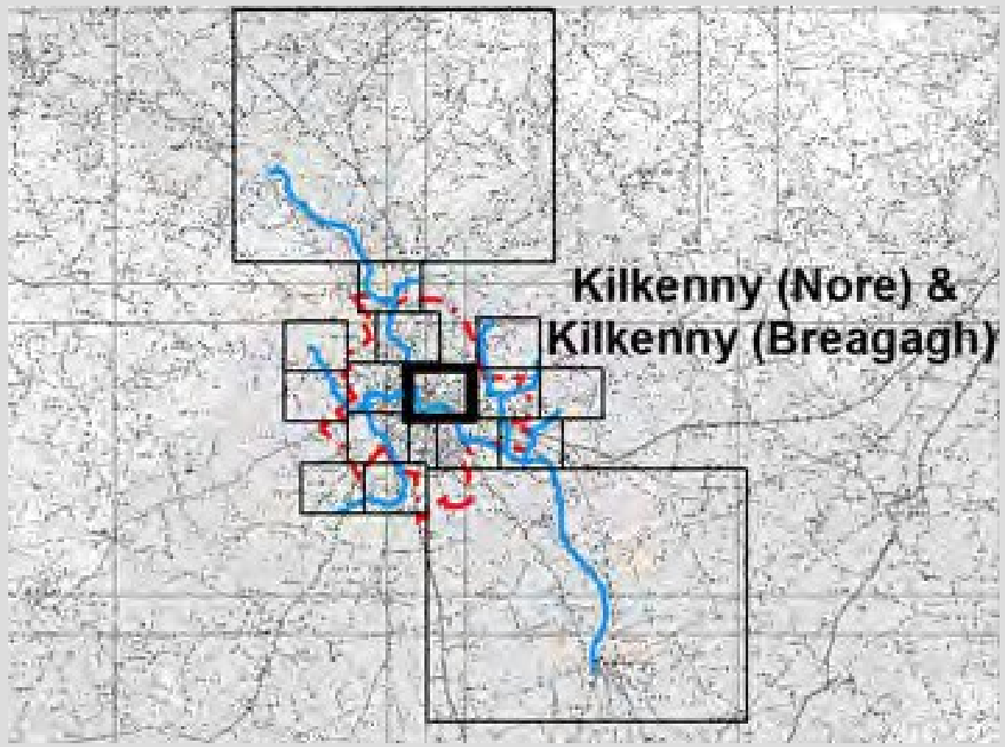


D

Appendix D

Flood Risk Assessment

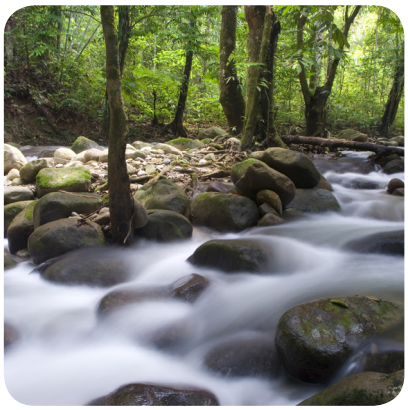
Abbey Creative Quarter, Kilkenny

Flood Risk Assessment

IBE1023 / October 2015







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Abbey Creative Quarter, Kilkenny

Flood Risk Assessment

Document Control Sheet

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APPENDICES

1 INTRODUCTION

RPS were commissioned by Kilkenny County Council to carry out a Flood Risk Assessment in relation to a non-statutory Masterplan prepared by Kilkenny County Council for the proposed urban re-generation of the Abbey Creative Quarter site in the heart of Kilkenny City. Kilkenny County Council has purchased the site from Diageo Ireland with a view to creating a mixed-use development incorporating amenity areas.

The site has been identified for development in the Kilkenny City & Environs Development Plan 2014-2020, where it is zoned for 'General Business'. A Strategic Flood Risk Assessment (SFRA) undertaken for the County Development Plan applied the Development Plan Justification Test as required by the 'Planning System and Flood Risk Management Guidelines for Planning Authorities' published by the Department of the Environment, Heritage and Local Government and the OPW in November 2009. An objective is included to the County Development Plan specifying that any development proposed within Flood Zones A or B are subject to site-specific Flood Risk Assessment (FRA) appropriate to the scale and type of the development being proposed.

This document sets out the detailed FRA, incorporating the Development Management Justification Test, as required by the 'Planning System and Flood Risk Management Guidelines'. The FRA assesses the risk to the proposed development from all potential sources of flooding and proposes suitable mitigation measures where appropriate.

A Strategic Environmental Assessment (SEA) being undertaken in relation to the Masterplan will also consider the issue of flooding.

2 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 SITE LOCATION

The site is located in the heart of Kilkenny City. It is situated along the western banks of the River Nore, and the River Breagagh flows west to east through the site (see Figure 2.1)

The site forms part of the city centre and is predominately occupied by a former brewery and bottling plant (Smithwicks Brewery). Operations at the brewery ceased in 2013 and the site is now disused.

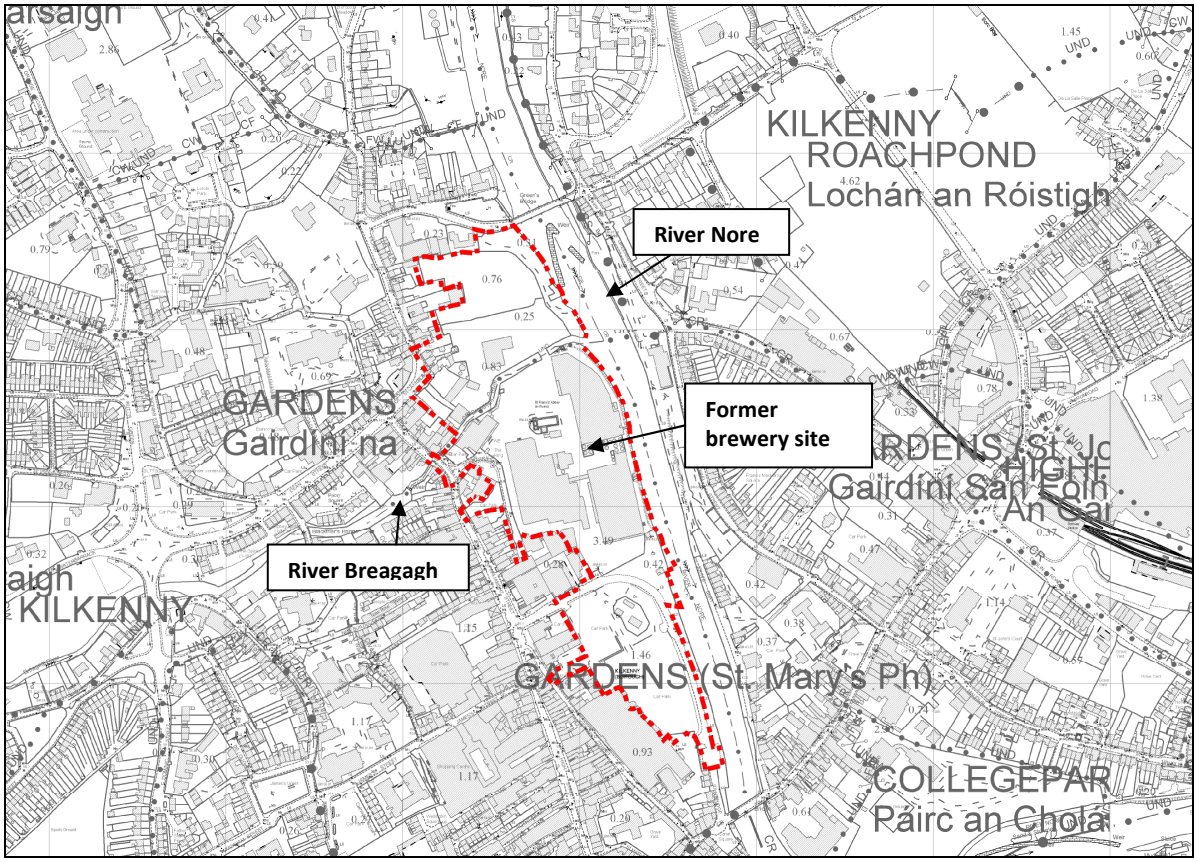


Figure 2.1 Location overview map

2.2 SITE DESCRIPTION

2.2.1 General

The old brewery site is a very significant one, measuring approximately 10.9 acres in the heart of Kilkenny City. Kilkenny County Council owns a further 3.8 acres in the immediate vicinity of the brewery site, bringing the total area covered by the Masterplan to approximately 14.7 acres. The site itself, and the general vicinity, is urban in nature. The zoning for the site is 'General Business'.

