		Recurring flood points at GAA pitch on R700 (Thomastown Road). Flood event in in December 2015 (From OPW info, but currently not available on the OPW flood portal; www.floodinfo.ie.)	Recurring flooding in the area from the GAA pitch to the bridge over the river Nore on the R700 (western bank of river). Properties fronting onto the river (between the square and the bridge) have been badly flooded on a number of occasions.	Benefitting lands mapped along River Nore	

Settlement /Town/ village	Available Data by source					
	CFRAM (HPW or MPW)	**PFRAM**	**www.floodinfo.ie**	**Local Authority information**	**Benefitting lands**	**Flood relief scheme details**
Johnstown			No events recorded.		No benefitting lands mapped in village.	
Kells	MPW		Recurring flood points recorded at King's River Kells Bridge	R697 near Glory Cottage floods, road impassable on occasions. LP1023 Kells-Stoneyford road also floods circa 750m east of Kells Priory and road can be impassable. Frequency/severity of events increasing.	Benefitting lands mapped along King's River	

Settlement /Town/ village	Available Data by source					
	CFRAM (HPW or MPW)	**PFRAM**	**www.floodinfo.ie**	**Local Authority information**	**Benefitting lands**	**Flood relief scheme details**
Kilmacow	MPW - Suir CFRAM Possible Area for further assessment – not selected as AFA.		No flood incident points recorded in village.	Flooding occurred in 2007 and 2008 on Upper Street in the village. Also flooding affected Dunkitt two houses flooded. Report by Ryan Hanley.	Benefitting lands mapped along River Blackwater	
Kilmagann y			No flood incident points recorded in village. Incidents recorded at the Glory River to the north of the settlement.		Benefitting lands mapped along River Srughwadda, Shancashlaun and Glory to the north and west of the village.	
Knocktoph er		Yes, along Little Arrigle River.	Recurring flood incident recorded to west of Knocktopher on R699 road and recurring incident to northwest on N10 road near Barretstown.	Regular flooding events on R699 link road from R448 (Old N10) to Knocktopher village and R448 in vicinity of Moanrue X. Floods from Little Arrigle River. Road generally always passable.	Benefitting lands mapped along stream through centre of village	

Settlement /Town/ village	Available Data by source					
	CFRAM (HPW or MPW)	**PFRAM**	**www.floodinfo.ie**	**Local Authority information**	**Benefitting lands**	**Flood relief scheme details**
Moneenroe			No events recorded.		No benefitting lands mapped in village.	
Mooncoin	Possible Area for further assessment in Suir CFRAM – not selected.		Flood incident recorded to the northwest of the village	Local information - surface-water/ storm-water run-off along the New Road and Ballytarsna Crossroads Ballytarsna Cross and Chapel St 2009/2010 Drainage measures completed.	No benefitting lands mapped in village.	
Mullinavat	HPW - Identified as Area for further assessment in Suir CFRAM study.		Flood incident recorded on Main street in November 2000	Flooding of Glen Crescent in 2008 and 2009. Works were undertaken in conjunction with the OPW to eliminate flood risk to houses.	Benefitting lands mapped along the River Blackwater to the west of the town.	Included in OPW Minor Flood Mitigation Works & Studies Scheme Approved Projects 2010

Settlement /Town/ village	Available Data by source					
	CFRAM (HPW or MPW)	**PFRAM**	**www.floodinfo.ie**	**Local Authority information**	**Benefitting lands**	**Flood relief scheme details**
New Ross Environs	HPW - Identified as Area for further assessment in SE CFRAM study.		Flood incident recorded at the Quay, in Wexford's administrative area	Flooding occurred on the N24 west of New Ross in 2009. Road closed to all but HGV's for a period of time.	No benefitting lands mapped	Flood defence schemes undertaken over last 15 years.
Paulstown			No flood incident points recorded in village		No benefitting lands mapped in village.	
Piltown	HPW - Identified as Area for further assessment in Suir CFRAM study.		Recurring flood points recorded at River Pil, last recorded 28/10/2004.		Benefitting lands mapped along River Pil.	
Slieverue			No flood incident points recorded in village	No occurrences of flooding to the village over the past number of years.	No benefitting lands mapped in village.	

Settlement /Town/ village	Available Data by source					
	CFRAM (HPW or MPW)	PFRAM	www.floodinfo.ie	Local Authority information	Benefitting lands	Flood relief scheme details
Stoneyford		Yes, along stream through centre.	Two recurring flood incident points recorded on the Main Street	Improved drainage works in the town and its environs in 2009/2010/2011 have eased drainage issues significantly in the main area of the town. No incidents of note have occurred since this work was completed.	Benefitting lands mapped along the stream through the centre of the village.	
Urlingford		Yes, in centre and southwest.	No flood incident points recorded in village	No flooding issues in town.	Benefitting lands mapped along River Goul to north, along stream through centre and on lands to southwest of town.	
Kilkenny City	HPW - Rivers Nore and Breagagh[8] in Kilkenny identified as Areas of Further Assessment in SE CFRAMs.		A number of flood incident points recorded for the Breagagh and the Nore. The last flood recorded for the Nore was in 1997, the last for the	Flooding in Irishtown and Blackmill Street has been addressed through the Nore Flood Relief Scheme. Three locations in the city were subject to flooding: R. Breagagh on Circular Road, adjacent to Robertshill	Benefitting lands mapped along River Nore through the centre of the city and also along the R. Breagagh to the west and Pococke to the	Flood Relief Scheme for River Nore was completed in 2005

[8] River Breagagh currently under review.

Settlement /Town/ village	Available Data by source					
	CFRAM (HPW or MPW)	PFRAM	www.floodinfo.ie	Local Authority information	Benefitting lands	Flood relief scheme details
			Breagagh in 2006. The most recent Breagagh flooding affected a sports pitch at the Water Barrack and properties on the Circular Road.	housing estate and at the Water Barrack and R. Nore at Canal Walk. Flooding at Water Barrack affects the roadway and prevents vehicular access to some properties. Sections of the Breagagh are cleaned annually to alleviate the problem. Construction of the Western Environs access road will relieve flooding but not totally eliminate in Circular Road area. Minor river channel maintenance carried out in 2010 on R. Breagagh upstream of Kennyswell Road appears to have been very beneficial to the Circular Road, Robertshill area and no flooding event has taken place since. The R. Nore floods along the Canal Walk, directly downstream of the area remediated under Flood Relief scheme. It affects the	east.	

Settlement /Town/ village	Available Data by source					
	CFRAM (HPW or MPW)	**PFRAM**	**www.floodinfo.ie**	**Local Authority information**	**Benefitting lands**	**Flood relief scheme details**
				Canal Walk footpath and prevents vehicular access to three residences.		

4 Flood Zone Development

Following on from the data collection stage, Stage 2 confirms the sources of flooding, appraises the adequacy of existing information and determines the extent of additional surveys and the degree of modelling that will be required. As set out in the RSES Regional Flood Risk Appraisal Report, and under the Planning Guidelines, the Flood Zone mapping for the County is principally derived from the CFRAM Study where available. However, as can be seen in Table 3.1, a number of settlements in the county are not covered by the CFRAM. In this case, other datasets, as outlined in Table 3.1 were used as supplementary information to inform this SFRA.

Due to the indicative nature of the first generation PFRA mapping and the resulting flood extents, the approach used in this SFRA has been precautionary. All sources of available flood mapping were reviewed in cases where proposed undeveloped lands are zoned for highly or less vulnerable use (where CFRAM was not available).

When the NIF mapping is issued to Local Authorities the data will be used in conjunction with the other available datasets and site visits to provide a countywide Flood Zone dataset, subject to further verification.

The review of the suite of flood risk data has been developed as a spatial planning tool to guide the Council in making land-use zoning and development management decisions and it is recognised that site specific information may contradict the Flood Zones, either to demonstrate a greater or lesser level of flood risk. However, the data has been deemed appropriate for the planning decisions being made at this stage of the plan making process.

5 Settlement Zoning Review

The purpose of land use zoning objectives is to indicate the types of development the Planning Authority considers most appropriate in each land use category. The land use zoning objectives proposed under this Plan must be examined to ensure that all relevant flood risk issues are assessed in relation to the decisions to be made and potential conflicts between flood risk and development are addressed to the appropriate level of detail.

This section of the SFRA will:

- Outline the strategic approach to flood risk management.
- Consider the land use zoning objectives proposed and the flood risk for each settlement and assess the potential vulnerability to flooding.
- Based on the vulnerability of the particular use, establish whether the Justification Test is required.
- Conclusions will be drawn on how flood risk is proposed to be managed in the settlement.

5.1 The Strategic Approach to Flood Risk Management

Following the Planning Guidelines, development should always be located in areas of lowest flood risk first, and only when it has been established that there are no suitable alternative options should development (of the lowest vulnerability) proceed. Consideration may then be given to factors which moderate risks, such as defences, and finally consideration of suitable flood risk mitigation and site management measures is necessary. It is important to note that whilst it may be technically feasible to mitigate or manage flood risk at site level, strategically it may not be a sustainable approach.

As there are two different development frameworks proposed under this DCCDP (see Section 1.1, Draft City and County Development Plan) there are two different approaches to this stage, depending on whether a settlement boundary or zoning framework is proposed.

5.1.1 Consideration of Climate Change

Through the CFRAM Studies, both MRFS and HEFS model runs have been completed on all study watercourses, providing flood extent and depth maps. This information was used to examine the areas that may be impacted with climate change. For watercourses that are not part of the CFRAM programme, fluvial flood extents were qualitatively assessed by using the Flood Zone B outline as a surrogate for 'Flood Zone A with allowance for the possible impacts of climate change', as suggested in the '*Planning System and Flood Risk Management*' Guidelines.

In line with the OPW's move towards requiring that flood relief schemes are accompanied by Scheme Climate Change Adaptation Plans, the Council will work with the OPW to examine the preparation of Scheme Climate Change Adaptation Plans for proposed schemes under the 2018-2027 Flood Risk Management Plans National Programme.

5.2 Framework - Settlement boundaries

Under this DCCDP, twenty-two settlements will be subject to settlement boundaries, within which the following objective will apply:

"*To encourage development of economic activity, services and infrastructure provision in the smaller towns and villages of the county and allow for town renewal and serviced site housing provision in smaller towns and villages where services are available and or planned, at a scale and character which is proportionate to their scale, in order to sustain and renew population and services in these areas*".

Using a combination of the available datasets, as described earlier, the flood zones were mapped for each of these settlements, see Maps 1-22. Where CFRAM was available, this was used to denote flood zones. Where no CFRAM data was available, an area was denoted within which a site specific flood risk assessment will be required for any development proposal.

The maps illustrate the proposed settlement boundaries under the DCCDP. The proposed settlement boundary was devised having regard to a number of factors, including a consideration of flood risk.

Within these settlement boundaries, the sequential approach should be applied at the development management stage. If a Site Specific FRA demonstrates an unmanageable level of flood risk and/or impacts to 3rd party lands, development cannot proceed. Where CFRAM data was available, the flood zones were identified on the maps. Where CFRAM data was not available, an area of flood risk was identified. Any area within or adjoining a flood zone, or flood risk area, shall be the subject of a site-specific Flood Risk Assessment appropriate to the type and scale of the development being proposed. Section 10.2.6 Flooding of the DCCDP contains text referring to this requirement.

5.3 Framework - Zoned settlements: Kilkenny and New Ross Environs

For each of the two settlements which include zoning under this DCCDP, an iterative process of flood risk assessment has been undertaken.

This has involved the refinement of the zoning objective maps, which have been reviewed and amended according to the Flood Zones and the vulnerability of the proposed development.

Both settlements were included in the SE CFRAMs, and therefore the flood zone maps are based primarily on that.

5.3.1 Application of the Sequential Approach

Having identified the flood zones within the plan areas the next step is to apply the sequential approach to land use planning. The areas of flood risk were overlaid on the current zoning for each settlement. (This was taken from the 2014 Development Plan for New Ross Environs and Variation 6 to the City and Environs Development Plan (2018).) This identified where flood risk management and future development may cause a conflict.

Table 3.2 of the Guidelines sets out how the vulnerability classes interact with the flood zones and when the Justification Test is required, see Table 2.3.

Where some of the settlement is located within either Flood Zone A or B, the need for a further review of flood risk, and the specific zoning objectives, is required. If the proposed zoning was found to be water compatible (such as open space) and located within either Flood Zone A or B, there was no requirement to apply the Justification Test. If, however, less vulnerable uses were proposed for Flood Zone A, or highly vulnerable uses were proposed for Flood Zones A or B, the Justification Test was applied, and if necessary, the zoning objective revised. This process is detailed below.

Note: Vulnerability to pluvial flood risk should not be a limitation to development, but should be incorporated into the local drainage strategy (for Kilkenny City, see Irish Water's *Drainage Area Plan*), therefore areas of pluvial flooding were not subjected to the Sequential approach.

5.3.2 Kilkenny City Zoning Proposals

The Flood Zones in Kilkenny City were overlain on the Zoning Map, taken from the City & Environs Development Plan 2014, Variation 6, see Figure 23a.

A total of 15 zones govern land use in Kilkenny City. The uses permitted within each of these zones were examined in detail to ascertain in what circumstances the (plan level) Justification Test would be required. Four of the zones (Agriculture, Open Space/Biodiversity, Urban Agriculture and Strategic Reserve) do not pose a conflict between flood risk and development, as detailed below.

Agriculture

For the most part, the uses permissible under the Agriculture zoning fall into either the 'Less Vulnerable development' category or the 'Water Compatible development' categories of vulnerability. Houses, guesthouses and nursing homes, which are 'Highly vulnerable developments' are open for consideration within the Agriculture zoning, however, a proviso will be included that they will not be permitted within flood zones A or B. The Draft Plan also proposes to include a proviso that less vulnerable uses will not be permitted within the Agriculture zoning in Flood Zone A. In the case of less vulnerable development in Flood Zone B and Minor Developments in Flood Zone A or B, a suitably detailed site specific FRA should be carried out.

Open Space / Biodiversity

In the main, the uses permissible under the Open Space zoning fall into either the 'Less Vulnerable development' category or the 'Water Compatible development' categories of vulnerability. The Draft Plan also includes a proviso that less vulnerable uses will not be permitted within the Open Space zone in Flood Zone A. Therefore Justification Tests at this plan-making stage are not required for Open Space zoning. In the case of less vulnerable development in Flood Zone B and Minor Developments in Flood Zone A or B, a suitably detailed site specific FRA should be carried out.

Urban Agriculture

The uses permissible under Urban Agriculture fall into either the 'Less Vulnerable development' category or the 'Water Compatible development' categories of vulnerability. The Draft Plan also includes a proviso that less vulnerable uses will not be permitted within the Urban Agriculture zone in Flood Zone A. In the case of less vulnerable development in Flood Zone B and Minor Developments in Flood Zone A or B, a suitably detailed site specific FRA should be carried out.

Strategic Reserve

For the most part, the uses permissible in Strategic Reserve zoning fall into either the 'Less Vulnerable development' category or the 'Water Compatible development' categories of vulnerability. Houses, guesthouses and nursing homes, which are 'Highly vulnerable developments' are open for consideration within Strategic Reserve, however, a proviso will be included that they will not be permitted within flood zones A or B. The Draft Plan also proposes to include a proviso that less vulnerable uses will not be permitted here within Flood Zone A. In the case of less vulnerable development in Flood Zone B and Minor Developments in Flood Zone A or B, a suitably detailed site specific FRA should be carried out.

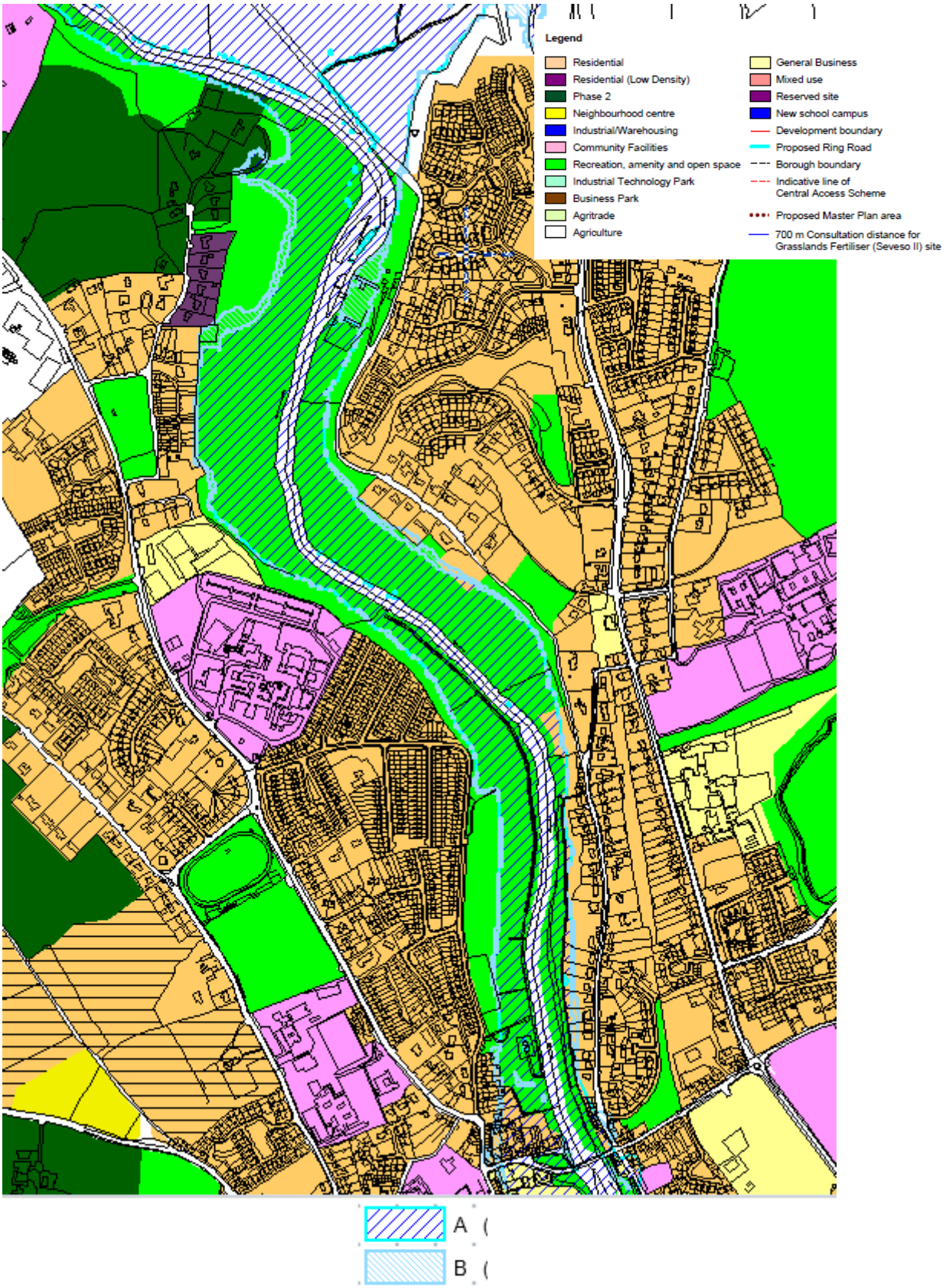
Minor developments

For each of the four zones above, Minor developments, such as extensions to existing uses or structures, and most changes of use, fall under Section 5.28 of the Flooding Guidelines and do not require the Justification Test.

5.3.3 Justification Tests for Kilkenny City

Having examined all the areas of overlap between flood risk and the development objectives, and ruled out the 4 zones as detailed above, a total of six areas of overlap are mapped, and the zoning in each of these areas was examined.

Area 1: Either side of the River Nore, north of Greens Bridge

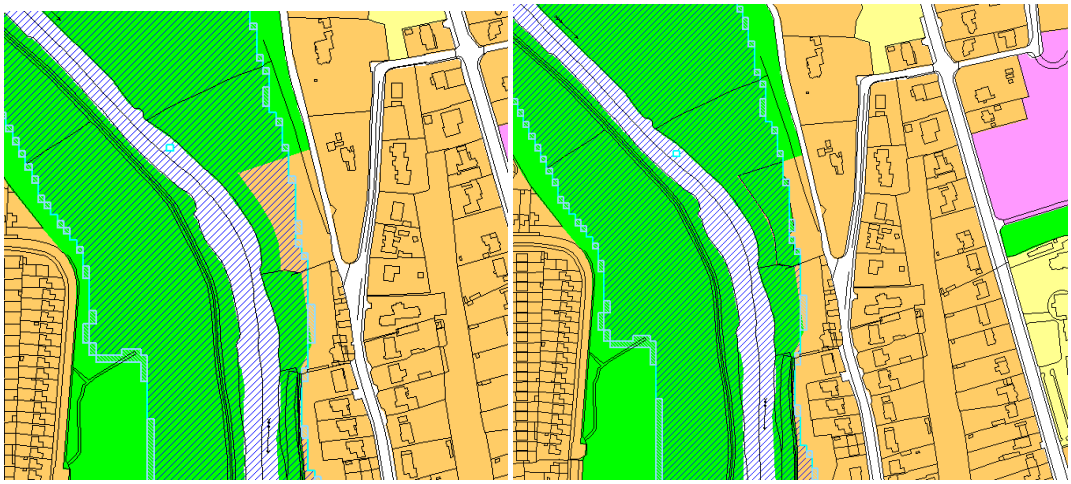


A large proportion of the land within flood zones A and B is zoned for Open Space. This is a water compatible use, therefore no Justification Test is required.

For the highly vulnerable residential zoning, the Sequential approach was used and this resulted in the avoidance of 2 sites and rezoning as follows:

i. From Residential to Open space on the Bleech Road

ii) From Residential to Open space on the Bleech Road



The amended zoning map, incorporating these 2 changes, is shown on Figure 23b. Only a small amount of residentially zoned land remains within the flood zones, around Greens Bridge. In order for this land to remain zoned for residential use, the zoning must satisfy the Justification Test. The criteria are outlined in Section 2.7 and the test is set out below.

1) The urban settlement is targeted for growth....

Kilkenny is identified as a Key Town in the Southern Regional Spatial and Economic Strategy 2020[9] and is targeted for growth in the County and City Development Plan.

