Appendix H
Strategic Flood Risk Assessment

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Contents

List of Figures

List of Tables

Abbreviations

1D	One Dimensional (modelling)
AEP.....	Annual Exceedance Probability
AFA	Area for Further Assessment
CFRAM	Catchment Flood Risk Assessment and Management
DoEHLG.....	Department of the Environment, Heritage and Local Government
DTM	Digital Terrain Model
EPA.....	Environmental Protection Agency
FRA.....	Flood Risk Assessment
HEFS	High End Future Scenario
JFLOW.....	2-D hydraulic modelling package developed by JBA
LA.....	Local Authority
LiDAR.....	Light Detection And Ranging
MRFS.....	Medium Range Future Scenario
OPW	Office of Public Works
OS.....	Ordnance Survey
PFRA	Preliminary Flood Risk Assessment
SAC.....	Special Area of Conservation, designated under the Habitats
.....	Directive
SEA.....	Strategic Environmental Assessment
SFRA	Strategic Flood Risk Assessment
SPA.....	Special Protection Area for birds, protected under the EU Birds Directive
SPR.....	Standard percentage runoff
SUDS.....	Sustainable Urban Drainage Systems
Tp.....	Time to Peak

1 Background to the Study

1.1 Commission

JBA Consulting was commissioned by Meath County Council to undertake a Strategic Flood Risk Assessment of Trim having regard to the current Trim Development Plan 2008-2014. This will assist Meath County Council and Trim Town Council in the preparation of the next Trim Development Plan to cover the period 2014 - 2020.

This report details the Flood Risk Assessment and Management Plan for the town development plan area and has been prepared in accordance with the requirements of the DoEHLG and OPW Planning Guidelines, The Planning System and Flood Risk Management[1].

1.2 Scope of the Study

Under the "Planning System and Flood Risk Management" guidelines, the purpose for the FRA is detailed as being *"to provide a broad (wide area) assessment of all types of flood risk to inform strategic land-use planning decisions. SFRAs enable the LA to undertake the sequential approach, including the Justification Test, allocate appropriate sites for development and identify how flood risk can be reduced as part of the development plan process".*

The Trim Development Plan 2014-2020 (TDP) will be the key document for setting out a vision for how Trim should develop during the plan period.

It is important that the TDP is consistent with the Meath County Development Plan 2013-2019 and compliant with the requirements of the document “The Planning System and Flood Risk Management Guidelines for Planning Authorities” (OPW/DoEHLG, 2009) which states that flood risk management should be integrated into spatial planning policies at all levels to enhance certainty and clarity in the overall planning process.

In order to ensure that flood risk is integrated into the TDP, Meath CC has issued a brief to consultants for the provision of a Flood Risk Assessment. As laid out in the tender documents, the main requirements are:

1. Undertake a flood risk assessment for Trim,
2. Undertake flood mapping for Trim Town & Environs,
3. Prepare a flood risk management plan.

1.3 Report Structure

The FRA considers the broader settlement strategy of the Greater Dublin Regional Planning Guidelines and the countywide policies and objectives of the County Development Plan. It is intended to be read in conjunction with the Strategic Flood Risk Assessment for the current County Development Plan.

On a more local level, this study considers the development strategy that will form part of the Development Plan for Trim. The context of flood risk in the Trim area is considered with specific reference to people, property, infrastructure and the environment. A range of flood sources are analysed including fluvial, pluvial and groundwater.

A two stage assessment of flood risk has been undertaken, as recommended in 'The Planning System and Flood Risk Management' guidelines, for the area that lies within the development boundary of the Development Plan. The first stage is to identify flood risk; historical records and recent events demonstrate that the Trim area has a significant history of flooding from the River Boyne. The second stage and the main purpose of this SFRA report is to appraise the adequacy of existing information, to prepare flood zone maps and to highlight potential development areas that require more detailed assessment on a site specific level. The SFRA also provides guidelines for development within areas at potential risk of flooding, and specifically looks at flood risk and the potential for development within the key sites in Trim.

Section 2 of this report provides an introduction to the study area and Section 3 discusses the concepts of flooding, Flood Zones and flood risk as they are incorporated into the Planning System and Flood Risk Management.

[1] DoHELG and OPW (2009) The Planning System and Flood Risk Management: Guidelines for Planning Authorities

In Section 4, the available data related to flooding is summarised and appraised. It also outlines the sources of flooding to be considered, based on the review of available data. Finally it discusses climate change and residual risk.

Having established flood risk within the town and environs, Section 5 provides guidance and suggested approaches to managing flood risk and development; the contents of this section will be of particular use in informing the policies and objectives within the development plan. In Section 6, specific responses to flood risk are discussed in relation to a number of key development sites within Trim. Finally, triggers for the ongoing monitoring and future review of the SFRA are detailed in Section 7.

2 Study Area

2.1 Introduction

The area of interest comprises the development plan boundary of Trim Town which covers the existing urban area and greenfield periphery sites.

Trim town is located 14.5km south west of Navan and approximately 50km north west of Dublin. Although Trim is not on any National Primary Routes, a number of regional routes converge in the town including the R154, R160, R161 and R158. Trim town is a Heritage town situated on the banks of the River Boyne. Key land-use activities include the headquarters of the Office of Public Works, Court Service facilities and St. Josephs Hospital run by the Health Service Executive. Other significant land uses include educational, recreational, commercial and residential.

This section of the report will provide an overview of the study area, the drainage catchment, the population and the nature of settlement, to give context to the study.

2.2 People and Property

Based on the available census figures the population of the Trim town and environs area has increased to 8,268 in 2011 from 6,870 in the 2006 census. The population change demonstrates a growth of 20.3%.

Trim is an important Heritage town and is one of the oldest settlements in Ireland. Trim has maintained a steady growth in population and within County Meath, it is a designated Moderate Growth Town with continued growth to be allowed for in-line with the Regional Planning Guidelines. It is therefore important that the growth and development of Trim is considered with respect to the impacts and extents of flooding.

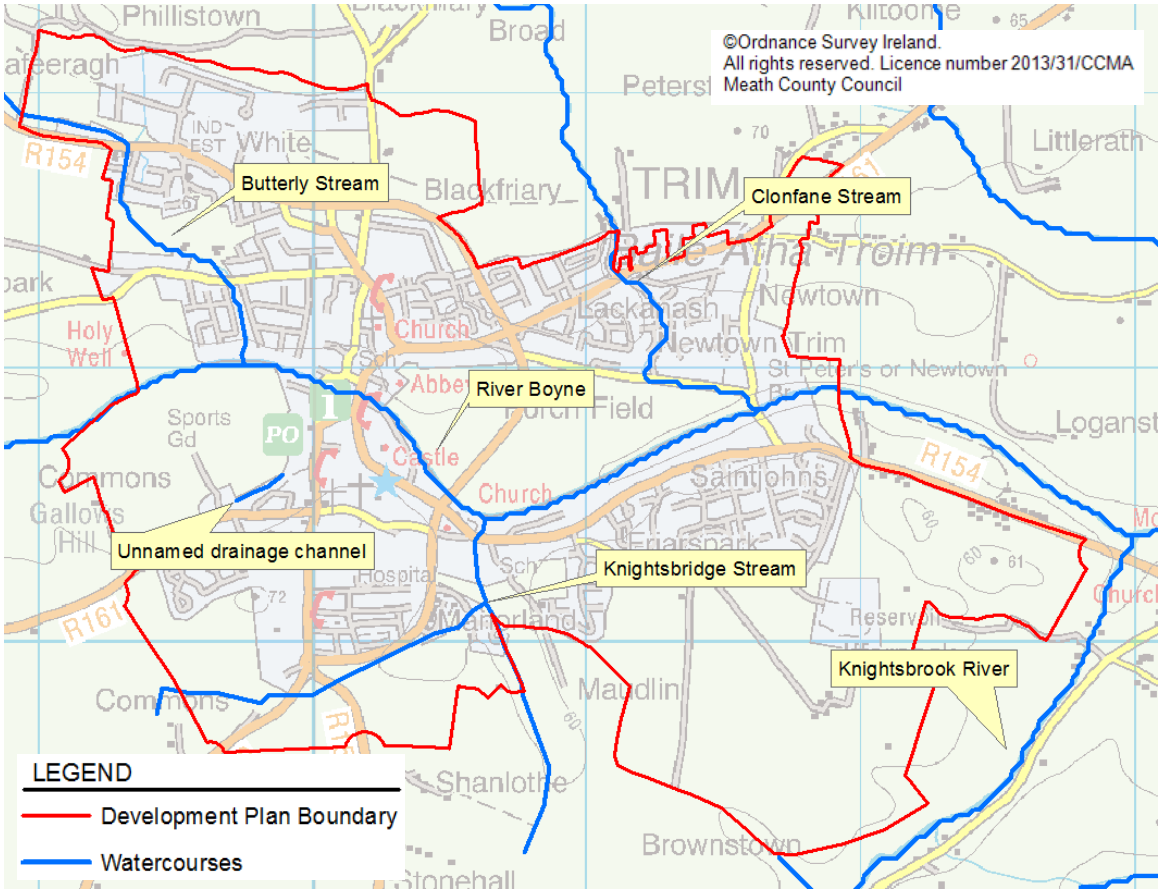
Table 2-1 Census Population

Area	2006	2011	% Change
1. Trim Urban Population Town	1,375	1,440	4.7% increase
2.Overall Trim Population (incl. Environs)	6,870	8,268	20.3% increase

2.3 Trim Watercourses

Trim is located at a key crossing point of the River Boyne. The entire River Boyne catchment covers approximately 2,695 km^2 and includes parts of counties Louth, Cavan, Meath, Westmeath, Offaly and Kildare. The River Boyne flows through Trim and Navan to its estuary in Drogheda. The total length of the River Boyne flowing through Trim is approximately 3km and includes for approximately 1285km^2 of catchment area. The Knightsbrook River and the Boycetown River are tributaries of the Boyne to the east of the town which are outside the development boundary. There are a number of smaller streams in the area which flow within the town environs, and which have been considered in this report. These include the Butterly Stream (to the west of the town centre), the Clonfane Stream (to the east of the town centre) and the Knightsbridge Stream (to the south of the town centre). These are all shown in Figure 2-1 overleaf.

Figure 2-1 Trim Watercourses



2.4 Environment

The River Boyne (in conjunction with the River Blackwater) is designated as a Special Area of Conservation (SAC 002299) and a Special Protection Area (SPA 004232) and as such the management of flood risk within such areas must have regard to potential negative impacts to this environment.

3 The Planning System and Flood Risk Management Guidelines

This chapter is replicated from the Meath County Development Plan 2013-2019 SFRA document; it is fundamental to understanding the SFRA process and has therefore been repeated.

