ARUP

Reside (Castlepark) Ltd

Castlepark, Castlelands, Mallow, Co. Cork

Flood Risk Assessment

Reference: 305321-ARUP-ZZ-XX-RP-CF-000001

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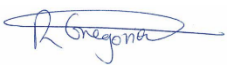
		Signature			
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1. Introduction

1.1 Project background

Arup have been engaged by Reside (Castlepark) Ltd to prepare a site-specific Flood Risk Assessment (FRA) to support an LRD application for the proposed development at Castlepark, Castlelands, Mallow, Co. Cork.

This FRA has been undertaken in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' published in November 2009, jointly by the Office of Public Works (OPW) and the then Department of Environment, Heritage and Local Government (DEHLG), herein referred to as the guidelines.

1.2 Scope of the study

The scope of this study is to provide an FRA for the proposed development at Castlepark, Castlelands, Mallow, Co. Cork The scope includes the following;

- Confirmation of the sources of flooding which may affect the site;
- A qualitative assessment of the risk of flooding to the site and to adjacent sites as a result of the proposed development;
- Review of the availability and adequacy of existing information; and
- Identification of possible measures which could mitigate flood risk to acceptable levels.

1.3 Summary of data used

Data regarding flood risk relevant to the proposed development and surrounding area has been obtained from the following sources:

- Cork County Development Plan 2022 - 2028 (https://www.corkcoco.ie/en/resident/planning-and-development/cork-county-development-plan-2022-2028)
- South Western CFRAM Hydrology and Hydraulics Reports and predictive flood extent mapping (https://www.floodinfo.ie);
- Flood history of the site from the OPW National Flood Hazard Mapping website (https://www.floodinfo.ie);
- Hydrological and hydraulic assessments of the River Blackwater catchment undertaken for the Mallow Flood Relief Scheme;
- Geological Survey of Ireland maps;
- Historical maps.

All levels referred to in this report are to Malin Head Ordnance Datum, unless otherwise indicated.

1.4 Site Location

The proposed development is located at a greenfield site on the southeast of Mallow Town, at approximate National Grid Reference E: 157125, N: 098604. The location of the proposed development is shown in Figure 1.

The proposed development site is circa 18.2 hectares in area, shown within the redline boundary in Figure 1 below. The site is located approximately 100m north of the Blackwater River.

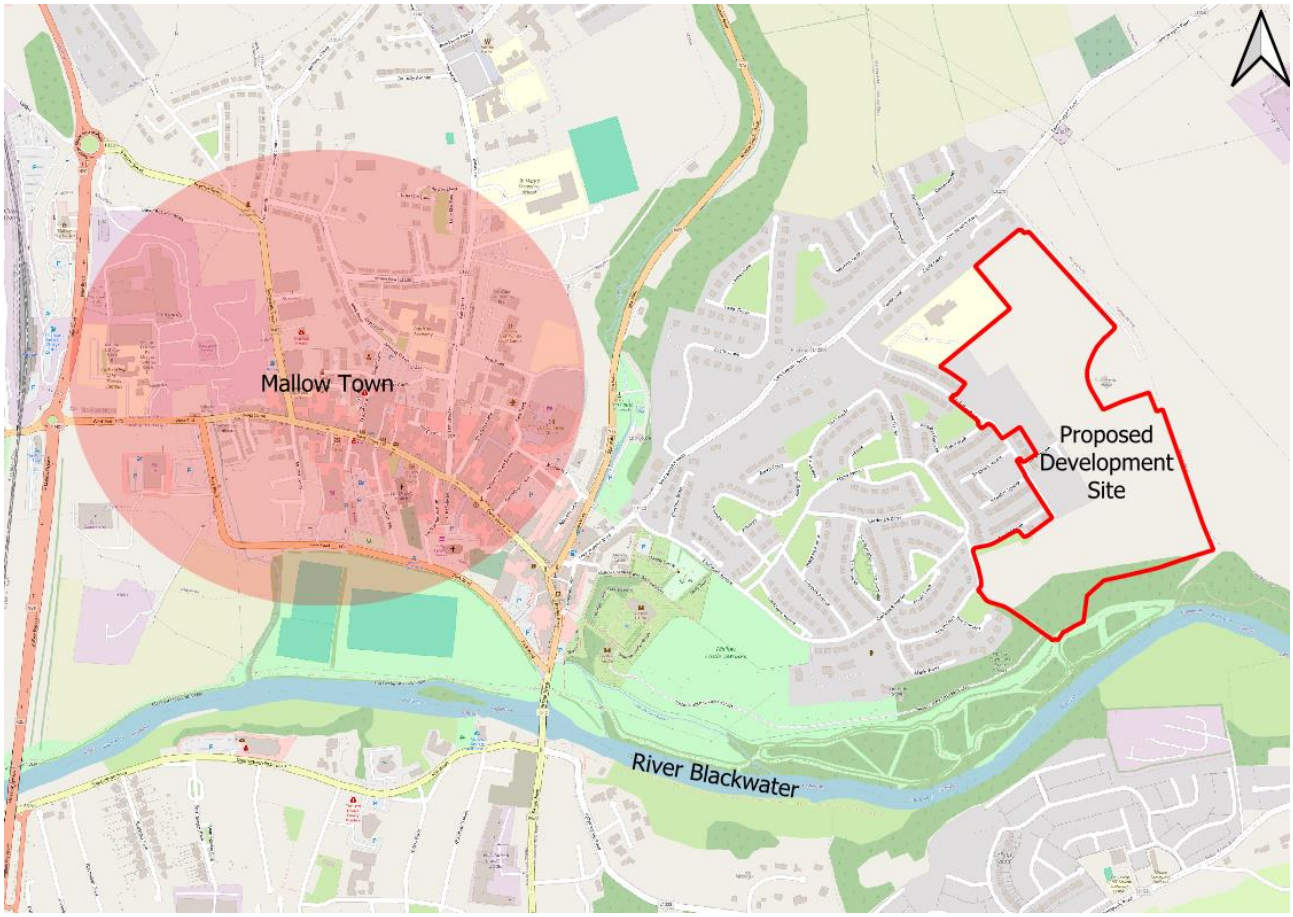


Figure 1 Site Location (© Open Street Map (and) contributors)

1.5 Site Description

The proposed residential development will be located on a greenfield site that is currently undeveloped. The proposed Large Scale Residential Development comprises the construction of 469 no. residential units, a creche, a interpretive centre/café, and all associated site development works at Castlepark, Castlelands (townland), St Jospeh's Road, Mallow, Co. Cork.

The topography of the existing site comprises of a steep southwards slope towards the Blackwater River. Levels vary from +87.5mOD along the north boundary +43mOD at its southern extremity.

1.5.1 Hydrology and Surface Water Features

The River Blackwater flows in an easterly direction approximately 100m south of the site. The river flows underneath the N20 road to the southwest of the site and is joined by the Baltydaniel and Caherduggan/Spa stream before flowing south of the site.

