

Kilkenny County Council



N24 Carrick Road Improvement Scheme

Flood Risk Assessment

April 2022



Halcrow Barry is now **Barry Transportation**

Still the same excellent people providing our Clients with exceptional service

Client:	Kilkenny County Council
Project Title:	N24 Carrick Road Improvement Scheme
Document Title:	Flood Risk Assessment
File Name:	20408-BT-XX-XX-RP-Z-00021_Flood_Risk_Assessment

[illegible]

Table of Contents

SECTION 1:	INTRODUCTION	1
1.1	General	1
1.2	Proposed Development.....	1
SECTION 2:	FLOOD RISK ASSESSMENT METHODOLOGY.....	3
2.1	Methodology	3
2.2	Data Collection	6
SECTION 3:	EXISTING HYDROLOGICAL ENVIRONMENT	7
3.1	Salient Hydrological Features	7
3.2	Existing Geology and Hydrogeology	7
3.3	Flood Regime	10
3.4	Existing Flood Studies	11
SECTION 4:	FLOOD RISK ASSESSMENT	14
4.1	Introduction	14
4.2	Flood Risk Identification	14
4.3	Initial Flood Risk Assessment	15
4.4	Detailed Flood Risk Assessment.....	16
SECTION 5:	CONCLUSIONS	17
5.1	Summary of Results.....	17
APPENDIX A:	FLOOD MAP REPORTS.....	18

SECTION 1: Introduction

1.1 General

Barry Transportation have been appointed by Kilkenny County Council (KCC) as Consulting Engineers to undertake Flood Risk Assessment (FRA) in respect of the N24 Carrick Road Improvement Scheme, Co. Kilkenny. The aim of the FRA is to identify, quantify and communicate to decision makers and other stakeholders the risk of flooding associated with the proposed development.

The FRA has been carried out in accordance with *The Planning System and Flood Risk Management Guidelines for Planning Authorities* (hereafter referred to as the FRM Guidelines) published in November 2009 jointly by the then Department of the Environment, Heritage and Local Government, DEHLG, (now the Department of the Environment, Community and Local Government, DECLG) and the Office of Public Works (OPW).

This report draws on information provided in the *Preliminary Design Report* prepared by the Tramore House Regional Design Office (THRDO, 2021).

1.2 Proposed Development

The N24 is a National Primary Route located in County Waterford, County Kilkenny, County Tipperary and County Limerick, with an overall total length of approximately 116km. The proposed N24 Carrick Road Improvement Scheme located near Mooncoin, Co. Kilkenny is approximately 2.2km (northwest-southeast) in length. The scheme involves both offline and online works, approximately 950m of the road scheme will run along the existing N24 and the remaining 1.25km of the scheme requires realignment. The scheme is surrounded predominantly by agricultural land. The site location is shown in Figure 1-1.



Figure 1-1: Site Location

The proposed scheme involves:

- Surface water drainage.
- Provision of 2no. attenuation pond, with 2m high palisade fencing, one on the western side of the scheme and other on the eastern.
- Provision of a construction compound at the location of the proposed eastern attenuation pond.
- Proposed realignment of the Skelpstown 16 stream which flows through the site with box culvert for stream crossing.
- Provision of an underbridge structure which will also incorporate a separate (adjacent) cattle track.
- Provision of 1.5m footpath underneath the road at the location of the Local Road L7416.
- Provision of a timber post and tension mesh fences along much of the scheme length, as well as 2.5m wide shared surface either side of the carriageway.
- Provision of agricultural access tracks and adjacent field access tracks.

SECTION 2: Flood Risk Assessment Methodology

2.1 Methodology

The methodology used for the flood risk assessment for the proposed development is based the FRM Guidelines, which require the planning system at national, regional and local levels to:

- Avoid development in areas at risk of flooding, particularly floodplains, unless there are proven wider sustainability grounds that justify appropriate development;
- Adopt a sequential approach to flood risk management when assessing the location for new development based on avoidance, reduction and then mitigation of flood risk; and
- Incorporate flood risk assessment into the process of making decisions on planning applications and planning appeals.

The sequential approach (see Figure 2-1) in flood risk management requires the following three steps to identify the necessity for the justification test for a development:

- Step 1: Identification of the Flood Zone at the proposed development site (Section 2.23 of the FRM Guidelines);
- Step 2: Identification of the vulnerability of the type of the proposed development (Table 3.1 of the FRM Guidelines); and
- Step 3: Using the matrix of vulnerability versus Flood Zone (Table 3.2 of the FRM Guidelines), identify the necessity for the justification test for the proposed development.

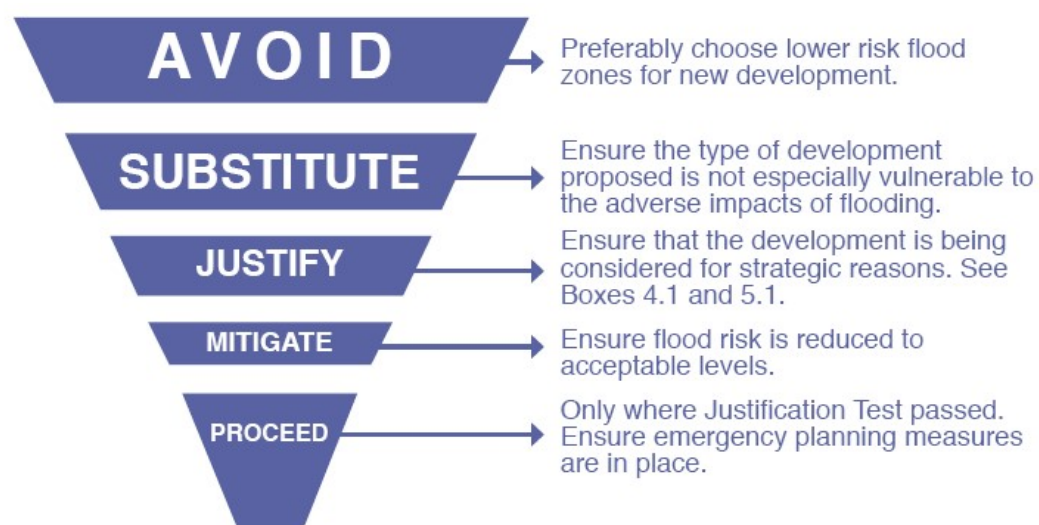


Figure 2-1: Sequential Approach Principles in Flood Risk Management (Figure 3.1 of the FRM Guidelines)

While Figure 2-1 sets out the broad philosophy underpinning the sequential approach in the flood risk management, Figure 2-2 describes the mechanism of the sequential approach for use in the planning process.

