STRATEGIC FLOOD RISK ASSESSMENT

UNDERTAKEN AS PART OF THE PREPARATION OF

DRAFT TUAM LOCAL AREA PLAN 2018-2024

for: **Galway County Council**

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Section 1 Introduction and Policy Background

1.1 Introduction and Terms of Reference

Galway County Council has prepared a Draft Local Area Plan 2018-2024 for Tuam. The Local Area Plan is a land use plan and overall strategy for the development of Tuam over the period 2018-2024. It includes various policies and objectives, including land use zoning objectives, that development must comply with.

The preparation of the Plan has undergone an appropriate level of Strategic Flood Risk Assessment (SFRA) and this document presents the findings of the SFRA. The SFRA is an assessment of flood risk and includes mapped boundaries for Indicative Flood Risk Zones, taking into account factors including site walkovers and flood risk indicators.

The SFRA has been undertaken and prepared in accordance with *The Planning System and Flood Risk Management - Guidelines for Planning Authorities* (Department of the Environment, Heritage and Local Government and Office of Public Works, 2009) and Department of the Environment, Community and Local Government Circular PL 2/2014. The SFRA is being placed on public display alongside the Draft Plan and will take account of any relevant information provided in submissions made on the Draft Plan and associated documents.

1.2 Summary of Conclusion and Recommendations

The purpose of this document is to detail the findings of the SFRA that has been undertaken alongside the preparation of the Draft Plan.

The SFRA has informed the Draft Plan and enabled compliance with the Flood Risk Management Guidelines. All SFRA recommendations – including those related to land use zoning and flood risk management provisions – have been integrated into the Draft Plan.

1.3 Flood Risk and its Relevance as an Issue to the Draft Plan

Flooding is an environmental phenomenon and can pose a risk to human health as well as causing economic and social effects. Some of the effects of flooding are identified on Table 1.

Certain lands within Tuam provided with land use zoning by the Draft Plan have the potential to be vulnerable to flooding, such as that arising from tidal, fluvial and pluvial flooding sources, and this vulnerability could be exacerbated by changes in both sea level rise and the severity and frequency of extreme weather events. Local conditions such as low-lying lands and slow surface water drainage can increase the risk of flooding.

Table 1 Potential effects that may occur as a result of flooding

Tangible Effects	**Intangible Human and Other Effects**
Damage to buildings (houses)	Loss of life
Damage to contents of buildings	Physical injury
Damage to new infrastructure e.g. roads	Increased stress
Loss of income	Physical and psychological trauma
Disruption of flow of employees to work causing knock on effects	Increase in flood related suicide
Enhanced rate of property deterioration and decay	Increase in ill health
Long term rot and damp	Homelessness
	Loss of uninsured possessions

1.4 Flood Risk Management Policy

1.4.1 EU Floods Directive

European Directive 2007/60/EC on the assessment and management of flood risk aims to reduce and manage the risks that floods pose to human health, the environment, cultural heritage and economic activity. The Directive applies to inland waters as well as all coastal waters across the whole territory of the EU. The Directive requires Member States to:

- Carry out a preliminary assessment by December 2011 in order to identify the river basins and associated coastal areas where potential significant flood risk exists.
- Prepare flood hazard and risk maps for the identified areas (these maps have been finalised for inclusion in Flood Risk Management Plans – see below).
- Prepare flood risk management plans focused on prevention, protection and preparedness. These plans are to include measures to reduce the probability of flooding and its potential consequences. Draft Plans have been prepared and subjected to public consultation.

Implementation of the EU Floods Directive is required to be coordinated with the requirements of the EU Water Framework Directive and the current River Basin Management Plans.

1.4.2 National Flood Policy

Historically, flood risk management focused on land drainage for the benefit of agricultural improvement. With increasing urbanisation, the Arterial Drainage Act, 1945, was amended in 1995 to permit the OPW to implement localised flood relief schemes to provide flood protection for cities, towns and villages.

In line with changing national and international paradigms on how to manage flood risk most effectively and efficiently, a review of national flood policy was undertaken in 2003-2004. The review was undertaken by an Inter-Departmental Review Group, led by the Minister of State at the Department of Finance with special responsibility for the OPW. The Review Group prepared a report that was put to Government, and subsequently approved and published in September 2004 (Report of the Flood Policy Review Group, OPW, 2004).

The scope of the review included a review of the roles and responsibilities of the different bodies with responsibilities for managing flood risk, and to set a new policy for flood risk management in Ireland into the future. The adopted policy was accompanied by many specific recommendations, including:

- Focus on managing flood risk, rather than relying only flood protection measures aimed at reducing flooding;
- Taking a catchment-based approach to assess and manage risks within the whole-catchment context; and
- Being proactive in assessing and managing flood risks, including the preparation of flood maps and flood risk management plans.

1.4.3 National CFRAM Programme

The national Catchment Flood Risk Assessment and Management (CFRAM) programme commenced in Ireland in 2011. The CFRAM Programme is intended to deliver on core components of the National Flood Policy, adopted in 2004, and on the requirements of the EU Floods Directive. The Programme is being implemented through CFRAM studies that are being undertaken for each of the river basin districts in Ireland. Tuam is located within the Western River Basin District.

The CFRAM Programme comprises three phases as follows:

- The Preliminary Flood Risk Assessment[1] (PFRA) mapping exercise in 2011;
- The CFRAM Studies and parallel activities, from 2011; and
- Implementation and Review (2017/2018 onwards).

The Programme provides for three main consultative stages as follows:

- PFRAs in 2011;
- Flood Hazard Mapping (these maps have been finalised for inclusion in Flood Risk Management Plans – see below); and
- Flood Risk Management Plans, drafts of which have been prepared and subjected to public consultation.

The OPW is the lead agency for flood risk management in Ireland. The coordination and implementation of Government policy on the management of flood risk in Ireland is part of its responsibility. The European Communities (Assessment and Management of Flood Risks) Regulations 2010 (S.I. No. 122) identifies the Commissioners of Public Works as the 'competent authority' with overall responsibility for implementation of the Floods Directive 2007/60/EC. The Office of Public Works is the principal agency involved in the preparation of Flood Risk Assessment and Management studies (FRAMs).

1.4.4 Flood Risk Management Guidelines

1.4.4.1 Introduction

In 2009, the OPW and the then Department of the Environment and Local Government (DEHLG) published Guidelines on flood risk management for planning authorities entitled *The Planning System and Flood Risk Management - Guidelines for Planning Authorities*. The Guidelines introduce mechanisms for the incorporation of flood risk identification, assessment and management into the planning process. Implementation of the Guidelines is intended to be achieved through actions at the national, regional, local authority and site-specific levels. Planning authorities and An Bord Pleanála are required to have regard to the Guidelines in carrying out their functions under the Planning Acts.

The core objectives of the Guidelines 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 water 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.

1.4.4.2 Principles of Flood Risk Management

The key principles of flood risk management set out in the Flood Guidelines are to:

- Avoid development that will be at risk of flooding or that will increase the flooding risk elsewhere, where possible;
- Substitute less vulnerable uses, where avoidance is not possible; and
- Mitigate and manage the risk, where avoidance and substitution are not possible.

[1] The PFRAs identified areas at risk of significant flooding and includes maps showing areas deemed to be at risk. The areas deemed to be at significant risk, where the flood risk that is of particular concern nationally, are identified as Areas for Further Assessment (AFAs) and more detailed assessment on the extent and degree of flood risk is currently being undertaken in these areas with the objective of producing Flood Hazard Mapping. Tuam is not identified as an AFA.

The Guidelines follow the principle that development should not be permitted in flood risk areas, particularly floodplains, except where there are no alternative and appropriate sites available in lower risk areas that are consistent with the objectives of proper planning and sustainable development.

Development in areas that have the highest flood risk should be avoided and/or only considered in exceptional circumstances (through a prescribed *Justification Test*) if adequate land or sites are not available in areas that have lower flood risk. Most types of development would be considered inappropriate in areas that have the highest flood risk. Only water-compatible development such as docks and marinas, dockside activities that require a waterside location, amenity open space, outdoor sports and recreation and essential transport infrastructure that cannot be located elsewhere would be considered appropriate in these areas.

1.4.4.3 Stages of SFRA

The Flood Risk Management Guidelines recommend a staged approach to flood risk assessment that covers both the likelihood of flooding and the potential consequences. The stages of appraisal and assessment are:

Stage 1 Flood risk identification – to identify whether there may be any flooding or surface water management issues related to either the area of regional planning guidelines, development plans and Local area Plans or a proposed development site that may warrant further investigation at the appropriate lower level plan or planning application levels;

Stage 2 Initial flood risk assessment – to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps. Where hydraulic models exist the potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures can be assessed. In addition, the requirements of the detailed assessment should be scoped; and

Stage 3 Detailed flood risk assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

1.4.4.4 Flood Zones

Flood risk is an expression of the combination of the flood probability or likelihood and the magnitude of the potential consequences of the flood event. It is normally expressed in terms of the following relationship:

Flood risk = Likelihood of flooding x Consequences of flooding

Likelihood of flooding is normally defined as the percentage probability of a flood of a given magnitude or severity occurring or being exceeded in any given year. For example, a 1% Annual Exceedance Probability (AEP) indicates the severity of a flood that is expected to be exceeded on average once in 100 years, i.e. it has a 1 in 100 (1%) chance of occurring in any one year.

Consequences of flooding depend on the hazards associated with the flooding (e.g. depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality), and the vulnerability of people, property and the environment potentially affected by a flood (e.g. the age profile of the population, the type of development, presence and reliability of mitigation measures etc.).

Flood zones are geographical areas within which the likelihood of flooding is in a particular range and they are a key tool in flood risk management within the planning process as well as in flood warning and emergency planning.

There are three types or levels of flood zones defined for the purposes of the Flood Guidelines:

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);
- **Flood Zone B** – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and
- **Flood Zone C** – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all other areas that are not in zones A or B.

1.5 Emerging Information and Disclaimer

It is important to note that compliance with the requirements of the Flood Risk Management Guidelines is currently based on emerging and incomplete data as well as estimates of the locations and likelihood of flooding.

Accordingly, all information in relation to flood risk may be altered in light of future data and analysis, or future flood events. As a result, all landowners and developers are advised that Galway County Council and their 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 and buildings (including basements) in which they have an interest prior to making planning or development decisions.

The SFRA is being placed on public display alongside the Proposed Variation and will take account of any relevant information provided in submissions made on the Proposed Variation and associated documents.

Any future SFRAs for the area will integrate other new and emerging data.

1.6 Context for this SFRA: SFRA for the Galway County Development Plan 2015-2021

SFRA has already been undertaken on the Galway County Development Plan 2015-2021. That SFRA facilitated the integration of various provisions into the County Development Plan that provide for flood risk management within County Galway, including Tuam. New developments within Tuam will be required to comply with the flood risk management provisions from the County Plan, in addition to the provisions from the Tuam Plan.

1.7 Content of the Draft Plan

The Draft Plan consists of a written statement and accompanying maps. The most relevant parts of the Draft Plan for this SFRA relate to the land use zoning map for Tuam (see Figure 1) and provisions relating to flood risk management (see Section 4).