3.1 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 Planning System and Flood Risk Management in a consistent manner.

The Planning System and Flood Risk Management: Guidelines for Planning Authorities, published in November 2009, 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 planning guidelines and the management of flood risk in the planning system will follow.

3.2 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 3-1, illustrates this and is a widely used environmental model to assess and inform the management of risk.

Figure 3-1 Source Pathway Receptor Model

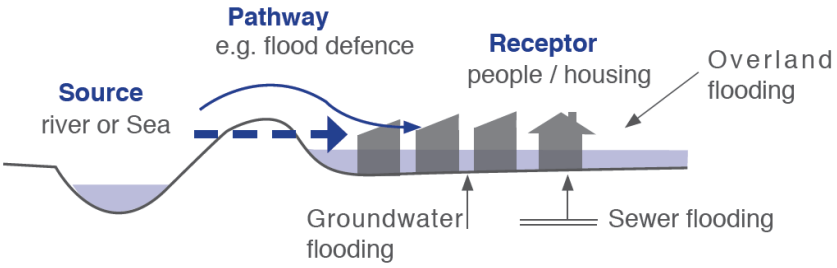


Fig. A1: Sources, pathways and receptors of flooding

Source: Figure A1 The Planning System and Flood Risk Management Guidelines Technical Appendices

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.

3.3 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 3-1.

Table 3-1 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.

3.3.1 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 Planning System and Flood Risk Management guidelines provide three vulnerability categories, based on the type of development, which are detailed in Table 3.1 of the Guidelines, and are summarised as:

- **Highly vulnerable**, including residential properties, essential infrastructure and emergency service facilities;
- **Less vulnerable**, such as retail and commercial and local transport infrastructure;
- **Water compatible**, including open space, outdoor recreation and associated essential infrastructure, such as changing rooms.

3.4 Definition of Flood Zones

In the Planning System and Flood Risk Management 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 in Table 3-2.

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.

Table 3-2 Definition of Flood Zones

Zone	Description
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).

3.5 Objectives and Principles of the Planning Guidelines

The 'Planning System and Flood Risk Management' describes good flood risk practice in planning and development management. Planning authorities are directed to have regard to the guidelines in the preparation of Development Plans and Local Area Plans, and for development control purposes.

The objective of the 'Planning System and Flood Risk Management' is to integrate flood risk management into the planning process, thereby assisting in the delivery of sustainable development. For this to be achieved, flood risk must be assessed as early as possible in the planning process. Paragraph 1.6 of the Guidelines states that the core objectives are to:

- "*avoid inappropriate development in areas at risk of flooding;*
- *avoid new developments increasing flood risk elsewhere, including that which may arise from surface run-off;*
- *ensure effective management of residual risks for development permitted in floodplains;*
- *avoid unnecessary restriction of national, regional or local economic and social growth;*
- *improve the understanding of flood risk among relevant stakeholders; and*
- *ensure that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management".*

The guidelines aim to facilitate '*the transparent consideration of flood risk at all levels of the planning process, ensuring a consistency of approach throughout the country.*' SFRAs therefore become a key evidence base in meeting these objectives.

The 'Planning System and Flood Risk Management' works on a number of key principles, including:

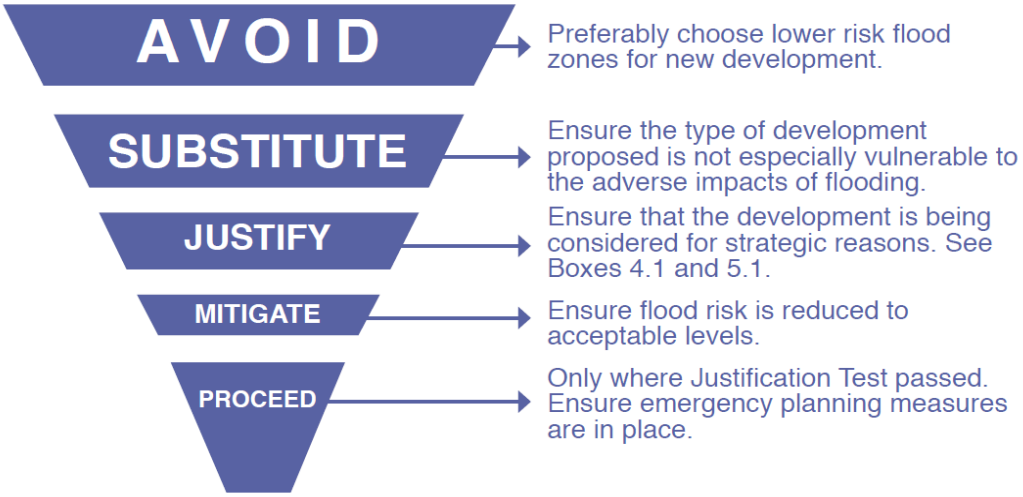
- Adopting a staged and hierarchical approach to the assessment of flood risk;
- Adopting a sequential approach to the management of flood risk, based on the frequency of flooding (identified through Flood Zones) and the vulnerability of the proposed land use.

3.6 The Sequential Approach and Justification Test

Each stage of the FRA process aims to adopt a sequential approach to management of flood risk in the planning process.

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.

Figure 3-2 Sequential Approach Principles in Flood Risk Management



Source: The Planning System and Flood Risk Management (Figure 3.1)

Where rezoning is not possible, exceptions to the development restrictions are provided for through the Justification Test. Many towns and cities have central areas that are affected by flood risk and have been targeted for growth. 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.

Table 3-3 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 3-3 Matrix of Vulnerability versus Flood Zone

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (Including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Source: Table 3.2 of The Planning System and Flood Risk Management

The application of the Justification Test in the context of specific development sites in Trim is discussed in Section 6.

3.7 Scales and Stages of Flood Risk Assessment

Within the hierarchy of regional, strategic and site-specific flood-risk assessments, a tiered approach ensures that the level of information is appropriate to the scale and nature of the flood-risk issues and the location and type of development proposed, avoiding expensive flood modelling and development of mitigation measures where it is not necessary. The stages and scales of flood risk assessment comprise of:

- **Regional Flood Risk Appraisal (RFRA)** – a broad overview of flood risk issues across a region to influence spatial allocations for growth in housing and employment as well as to identify where flood risk management measures may be required at a regional level to support the proposed growth. This should be based on readily derivable information and undertaken to inform the Regional Planning Guidelines.

- **Strategic Flood Risk Assessment (SFRA)** – an assessment of all types of flood risk informing land use planning decisions. This will enable the Planning Authority to allocate appropriate sites for development, whilst identifying opportunities for reducing flood risk. This SFRA will revisit and develop the flood risk identification undertaken in the RFRA, and give consideration to a range of potential sources of flooding. An initial flood risk assessment, based on the identification of Flood Zones, will also be carried out for those areas, which will be zoned for development. Where the initial flood risk assessment highlights the potential for a significant level of flood risk, or there is conflict with the proposed vulnerability of development, then a site specific FRA will be recommended, which will necessitate a detailed flood risk assessment.
- **Site Specific Flood Risk Assessment (FRA)** – site or project specific flood risk assessment to consider all types of flood risk associated with the site and propose appropriate site management and mitigation measures to reduce flood risk to and from the site to an acceptable level. If the previous tiers of study have been undertaken to appropriate levels of detail, it is highly likely that the site specific FRA will require detailed channel and site survey, and hydraulic modelling.

4 Flood Risk in Trim

4.1 Overview

There are a number of sources of flood data available for the Trim area. The following table lists the core datasets used to compile the flood map for the Trim Development Plan area and gives an assessment of the data quality and the confidence in its accuracy.

Table 4-1 Flood Data Used to Compile Flood Zone Mapping

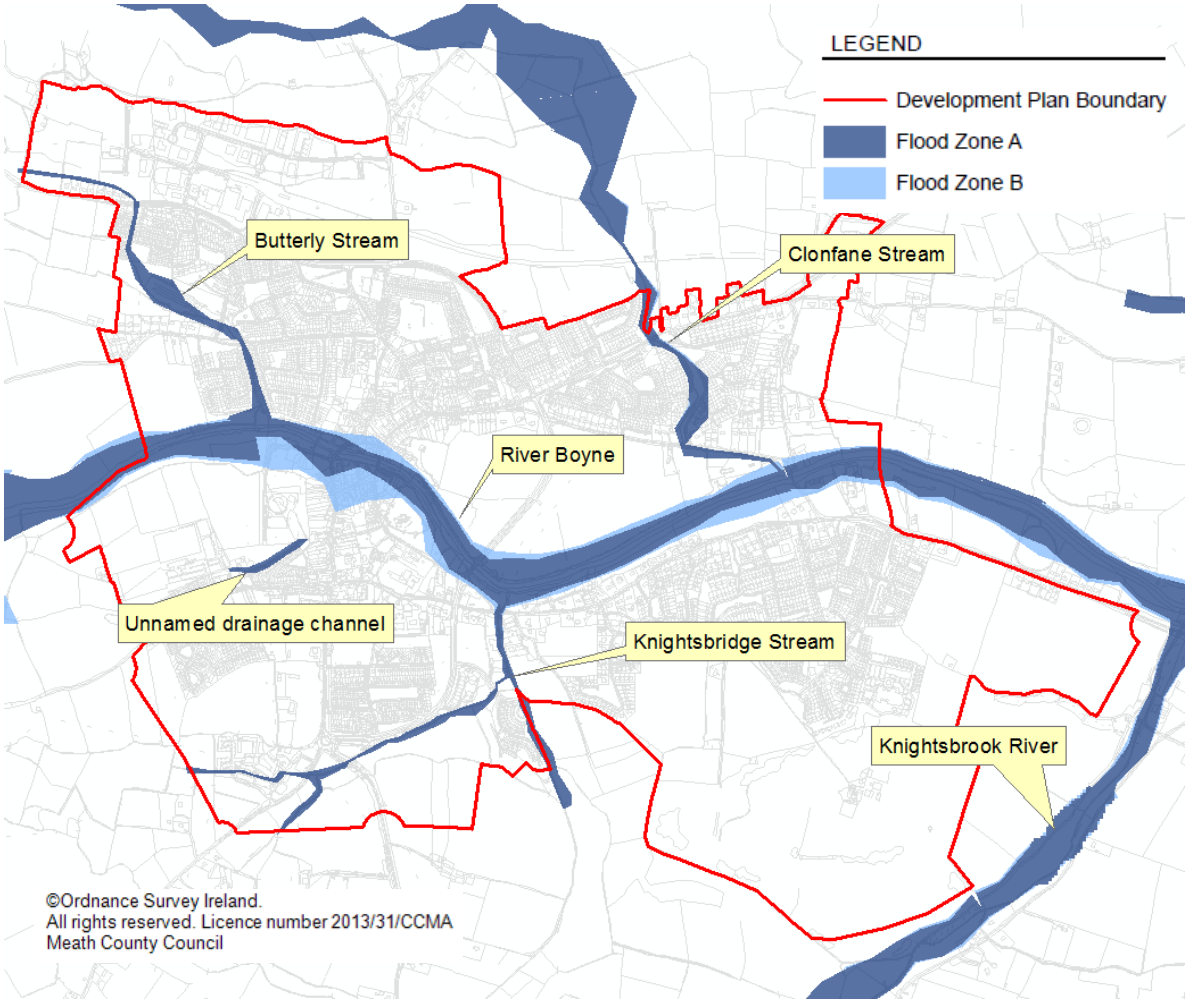
Description	Coverage	Quality	Confidence	Used
SFRA for Meath County Development Plan	Whole County	Moderate	Moderate	Yes, indirectly to validate Flood Zones
Eastern CFRAM Flood Risk Review Report	Hydrometric Area 07 including Trim	Moderate	Moderate	Yes, indirectly to validate PFRA mapping.
OPW Benefitting land maps	Whole County	Moderate	Low	Yes, to validate mapping for Knightsbridge Stream as not covered by PFRA mapping.
OPW PFRA flood extent maps	Full Study Area with exception of Knightsbridge Stream.	Moderate	Moderate	Yes for the River Boyne, Knightsbrook River, Butterly Stream and Clonfane River
Historical Flood Records and Consultation with Area Engineer	Spot coverage of whole county and Trim (Area Engineer specific input)	Various	Various	Yes indirectly to validate Flood Zones & identify other flood sources
Walkover Survey	Trim Town	Moderate	Moderate to Low	Yes, to validate outlines and flow paths at key locations