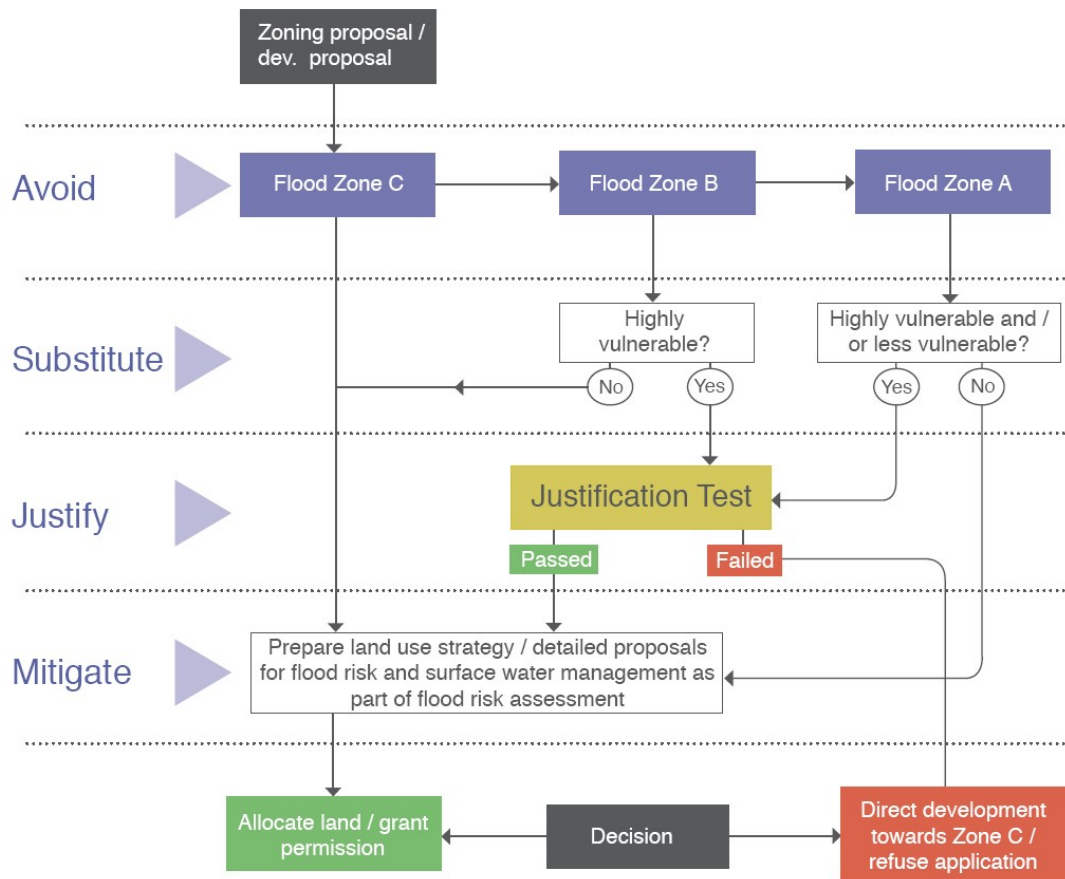


Figure 2-2: Sequential Approach Mechanism in the Planning Process (Figure 3.2 of the FRM Guidelines)

According to the FRM Guidelines, Flood Zones are graphical areas within which the likelihood of flooding is in a particular range. 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 Flood Zones, namely,

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% AEP or 1 in 100 year 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% AEP or 1 in 1000 year and 1% AEP or 1 in 100 year for river flooding and between 0.1% AEP or 1 in 1000 year and 0.5% AEP or 1 in 200 year for coastal flooding); and
- **Flood Zone C** – where the probability of flooding from rivers and the sea is low (less than 0.1% AEP or 1 in 1000 for both river and coastal flooding).

Flood Zones A, B and C are based on the current assessment of the 1% AEP and the 0.1% AEP fluvial events and the 0.5% AEP and 0.1% AEP tidal events, without the inclusion of climate change factors. Table 2-1 shows the classification of vulnerability to flooding of different types of development.

**Table 2-1: Classification of Vulnerability to Flooding of Different Types of Development
(Table 3.1 of the FRM Guidelines)**

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

Table 2-2 identifies the types of development that would be appropriate for each Flood Zone and those that would be required to meet the Justification Test. Since local transport infrastructure is classified as 'Less vulnerable development' the section highlighted in Table 2-2 presents the required actions for each flood zone.

Table 2-2: Matrix of Vulnerability & Flood zone to Illustrate Appropriate Development (Table 3.2 of the FRM Guidelines)

	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

The FRM Guidelines (Chapter 2) outline the following three stages of flood risk assessment:

Stage 1: Flood risk identification – to identify whether there may be any flooding or surface water management issues relating to the proposed development site that may warrant further investigations.

Stage 2: Initial flood risk assessment – to confirm sources of flooding that may affect the proposed development site, to appraise the adequacy of existing information and to determine what surveys and modelling approach is appropriate to match the spatial resolution required and complexity of the flood risk issues. This stage involves the review of existing studies and hydraulic modelling to assess flood risk and to assist with the development of FRM measures.

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, of its potential impacts on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will typically involve use of an existing or construction of a hydraulic model across a wide enough area to appreciate the catchment wide impacts and hydrological process involved.

2.2 Data Collection

Data required for the flood risk assessment was obtained from various sources, as described below.

- The historic flood data was obtained from the National Flood Hazard Mapping website <https://www.floodinfo.ie/map/floodmaps/>;
- The Subsoil and Aquifer vulnerability data was obtained from the Geological Survey of Ireland website <https://www.gsi.ie/en-ie/Pages/default.aspx>;
- National CFRAM Study.

SECTION 3: Existing Hydrological Environment

3.1 Salient Hydrological Features

The proposed scheme is located approximately 700m northeast of the River Suir and also crosses a stream, named Skelpstown 16 under the EPA website, which is an open watercourse which discharges directly into the River Suir. The River Suir flows in south easterly direction and discharges into the Waterford harbour approximately 25km south of the scheme. The River Suir forms the part of the Lower River Suir SAC. Refer to Figure 3-1 for the main hydrological features associated with the site.