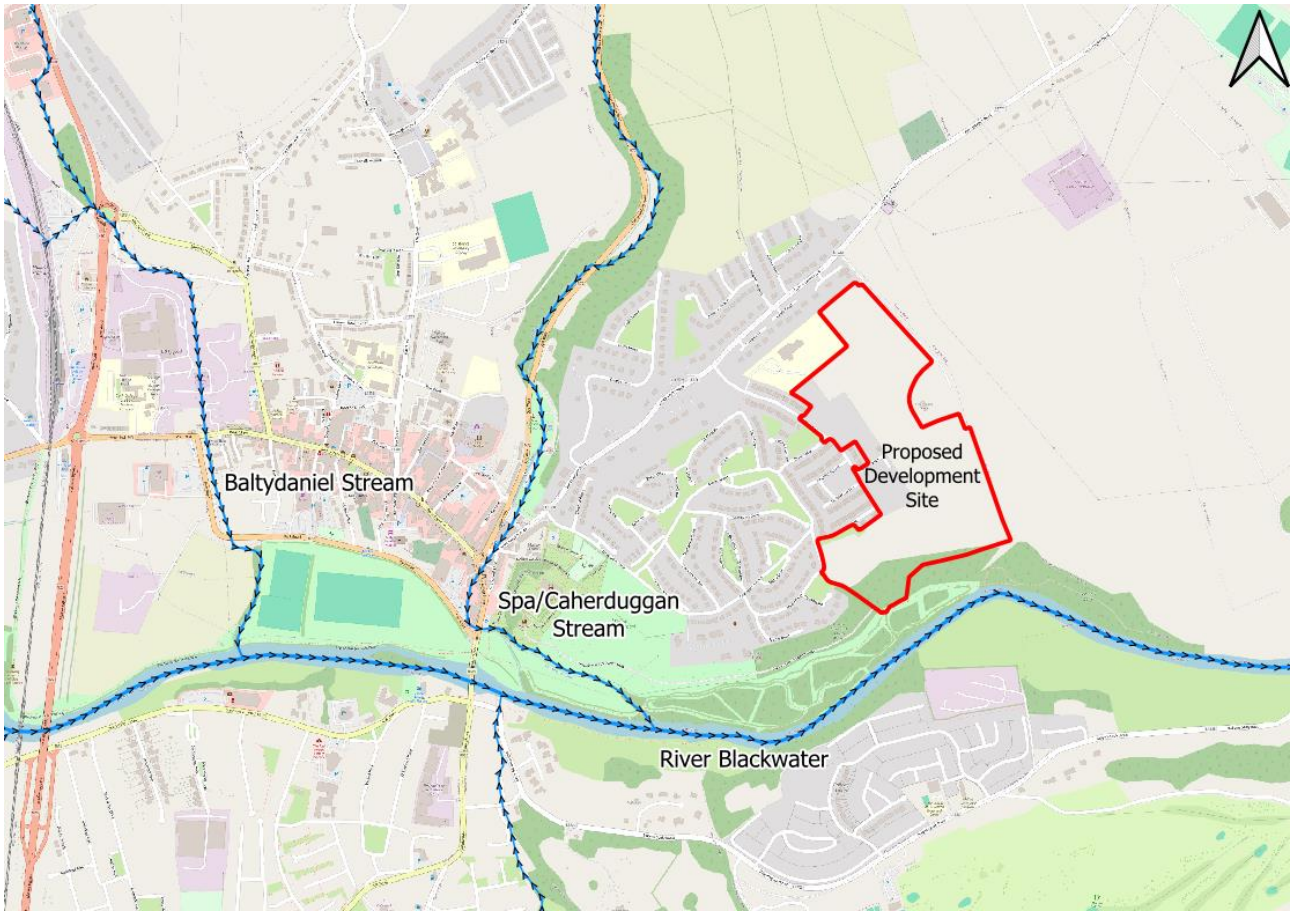


Figure 2 Surrounding Hydrological Features

1.5.2 Geology and Hydrogeology

Review of the GSI mapping shows that the site is underlain by Dinantian pure unbedded limestone which is a Regionally Important karstified bedrock aquifer (RKD) dominated by diffuse flow. This type of bedrock is highly productive, and groundwater can travel over large distances through the karstified faults and joints. The nearest Geological Survey Ireland (GSI) mapped karst feature is approximately 500m west of the site near the N72, at an elevation below +50mOD. The groundwater vulnerability at the site is generally classified as extreme with a small section classified as highly vulnerable.

Due to the karstified nature of the bedrock, the local groundwater flow direction may not reflect the topography, however the regional groundwater flow direction will likely be towards rivers. Therefore, the groundwater flow direction beneath the site is assumed to be south towards the River Blackwater.

The Teagasc Soil map indicates that the soil at the site is predominantly shale and sandstone till (Namurian) with a section noted to be calcareous bedrock at the surface. The map categorises the majority of the soil at the site as 'Deep well drained mineral' with the bedrock section categorised as "Shallow well drained mineral". The Teagasc Soil map indicates that the soil is derived from mainly non-calcareous parent materials.

The subsoil permeability within the majority of the site boundary is not mapped on the GSI Spatial Resources. A small section of the site's western boundary is noted as having 'Moderate' permeability.

The GSI Maps are included in Appendix A.1.

1.5.3 Existing Surface Water Drainage

There is no formal surface water drainage system within the site. Surface water will infiltrate to ground during low intensity rainfall events and flows overland to the River Blackwater during higher intensity events. The Surface Water Management Plant prepared by DOSA Consulting Engineers notes the presence of existing ditches within the site.

An existing stormwater network is located on the western boundary of the proposed development laid within the existing estate along Kingsfort Avenue, Maple Square and Maple Avenue which outfalls directly into the River Blackwater.

1.6 The Proposed Development

The planning description relating to the proposed development is as follows:

- The proposed residential development will be located on a greenfield site that is currently undeveloped. The proposed Large Scale Residential Development comprises the construction of 469 no. residential units, a creche, a interpretive centre/café, and all associated site development works at Castlepark, Castlelands (townland), St Jospeh's Road, Mallow, Co. Cork
- The architectural proposals can be found in Appendix A.5.

2. Planning Context

2.1 Introduction

The following planning policy documents are relevant to the flood risk assessment of this proposed development:

- The Planning System and Flood Risk Management Guidelines for Planning Authorities jointly published in 2009 by the then Department of Environment, Heritage and Local Government and the Office of Public Works;
- The Cork County Development Plan 2022-2028 and accompanying Strategic Flood Risk Assessment (SFRA).

2.2 The Planning System and Flood Risk Management

In November 2009, the Department of Environment, Heritage and Local Government and the Office of Public Works jointly published a Guidance Document for Planning Authorities entitled 'The Planning System and Flood Risk Management'.

The guidelines are issued under Section 28 of the Planning and Development Act 2000; and Planning Authorities and An Bord Pleanála are therefore required to implement these Guidelines in carrying out their functions under the Planning Acts.

The aim of the guidelines is to ensure that flood risk is neither created nor increased by inappropriate development. The guidelines require the planning system to avoid development in areas at risk of flooding, unless they can be justified on wider sustainability grounds, where the risk can be reduced or managed to an acceptable level.

They require the adoption of a Sequential Approach (to Flood Risk Management) of Avoidance, Reduction, Justification and Mitigation and they require the incorporation of Flood Risk Assessment into the process of making decisions on planning applications and planning appeals. Fundamental to the guidelines is the introduction of flood risk zoning and the classifications of different types of development having regard to their vulnerability. The management of flood risk is now a key element of any development proposal in an area of potential flood risk and should therefore be addressed as early as possible in the site master planning stage.

2.2.1 Definition of Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range.

There are three types of flood zones defined in the guidelines as follows:

Table 1 Flood zone categories

Zone category	Description
Flood Zone A	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	Probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 year 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).
Flood Zone C	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 areas of the plan which are not in zones A or B.

2.2.2 Definition of Vulnerability Classes

The following table summarises the Vulnerability Classes defined in the Guidelines and provides a sample of the most common type of development applicable to each.