The site includes three National Monuments - St. Frances Abbey, Evans Turret and the City Wall, as well as several other protected structures.

A bridge is currently under construction over the River Nore at the development site, as part of the Kilkenny Central Access Scheme. This is a five span structure supported by abutments at each end and in between banks on four pairs of concrete piers.

2.2.2 Topography

The site is flat and low lying relative to lands located further inland from the River Nore and the River Breagagh. Typical levels at the site vary between 44.2 and 45.2 mOD. The lowest part of the site is in the vicinity of the ruins of St. Francis Abbey.

2.2.3 Existing drainage infrastructure

The eastern boundary of the site is bounded by the River Nore and the River Breagagh flows from west to east through the site. The River Breagagh discharges to the River Nore within the site.

The site is completely covered by a concrete slab. Discussions with staff from Diageo have indicated that all surface water from the brewery site is collected and passed through a petrol interceptor before being discharged to the River Nore. Areas outside of the brewery site are thought to drain directly to either the River Nore or the Breagagh River.

2.3 EXISTING FLOOD RELIEF SCHEME

The Kilkenny Flood Relief Scheme was completed in 2005. It consisted of a combination of river widening and deepening, flood walls, embankments and associated drainage works. The scheme was designed to protect against a 100 year flood (1% AEP).

Based on available information, the location of flood defences in the area is shown in Figure 2.2. Note that these locations are subject to confirmation by OPW. The defences vary in type along the site. To the north of the River Breagagh is a wall which acts as a flood defence. Along the Breagagh River are parapet walls which act as floodwalls. Along the brewery site is a stone revetment sloping down to the River Nore. South of the brewery site there is a grassed embankment set back from the river. From a preliminary visual inspection, the flood defences adjacent to the site appear to be in good condition. The defences are maintained by OPW.

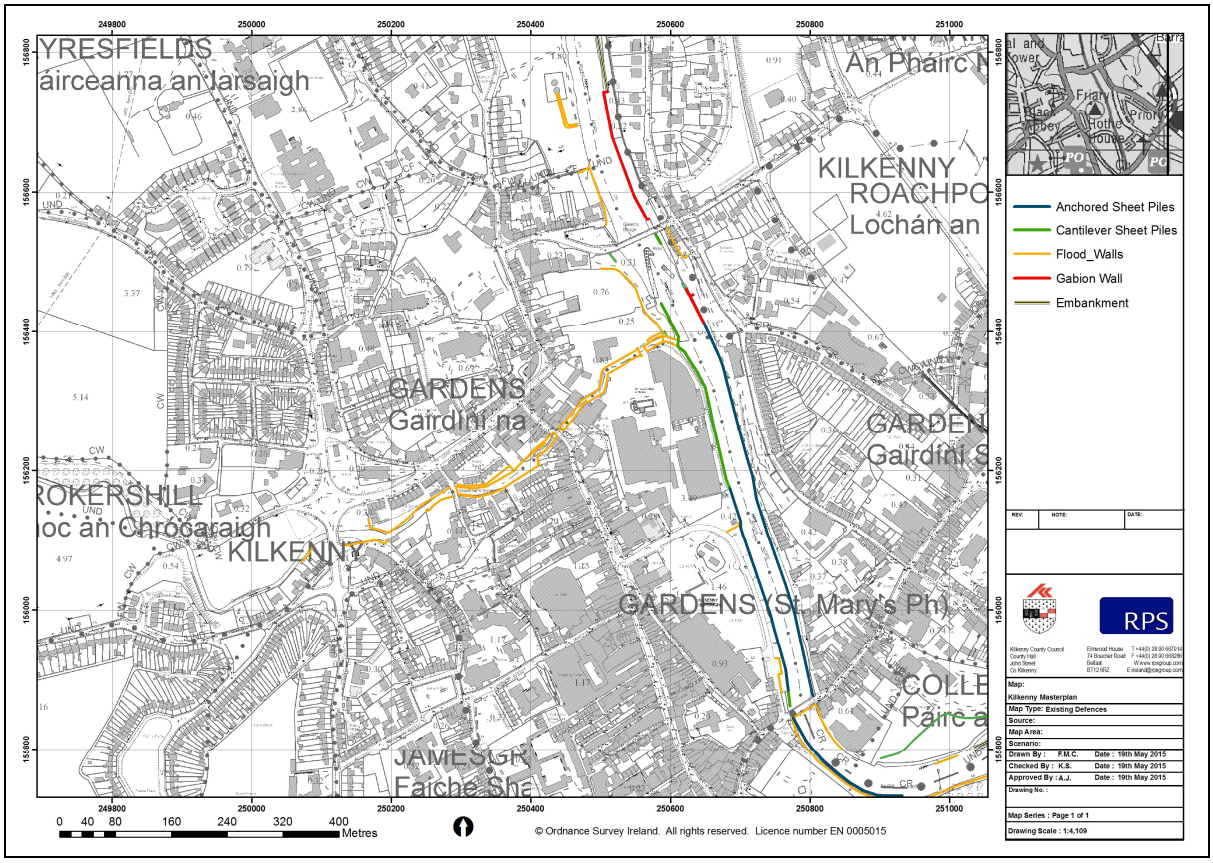


Figure 2.2 Flood defences in the area

2.4 HISTORICAL FLOODING

There were more than 20 recorded flood events in Kilkenny City prior to the completion of the Flood Relief Scheme in 2005. Flood events have been recorded as far back as October 1763 when the worst known flood on the River Nore occurred, and all but two bridges on the river were washed away. Many of the past recorded floods affected the site which, according to an OPW engineering report on the Kilkenny City Flood Relief Scheme, was liable to flood on average every five years (OPW, 1999). Flooding at the site arose from both the River Nore and the River Breagagh.

Since the completion of the flood relief scheme, there have been three flooding events in Kilkenny City due to the Breagagh overtopping its banks (October 2006, November 2006 and August 2008). However, none of these events affected the development site.

2.5 PROPOSED DEVELOPMENT

The extent of the development site is shown in Figure 2.3. The development will be mixed use, incorporating both residential and retail units as well as office and educational uses. Some existing buildings are to be retained, and a number of new buildings will be constructed. The proposal will create a landscaped linear park along the edge of the River Nore.