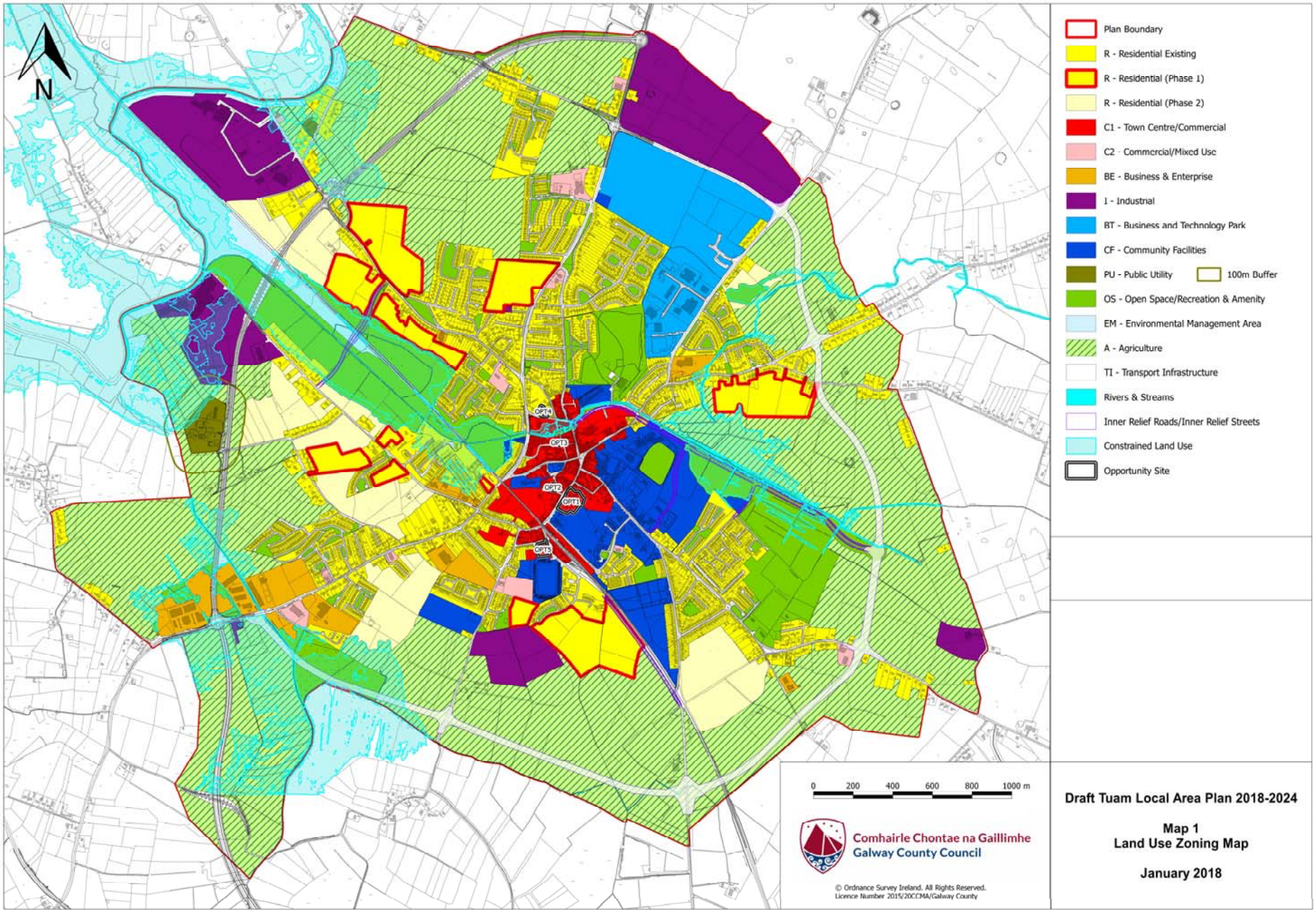

Figure 1 Land Use Zoning Map for Tuam

Section 2 Stage 1 SFRA - Flood Risk Identification

2.1 Introduction

Stage 1 SFRA (flood risk identification) was undertaken in order to identify whether there may be any flooding or surface water management issues within or adjacent to the lands in Tuam zoned by the Plan and consequently whether Stage 2 SFRA (initial flood risk assessment) should be proceeded to.

The Stage 1 SFRA was based on existing information on flood risk indicators based on historical evidence and computational models.

Tuam is located within the catchment of the Corrib. The river Nanny and a tributary of the Nanny flow from the east, through the town and towards Weir Bridge, where it confluences with the River Clare. The River Clare flows to the west of the town in a meandering north to south direction and eventually flows into Lough Corrib, over 30km downstream, to the southwest of Tuam. Another tributary of the River Clare, the Killeelaun (Suileen), drains part of the town's southern environs. These watercourses have significant floodplains associated with them and most development within the town has avoided these areas to date.

2.2 Flood Risk Indicators

The Stage 1 SFRA was a desk-based exercise based on existing information on flood risk indicators and involved consulting with a range of sources as detailed on Table 2 below. A number of these sources are mapped on Figure 2 (Flood Risk Indicators).

Table 2 Information Sources Consulted with for the Identification of Flood Risk

Information Source	Description	Indicator within or adjacent to Tuam?
Predictive, Modelled Flood Risk Indicators		
Previous Strategic Flood Risk Assessments	Strategic Flood Risk Assessments required for land use plans, based on best available information.	Yes, previous SFRA for the Galway County Development Plan (Galway County Council, 2013)
The OPW Preliminary Flood Risk Assessment (PFRA) Fluvial, Coastal, Groundwater and Pluvial flood maps	The Draft OPW Preliminary Flood Risk Assessment (PFRA) mapping dataset has been arrived at by: • Reviewing records of floods that have happened in the past; • Undertaking analysis to determine which areas might flood in the future, and what the impacts might be; and • Extensive consultation with each local authorities and other Government departments and agencies. This assessment has considered all types of flooding, including that which can occur from rivers, the sea and estuaries, heavy rain, groundwater, the failure of infrastructure, and so on. It has also considered the impacts flooding can have on people, property, businesses, the environment and cultural assets. The PFRA is only a preliminary assessment, based on available or readily derivable information. Analysis has been undertaken to identify areas prone to flooding, and the risks associated with such flooding, but this analysis is purely indicative and undertaken for the purpose of completing the draft PFRA. The mapping has been developed using simple and cost-effective methods and is based on broad-scale simple analysis and may not be accurate for a specific location/use. There are instances where lands are transected by the PFRA Fluvial mapping boundary and the boundary does not reflect local topographical and flood path conditions on the ground. This is due to the strategic nature of development of the PFRA Fluvial mapping and the inaccuracies contained within it. The prime source will ultimately be the flood zone maps produced by the OPW, but where these have not been prepared or are not on watercourses that will be covered by a CFRAM study then the planning body or developer will need to refer to alternative sources of information. For pluvial flooding, the process for developing the pluvial flood extent maps (Flood Risk Assessment and Management Programme: National Pluvial Screening Project for Ireland – Rep EX6335/2.0, HR Wallingford, November 2010) was based on 'dropping' various depths and intensities of rainfall over a range of durations, and modelling how that rainfall would flow over the land and, in particular, pond in low-lying areas. The rainfall events (depth, duration and intensity) were derived from the rainfall analysis undertaken by Met Éireann on behalf of the OPW for the Flood Studies Update research programme. The amount of rainfall that was absorbed by the ground or, in urban areas, drained by the urban storm-water drainage system, and hence deducted from the water that would flow overland and pond, was estimated. It must be noted however that process assumed a constant capacity of urban storm-water drainage systems and generally did not taken into account local drainage structures such as culverts through embankments or other local drainage that would not be resolved in the model used for the mapping at a national scale. In addition to the above limitations, there are further intrinsic uncertainties associated with pluvial	Yes fluvial and pluvial risk areas present throughout Plan area with groundwater risk areas identified to the north of the Plan area (see Figure 2).

Information Source	Description	Indicator within or adjacent to Tuam?
	flooding and it can be influenced by, for example, blocked drains. Taking this into account, it was recommended the Council deal with pluvial risk through written Plan provision(s). Further information on the purpose, development and limitations of the OPW PFRA Maps are available in the available report (see www.cfram.ie)	
Western CFRAM Flood Risk Review	The Western CFRAM Flood Risk Review (JBA for OPW, May 2011) was undertaken to help validate the findings of the PFRA, informing decisions on which sites were taken forward as Areas for Further Assessment for a more detailed assessment within the CFRAM Programme.	Yes. Information from the Flood Risk Review identifies areas at elevated levels of flood risk within and surrounding the town.
Western CFRAM Flood Hazard and Risk Maps	Flood Hazard and Risk Maps were finalised for Areas for Further Assessment (AFAs) in 2017. These maps have informed Draft Flood Risk Management Plans that have been subject to public consultation and are in the process of being finalised.	Yes. Tuam is an AFA and Flood Hazard and Risk Maps have been finalised (CFRAM Flood Risk Extents are shown on Figure 3).
Historical Flood Risk Indicators		
Alluvium Soils	Mineral alluvial soil mapping is An Teagasc dataset indicative of recurrent or significant fluvial flooding at some point in the past. This dataset does not provide full coverage and is found to provide a reasonable indicator of high-medium probability fluvial flood hazard. Drainage may have changed significantly since the laying down of these soils.	Yes – areas of alluvial soil identified along the flood plain of the Clare River in the north west the town (see Figure 4).
Data from OPW: Benefitting lands	Benefitting lands mapping is a dataset identifying land that might benefit from the implementation of Arterial (Major) Drainage Schemes (under the Arterial Drainage Act 1945) and indicating areas of land estimated or reported to be subject to flooding or poor drainage. This source identifies large broad areas – providing a low resolution for flood risk management.	Yes. Benefitting lands identified along watercourses throughout the town (see Figure 4).
Data from OPW: Recorded Flood Events or Extents	A flood event is the occurrence of recorded flooding at a given location on a given date. The Flood event is derived from different types of information (reports, photographs etc.). A flood extent is an inundated area as recorded at a certain moment in time. A number of recurring flood extents, where a flood event has occurred in one location more than once, are identified within or adjacent to the Plan area.	Yes at a number of locations (see Figure 4).
Areas liable to flooding taken from the Ordnance Survey of Ireland's Historical Mapping	The Ordnance Survey of Ireland's Historical Mapping (of 1842 and c. 1900) identifies areas that are liable to flooding. This data has been digitised and is available for use in SFRAs.	Yes, along the River Nanny and River Clare (see Figure 5).

2.3 Conclusion of Stage 1 SFRA

The information provided in this section identifies that there is potentially elevated levels of fluvial flood risk arising within Tuam therefore Stage 2 SFRA must be undertaken.