The Flood Zone mapping represents a combination of the above flood sources. The OPW PFRA mapping, as verified under the Eastern CFRAM, has formed the core source of the final Flood Zones, but it has been adjusted in places based on; consultation with the Local Authority Area Engineer, a review of historic flood records, the OPW benefitting lands maps and the walkover survey.

The OPW PFRA mapping covered all watercourses with the exception of the Knightsbridge Stream. For the Knightsbridge Stream an assessment of flood extent was made based on consultation with the Area Engineer, a review of the OPW benefitting land maps and a site walkover.

The resultant Flood Zones for Trim, based on the best available information is presented in Appendix A. Figure 4-1 over the page presents an overview of the Flood Zones and watercourses. Each of the sources of flood information is discussed in more detail in the following sections of report.

Figure 4-1 Flood Zone mapping with watercourse annotation



4.2 OPW National PFRA Study Fluvial Flood Outlines

The Preliminary Flood Risk Assessment (PFRA) was a national screening exercise that was undertaken to identify areas at potential flood risk. The PFRA is a requirement of the EU Floods Directive and the publication of this work has lead to, and informed, more detailed assessment that is being undertaken as part of the Catchment Flood Risk Assessment and Management (CFRAM) studies. The OPW PFRA study considered flooding from a number of sources, namely fluvial, tidal, pluvial and groundwater, and resulted in a suite of broadscale flood maps.

For the preparation of the OPW PFRA fluvial flood maps, flood flow estimates were calculated at regular intervals along the entire river network. (The river network is the EPA 'blue-line' network, which, for the most part, matches the rivers mapped at the 1:50,000 scale Discovery Series OS mapping). This flow estimation was based on the OPW Flood Studies Update[2] research programme. An assumption was made that the in-channel flow equates to the mean annual flood and so the out of bank flow for a particular AEP event was determined by deducting the mean annual flood from the flood flow estimate for that probability event.

Using the OPW's 5m national digital terrain model (DTM) cross sections were generated at 100m spacings. The Manning's equation, a hydraulic equation for normal flow was used to calculate a flood level which was then extrapolated across the DTM to determine the flood extent. This exercise was completed for all river catchments greater than 1km^2.

This methodology did not take into account defences, channel structures or channel works. Potential sources of error in the mapping include local errors in the DTM or changes to the watercourse flow route due to an error in mapping or new development. In Trim, the PFRA mapping covers the River Boyne and its tributaries and is generally considered an appropriate flood mapping source for these watercourses at this time.

[2] OPW FSU Research is due for formal publication and dissemination under Work Package 6 in mid-late 2013. http://www.opw.ie/en/floodriskmanagement/hydrometrichydrologicaldata/floodstudiesupdate/

4.3 Trim and the Eastern CFRAM

Under the EU Floods Directive, the national Catchment Flood Risk Assessment and Management (CFRAM) programme is being undertaken by the Office of Public Works. It will review flood risk across the country and produce flood hazard mapping and flood risk management plans.

The Eastern CFRAM will include Trim in its detailed assessment of flood risk, and final delivery of all CFRAM projects is due by the end of 2015 or early 2016. At the time of preparing the SFRA, outputs from the Eastern CFRAM relating to Trim were not available, but when published they will be used to update and inform the SFRA and Development Plan.

4.4 Historical Flood Review and Consultation with Area Engineer

Records of past flooding are useful for looking at the sources, seasonality, frequency and intensity of flooding. Historical records are mostly anecdotal and incomplete, but are useful for providing background information.

4.4.1 OPW Floodmaps.ie

The OPW hosts a National Flood Hazard Mapping website[3] that makes available information on areas potentially at risk from flooding. This website provides information on historical flood events across the country and formed the basis of the Regional Flood Risk Appraisal.

Information is provided in the form of reports and newspaper articles which generally relate to rare and extreme events. Since the establishment of the hazard mapping website, more records are available which identify more frequent and often recurring events. These tend to include memos and meeting records from local authority area engineers, often relating to road flooding.

4.4.2 Consultation

A consultation meeting and site walk with the Trim Area Engineer was conducted and this helped to clarify and improve on the general appreciation of flood risk in Trim. The following details were gathered through this consultation process:

- The main source of flooding in the town in the past has been the River Boyne. The horse statue on the banks of the river does not usually "get its feet wet" during times of flooding.
- The pitch and putt course has flooded in the past from the Boyne
- The area engineer does not recall previous events from the Butterly stream affecting properties
- On the Clonfane Stream, since works were completed to the culvert under the road in the Bloomfield area there have been no flood events.
- The area engineer did not recall any flood event from the stream flowing through the Knightsbridge development though it was pointed out that it is not shown at all on the PFRA mapping.

4.4.3 Results

The pertinent flood risk history from both the consultation and OPW floodmaps.ie sources are summarised in the Figure 4.1 and Table 4.2 over the page.

[3] www.floodmaps.ie

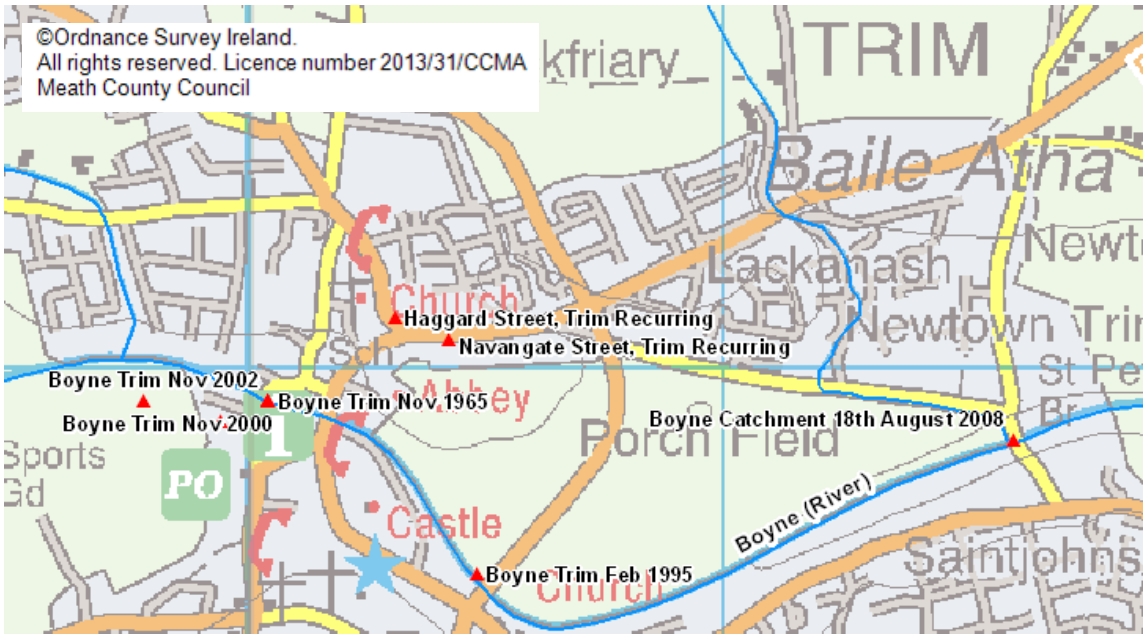
Table 4-2 Historic Flooding Information (source: Eastern CFRAM Flood Risk Review[4])