Table 2 Vulnerability classes

Vulnerability Class	Land Uses and Types of Development which include;
Highly Vulnerable Development	Includes Garda, ambulance and fire stations, hospitals, schools, residential dwellings, residential institutions, essential infrastructure, such as primary transport and utilities distribution and SEVESO and IPPC sites, etc.
Less Vulnerable Development	Includes retail, leisure, warehousing, commercial, industrial and non-residential institutions, etc.
Water Compatible Development	Includes Flood Control Infrastructure, docks, marinas, wharves, navigation facilities, water based recreation facilities, amenity open spaces and outdoor sport and recreation facilities.

2.2.3 Sequential Approach and Justification Test

The Guidelines outline the sequential approach that is to be applied to all levels of the planning process. This approach should also be used in the design and layout of a development and the broad philosophy is shown in Figure 3. In general, development in areas with a high risk of flooding should be avoided as per the sequential approach.

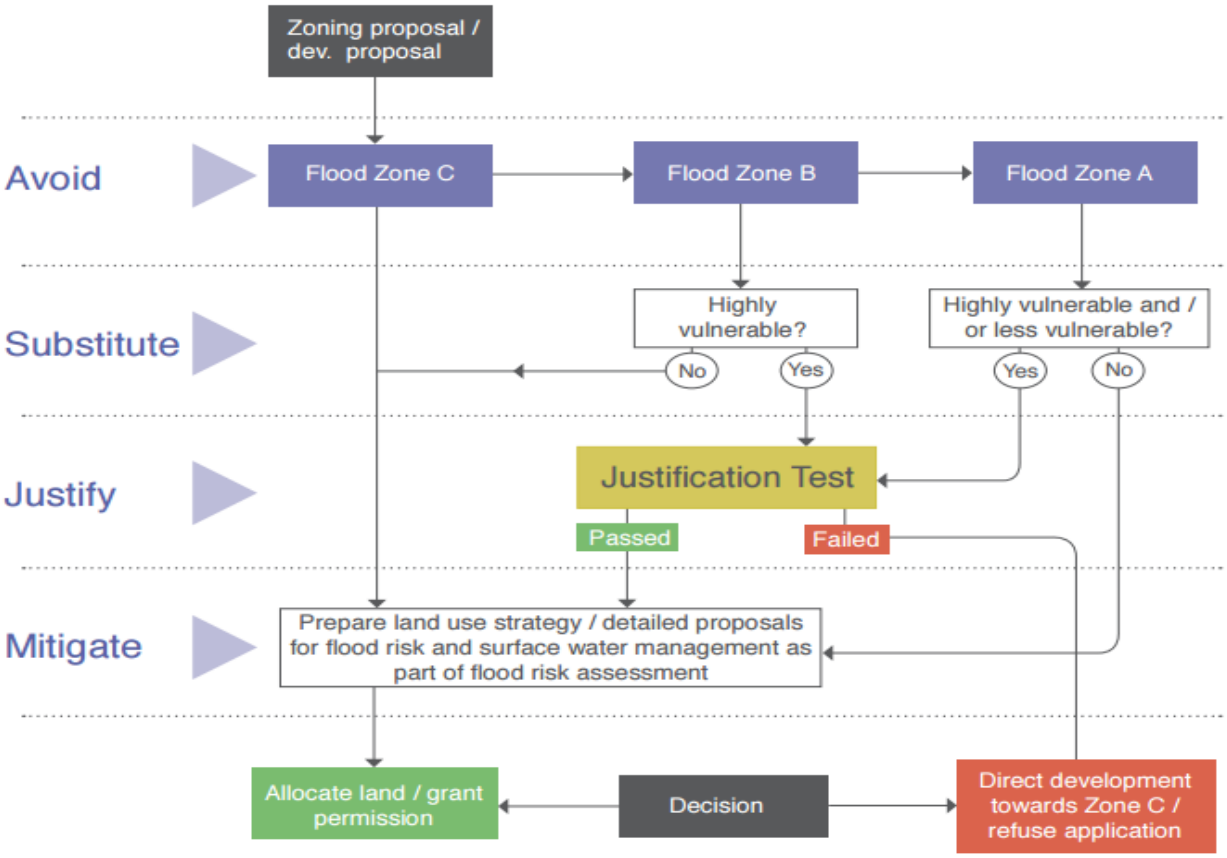


Figure 3 Sequential approach (reproduced from The Guidelines)

The Justification Test has been designed to rigorously assess the appropriateness, or otherwise, of developments that are being considered in areas of moderate or high flood risk. The test comprises the following two processes.

- The first is the Plan-making Justification Test and is used at the plan preparation and adoption stage where it is intended to zone or otherwise designate land which is at moderate or high risk of flooding.

- The second is the Development Management Justification Test and is used at the planning application stage where it is intended to develop land at moderate or high risk of flooding for uses or development vulnerable to flooding that would generally be inappropriate for that land.

Table 3 illustrates the different types of Vulnerability Class appropriate to each zone and indicates where the Justification Test is required.

Table 3 Vulnerability classes

	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable	Justification Test	Justification Test	Appropriate
Less Vulnerable	Justification Test	Appropriate	Appropriate
Water Compatible	Appropriate	Appropriate	Appropriate

2.3 Cork County Development Plan 2022 – 2028

On Monday 6th June 2022, the Cork County Development Plan 2022-2028 came into effect, replacing the following:

- The Cork County Development Plan, 2014;
- The 8 Municipal District Local Area Plans adopted in 2017;
- The 9 Town Development Plans of former Town Council Towns.

The Plan contains policies, objectives, and overall strategy to guide future growth and development in the County. As part of the Cork County Development Plan, Mallow is identified as a Key Town in the Regional Spatial and Economic Strategy for the Southern Region. The proposed development site is predominantly located within the Mallow town residential zone, site number MW-R-01.

The following objectives relevant to flood risk are set out in Volume 1, Chapter 11, of the Cork County Development Plan.

Table 4 Water management objectives relevant to flood risk, CCDP 2022-2028

Objective	Details
WM11-10	Require that all new developments incorporate sustainable drainage systems (SuDS). Efforts should be taken to limit the extent of hard surfacing and impermeable paving. Encourage the application of a Water Sensitive Urban Design approach in the design of new development or other urban interventions. Opportunities to contribute to, protect or re-enforce existing green infrastructure corridors or assets should be maximised. Optimise and maximise the application of Sustainable Urban Drainage Systems (SuDS) to mitigate flood risk, enhance biodiversity, protect and enhance visual and recreational amenity; all in the most innovative and creative manner appropriate and in accordance with best practices. Proposals should demonstrate that due consideration has been given to nature based solutions in the first instance in arriving at the preferred SuDS solution for any development. Provide adequate storm water infrastructure in order to accommodate the planned levels of growth expected for the County. Where surface water from a development is discharging to a waterbody, appropriate pollution control measures (e,g, hydrocarbon interceptors, silt traps) should be implemented. The capacity and efficiency of the national road network drainage regimes will be safeguarded for national road drainage purposes.
WM11-14	Strategic Flood Risk Management Support the implementation of: the EU Flood Risk Directive (20010/60/EC) on the assessment and management of flood risks, the Flood Risk Regulations (SI No 122 of 2010), the Guidelines on 'The Planning System and Flood Risk Management' (2009) and the recommendations of the South Western CFRAM study. Application of the flood policies of this Plan shall be fully informed by the recommendations contained in the updated Strategic Flood Risk Assessment (June 2022) accompanying the Plan, including the conclusions of Justification Tests contained therein.
WM11-15	Flood Risk Assessments To require flood risk assessments to be undertaken for all new developments within the County in accordance with The Planning System and Flood Risk Management – Guidelines for Planning Authorities (2009) and the requirements of DECLG Circular P12/2014 and the EU Floods Directive. For sites within Flood Zone A or B, a site-specific Flood Risk Assessment will be required. For sites within Flood Zone C, an examination of all potential sources of flooding, and consideration of climate change (flood risk screening assessment), will be required. In limited circumstances where the 'Flood Risk Screening assessment' identifies potential sources of flood risk, a site-specific flood risk assessment may also be required. All proposed development must consider the impact of surface water flood risks on drainage design through a Drainage Impact Assessment. The drainage design should ensure no increase in flood risk to the site, or the downstream catchment.
WM11-16	Flood Risks – Overall Approach Take the following approach in order to reduce the risk of new development being affected by possible future flooding: Avoid development in areas at risk of flooding; and Apply the sequential approach to flood risk management based on avoidance, substitution, justification and mitigation of risk. Where development in floodplains cannot be avoided, applications for development must meet the definition of Minor Development or have passed the Justification Test for Development Plans in the updated SFRA and can pass the Justification Test for Development Management to the satisfaction of the planning authority. Consider the impacts of climate change on the development. In areas where the Justification Test for Development Plans has not been applied, or has been failed, the sequential approach should be applied as follows:

Objective	Details
	In areas where there is a high probability of flooding-'Flood Zone A' – avoid highly and less vulnerable development as described in Section 3 of 'The Planning System and Flood Risk Management – Guidelines for Planning Authorities' issued in November 2009 by DoEHLG. In areas where there is a moderate probability of flooding - 'Flood Zone B' - avoid 'highly vulnerable development' described in section 3 of 'The Planning System and Flood Risk Management – Guidelines for Planning Authorities' issued in November 2009 by DoEHLG. In areas where there is low probability of flooding – 'Flood Zone C' all uses may be considered subject to a full consideration of all flood risks.
WM11-17	Development in Flood Risk Areas When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2 of the Guidelines, the following criteria must be satisfied: 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. The proposal has been subject to an appropriate flood risk assessment that demonstrates: The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk; The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible; 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 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 predicted future use of the development and the local development context. The development is assessed not to have the potential to give rise to negative or adverse impacts on the integrity of Natura 2000 sites or Natural Heritage Areas or proposed Natural Heritage Areas.

The plan includes guidelines on climate change allowances, in accordance with OPW guidelines. For less vulnerable and highly vulnerable developments, a 20% increase to fluvial flows shall be allowed and 0.5m increase in sea level rise, if there is tidal influence. This is known as the Mid-Range Future Scenario (MRFS). For development described as critical infrastructure, higher allowances for climate change shall be allowed, referred to us the High End Future Scenario (HEFS).

2.4 County Cork Development Plan 2022-2028 Land Zoning

The County Cork Development Plan maps indicates that the proposed development is zoned as 'Residential.' The zoning objective (Objective No. MW-R-01) supports medium density residential development.

3. Flood Mechanisms and Historic Flooding at the Site

3.1 Potential Flood Mechanisms at the Site

The following potential sources of flood risk at the site were assessed;

- Fluvial flooding from the River Blackwater;
- Tidal flood risk is not applicable to the site due to the remoteness of the site from coastal waterbodies;
- Pluvial flooding/urban drainage may occur when the capacity of the local surface water drainage network or soil infiltration capacity is exceeded during periods of intense rainfall; and

- Groundwater flooding can occur during lengthy periods of heavy rainfall, typically during late winder/early spring when the groundwater table is already high. If the groundwater level rises above ground level, it can pond at local low points and cause periods of flooding.

3.2 Historic Flood Data

Records of historic floods were obtained from the OPW National Flood Hazard Mapping website, www.floodinfo.ie, and reports produced as part of the South Western CFRAM Study. The OPW Past Flood event Local Area report is included in Appendix A.2.

3.2.1 Historic Fluvial Flooding

There are numerous reports of flooding in Mallow outlined on the OPW National Flood Hazard Mapping website including events ranging from 1853 to 2021. However, no flood events include details relevant to the proposed development site. The South Western CFRAM study contains information on two fluvial flood events, December 1998 and November 2000, used in the calibration of the Mallow hydraulic model used as part of the development of the Mallow Flood Relief Scheme.

3.2.1.1 November 2009 Flood Event

Widespread flooding occurred in the River Blackwater catchment in the November 2009 event as a result of prolonged rainfall on an already saturated catchment. The flood report for this event on the OPW National Flood Hazard Mapping website includes an aerial photograph, reproduced in Figure 4, overlaid by the extent of flooding in Mallow Town.

Figure 4 Aerial photograph showing extent of flooding at Mallow Town during the November 2009 flood event.

The flood extent shown on this map do not extend to the proposed development. The proposed site is located to the east of the area shown within the OPW National Flood Hazard Map. This flood event was used in the calibration of the South Western CFRAM Study hydraulic model of the River Blackwater at Mallow.

3.2.1.2 November 2000 Flood Event

Two large flood events occurred on 5th and 6th November 2000. The second event caused flooding as the catchment was already saturated and river levels were high from the day before. This event was used in the calibration of the South Western CFRAM Study hydraulic model of Mallow with the flood extents

determined from aerial footage flown on 8th November 2000. An extract from the South Western CFRAM Study calibration map is shown in Figure 5. There are no records of the site being flooding during this event.

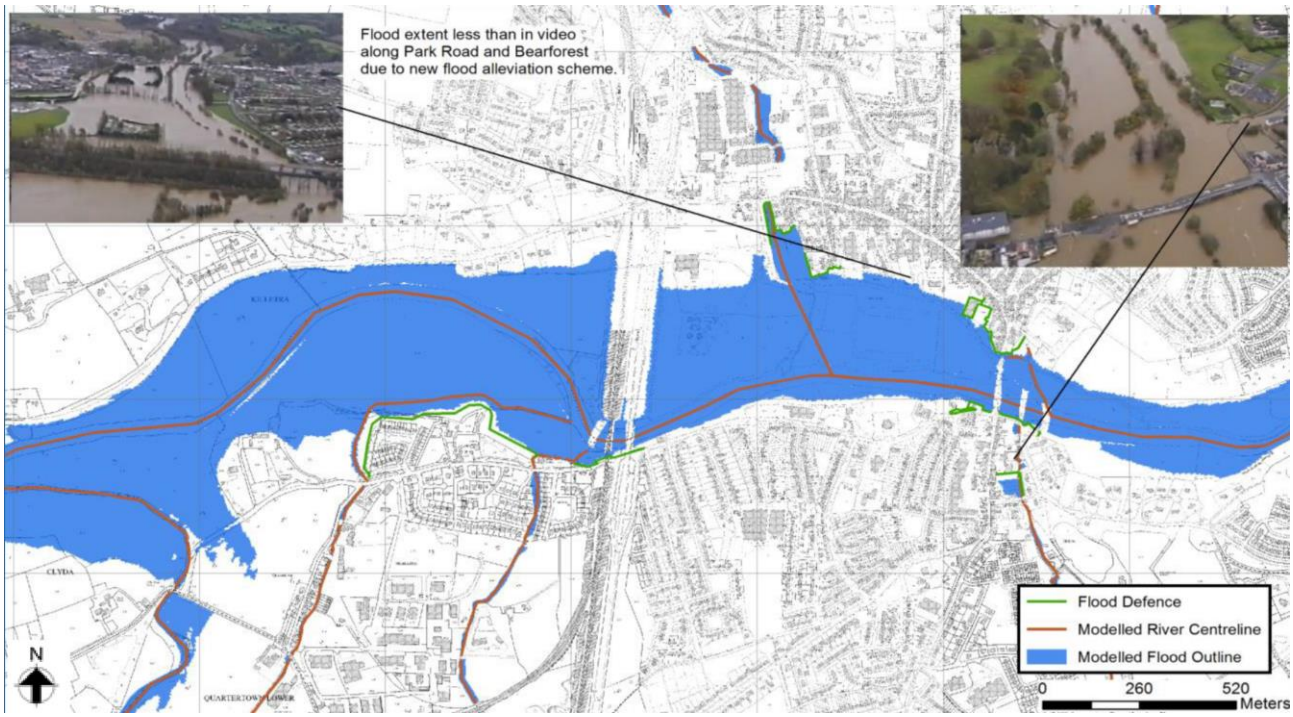


Figure 5 Extract from South Western CFRAM Study Map 5.6 – Calibration of Mallow Model to 6 November 2000 Event