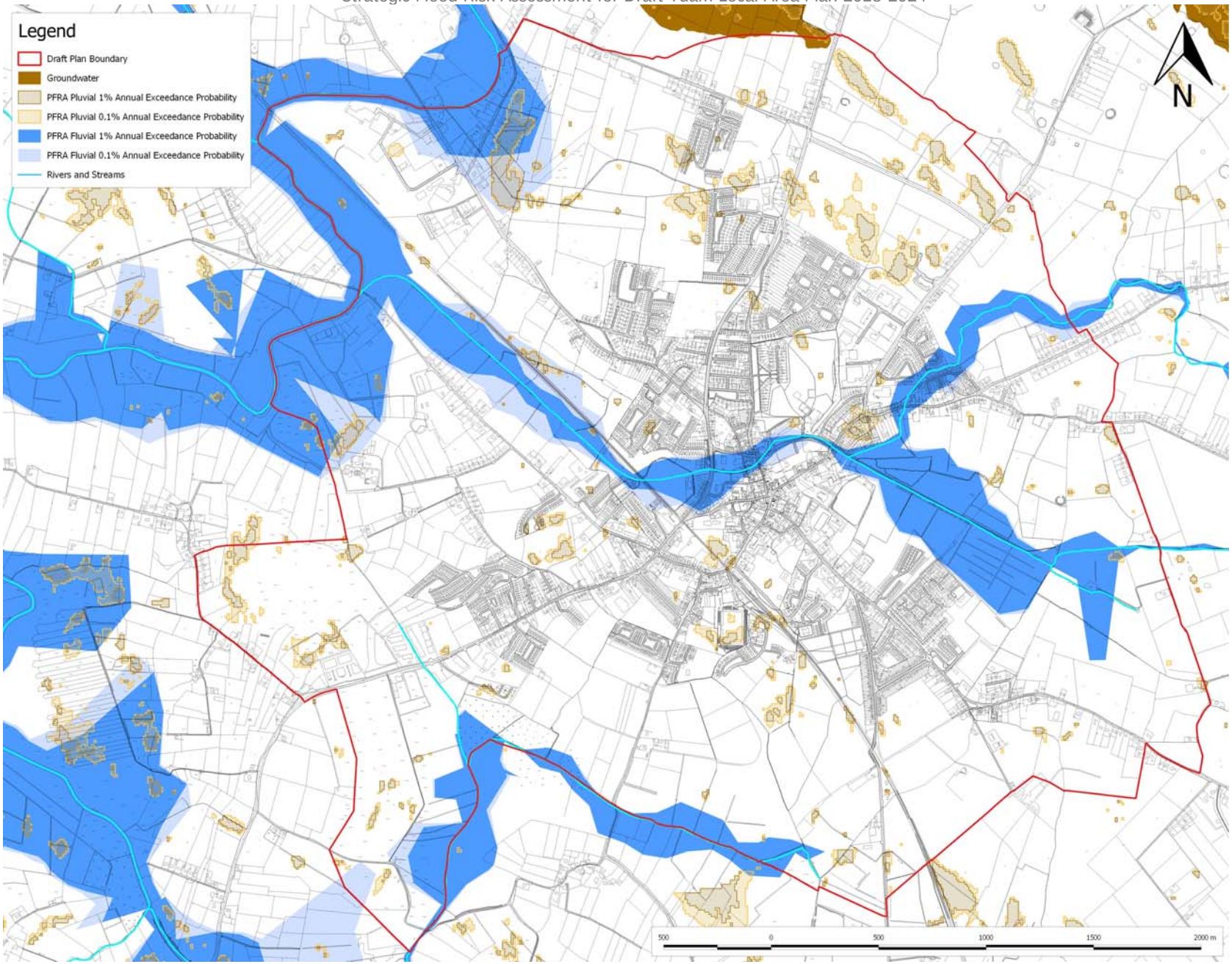

Figure 2 Preliminary Flood Risk Assessment Mapping

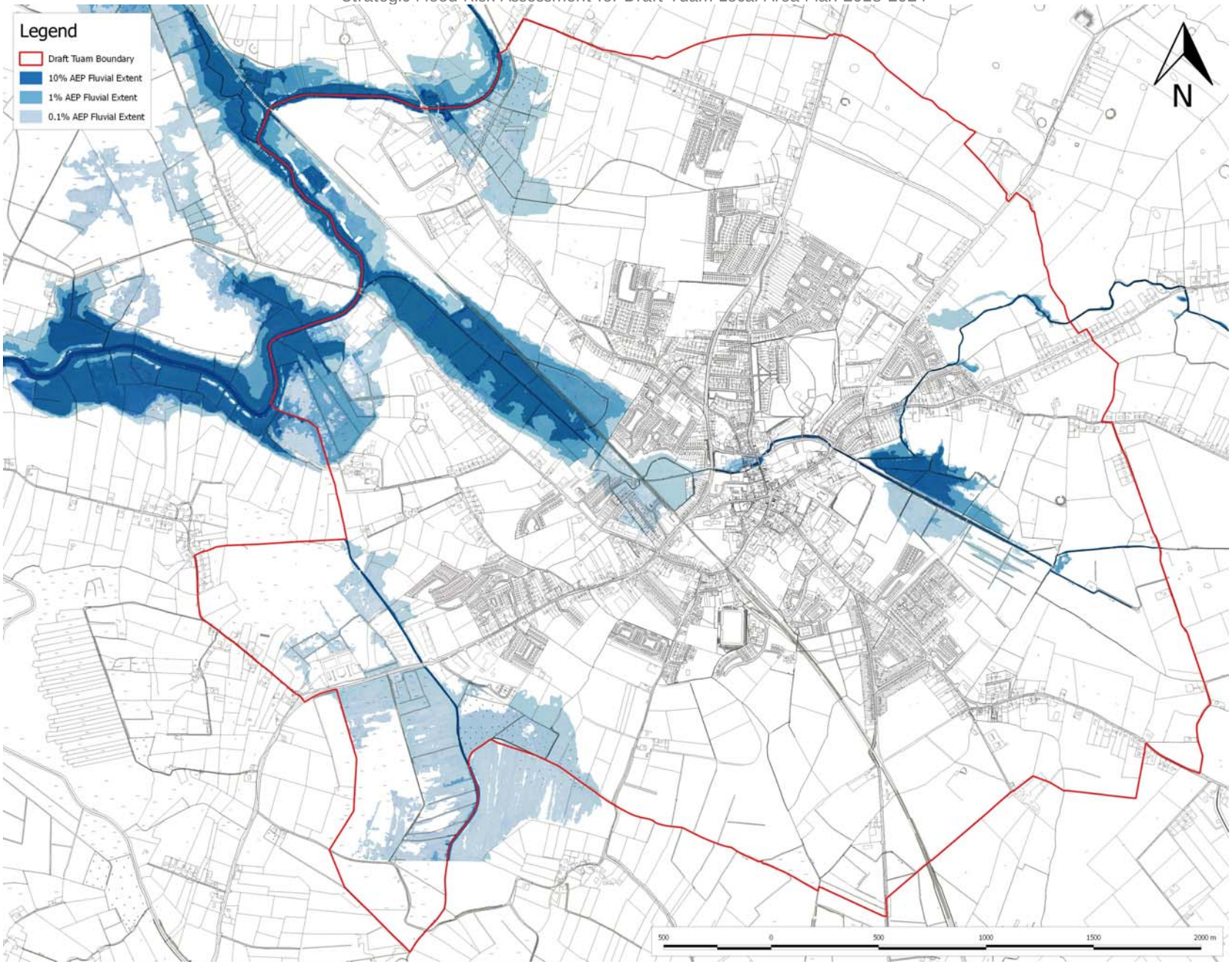

Figure 3 CFRAMS Flood Risk Extent Mapping

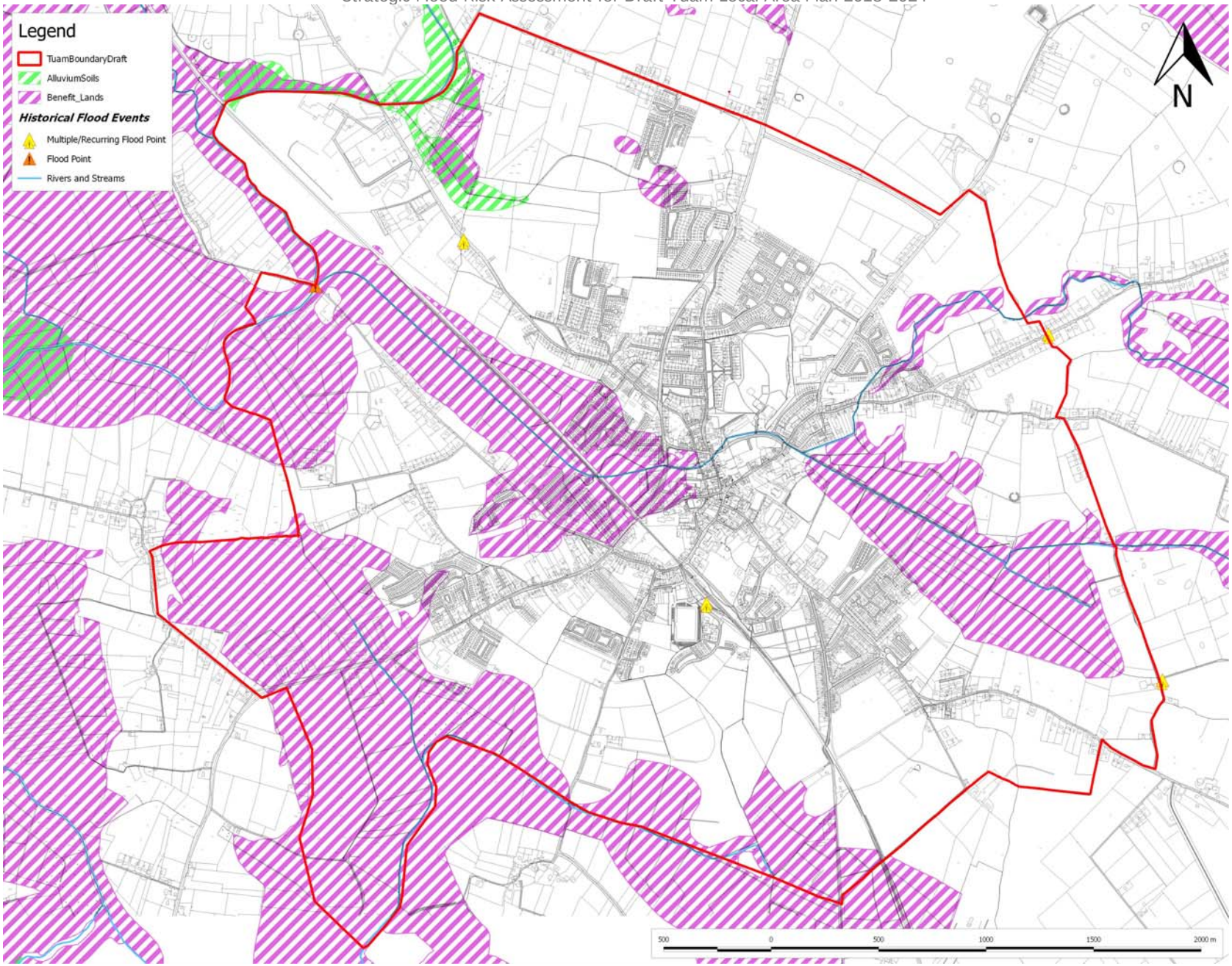

Figure 4 Historical Flood Risk Indicators – Alluvium Soils, Benefitting Lands and Recurring Flood Events