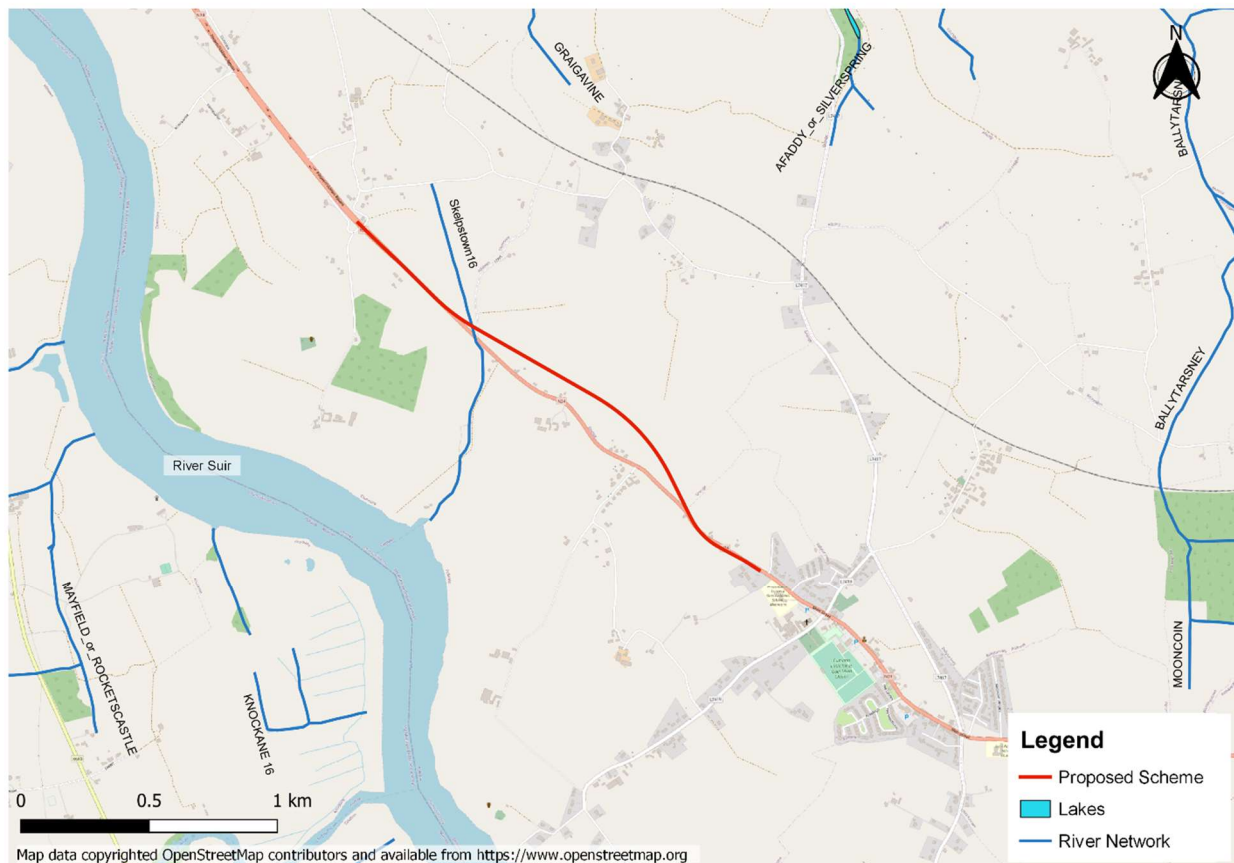


Figure 3-1: Hydrological Features in Vicinity of the Scheme

3.2 Existing Geology and Hydrogeology

The Geological Survey of Ireland (GSI) website provides information on their public online mapping service at www.gsi.ie on quaternary sediments and aquifer vulnerability.

The N24 Carrick Road Improvement Scheme is largely within an agricultural area. The quaternary sediments underlying the proposed scheme is predominantly till derived from Devonian sandstone. Alluvial deposits were identified associated with the water courses in the vicinity of the N24 road. Localized pockets of bedrock outcrop were identified to be in the vicinity of the scheme. Refer to Figure 3-2 for an extract of the quaternary sediments map obtained from the GSI website.

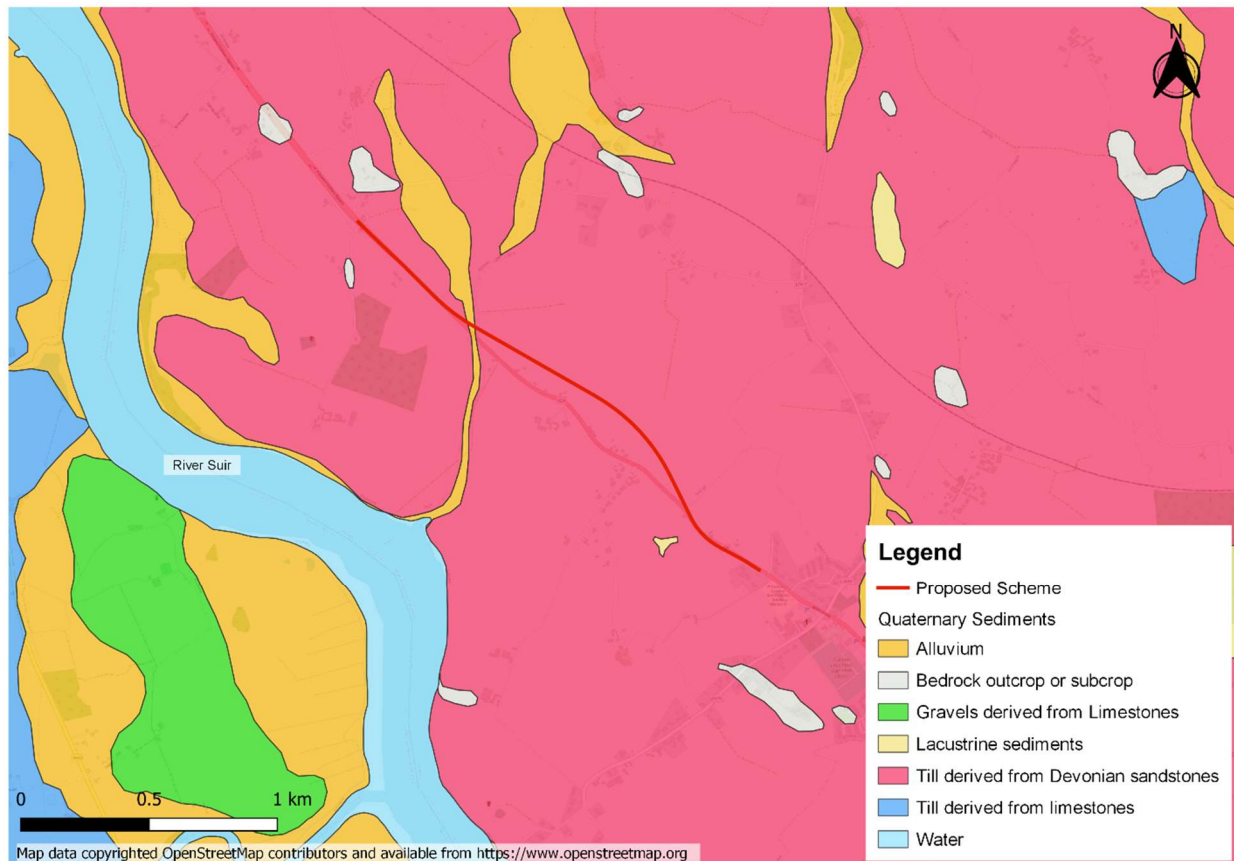


Figure 3-2 Quaternary Sediments Mapping

The proposed scheme is underlain by a 'Regionally important bedrock aquifer- karstified (diffuse)' (GSI 2022), as shown in Figure 3-3.

The national vulnerability mapping indicates that majority of the scheme area is classified as of 'low vulnerability', depicted in Figure 3-4. A part of the existing N24 in the north-western part of the site falls under 'moderate vulnerability'. The GSI states that "Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities". The GSI further describes that the vulnerability of groundwater depends on:

- The time of travel of infiltrating water (and contaminants);
- The relative quantity of contaminants that can reach the groundwater; and
- The contaminant attenuation capacity of the geological materials through which the water and contaminants infiltrate

Areas of high to extreme vulnerability are identified northwest of Mooncoin and along the N24 route south of Turkstown possibly associated with shallow depth to bedrock. There are no designated Source Protection Areas (SPAs) within the general vicinity of the scheme. The nearest SPA is Pilltown-Fiddown public water supply located approximately 7.5km to the northeast of the scheme.