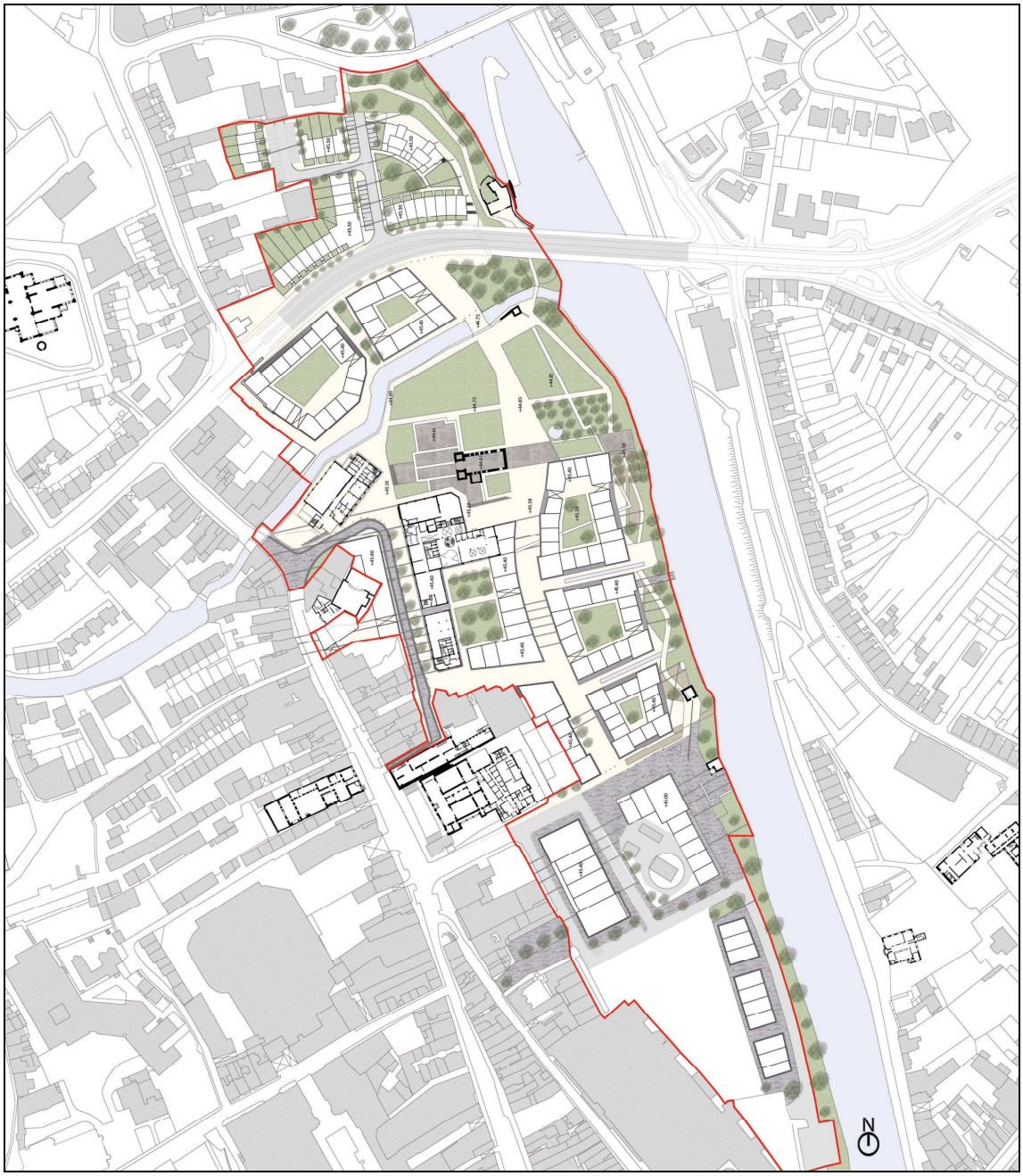


Figure 2.3 Extent of the development site

3 POTENTIAL SOURCES OF FLOODING

Sources of flooding relevant to the site include fluvial flooding and pluvial flooding. There is no tidal influence.

3.1 FLUVIAL FLOOD RISK

3.1.1 River Flood Levels

Fluvial flood risk at the site comes from the River Nore and the River Breagagh.

RPS has constructed a detailed computer model for Kilkenny using the MIKE suite of software as part of the South Eastern Catchment-based Flood Risk Assessment and Management (CFRAM) Study. The model encompasses the mid and lower reaches of the River Nore, and includes the River Breagagh and other tributaries. The total contributing area at the downstream limit of the model is 1,744.5 km^2, 4% of the total contributing area comes from the River Breagagh catchment. Figure 3.1 illustrates elements of the model in the vicinity of Kilkenny City. The model includes the existing flood defences along the River Nore and River Breagagh.

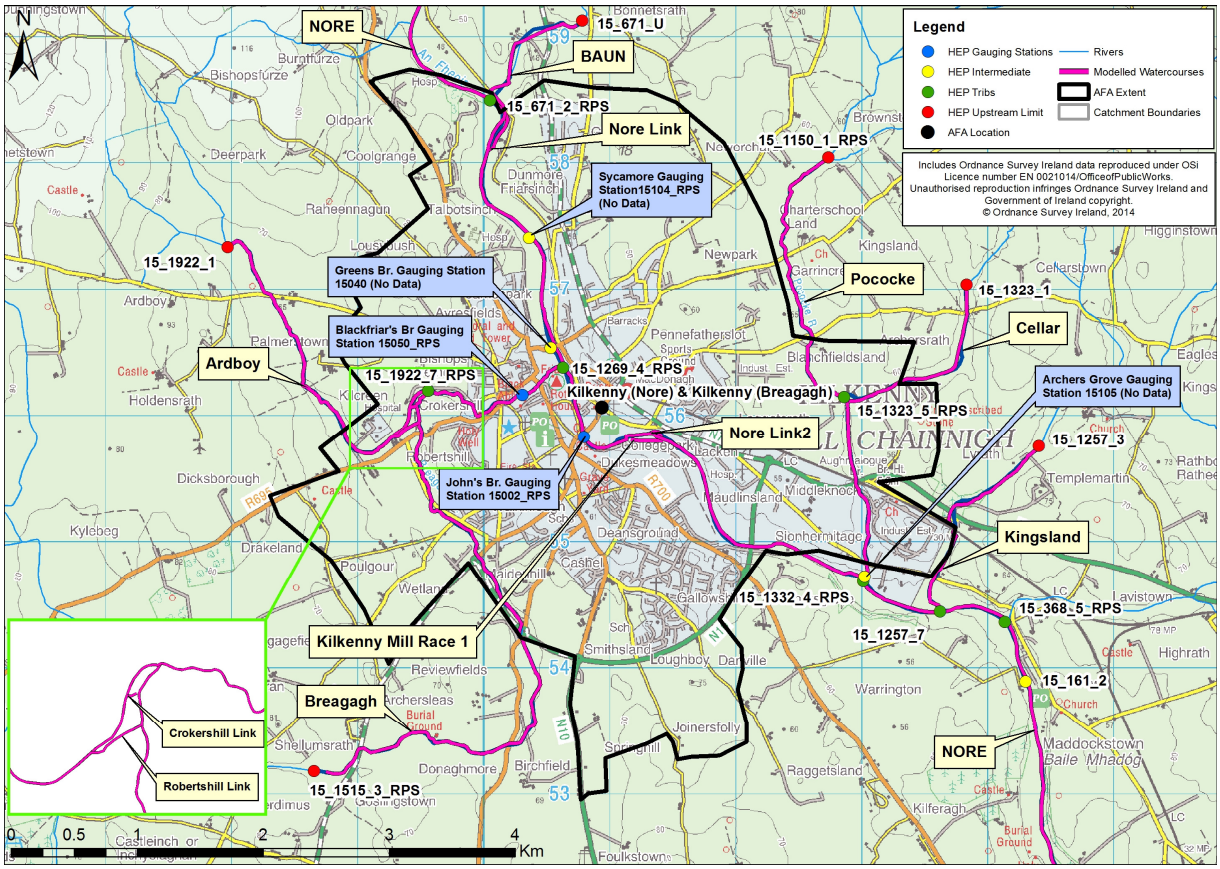


Figure 3.1 Model extents in the area of Kilkenny City

Draft flood mapping was published for Kilkenny city by the South Eastern CFRAM Study in March 2015. Although the mapping is draft and is subject to change based on submissions made during public consultation between March and July 2015, it is the best available information and is being used in this FRA with the full understanding and permission of the OPW. In addition, consultation to date with stakeholders and the general public has not highlighted any issues with the maps. The draft flood map is shown in Appendix A.

Predicted flood levels were extracted from the computer model at a number of points close to the development. These levels are shown in Table 3.1 and the node locations can be seen in Figure 3.2.