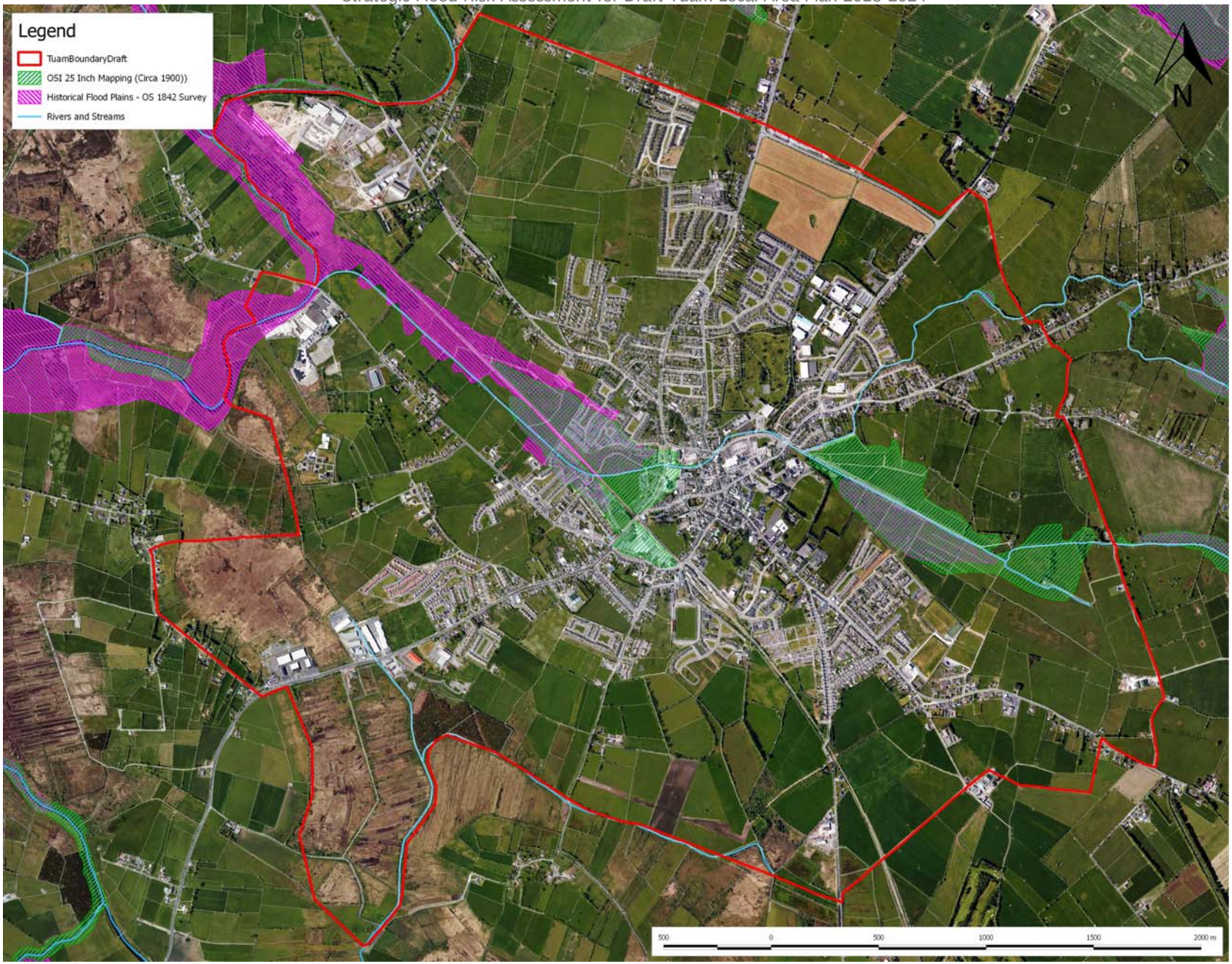

Figure 5 Historical Flood Risk Indicators – Ordnance Survey of Ireland Historical Mapping of Areas Liable to Flooding

Section 3 Stage 2 SFRA - Initial Flood Risk Assessment

3.1 Introduction

A Stage 2 SFRA (initial flood risk assessment) was undertaken at Tuam in order to:

- Confirm the sources of flooding that may affect zoned and adjacent areas;
- Appraise the adequacy of existing information as identified by the Stage 1 SFRA; and
- Scope the extent of the risk of flooding through the preparation of flood zone maps.

3.2 Site Walkovers and Groundtruthing

In order to inform the Stage 2 assessment, the town was inspected on foot by experienced professionals (lands were visited on 6th December 2017) to examine, inter alia, the potential source and direction of flood paths from fluvial sources, locations of topographic and built features that coincide with the flood indicator related boundaries and to identify vegetation associated with a high frequency of inundation.

Flood risk indicator information that was considered during the Stage 2 SFRA is detailed under Section 2. Further field examination may be undertaken on foot of any submissions received or Material Alterations proposed later in the Local Area Plan preparation process.

3.3 Findings and Delineation of Flood Zones

Table 3 summarises the findings of groundtruthing undertaken. Indicative Flood Risk Zone maps were produced taking into account the findings of the Stage 1 and Stage 2 SFRA as detailed in Section 2 and
Table 3.

Figure 6 identifies Flood Zone A (darker blue) and Flood Zone B (lighter blue). All other areas fall within Flood Zone C. As per the Guidelines, the flood zones comprise fluvial risk areas as follows (there is no coastal risk at Tuam):

- Flood Zone A – where the probability of flooding from rivers is highest (greater than 1% or 1 in 100 for river flooding);
- Flood Zone B – where the probability of flooding from rivers is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding); and
- Flood Zone C – where the probability of flooding from rivers is low (less than 0.1% or 1 in 1000 for river flooding).

As identified by the Guidelines, in rivers with a well-defined floodplain the limits of Zones A and B will virtually coincide. Zone B will only be significantly different in spatial extent from Zone A where there is extensive land with a gentle gradient away from the river.

Pluvial flood risk is identified in a number of areas within and surrounding Tuam. Groundwater risk areas are identified to the north of the Plan area. Neither pluvial nor groundwater flood risk is taken into account in the delineation of flood zones, however; it has informed the development of flood risk management provisions detailed in Section 4.

Table 3 Summary of Groundtruthing Findings in Tuam

Selected Location	Description	Findings	Conclusion on delineation of Indicative Flood Risk Zone
Overall Findings The PFRA Fluvial and the CFRAMS Flood Hazard and Risk maps were found to reflect what was observed to be the main areas of elevated flood risk on the ground during groundtruthing. There is a significant risk from fluvial flooding adjacent to the River Nanny to the east of the town in the townlands of Curraghcreen and Parkmore and to the west of the town in the townlands of Townpark, Killaoonty and Halfstraddle. There is significant risk from fluvial flooding upstream and downstream of the confluence of the River Nanny with the Clare River at Weir Bridge to the west of the town. There is significant risk from fluvial flooding in the south west of the town's environs from another tributary of the River Clare, the Killeelaun (Suileen), especially in the townlands of Killeelaun and Cloontooa. Groundtruthing and the delineation of flood zones was informed by, inter alia, flood risk indicator mapping, local topography and structures, flow path and direction and other flood risk indicator maps.			
Location 1 Figure 6	Millstream Park and Carrigweir	The southwestern parts of these sites, closer to Weir Road have been constructed on higher ground. Lands closer to the River Nanny to the northeast are at lower heights above the river and are at elevated levels of flood risk from the river.	The CFRAMS flood risk extent and PFRA fluvial mapping are consistent with these findings. Parts of the lands are identified by historical Ordnance Survey of Ireland mapping as being liable to flooding as well as being identified by the OPW as benefitting lands with regard to arterial drainage. Lands at risk in this area form part of Flood Zone B.
Location 2 Figure 6	Individual residential developments along the eastern side of Weir Road	Individual properties have been built on lands that are higher than areas adjacent to the river. These properties have avoided areas that are at the highest levels of risk of flooding by the River Nanny.	The CFRAMS flood risk extent and PFRA fluvial mapping are consistent with these findings. Parts of the lands are identified by historical Ordnance Survey of Ireland mapping as being liable to flooding as well as being identified by the OPW as benefitting lands with regard to arterial drainage. Lands closer to the river form part of Flood Zones A and B.
Location 3 Figure 6	Industrial area at intersection of weir road and River Clare	The River Nanny confluences with the River Clare to the north east of this site at Weir Bridge. Most of this area is at risk of flooding from the River Clare. Any development or storage of chemicals within or adjacent to this area should be subject to a detailed flood risk assessment. Micro-topography at this area, including spoil from arterial drainage along stretches of the banks of the River Clare, would influence predicted flow paths and direction at the site-specific level.	The CFRAMS flood risk extent and PFRA fluvial mapping are consistent with these findings. Parts of the lands are identified by historical Ordnance Survey of Ireland mapping as being liable to flooding as well as being identified by the OPW as benefitting lands with regard to arterial drainage. Lands at risk in this area form part of Flood Zones A and B.
Location 4 Figure 6	Cois na h-Abhainn	There is an abrupt change in flood risk indicators at this location. The housing estate - Cois na h-Abhainn – has been constructed on made ground that is higher than other areas adjacent to the River Nanny. Consequently, the estate is not within areas that are at the highest levels of risk.	The CFRAMS flood risk extent and PFRA fluvial mapping are generally consistent with these findings. Lands to the immediate west of Cois na h-Abhainn form part of Flood Zones A and B.
Location 5 Figure 6	Lands to the north of Parkmore and River Crest	Parkmore and River Crest housing estates have avoided areas that are at the highest levels of risk of flooding from the River Nanny. There is a wide area of lands that are at elevated levels of flood risk to the north of these estates.	The CFRAMS flood risk extent and PFRA fluvial mapping are consistent with these findings. Parts of the lands are identified by the OPW as benefitting lands with regard to arterial drainage. Lands at risk in this area form part of Flood Zones A and B.
Location 6 Figure 6	Lands along the N83 Galway Road to the west of Lidl	The Killeelaun (Suileen) stream drains the lands at this location to the south of the Galway Road. There is a planning history associated with these and adjacent lands. Although not the focus for this study, documents submitted to the Council identify that parts of the general area are at high risk of flooding from the stream and that there is local knowledge of a past flood event in the area. It appears as if some of the lands at this location have been filled.	The CFRAMS flood risk extent mapping is consistent with these findings. Parts of the lands are identified by historical Ordnance Survey of Ireland mapping as being liable to flooding as well as being identified by the OPW as benefitting lands with regard to arterial drainage. Lands at risk in this area form part of Flood zone B.
Location 7 Figure 6	Lands in the north of Farrannamartin along the N83 Galway Road	Peaty, wet soils were observed in this location and identified by An Teagasc subsoils.	The CFRAMS flood risk extent mapping is consistent with these findings. Areas of PFRA pluvial are identified at these lands also. Parts of the lands are identified by the OPW as benefitting lands with regard to arterial drainage. Lands at risk in this area form part of Flood zone B.