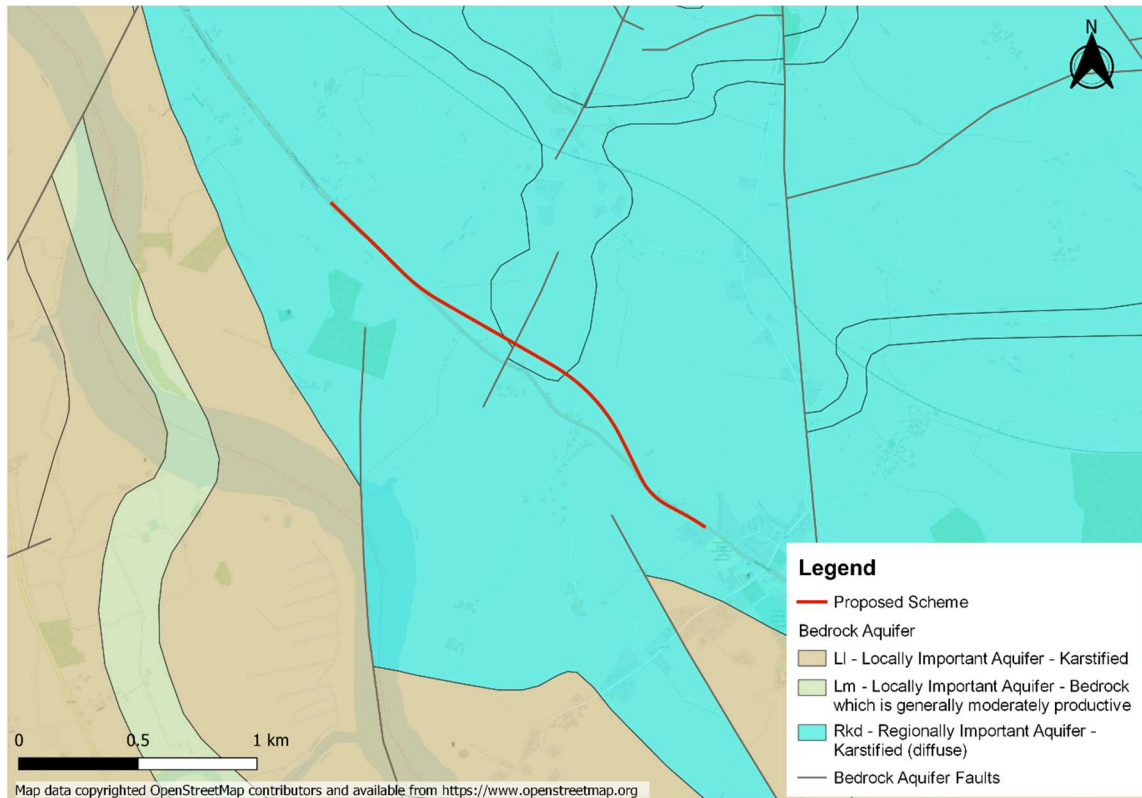


Figure 3-3 Bedrock Aquifer Mapping

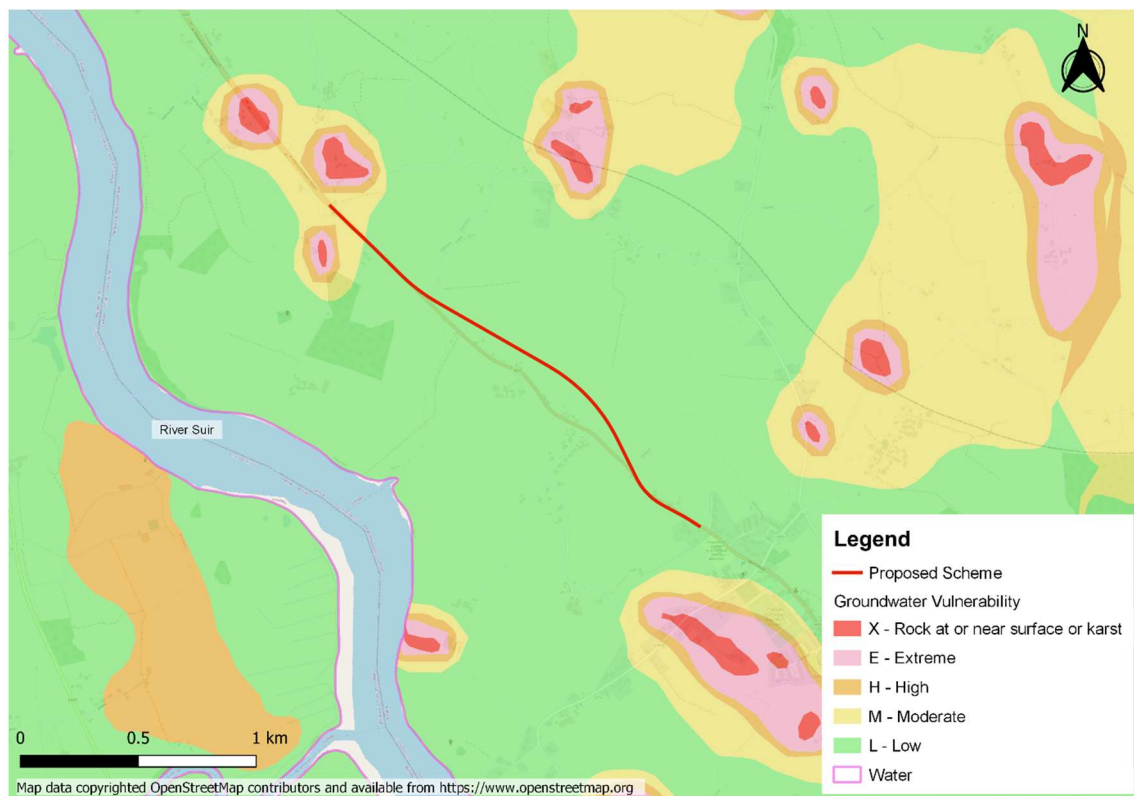


Figure 3-4 Groundwater Vulnerability Mapping

3.3 Flood Regime

The National Flood Hazard Mapping Website shows one record of historic flooding occurring at the proposed development site. It is identified as a recurring flood event (ID 2593 in Figure 3-5) associated with the River Suir catchment. The recorded floods within the vicinity of the site are shown in Figure 3-5 below and reports on the flooding incident compiled by the local authority and OPW are presented in Appendix A. The recurring flood event on N24 is shown as flooding event 3 in maps presented in Appendix A.

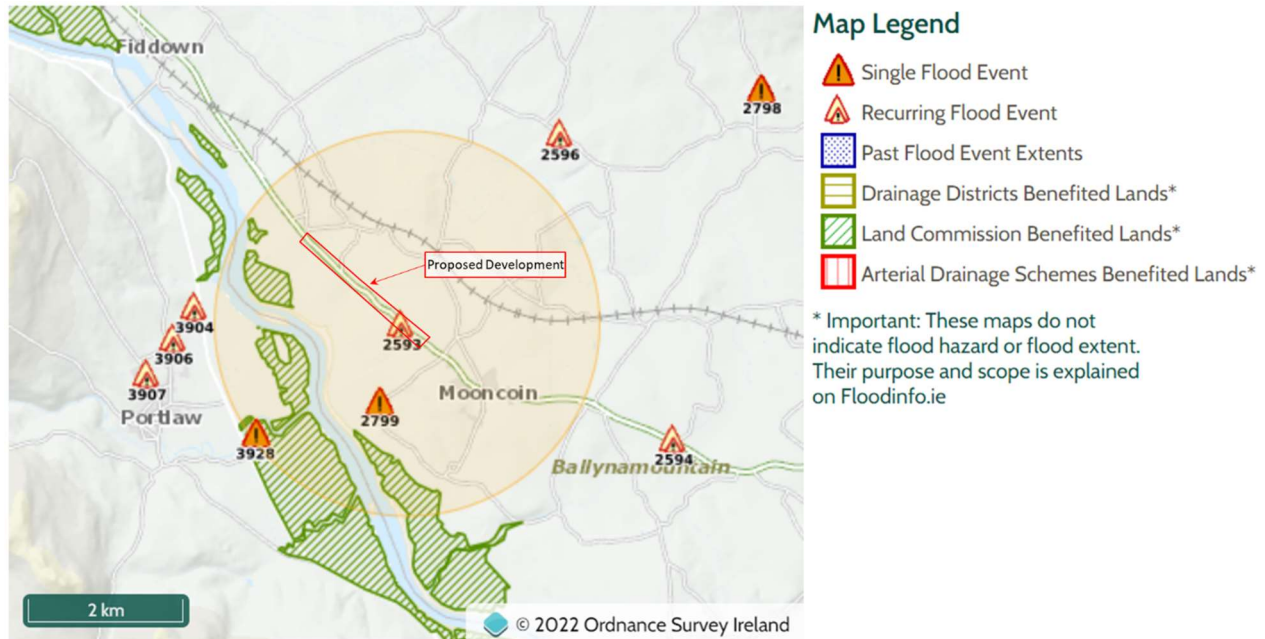


Figure 3-5: Past Flood Event Local Area Summary (Generated on OPW Website on 07th March 2022)

The recurring flood event on N24 is located just outside Mooncoin village to the northwest along the N24 and is associated with sustained periods of heavy rainfall. According to minutes from Kilkenny Co Co LA meetings these floods occur 2-4 times a year and flood the road, but it remains passable. The flood reports identify this location as a low-lying area with poor soakage. The extents of this flood event with respect to the proposed development are shown in Figure 3-6.