Date of Flood	Comment
August 2008	At Trim, the heavy rainfall on the Boyne catchment resulted in the River Boyne overtopping its banks. The level reading at Trim Hydrometric Station was the 7th highest on record. Trim Pitch and Putt course flooded; however no further information on properties flooded or resultant damage was available.
January 2005	On 7th January 2005, the River Boyne overflowed into low lying ground and subsequently flooded the swimming pool and children's play area in Trim. A peak flow of 125.9 m3/s occurred at Trim Hydrometric Station during this flood event.
November 2002	The level reading at Trim Hydrometric Station was approximately 100mm below the peak water level recorded (which was in June 1993). From available photos, it appears the flooding in Trim affected mostly low lying areas adjacent to the flood plain, although the swimming pool and Mill Street area were flooded.
November 2000	In Trim, Patrick Street, Loman Street and Watergate Street Bridge were flooded. The bridge remained closed for a period after the flood had passed due to fears regarding its integrity. It was estimated in an OPW memo that the flood event had an AEP of 3.33% based on the flow in the River Boyne at Slane Castle. The mean daily flows (as per http://www.opw.ie/hydro) for this flood event at Blackcastle and Liscartan Hydrometric Stations exceeded those for the November 2002 flood, while at Navan Weir (256m3/s) and Trim Hydrometric Stations (127m3/s), the November 2000 flows were marginally lower than the corresponding November 2002 figures.
February 1995	In Trim, the peak flow recorded at Trim Hydrometric Station (07005) for this event was 130.4m3/s (Table 4.9). The River Boyne overflowed its banks and Watergate Street Bridge was closed as a precaution. No further information is available.
June 1993	In Trim, the peak flow for this event (as per Table 4.9) was measured at 138m3/s. The River Boyne overflowed, and Watergate Street Bridge was closed as a precaution as the water level was 2-3 inches below the deck of the bridge. The daily mean water level at Trim Hydrometric Station (as per http://www.opw.ie/hydro), which is located just upstream of Watergate Street Bridge, was measured as 56.0mOD Poolbeg, or approximately 53.3mOD Malin.
December 1978	A maximum flow of 130m3/s was recorded at Trim hydrometric station (07005) where the River Boyne overflowed. Griffin Park, Athboy Road, Market Street, Haggard Street, High Street, St. Joseph's home and St. Mary's secondary school were all mentioned as being flooded.
1968/January 1969	An OPW report indicates that flooding occurred during December 1968/January 1969 in Navan and Trim when the River Boyne overflowed. The affected areas were at Derrindaly, near Trim. However, no exact date or specific details are available for this flood event.
November 1965	In Trim, the River Boyne overtopped its banks. The peak flow recorded at Trim hydrometric station was 186.52m3/s, as per Table 4.9. Some press articles reported that the level of the River Boyne rose to 6 feet above its normal level (from http://www.opw.ie/hydro, the 95 percentile level at Trim hydrometric station, upstream of Watergate Bridge, is 53.36mOD Poolbeg derived for the period 1975 to 2008), while others reported that the level was an inch above the 1954 flood level (which itself was reported to have risen above the parapets of the New Bridge). The New Bridge was impassable and 3 houses flooded with reported depths of over 3 feet of water. Photographs show flooding of roads and residential properties.
January 1965	Flooding occurred in Trim in January 1965. Flooding was reported in the Moymet area of Trim.
December 1954	In Trim, the River Boyne overflowed its banks and the water level rose above the parapets of the "newbridge". Press article reported flooding of houses on Mill Lane and Athboy Road. During this flood event, the

[4] OPW Eastern CFRAM Flood Risk Review http://www.eastcframstudy.ie/

	automatic flood gauge in the river was swept away; hence hydrometric data is not available.
March 1947	In Trim, the River Boyne overtopped its banks and press articles report the river rising to 8 feet above its normal level. The bridge in Trim was submerged and families in low lying areas had to abandon their homes. Some roads were impassable. Reports indicate that approaches to one bridge in the town were blocked by 3 feet of water, indicating that the water level reached approximately 58.83mOD Poolbeg.
August 1905	Flooding occurred in Trim in August 1905 caused by approximately 36 hours of heavy rainfall in the Trim area. Only outline information for this flood event is available from a press report. This states that damage was caused to crops along the River Boyne; however no further details are available.

Figure 4-2 Historical Flood Locations



4.5 Walkover Survey

A walkover survey of the River Boyne, Butterly Stream, Clonfane Stream and Knightsbridge Stream sites was conducted to help assess flood risk and provide a local understanding of the sites. Information collated on the site visits was used to inform the Flood Zone mapping process.

Photographs taken on site are presented in Figure 4-3 over the page.

Figure 4-3 Site Walkover Photographs

Horse Statue at Banks of the Boyne

Banks of the Boyne facing Emmet Street Bridge

Horse Statue at Banks of the Boyne

Banks of the Boyne facing Emmet Street Bridge

Butterly stream just upstream of the Boyne

Butterly Stream culverted at Avondale Drive

Butterly stream culverted at Kildalkey Road

Butterly stream culvert at Athboy Road

4.6 Sources of Flooding

A review of the historical event data, and predictive flood information has highlighted a number of sources of potential flood risk to the town. These are discussed in the following sections.

4.6.1 Fluvial Flooding

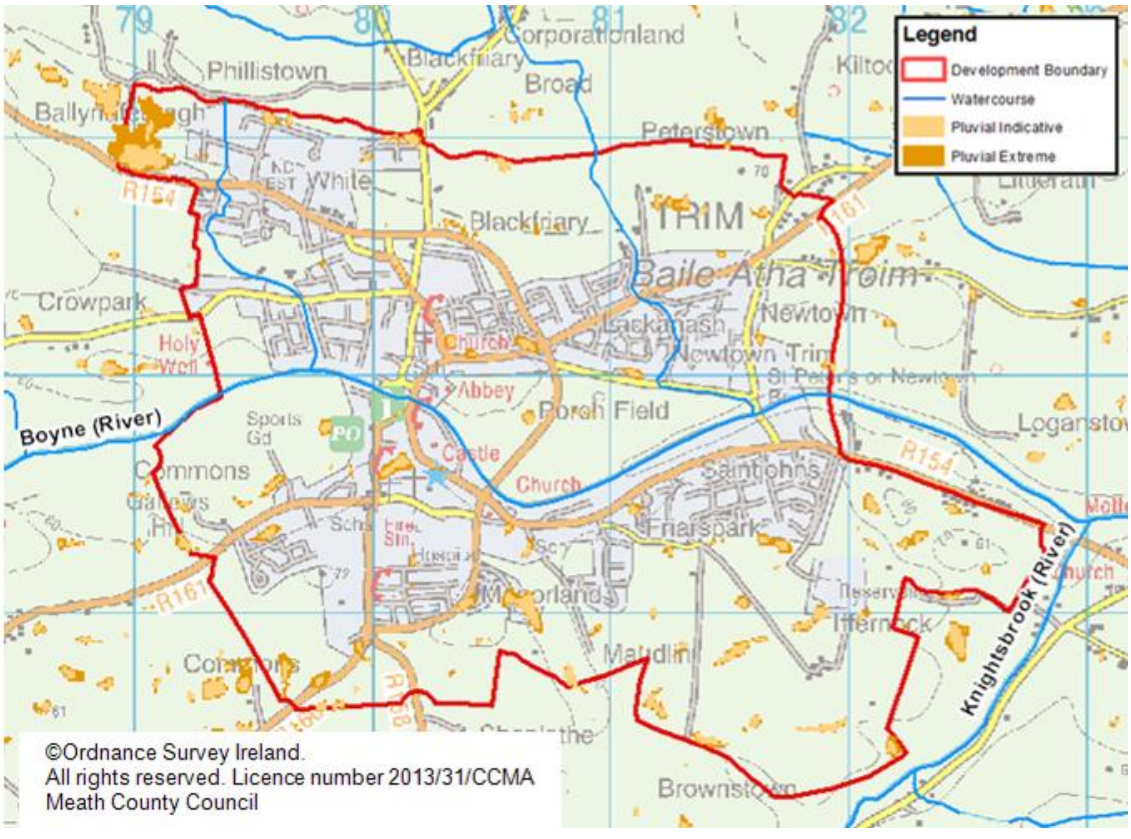
Trim is predominantly at risk of fluvial flooding from the River Boyne, although the smaller watercourses are predicted to have some degree of risk. A full review of locations where development is impacted by flood risk is included in Section 6.

4.6.2 Pluvial Flooding

Flooding of land from surface water runoff is usually caused by intense rainfall that may only last a few hours. Areas at risk from fluvial flooding will almost certainly be at risk from surface water flooding. The indicative pluvial map from the OPW PFRA study is presented in Figure 4-4 below, it has been used to identify development areas at particular risk of surface water and pluvial flooding.

Based on the PFRA mapping the risk of pluvial flooding in Trim is generally low. Some of the higher risk areas are to the north west corner of the settlement area within the Ballynafeeragh lands that are currently undeveloped and are zoned E2 for general enterprise and employment. For new development, adhering to the policies on the management of surface water will ensure the risk will be adequately managed.

Figure 4-4 PFRA Indicative Pluvial Flood Map[5]



[5] Source: OPW, PFRA Study Draft Data, licensed to Meath County Council

4.6.3 Groundwater Flooding

Groundwater flooding is caused by the emergence of water originating from the subsurface, and is particularly common in karst landscapes. This source of flooding can persist over a number of weeks and poses a significant but localised issue that has attracted an increasing amount of public concern in recent years. In most cases groundwater flooding cannot be easily managed or lasting solutions engineered, however the impact on buildings can be mitigated against through various measures.

The draft PFRA groundwater flood maps[6], which entailed an evidence-based approach and considered the hydro-geological environment, such as the presence of turloughs, did not show any significant risk in the Trim area. Based on the PFRA study the risk of groundwater flooding is not considered significant enough to warrant further investigation in this SFRA.

4.7 Climate Change

The Planning System and Flood Risk Management guidelines recommends that a precautionary approach to climate change is adopted due to the level of uncertainty involved in the potential effects.

Specific 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 Table 3 4 below.

Table 4-3 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) accordingly; 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

4.7.1 Climate Change and Flood Risk Assessment

The Flood Zones are determined based on readily available information and their purpose is to be used as a tool to avoid inappropriate development in areas of flood risk. Where development is proposed within an area of potential flood risk (Flood Zone A or B), a flood risk assessment of appropriate scale will be required and this assessment must take into account climate change and associated impacts. Under the National CFRAM programme, the detailed modelling and assessment stage of each study will include for climate change effects.

Climate change may result in increased flood extents and therefore caution should be taken when zoning lands in transitional areas. **As recommended in the Planning System and Flood Risk Management Guidelines; Flood Zone B, which represents the 0.1% AEP extent, can be taken as an indication of the extent of the 1% AEP flood event with climate change.** In steep valleys an increase in water level will relate to a very small increase in extent, however in flatter low-lying basins a small increase in water level can result in a significant increase in flood extent.

In the design of flood alleviation measures, climate change should be taken into account and design levels of structures, such as flood walls or embankments, must be sufficient to cope with the effects of climate change over the lifetime of the structure or where circumstances permit, be capable of adaptation.

[6] Reference: Preliminary Flood Risk Assessment Groundwater Flooding, June 2010

Further consideration to the potential future impacts of climate change will be given for specific areas of Trim within Section 6. In general it is likely that the greatest sensitivity to the impacts of climate change will be from flooding triggered by the River Boyne, particularly in areas where there is a large degree of difference between the Flood Zone A and B extents. This would indicate that the centre of Trim is likely to be sensitive to the impacts of climate change.

5 Flood Risk Management

The Planning Guidelines recommend a sequential approach to spatial planning, promoting avoidance rather than justification and subsequent mitigation of risk. The implementation of the Planning Guidelines is achieved through the application of policies and objectives within specific development plans.

Section 7.15 'Flood Risk Management' of Volume 1 of the Meath County Development Plan (MCDP) 2013-2019 includes a number of policies and objectives which set out the framework for flood management within the County.