3.2.1.3 December 1998 Flood Event

The flood event in Mallow on 30th December 1998 occurred as a result of high flows in the River Blackwater. There are no observed flood extents available for this event, however, as the event was used in the calibration of the South Western CFRAM hydraulic model, the indicative flood extents are available. An extract from the South Western CFRAM Study calibration map is shown in Figure 6. The highest recorded water level at the most eastern node, nearest to the proposed development was 46.03mOD. It is understood that the southern low lying part of the site would have flooded during this event, however there are no records available to confirm this.

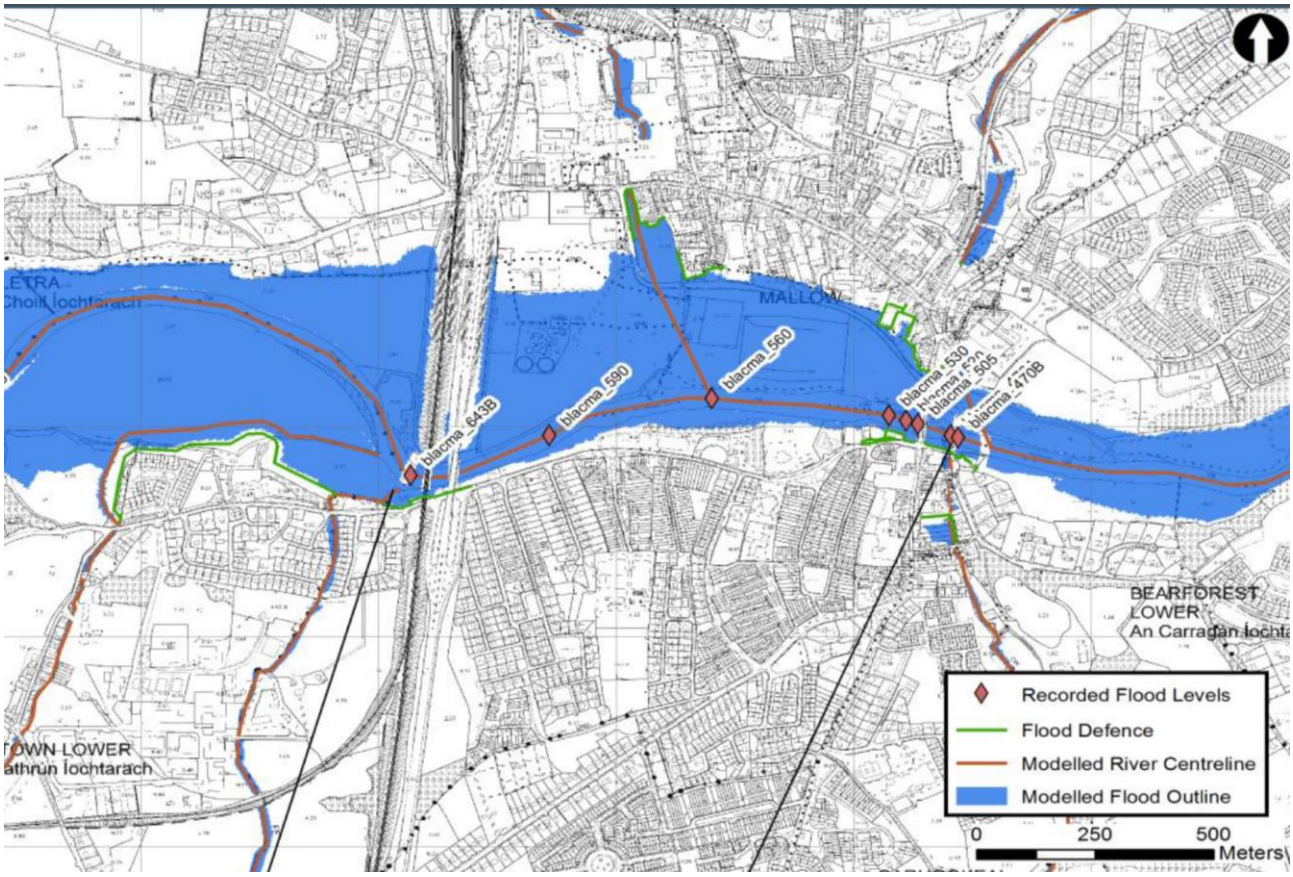


Figure 6 Extract from South Wester CFRAM Study Map 5.2 – Calibration of Mallow Model to 30 December 1998 Event.

4. Existing Flood Risk

4.1 Fluvial Flood Risk

4.1.1 South Western CFRAM Study

The South Western CFRAM study was undertaken in 2016, following completion of the Mallow Flood Relief Scheme. Refined hydrology parameters and further hydraulic modelling (which includes calibration against more recent flood events) has been subsequently taken into account as part of the South Western CFRAM Study which postdates the hydraulic modelling carried out as part of the Mallow Flood Relief Scheme. As such, the South Western CFRAM Study supersedes the Mallow Flood Relief Scheme modelling.

An extract from the South Western CFRAM Study fluvial flood extent map (current) is displayed in Figure 7 overlaid by the site boundary. The predicted flood extents for three separate return period events are presented on the map; 1 in 10, 100 and 1000 year fluvial flood extents (current). Refer to Appendix A.3 for a copy of the flood extent map from floodinfo.ie. Of note, the extent of these varying flood magnitudes in the vicinity of the site is very limited owing to naturally steep terrain around the river banks that does not permit much lateral spread of the floodwater at this location.

As shown in Figure 7, the majority of the site is in Flood Zone C, an area at low risk of flooding (less than 0.1% Annual Exceedance Probability - AEP). A small section of the site at the southern boundary is within Flood Zone A, indicating a high risk of flooding (more than 1% AEP). This section of the proposed development is a link path from the residential development to the riverside amenity path that is considered a water compatible use and, as such, appropriate for development in Flood Zone A. Figure 8 provides an overlay of the flood extents over the proposed site architectural plans.