Figure 3-6: Flood Event Extents and Proposed Scheme

There is no historical evidence of groundwater flooding near proposed development as assessed from GSI's online viewer¹.

3.4 Existing Flood Studies

3.4.1 CFRAM Study

The OPW, as lead agency for flood risk management in Ireland, is producing Flood Risk Management Plans (FRMP), in line with National Flood Policy and the requirements of the EU Floods Directive. Draft FRMP's were made available online in 2016 for public consultation and were finally published in 2018. The FRMPs make use of the information provided through the flood maps that have previously been produced under the CFRAMS Programme and previous parallel projects. They set out a range of proposed measures and actions to manage and reduce flood risk within the catchments and coastal reaches covered by each Plan, focusing on the 300 areas of potentially significant flood risk around Ireland that were identified under the PFRA. The Flood Maps interactive viewer associated with the FRMPs is available online at <https://www.floodinfo.ie/map/floodplans/>.

¹

<https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc>

The extents of Suir River Basin near the proposed development, as identified in the Flood Risk Management Plan for the Suir River Basin (UOM16), are shown in Figure 3-7.

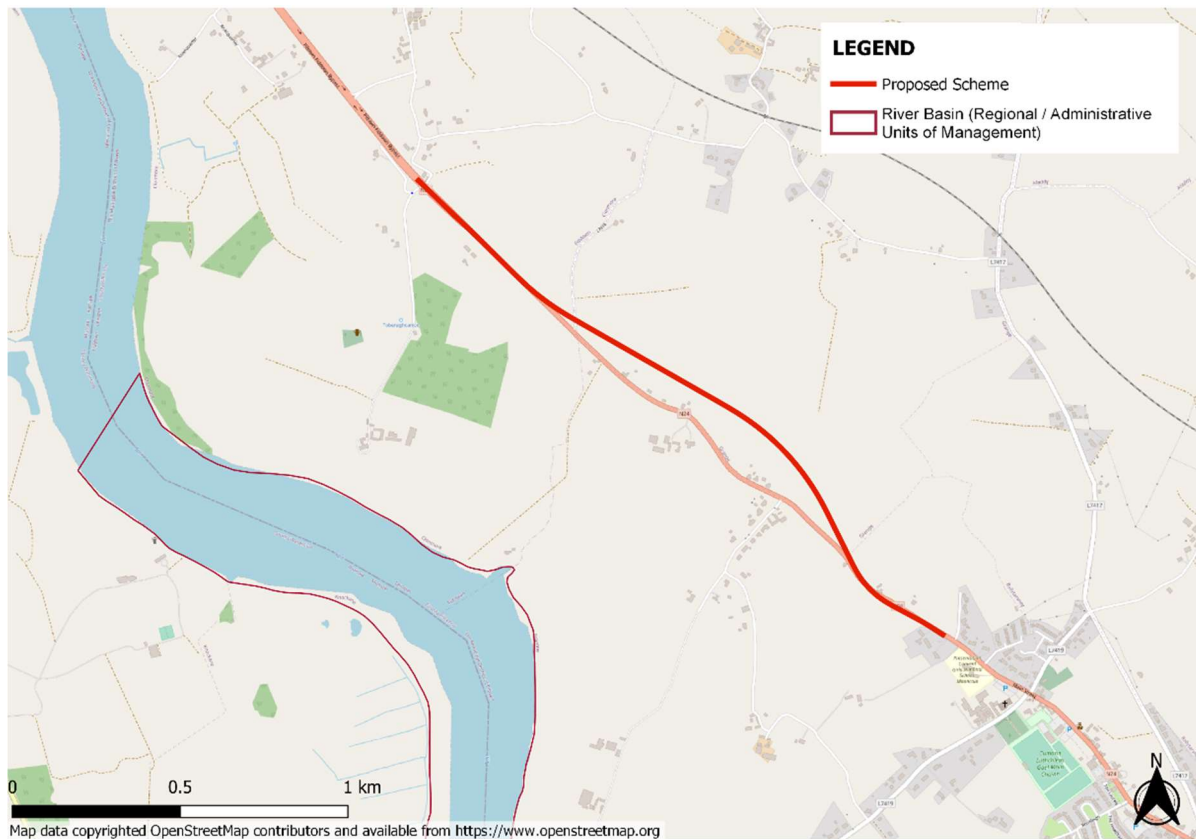


Figure 3-7: Suir River Basin Extents near Proposed Development

Figure 3-8 and Figure 3-9 provide extracts from the CFRAMS website showing the fluvial and coastal extents respectively, near the proposed development site. The map shows that the flood extents of the River Suir do not extend to the proposed development site. All proposed development is outside of the River Suir 0.1% AEP fluvial and coastal flood extent and is therefore located within **Flood Zone C**.