The Trim SFRA will build on the overview of flood risk contained within the MCDP 2013-2019 SFRA by considering the policies and objectives contained within the MCDP and adding to them, where necessary, to cater for the specific needs of the Trim Development Plan area.

5.1 Flood Risk Policies and Objectives

The policies and objectives listed in this section have been considered and applied during the preparation of the Trim Development Plan 2014-2020. In particular Policies 29-30 and 35 have ensured that the sequential approach has been adopted when considering land use zoning objectives and where necessary the Justification Test has been applied. This has resulted in re-zoning of land to open space in areas at risk of flooding, it has also protected development areas where there is a strategic requirement for town centre expansion. The policies contained within Volume 1, Section 7.15 of the MCDP 2013-2019 are included below.

WS POL 29	To have regard to the "Planning System and Flood Risk Management – Guidelines for Planning Authorities" (DoEHLG/OPW, 2009) through the use of the sequential approach and application of the Justification Tests for Development Management and Development Plans, during the period of this Plan.
WS POL 30	To have regard to the findings and recommendations of the current Strategic Flood Risk Assessment prepared as part of the County Development Plan review. See Appendix 6.
WS POL 31	To ensure that all developments have regard to the surface water management policies in the Greater Dublin Strategic Drainage Study (GDSDS). Compliance with the recommendations contained in Technical Guidance Document, Volume 2, Chapter 4 of the Greater Dublin Strategic Drainage Study shall be required in all instances.
WS POL 32	To ensure that a flood risk assessment is carried out for any development proposal, where flood risk may be an issue in accordance with the "Planning System and Flood Risk Management – Guidelines for Planning Authorities" (DoECLG/OPW, 2009). This assessment shall be appropriate to the scale and nature of risk to the potential development.
WS POL 33	To consult with the Office of Public Works in relation to proposed developments in the vicinity of drainage channels and rivers for which the OPW are responsible, and the Council will retain a strip of 10 metres on either side of such channel where required, to facilitate access thereto.
WS POL 34	To consult, where necessary, with Inland Fisheries Ireland, the National Parks and Wildlife Service and other relevant agencies in the construction of flood alleviation measures in County Meath.
WS POL 35	To ensure that flood risk management is incorporated into the preparation of Local Area Plans and Town Development Plans in accordance with 'The Planning System and Flood Risk Management - Guidelines for Planning Authorities (2009)'.
WS POL 36	To have regard to the recommendations of the Fingal East Meath Flood Risk Assessment and Management Study, the Eastern, North West and Neagh Bann Catchment Flood Risk Assessment and Management Study when finalised and approved.

The objectives contained within Volume 1, Section 7.15 of the MCDP 2013-2019 are as follows:

WS OBJ 11	To undertake a review of the 'Strategic Flood Risk Assessment for County Meath' following the publication of the flood mapping which is being produced as part of the Catchment Flood Risk Assessment and Management (CFRAM) Studies.
WS OBJ 12	To design flood relief measures to ensure appropriate protection for alluvial woodland (i.e. a qualifying interest) along the Boyne.
WS OBJ 13	To design flood relief measures to protect the conservation objectives of Natura 2000 sites and to avoid indirect impacts of conflict with other qualifying interests or Natura 2000 sites.
WS OBJ 14	To promote positive flood relief measures that can enhance habitats in the Boyne floodplain such as swales, constructed wetland basins etc.
WS OBJ 15	To seek to ensure that construction works are designed so as not to result in surface water runoff into cSAC or SPAs either directly or indirectly via a watercourse.

Additional objectives in relation to Sustainable Drainage Systems (SuDS) are included within Section 7.16 of the MCDP 2013-2019:

WS OBJ 16	To design flood relief measures to protect the conservation objectives of Natura 2000 sites and to avoid indirect impacts of conflict with other qualifying interests or Natura 2000 sites.
WS OBJ 17	To promote positive flood relief measures that can enhance habitats in the Boyne floodplain such as swales, constructed wetland basins etc.
WS OBJ 18	To seek to ensure that construction works are designed so as not to result in surface water runoff into cSAC or SPAs either directly or indirectly via a watercourse.

5.2 Specific Policy Recommendations

In addition to the more general management policies and objectives stated above and within the MCDP 2013-2019 it is also appropriate to include for policies and objectives that are specific to the development plan area. This approach allows for the management of specific flood risk issues on a local basis.

5.2.1 Emergency Management Plan

Central areas of Trim are at risk of flooding from the River Boyne and have suffered from numerous historic flood events. The town centre area contains significant commercial and residential property. To help manage the risk it is recommended that a plan is developed to assist with the emergency management of a flood event, this could be considered for inclusion within the Meath Local Authorities Major Emergency Plan. The plan should provide for dissemination of warnings, traffic and people management and clear-up procedures. In addition, the management plan for the Eastern CFRAM (available 2015/16) may identify additional risk management measures which are appropriate, including more detail on warning systems.

5.2.2 Development Management - Planning Applications in Trim

To clarify the application of WS POL 31 & 32 contained within the MCDP 2013-2019 the following outlines the key requirements relating to the management of development and flood risk in Trim;

- Development proposals will require an appropriately detailed flood risk assessment. As a minimum this will include a "Stage 1 - Identification of Food Risk"; where flood risk is identified a "Stage 2 - Initial FRA" will be required and depending on the scale and nature of the risk a "Stage 3 - Detailed FRA" may be required. The requirement for all applications to have an accompanying stage 1 assessment is important, as for example a large site located in Flood Zone C may be appropriate in terms of vulnerability, but might be at potential risk of surface water flooding or residual risk of culvert failure, it is noted that this SFRA effectively deals with Stage 1 and can be referred to as such.
- Under the FRA the impacts of climate change and residual risk (culvert/structure blockage) should be considered and remodelled where necessary, using an appropriate level of detail, in the design of FFL.
- All development proposals will require the FRA to consider surface water management in line with the GDSDS as stated in the MCDP WS POL 31.

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.

5.2.3 Existing Development at Risk of Flooding in Trim

For existing development it is not feasible to alter the wider land use zoning objective and in most cases will not be possible to re-locate the existing development to an area at lower risk of flooding. For this reason changes to existing development or reconstruction/new development (within existing developed areas) will require careful management.

Areas of existing development, along with their corresponding land use zoning objective, that are at risk of flooding in Trim are identified in Table 6-2 in the next section. This includes for all existing development within Flood Zone A or B resulting from the River Boyne, Butterly Stream, Clonfane Stream, Knightsbrook Stream, or any un-named watercourses.

Any proposal in an area at high or moderate risk of flooding (Flood Zone A or B) that is considered acceptable in principle must demonstrate that appropriate mitigation measures can be put in place and that residual risks can be managed to acceptable levels through the submission of an appropriately detailed FRA as detailed in Section 5.2.2. Specific requirements for new development FRA within B1 lands is provided in Section 5.2.4 below.

To ensure that adequate measures are put in place to deal with residual risks, proposals should demonstrate 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. This will mainly be applicable in the town centre of Trim within Flood Zone A where significant increases in FFL is not possible. Such measures include the design and specification of internal building services and finishes. Further detail on flood resilience and flood resistance are included in the Technical Appendices of the Planning Guidelines, The Planning System and Flood Risk Management.

5.2.4 New Commercial/Town Centre (B1) development at risk of flooding

For new development within the currently undeveloped B1 lands identified in Section 6.2.2 it is recommended that the following detail is included for in the policies and objectives:

Development proposals for the subject site must consider the sequential approach and allocate water compatible development within Flood Zones A and some/all of Zone B where possible. Whilst re-profiling of land within this area may be acceptable, land filling without provision of compensatory storage would not be permissible.

Planning applications within this area must be accompanied by an appropriately detailed FRA, setting out the above approach that clearly assesses flood risks, mitigation measures and demonstrates compliance with the Planning Guidelines.

Recommendations from the Eastern CFRAM flood management plan will provide additional detail, and may include recommendations for flood management at the site. A more general emergency plan for periods of town centre flooding is recommended, potential for flood warning is significant.

5.2.5 Future Distributor Roads

Proposed distributor roads are indicative and subject to review within the lifetime of the 2014-2020 Development Plan. During the environmental assessment stage, the Justification Test will need to be applied to route alignments if there is interaction with Flood Zone A/B. FRA will be required to manage the risk and to demonstrate there will be no impact on adjacent lands. OPW Section 50 consent for all watercourse crossings will be required.

6 Development Zoning and the Justification Test

This section presents the land use zoning objectives contained within the Draft Development Plan and reviews the flood risk to these objectives. Where new development is zoned within areas at risk of flooding then more detailed commentary is provided along with details for justification.

6.1 Land Use Zoning

The purpose of zoning is to indicate to property owners and members of the public the types of development which the Planning Authority considers most appropriate in each land parcel.

Zoning is designed to reduce conflicting uses within areas, to protect resources and, in association with phasing, to ensure that land suitable for development is used to the best advantage of the community as a whole.

The zoning objectives can be related to the vulnerability classifications in the 'Planning System and Flood Risk Management'; highly vulnerable, less vulnerable and water compatible. The vulnerability of the land use, coupled with the Flood Zone in which it lies, guides the need for application of the Justification Test.

Table 6-1 Land Zoning Objectives and Vulnerabilities

Objective/Use	Vulnerability*	Justification Test Required
A1 - Existing Residential	High	For development in Flood Zone A or B
A2 - New Residential	High	For development in Flood Zones A or B
B1 - Commercial/Town or Village Centre	High / Less	For highly vulnerable development in Flood Zone A or B For less vulnerable development in Flood Zone A
B2 - Retail Warehouse	Less	For development in Flood Zone A
C1 - Mixed Use	High / Less	For highly vulnerable development in Flood Zone A or B For less vulnerable development in Flood Zone A
D1 - Tourism	High / Less / Water Compatible	For highly vulnerable development in Flood Zone A or B For less vulnerable development in Flood Zone A Or appropriate - if water compatible
E2 - General Enterprise & Employment	High / Less	For highly vulnerable development in Flood Zone A or B For less vulnerable development in Flood Zone A
F1 - Open Space	Water Compatible	Development is generally appropriate
G1 - Community Infrastructure	High / Less	For highly vulnerable development in Flood Zone A or B For less vulnerable development in Flood Zone A
H1 - High Amenity	Water Compatible	Development is generally appropriate

* Land Use Vulnerability is expressed in relation to Table 3.1 (p25) of the Planning System and Flood Risk Management Guidelines for Planning Authorities. Some Zoning Objectives include a mix of different vulnerabilities of land use and are therefore presented as such in the table above.