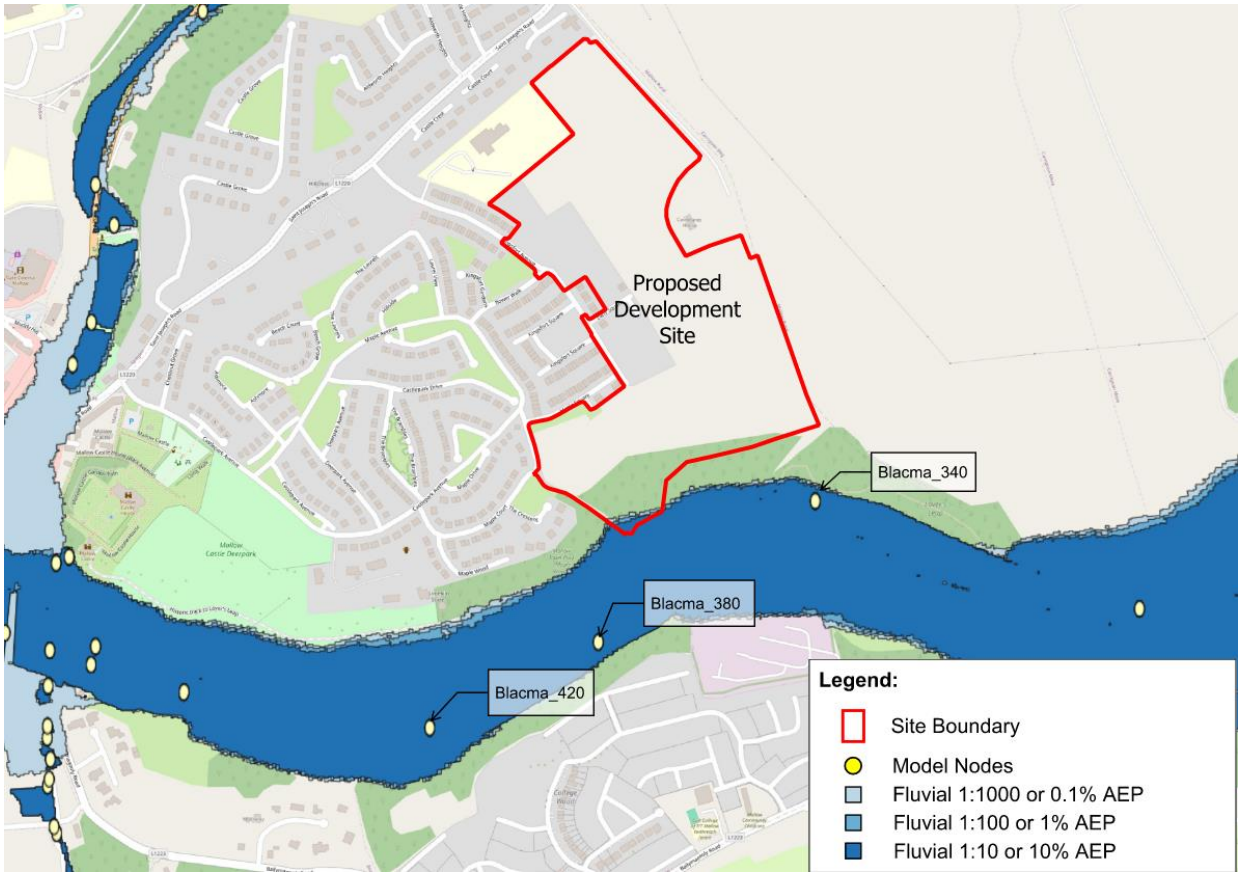


Figure 7 Extract from South Western CFRAM Study Fluvial Flood Extent Map, Current Scenario

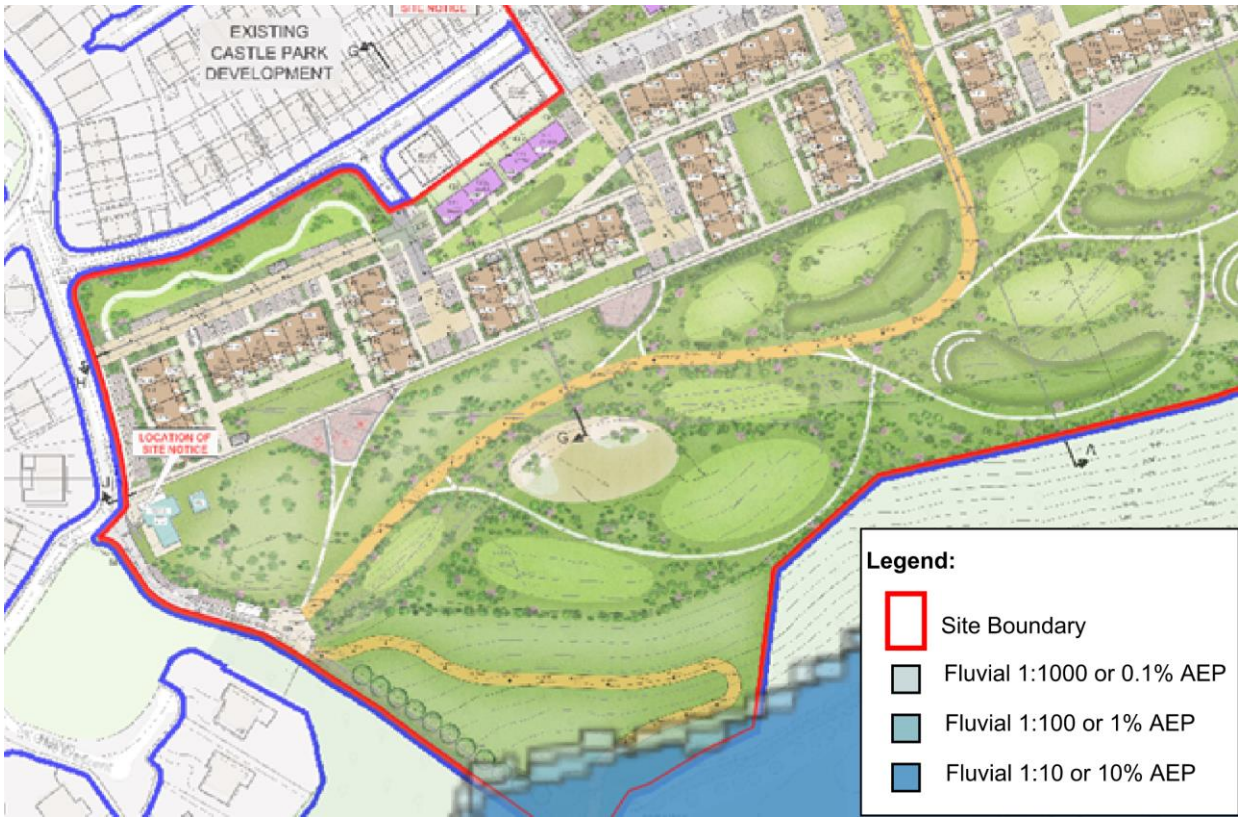


Figure 8 South Western CFRAM Study Fluvial Flood Extent Map, current, overlaid on architectural plans

The nearest model node points to the proposed development are blacma_420, blacma_380 and the blacma_340 on the River Blackwater. The 10% AEP, 1% AEP and 0.1% AEP year current scenario fluvial water levels from these nodes are included in Table 5.

Table 5 South Western CFRAM Study – Predictive Fluvial Flood Levels (Current)

Node	Current		
	10% AEP Water Level (mOD)	1% AEP Water Level (mOD)	0.1% AEP Water Level (mOD)
Blacma_420	45.44	46.12	46.77
Blacma_380	45.05	45.73	46.37
Blacma_340	44.39	45.36	45.96

The extreme flood water level from Blackwater River at the nearest node to the site (Blacma_380) is 46.37mOD for the 0.1% AEP. All highly and less vulnerable development is proposed above this level, between 61.75mOD and 85.15mOD. The risk of fluvial flooding to the development is therefore low.

4.2 Pluvial flooding

Pluvial flooding occurs when extreme rainfall overwhelms drainage systems or soil infiltration capacity, causing excess rainwater to pond above ground at low points in the topography.