Table 3.1 Predicted flood levels

Node ID	Water level (m OD) 1% AEP	Water level (m OD) 0.1% AEP
A	45.08	45.86
B	44.83	45.54
C	44.55	45.37
D	44.30	45.10
E	44.15	44.91

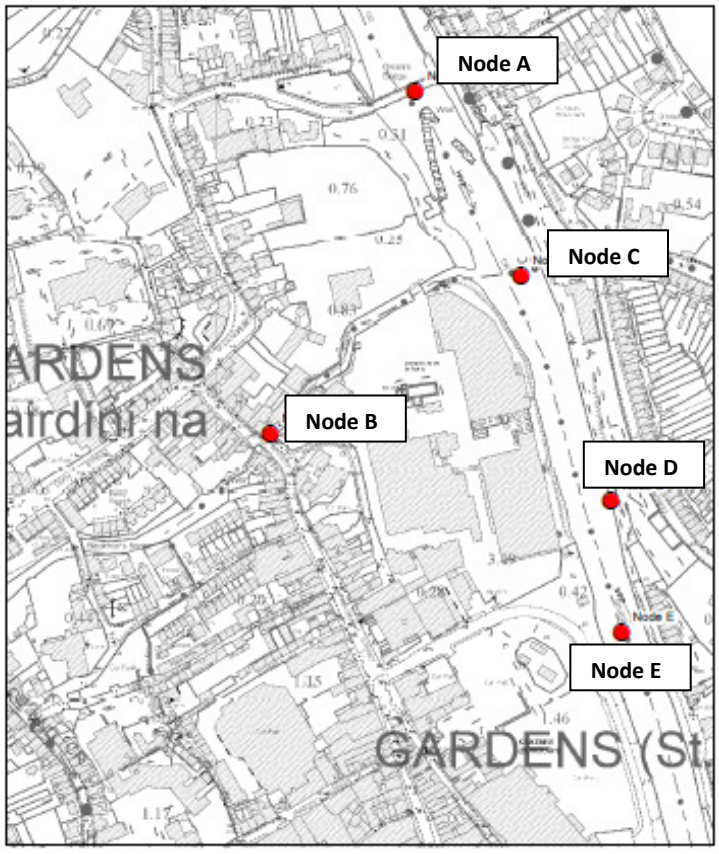


Figure 3.2 Location of nodes for water levels

3.1.2 Proposed Bridge Construction

This bridge currently under construction as described in section 2.2.1 is not included in the RPS computer model for the CFRAM study. However, Hydro Environmental Ltd, acting as a sub-consultant to Malone O'Regan Scott Wilson, has previously undertaken a study on behalf of Kilkenny County Council as part of the EIS for the proposed bridge to determine the potential impact on the river. Full details can be found in Chapter 8 of Volume II of the EIS, available on the Kilkenny City Council website.

The study evaluated what impact the supports for the proposed bridge in the River Nore are likely to have on flood levels in the river, and if such an increase is likely to be significant in the context of flood risk. The impact was considered for the 1% AEP event using a computer model supplied by OPW that included the flood relief scheme. The results from the model with the bridge piers in place showed an increase in water level of 40mm immediately upstream of the proposed bridge location, which dissipates to zero within the reach covered by the model. Downstream of the proposed bridge location the flood profile remains at the same level as would be the case without the influence of the proposed bridge. The report concludes that an increase of up to 40mm in flood levels over a localised area for the 1% AEP event will not have a significant impact on the flood risk to properties in the vicinity of the proposed bridge.

RPS have compared the flood flows and predicted levels from the bridge model to those used in the CFRAMS model. The 1% AEP flow used in the bridge model is 475 cumecs, compared with 408 cumecs in the CFRAMS model. The 1% AEP predicted flood level from the bridge model is 44.8m OD, compared with 44.55m OD from the CFRAMS model.

Due to the impact of the proposed bridge being so minimal, as demonstrated by this study, RPS considers the levels produced by the CFRAMS model to be applicable without the need to incorporate the bridge.

3.2 PLUVIAL FLOOD RISK

Generally, in order for a site to be considered at risk from surface water flow it characteristically has steep gradients either within or above the site and a reasonably large contributing catchment area. In this case the application site and the surrounding land are low lying and flat and therefore the risk of significant flooding from overland flow would be considered low.

When the brewery was in operation, surface water from the site was collected and treated in the on-site waste water treatment plant before being discharged to the River Nore. As the site has been fully developed in the past, there will be no increase in surface runoff as a result of the development. The River Nore is a substantial watercourse so the volume of discharge is insignificant compared with flows in the river. The upstream catchment area of the River Nore at this point is 1,573km^2. Also, during a storm event the peak of the surface water runoff from the site will enter the River Nore well before the peak river flow occurs.

4 CLASSIFICATION UNDER PLANNING SYSTEM AND FLOOD RISK MANAGEMENT GUIDELINES

4.1 FLOOD ZONES

Flood zones as classified under the Planning System and Flood Risk Management Guidelines (2009) are as follows:

- **Flood Zone A**: areas where the probability of flooding from the river is highest (1%);
- **Flood Zone B:** areas where the probability of flooding from the river is moderate (between 0.1% and 1%);
- **Flood Zone C**: Areas where the probability of flooding from the river is low (less than 0.1%).

RPS have used topographical information and the predicted flood levels from Table 3.1 to plot flood zones at the development site. While the site has a good level of protection from the existing flood alleviation scheme, the 'Planning System and Flood Risk Management Guidelines' recommend a conservative approach. The flood zones have therefore been plotted as if there are no defences in place (undefended). Figure 4.1 illustrates the flood zones in the vicinity of the site.

For the purposes of the FRA, the site has been divided into five 'Development Areas'. Figure 4.1 shows that the majority of Development Areas 2, 3, 4 and 5 are in Flood Zone B or C. Development Area 1 is located primarily in Flood Zone A. In reality, this area is protected by a large stone wall which is shown as a flood defence in Figure 2.2.

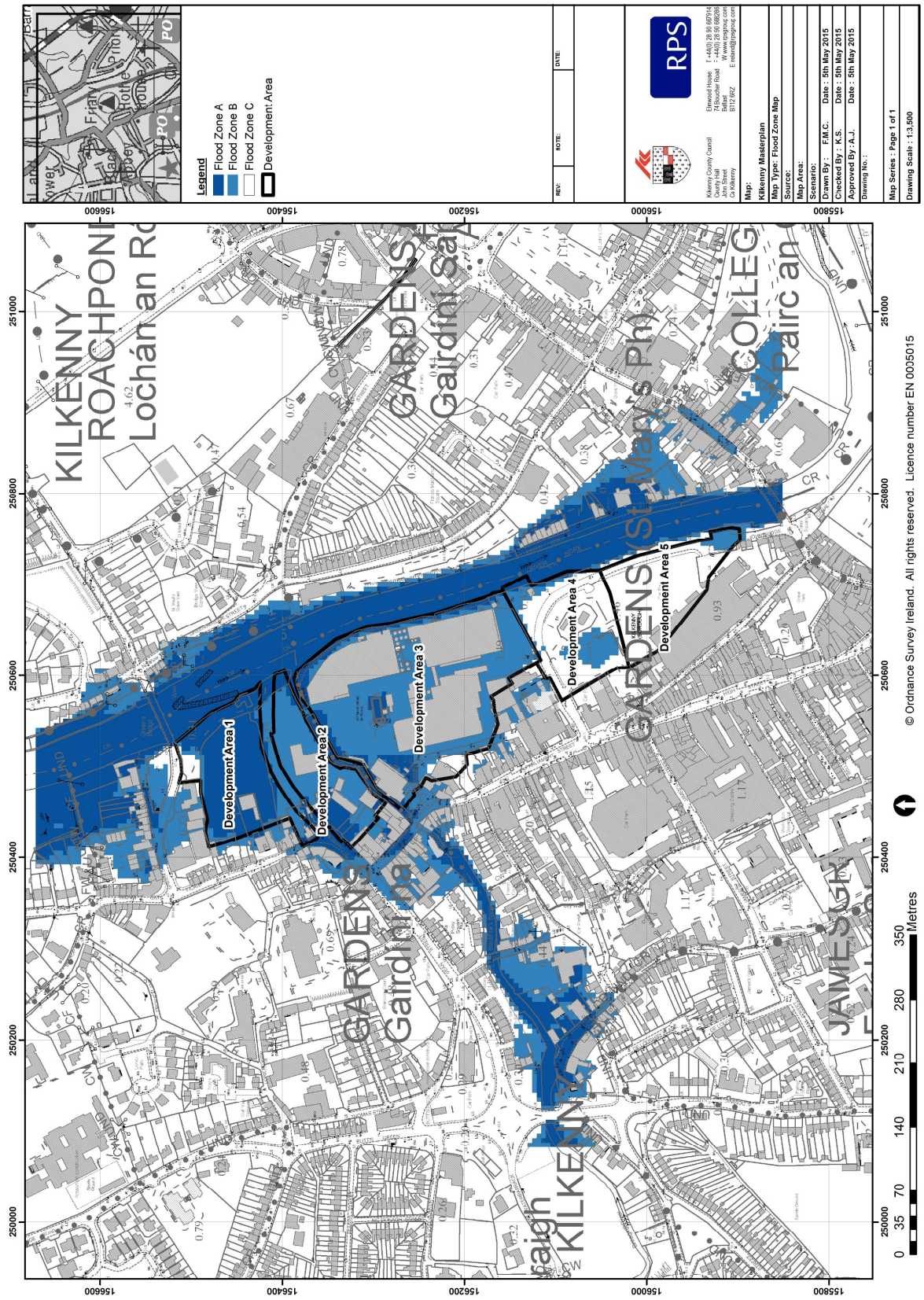


Figure 4.1 Flood zones

4.2 CLASSIFICATION OF VULNERABILITY

The 'Planning System and Flood Risk Management Guidelines' classify different types of development in terms of their vulnerability class (Table 3.1 of the guidelines). Table 3.2 of the Guidelines identifies the type of development that would be appropriate to each flood zone and those that would need the Justification Test. This table has been reproduced as Figure 4.2.