2) The zoning or designation of the lands for the particular use or development type is required to achieve the proper and sustainable planning of the urban settlement ....

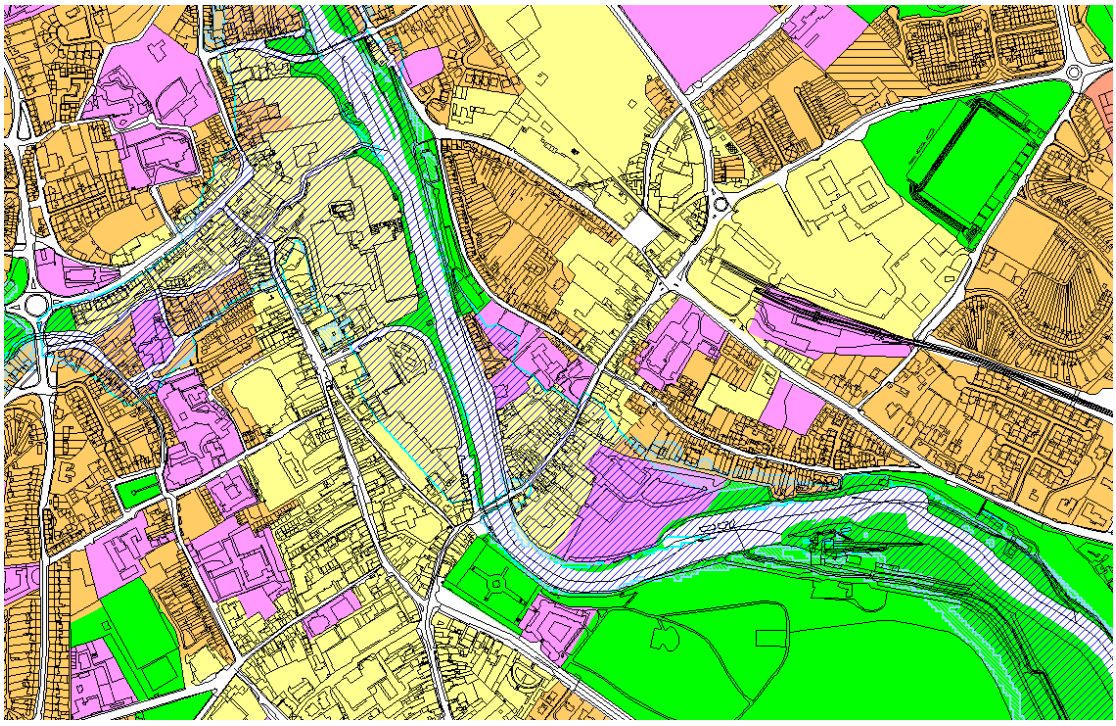
[9] Southern Regional Assembly, *Regional Spatial and Economic Strategy*, 2020

i. The zoning of this area for residential use is intended mainly to reflect the existing uses in operation. The continued zoning of the land will facilitate the regeneration and/or expansion of the centre.
ii. All of the land is currently in use.
iii. All of the land adjoins the core of Kilkenny (as core is defined in the Flooding Guidelines).
iv. The continued development of this land is essential in achieving compact and sustainable urban growth as it will provide residential use to Kilkenny.
v. The zoning of this land reflects the existing uses on the sites, and is intended to facilitate their appropriate expansion. Therefore this land is the most suitable for this purpose.

3) A flood risk assessment to an appropriate level of detail has been carried out....

In the main, this land is built out and the opportunities for future development are limited. In this context, this SFRA contains sufficient information appropriate to the scale and nature of the development potential. Mitigation measures are included in the DCCDP and an objective will state that any development within Flood Zone A or B will be subject to a site specific Flood Risk Assessment appropriate to the scale and type of the development being proposed. This mitigation measure will ensure that any development taking place will not exacerbate any flooding issue. Any vulnerable development proposed will have to satisfy the development management Justification Test.

Area 2: Between Green's bridge and John's Bridge/John Street as far as Maudlin Street/Dublin Road junction, around River Nore and to Dominic Street/Dean Street roundabout around R. Breagagh.



This area forms part of Kilkenny city centre, including the Abbey Quarter, and was zoned for numerous uses, namely General Business, Industrial, Open Space, Residential and Community facilities. Open space is a water compatible use and does not require the Justification test, however the other uses, all of which are partially located within Flood Zone A, must satisfy the Justification Test. The criteria are outlined in Section 2.7 and the test is set out below.

1) The urban settlement is targeted for growth....

Kilkenny is identified as a Key Town in the Southern Regional Spatial and Economic Strategy 2020[10] and is targeted for growth in the County and City Development Plan.

2) The zoning or designation of the lands for the particular use or development type is required to achieve the proper and sustainable planning of the urban settlement ....
    i. The zoning of this area for this range of uses is intended mainly to reflect the existing uses in operation. The General Business zoning of the Abbey Quarter is essential to facilitate the regeneration and/or expansion of the centre.
    ii. The land comprises significant previously developed and/or under-utilised lands.
    iii. All of the land is within the core of Kilkenny (as core is defined in the Flooding Guidelines).
    iv. The continued development of this land is essential in achieving compact and sustainable urban growth.
    v. There are no suitable alternative lands within or adjoining the core to provide such city centre uses.

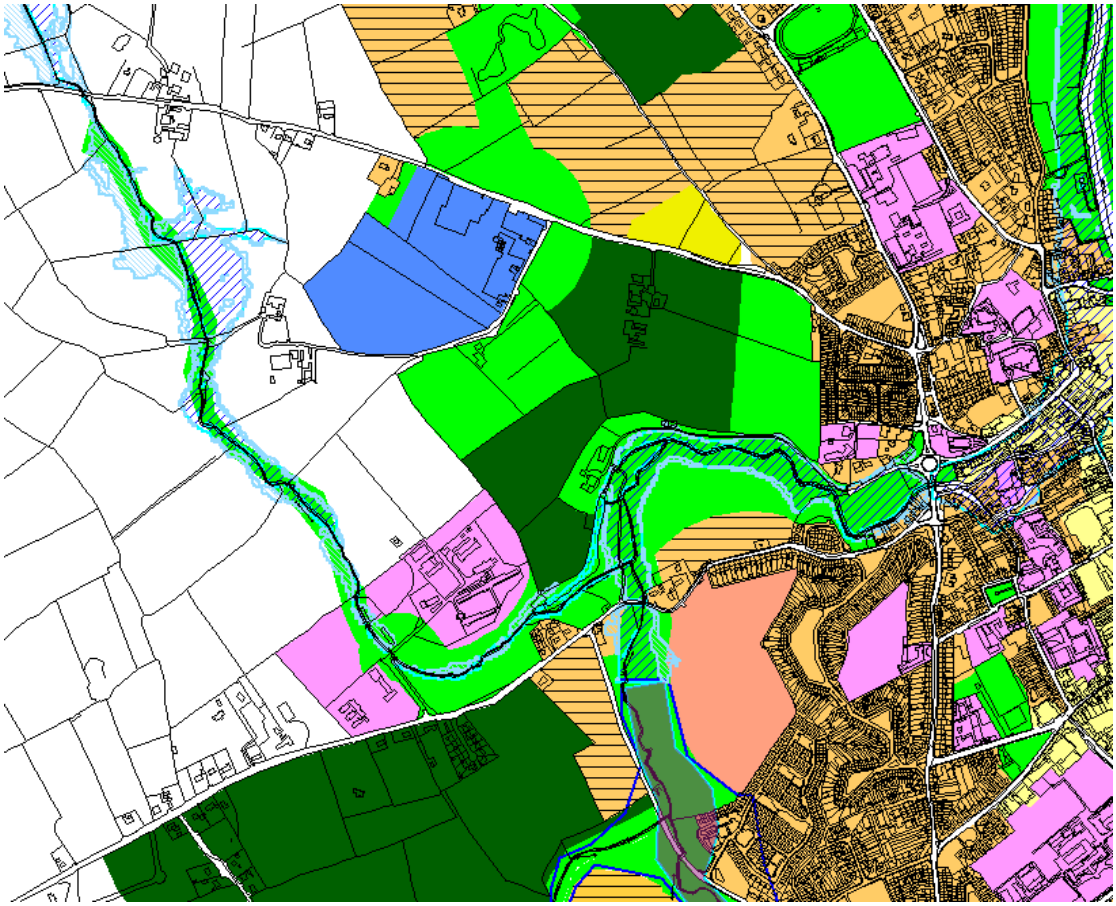
3) A flood risk assessment to an appropriate level of detail has been carried out....

In the main, apart from the Abbey Quarter, this land is built out and the opportunities for future development are limited. In this context, this SFRA contains sufficient information appropriate to the scale and nature of the development potential. The Abbey Quarter has significant development potential. A Flood Risk Assessment was prepared as part of the preparation of the Abbey Quarter Masterplan[11]. Any development taking place will not exacerbate any flooding issue. Any vulnerable development proposed will have to satisfy the development management Justification Test.

Area 3: West of Dominic Street/Dean Street roundabout around Breagagh, north of Croker's Hill.

[10] Southern Regional Assembly, *Regional Spatial and Economic Strategy*, 2020

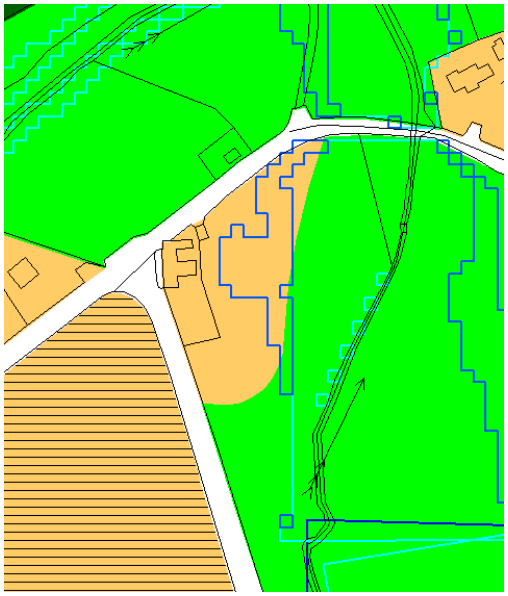
[11] https://www.kilkennycoco.ie/eng/Services/Planning/Abbey-Quarter-Brewery-site/Appendix-D-Flood-Risk-Assessment.pdf

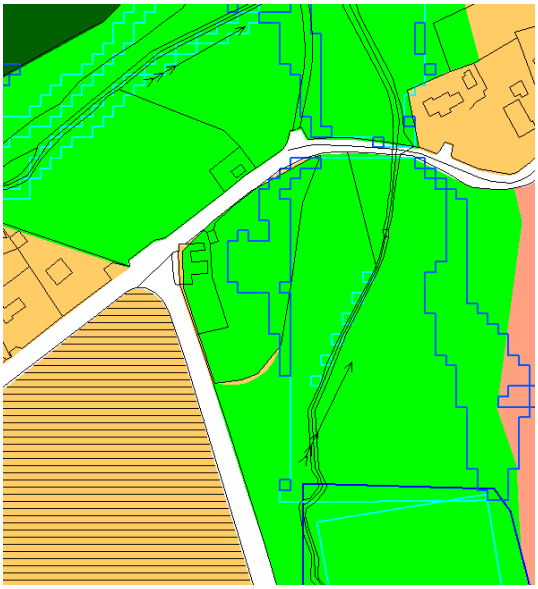


This area lies to the west of the city centre and is zoned for numerous uses, namely Residential, Open Space, Community facilities and Agriculture. For the most part, the land within flood zones A and B are zoned as Open Space and Agriculture, which as discussed above, do not require the Plan making Justification Test.

For more vulnerable uses, the Sequential approach was used and this resulted in the avoidance of a site and rezoning as follows:

From Residential to Open Space at the Kilmanagh Road and Circular Road junction (Teehan's cottage).





One area of residential zoning remains within Flood zones A and B, near the Dean Street roundabout. As a highly vulnerable use, this must be subjected to the Justification Test, as follows:

1) The urban settlement is targeted for growth....
Kilkenny is identified as a Key Town in the Southern Regional Spatial and Economic Strategy 2020[12] and is targeted for growth in the County and City Development Plan.

2) The zoning or designation of the lands for the particular use or development type is required to achieve the proper and sustainable planning of the urban settlement ....

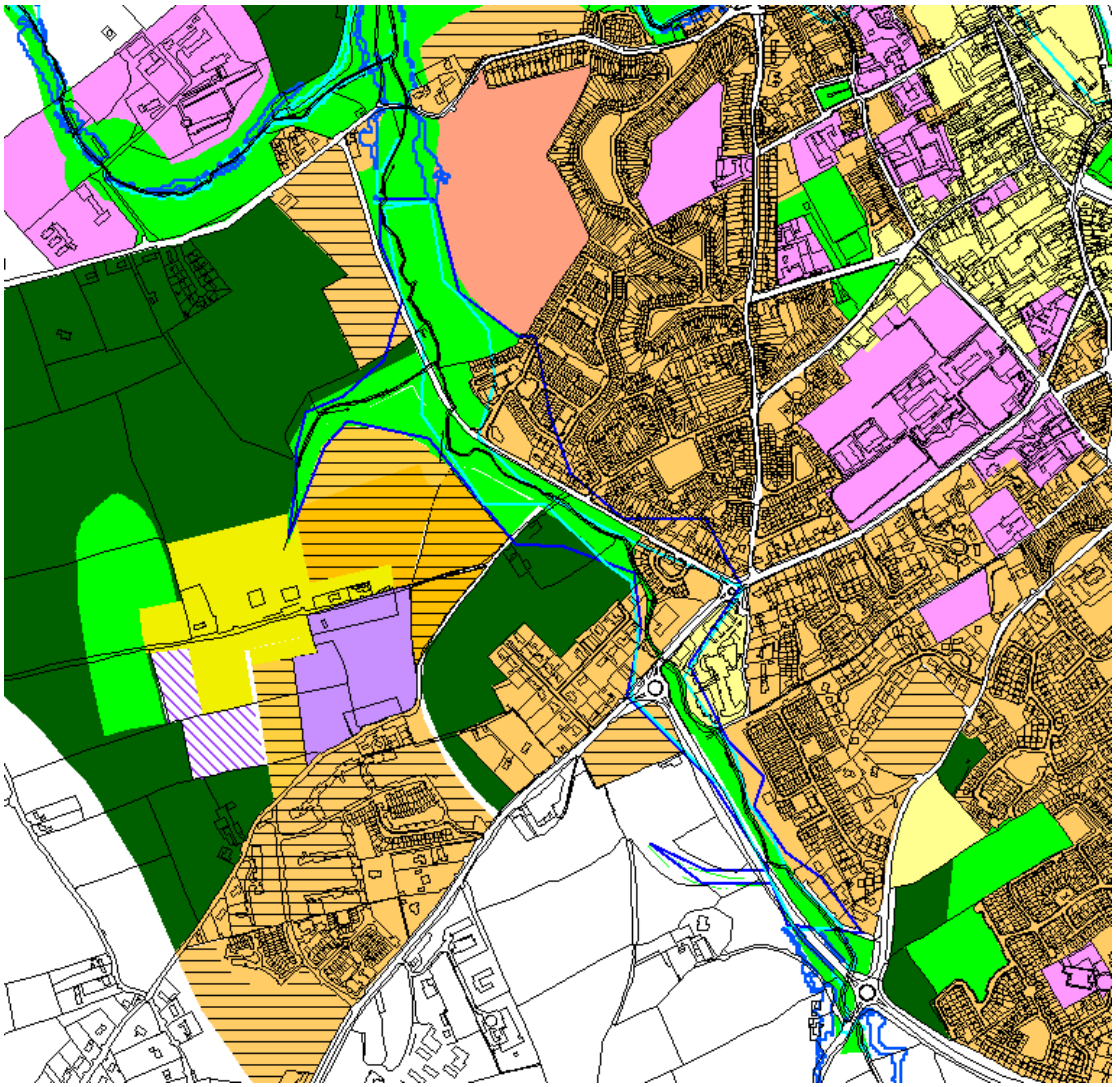
i. The zoning of this area for residential use is intended mainly to reflect the existing uses in operation. The continued zoning of the land will facilitate the regeneration and/or expansion of the centre.
ii. All of the land is currently in residential use.
iii. All of the land adjoins the core of Kilkenny (as core is defined in the Flooding Guidelines).
iv. The continued development of this land is essential in achieving compact and sustainable urban growth as it will provide residential use to Kilkenny.
v. The zoning of this land reflects the existing uses on the sites, and is intended to facilitate their appropriate expansion. Therefore this land is the most suitable for this purpose.

2) A flood risk assessment to an appropriate level of detail has been carried out....

In the main, this land is built out and the opportunities for future development are limited. In this context, this FRA contains sufficient information appropriate to the scale and nature of the development potential. Mitigation measures are included in the DCCDP and an objective will state that any development within Flood Zone A or B will be subject to a site specific Flood Risk Assessment appropriate to the scale and type of the development being proposed. This mitigation measure will ensure that any development taking place will not exacerbate any flooding issue. Any vulnerable development proposed will have to satisfy the development management Justification Test.

[12] Southern Regional Assembly, *Regional Spatial and Economic Strategy*, 2020

Area 4: South of Croker's Hill around the River Breagagh, to the Kells road roundabout.



This area adjoins the city centre and is zoned for numerous uses, namely Mixed use, Residential, Open Space, Phase 2, Neighbourhood centre and Agriculture.

Both Open Space and Phase 2 (development not to take place during the lifetime of this plan) are considered water compatible uses. In the Draft Plan, the Strategic Reserve zoning has replaced the Phase 2. The Strategic Reserve zone does not pose a conflict, as detailed earlier. As set out in Table 3.1, the Breagagh is undergoing review by the OPW. The source of flood zone mapping is uncertain as it is based on the 1st generation PFRA, however no decision on land zoning has been made, and this area will be reviewed in the light of more detailed flood zone mapping at the next stage of the DP.

The amended zoning map is shown on Figure 23b. Only a small amount of zoned land (General Business and Residential) remains within either Flood zone A or B, near the Callan Road roundabout and Ring Road. As both zones can contain residential uses, which are a highly vulnerable use, they must be subjected to the Justification Test, as follows:

1) The urban settlement is targeted for growth....

Kilkenny is identified as a Key Town in the Southern Regional Spatial and Economic Strategy 2020[13] and is targeted for growth in the County and City Development Plan.

2) The zoning or designation of the lands for the particular use or development type is required to achieve the proper and sustainable planning of the urban settlement ....

i. The zoning of this area for residential and General Business use is intended mainly to reflect the existing uses; Hotel Kilkenny, private residences and some sites with permission for residential use. The continued zoning of the land will facilitate the regeneration and/or expansion of the centre.
ii. The land comprises significant previously developed and/or under-utilised lands.
iii. All of the land adjoins the core of Kilkenny (as core is defined in the Flooding Guidelines).
iv. The continued development of this land is essential in achieving compact and sustainable urban growth.
v. The zoning of this land reflects the existing uses on the sites, and is intended to facilitate their appropriate expansion. Therefore this land is the most suitable for this purpose.

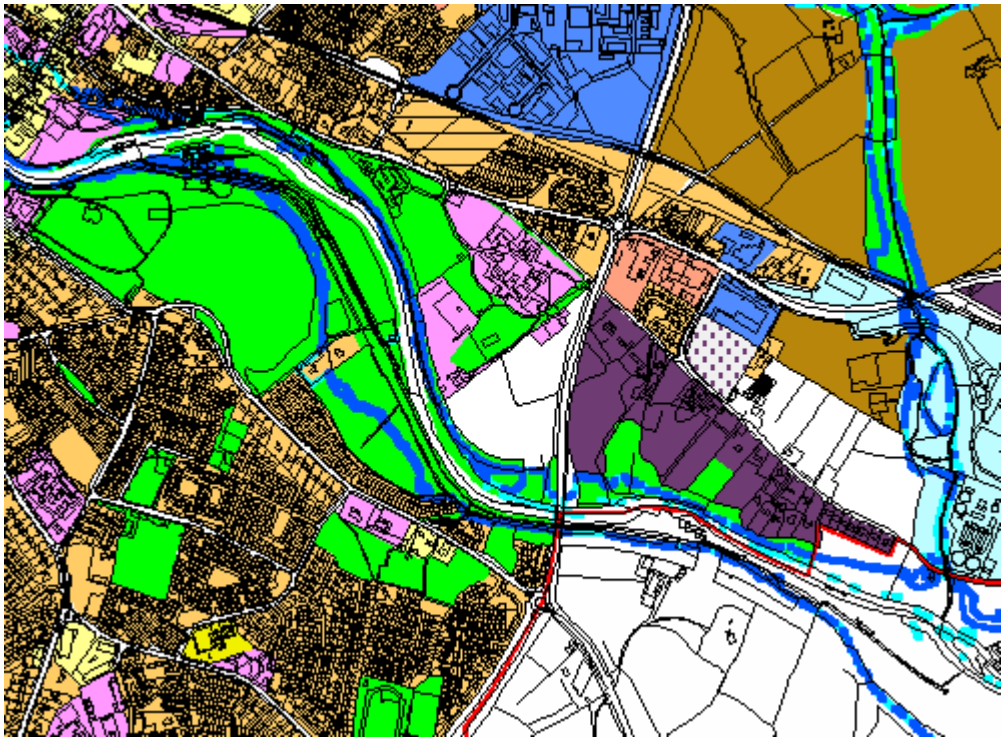
3) A flood risk assessment to an appropriate level of detail has been carried out....

In the main, the zoning of this land for water compatible uses in the area covered by the indicative PFRA is appropriate. A site specific FRA was carried out for the only site with significant development potential.

In this context, this FRA contains sufficient information appropriate to the scale and nature of the development potential. Mitigation measures are included in the DCCDP and an objective will state that any development within Flood Zone A or B will be subject to a site specific Flood Risk Assessment appropriate to the scale and type of the development being proposed. This mitigation measure will ensure that any development taking place will not exacerbate any flooding issue. Any vulnerable development proposed will have to satisfy the development management Justification Test.