In order to assess the risk of pluvial flooding to the proposed development, the findings of the Preliminary Flood Risk Assessment (PFRA) undertaken by the OPW have been reviewed. The Integrated flood risk PFRA map for the study area is presented in Figure 9. The entire OPW PFRA map for the region is included in Appendix A.4. This map shows the flood extents for all assessed risks of flooding, including pluvial. In terms of the extents shown for fluvial events, these extents have now been superseded by the CFRAM studies, as presented in Section 4.1. As shown in Figure 9, the site is not located within the OPW pluvial Indicative 1% AEP and Extreme Event extents.

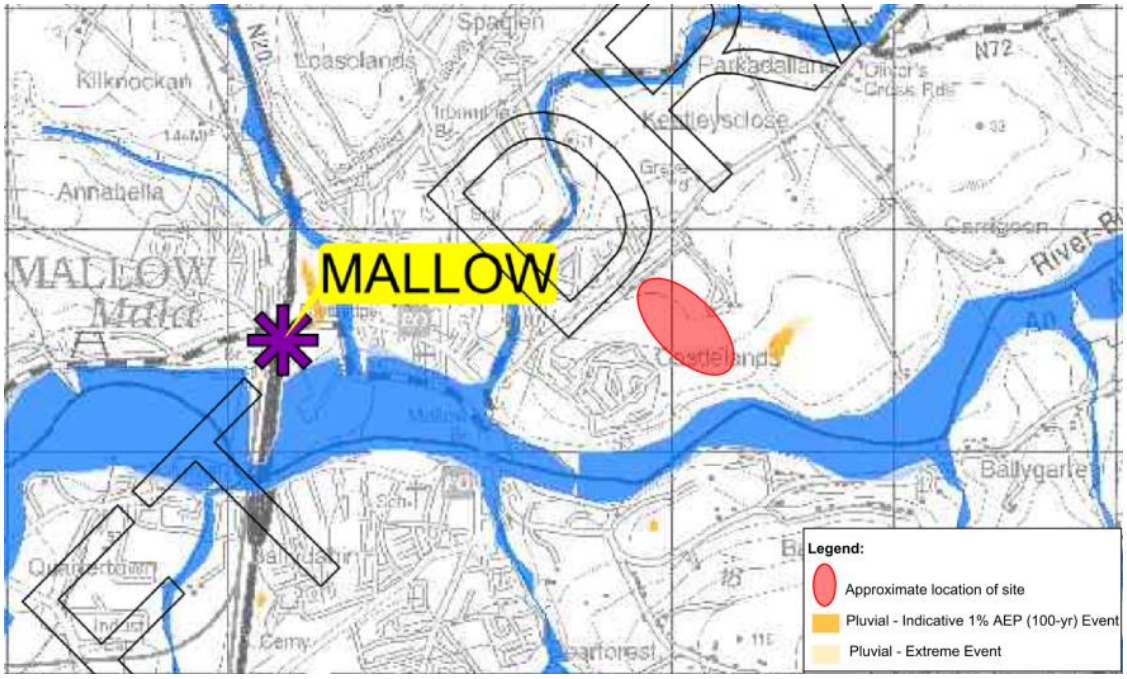


Figure 9 PFRA Integrated Flood Maps (OPW, PFRA)

To further assess the risk of pluvial flooding within the site, the site-specific topographic survey and the GSI contour map were used to assess the likely pluvial flow paths and potential ponding areas within the site boundary. The topographic survey displays that the general topographic gradient across the site is from north to south, towards the River Blackwater. As shown Figure 10 below, St Joseph's Road north of the site lies on

a ridge and forms the local high point. This high point location limits the catchments upstream of the proposed development site and as such, minimal overland flows from outside the development would enter the site to add to any pluvial flood potential. Therefore, the risk of pluvial flooding at the site is considered low, and should be manageable via appropriate drainage design as part of the site development process.

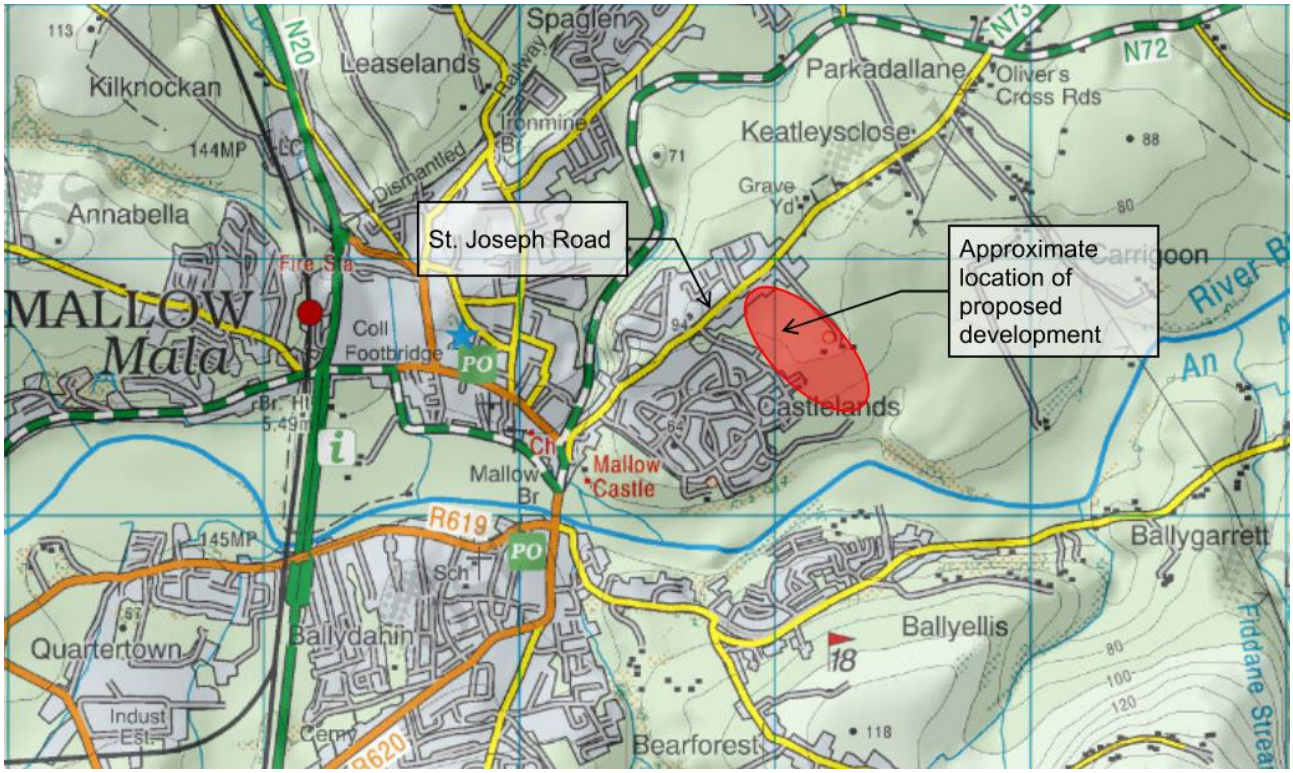


Figure 10 Geological Survey Ireland Contour Map

4.3 Groundwater Flooding

Groundwater flooding can occur during lengthy periods of heavy rainfall, typically during late winter/early spring when the groundwater table is already high. If the groundwater level rises above ground level, it can pond at local low points and cause periods of flooding. In order to assess the risk of groundwater flooding to the subject site, the PFRA mapping undertaken by the OPW has been reviewed. The OPW PFRA map is included in Appendix A.4. The PFRA map does not show the site or any areas of the site as being at risk of groundwater flooding.