	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 3.2: Matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test.

Figure 4.2 Extract from Planning Guidelines- Vulnerability versus flood zones

The type of development proposed for the site is mixed use development and is likely to incorporate the following:

- dwelling houses- classified as 'highly vulnerable development'. This type of development requires a Justification Test in Flood Zones A and B (Table 3.2 of the guidelines);
- retail buildings – classified as 'less vulnerable development'. This type of development is appropriate in Flood Zone B but requires a Justification Test in Flood Zone A (Table 3.2 of the guidelines).

The use of each development area, along with its flood zoning and vulnerability class is summarised in Table 3.2.

Table 4.1 Summary of Development Areas

Development Area	Flood Zone	Proposed Use	Vulnerability Classification	Justification Test
1	A and B	Social housing	Highly vulnerable	Yes
2	A and B	Buildings used for retail, leisure, commercial	Less vulnerable	Yes
3	A and B	Buildings used for retail, leisure, commercial	Less vulnerable	Yes
4	A and B	Buildings used for retail, leisure, commercial	Less vulnerable	Yes
5	B	Buildings used for retail, leisure, commercial	Less vulnerable	No

5 JUSTIFICATION TEST FOR DEVELOPMENT MANAGEMENT

The site has been zoned for development in the Kilkenny City & Environs Development Plan 2014-2020. The Development Plan Justification Test (outlined in Box 4.1 of the guidelines) was applied during a Strategic Flood Risk Assessment carried out during the development of the plan. Therefore, there is no need to re-apply this test. A copy of this is provided in Appendix B.

The FRA process can now proceed to the Development Management Justification Test (outlined in Box 5.1 of the guidelines and reproduced as Figure 5.1).

Box 5.1 Justification Test for development management (to be submitted by the applicant)

When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, the following criteria must be satisfied:

1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.
2. The proposal has been subject to an appropriate flood risk assessment that demonstrates:
   - (i) The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;
   - (ii) The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;
   - (iii) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and
   - (iv) The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes.

The acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.

Note: See section 5.27 in relation to major development on zoned lands where sequential approach has not been applied in the operative development plan.

Refer to section 5.28 in relation to minor and infill developments.

Figure 5.1 Justification test for development management

5.1 JUSTIFICATION TEXT – CRITERIA 1

The site is zoned for 'General Business' in the Kilkenny City and Environs Development Plan 2014-2020. The mixed use development proposed in the Masterplan is fully compatible with the zoning objective in the County Development Plan.

Kilkenny City is identified as a hub in the South East Regional Guidelines, as well as in the county and city development plans. The entire site is located within the 'core' of Kilkenny city (as defined by the

guidelines). The 'General Business' zoning is considered essential to facilitate the regeneration and expansion of the city centre, and also facilitates compact and sustainable urban growth. The site has been previously developed and is currently under-utilised.

The Kilkenny City and Environs Development Plan 2014-2020 was prepared with regard to the 'Planning System and Flood Risk Management Guidelines'. The plan was also subject to Strategic Flood Risk Assessment and Strategic Environmental Assessment, both of which had due regard to the guidelines.

It is concluded that the zoning objective is appropriate, having regard to the 'Planning System and Flood Risk Management Guidelines', and the proposed development is entirely compatible with the zoning objective.

5.2 JUSTIFICATION TEXT – CRITERIA 2

Under Criteria 2 it must be demonstrated that the proposed development is not at undue risk of flooding, nor does it increase the risk of flooding elsewhere. It also needs to demonstrate low residual risk and resilience to climate change. As this is a major development in the centre of Kilkenny City RPS have carefully considered a range of mitigation measures to be incorporated within the proposed development to minimise the risk of flooding to the site from the River Nore and River Breagagh but also to ensure there is no increase in the risk of flooding elsewhere and the standard of protection offered by the OPW flood defence scheme is not comprised. These range of mitigation measures are described below.

5.2.1 Proposed finished floor levels

For the purpose of assigning appropriate finished floor levels, the site has been divided into five 'development areas'. Finished floor levels are generally set by adding a suitable freeboard to the 1% AEP predicted flood levels, this is generally considered to be between 300-500mm. However in this case RPS were concerned when a comparison was made between the 0.1% AEP predicted flood levels and the 1% AEP levels along this reach of the Nore. It was noted that there was a substantial increase in water levels between these two return periods. For example, at Node C (Figure 3.2) the 1% AEP water level is 44.55m OD, compared with 45.37m OD for the 0.1% AEP water level. RPS recognised that given the significance of the proposed development a conservative approach must be undertaken to ensure that the scheme is a flood resilient and sustainable design that will not require any additional flood protection measures over its design life and possibly beyond. In order to ensure this was the case, RPS took a conservative approach in determining suitable finished floor and general development levels across the site and not only compared the 1% AEP flood levels in the Nore and the Breagagh to the proposed finished floor levels but also considered the 0.1% AEP levels. Figure 5.2 indicates the predicted 0.1% AEP flood levels at various nodes and also the proposed finished floor levels as a comparison.

5.2.2 Proposed development levels

To ensure safe egress and access from the proposed development, all roads and pavements will be raised to within 200-300mm of the proposed finished flood levels. These levels will mostly be above the 1% AEP flood level. This will ensure pedestrians and vehicles will be free to move within the site in relative safety during an extreme 1% AEP flood event. It should be noted there are areas of the

site which must be tied into existing access roads, etc and the proposed development levels at these locations may fall below the 1% AEP flood levels on the Nore and Breagagh however in all cases these areas are still afforded protection by the flood defence scheme.