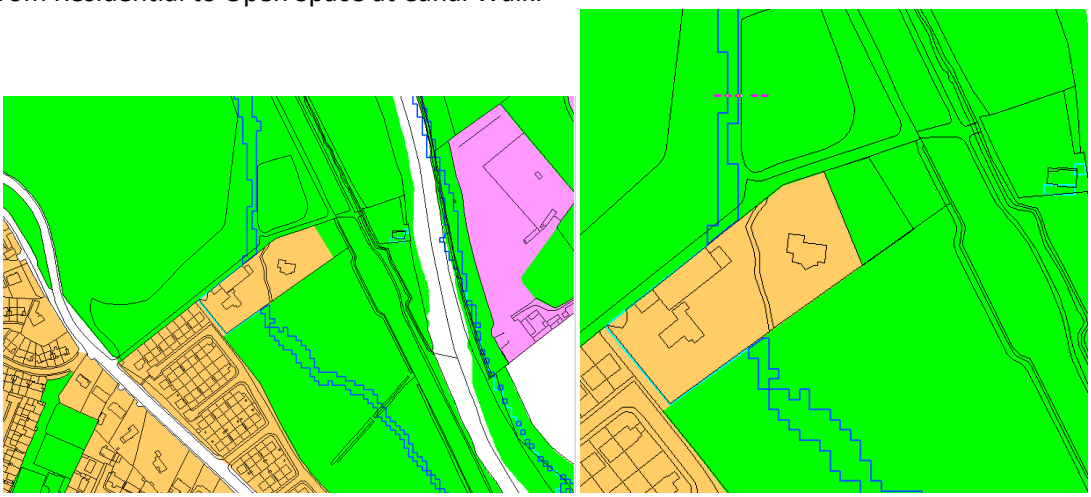
Area 5: From Lacken Mill to City's eastern boundary around the River Nore.

[13] Southern Regional Assembly, *Regional Spatial and Economic Strategy*, 2020



For the less and highly vulnerable uses, the Sequential approach was used and this resulted in the avoidance of a greenfield site and rezoning as follows:

From Residential to Open Space at Canal Walk.



Only a small amount of zoned land (Residential) remains within either Flood zone A or B. As residential is a highly vulnerable use, these parcels must be subjected to the Justification Test, as follows:

1) The urban settlement is targeted for growth....

Kilkenny is identified as a Key Town in the Southern Regional Spatial and Economic Strategy 2020[14] and is targeted for growth in the County and City Development Plan.

[14] Southern Regional Assembly, *Regional Spatial and Economic Strategy*, 2020

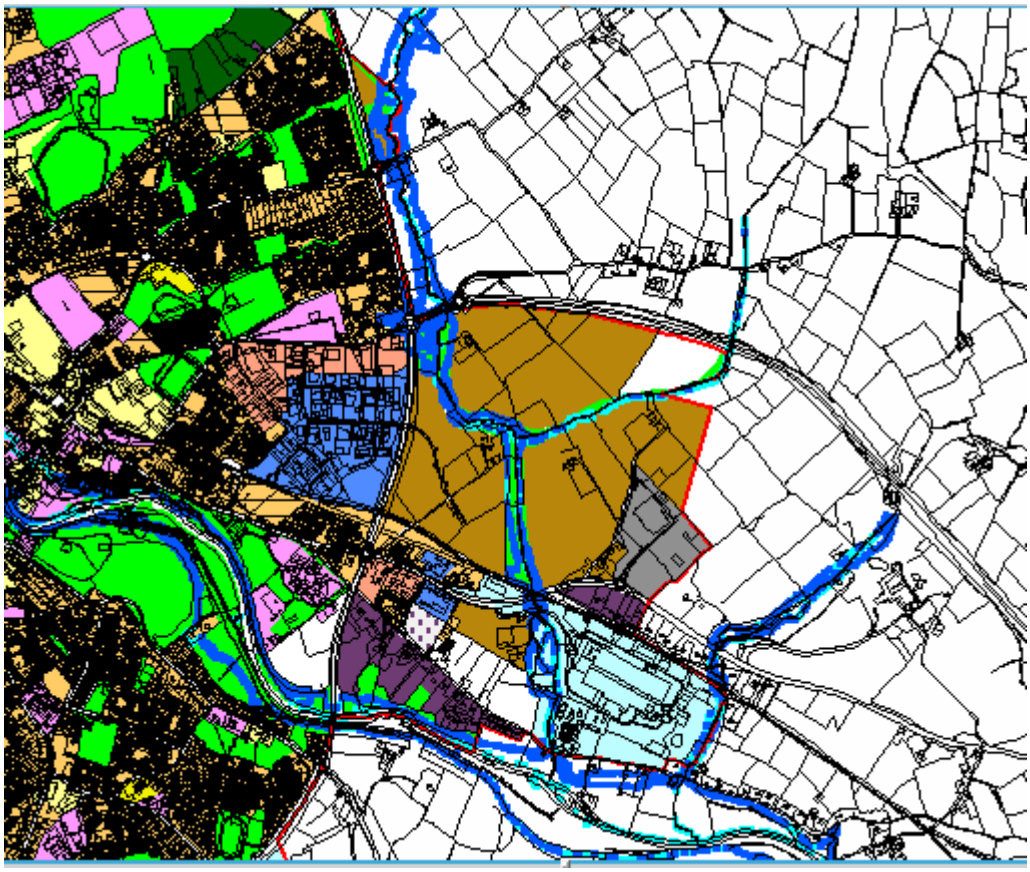
2) The zoning or designation of the lands for the particular use or development type is required to achieve the proper and sustainable planning of the urban settlement ....

i. The zoning of this area for residential use is intended mainly to reflect the existing uses of private residences. The continued zoning of the land will facilitate the regeneration and/or expansion of the centre.
ii. The land comprises significant previously developed and/or under-utilised lands.
iii. All of the land adjoins the core of Kilkenny (as core is defined in the Flooding Guidelines).
iv. The continued development of this land is essential in achieving compact and sustainable urban growth.
v. The zoning of this land reflects the existing uses on the sites, and is intended to facilitate their appropriate expansion. Therefore this land is the most suitable for this purpose.

4) A flood risk assessment to an appropriate level of detail has been carried out....

In the main, this land is built out and the opportunities for future development are limited. In this context, this FRA contains sufficient information appropriate to the scale and nature of the development potential. Mitigation measures are included in the DCCDP and an objective will state that any development within Flood Zone A or B will be subject to a site specific Flood Risk Assessment appropriate to the scale and type of the development being proposed. This mitigation measure will ensure that any development taking place will not exacerbate any flooding issue. Any vulnerable development proposed will have to satisfy the development management Justification Test.

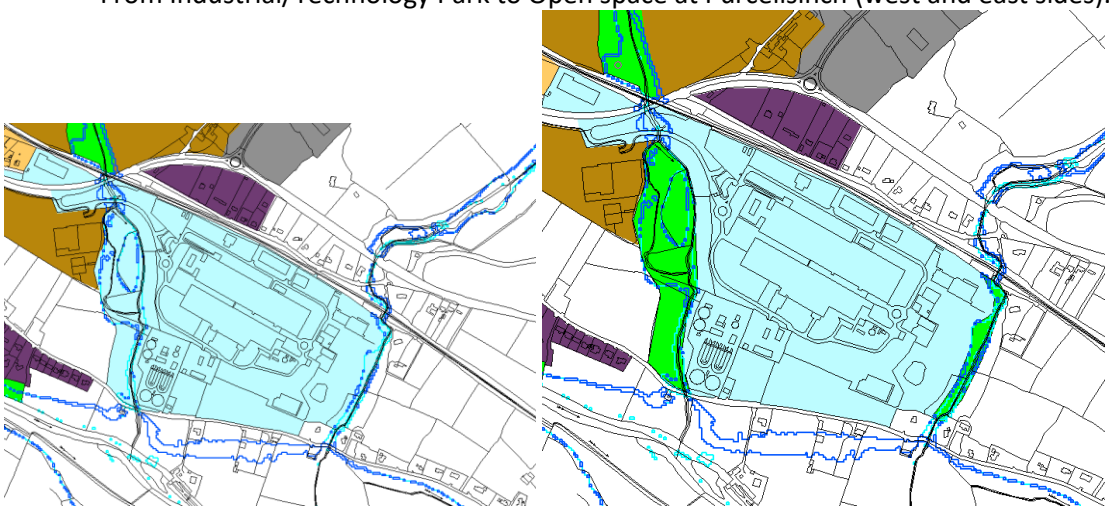
Area 6: Area around Pococke River to east of city



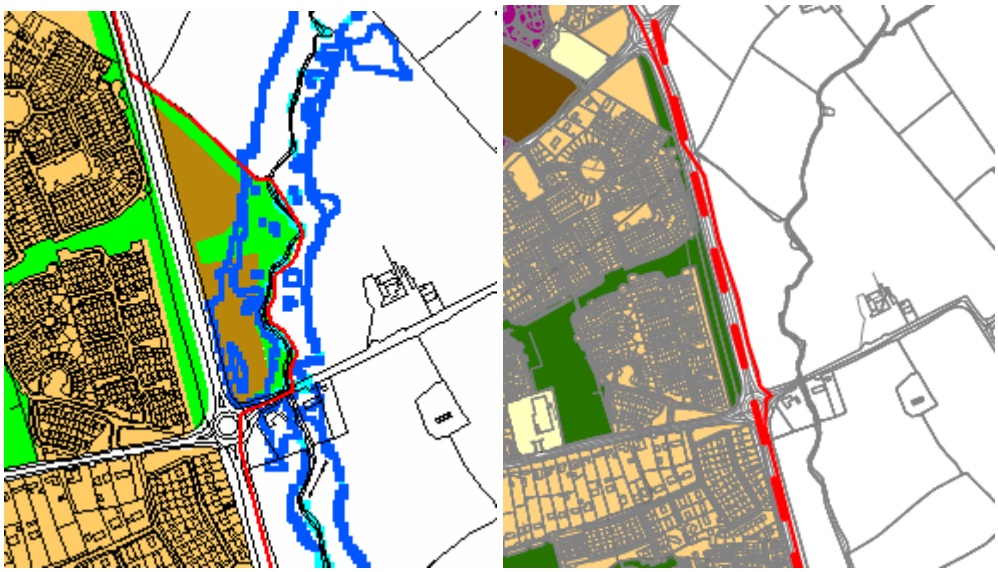
This area lies to the east of the city centre and is zoned for numerous uses, namely Industrial/Technology park, Residential, Open Space, Business park and Residential. For the most part, the area is undeveloped.

For the less and highly vulnerable uses, the Sequential approach was used and this resulted in the avoidance of sites and rezoning as follows:

- From Industrial/Technology Park to Open space at Purcellsinch (west and east sides).



- From Business park to outside the development boundary at the Pococke.



The amended zoning map is shown on Figure 23b. Only a small amount of General Business zoning remains within the flood zones at the M9 Motorway/Hebron Road roundabout.

As vulnerable uses, this land must be subjected to the Justification Test, as follows:

1) The urban settlement is targeted for growth....
Kilkenny is identified as a Key Town in the Southern Regional Spatial and Economic Strategy 2020[15] and is targeted for growth in the County and City Development Plan.

2) The zoning or designation of the lands for the particular use or development type is required to achieve the proper and sustainable planning of the urban settlement ....

vi. The zoning of this area for General Business use reflects the existing use of a fast food takeaway/restaurant. The continued zoning of the land will facilitate the regeneration and/or expansion of the centre.
vii. The land comprises significant previously developed and/or under-utilised lands.
viii. All of the land adjoins the core of Kilkenny (as core is defined in the Flooding Guidelines).
ix. The continued development of this land is essential in achieving compact and sustainable urban growth.
x. The zoning of this land reflects the existing uses on the sites, and is intended to facilitate their appropriate expansion. Therefore this land is the most suitable for this purpose.

5) A flood risk assessment to an appropriate level of detail has been carried out....

In the main, this land is built out and the opportunities for future development are limited. In this context, this FRA contains sufficient information appropriate to the scale and nature of the development potential. Mitigation measures are included in the DCCDP and an objective will state that any development within Flood Zone A or B will be subject to a site specific Flood Risk Assessment appropriate to the scale and type of the development being proposed. This mitigation measure will ensure that any development taking place will not exacerbate any flooding issue. Any vulnerable development proposed will have to satisfy the development management Justification Test.

5.3.4 Environs of New Ross Zoning Proposals

The Flood Zones in the Environs of New Ross were overlain on the Zoning Map, taken from the County Development Plan, 2014.

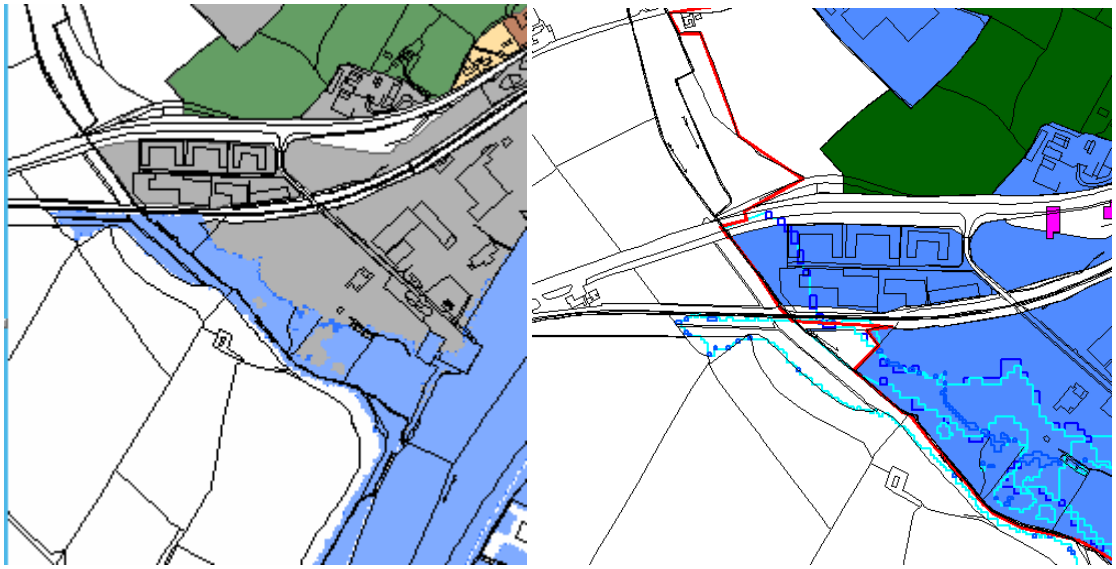
An area of possible conflict between flood risk and future development was identified around the Port area. The Sequential approach was used and this resulted in the avoidance of one greenfield site as follows:

- From Industrial to outside the Development boundary.

i) the industrial zoning in the south.

Just south of the rail line there is an area of greenfield land of approx. 0.6 hectares. Following the sequential approach, this land will be avoided, and the development boundary will be redrawn to exclude this parcel of land.

[15] Southern Regional Assembly, *Regional Spatial and Economic Strategy*, 2020



This is shown on Map 24a.

Under the proposed zoning for New Ross Environs, this area is included as Industrial. In order for this land to remain zoned, the zoning must satisfy the Justification Test. The criteria are outlined in Section 1.5 and the test is set out below.

1) The urban settlement is targeted for growth....
New Ross is identified as a Hinterland Town in the Southern Regional Spatial and Economic Strategy 2020, and is targeted for growth in both the Wexford Draft County Development Plan 2021 and the Kilkenny County Development Plan. According to the RSES, "*Sustainable growth of settlements in the Hinterland Area provides long-term options for employment and residential locations, where the towns of Carrick-on-Suir, New Ross and Tramore can be supported by sustainable transport links to the Metropolitan Area*."

2) The zoning or designation of the lands for the particular use or development type is required to achieve the proper and sustainable planning of the urban settlement ....

a. The zoning of this area for industrial development is intended mainly to reflect the existing uses in operation. The continued zoning of the land will facilitate the regeneration and/or expansion of the centre.
b. Most of the land is currently in use.
c. The land adjoins the core of New Ross (as core is defined in the Flooding Guidelines).
d. The continued development of this land is essential in achieving compact and sustainable urban growth as it provides employment and services to New Ross.
e. The zoning of this land reflects the existing uses on the sites, and is intended to facilitate their appropriate expansion. Therefore this land is the most suitable for this purpose.

3) A flood risk assessment to an appropriate level of detail has been carried out....
In the main, this land is built out and the opportunities for future development are limited. In this context, this FRA contains sufficient information appropriate to the scale and nature of the development potential. Mitigation measures are included in the DCCDP and an objective will state that any development within Flood Zone A or B will be subject to a site specific Flood Risk Assessment appropriate to the scale and type of the development being proposed. This mitigation

measure will ensure that any development taking place will not exacerbate any flooding issue. Any vulnerable development proposed will have to satisfy the development management Justification Test.

See Figure 24b for the revised zoning proposed for New Ross Environs.

6 Recommendations

This SFRA considers Kilkenny county, and towns and villages for which a specific development framework is included in the DCCDP.

For those functional areas where strategic land-use decisions will be made through any Local Area Plans, it is recommended that detailed flood risk assessments are carried out in respect of each such area.

For the settlements identified through this SFRA that are covered by either Flood Zone A or B, text will be included in Chapter 10 of the DCCDP to ensure that development proposals shall be the subject of a site-specific Flood Risk Assessment, appropriate to the type and scale of the development being proposed and shall be carried out in line with the Flooding Guidelines. Detailed guidance is set out below.

6.1 Development Management and Flood Risk

In order to guide both applicants and relevant council staff through the process of planning for and mitigating flood risk, the key features of a range of development scenarios have been identified (relating the flood zone, development vulnerability and presence or absence of defences). For each scenario, a number of considerations relating to the suitability of the development are summarised below.

It should be noted that this section of the SFRA begins from the point that all land zoned for development has passed the Justification Test for Development Plans, and therefore passes Part 1 of the Justification Test for Development Management – which states that the land has in the first instance been zoned accordingly in a development plan (that underwent an SFRA).

In order to determine the appropriate design standards for a development it may be necessary to undertake a site-specific flood risk assessment. This may be a qualitative appraisal of risks, including drainage design. Alternatively, the findings of the CFRAM, or other detailed study, may be drawn upon to inform finished floor levels. In other circumstances a detailed modelling study and flood risk assessment may need to be undertaken. Further details of each of these scenarios, including considerations for the flood risk assessment are provided in the following sections.

6.1.1 Requirements for a Flood Risk Assessment

As specified under Chapter 10 of the DCCDP, assessment of flood risk is required in support of any planning application where flood risk may be an issue, and this may include sites in Flood Zone C (low probability of flooding) where a watercourse or field drain exists nearby. The level of detail will vary depending on the risks identified and the proposed land use. As a minimum, all proposed development, including that in Flood Zone C, must consider the impact of surface water flood risks on drainage design. In addition, flood risk from sources other than fluvial should be reviewed.

For sites within Flood Zone A or B (high/moderate probability of flooding), a site specific "Stage 2 - Initial FRA" will be required and may need to be developed into a "Stage 3 - Detailed FRA". The extents of Flood Zone A and B are delineated through this SFRA. However, future studies may refine the extents (either to reduce or enlarge them) so a comprehensive review of available data should be undertaken once an FRA has been triggered.

Within the FRA the impacts of climate change and residual risk (including culvert/structure blockage) should be considered and remodelled where necessary, using an appropriate level of detail, in the design of finished floor levels. Further information on the required content of the FRA is provided in the *Planning System and Flood Risk Management Guidelines*.

Any proposal that is considered acceptable in principle shall demonstrate the use of the sequential approach in terms of the site layout and design and, in satisfying the Justification Test (where required), the proposal will demonstrate that appropriate mitigation and management measures are put in place.

6.1.2 Drainage Design

As set out in Chapter 10, all proposed development, whether in Flood Zone A, B or C, must consider the impact of surface water flood risks on drainage design as specified by the surface water management policies in the Greater Dublin Strategic Drainage Study (GDSDS) and this will be considered in the planning process. This may be in the form of a section within the flood risk assessment (for sites in Flood Zone A or B) or part of a surface water management plan.

Areas vulnerable to ponding are indicated on the OPW's PFRA mapping. Particular attention should be given to development in low-lying areas which may act as natural ponds for collection of run-off.

The drainage design should ensure no increase in flood risk to the site, or the downstream catchment. Where possible, and particularly in areas of new development, floor levels should at a minimum be 300mm above adjacent roads and hard standing areas to reduce the consequences of any localised flooding. Where this is not possible, an alternative design appropriate to the location may be prepared.

In addition, for larger sites (i.e. multiple dwellings or commercial units) master planning should ensure that existing flow routes are maintained, through the use of green infrastructure.

6.1.3 Development Proposals in Flood Zone C

Where a site is within Flood Zone C, but adjoining or in close proximity to Flood Zone A or B there could be a risk of flooding associated with factors such as future scenarios (climate change) or in the event of failure of a defence, blocking of a bridge or culvert. Risk from sources other than fluvial must also be addressed for all development in Flood Zone C. As a minimum in such a scenario, a flood risk assessment should be undertaken which will screen out possible indirect sources of flood risk and where they cannot be screened out, it should present mitigation measures. The most likely mitigation measure will involve setting finished floor levels to a height that is above the 1 in 100 year fluvial flood level, with an allowance for climate change and freeboard, or to ensure a step up from road level to prevent surface water ingress. Design elements such as channel maintenance or trash screens may also be required. Evacuation routes in the event of inundation of surrounding land should also be detailed.

The impacts of climate change should be considered for all proposed developments. A development which is currently in Flood Zone C may be shown to be at risk when 0.5m is added to the extreme (1 in 200 year) tide.

6.1.4 Applications for Developments in Flood Zone A or B

6.1.4.1 Minor Developments

Section 5.28 of the *Planning Guidelines on Flood Risk Management* identifies certain types of development as being 'minor works' and therefore exempt from the Justification Test. Such development relates to works associated with existing developments, such as small extensions to houses, and most changes of use of existing buildings and or extensions and additions to existing commercial and industrial enterprises. Since such applications concern existing buildings, the sequential approach cannot be used to locate them in lower-risk areas and the Justification Test will not apply. However, a commensurate assessment of the risks of flooding should accompany such applications to demonstrate that they would not have adverse impacts or impede access to a watercourse, floodplain or flood protection and management facilities. These proposals should follow best practice in the management of health and safety for users and residents of the proposal. Where it is determined that there will be an increase in risk as a result of changes in occupation levels or use, the development should be assessed as Major development. In this context it should be noted that the Plan Making Justification Test has not been applied and development should avoid Flood Zones A and B.