3.4 Sensitivity to Climate Change

Certain lands within Tuam have the potential to be vulnerable to flooding, such as that arising from fluvial and pluvial flooding sources, and this vulnerability could be exacerbated by changes in the severity and frequency of extreme weather events.

'The Planning System and Flood Risk Management Guidelines for Planning Authorities and Technical Appendices, 2009' recommends that a precautionary approach to climate change is adopted due to the level of uncertainty involved in the potential effects. In this regard, the Guidelines recommends:

- Recognising that significant changes in the flood extent may result from an increase in rainfall or tide events and accordingly adopting a cautious approach to zoning land in these potential transitional areas;
- Ensuring that the levels of structures designed to protect against flooding such as flood defences, land raising or raised floor levels are sufficient to cope with the effects of climate change over the lifetime of the development they are designed to protect (normally 85-100 years); and
- Ensuring that structures to protect against flooding and the development protected are capable of adaptation to the effects of climate change when there is more certainty about the effects and still time for such adaptation to be effective.

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 in relation to river flows and sea levels - these are given in Table 4 overleaf. 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. Climate change allowances have been integrated into the recommendations provided at Section 4 of this report.

At this, the development planning stage, a detailed knowledge of the impact of climate change on flood levels is not required to inform the strategic allocation of land. Instead, and in the absence of detailed projections of climate change impacts, flood extents can be assessed by using the extent of the Flood Zone B outline to indicate where climate change may result in greater extents in the future.

Table 4 Allowances for Future Scenarios (100-Year Time Horizon)

Criteria	MRFS – to be considered for most development scenarios	HEFS – to be considered in relation to high value, high vulnerability development which cannot be relocated
Extreme Rainfall Depths	+20%	+30%
Flood Flows	+20%	+30%
Mean Sea Level Rise	+500mm	+1000mm

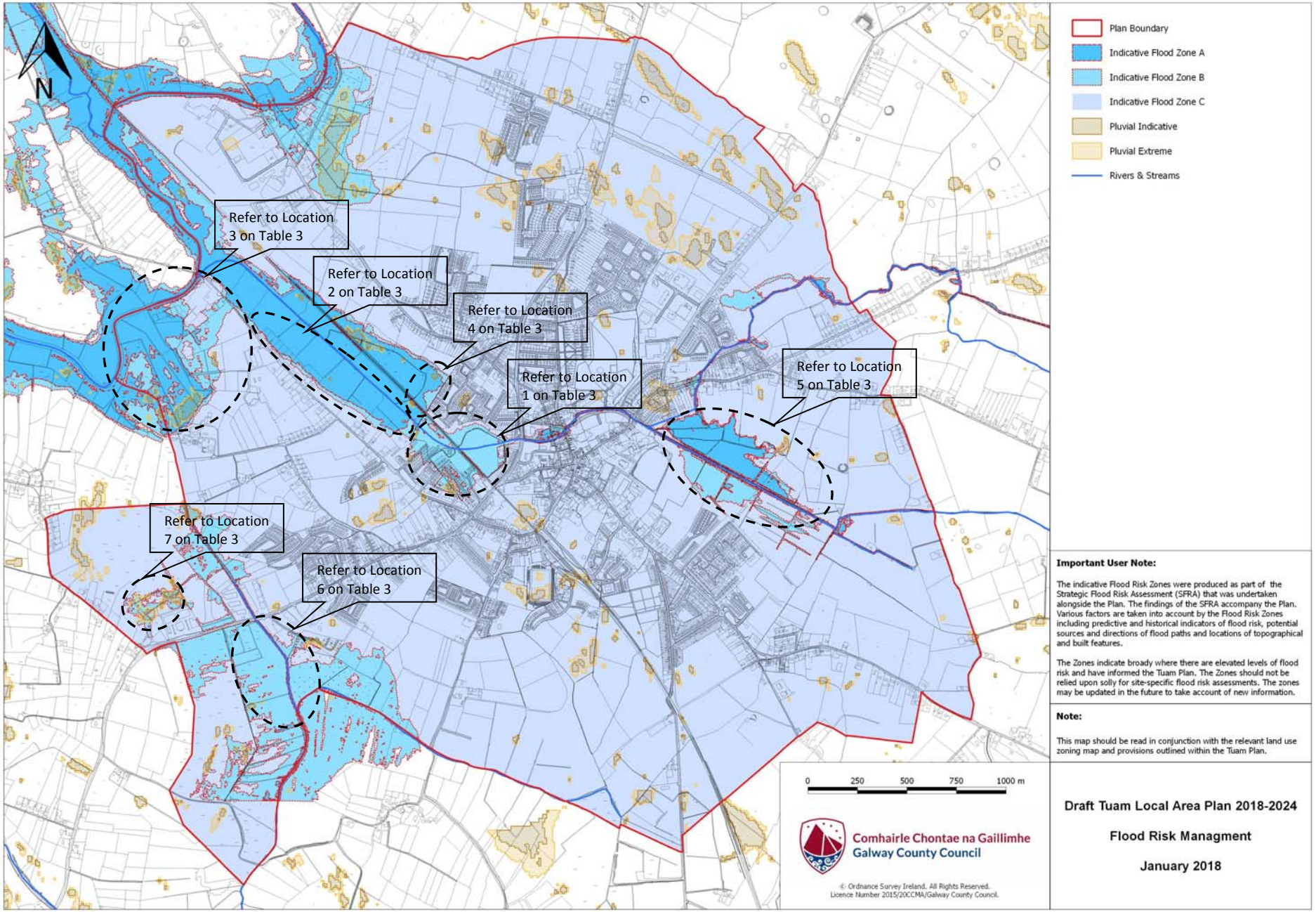

Figure 6 Indicative Flood Risk Zones and Groundtruthing Locations

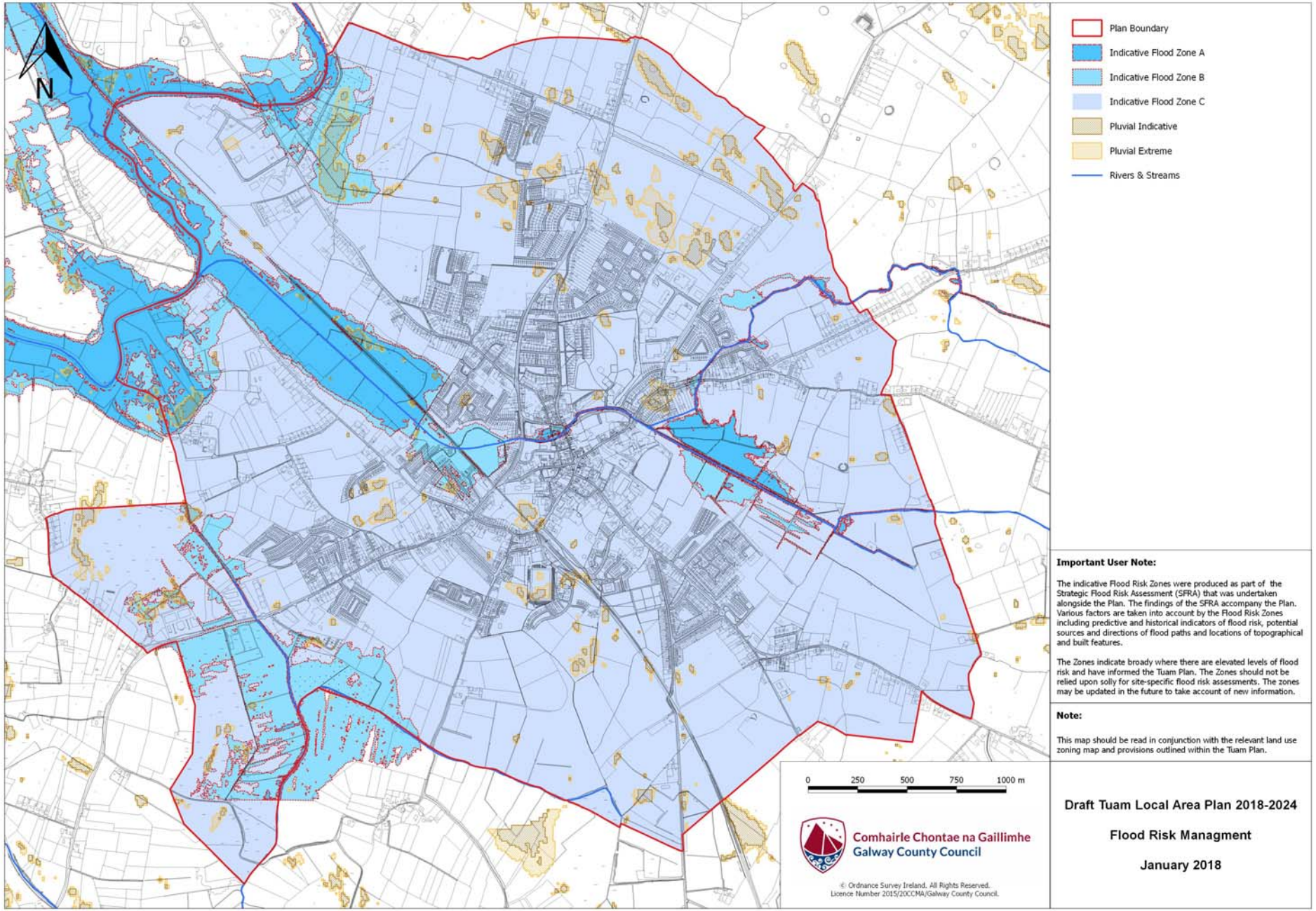

Figure 7 Indicative Flood Risk Zones

Section 4 Measures for Flood Risk Management

The measures detailed on Table 5 will contribute towards flood risk management and compliance with *The Planning System and Flood Risk Management - Guidelines for Planning Authorities* (Department of the Environment, Heritage and Local Government and Office of Public Works, 2009).