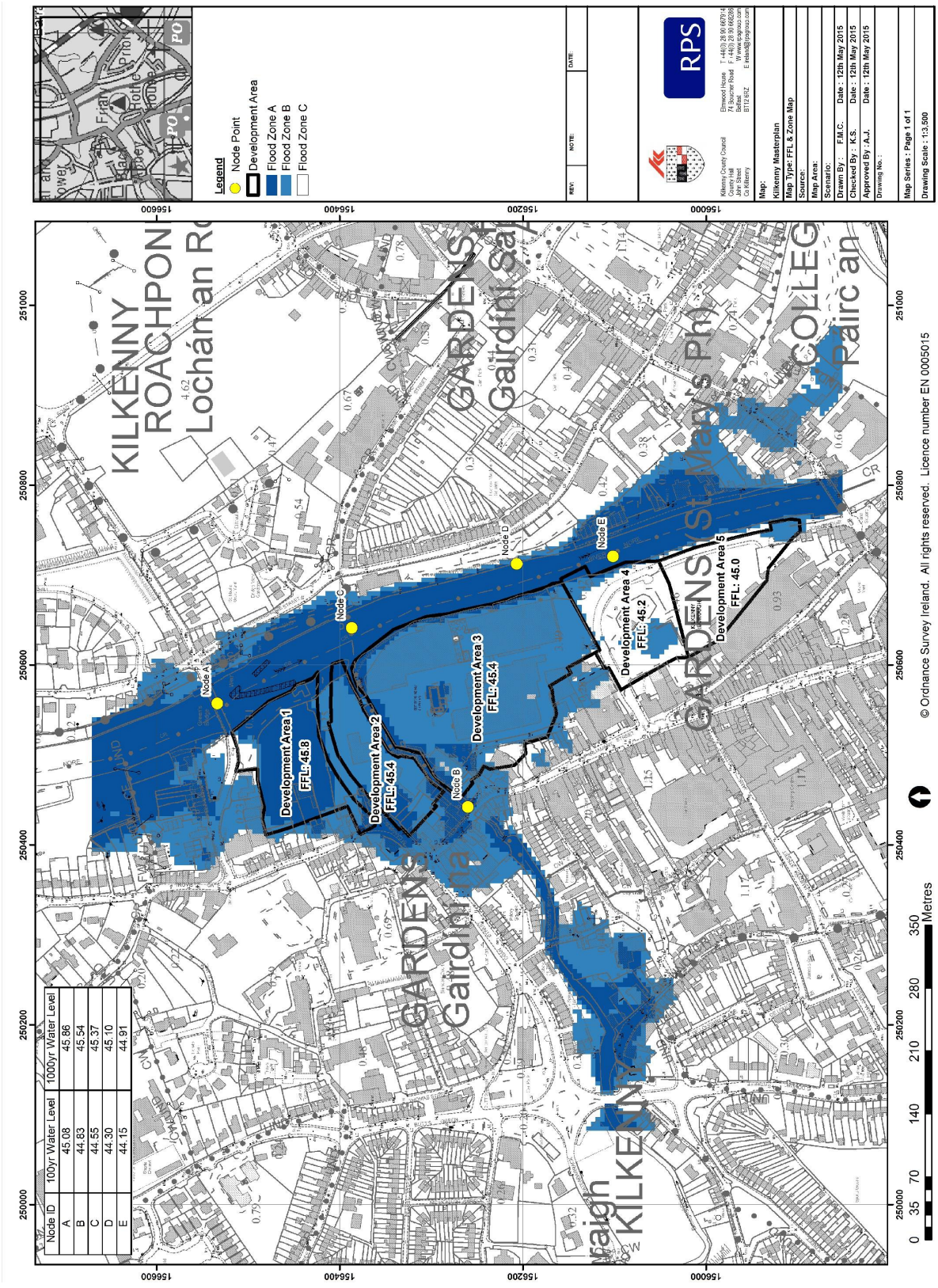


Figure 5.2 Proposed finished floor levels

5.2.3 Impact of Climate Change

An allowance of approximately 20-25% is normally added to flood flows to account for climate change impact, but currently these model runs have yet to completed for the Kilkenny area as part of the South Eastern CFRAM study. RPS have therefore considered the 0.1% AEP event as being indicative of the 2100, 1% AEP climate change flow. As described in Section 5.2.1 this is a very conservative approach as the present day 1% AEP flow in the River Nore is 408 cumecs and the 0.1% AEP flow is 561 cumecs, an increase of 38%. Therefore using the 0.1% AEP levels to set the finished floor levels for the proposed development will ensure a sustainable approach to flood risk management and has tested the robustness of the proposed mitigation measures to flows well in exceedance of the current design standards for flood schemes in Ireland. This will ensure that no further engineering works will be required to protect the proposed development should the effects of climate change be realised.

5.2.4 Impacts of flooding on adjacent lands

During the development of the application site the Nore and Breagagh Rivers will not be altered in any way and therefore current conveyance will be maintained at all times. The proposed mitigation measures described in sections 5.2.1 and 5.2.2 will result in the raising of areas of the site. However, as the site is currently protected by flood defences, the development is not reducing the amount of storage available during an extreme fluvial event. To further demonstrate this RPS have undertaken pre and post-development model runs to ensure this is the case. These have been undertaken for the both the 1% and 0.1% AEP events. In order to do this RPS raised all levels on the proposed development site to the levels indicated in Sections 5.2.1 and 5.2.2, and re-ran the CFRAM models to understand the impact to the wider areas and whether the development would reduce the standard of protection currently afforded to the city from the flood protection scheme.

As expected the 1% AEP flood extents were not altered during the pre and post development model runs. Figure 5.3 shows the results from the 0.1% AEP flood event. The red areas show where there is predicted flooding post development that did not flood pre development. There is one significant area within the site that is shown as red. As part of the development ground levels in this area are being lowered for archaeological reasons and this area will be grassed and not developed, therefore flooding in this area is acceptable. Therefore RPS can confirm that there is a negligible change in the 0.1% AEP predicted flood extents as a result of the development.

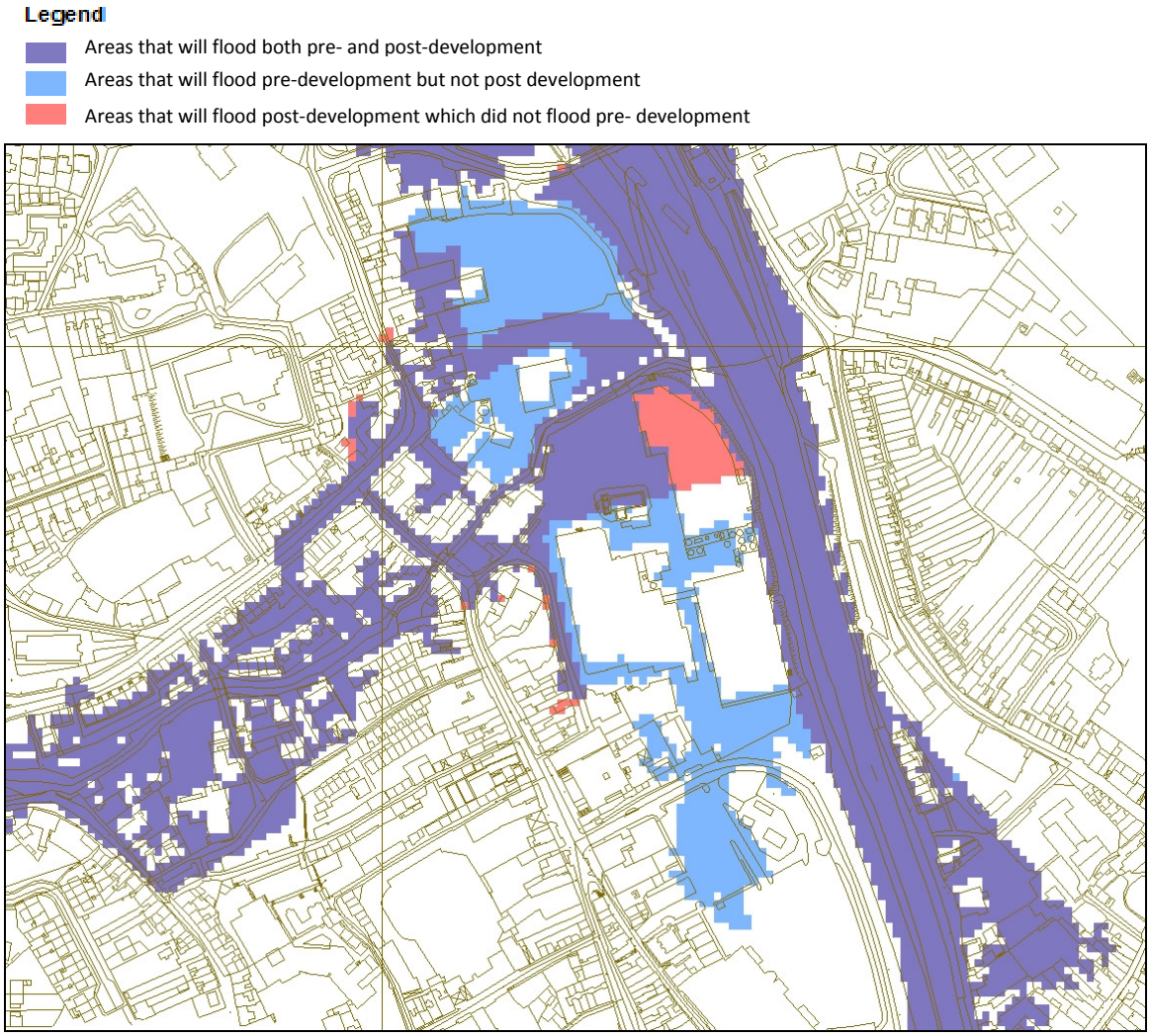


Figure 5.3 Flooding Pre and Post Development 0.1% AEP Event

5.2.5 Surface water runoff

The site is currently covered in hard standing, so there will be no increase in runoff as a result of the development. All surface water runoff from the development site will be captured within the existing or new storm drainage system, and therefore adjoining areas will not be impacted by overland flow from the site. A further benefit from the proposed development is the raising of ground levels will actually help with discharge of storm water under gravity during extreme events.