Where possible, the design of built elements in these applications should demonstrate principles of flood resilient design (See '*The Planning System and Flood Risk Management Guidelines for Planning Authorities Technical Appendices, 2009', Section 4 - Designing for Residual Flood Risk*).

Generally, the approach to deal with flood protection would involve raising the ground floor levels above the level of extreme river levels. If this leads to floor levels being much higher than adjacent streets it could create a hostile streetscape for pedestrians. This would cause problems for infill development sites if floor levels were required to be significantly higher than those of neighbouring properties. In this regard, it has been recognised that some flexibility could be allowed, in limited circumstances, on a site by site basis, for commercial and business developments. In these cases, the detailed design of the development should reflect the vulnerability of the site in terms of materials, fixtures and fittings and internal layout. For high risk areas, less vulnerable uses are encouraged at ground floor levels. A site-specific FRA will inform appropriate uses and detailed design and layout.

It should be noted that for residential buildings within Flood Zone A or B, bedroom accommodation is more appropriate at upper floor levels.

For commercial operations, business continuity must be considered, and steps taken to ensure operability during and recovery after a flood event for both residential and commercial developments. Emergency access must be considered as in many cases flood resilience will not be easily achieved in the existing built environment.

6.1.4.2 Highly Vulnerable Development in Flood Zone A or B

Development which is highly vulnerable to flooding, as defined in *The Planning System and Flood Risk Management*, includes (but is not limited to) dwelling houses, schools, hospitals, emergency services and caravan parks.

6.1.4.3 New Development

It is not appropriate for new highly vulnerable development to be located on greenfield land in Flood Zones A or B, particularly outside the core of a settlement and where there are no flood defences. Such proposals do not pass the Justification Test. Instead, a less vulnerable use should be considered.

6.1.4.4 Existing Developed Areas

In cases where development has been justified, the outline requirements for a flood risk assessment and flood management measures have been detailed in this SFRA. Of prime importance is the requirement to manage risk to the development site and not to increase flood risk elsewhere. This should give due consideration to safe evacuation routes and access for emergency services during a flood event.

6.1.4.5 Less Vulnerable Development in Flood Zone A or B

Less vulnerable development includes retail, leisure, warehousing, technology, enterprise and buildings used for agriculture and forestry, see Table 2.2.

The design and assessment of less vulnerable development should generally begin with 1% AEP fluvial event as standard, with climate change and a suitable freeboard included in the setting of finished floor levels. The site-specific FRA should ensure that the risks are defined, understood, and accepted. Operability and emergency response should also be clearly defined. In a limited number of cases this may allow construction as low as the 1% AEP level to be adopted, provided the risks of climate change are included in the development through adaptable designs or resilience measures.

6.2 Key Points for FRA for all types of Development

- Finished floor levels to be set above the 1% AEP fluvial (0.5% AEP tide) level, with an allowance for climate change plus a freeboard of at least 300mm. The freeboard allowance should be assessed, and the choice justified.
- Flow paths through the site and areas of surface water storage should be managed to maintain their function and without causing increased flood risk elsewhere.
- Compensatory storage is to be provided to balance floodplain loss as a result of raising ground levels within Flood Zone A. The storage should be provided within the flood cell and on a level for level basis up to the 1% level.
- In a defended site, compensatory storage is not required, but the impact of removing the net reduction in floodplain storage should be assessed, and any impacts to existing development mitigated for the 0.1% event or a breach of these defences.
- A site is considered to be defended if the standard of protection is 1% AEP, within which a freeboard of at least 300mm is included. The FFL of the proposed development needs to take into account the impacts of climate change and other residual risks, including the 0.1% event, unless this has also been incorporated into the defence design. This may be assessed through breach analysis, overtopping analysis or projection of levels from the channel inland.
- For less vulnerable development, it may be that a finished floor level as low as the 1% AEP level could be adopted, provided the risks of climate change are included in the development through adaptable designs or resilience measures. This approach should reflect emergency planning and business continuity to be provided within the development.

It may reflect the design life of the development, the proposed use, the vulnerability of items to be kept in the premises, the occupants and users, emergency plan and inclusion of flood resilience and recovery measures.

6.3 Incorporating Climate Change into Development Design

In all developments, climate change should be considered when assessing flood risk and in particular residual flood risk. Consideration of climate change is particularly important where flood alleviation measures are proposed, as the design standard of the proposal may reduce significantly in future years due to increased rainfall, river flows and sea levels.

The *Guidelines* recommend that a precautionary approach to climate change is adopted due to the level of uncertainty involved in the potential effects. A significant amount of research into climate change has been undertaken on both a national and international front, and updates are ongoing.

Advice on the expected impacts of climate change and the allowances to be provided for future flood risk management in Ireland is given in the OPW draft guidance. Two climate change scenarios are considered; these are the Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS). The MRFS is intended to represent a "likely" future scenario based on the wide range of future predictions available. The HEFS represents a more "extreme" future scenario at the upper boundaries of future projections. Based on these two scenarios the OPW recommended allowances for climate change are given in the table below. These climate change allowances are particularly important at the development management stage of planning and will ensure that proposed development is designed and constructed to take into account best current knowledge.

Table 6.1 Allowances for Future Scenarios (100-year Time Horizon)

Criteria	MRFS	HEFS
Extreme Rainfall Depths	+20%	+30%
Flood Flows	+20%	+30%
Mean Sea Level Rise	+500mm	+1000mm
Land Movement	-0.5mm / year*	-0.5mm / year*
Urbanisation	No General Allowance - Review on Case by Case Basis	No General Allowance - Review on Case by Case Basis
Forestation	-1/6 Tp**	-1/3 Tp** +10% SPR***

Notes:
* Applicable to the southern part of the country only (Dublin - Galway and south of this)
** Reduce the time to peak (Tp) by a third; this allows for potential accelerated runoff that may arise as a result of drainage of afforested land
*** Add 10% to the Standard Percentage Runoff (SPR) rate; this allows for increased runoff rates that may arise following felling of forestry

As set out in Section 5.1.1 Consideration of Climate Change, through the CFRAM Studies, both MRFS and HEFS model runs have been completed on all study watercourses, providing flood extent and depth maps. This information can be used to support flood risk assessments where the current CFRAM scenario has been deemed appropriate to the location.

For watercourses that are not part of the CFRAM programme, fluvial flood extents can be qualitatively assessed by using the Flood Zone B outline as a surrogate for 'Flood Zone A with allowance for the possible impacts of climate change', as suggested in the 'Planning System and Flood Risk Management'. Quantitative assessment of risks may require an additional model run to fully understand risks.

For most development, including residential, nursing homes, shops and offices, the medium-range future scenario (20% increase in flows) is an appropriate consideration. This should be applied in all areas that are at risk of flooding (i.e. within Flood Zone A and B) and should be considered for sites which are in Flood Zone C but are adjacent to Flood Zone A or B. This is because land which is currently not at risk may become vulnerable to flooding when climate change is taken into account.

Where the risk associated with inundation of a development is low and the design life of the development is short (typically less than 30 years) the allowance provided for climate change may be less than the 20% / 0.5m level. However, the reasoning and impacts of such an approach should be provided in the site-specific FRA.

Conversely, there may be development which requires a higher-level response to climate change. This could include major facilities which are extremely difficult to relocate, such as hospitals, airports, Seveso sites or power stations, and those which represent a high-economic and long-term investment within the scale of development across the county. In such situations it would be reasonable to expect the high-end future scenario (30% increase in flow) to be investigated in the site-specific FRA and used as the design standard.

In general, climate change will be accounted for by the setting of finished floor levels to a height which includes an allowance for climate change. However, climate change may also reveal additional flow paths which need to be protected or give rise to flows which exceed culvert capacity or overtop defences. These outcomes will need to be specifically investigated for each site, and an appropriate response provided.

6.4 Flood Mitigation Measures at Site Design

For any development proposal in an area at moderate or high risk of flooding that is considered acceptable in principle (i.e. has passed the Plan Making Justification Test), the site specific FRA must demonstrate that appropriate mitigation measures can be put in place and that residual risks can be managed to acceptable levels. This may include the use of flood-resistant construction measures that are aimed at preventing water from entering a building and that mitigate the damage floodwater causes to buildings. Alternatively, designs for flood resilient construction may be adopted where it can be demonstrated that entry of floodwater into buildings is preferable to limit damage caused by floodwater and allow relatively quick recovery.

Various mitigation measures are outlined below and further detail on flood resilience and flood resistance are included in the Technical Appendices of the Guidelines.

6.4.1.1 Site Layout and Design

To address flood risk in the design of new development, a risk-based approach should be adopted to locate more vulnerable land use to higher ground while water compatible development i.e. car parking (with appropriate flood management plan) and recreational space can be located in higher flood risk areas.

The site layout should identify and protect land required for current and future flood risk management. Waterside areas or areas along known flow routes can be used for recreation, amenity and environmental purposes to allow preservation of flow routes and flood storage, while at the same time providing valuable social and environmental benefits.

6.4.1.2 Ground Levels, Floor Levels and Building Use

Modifying ground levels to raise land above the design flood level is a very effective way of reducing flood risk to the site. However, in most areas of fluvial flood risk, conveyance or flood storage would be reduced locally and could increase flood risk off site. There are a number of criteria which must all be met before this is considered a valid approach:

- Development at the site must have been justified through this SFRA based on the existing (unmodified) ground levels.
- The FRA should establish the function provided by the floodplain. Where conveyance is a prime function then a hydraulic model will be required to show the impact of its alteration.
- The land being given over to storage must be land which does not flood in the 1% AEP fluvial event (i.e. Flood Zone B or C).
- Compensatory storage should be provided on a level for level basis to balance the total area that will be lost through infilling where the floodplain provides static storage.
- The provision of the compensatory storage should be in close proximity to the area that storage is being lost from (i.e. within the same flood cell).
- The land proposed to provide the compensatory storage area must be within the ownership / control of the developer.

- The compensatory storage area should be constructed before land is raised to facilitate development.
- Compensatory storage is generally not required for loss of floodplain in locations behind defences.

In some sites it is possible that ground levels can be re-landscaped to provide a sufficiently large development footprint. However, it is likely that in other potential development locations there is insufficient land available to fully compensate for the loss of floodplain. In such cases it will be necessary to reconsider the layout or reduce the scale of development, or propose an alternative and less vulnerable type of development. In other cases, it is possible that the lack of availability of suitable areas of compensatory storage mean the target site cannot be developed and should remain open space.

Raising finished floor levels within a development is an effective way of avoiding damage to the interior of buildings (i.e. furniture and fittings) in times of flood. Alternatively, assigning a water compatible use (i.e. garage / car parking) or less vulnerable use to the ground floor level, along with suitable flood resilient construction, is an effective way of raising vulnerable living space above design flood levels. It can however have an impact on the streetscape. Safe access and egress are a critical consideration in allocating ground floor uses.

Depending on the scale of residual risk, resilient and resistance measures may be an appropriate response, but this will mostly apply to less vulnerable development.

6.4.1.3 Raised Defences

Construction of raised defences (i.e. flood walls and embankments) has traditionally been the response to flood risk. However, this is not a preferred option on an ad-hoc basis where the defences to protect the development are not part of a strategically led flood relief scheme. Where a defence scheme is proposed as the means of providing flood defence, the impact of the scheme on flood risk up and downstream must be assessed and appropriate compensatory storage must be provided.

6.5 'Green Corridor'

It is recommended that, where possible, and particularly where there is greenfield land adjacent to the river, a 'green corridor', is retained on all rivers and streams. This will have a number of benefits, including:

- Retention of all, or some, of the natural floodplain;
- Potential opportunities for amenity, including riverside walks and public open spaces;
- Maintenance of the connectivity between the river and its floodplain, encouraging the development of a full range of habitats;
- Natural attenuation of flows will help ensure no increase in flood risk downstream;
- Allows access to the river for maintenance works.

The width of this corridor should be determined by the available land, and topographical constraints, such as raised land and flood defences, but would ideally span the fully width of the floodplain (i.e. all of Flood Zone A).

6.5.1 Surface Water Drainage

This SFRA has also included a review of the current text in relation to flooding and surface water drainage. In line with the recommendations of the Guidelines, changes are proposed to the surface water drainage text to encourage the use of Sustainable Drainage Systems.

Surface water drainage systems are designed to channel stormwater (rainwater) to the nearest suitable river. Rain falling on impervious surfaces is usually directed into surface water drainage systems. Best practice is to separate the surface water drainage system from the foul drainage system to maximise the efficiency of our waste water treatment plants.

Surface water drainage systems are effective at transferring surface water quickly, but they can cause the volume of water in the receiving watercourse to increase more rapidly thereby increasing flood risk. Sustainable Drainage Systems (SuDS) can play a role in reducing and managing run-off to surface water drainage systems as well as improving water quality.

Development Management Requirements:

The Planning Authority will have regard to the Inland Fisheries Ireland guidance on '*Planning for Watercourses in the Urban Environment*' in assessing applications.

- Development must, so far as is reasonably practicable, incorporate the maximum provision to reduce the rate and quantity of runoff e.g.: -
- Hard surface areas (car parks, etc.), should be constructed in permeable or semi-permeable materials,
- On site storm water ponds to store and/or attenuate additional runoff from the development should be provided,
- Soak-aways or french drains should be provided to increase infiltration and minimise additional runoff.
- The Planning Authority will normally require that all new developments, include rainwater harvesting and/or grey water recycling in their design, except where not practical or feasible
- Individual developments shall be obliged, in all cases where surface water drainage measures are required, to provide a surface water drainage system separated from the foul drainage system.
- In the case of one-off rural dwellings or extensions, except in circumstances where an existing surface water drainage system is available to the proposed site for development and which, in the opinion of the planning authority has adequate capacity to accommodate the identified surface water loading, surface water shall be disposed of, in its entirety within the curtilage of the development site by way of suitably sized soak holes.
- In the case of driveways, drainage measures shall be provided to a detail acceptable to the planning authority so as to avoid run-off from the site to the adjoining public road.
- For all other green-field developments in general the limitation of surface water run-off to pre-development levels will be required. Where a developer can clearly demonstrate that capacity exists to accommodate run-off levels in excess of green-field levels then the planning authority shall consider such proposals on a case by case basis.
- In the case of brown-field development, while existing surface water drainage measures will be taken into account, some attenuation measures for surface water may be required at the discretion of the planning authority in the interests of balanced and sustainable development.
- In line with the above Kilkenny County Council will consider all drainage proposals consistent with SuDS (Sustainable Drainage Systems).

- For developments adjacent to watercourses of a significant conveyance capacity any structures (including hard landscaping) must be set back a minimum of 5-10m from the edge of the watercourse to allow access for channel clearing/maintenance. Any required setback may be increased to provide for habitat protection. Development consisting of construction of embankments, wide bridge piers, or similar structures will not normally be permitted in or across flood plains or river channels.
- The culverting of water courses is discouraged. Where culverting is unavoidable, the use of ecologically friendly box culverts is required. A development proposal requiring culverting should document open watercourse habitat lost and provide compensatory habitat.
- Adequate allowance shall be made for climate change; in designing surface water proposals a multiplication factor of 1.2 shall be applied to all river return periods up to 100 years except in circumstances where the OPW have provided advice specifying the particular multiplication factor for return periods up to 100 years. In the case of rainfall a multiplication factor of 1.1 shall be applied to rainfall intensities to make allowance for climate change requirements.
- In the design of surface water systems, regard shall be had to the Greater Dublin Regional Code of Practice for Drainage Works and associated GDSDS technical documents.
- For larger scale developments a report will be required specifying the SUDS measures considered in principle. If natural measures are not included, the reasons why not should be outlined.

6.6 Monitoring and Review

As outlined in Section 2, additional information, in the form of second generation PFRA mapping, or NIFM will be made available from the OPW soon that will inform flood risk assessments in the County. We are also awaiting the revised Breagagh mapping.

It is recommended that the OPW be consulted and information on these two elements be updated prior to the preparation of any amendments to the Draft.

This SFRA is based on currently available data and in accordance with its status as a “living document” it will be subject to modification by these emerging datasets of maps and plans as they become available.

7 Maps

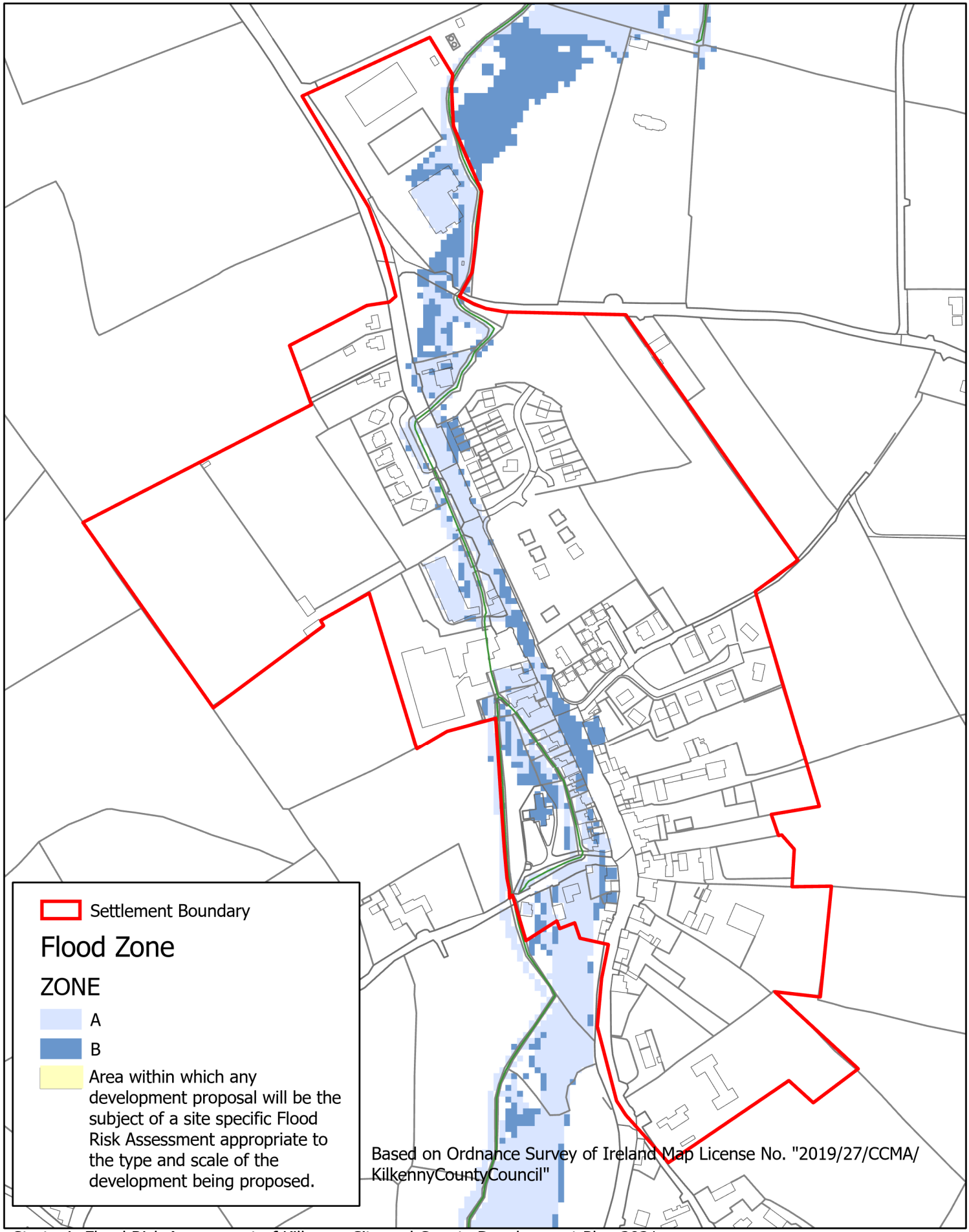
Maps are included for the following settlements:

Settlement boundary maps:

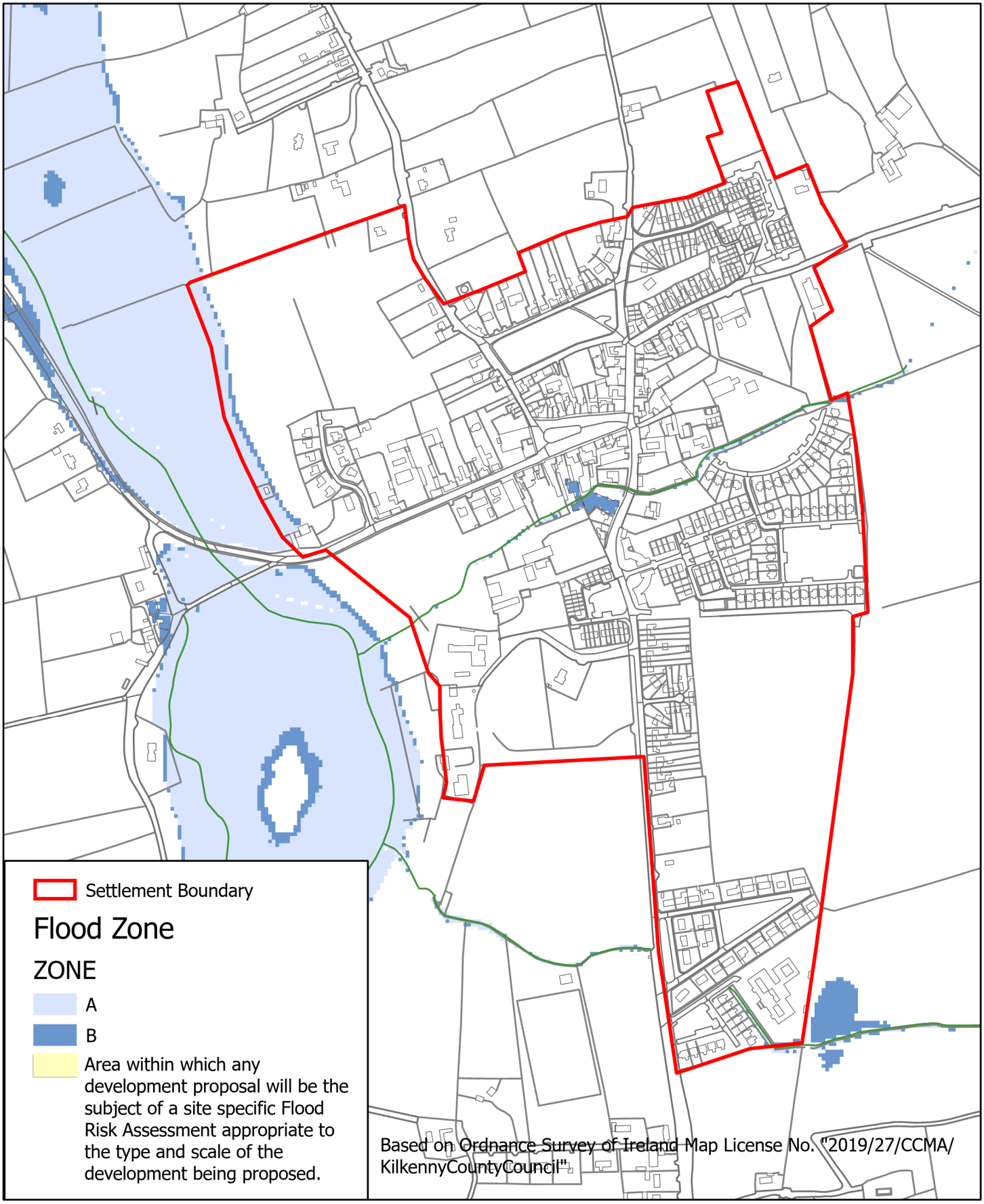
1) Ballyhale
2) Ballyragget
3) Bennettsbridge
4) Clogh-Chatsworth
5) Fiddown
6) Freshford
7) Goresbridge
8) Gowran
9) Inistioge
10) Johnstown
11) Kells
12) Kilmacow
13) Kilmaganny
14) Knocktopher
15) Moneenroe
16) Mooncoin
17) Mullinavat
18) Paulstown
19) Piltown
20) Slieverue
21) Stoneyford
22) Urlingford

Zoning maps:

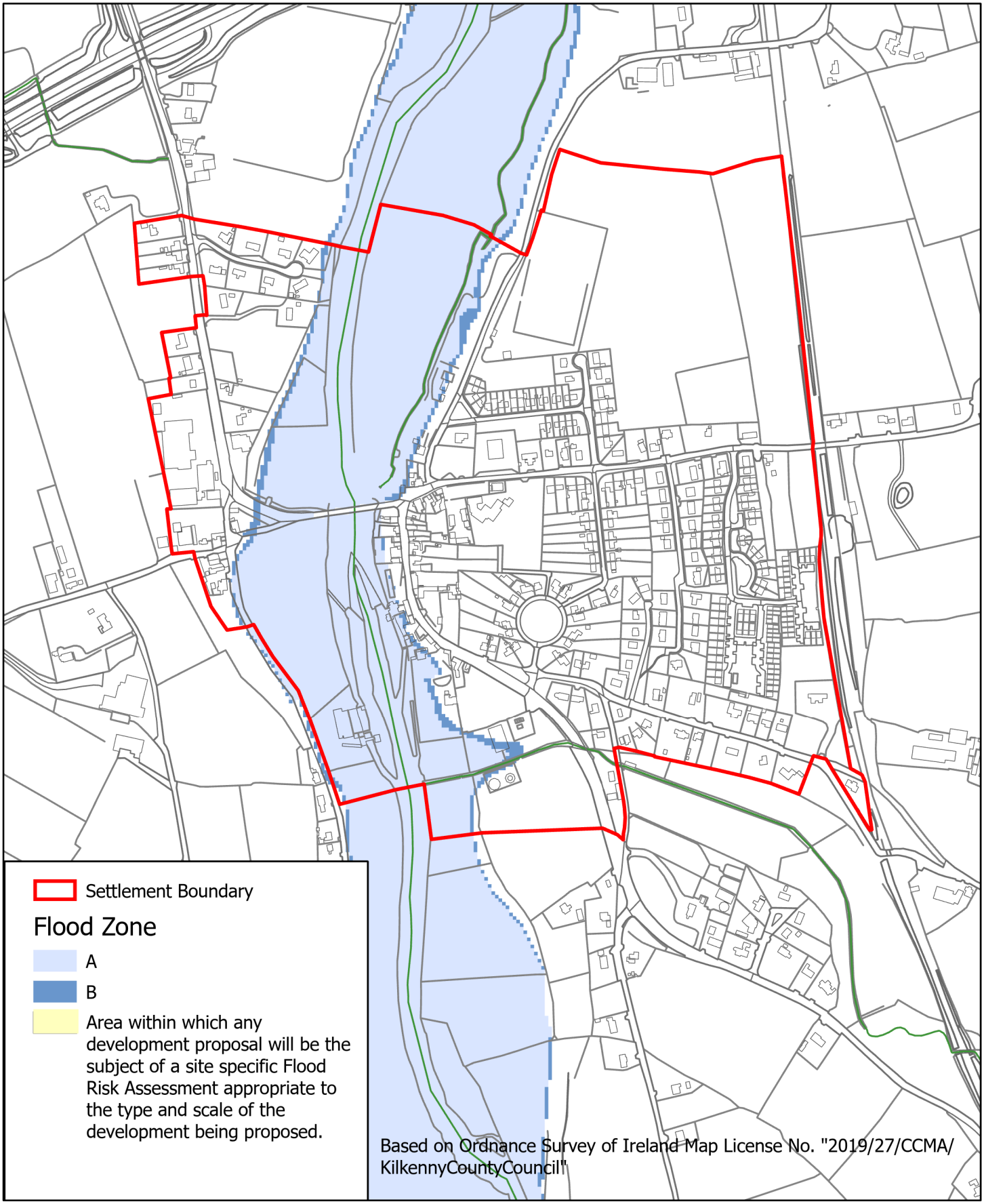
23a) Kilkenny – Areas of flood risk on Variation 6 Zoning Map
23b) Kilkenny – Areas of flood risk on Zoning Map
24 a) New Ross Environs – Areas of flood risk on Variation 2 Zoning Map
24b) New Ross Environs – Areas of flood risk on zoning map



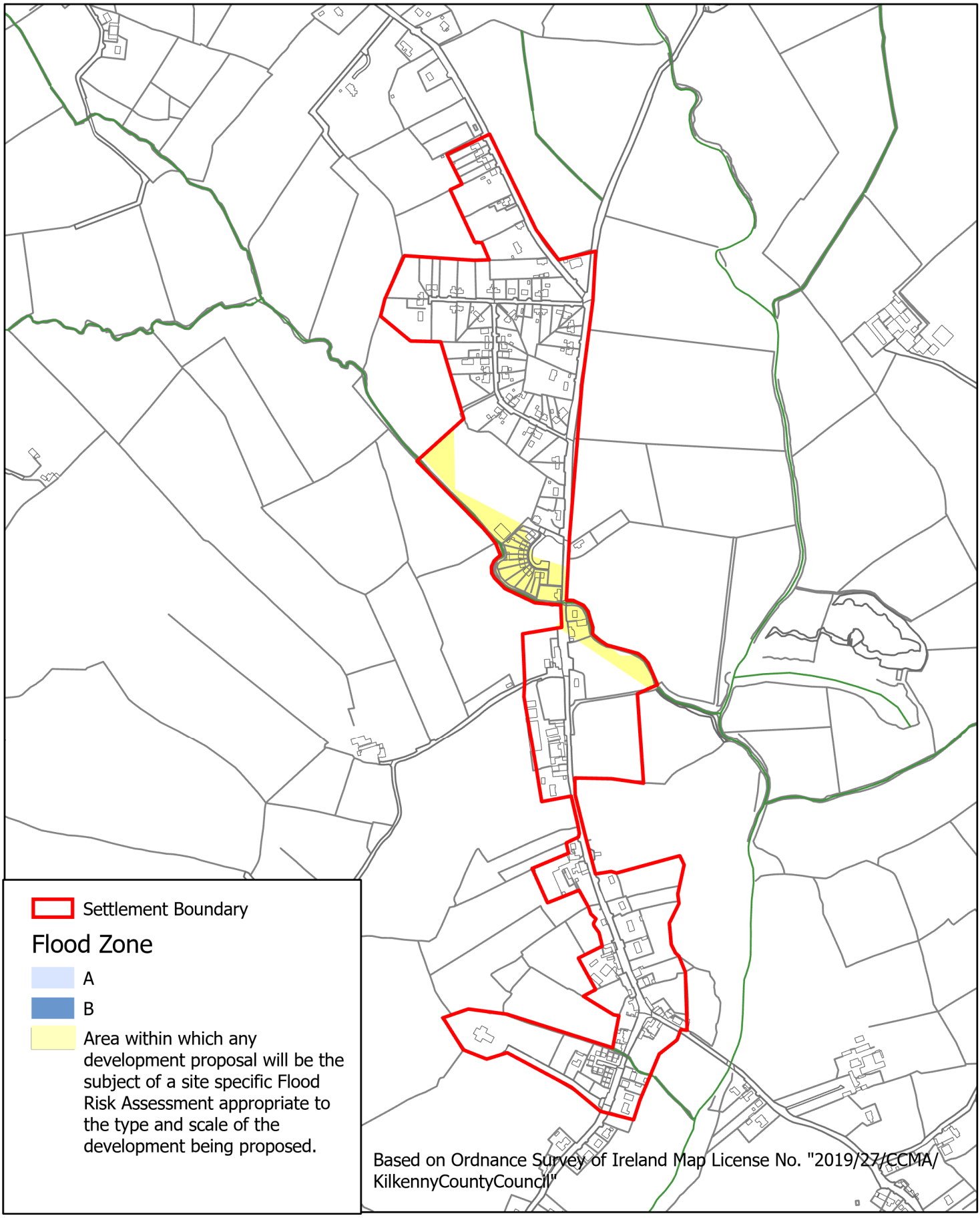
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 1: SFRA Ballyhale Settlement Boundary
Date: September 2021



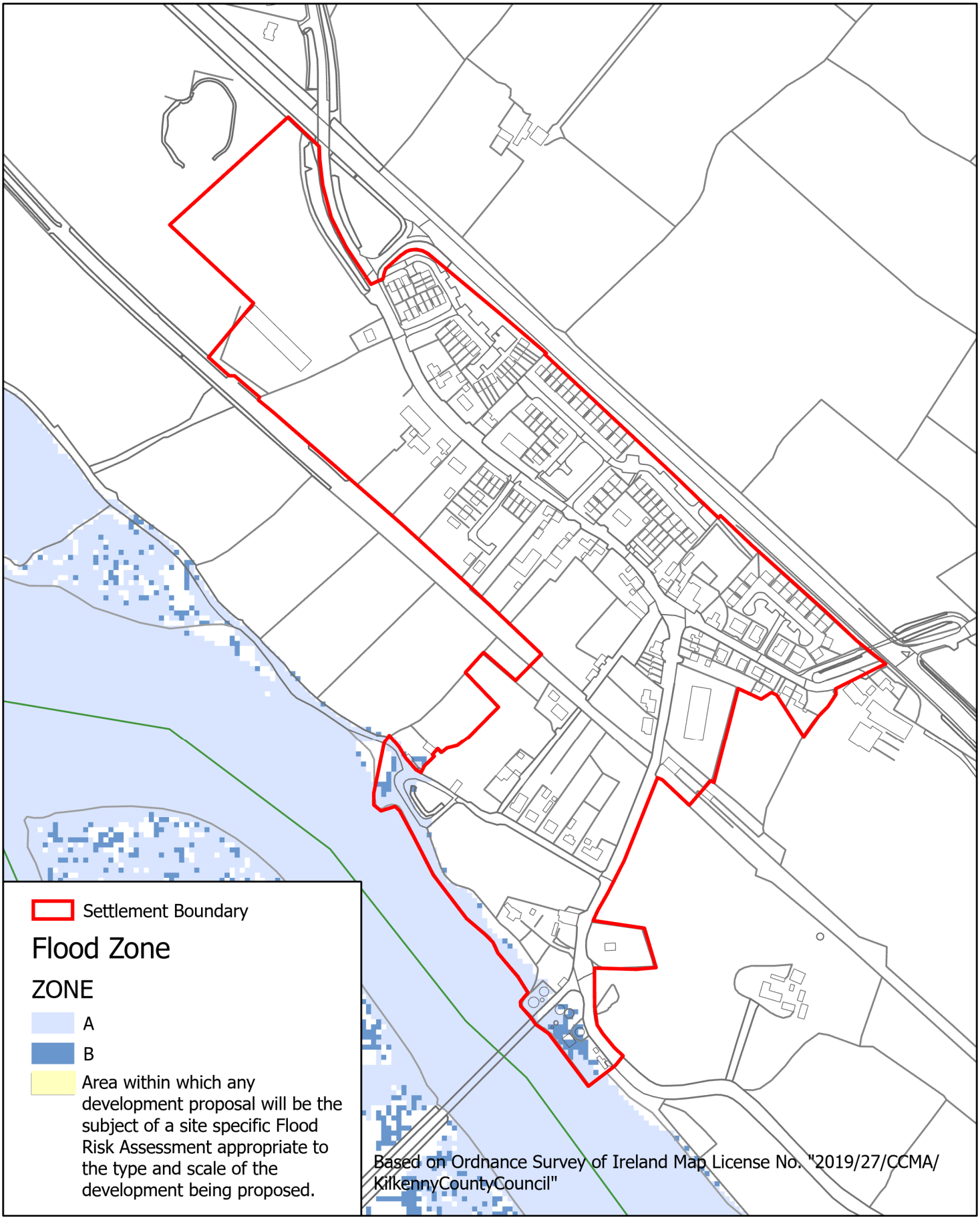
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 2: SFRA Ballyragget Settlement Boundary
Date: September 2021



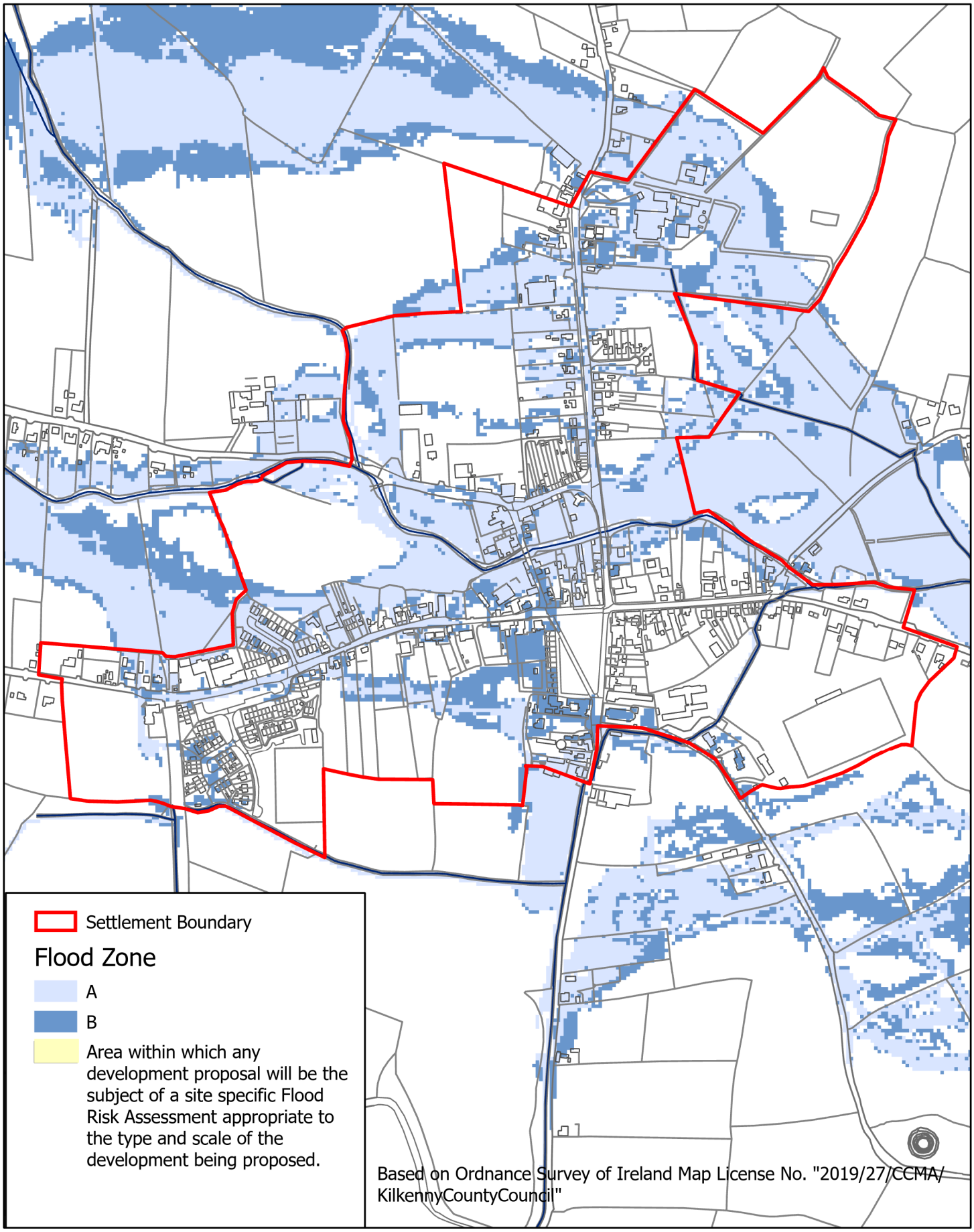
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 3: SFRA Bennettsbridge Settlement Boundary
Date: September 2021



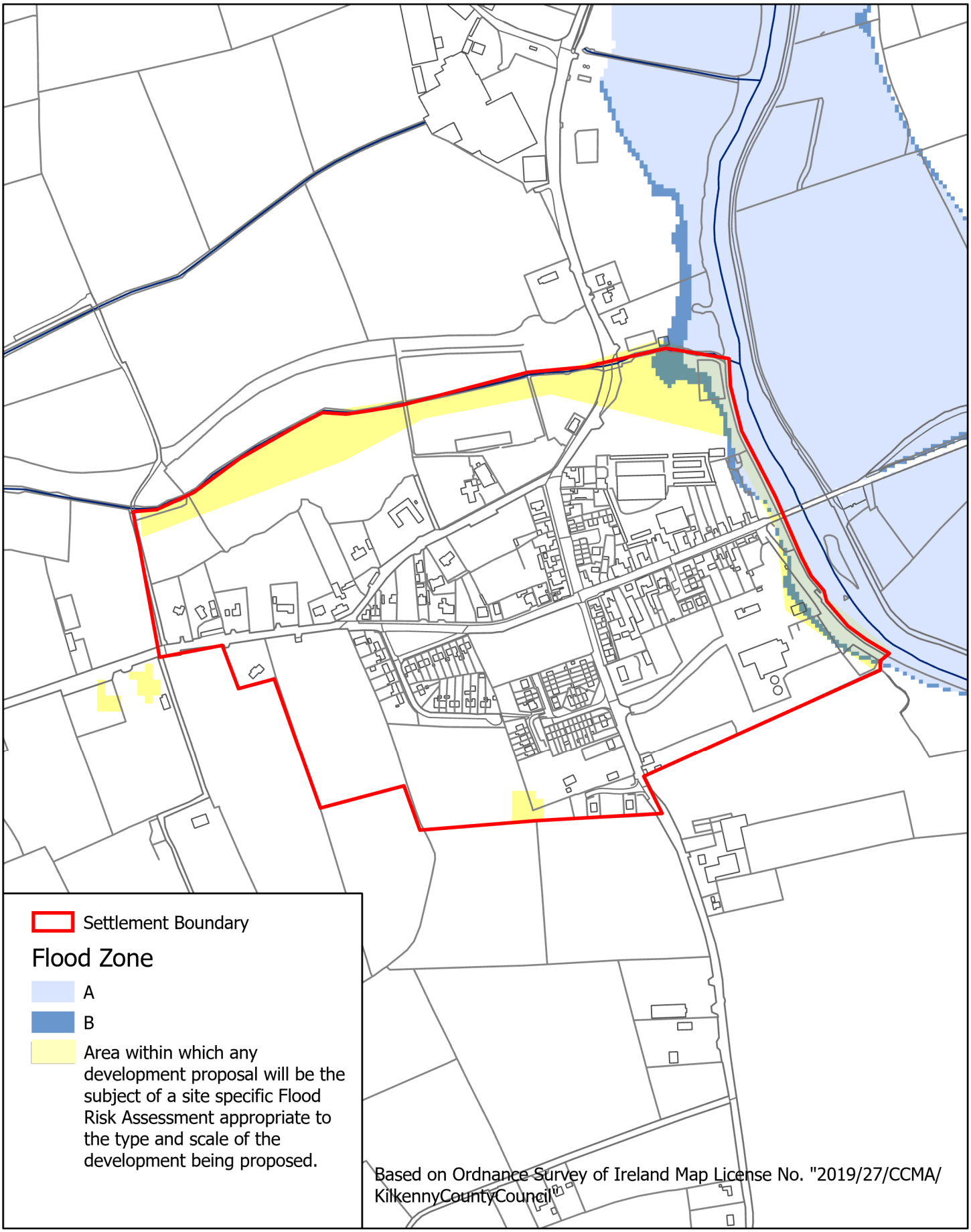
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 4: SFRA Clogh Settlement Boundary
Date: September 2021