The land zoning objectives and their respective vulnerabilities are shown in Table 6-1. It is important to note that this table is provided as a general guide and the specific development types within the zoning objective must be considered individually, and with reference to Table 3-1 of the 'Planning System and Flood Risk Management'. For example the B1, C1, D1, E2 and G1 zonings can include for high or less vulnerable development, and depending which flood zone they lie in, this results in a varying requirement for the application of the Justification Test.

6.2 Development Land Use Zoning Review in Trim

This review will look at each of the land use zonings in turn and discuss the associated flood risk issues in each area.

Whilst preparing the Draft Trim Development Plan 2014-2020 zoning objectives for new development, the Local Authority have applied the sequential approach and preferentially avoided highly vulnerable or less vulnerable land uses within areas of moderate or high flood probability (Flood Zone A or B). Where land use zonings are subject to flooding, but development pressures remain, the Justification Test has been applied.

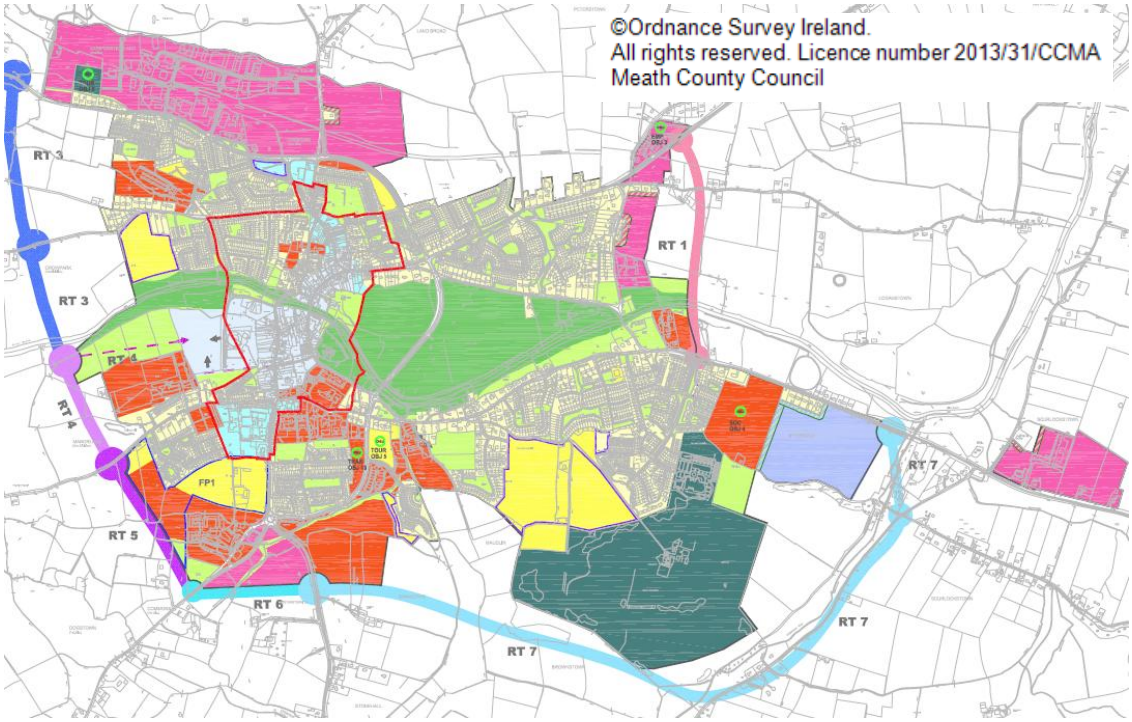
Where existing development is already in place, within a given land use zoning objective, it is not feasible to alter zoning during development plan preparation. For this reason changes to existing development or reconstruction/new development (within existing developed areas) will require site specific FRA to be conducted at the development management stage; when planning permission is being sought. The procedure for site specific FRA is outlined in Sections5.2.2, 5.2.3 and 5.2.4. A review of flood risk to the land use zoning objectives is presented in Table 6-2 below. Detailed commentary on sites identified for the Justification Test then follows.

Table 6-2 Land Use Zoning and Flood Risk in Trim

Land Use Zoning	Comment flood risk	Justification Test Required?
A1 - Existing Residential	*Existing housing estates on the Butterly Stream, Clonfane Stream, Knightsbrook Stream and the un-named drainage channel. Residential development is highly vulnerable to flooding, but as this risk is to existing development it is not impacted on by the proposed zoning objectives and the Justification Test is not applicable.*	No
A2 - New Residential	*No fluvial risk in this zoning*	No
B1 - Commercial/ Town or Village Centre	*Adjacent to the River Boyne through the core area of Trim. This land could comprise highly and/or less vulnerable uses as it is the core of the town. Most development is existing, any additional development must be assessed and managed on a site by site basis. The Justification Test is required for undeveloped B1 lands adjacent to the River Boyne that are at risk of flooding, next section refers.*	Yes
B2 - Retail Warehouse	*No fluvial risk in this zoning*	No
C1 - Mixed Use	*No fluvial risk in this zoning*	No
D1 - Tourism	*No fluvial risk in this zoning*	No
E2 - General Enterprise & Employment	*No fluvial risk in this zoning*	No
F1 - Open Space	*The majority of open space at risk of flooding is from the River Boyne, also other areas along the Buttlerly Stream, Clonfane Stream and Knightsbridge Stream. Open space is water compatible, so this is the preferred zoning within Flood Zones A and B.*	No
G1 - Community Infrastructure	*The existing development of Butterstream Manor and the water treatment works are at risk from the Butterly Stream and River Boyne respectively. G1 can comprise highly and less vulnerable uses. Any extensions or additional development within these lands should be assessed and managed on a site by site basis.*	No
H1 - High Amenity	*Open space within a Natura 2000 site (SAC) - adjacent to the River Boyne. Trim Castle lands and Porchfield heritage sites adjacent to the River Boyne. Zoning is generally appropriate within Flood Zones A and B.*	No
Distributor Roads	*RT 1, 3, 4, 5, 6, 7 - indicative routes are subject to review but currently present several river crossings or interaction with Flood Zones A/B. Justification text will be required once routes are confirmed, next section refers.*	Yes - at later stage

6.2.1 Distributor Roads

Various Distributor Roads to south and west of the town



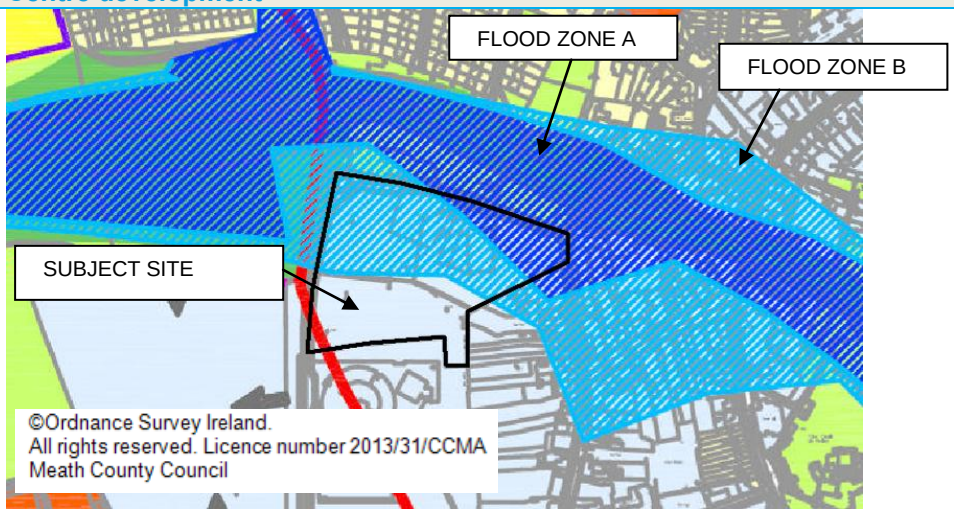
Indicative distributor road alignments (listed RT above) are included within the Flood Zones from the south east to the north west of Trim. River crossings are included for the Knightsbrook River, Knightsbridge Stream, River Boyne and Butterly Stream.

Meath County Council have proposed that a review of the current requirement for the distributor road network will be completed under a specific transport policy within the Draft Trim Development Plan 2014-2020. The review will include environmental considerations, under which the route configuration will be assessed with regard to the Planning System and Flood Risk Management Guidelines - this will include for the Justification Test.

Conclusions	Proposed distributor roads are indicative and subject to review. During the environmental assessment stage, the Justification Test will need to be applied if alignments interact with Flood Zone A/B. FRA will be required to manage the risk and to demonstrate there will be no impact on adjacent lands. OPW Section 50 consent for all watercourse crossings will be required.

6.2.2 Commercial/Town Centre (B1)

New Town Centre development



One area of undeveloped land is within Flood Zone A and B, and has retained B1 zoning for town centre expansion from the Trim Development Plan 2008-2014. The black outline above refers.

A portion of the land parcel identified by the black outline is currently being used as a temporary car park, the remainder is fenced off disused/brownfield. The site borders the access road adjacent to the River Boyne and extends to the south, away from the River Boyne. Historical records suggest that the lands may have been subject to flooding in the past. Approximately 50% of the land parcel is within Flood Zone A and B with the remainder in Zone C.

The site has passed Parts 1 and 2 of the Justification Test for Development Plans and has clearly identified the strategic planning requirement for development at this location. Part 3 of the Justification Test involves demonstrating that flood risks to the site, and arising from development on the site can be managed in a sustainable way. The Justification test has been undertaken in an iterative process, and has involved consultation between Meath County Council, JBA Consulting and RPS as part of the Strategic Environmental Assessment of the Trim Development Plan 2014-2020. The full Justification Test is presented in Appendix B. The following paragraphs provide background to the Part 3 justification and provide recommendations for development management.

The current level of information suggests that developing within Flood Zones A or B could have negative impacts on flood risk elsewhere, both through obstructing flow paths and reducing floodplain capacity. However, given that a significant percentage of the site is within Flood Zone C, it is anticipated that sustainable flood risk mitigation measures could be designed to allow development of the wider subject site. This must be undertaken through an appropriately detailed Flood Risk Assessment, which would form part of the planning application.

The FRA should consider the Sequential Approach within the subject site and would typically involve allocating open space/car parking within Flood Zones A and some/all of Zone B. Whilst re-profiling of land within this area may be acceptable, land filling without provision of compensatory storage would not be permissible. Further details on compensatory storage are provided in Appendix B of the Planning System and Flood Risk Management. Buildings should be sited at an appropriate FFL, which should be above the 1 in 100 year flood level, with an allowance for freeboard and climate change. It is noted that splitting this site into smaller sub-plots and adopting a piecemeal approach to mitigation may preclude adequate risk management, and will not provide sufficient land within Flood Zone C to allow compensatory storage to be provided.