Figure 3-8: CFRAMS Fluvial Flood Extent – Present Day

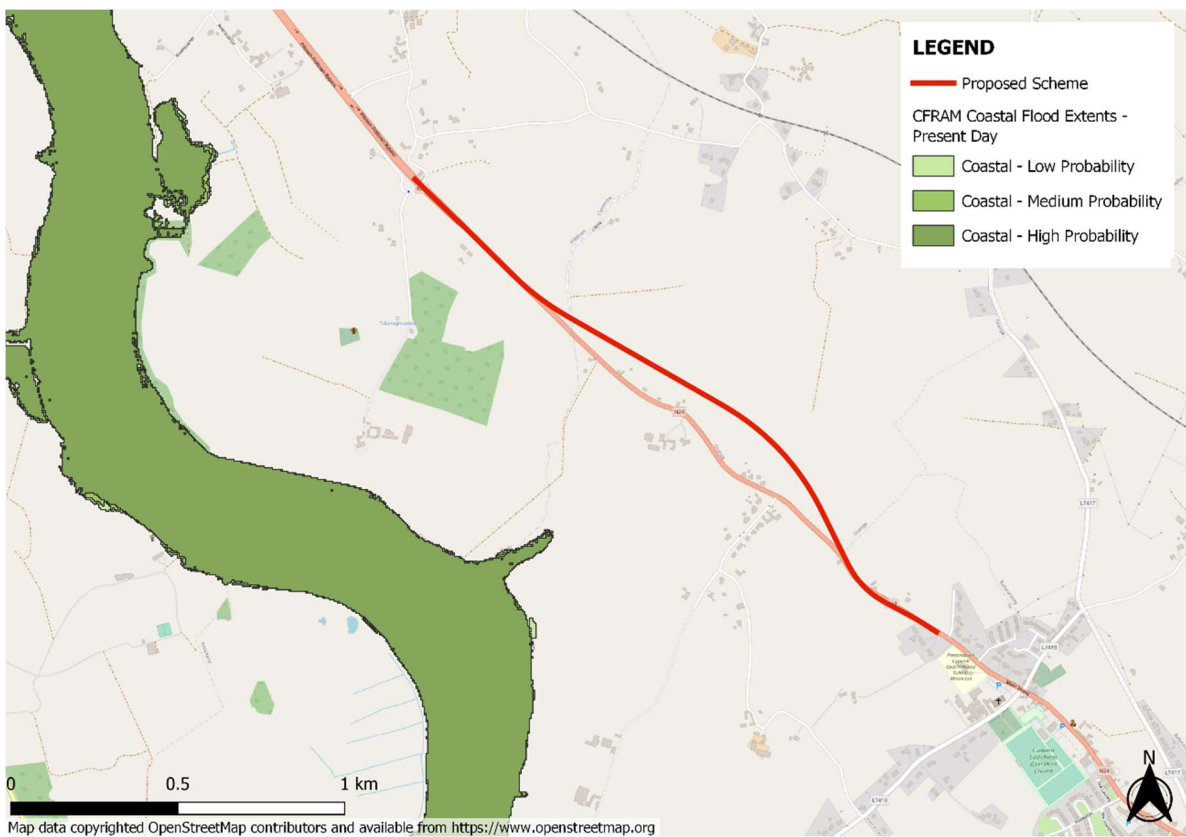


Figure 3-9: CFRAMS Coastal Flood Extent – Present Day

SECTION 4: Flood Risk Assessment

4.1 Introduction

As outlined in Section 2 of this report the FRM guidelines identify three stages of Flood Risk Assessment namely:

- Stage 1: Flood Risk Identification
- Stage 2: Initial Flood Risk Assessment
- Stage 3: Detailed Flood Risk Assessment

4.2 Flood Risk Identification

According to the FRM Guidelines, flood risk identification is the process for deciding whether a plan or project requires further investigation. This is a desk-based exercise based on existing information. All the existing information is described in Section 3 and the identification of flood risk from each of the five sources of flooding (coastal, fluvial (river), groundwater, pluvial (rainfall) and from artificial drainage systems) is considered.

Coastal Flood Risk

The Coastal CFRAMS Map in Figure 3-9 indicates that the proposed development site lies outside of the 0.1% AEP coastal flood event and hence is located within **Flood Zone C** for Coastal flood risk, where the risk of flooding is low.

Fluvial Flood Risk

The Fluvial CFRAMS Map in Figure 3-8 indicates that the proposed development site lies outside of the 0.1% AEP fluvial flood event and hence is located within **Flood Zone C** for Fluvial flood risk, where the risk of flooding is low. The OPW Summary Local Area Report shows one record of recurring flooding event at the proposed site.

Groundwater Flood Risk

The aquifer vulnerability map (refer to Figure 3-4) classifies the site as having low to moderate vulnerability which indicates a low water table and hence low risk of groundwater related flooding. Additionally, there is no historical evidence of groundwater flooding at the site. There is one well located close to the site for which the well type is unknown. Groundwater risk is however not considered to be significant.

There is no historical evidence of groundwater flooding near proposed development as assessed from GSI's online viewer².

Pluvial Flood Risk

The OPW Summary Local Area Report shows records of previous recurring pluvial related flooding at the site. These floods were as a result of heavy rainfall in low lying land with poor soakage. It is believed that the drainage design of the proposed development will alleviate any future pluvial flooding at this location.

2

<https://dcenr.maps.arcgis.com/apps/webappviewer/index.html?id=848f83c85799436b808652f9c735b1cc>

Artificial Drainage Systems Flood Risk

There have been no records of any flooding caused by artificial drainage at the vicinity of the site.

4.3 Initial Flood Risk Assessment

The Flood Risk Assessment has identified that there is a low flood risk to the development on site. Under the sequential approach identified in the FRM Guidelines a three-step approach is required to confirm the appropriateness of the development in terms of flood risk.

4.3.1 Step 1: Identification of the Flood Zone at the proposed development site

Using the Flood Zone criteria from the FRM Guidelines and as defined in Section 2 previously, the flood zone for the site was determined.

- **Flood Zone A** – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 year 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 year and 1% or 1 in 100 year for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 year 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).

As discussed in Section 4.2 above, the proposed development site lies within **Flood Zone C** – where risk of flooding is lowest.

4.3.2 Step 2: Identification of the vulnerability of the type of the proposed development (Table 3.1 of the FRM Guidelines)

The different types of proposed infrastructure are then assigned a vulnerability classification according to the definitions in 'Table 3.1 – Classification of vulnerability of different types of development' of the FRM Guidelines.

As described in Section 1.2 above, the proposed development is for local transport infrastructure. This is classified as 'less vulnerable development'.

4.3.3 Step 3: Using the matrix of vulnerability versus Flood Zone (Table 3.2 of the FRM Guidelines), identify the necessity for the justification test for the proposed development

The proposed development site is located in Flood Zone C and is categorised as Highly Vulnerable Development. Table 3.2 of the FRM guidelines and Figure 3.2 – Sequential approach mechanism in the planning process (FRM guidelines) stipulate that a justification test is not required for such a development and is deemed appropriate development for the flood zone categories. Table 4-1 below highlights the matrix of vulnerability versus flood zone.

Table 4-1: Matrix of Vulnerability & Flood zone to Illustrate Appropriate Development (Table 3.2 of the FRM Guidelines)

	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

4.4 Detailed Flood Risk Assessment

Following from Stage 2 – Initial Flood Risk Assessment, it was determined that there is no requirement to undertake a detailed flood risk assessment on the N24 Scheme. The vulnerability matrix as shown in Table 4-1 identifies that there is no need for a Justification Test to be undertaken.

SECTION 5: Conclusions

5.1 Summary of Results

A flood risk assessment for the proposed N24 Carrick Road Improvement Scheme, Co. Kilkenny has been undertaken in accordance with the methodology recommended in the FRM Guidelines. The following is the summary of the flood risk assessment:

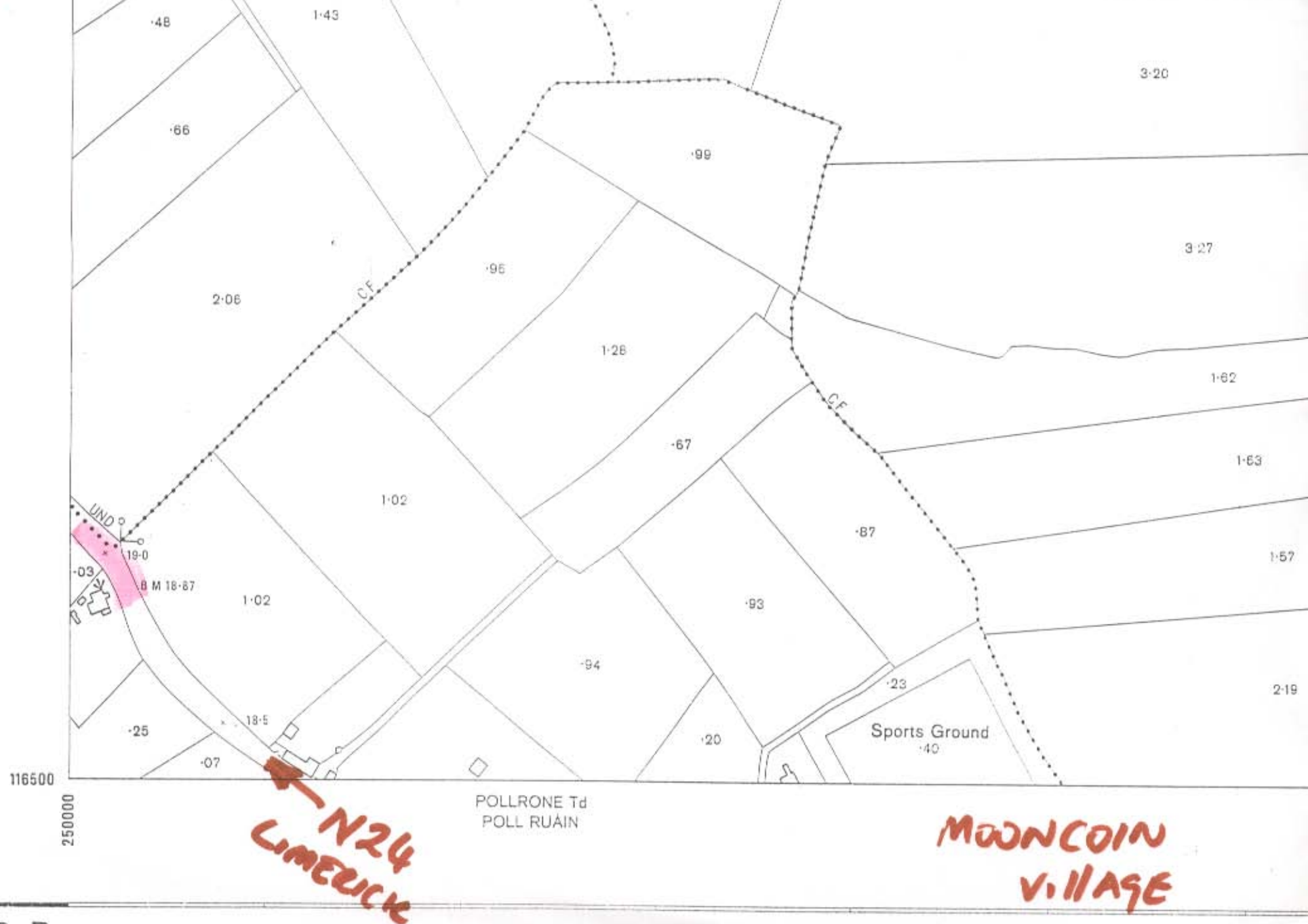
- The River Suir flows in a south easterly direction and is located southwest of the proposed scheme. Historical flood data gathered from www.floodmaps.ie has indicated that the river flooded historically on-site and there is a history of flooding downstream of the site. Historic flooding along the N24 resulted from periods of heavy rainfall in low lying land with poor soakage. Detailed drainage design of the proposed scheme will alleviate any potential pluvial flooding risks at this location.
- The CFRAMS Maps indicate that the site is outside the extents of fluvial and coastal flooding. All infrastructure will be constructed where there is no risk of flooding. Therefore, the site lies within **Flood Zone C**.
- The type of development is defined as 'Less Vulnerable Development'. Using the sequential approach mechanism, it is assessed that a justification test is not required for the proposed development.

Appendix A: Flood Map Reports

②

3

SS63-B



SS64-C

DÚNGOOLY TD
DÚN gCUAILLE

5564-D



IS I MEADAIR A THUGTAR AIRDE DE RÉIR LÍNE THAGRA NA SUIRBHEIREACHTA ORDANAÍS,
IS É SIN, MEANLEIBHÉAL NA MARA, AG CIONN MHALANNA, CONTAE DHÚN NA nGALL
(CEARTÚ 1970)

ALTITUDES ARE GIVEN IN METRES AND ARE REFERRED TO ORDNANCE SURVEY DATUM WHICH IS MEAN SEA LEVEL AT MALIN HEAD. Cf. DOMFOL (1970) ADJUSTMENT.

Is í heicteoir a thugtar na faoi ar go cruinn
na ar IMFAL I GACH PLEAN.