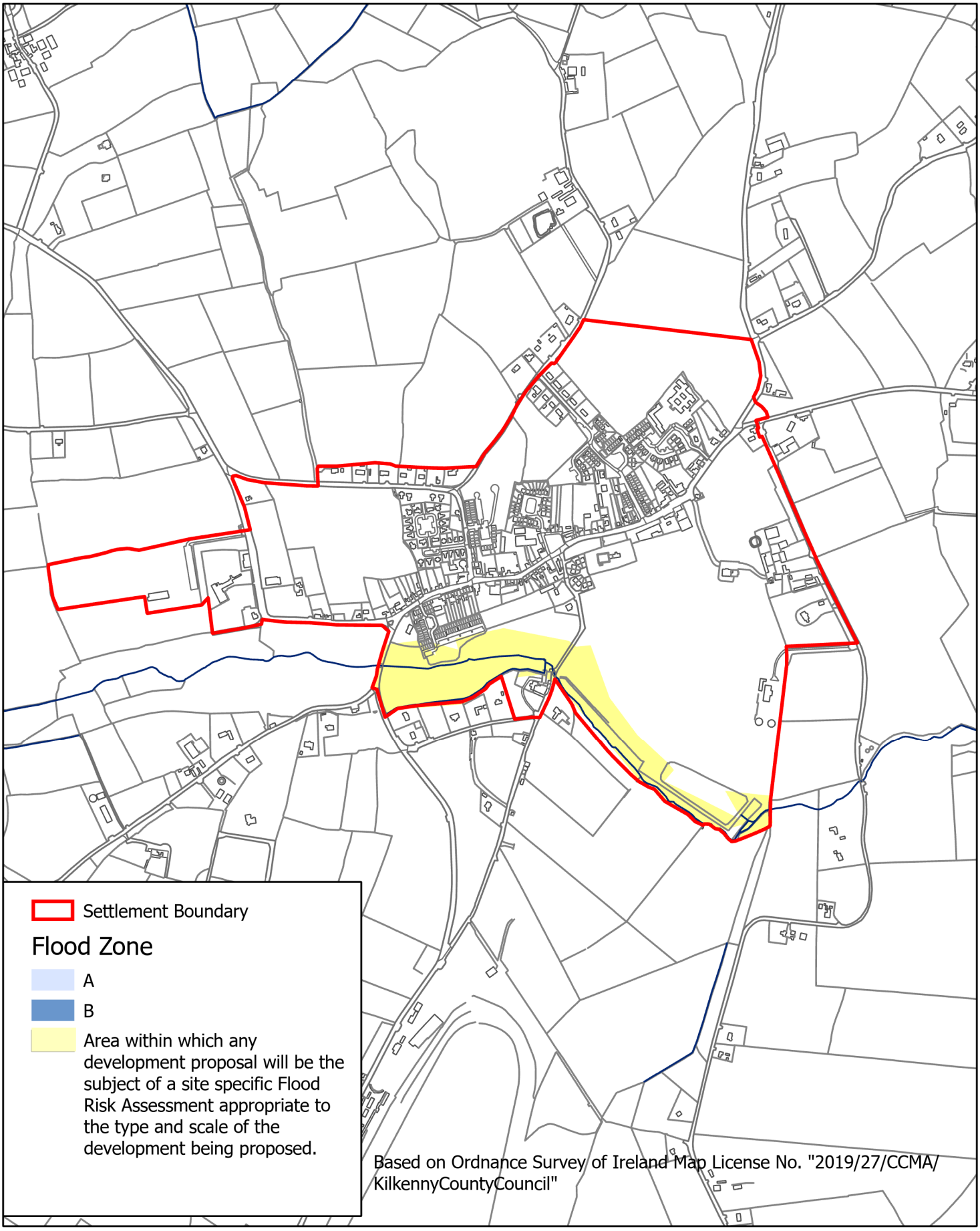
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 5: SFRA Fiddown Settlement Boundary
Date: September 2021



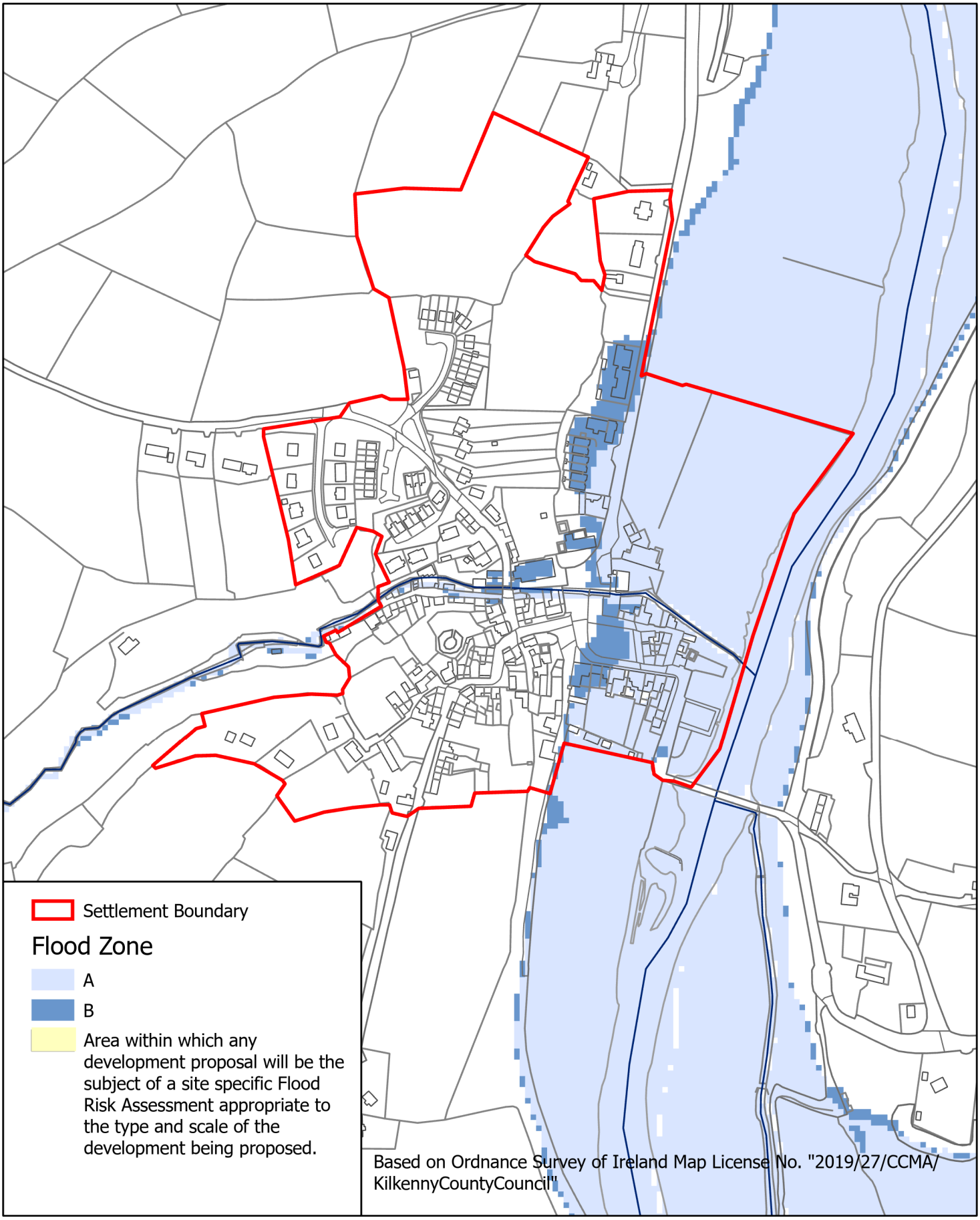
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 6: SFRA Freshford Settlement Boundary
Date: September 2021



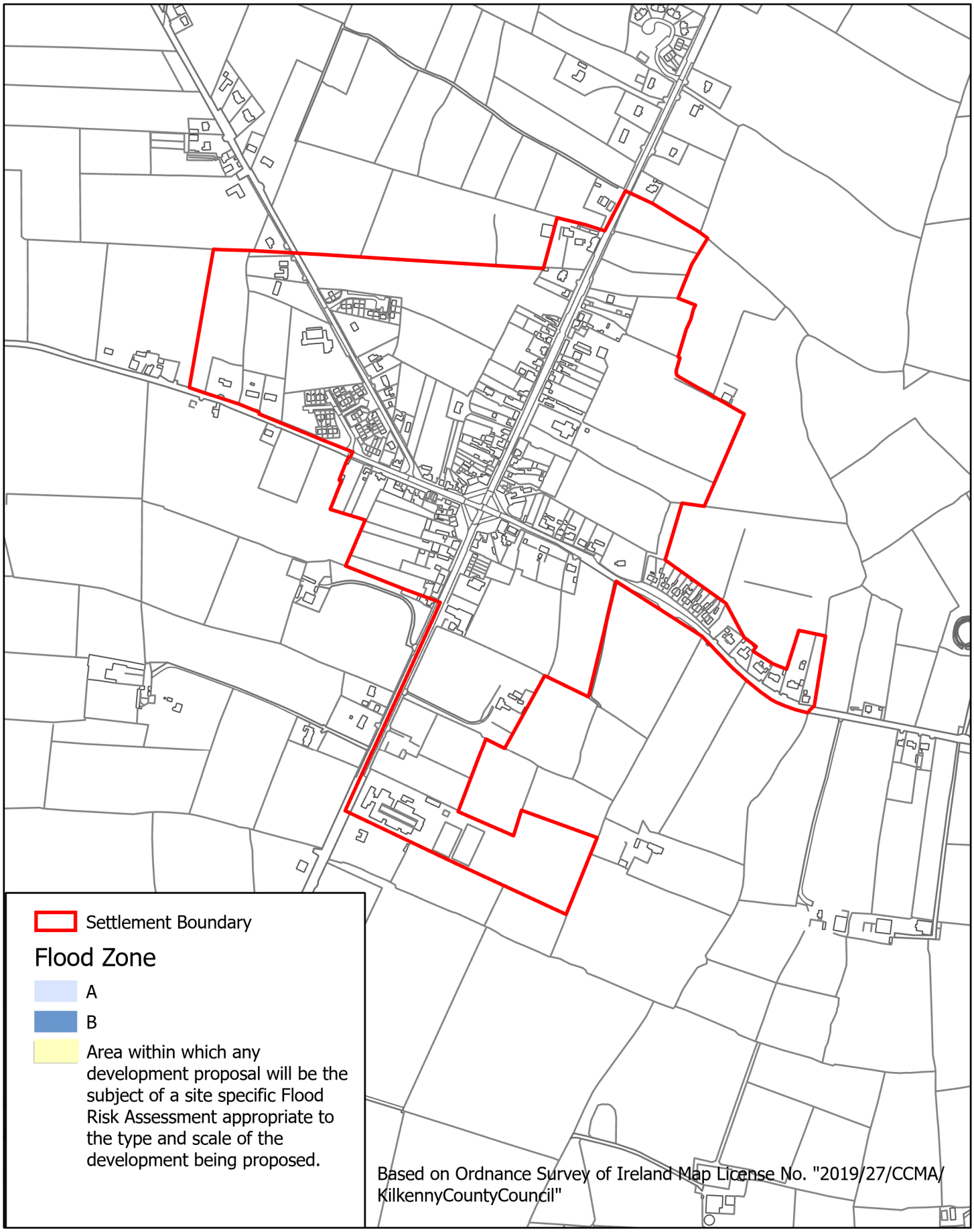
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 7: SFRA Goresbridge Settlement Boundary
Date: September 2021



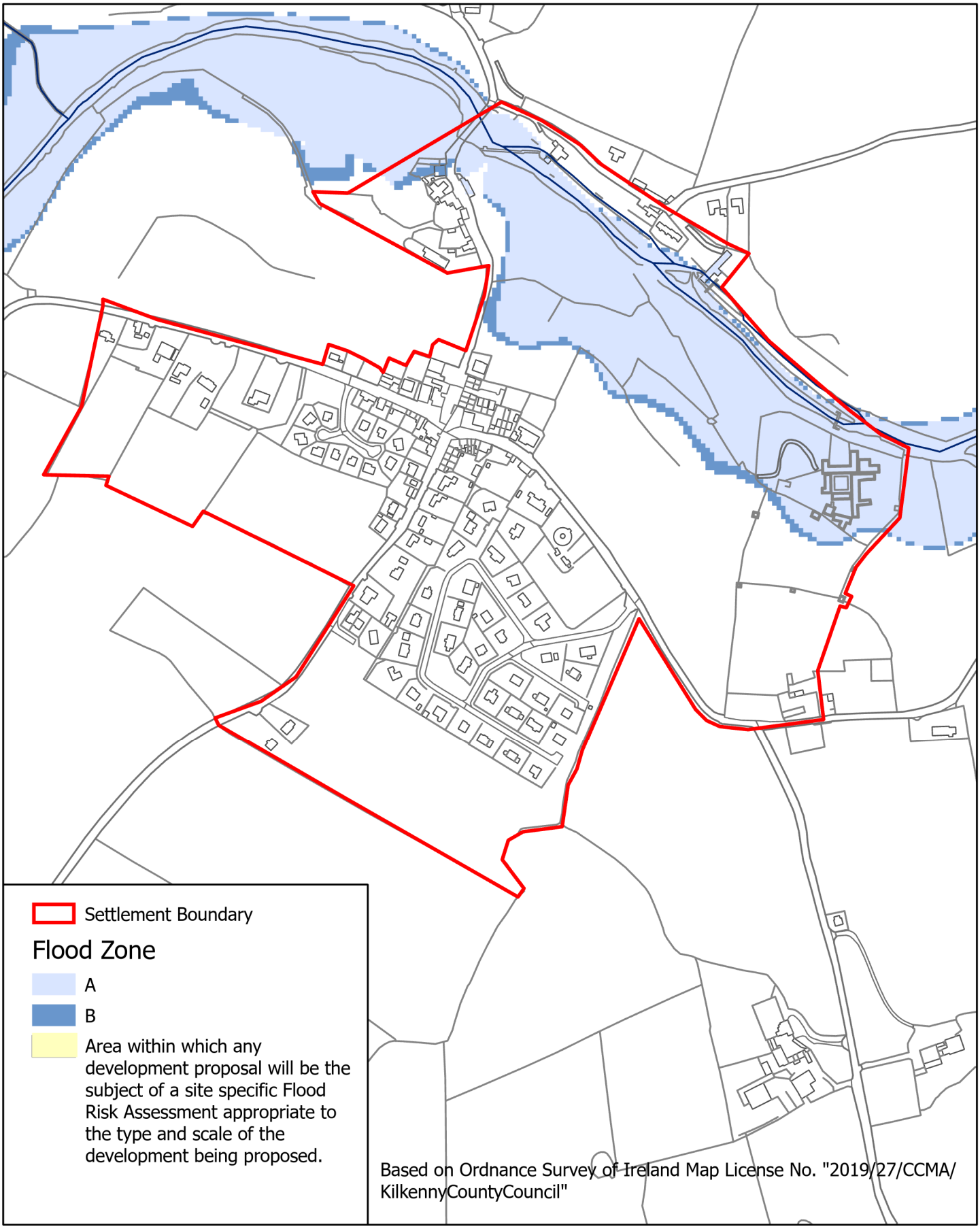
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 8: SFRA Gowran Settlement Boundary
Date: September 2021



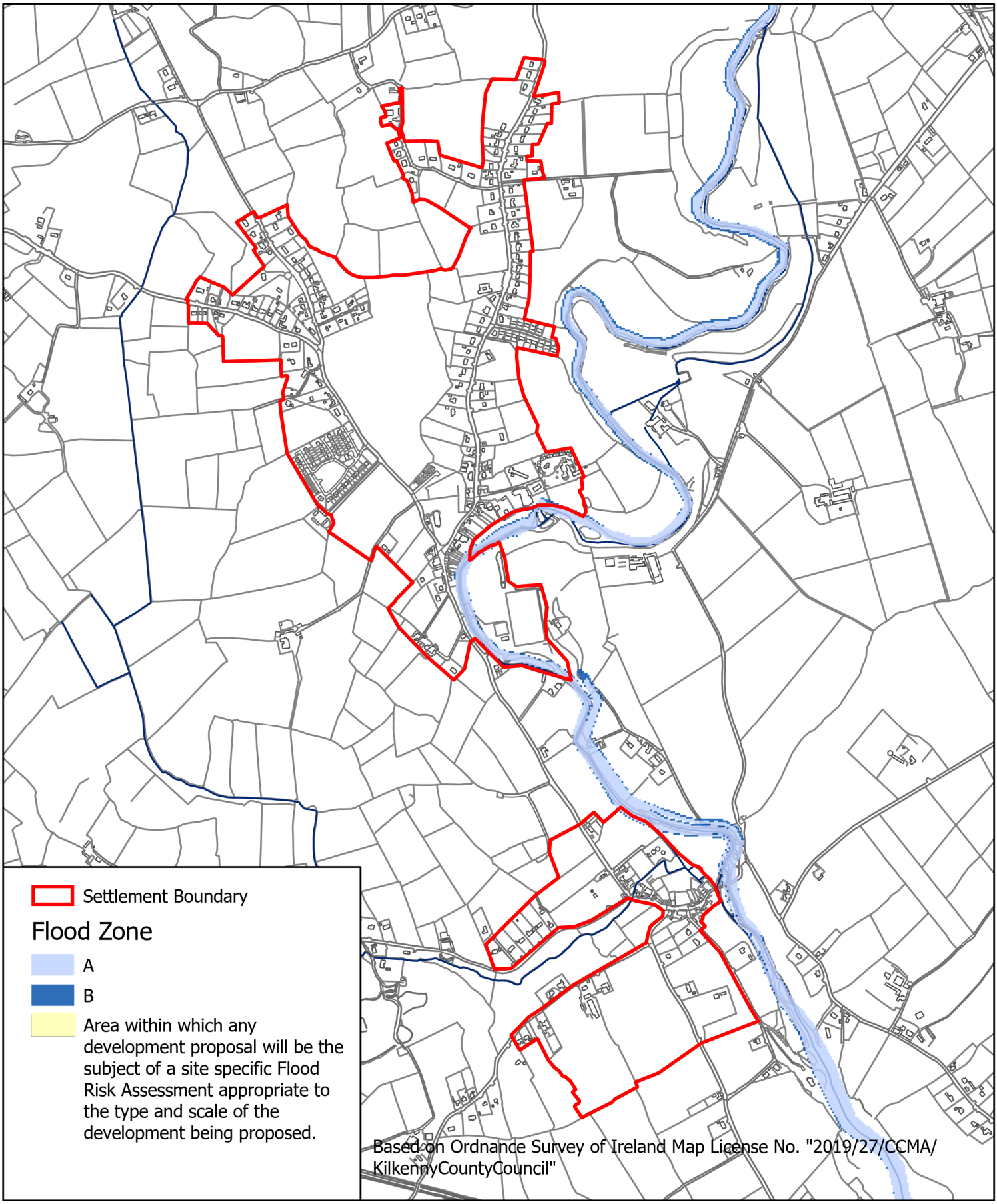
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 9: SFRA Inistioge Settlement Boundary
Date: September 2021



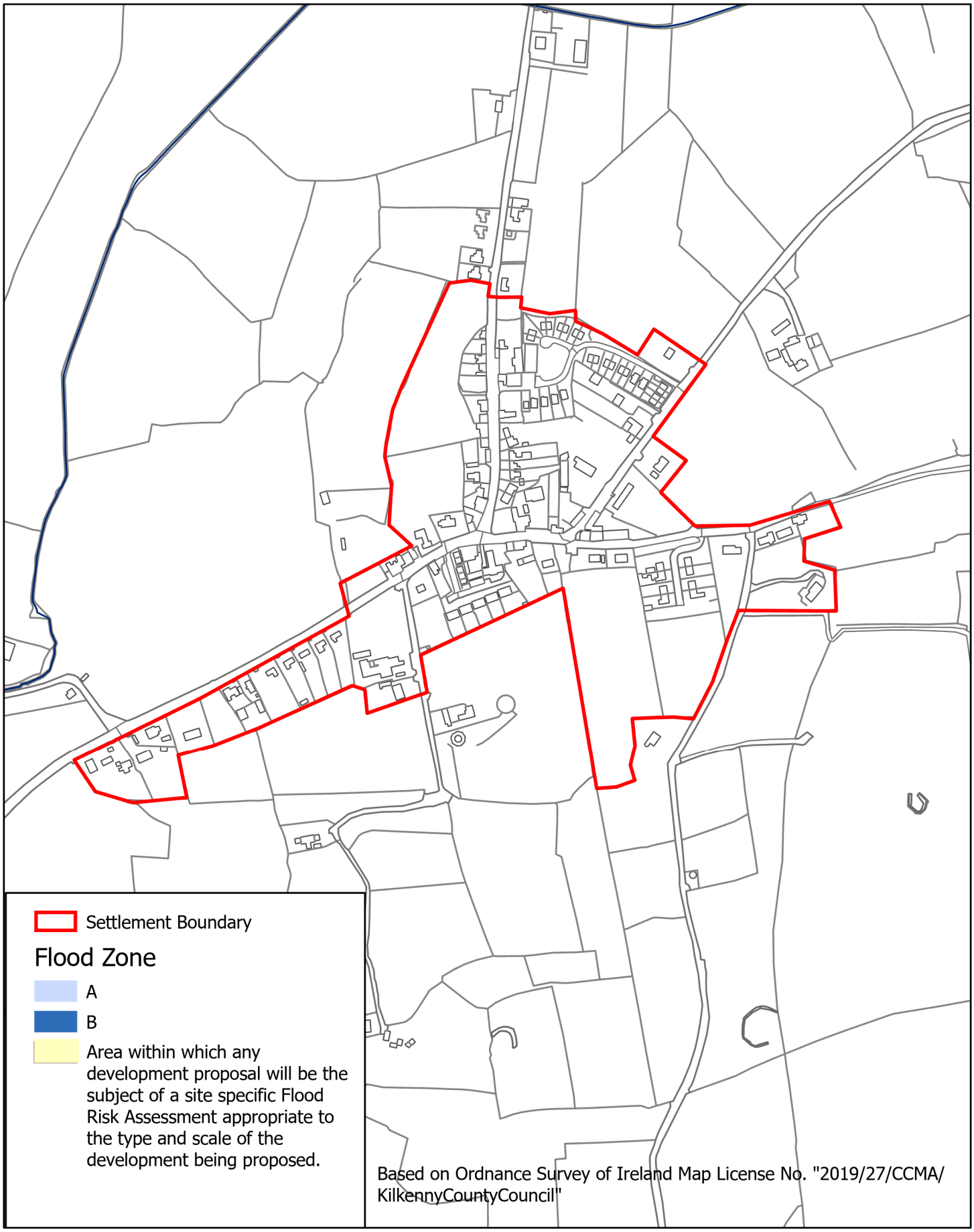
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 10: SFRA Johnstown Settlement Boundary
Date: September 2021