The River Boyne floodplain is at risk from the impacts of climate change and any future FRA must include adequate consideration of these impacts, in line with OPW guidance. Consideration should also be given to emergency management and evacuation procedures.

The Eastern CFRAM flood mapping (available late 2013/early 2014) and management plan (available 2015/16) will provide additional clarity to flood mapping and risk management measures and should be consulted when available.

Conclusions	Development proposals for the subject site must consider the sequential approach and allocate water compatible development within Flood Zones A and some/all of Zone B where possible. Whilst re-profiling of land within this area may be acceptable, land filling without provision of compensatory storage would not be permissible. Planning applications within this area must be accompanied by an appropriately detailed FRA, setting out the above approach that clearly assesses flood risks, mitigation measures and demonstrates compliance with the Planning Guidelines. Recommendations from the Eastern CFRAM flood management plan will provide additional detail, and may include recommendations for flood management at the site. A more general emergency plan for periods of town centre flooding is recommended, potential for flood warning is significant.

7 SFRA Review and Monitoring

An update to the SFRA will be triggered by the six year review cycle that applies to Local Authority development plans. In addition, there are a number of other potential triggers for an SFRA review and these are listed in the table below.

There are a number of key outputs from possible future studies and datasets, which should be incorporated into any update of the SFRA as availability allows. Not all future sources of information should trigger an immediate full update of the SFRA; however, new information should be collected and kept alongside the SFRA until it is updated.

Trim is currently subject to a detailed flood risk mapping and management study under the Eastern CFRAM. It will be necessary to review the results and recommendations of the Eastern CFRAM with respect to Trim when the results become available.

Table 7-1 SFRA Review Triggers

Trigger	Source	Possible Timescale
Catchment Flood Risk Assessment and Management (CFRAM) Flood Hazard Mapping	OPW under the Floods Directive	2013/4
Eastern River Basin Flood Risk Assessment and Management (EFRAM) Plan	OPW	2015/6
Flood maps of other sources, such as drainage networks	Various	Unknown
Significant flood events	Various	Unknown
Changes to Planning and / or Flood Management Policy	DoEHLG / OPW	Unknown
Detailed FRAs	Various	Unknown

Appendices

A Flood Zone Mapping

North

LEGEND

Development Plan Boundary

Flood Zone A

Flood Zone B

JBA consulting

APPENDIX A

FLOOD ZONE MAPPING

B Justification Test for B1 Lands

The Justification Test for Development Plans has been undertaken in an iterative process, and has involved consultation between Meath County Council, JBA Consulting and RPS, as part of the Strategic Environmental Assessment of the Trim Development Plan 2014-2020.

B.1 Site Description

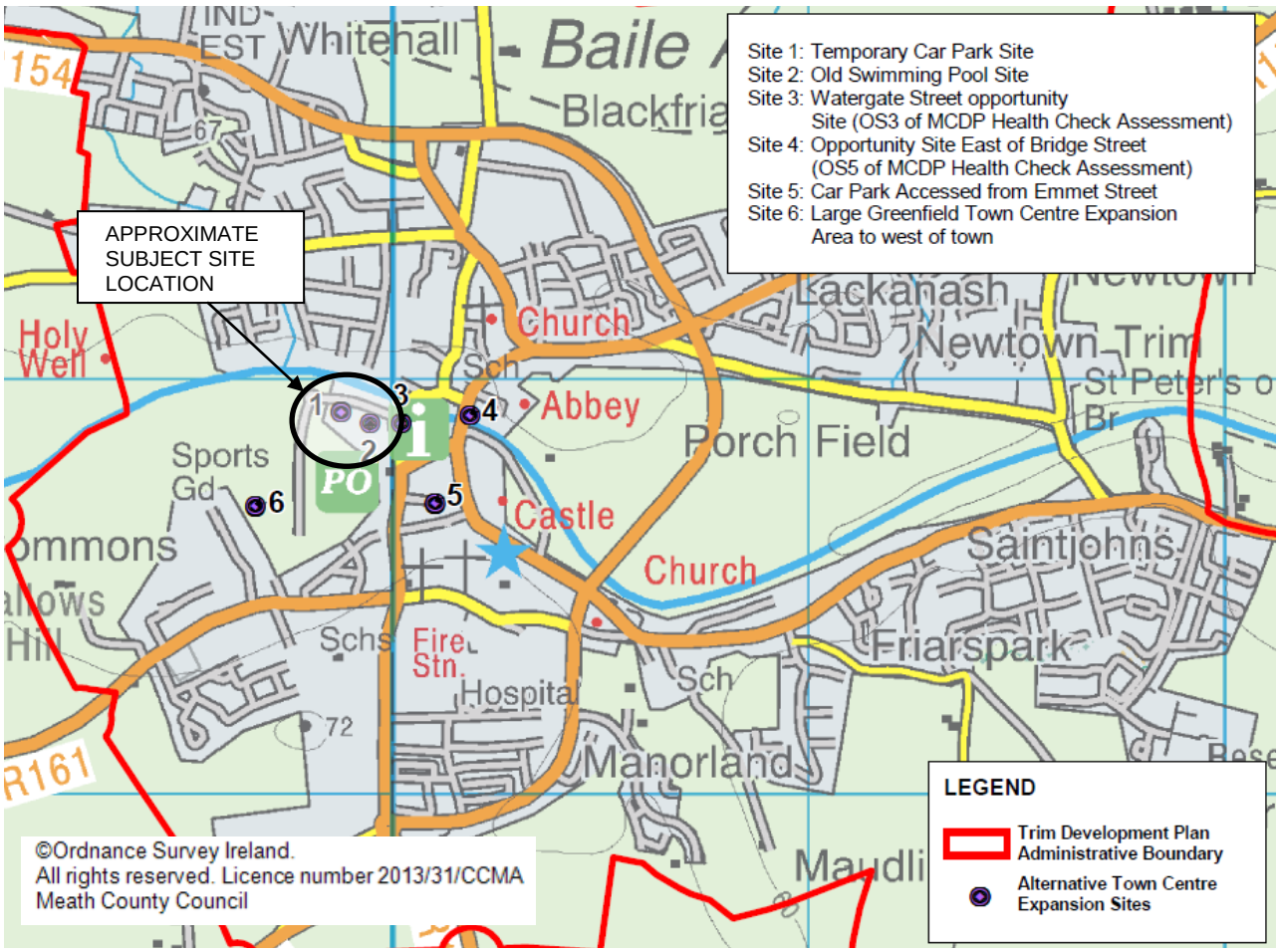
The subject site is located to the west of the town centre core area to the west of Watergate Street and to the south of the River Boyne. These lands essentially comprise of two sites. Site 1 which comprises of the western part of the site includes for a temporary car park with hardcore and gravel surfacing, and partly of undeveloped open lands. Site 2 comprises of the old municipal swimming pool site and unused scrub land.

The overall site lies to the west of the existing town centre and is accessed from Emmet Street via a new local access road which leads to the recently constructed OPW offices and library building to the south of the subject site. This local access road forms the northern and western boundaries of the site.

To the north of the site, between the access road and the Boyne River is a public park to the north west and open space to the north east of the site. The OPW building lies to the south east of the site. The site is bounded to the south east by Kavanagh Car sales garage.

The northern half of the Site 1 which incorporates the car park and some undeveloped lands lies within Flood Zone A. The southern portion, all of which is currently undeveloped, lies within Flood Zone B. The north eastern portion of the Site 2, which comprises largely of unused scrub land and a small portion of the old swimming pool building lies within Flood Zone A. The south eastern portion of the site, which contains the remainder of the old swimming pool building and areas of unused scrub, lies within Flood Zone B.

Alternative Town Centre Expansion Sites



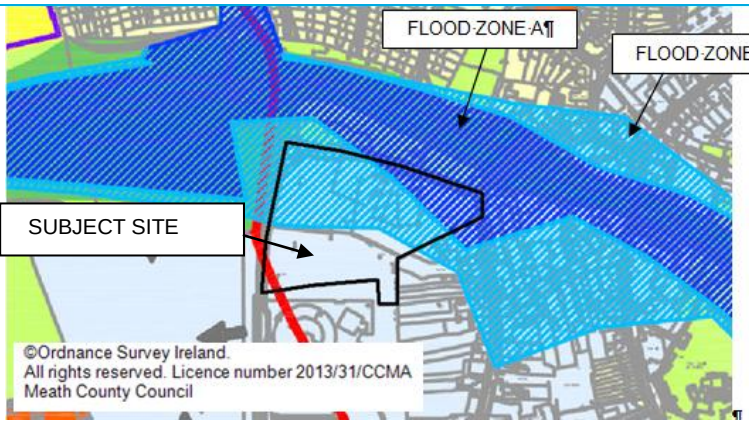
B.1.1 Justification Test Detail

Site 1 & 2 – Car Park & Old Swimming Pool Site	
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.	The NSS identifies Trim as having urban strengthening capacity. It sets out that towns such as Trim located on important economic and transport corridors or in important locations and with a capacity to grow, must become a focus for the settlement policies of local authorities to be incorporated in county development plans. The NSS explains that smaller towns, such as Trim, should cater for local growth in residential, employment and service functions and should enhance the built environment, water services, public transport links and capacity for development. The RPGGDA designates Trim along with Kells as part of the 'Navan Core Economic Area' with linkages to the gateways and other primary economic hubs, which support business flows and make them attractive locations for investment. The RPGs designate Trim as a 'Moderate Sustainable Growth Town' which should develop in a self-sufficient manner in tandem with growth in population and employment opportunities resulting in a reduction in long distance commuting and will serve the surrounding rural catchment area. The RPGs state that in relation to these towns, key sites and facilities should be identified that are fully serviceable and available for encouragement of economic investment opportunities. The MCDP 2013 – 2019 Core Strategy incorporates the recommendations of the RPGGDA and also designates Trim as a Moderate Sustainable Growth Town that should develop in a self-sufficient manner in tandem with growth in population and employment opportunities resulting in a reduction in long distance commuting and will serve the surrounding rural catchment area. Based on the MCDP Core Strategy which applies an allocation of 518 additional dwelling units within Trim up to 2019 combined with the number of extent permissions (912), it is estimated that the target population for Trim Town & Environs over the plan period up to 2019 & beyond shall be 12,272 persons (an increase of 4,004 persons on Census 2011). There will be a need to ensure that services and employment uses are delivered in tandem with this growth. Furthermore Trim is identified in the MCDP as a 'District Employment Centre' in the hierarchy of economic centres in the County. These centres should provide employment needs for urban areas as well as their large rural hinterlands. Sectors targeted for Trim in the MCDP include enterprise and business startups as well as tourism, administration & healthcare which are all permitted uses within B1 zoning for the subject site. The MCDP acknowledges that Tourism is also a major force for development in Trim. The County Retail Strategy 2013 identifies the town as a 'Sub-County Town Centre' and the largest urban centre in the south west of the County. It reports that it is currently under provided for in terms of convenience and comparison floor space given its role. It states that further comparison and convenience operators, in particular from national and international multiples, would assist with retaining expenditure and increasing the attractiveness of the town as a retail and tourist destination.
2. The zoning or designation of the lands for the particular use or development type is required to achieve the proper planning and sustainable development of the urban settlement and, in particular:	
(i) Is essential to facilitate regeneration and / or expansion of the centre of the urban	According to the Health Check Assessment of Trim, which was prepared as part of the County Retail Strategy 2013, the town is currently under provided for in terms of convenience and comparison floor space given its role as a 'Sub-County Town