5.2.6 Existing Flood Defences

The layout and construction of the proposed development must not impede the operational effectiveness of the existing flood defences as highlighted in Figure 2.2, or hinder access to enable their maintenance. OPW have stated that some of the piled defences have anchors along this reach of the Nore but according to the provided as-constructed drawings these are not within the extent of the application site and therefore will remain unaffected. Discussions will be required between Kilkenny County Council and OPW to determine the requirements for maintenance of the defences but given the proposed provision of open space and the linear walkways adjacent to the river this should be improvement to the current situation, which is largely restricted by the existing brewery

buildings. Consideration will also need to be given to the impact of infilling in the vicinity of the existing defences as they may not have been designed to retain additional backfill. Again this should not be major issue given that all areas of infill are set a reasonable distance back from the defences but will need to be factored into the detailed design.

Development Areas 1 & 2
Sections of the existing flood defences have been removed to facilitate the construction of the new bridge over the River Nore. Whilst the ground is being raised in these areas it must be ensured that a continual lines of defence is provided to any potential flood flows. In both of these areas the development is close to the river so maintenance requirements must be agreed with OPW.

Development Area 3
Development is set back from the defences so will not have any impact.

Development Areas 4 & 5
There is an embankment along the River Nore that must be retained and incorporated into the proposals for these areas.

5.2.7 Residual impacts

With any development adjacent to a watercourse there is always a residual flood risk and defences can be overwhelmed. However, a conservative approach has been adopted in setting the finished floor levels at this site, which will minimise the impact of such events as described in Sections 5.2.3 and 5.2.4. This also ensures that the development will be resilient to climate change. Therefore, any residual flood risk can be considered acceptable.

5.2.8 Summary of compliance with Criteria 2

Criteria 2 includes four specific sub-criteria which must be addressed with appropriate flood mitigation measures to ensure the development complies fully with the Development Management Justification Test. It is the opinion of RPS that the mitigation measures described above comply with these sub-criteria for the following reasons:

"(i) The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk"

This has been addressed in section 5.2.4. Consideration has been given to the potential increase in flood risk elsewhere from the proposed mitigation measures and it has been shown that there is a negligible impact. By raising of the ground levels within the site to the 0.1% AEP flood level, this provides an overall reduction to flood risk reflected by the areas of light blue shown in Figure 5.3.

"(ii) The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as is reasonably possible"

The proposed mitigation measures will ensure that all property and users of the site will be protected from flooding up to a 0.1% AEP fluvial flood event. Therefore, the risk of flooding to people , property and the urban environment is very low. The level of protection will ensure that

there will be no impact on the economy, i.e. there will not be an unacceptable level of flood risk which might subsequently require government capital expenditure to alleviate the problem.

"(iii) The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions, for emergency services access"

The residual risk to the proposed development is low, as the buildings are protected up to a 0.1% AEP event and the roads are protected up to a 1% AEP event. This gives added assurance that the proposed mitigation measures are more than adequate to deal with any future flood risk. Also, emergency services will be able to access the site up to a 1 % AEP fluvial event. The users of the proposed development will be in relative safety compared to other areas of the city. No specific risks have been identified that would necessitate a flood evacuation plan for the site.

"(iv) The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes''

The flood mitigation measures proposed do not materially impact upon the desired layout, orientation or approach to the proposed development. Dividing the site into five 'development areas' allows the finished floor levels to be tailored across the site, rather than imposing a single level for the whole site. The finished floor levels do not represent a substantial increase from existing levels within the site.

It is considered that the proposed flood mitigation measures are entirely compatible with the wider planning objectives in relation to development of good urban design.

6 CONCLUSION

RPS have assessed the flood risk to the proposed development and determined the predominant source of flood risk emanates from fluvial flooding from the River Nore and River Breagagh.

Under the 'Planning System and Flood Risk Management Planning Guidelines' (2009) the application site would be classified predominantly as Flood Zones A and B, and is therefore subject to the Justification Test.

This report assesses the proposed development against the requirements of the Development Management Justification Test and proposes a range of flood mitigation measures which comply with the criteria set out under this part of the test.

The proposed development is, in the opinion of RPS, compliant with the 'Planning System and Flood Risk Management Planning Guidelines' (2009).

7 REFERENCES

Kilkenny City and Environs Development Plan 2014-2020. Kilkenny County Council (April 2014).

Strategic Flood Risk Assessment. Appendix 1 to the Environmental Report on the Strategic Environmental Assessment of the Kilkenny Draft City & Enviorns Development Plan. Kilkenny County Council (June 2013).

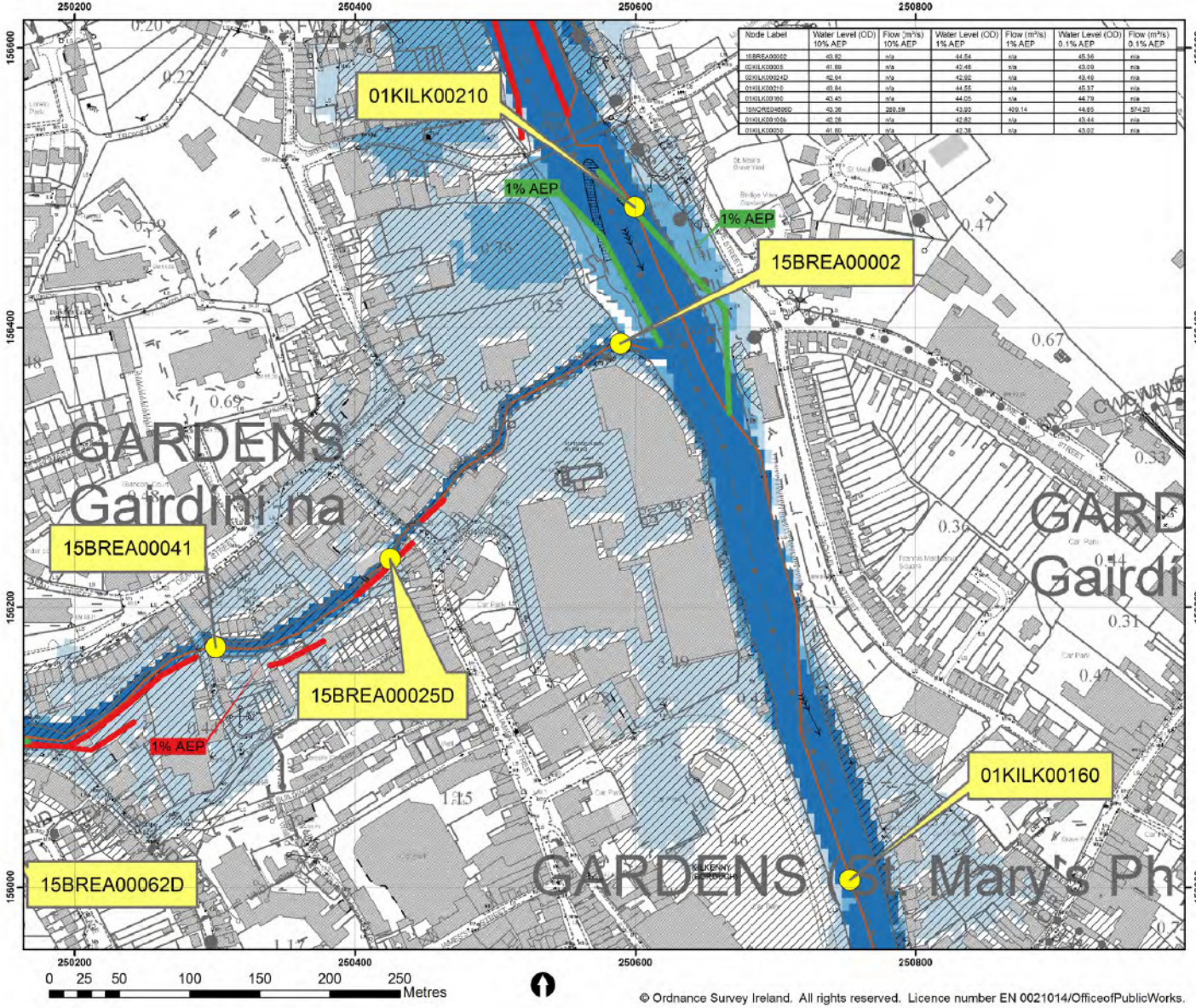
The Planning System and Flood Risk Management, Guidelines for Planning Authorities. Department of the Environment, Heritage & Local Government and OPW (November 2009).