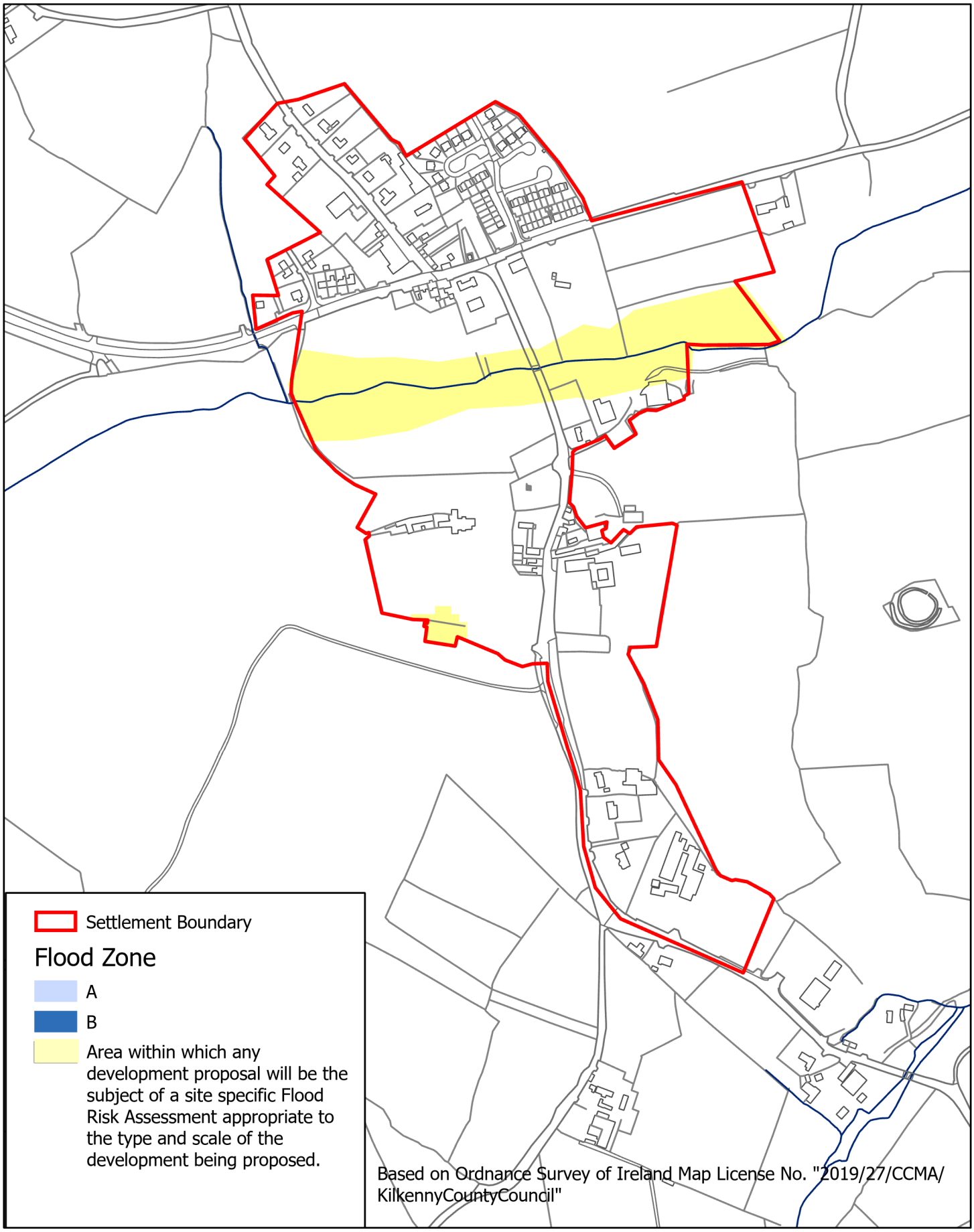
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 11: SFRA Kells Settlement Boundary
Date: September 2021



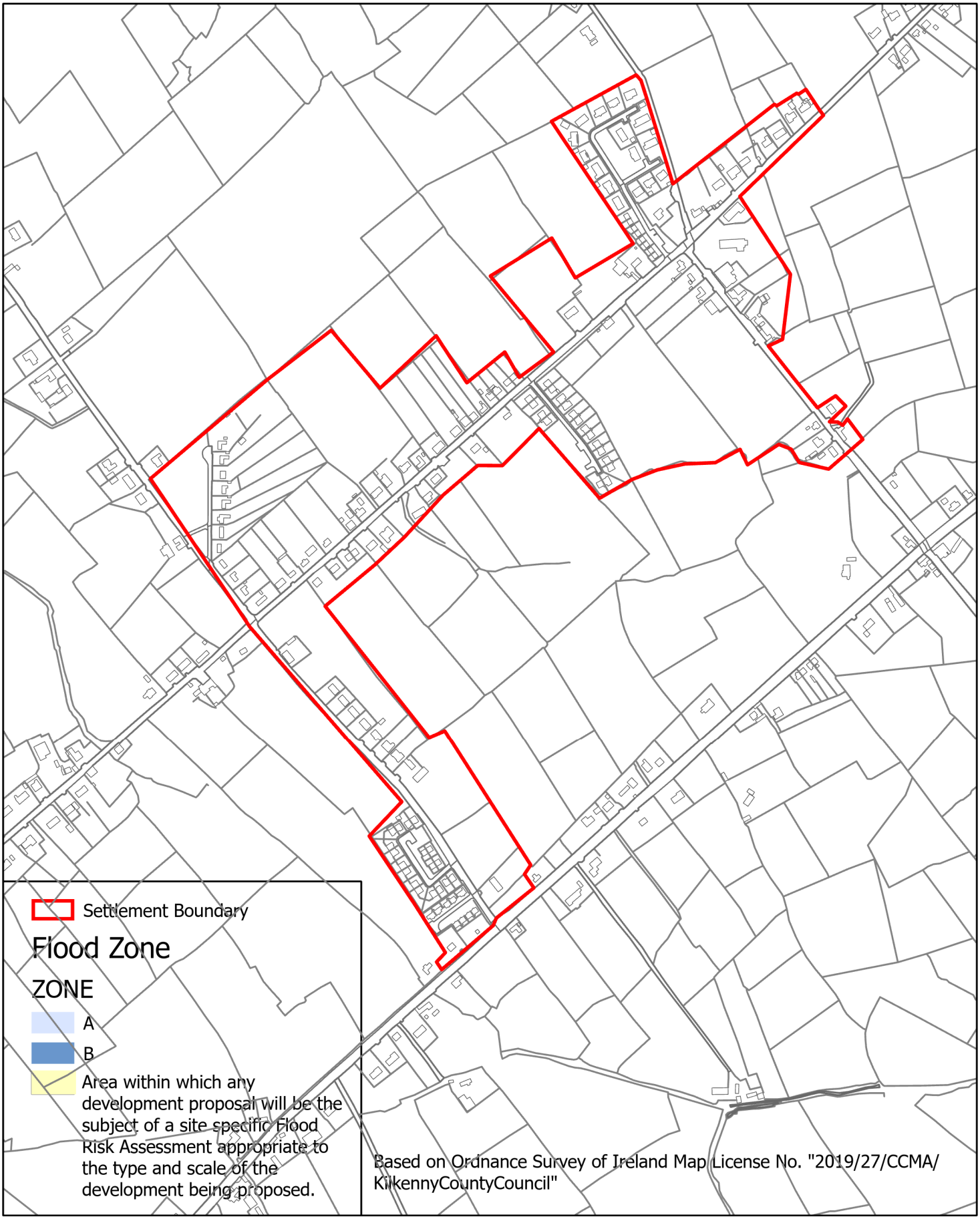
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 12: SFRA Kilmacow Settlement Boundary
Date: September 2021



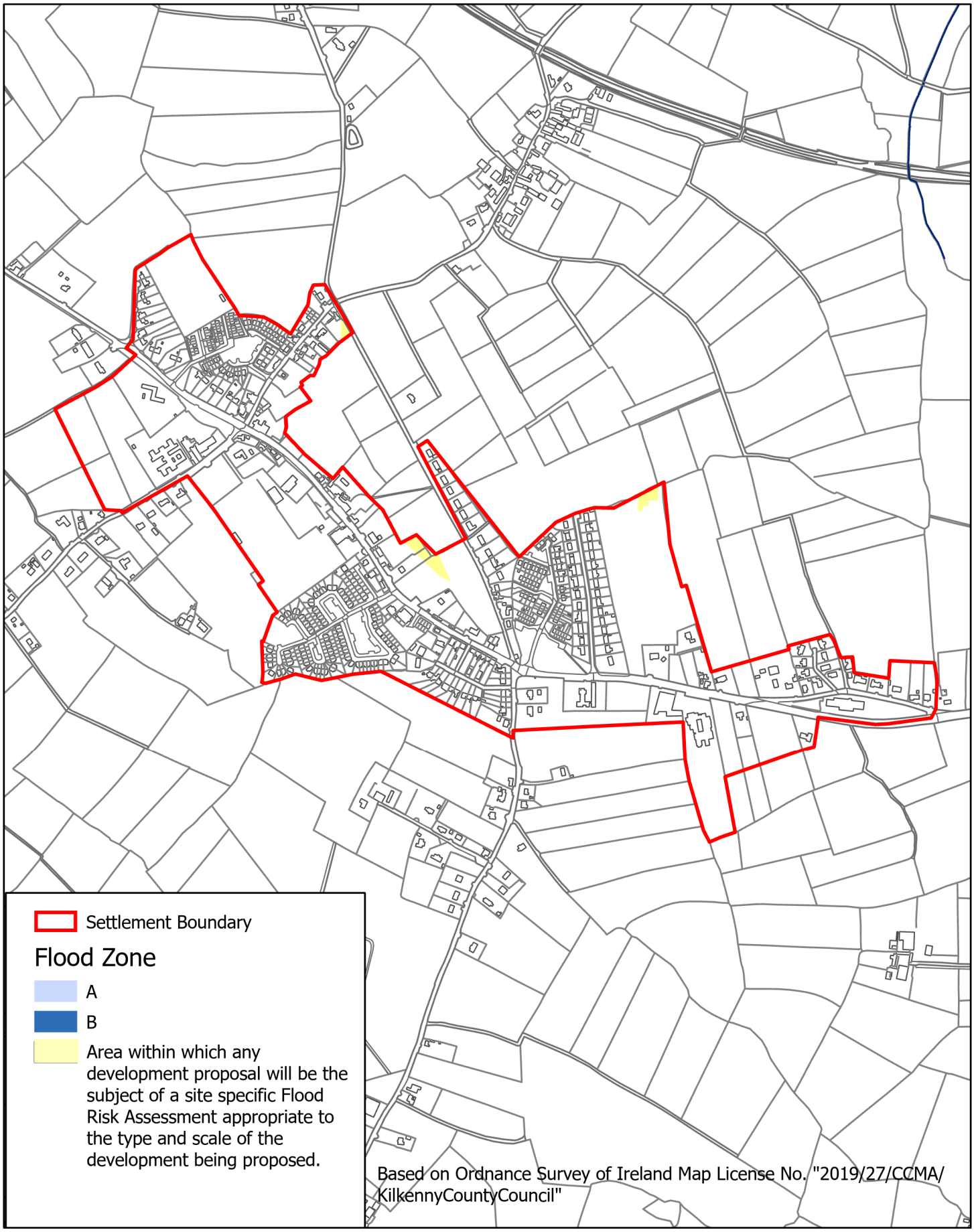
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 13: SFRA Kilmaganny Settlement Boundary
Date: September 2021



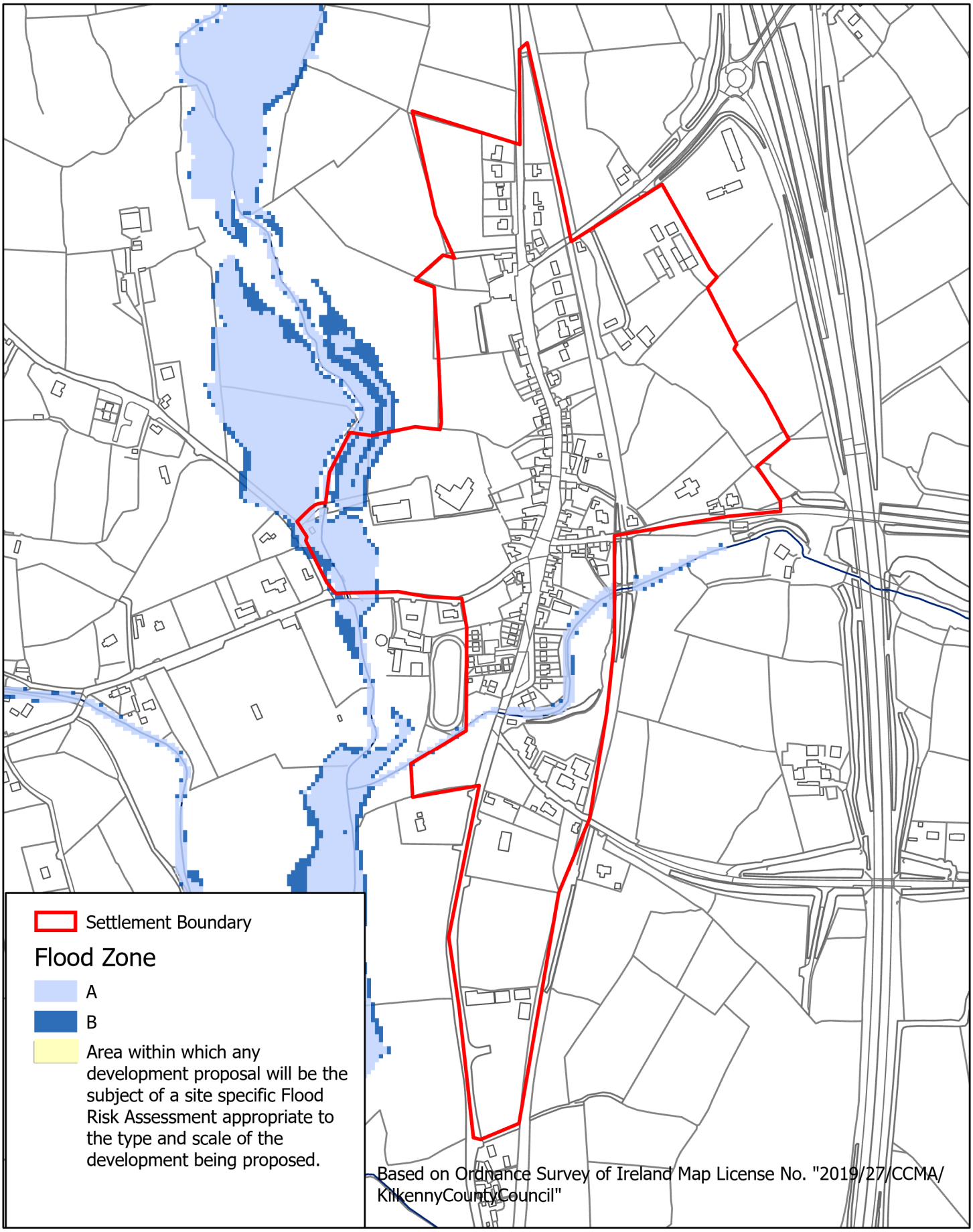
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 14: SFRA Knocktopher Settlement Boundary
Date: September 2021



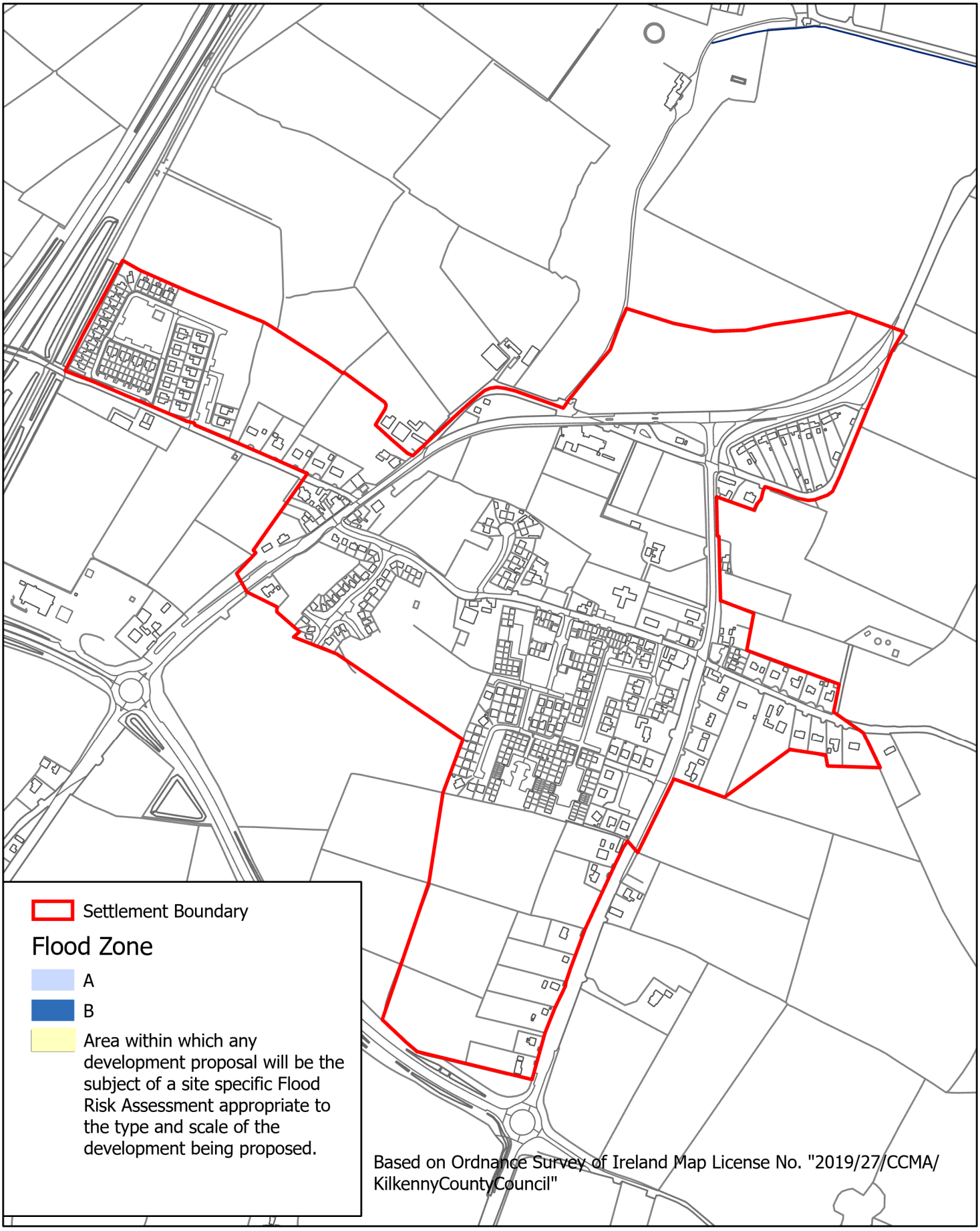
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 15: SFRA Moneenroe Settlement Boundary
Date: September 2021



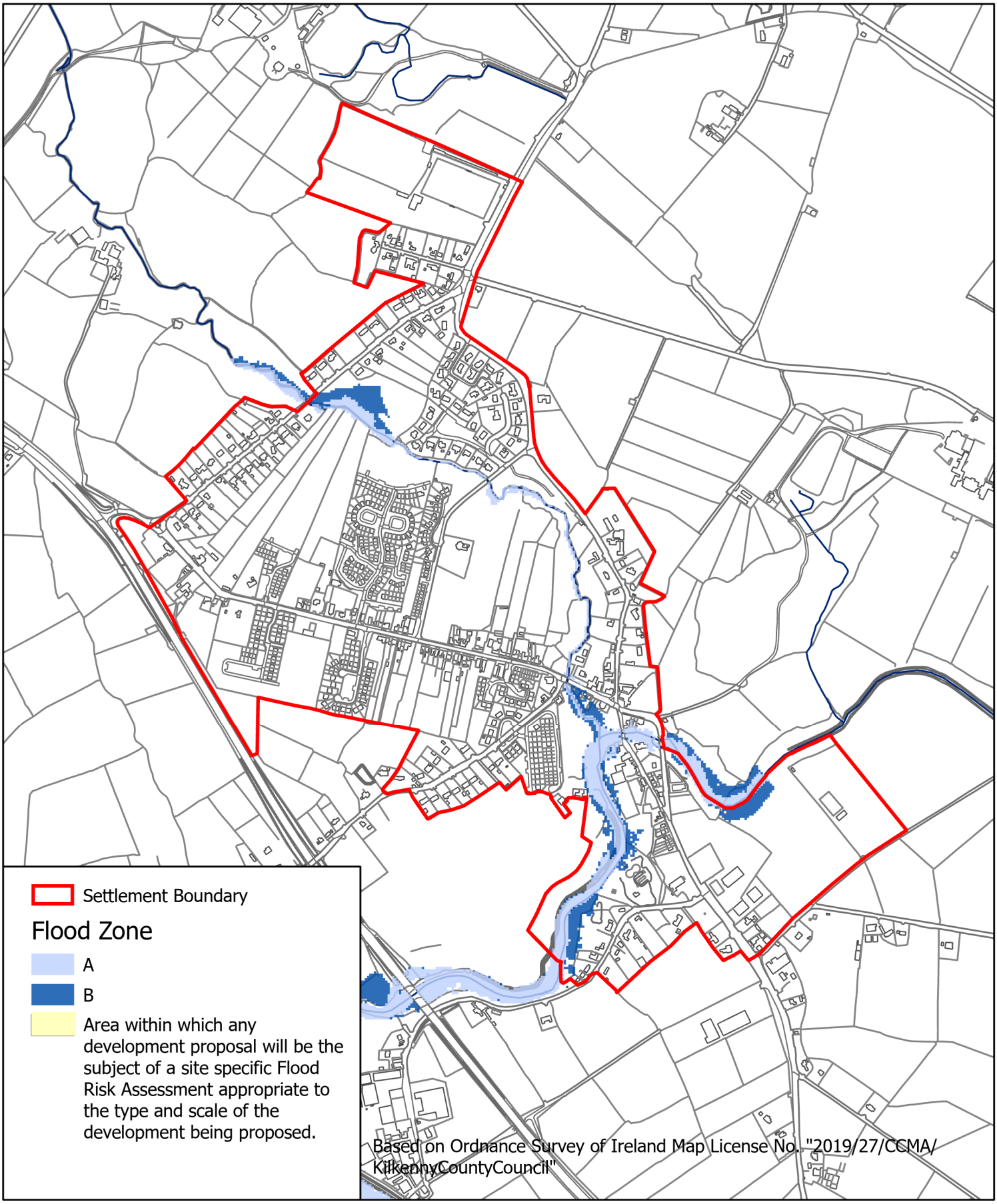
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 16: SFRA Mooncoin Settlement Boundary
Date: September 2021