Table 5 Measures for Flood Risk Management

From County Development Plan or Draft Plan?	Measure
Development Strategy Objectives from the Draft Local Area Plan	**Objective DS 7 – Flood Risk Management and Assessment** Ensure that proposals for new developments located within identified or potential flood risk areas, or which may exacerbate the risk of flooding elsewhere, are assessed in accordance with the provisions of The Planning System and Flood Risk Management Guidelines for Planning Authorities (2009) (or as updated) & Departmental Circular PL2/2014 and the relevant policies and objectives of this plan. (Refer to Map 8 – Flood Risk Management) **Objective DS 8 – Climate Change & Adaptation** Galway County Council shall support the National Climate Change Strategy and follow on document National Climate Change Adaptation Framework Building Resilience to Climate Change 2012 (or any updated/superseding document) including the transition to a low carbon future, taking account of flood risk, soil erosion, the promotion of sustainable transport, improved air quality, the importance of green infrastructure, the use of renewable resources and the reuse of existing resources.
Land Use Management Objectives from the Draft Local Area Plan	**Objective LU 8 – Constrained Land Use Zone (CL)** To facilitate the appropriate management and sustainable use of flood risk areas. This zoning limits new development, while recognising that existing development uses within these zones may require small scale development, as outlined below, over the life of the Local Area Plan, which would contribute towards the compact and sustainable urban development of the town. The underlying zoning or the existing permitted uses are deemed to be acceptable in principle for minor developments to existing buildings (such as small extensions to houses, most changes of use of existing buildings), which are unlikely to raise significant flooding issues, provided they do not obstruct important flow paths, introduce a significant additional number of people into flood risk areas or entail the storage of hazardous substances. Development proposals within this zone shall be accompanied by a detailed Flood Risk Assessment, carried out in accordance with The Planning System and Flood Risk Assessment Guidelines & Circular PL 2/2014 (or as updated), which shall assess the risks of flooding associated with the proposed development. Proposals shall only be considered where it is demonstrated to the satisfaction of the Planning Authority that they would not have adverse impacts or impede access to a watercourse, floodplain or flood protection and management facilities, or increase the risk of flooding to other locations. The nature and design of structural and non-structural flood risk management measures required for development in such areas will also be required to be demonstrated, so as to ensure that flood hazard and risk will not be increased. Measures proposed shall follow best practice in the management of health and safety for users and residents of the development. Specifications for developments in flood vulnerable areas set out in this plan shall be complied with as appropriate. (Please also refer to Objective FL3 & DM Guideline FL 2) **Objective LU 9 – Flood Risk Areas and Land Use Zones (Refer to Map 1, 2 and Map 8)** Ensure that any proposed development that may be compatible with the land use zoning objectives/matrix but which includes a use that is not appropriate to the Flood Zone (as indicated on Map 8 – Flood Risk Management) and/or that may be vulnerable to flooding is subject to flood risk assessment, in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities 2009 and the Departmental Circular Pl 2/2014 (or as updated within the lifetime of this plan) and the policies and objectives of this plan.
Flood Policy from the Draft Local Area Plan	**Policy FL 1 – Flood Risk Management** It is the policy of Galway County Council to support, in co-operation with the OPW, the implementation of the EU Flood Risk Directive (2007/60/EC), the Flood Risk Regulations (SI No. 122 of 2010) and the DoEHLG/OPW publication The Planning System and Flood Risk Management Guidelines for Planning Authorities (2009) and Departmental Circular PL2/2014 (or any updated/superseding legislation or policy guidance). Galway County Council will also take account of the OPW Catchment Flood Risk Management Plans (CFRAMs) as appropriate, the Preliminary Flood Risk Assessment (PFRA), the Strategic Flood Risk Assessment for County Galway 2012 and the Strategic Flood Risk Assessment carried out for Tuam and any recommendations and outputs arising that relate to or impact on the plan area.

From County Development Plan or Draft Plan?	Measure
Flood & Flood Related Objectives from the Draft Local Area Plan	**Objective FL 1 – Flood Risk Management and Assessment** Ensure the implementation of the DoEHLG/OPW publication The Planning System and Flood Risk Management Guidelines for Planning Authorities 2009, including the Department of the Environment, Heritage & Local Government's Circular PL 2/2014 (or any updated/superseding document) in relation to flood risk management within the Plan Area. This will include the following: • Avoid, reduce and/or mitigate, as appropriate in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities 2009 (and as updated), the risk of flooding within the flood risk areas indicated on Map 8 – Flood Risk Management, including fluvial, pluvial and groundwater flooding, and any other flood risk areas that may be identified during the period of the plan or in relation to a planning application. • Development proposals in areas where there is an identified or potential risk of flooding or that could give rise to a risk of flooding elsewhere may be required to carry out a Site-Specific Flood Risk Assessment, and justification test where appropriate, in accordance with the provisions of The Planning System and Flood Risk Management Guidelines for Planning Authorities 2009, (or any superseding document). Any flood risk assessment should include an assessment of the potential impacts of climate change, such as an increase in the extent or probability of flooding, and any associated measures necessary to address these impacts. • Development that would be subject to an inappropriate risk of flooding or that would cause or exacerbate such a risk at other locations shall not normally be permitted. • Where certain measures proposed to mitigate or manage the risk of flooding associated with new developments are likely to result in significant effects to the environment or Natura 2000 sites, such measures will undergo environmental assessment and Habitats Directive Assessment, as appropriate. **Objective FL 2 – Flood Zones and Appropriate Land Uses** Protect Flood Zone A and Flood Zone B from inappropriate development and direct developments/land uses into the appropriate Flood Zone in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities 2009 (or any superseding document) and the guidance contained in DM Guidance FL 1- Flood Zones and Appropriate Land Uses. Where a development/land use is proposed that is inappropriate within the Flood Zone, then the development proposal will need to be accompanied by a Development Management Justification Test and Site-Specific Flood Risk Assessment in accordance with the criteria set out under with The Planning System and Flood Risk Management Guidelines for Planning Authorities 2009 & Circular PL2/2014 (as updated/superseded). In Flood Zone C, (Please also refer to DM Guidelines FL1) where the probability of flooding is low (less than 0.1%, Flood Zone C), the developer should satisfy him or herself that the probability of flooding is appropriate to the development being proposed. (& Refer to Map 3 - Flood Risk Management) **Objective FL 3 – Structural and Non-Structural Risk Management Measures in Flood Vulnerable Zones** Ensure that applications to existing developments in flood vulnerable zones shall provide details of structural and non-structural risk management measures to include, but not be limited to specifications of the following - floor levels, internal layout, flood resilient construction, flood resistant construction, emergency response planning, access and egress during flood events. (Please Refer to Objective LU 8 & DM Guideline FL 2) **Objective FL 4 – Flood Risk Assessment for Planning Applications and CFRAMS** Ensure that site specific Flood Risk Assessments (FRA) accompany all planning applications in and adjacent to Flood Zones A and B, even for developments appropriate to the particular Flood Zone. The detail of the site specific FRAs will depend on the level of risk and scale of development. A detailed site specific FRA should quantify the risks and effects of selected mitigation and the management of residual risks. Potential interactions in the event of a flood between the existing or proposed storage of hazardous substances within or adjacent to the lands relating to the planning application shall also be considered. Galway County Council shall have regard to the results of the CFRAMS in the assessment of planning applications. **Objective FL 5 – Strategic Flood Risk Assessment and Flood Risk Assessments** Ensure that Strategic Flood Risk Assessments and site specific Flood Risk Assessments consider and provide information on the implications of climate change with regard to flood risk in relevant locations. The 2009 OPW Draft Guidance on Assessment of Potential Future Scenarios for Flood Risk Management (or any superseding document) shall be consulted with to this effect. **Objective FL 6 – Environmental Impact Assessment/Statement (EIA/EIS) & Flood Risk Assessment** Flood risk may constitute a significant environmental effect of a development proposal that in certain circumstances may trigger a sub-threshold EIS, therefore Galway County Council shall ensure that Flood Risk Assessment would form an integral part of any EIA undertaken for projects within the town. **Objective FL 7 – Pluvial and Groundwater Flood Risk** Planning applications on lands identified within pluvial and/or groundwater flood risk shall be accompanied by a Site Specific Flood Risk Assessment that corresponds with that outlined under Chapter 5 'Flooding and Development Management' of The Planning System and the Flood Risk Management Guidelines for Planning Authorities (2009) (or any updates to same). Such assessments shall be prepared by suitably qualified experts with hydrological experience and shall quantify the risks and the effects of any necessary mitigation, together with the measures needed or proposed to manage residual risks.

<table>
<tr><th>From County Development Plan or Draft Plan?</th><th>Measure</th></tr>
<tr><td></td><td>

Objective FL 8 – New and Emerging Data
Future amendments to the plan shall consider, as appropriate any new and/or emerging data, including, when available, any relevant information contained in the Flood Risk Management Plans.

Objective FL 9 – Water Bodies and Watercourses
Protect water bodies and watercourses within the plan area from inappropriate development, including rivers, streams, associated undeveloped riparian strips, wetlands and natural floodplains. This will include a general 10 metre protection buffer from rivers within the plan area, as measured from the near river bank (this distance may be increased and decreased on a site by site basis, as appropriate). In addition, promote the sustainable management and uses of water bodies and avoid culverting or realignment of these features.

Objective FL 10 – Arterial Drainage Scheme
Facilitate access to the channels that the Office of Public Works maintain and ensure that, in general no development takes place within 10 metres of these maintenance channels. (This distance may be increased and decreased on a site by site basis, as appropriate). The OPW shall be consulted with regard to any proposed development in or adjacent to these watercourses.

Objective FL 11 – Improvement &/Or Restoration of Natural Flood Risk Management Functions
Where resources are available and subject to compliance with the Habitats and Birds Directives, Galway County Council will contribute towards the improvement and/or restoration of the natural flood risk management functions of flood plains.
</td></tr>
<tr><td>Development Management Guidelines from the Draft Local Area Plan</td><td>

DM Guideline FL 1 – Flood Zones and Appropriate Land Uses
The table below indicates the types of land uses that are appropriate in each of the Flood Zones identified within the plan area, in accordance with The Planning System and Flood Risk Management Guidelines 2009 (and as updated). Where developments/land uses are proposed that are considered inappropriate to the Flood Zone, then a Development Management Justification Test and Site-Specific Flood Risk Assessment will be required in accordance with The Planning System and Flood Risk Management Guidelines 2009 (and as updated).

Land Uses	Flood Zone A	Flood Zone B	Flood Zone C
HVD – Highly Vulnerable Development	Inappropriate (if proposed then Justification Test & detailed FRA required)	Inappropriate (if proposed then Justification Test & detailed FRA required)	Appropriate (screen for flood risk)
LVD – Less Vulnerable Development	Inappropriate (if proposed then Justification Test & detailed FRA required)	Inappropriate due to climate change (if proposed then Justification Test & detailed FRA required)	Appropriate (screen for flood risk)
WCD – Water-Compatible Development	Appropriate (detailed FRA may be required)	Appropriate (detailed FRA may be required)	Appropriate (screen for flood risk)

Notes (refer to Flood Risk Management Guidelines 2009 for additional detail):
HVD – Houses, schools, hospitals, residential institutions, emergency services, essential infrastructure, etc.
LVD – Economic uses (retail, leisure, warehousing, commercial, industrial, non-residential institutions, etc.), land and buildings used for agriculture or forestry, local transport infrastructure, etc.

WCD – Docks, marinas, wharves, water-based recreation and tourism (excluding sleeping accommodation), amenity open space, sports and recreation, flood control infrastructure, etc.

Please refer to separate supporting document 'Stage 2 Strategic Flood Risk Assessment for the Tuam Local Area Plan 2018-2024'

DM Guideline FL 2 – Structural and Non-Structural Risk Management Measures in Flood Vulnerable Zones

Applications for development in flood vulnerable zones shall provide details of structural and non-structural risk management measures to include, but not be limited to specifications of the following:

Floor Levels
In areas of limited flood depth, the specification of the threshold and floor levels of new structures shall be raised above expected flood levels to reduce the risk of flood losses to a building, by raising floor heights within the building structure using a suspended floor arrangement or raised internal concrete platforms.

When designing an extension or modification to an existing building, an appropriate flood risk reduction measure shall be specified to ensure the threshold levels into the building are above the design flood level. However, care must also be taken to ensure access for all is provided in compliance with Part M of the Building Regulations.