Kilkenny City Flood Relief Scheme, Engineering Report. OPW.(May 1999).

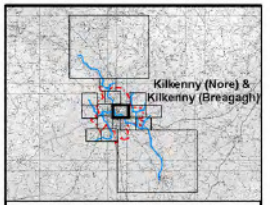
Proposed Kilkenny Central Access Scheme, Revised Environmental Statement, Volume 2- Main Report. Malone O'Regan Scott Wilson (January 2011). Available at www.kilkennycity.ie/eng/Publications/Public_Notices/Environmental_Impact_Statement_Central_Access_Scheme_Kilkenny_City.html).

APPENDIX A

DRAFT FLOOD MAP FROM SOUTH EASTERN CFRAM STUDY



Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
15BREA00002	43.82	n/a	44.54	n/a	45.36	n/a
01KILK00005	41.89	n/a	42.48	n/a	43.09	n/a
02KILK00024D	42.94	n/a	42.99	n/a	43.48	n/a
01KILK00210	43.84	n/a	44.55	n/a	45.37	n/a
01KILK00160	43.45	n/a	44.05	n/a	44.79	n/a
15NCRSDR0050	43.26	269.58	43.93	409.14	44.65	574.20
01KILK00150b	42.26	n/a	42.82	n/a	43.44	n/a
01KILK00250	41.80	n/a	42.36	n/a	43.02	n/a



The viewer of this map should refer to the Disclaimer, Guidance Notes and Conditions of Use that accompany this map. This draft map is for consultation purposes only, and should not be used for any other purpose.

Legend

- 10% Fluvial AEP Event
- 1% Fluvial AEP Event
- 0.1% Fluvial AEP Event
- Modelled River Centreline
- AFA Extents
- Embankment
- Wall
- Defended Area
- 1% AEP — Standard of Protection of Flood Defence (Walls / Embankments)
- Node Point
- Node ID — Node Label

DRAFT

REV:	NOTE:	DATE:

SOUTH EASTERN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

OPW — RPS

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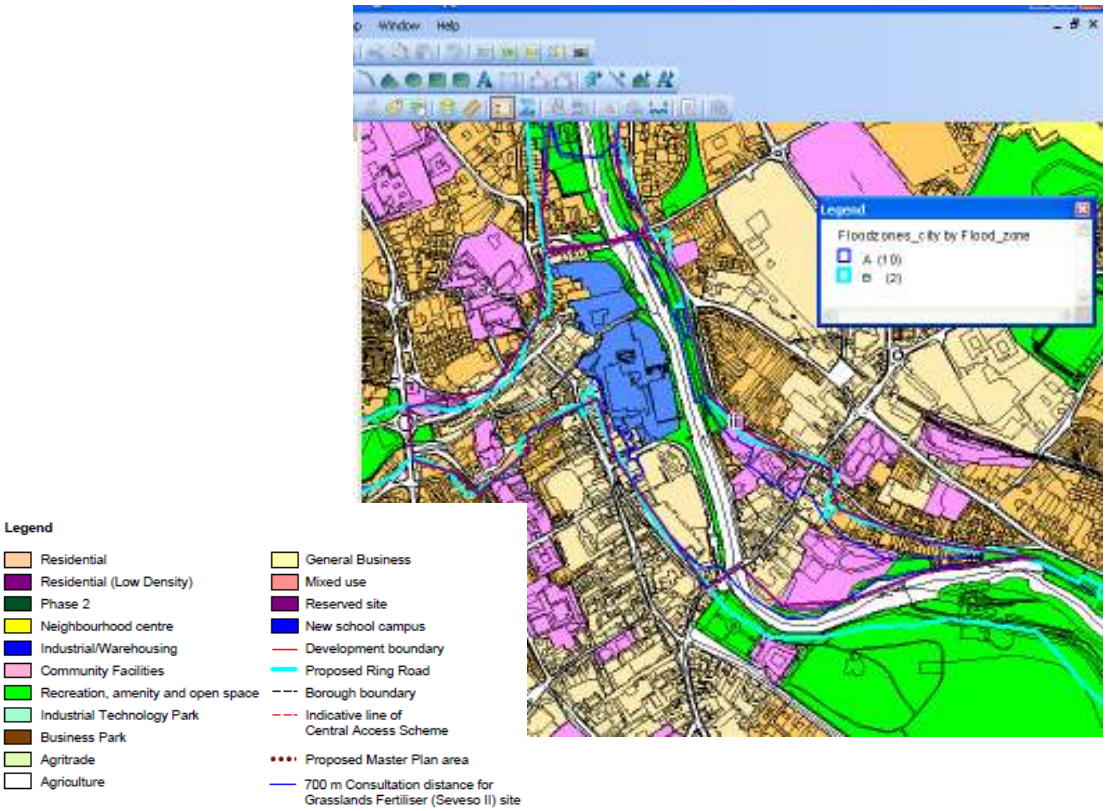
Map: Kilkenny (Nore) & Kilkenny (Breagagh) Fluvial Flood Extent

Map Type:	EXTENT
Source:	FLUVIAL
Map Area:	HPW
Scenario:	CURRENT
Drawn By :	
Checked By :	
Approved By :	
Drawing No. :	
Map Series :	
Drawing Scale :	

APPENDIX B

DEVELOPMENT PLAN JUSTIFICATION TEST

Area 2: Between Green's bridge and John's Bridge/John Street as far as Maudlin Street/Dublin Road junction, around River Nore and to Dominic Street/Dean Street roundabout around R. Breagagh (see iii on Figure 1).



This area forms part of Kilkenny city centre and was zoned for numerous uses, namely General Business, Industrial, Open Space, Residential and Community facilities. The proposed zoning for the Brewery site is as General Business. Open space is a water compatible use and does not require the Justification test, however the other uses, all of which are partially located within Flood Zone A, must satisfy the Justification Test. The criteria are outlined in Section 1.5 and the test is set out below.

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

Kilkenny is identified as a Hub in the South East Regional Planning Guidelines and in the County and City Development Plans.

2) The zoning or designation of the lands for the particular use or development type is required to achieve the proper and sustainable planning of the urban settlement ....
   i. The zoning of this area for this range of uses is intended mainly to reflect the existing uses in operation. The General Business zoning of the Smithwick's site will is essential to facilitate the regeneration and/or expansion of the centre.
   ii. The land comprises significant previously developed and/or under-utilised lands.
   iii. All of the land is within the core of Kilkenny (as core is defined in the Flooding Guidelines).
   iv. The continued development of this land is essential in achieving compact and sustainable urban growth.

v. There are no suitable alternative lands within or adjoining the core to provide such city centre uses.

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

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

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

This area adjoins the city centre and is zoned for numerous uses, namely Residential, Open Space, Community facilities and Agriculture. For the non-compatible uses, the Sequential approach was used and this resulted in the avoidance of three sites and rezoning as follows:

iv) From Agriculture to Open space at Palmerstown and Kilcreene (within Flood Zone A)
v) From Community Facilities to Open Space at Kilcreene Hospital
vi) From Residential to Open space at Croker's Hill

One area of land, zoned for Agricultural use, located adjacent to the development boundary is within Flood Zone B (vii). As Agriculture is a less vulnerable use, there is no need for the Justification test to be applied to this parcel.

The amended zoning map is shown on Figure 2. Only a small amount of residentially zoned land remains within the flood zones, near the Dean Street roundabout (viii). As a highly vulnerable use, this must be subjected to the Justification Test, as follows:

1) The urban settlement is targeted for growth....
Kilkenny is identified as a Hub in the South East Regional Planning Guidelines and in the County and City Development Plans.

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

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