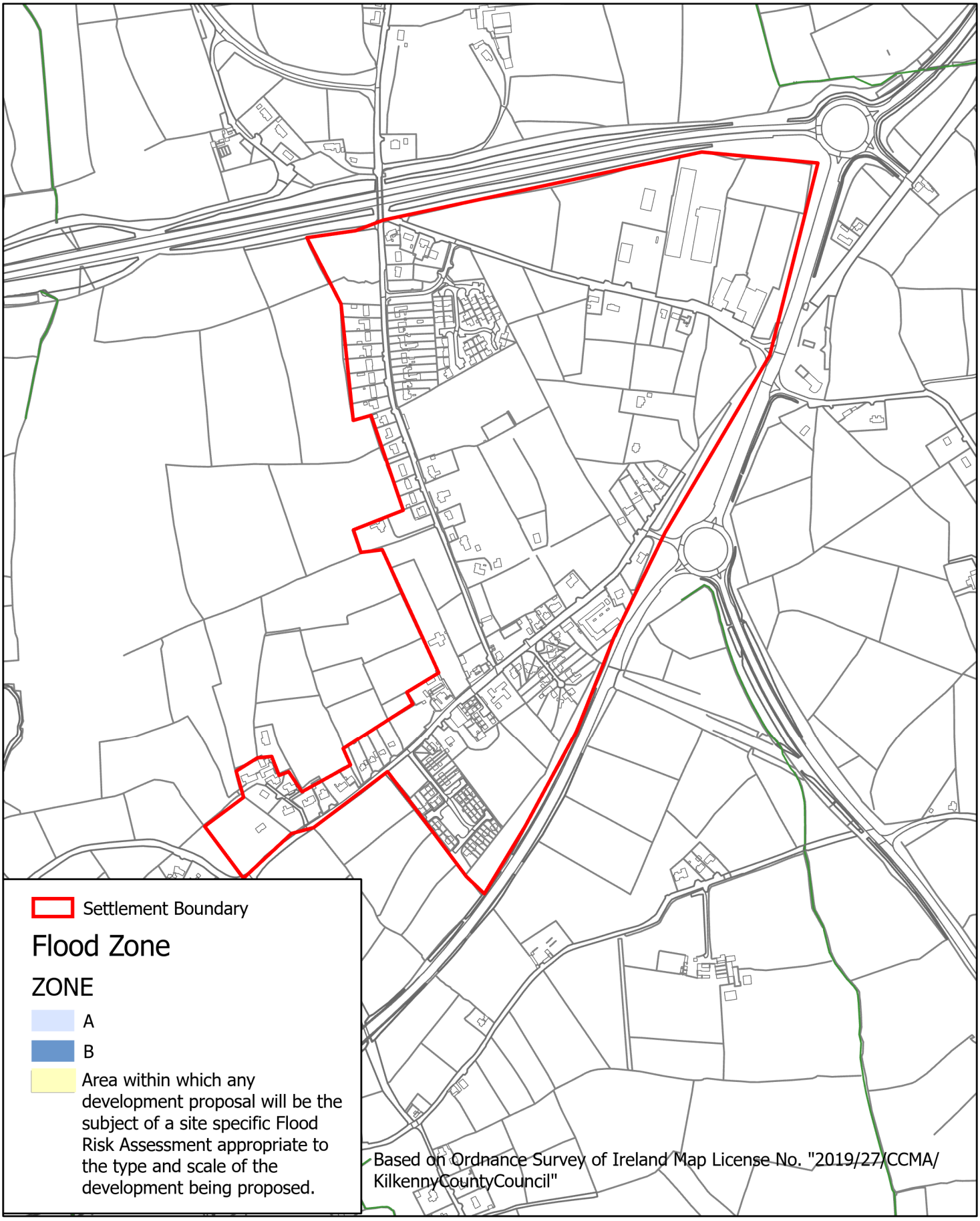
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 17: SFRA Mullinavat Settlement Boundary
Date: September 2021



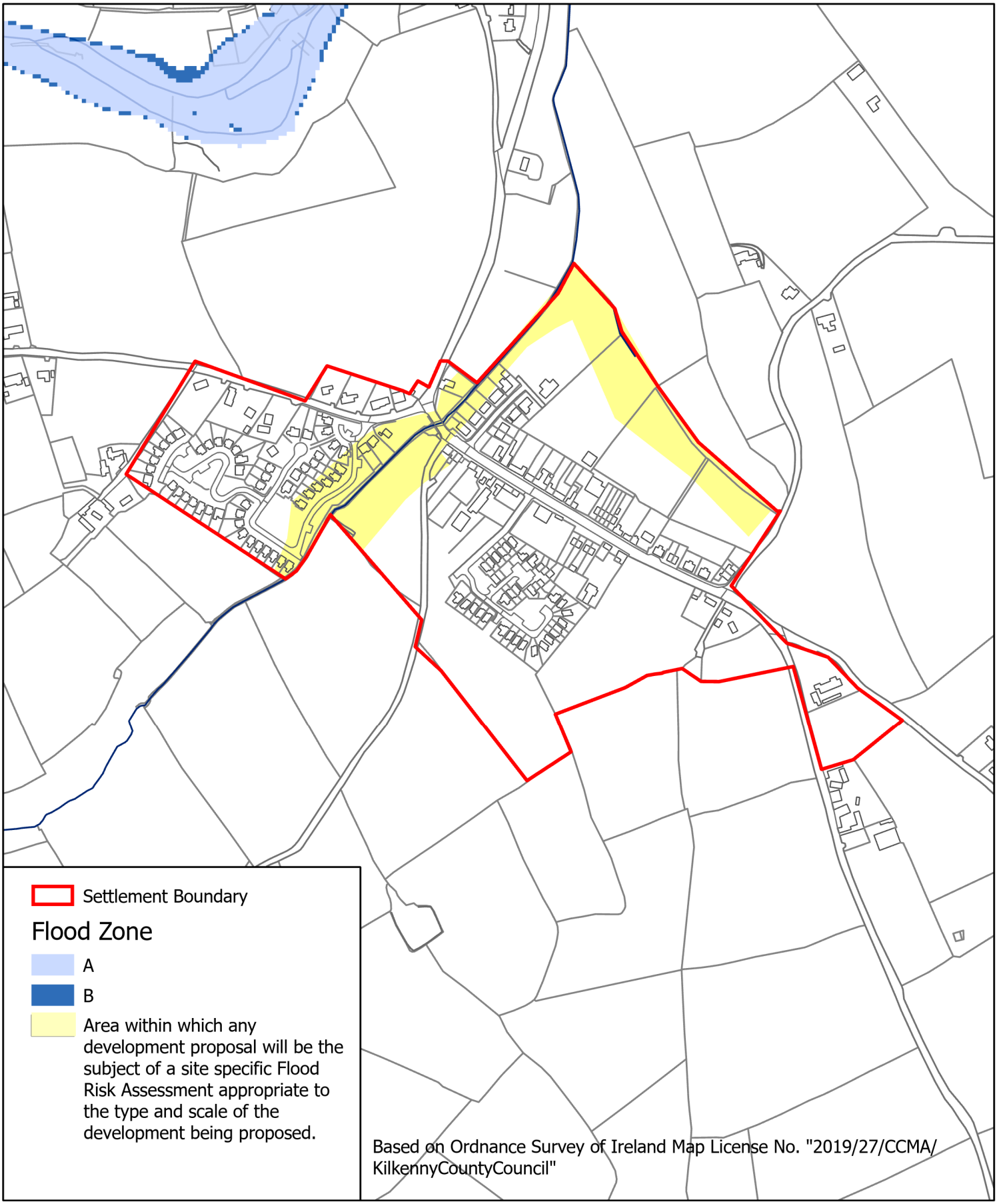
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 18: SFRA Paulstown Settlement Boundary
Date: September 2021



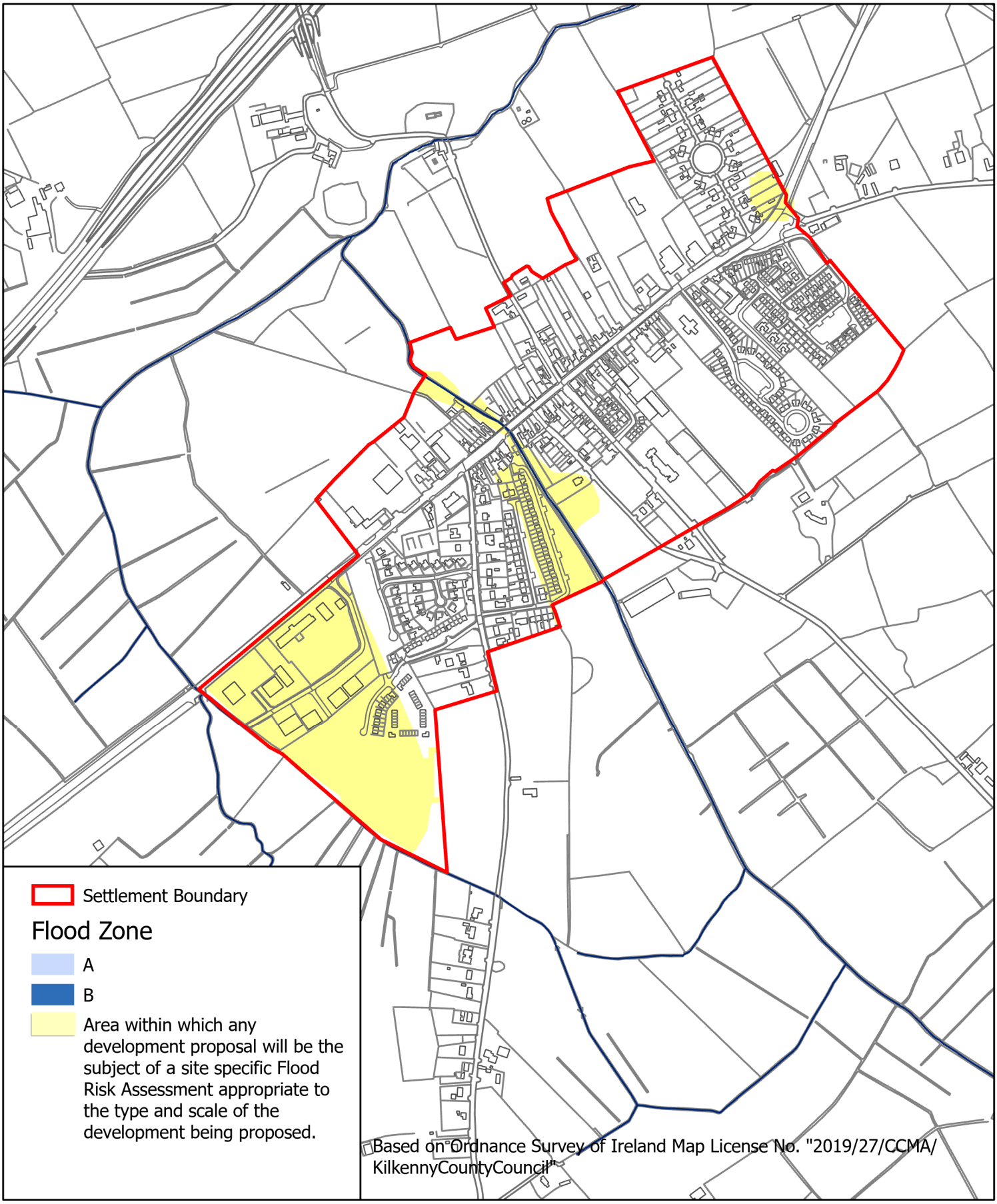
Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 19: SFRA Piltown Settlement Boundary
Date: September 2021



Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 20: SFRA Slieverue Settlement Boundary
Date: September 2021



Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 21: SFRA Stoneyford Settlement Boundary
Date: September 2021



Strategic Flood Risk Assessment of Kilkenny City and County Development Plan 2021
Map 22: SFRA Urlingford Settlement Boundary
Date: September 2021

Figure 23a) Kilkenny – Areas of flood risk on Variation 6 Zoning Map

flood_zone_current_export by Zone
A (277)
B (281)

Kilkenny City and County Development Plan 2021-2027

Figure 23b Areas of flood risk on Kilkenny City Zoning

Date: September 2021
Based on Ordnance Survey of Ireland Map License No. "2019/27/ CCMA/KilkennyCountyCouncil"

- Kilkenny City Development Plan Boundary
- 700m Consultation Buffer of Seveso Site
- Roads Under Construction
- Loughmacask Masterplan
- Breagagh Masterplan
- Masterplan Areas
- Cycle Lane/Pedestrian Improvement

ZONE
- A
- B
- <all other values>

ZONE_ORIG
- Agricultural Trade
- Agriculture
- Amenity / Green links/Biodiversity conservation/ Open Space/Recreation
- Business Park
- Community Facilities
- Existing Residential
- Existing low density residential
- General Business
- Industrial/Technology Park
- Industrial/Warehousing
- Mixed Use Zoning
- Neighbourhood Centre
- New Residential
- Strategic Reserve
- <all other values>

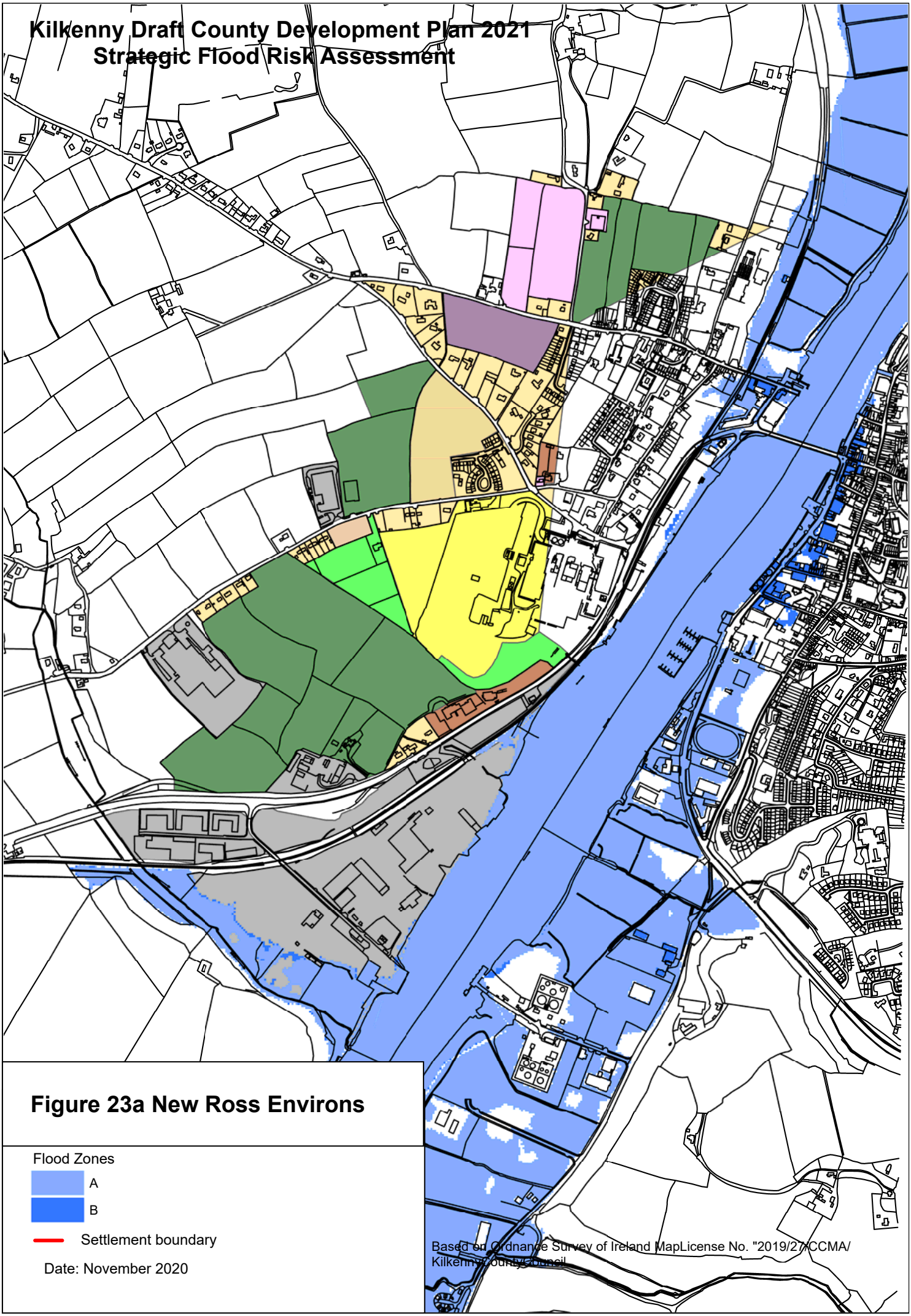


Figure 23a New Ross Environs

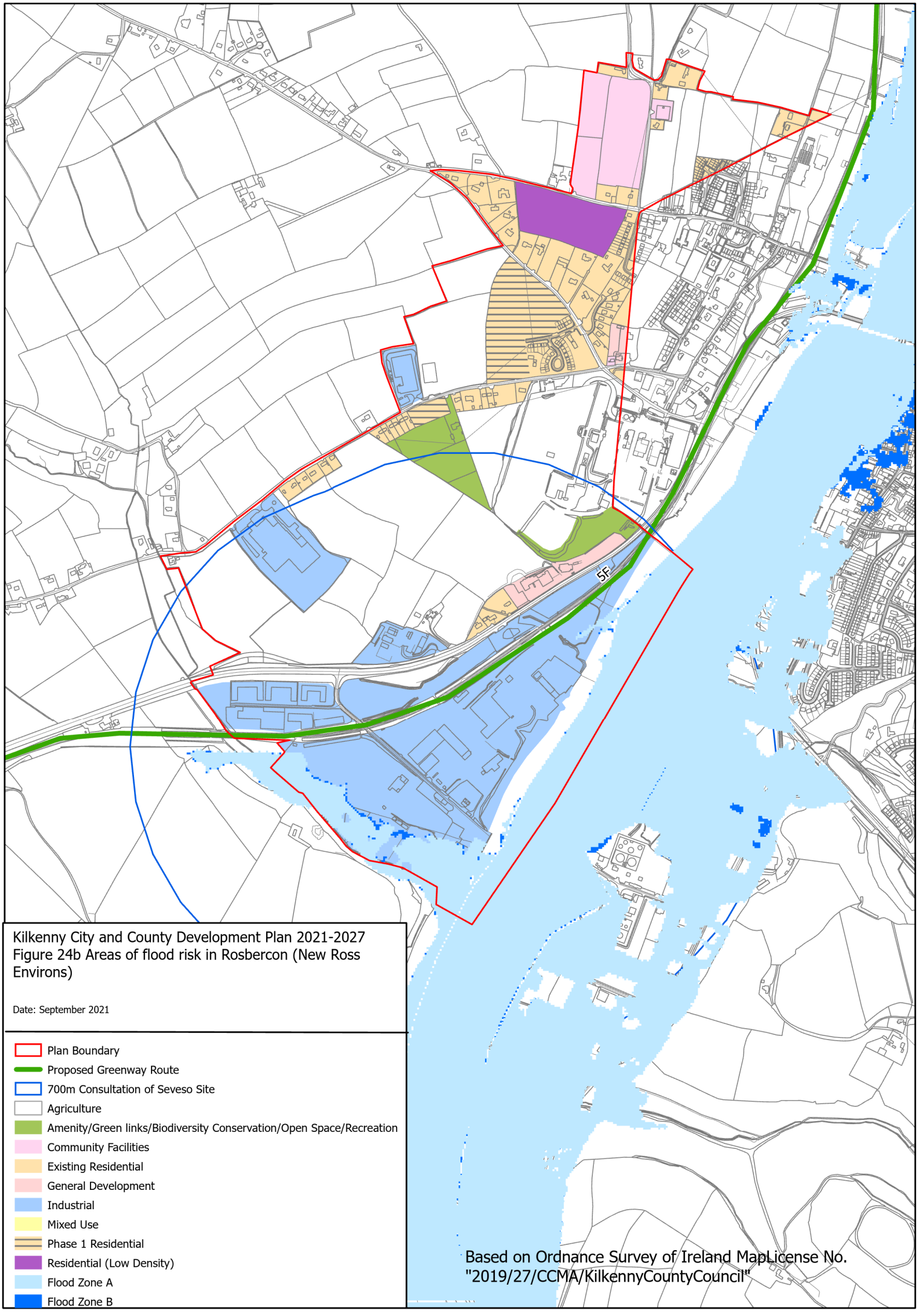
Flood Zones

A

B

Settlement boundary

Date: November 2020



Kilkenny City and County Development Plan 2021-2027
Figure 24b Areas of flood risk in Rosbercon (New Ross Environs)

Date: September 2021

- Plan Boundary
- Proposed Greenway Route
- 700m Consultation of Seveso Site
- Agriculture
- Amenity/Green links/Biodiversity Conservation/Open Space/Recreation
- Community Facilities
- Existing Residential
- General Development
- Industrial
- Mixed Use
- Phase 1 Residential
- Residential (Low Density)
- Flood Zone A
- Flood Zone B