Where threshold levels cannot be raised to the street for streetscape, conservation or other reasons, the design shall specify a mixing of uses vertically in buildings - with less vulnerable uses located at ground floor level, along with other measures for dealing with residual flood risk.
</td></tr>
</table>

From County Development Plan or Draft Plan?	Measure
	Internal Layout Internal layout of internal space shall be designed and specified to reduce the impact of flooding [for example, living accommodation, essential services, storage space for provisions and equipment shall be designed to be located above the predicted flood level]. In addition, designs and specifications shall ensure that, wherever reasonably practicable, the siting of living accommodation (particularly sleeping areas) shall be above flood level. With the exception of single storey extensions to existing properties, new single storey accommodation shall not be deemed appropriate where predicted flood levels are above design floor levels. In all cases, specifications for safe access, refuge and evacuation shall be incorporated into the design of the development. Flood-Resistant Construction Developments in flood vulnerable zones shall specify the use of flood-resistant construction aimed at preventing water from entering buildings - to mitigate the damage floodwater caused to buildings. Developments shall specify the use of flood resistant construction prepared using specialist technical input to the design and specification of the external building envelope – with measures to resist hydrostatic pressure (commonly referred to as "tanking") specified for the outside of the building fabric. The design of the flood resistant construction shall specify the need to protect the main entry points for floodwater into buildings - including doors and windows (including gaps in sealant around frames), vents, air-bricks and gaps around conduits or pipes passing through external building fabric. The design of the flood resistant construction shall also specify the need to protect against flood water entry through sanitary appliances as a result of backflow through the drainage system. Flood-Resilient Construction Developments in flood vulnerable zones that are at risk of occasional inundation shall incorporate design and specification for flood resilient construction which accepts that floodwater will enter buildings and provides for this in the design and specification of internal building services and finishes. These measures limit damage caused by floodwater and allow relatively quick recovery. This can be achieved by specifying wall and floor materials such as ceramic tiling that can be cleaned and dried relatively easily, provided that the substrate materials (e.g. blockwork) are also resilient. Electrics, appliances and kitchen fittings shall also be specified to be raised above floor level, and one-way valves shall be incorporated into drainage pipes. Emergency Response Planning In addition to considering physical design issues for developments in flood vulnerable zones, the developer shall specify that the planning of new development also takes account of the need for effective emergency response planning for flood events in areas of new development. Applications for developments in flood vulnerable zones shall provide details that the following measures will be put in place and maintained: Provision of flood warnings, evacuation plans and ensuring public awareness of flood risks to people where they live and work; Coordination of responses and discussion with relevant emergency services i.e. Local Authorities, Fire & Rescue, Civil Defence and An Garda Siochána through the SFRA; and Awareness of risks and evacuation procedures and the need for family flood plans. Access and Egress During Flood Events Applications for developments in flood vulnerable zones shall include details of arrangements for access and egress during flood events. Such details shall specify that: • flood escape routes have been kept to publicly accessible land. • such routes will have signage and other flood awareness measures in place, to inform local communities what to do in case of flooding. • this information will be provided in a welcome pack to new occupants.
Development Strategy Objectives from the existing County Development Plan	**Objective DS 7 - Flood Risk Management and Assessment** Ensure that proposals for developments located within identified or potential flood risk areas, or which may exacerbate the risk of flooding elsewhere, are assessed in accordance with the provisions of the Flood Risk Management Guidelines 2009 (or any updated/superseding document) the relevant policies, objectives and guidelines within this plan and shall also take account of the National CFRAM Programme Flood Hazard Mapping and Flood Risk Management Plans when they become available. **Objective DS 8 – Climate Change** Galway County Council shall support the National Climate Change Strategy and follow on document National Climate Change Adaptation Framework Building Resilience to Climate Change 2012, on a ongoing basis through implementation of supporting objectives in this plan, particularly those supporting the use of alternative and renewable energy sources, sustainable transport, air quality, biodiversity, green infrastructure, coastal zone management, flooding and soil erosion.

From County Development Plan or Draft Plan?	Measure
	Objective DS 9 – Projects/Associated Improvement Works/Infrastructure and Appropriate Assessment Ensure that proposed projects and any associated improvement works or associated infrastructure relating to renewable energy projects; water supply and abstraction; wastewater and discharges; flood alleviation and prevention; roads, power lines and telecommunications; and amenity and recreation provision are subject to Appropriate Assessment where relevant.
Wastewater Policies and Objectives from the existing County Development Plan	**Objective WW 7 – Surface Water Drainage & Sustainable Drainage Systems (SuDS)** Maintain and enhance, as appropriate, existing surface water drainage systems in the County, ensure that new developments are adequately serviced with surface water drainage infrastructure and promote the use of Sustainable Drainage Systems in all new developments.
Flood Risk Management Policies and Objectives from the existing County Development Plan	**Policy FL 1 - Flood Risk Management Guidelines** It is the policy of Galway County Council to support, in co-operation with the OPW, the implementation of the EU Flood Risk Directive (2007/60/EC), the Flood Risk Regulations (SI No. 122 of 2010) and the DEHLG/OPW publication *The Planning System and Flood Risk Management Guidelines (2009)* (and any updated/superseding legislation or policy guidance). Galway County Council will also take account of the Shannon International and Western Catchment Flood Risk Assessment and Management Studies. **Policy FL 2 – Catchment Planning** The Council will actively work with the CFRAM Programme and catchment based Flood Planning Groups, especially in the east of the County where catchments go beyond the Council's administrative boundary, in the development and implementation of catchment-based strategies for the management of flood risk - including those relating to storage and conveyance. **Policy FL 3 – Improvement and/or Restoration of Natural Flood Risk Management Functions** Where resources are available and subject to compliance with the Habitats and Birds Directives, the Council will contribute towards the improvement and/or restoration of the natural flood risk management functions of flood plains. **Policy FL 4 – Principles of the Flood Risk Management Guidelines** The Council shall implement the key principles of flood risk management set out in the Flood Risk Management Guidelines as follow: 1) Avoid development that will be at risk of flooding or that will increase the flooding risk elsewhere, where possible; 2) Substitute less vulnerable uses, where avoidance is not possible; and 3) Mitigate and manage the risk, where avoidance and substitution are not possible. Development should only be permitted in areas at risk of flooding when there are no alternative, reasonable sites available in areas at lower risk that also meet the objectives of proper planning and sustainable development. Development in areas which have the highest flood risk should be avoided and/or only considered in exceptional circumstances (through a prescribed Justification Test) if adequate land or sites are not available in areas which have lower flood risk. **Policy FL 5 – SFRA of Lower Tier Plans** Lower tier plans shall undertake SFRA (Strategic Flood Risk Assessment) in compliance with the Flood Risk Management Guidelines and in consultation with the OPW. **Flood Risk Management Objectives** **Objective FL 1 - Flood Risk Management and Assessment** Comply with the requirements of the DoEHLG/OPW The Planning System and Flood Risk Management-Guidelines for Planning Authorities and its accompanying Technical Appendices document 2009 (including any updated/superseding documents). This will include the following: a) Avoid, reduce and/or mitigate, as appropriate in accordance with the Guidelines; b) Development proposals in areas where there is an identified or potential risk of flooding or that could give rise to a risk of flooding elsewhere will be required to carry out a Site-Specific Flood Risk Assessment, and justification test where appropriate, in accordance with the provisions of The Planning System and Flood Risk Management Guidelines 2009 (or any superseding document). c) Development that would be subject to an inappropriate risk of flooding or that would cause or exacerbate such a risk at other locations shall not normally be permitted; d) Galway County Council shall work with other bodies and organisations, as appropriate, to help protect critical infrastructure, including water and wastewater, within the County, from risk of flooding. **Objective FL 2 – Surface Water Drainage and Sustainable Drainage Systems (SuDs)** Maintain and enhance, as appropriate, the existing surface water drainage system in the County. Ensure that new developments are adequately serviced with surface water drainage infrastructure and promote the use of Sustainable Drainage Systems in all new developments. Surface water runoff from development sites will be limited to pre-development levels and planning applications for new developments will be required to provide details of surface water drainage and Sustainable Drainage Systems proposals. **Objective FL 3 - Protection of Waterbodies and Watercourses** Protect waterbodies and watercourses within the County from inappropriate development, including rivers, streams, associated undeveloped riparian strips, wetlands and natural floodplains. This will include

From County Development Plan or Draft Plan?	Measure
	protection buffers in riverine, wetland and coastal areas as appropriate. **Objective FL 4 – Flood Risk Assessment for Planning Applications & CFRAMS** Site-specific Flood Risk Assessment (FRA) is required for all planning applications in areas at risk of flooding, even for developments appropriate to the particular Flood Zone. The detail of these site-specific FRAs will depend on the level of risk and scale of development. A detailed site-specific FRA should quantify the risks, the effects of selected mitigation and the management of any residual risks. The Council shall have regard to the results of any CFRAM Studies in the assessment of planning applications. **Objective FL 5 – SFRA/FRA & Climate Change** SFRAs and site-specific FRAs shall provide information on the implications of climate change with regard to flood risk in relevant locations. The 2009 OPW Draft Guidance on 'Assessment of Potential Future Scenarios for Flood Risk Management' (or any superseding document) shall be consulted with to this effect. **Objective FL 6 – FRA & Environmental Impact Assessment (EIA)** Flood risk may constitute a significant environmental effect of a development proposal that in certain circumstances may trigger a sub-threshold EIS. FRA should therefore be an integral part of any EIA undertaken for projects within the County.
Natural Heritage and Biodiversity Policies from the existing County Development Plan	**Objective NHB 14 – Protection of Riparian Zones** Protect the riparian zones of watercourse systems throughout the county, recognising the benefits they provide in relation to flood risk management and their protection of the ecological integrity of watercourse systems and ensure they are considered in the land use zoning in Local Area Plans.
Development Management Standards from the existing County Development Plan	**DM Standard 27: Surface Water Drainage & Flooding** Developments will be subject to the following requirements with regard to surface water drainage and flood prevention and management: **a) Surface Water Drainage** Drainage from paved surfaces may, after suitable treatment, be discharged to available watercourses or to adequate soakage areas on site. In any event, surface water shall not be permitted to flow on to the public road from any proposed development. Accesses and road frontage should be designed in such a manner as to deal with surface water and ensure that it does not impact on the public road. For rural houses, existing roadside drainage shall be maintained by the incorporation of a suitably sized drainage pipe. Each application shall be accompanied by design calculations or appropriate evidence to support the size of the pipe selected. **b) Surface Water Run-Off** Land uses shall not give rise to increases in the run-off characteristics above those that currently exist. **c) Sustainable Drainage Systems** The use of Sustainable Drainage Systems (SuDs) shall be encouraged in new developments to minimise the risk of flooding and contamination and to protect environmental and water resources. The Council will seek to ensure applicants incorporate sustainable drainage systems for significant developments in both urban and rural areas and will encourage them for other developments. SuDS is an approach that seeks to manage the water as close as possible to its origin by various engineering solutions that replicate natural drainage processes, before it enters the watercourse. The incorporation of SuDS techniques allows surface water to be either infiltrated or conveyed more slowly to water courses using porous surface treatments, ponds, swales, filter drains or other installations. SuDS should be designed to be cost-effective and require minimum maintenance. **d) Flooding** Development should not itself be subject to an inappropriate amount of flooding or exacerbate the risk of flooding at other locations. Development must so far as is reasonably practicable incorporate the maximum provision to reduce the rate and quantity of run-off. In particular, where appropriate: • 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 run-off from the development, should be provided. **e) Flood Risk Assessment** Where flood risk may be an issue for any proposed development, a flood risk assessment should be carried out that is appropriate to the scale and nature of the development and the risks arising. This shall be undertaken in accordance with the DoEHLG Flood Risk Assessment Guidelines 2009 (or any superseding document). Applicants are requested to refer to the OPW National Flood Hazard Mapping Website, to the County Stage 1 Strategic Flood Risk Assessment undertaken for the County Development Plan and Stage 2 Strategic Flood Risk Assessments undertaken for recently adopted and/or amended Local Area Plans where appropriate prior to submitting proposals for development. **f) Floodplains** Appropriately designed development that is not sensitive to the effects of flooding may be permissible in floodplains, provided it does not reduce the floodplain area or otherwise restrict flow across floodplains. Examples of such development might include park areas, sports pitches, certain types of industry warehousing, etc. designed to be flood resistant and/or sensitive. Such developments should only be permitted provided it incorporates adequate measures to cope with the over-existent flood risk, for example,