settlement	Centre' and the largest urban centre in the south west of the County. It also reports that further comparison and convenience operators, in particular from national and international multiples, would assist with retaining expenditure and increasing the attractiveness of the town as a retail and tourist destination. The required format of modern convenience retailing cannot be accommodated within the plot pattern of the historic core of the town thus requiring a larger open development site opportunity. The County Retail Strategy quantifies the additional retail capacity of Trim as being in the order of 5,000 sq.m. of convenience and 1,750 – 5,000 sq.m. of comparison floorspace within Trim to 2022 to meet the needs of the existing and future population expenditure of the Town. This significant quantum of retail floorspace will be required to be facilitated within a number of opportunity sites throughout the town, in addition to the subject site. The Health Check Assessment also identifies a very low vacancy rate within the town centre and supports the expansion of the town centre westwards into the subject site. Based on the foregoing, it is reasonable to conclude then that expansion of the town centre is in the first instance necessary and justified. The next matter to consider is where this expansion could occur and whether the subject site is the only reasonable and viable option in which to accommodate this expansion. The subject site is one of a limited number of sites which adjoin the existing commercial core of the town and which could potentially accommodate larger format international multiples and other town centre uses and expansion. These sites are identified in Appendix A enclosed with this report. Site 1 & 2: Car Park and Old Swimming Pool Site Site 3: Watergate Street opportunity Site (OS3 of MCDP Health Check Assessment): A portion of the northern section of this site is located within Flood Zone A and the remainder of the site is located within Flood Zone B. Mixed use planning permission was granted in respect of this site under Reg. Ref.'s TT40029 and TT40034, however both permissions expired in 2010. This is a relatively small site and is constrained in shape and by surrounding buildings. It is also located within the Town Walls, the zone of archaeological potential and adjoins a number of protected structures which further constrains development of this site. This site is sequentially located within the town centre core area. Sequentially this is a preferred site. However this site is at a higher risk of flooding (in parts) than the subject site, and has physical constraints which would present difficulties for modern format retail development which the subject site does not have. Site 4: Opportunity Site East of Bridge Street (OS5 of MCDP Health Check Assessment): This site is partly located within Flood Zone A and largely within Flood Zone B. It is limited in size, accessibility and frontage and is located within the northern part of the town, north of the Boyne and is therefore within the secondary retail core area. Expansion of town centre uses on the northern side of the town is less preferable. It does not adjoin the main existing town core and potentially presents access difficulties for larger format retail development. This site is small and has limited access. Site 5: Car Park Accessed from Emmet Street: This is a large central site which could possibly be the subject of redevelopment at some time in the future. However the site is currently in use as a public car park and therefore is not available for town centre development.

	Site 6: Large Greenfield Town Centre Expansion Area to south west of site: This site is currently removed from the existing town centre retail core area of Trim. Development of these lands for town centre uses would not currently form a natural linkage or extension for the town centre, and they would effectively be segregated. It is envisaged that these lands will be developed sequentially in time, once existing land banks closer to the town centre are developed. Having regard to the foregoing, development or redevelopment of possible sites closer to, and within the existing town centre would not accommodate modern large format retail and associated development which the town centre expansion seeks to provide for. The focal point of the existing town centre and the majority of its services and facilities are located on the southern side of the River Boyne and is focussed on Emmet Street, Market Street and to a lesser extent Castle Street. Growth of the primary core area is constrained by the river to the north, by the historic area of Trim Castle to the east and by an established built up area to the south. The only viable direction for growth of the town centre then is in a westwards direction towards the subject site. Sequentially, the subject site is the next available site to the west of the town centre which could accommodate the necessary growth requirements. If these sites were to remain undeveloped and the new town centre expansion were to jump to lands further west it would give rise to a severing effect whereby any such new development would not form a natural extension area for the town. Based on all of the foregoing then, it is concluded that zoning of the subject site for development is essential to accommodate expansion of the centre of Trim. This conclusion is based on the following findings:- An expansion or new development / redevelopment area is necessary to accommodate large format modern retail and associated development. This type of development cannot currently be accommodated on potential redevelopment or opportunity sites within or closer to the town centre. Growth of the town centre should logically take place on the southern side of the Boyne Growth is restricted to a western direction from the existing town centre Sequentially the subject site and Site No. 2 form the next available lands adjacent to the town centre. If these lands were to remain undeveloped and growth to move further westwards there would be a severing effect on the enlarged town centre with no linkage between the existing and the new. The site is located partly within Flood Zones A, B and C. The area of land located within Flood Zone C to the south of the site alone is not sufficient to cater for any significant town centre development. Furthermore should the southern section of Site 1, which is the only part of the site located outside of Flood Zones A and B, be the only developable part of the site, this would result in the loss of direct connectivity to the core retail area from this part of the site and would make this expansion area unfeasible. Development at this site will form a natural extension to the town centre westwards with direct linkages to the Watergate Street, Market Street and Emmet Street core retail area.
ii) Comprises significant previously developed and / or under utilised lands	Yes, this site comprises of a significant underutilised site which comprises of a temporary pay and display car park, an unused old swimming pool building and unused scrub land. This site forms part an overall development block comprising of the OPW Headquarters building to the south east of this site and is bounded to the west and north by the OPW access road which forms a natural boundary

	delineating the extent of development land within this town centre site. The subject site has no agricultural or particular amenity value at present and effectively comprises a residual or left over unused piece of land. It is however now readily accessible to the town centre via the OPW new link road and via Watergate Street to the east of the site.
(iii) Is within or adjoining the core of an established or designated urban settlement.	Yes this site adjoins the established town centre core as designated under the County Retail Strategy. As outlined above the new OPW access road has been developed along the eastern and northern boundary readily connecting the site in terms of pedestrian / cyclist /road connections to Watergate Street, Market Street and Emmet Street which form part of the town centre core area.
(iv) Will be essential in achieving compact and sustainable urban growth.	Yes, the site has been zoned as the town expansion area since 2002 and given readily available pedestrian / cyclist / vehicular connections to the existing town centre core area. As it stands Trim has a relatively compact town centre with the main shopping area concentrated around Market Street, Emmet Street and Castle Street. The growth of the town westwards is the only feasible direction for growth for the following reasons: Lands to the east of the town are of significant cultural heritage and landscape value given the location of Trim Castle and the Porchfields Conservation Area and therefore the town centre cannot extend in this direction; Town Centre lands to the north of the town are surrounded by the established built up area which largely comprises of residential uses. Lands to the north of the town are not easily accessible to the core retail area given the one-way system in place within this part of the town. Over time Haggard Street which is located within the northern extent of the town centre zoned area has developed as the secondary retail core which is not well connected to the main town core. Again lands to the south of the town are largely built up in nature and accommodate a number of community related uses including schools and churches. This area is also detached from the town centre to the north of the Boyne and is therefore not suitable for town centre expansion. The site adjoins and is directly accessible to the town centre core area; This site will be essential in achieving compact and sustainable urban growth as it forms a natural extension to the town core area and is located within the OPW access road. There is limited availability of large sites within the town centre that are not subject to a greater degree of flooding. If growth was to be accommodated in the town centre lands further to the west and the subject site left undeveloped, the expansion area would effectively be segregated from the existing town centre. This would be contrary to the objective to achieve a compact and sustainable town centre. The existing access road to the OPW forms a defined boundary for logical and defined expansion area of the town centre.
(v) 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.	As outlined in point 2 (i) and (iv) above 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. The subject site is the most appropriate site for town centre expansion over and above the sites reviewed in point 2 (i) above as these sites are either at a high risk of flooding also, are not sequentially preferable or are constrained in size, access or by designation.
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.	 The current level of information suggests that developing within Flood Zones A or B could have negative impacts on flood risk elsewhere, both through obstructing flow paths and reducing floodplain capacity. However, given that a significant percentage of the site is within Flood Zone C, it is anticipated that sustainable flood risk mitigation measures could be designed to allow development of the wider subject site. This must be undertaken through an appropriately detailed Flood Risk Assessment, which would form part of the planning application. The FRA should consider the Sequential Approach within the subject site and would typically involve allocating open space/car parking within Flood Zones A and some/all of Zone B. Whilst re-profiling of land within this area may be acceptable, land filling without provision of compensatory storage would not be permissible. Further details on compensatory storage are provided in Appendix B of the Planning System and Flood Risk Management. Buildings should be sited at an appropriate FFL, which should be above the 1 in 100 year flood level, with an allowance for freeboard and climate change. It is noted that splitting this site into smaller sub-plots and adopting a piecemeal approach to mitigation may preclude adequate risk management, and will not provide sufficient land within Flood Zone C to allow compensatory storage to be provided. The River Boyne floodplain is at risk from the impacts of climate change and any future FRA must include adequate consideration of these impacts, in line with OPW guidance. Consideration should also be given to emergency management and evacuation procedures.

Summary:

The subject site has been demonstrated to pass Parts 1, 2 and 3 of the Justification Test for Development Plans. The Test has been undertaken in an iterative process, and has involved consultation between Meath County Council, JBA Consulting and RPS as part of the Strategic Environmental Assessment of the Trim Development Plan 2014-2020.

The successful development of the subject site lands will depend on the satisfactory requirement of the measures highlighted below:

Development proposals for the subject site must consider the sequential approach and allocate water compatible development within Flood Zones A and some/all of Zone B where possible. Whilst re-profiling of land within this area may be acceptable, land filling without provision of compensatory storage would not be permissible.

Planning applications within this area must be accompanied by an appropriately detailed FRA, setting out the above approach that clearly assesses flood risks, mitigation measures and demonstrates compliance with the Planning Guidelines.

Recommendations from the Eastern CFRAM flood management plan will provide additional detail, and may include recommendations for flood management at the site. A more general emergency plan for periods of town centre flooding is recommended, potential for flood warning is significant.