AN EANGACH NÁISIUNTA

AN EANGACH NAISIUNTA
DIAGRAM OF NATIONAL GI

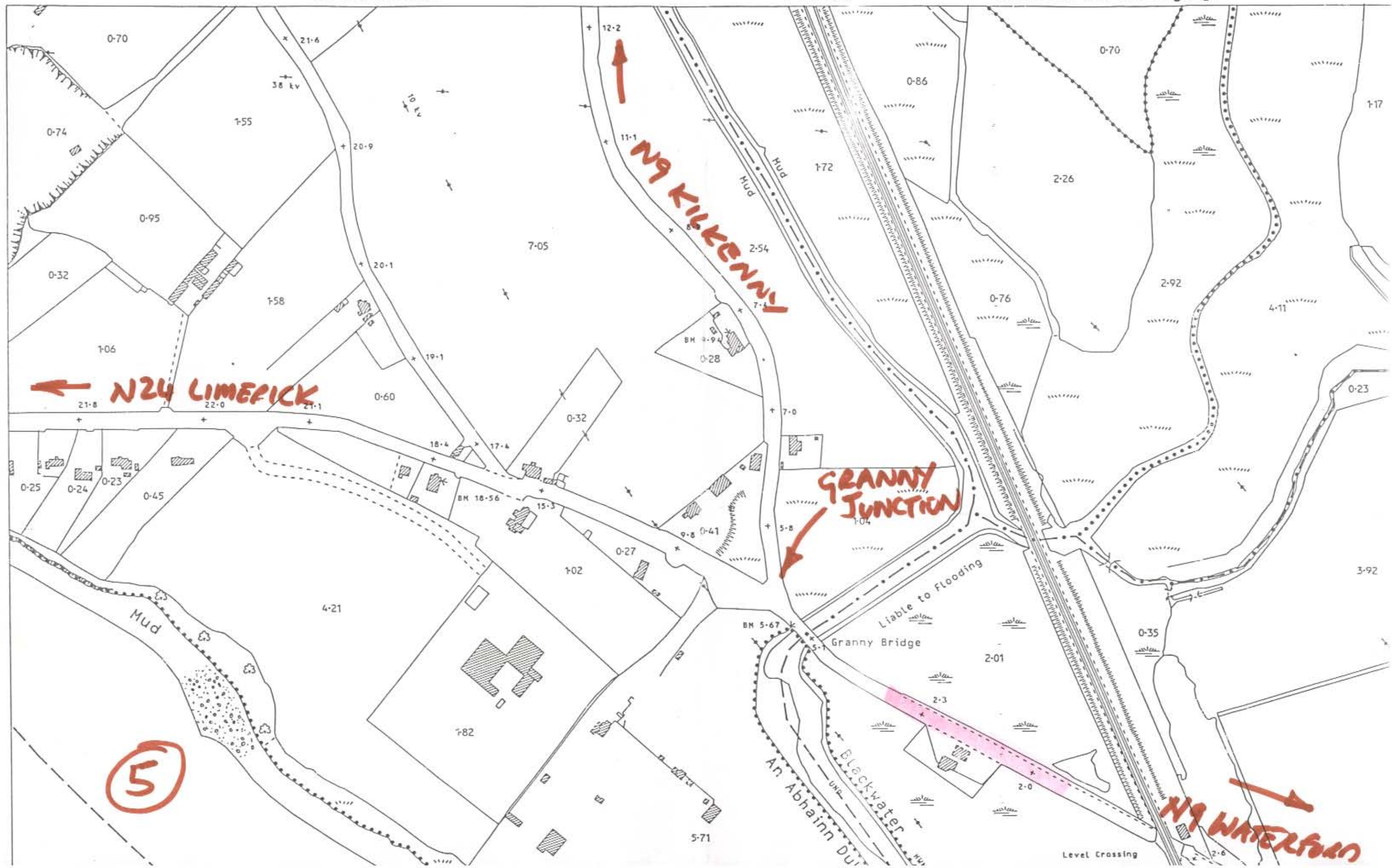
5631-B

GRANNY Td
An Ghreanach

DUNKITT Td
Dún Cit

STRANGSMILL Td
Muileann an Strangaigh

5565-D





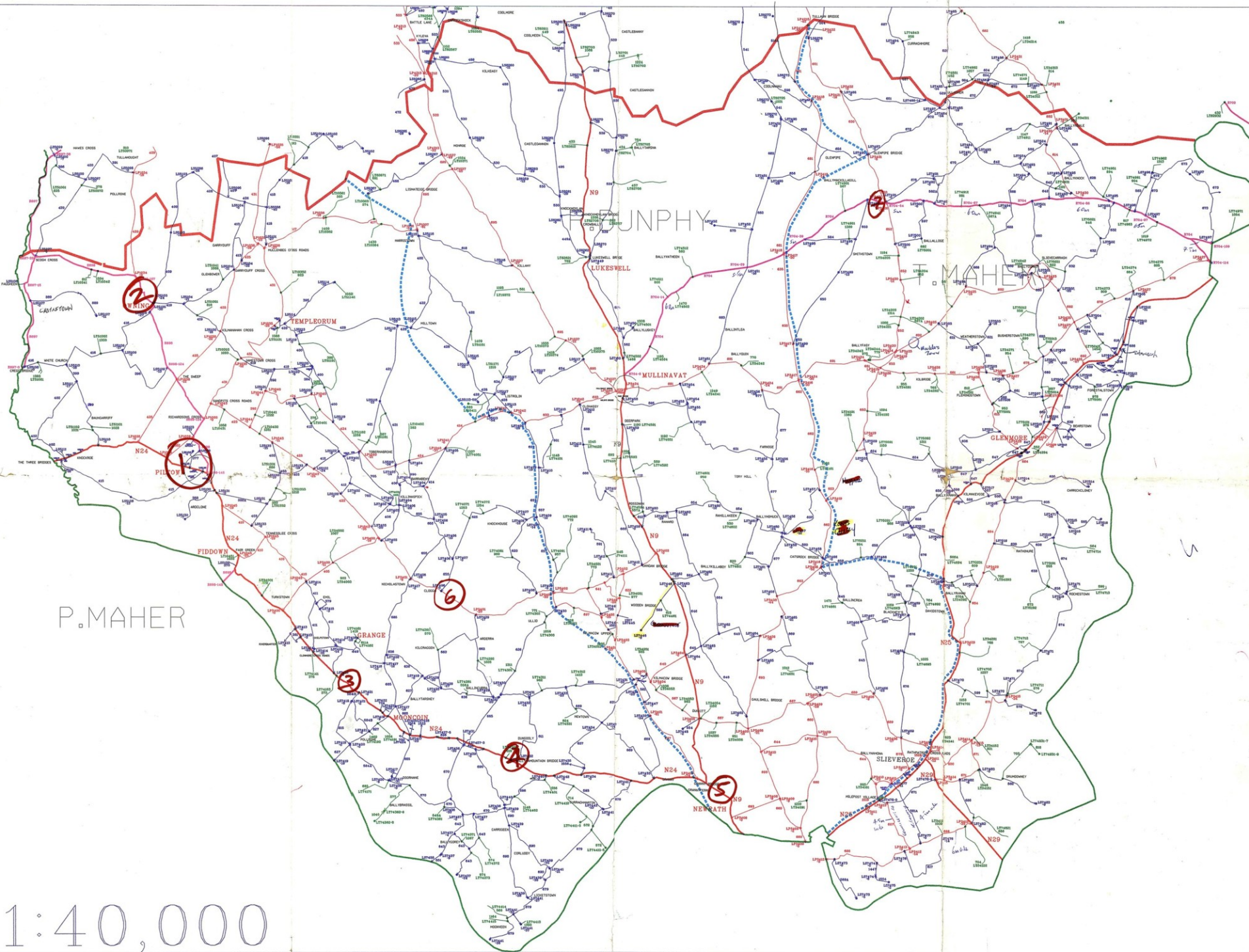
SMITHSTOWN TP
(E.D. Jerpoint West)

ces indicating that the spaces so

Published by the Director General at the Ordnance Survey Office, Phoenix Park, Dublin, 1902

7

36-12



P. MAHER

1:40,000

Newrath Area:-List of area's that flood and require alleviation works.

No	Location	Contributing Factors	Impact of Flooding	Frequency of Floods per year	Remarks
1	1) Piltown village Old N24 main street 2) Piltown village, Creamery road *** The river Pil flows thro' the village at the above locations	1) High Tides 2) South-easterly winds 3) Heavy Rainfall	1) Road impassable 2) 6 residential properties effected (RP) 3) 4 commercial properties effected (CP) (Damage ranging from ground floor level of RP and store areas & working platforms of CP flooding, & also farmland and gardens flooding)	1) Level One six times / yr 2) Level Two four times / yr	1) The Pil river is a tributary of the river Suir. 2) The Pil river is tidal. 3) Level One flooding only effects farmland & rear gardens. 4) Pil River Drainage Report Preliminary Report prepared by KCC & sent to OPW seeking an expert study and works to be carried out (08/12/02) Copy available if required
2	1) Owing village, on R696 at new graveyard (Stream)	1) Sustained period of heavy rainfall	1) Road impassable	1) 2 -4 times / yr	1) Bridge capacity unable to cater for demand during flash floods
3	2) Pollrone, just outside Mooncoin village along the N24 (no stream)	1) Sustained period of heavy rainfall	2) Road flooded but not impassable	1) 2 -4 times / yr	1) Low lying area, poor soakage 2) Main Waterford - Limerick Road
4	1) Ballymountain bridge, between Mooncoin and Grannagh junction along the N24 (Stream)	1) Sustained period of heavy rainfall	1) Road impassable (LS.7432) 2) 2 residential properties effected (RP) (Damage ranging from RP ground floor level and gardens flooding)	1) 1 -2 times / yr	1) I have written to NIWA, requesting that he investigate the capacity of the bridge 2) Landowners down stream of the bridge have been requested to maintain the watercourse within their land 3) Main Waterford - Limerick Road
5	1) Newrath at Redbridge Garage on the N9 (River Suir)	1) High Tides 2) South-easterly winds 3) Heavy Rainfall 4) Unauthorised reclamation of river beds at this location 5) Unauthorised Development Redbridge Garage, Forecourt and shop area substantially raised	1) Road impassable 2) 1 commercial property effected (CP)	1) up to six times / yr	1) Main Waterford - Dublin Road 2) Main Waterford - Limerick Road 3) I believe this location is subject to a Planning & Environmental investigation
6	1) Clogga Mooncoin 2) Clogga Mooncoin (Stream)	1) Sustained period of heavy rainfall	1) Road impassable 2) Farmland flooded	1) 2 -4 times / yr	1) Bridge / culvert capacity unable to cater for demand during flash floods
7	1) The river Arrigle, just west of Listerlin village along the R704	1) Sustained period of heavy rainfall	1) Road impassable 2) Farmland flooded	1) 2 -4 times / yr	1) Bridge capacity unable to cater for demand during flash floods 2) Watercourse needs maintenance