From County Development Plan or Draft Plan?	Measure
	adequate drainage systems, safety measures, emergency response facilities and/or warning and response systems, and where it is considered that flooding would not result in significant hardship/ financial loss or cost. **g) Watercourses** For developments adjacent to all watercourses of a significant conveyance capacity or where it is necessary to maintain the ecological or environmental quality of the watercourse, any structures (including hard landscaping) must be set back from the edge of the watercourse to allow access for channel clearing/ maintenance/vegetation. A minimum setback of 5-10m is required either side depending on the width of the watercourse. Development consisting of the construction of embankments, wide bridge piers or similar structures will not normally be permitted in or across floodplains or river channels, as these structures restrict/obstruct flow and increase the risk of flooding to property and land upstream. It is considered necessary in exceptional cases to permit such structures, however they should be designed to minimise and/or compensate for any potential negative effects. **h) Flood Design Standards** All new development must be designed and constructed to meet the following minimum flood design standards: • For urban/built up areas or where developments (existing, proposed or anticipated) are involved – the 100 year flood; • For rural areas or where further developments (existing, proposed or anticipated) are not involved – the 25 year flood; • Along the coast and estuaries – the 200 year tide level; • Where streams, open drains or other watercourses are being culverted - the minimum permissible culvert diameter is 900mm (access should be provided for maintenance as appropriate).

Section 5 Conclusion

A Stage 2 Strategic Flood Risk Assessment (SFRA) has been undertaken to inform the preparation of the Draft Plan. The requirement for SFRA is provided under *The Planning System and Flood Risk Management - Guidelines for Planning Authorities* (Department of the Environment, Heritage and Local Government and Office of Public Works, 2009).

The SFRA has mapped boundaries for Flood Risk Zones, taking into account factors including: the potential source and direction of flood paths from rivers and streams; and locations of topographic/built features that coincide with the flood indicator related boundaries.

The Plan does not conflict with the provisions of the Flood Risk Management Guidelines or associated Circular PL 2/2014 (or as updated).

Various measures have been integrated into the Plan (see Table 5) that will contribute towards flood risk management and compliance with the Guidelines.

Appendix I: Summary of Related Provisions contained in the DEHLG Flood Guidelines for Land Uses in Flood Zones A and B

The provisions set out in the DEHLG's 2009 Flood Guidelines (including at Chapter 3 Principles and Key Mechanisms and Chapter 5 Flooding and Development Management) and Departmental Circular PL2/2014 and should be adhered to.

- The Sequential Approach, including the Justification test -

The key principles of the Guidelines' risk-based sequential approach (see Figure 8) are:

- Avoid development in areas at risk of flooding. If this is not possible, consider substituting a land use that is less vulnerable to flooding. Only when both avoidance and substitution cannot take place should consideration be given to mitigation and management of risks.

- Inappropriate types of development that would create unacceptable risks from flooding should not be planned for or permitted.

- Exceptions to the restriction of development due to potential flood risks are provided for through the use of a Justification Test, where the planning need and the sustainable management of flood risk to an acceptable level must be demonstrated.

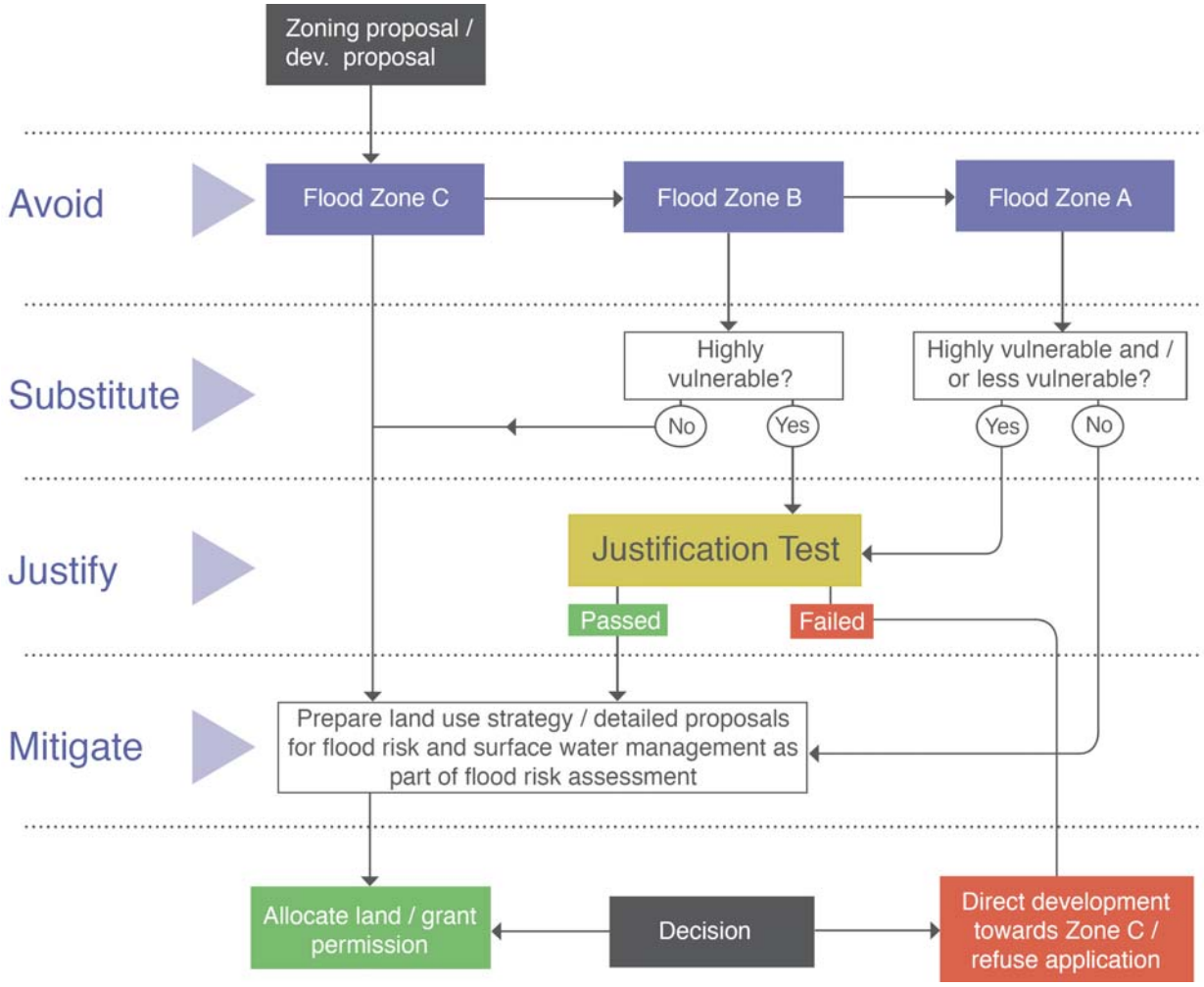

Figure 8 Sequential Approach Process[2]

In summary, the **planning implications** for each of the flood zones are:

Zone A - High probability of flooding. Most types of development would be considered inappropriate in this zone. Development in this zone should be avoided and/or only considered in exceptional circumstances, such as in city and town centres, or in the case of essential infrastructure that cannot be located elsewhere, and where the Justification Test has been applied. Only water-compatible development, such as docks and marinas, dockside activities that require a waterside location, amenity open space, outdoor sports and recreation, would be considered appropriate in this zone.

Zone B - Moderate probability of flooding. Highly vulnerable development, such as hospitals, residential care homes, Garda, fire and ambulance stations, dwelling houses and primary strategic transport and utilities infrastructure, would generally be considered inappropriate in this zone, unless the requirements of the Justification Test can be met. Less vulnerable development, such as retail, commercial and industrial uses, sites used for short-let for caravans and camping and secondary strategic transport and utilities infrastructure, and water-compatible development might be considered appropriate in this zone. In general however, less vulnerable development should only be considered in this zone if adequate lands or sites are not available in Zone C and subject to a flood risk assessment to the appropriate level of detail to demonstrate that flood risk to and from the development can or will adequately be managed.

Zone C - Low probability of flooding. Development in this zone is appropriate from a flood risk perspective (subject to assessment of flood hazard from sources other than rivers and the coast) but

[2] Flood Zone C covers all areas outside of Zones A and B

would need to meet the normal range of other proper planning and sustainable development considerations.

Table 6 overleaf classifies the vulnerability of different types of development while Table 7 identifies the appropriateness of development belonging to each vulnerability class within each of the flood zones as well as identifying what instances in which the Justification Test should be undertaken. Inappropriate development that does not meet the criteria of the Justification Test should not be considered at the plan-making stage or approved within the development management process.

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	

Table 6 Classification of vulnerability of different types of development

	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

Table 7 Vulnerability Classes and Flood Zones

The **Justification Test** which is referred to as part of the Sequential Approach is an assessment of whether a development proposal within an area at risk of flooding meets specific criteria for proper planning and sustainable development and demonstrates that it will not be subject to unacceptable risk nor increase flood risk elsewhere. The Justification Test should be applied only where development is within flood risk areas that would be defined as inappropriate under the screening test of the sequential risk based approach outlined above. This Justification Test is shown below.

Where, as part of the preparation and adoption or variation and amendment of a development/local area plan[1], 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, 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 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 settlement[2];

(ii) Comprises significant previously developed and/or under-utilised lands;

(iii) Is within or adjoining the core[3] of an established or designated urban settlement;

(iv) Will be essential in achieving compact and sustainable urban growth; and

(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[4].

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.

Figure 9 Justification Test [3]

[3] Footnotes: [1] Including Strategic Development Zones and Section 25 Schemes in the area of the Dublin Docklands Development Authority [2]In the case of Gateway planning authorities, where a number of strategic growth centres have been identified within the overall area of the authority, the Justification Test may be applied for vulnerable development within each centre. [3] See definition of the core of an urban settlement in Glossary of Terms. [4] This criterion may be set aside where section 4.27b applies.