The Geological Survey Ireland (GSI) groundwater flooding data maps and groundwater resources (Aquifers) maps were also reviewed (GSI, 2019). According to the Geological Survey of Ireland (GSI) groundwater data viewer, there are no historic groundwater flood events recorded within the proposed development.

There is no groundwater level monitoring available within the site. Due to the karstified nature of the bedrock the local groundwater flow direction may not reflect the topography, however the regional groundwater flow direction will be towards rivers. Therefore, the groundwater flow direction beneath the site is likely to be south towards the River Blackwater.

Taking the above into consideration, the risk of groundwater flooding to the site is considered low.

4.4 Summary of Existing Flood Risk

The risk of flooding to the existing site from fluvial, pluvial and groundwater sources has been assessed and is summarised as follows:

- The main risk of flooding at the site is fluvial flooding from the River Blackwater.
- The majority of the site lies within the Flood Zone C (less than 0.1% Annual Exceedance Probability - AEP). A small section of the site at the southern boundary is within Flood Zone A, is at high risk of flooding (more than 1% AEP). As the proposed development within Flood Zone A is considered to have

a low vulnerability and is water compatible, this development is deemed appropriate within Flood Zone A. The overall risk of fluvial flooding to the development is therefore low.

- Due to the topography of the site, the risk of pluvial flooding at the site is considered low.
- The risk of groundwater flooding to the site is considered low with the site not identified as being within the groundwater flood extents in the OPW PFRA mapping or the GSI Groundwater flood mapping.

5. Flood Risk Management

5.1 Finished Floor Levels

As outlined in Section 4.1.1, the proposed Finished Floor Level (FFL) for highly and less vulnerable developments within the site is 61.75mOD at the lowest proposed FFL. This varies to a maximum FFL of 85.15mOD at the site's northern boundary. The minimum proposed FFL is 15.38m above the predictive fluvial flood level for the 0.1% AEP water level at the nearest node presented in Table 5. This elevated FFL provides a high standard of flood protection to the vulnerable and highly vulnerable developments.

5.2 Surface Water Drainage

The proposed elevated floor level and proposed surface water drainage system will be sufficient to minimise the risk of pluvial flood risk to the development.

The Surface Water Management Plan for the site, developed by DOSA Consulting Engineering, details the surface water management strategies for the proposed development taking into consideration the following key documents/standards:

- Cork County Council Development Plan
- CIRIA report C753 The SuDS Manual-v6
- Greater Dublin Strategic Drainage Study (GDSDS)
- Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas Water Sensitive Urban Design - Best Practice Interim Guidance Document, (CDP Objective 9.4) - The Department of Housing, Local Government and Heritage.
- Inland Fisheries Irelands Planning for Watercourses in the Urban Area – (CDP Para 11.221)- IFI

The proposed storm water drainage system has been designed to cater for all surface water runoff from all hard surfaces within the proposed development including roadways, roofs, parking areas etc. Run-off from the development will be limited to greenfield run off rates through a proposed surface water network including SuDS and attenuated / managed on site prior to final discharge.

The stormwater generated will be treated through a number of nature-based solutions in line with adopted SuDS measures. The following methodologies are being implemented to support the site's surface water management:

- Permeable pavement
- Rainwater harvesting
- Infiltration basins
- Filter drains
- Tree pits
- Detention Basins
- Flow Control Devices

- Petrol interceptors
- Incorporation of existing drainage features into the proposed surface water management strategy.

Stormwater will be discharged to the River Blackwater on the southern boundary of the site. To minimise the impact of the proposed development, it is proposed to connect the new stormwater network to the existing network that is located on the western boundary of the site. Refer to A.6 for details of the proposed surface water network.

6. Management of Residual Risks

6.1 Safe Access and Egress

Access from the proposed development site to the national primary road network is provided via multiple routes. The main access to the site is via St Joseph's Road and Kingsfort Avenue northwest of the site.

To the north, St Josephs Road runs north-east and south-west for approximately 2km where it joins the N72 (the Mallow Road) at both its ends. The N72 appears to be flood-affected in the 1% AEP River Blackwater event (based on the CFRAM mapping) near Mallow Town Park, but alternate routes appear to exist via the local road network thereby enabling this section of the N72 to be avoided if necessary.

The N72 ultimately links in with the N20 (the Limerick Road / New Mallow Road) on the western fringe of Mallow town which acts as the main route between Limerick and Cork. While the CFRAM mapping shows parts of the local road network that may be travelled in accessing the N20/N72 to traverse smaller watercourses, namely the Baltydaniel and Caherduggan/Spa streams, these locations generally appear beyond the backwater flood extents of the River Blackwater based on a desktop assessment of the available flood mapping. Accordingly, these local roads (and parts of the N72 near Castlelands / Parkadallane) may instead be subject to flood risk from the local catchments of both streams (i.e. and not the River Blackwater).

With these two streams being much smaller in terms of catchment area than the Blackwater, they present a reduced risk of cutting access to the national primary road network for a number of reasons:

- Their critical durations will be much shorter than that of the Blackwater, which will consequently mean their flooding behaviour will typically be much flashier by comparison. This means it will typically not be long-duration flooding, and as such, access via flood-affected roads is not cut for prolonged periods.
- Also, owing to the difference in catchment scale and response-time, there is a reduced probability that the streams would be at the peak of their flood at the same time as that of the River Blackwater. Usually local and regional systems with vastly different catchment scales will generate flood peaks out of sync with one another.

For the reasons outlined above access to the national primary road network from the proposed site is not deemed to attract any unacceptable risk, nor any elevated risk relative to nearby, existing developments of a similar nature.

6.2 Risks to People and Property elsewhere

6.2.1 Floodplain Storage

To ensure there is limited loss of floodplain storage within the site, significant infrastructure including residential development within the proposed site has been positioned outside the current 1%AEP fluvial flood extent. The proposed amenity footpath will not alter the existing ground levels but follow the current topography, and the footpath will be constructed with permeable materials. Therefore, there will be no reduction in the volume of floodplain storage and no compensatory storage is required.

6.2.2 Conveyance

The proposed development will have no impact on the conveyance of flood waters within the floodplain during a current 1%AEP fluvial flood event as the proposed buildings will be located outside of the extent. The proposed development will have no impact on the conveyance of flood waters in even larger events also, and therefore presents a very low risk in this regard.

6.3 Summary of Post Development Flood Risk

The risk of flooding to the site post development has been assessed and is summarised as follows:

- The proposed development will have a minimum finished floor level of 61.75mOD. This is 15.38m above the predictive fluvial flood level for the 0.1% AEP water level.
- Access and egress to the site for emergency services and the public during flood events will be provided via Kingfort Avenue.
- The proposed development will have no impact on floodplain storage or conveyance.
- The proposed Surface Water drainage system will cater for run-off from the proposed development. Run-off will be limited to greenfield run off rates through the provision of various SuDs methods.

7. Application of "Flood Risk Management Guidelines"

7.1 Flood Zones

The majority of the site is located within Flood Zone C (less than 0.1%AEP current fluvial flood extent). A small southern section of the site is located within Flood Zone A and Flood Zone B.

7.2 Off-site impact

The proposed development will not have a significant impact on flood risk off site as the proposed buildings will be located outside of the 1% AEP flood extents (current), and will therefore not impede nor increase fluvial flow that is moving downstream along the Blackwater River. Similarly, any local flood sources (including pluvial and groundwater flooding) present as low risk for reasons outlined earlier, and these are also not expected to generate any appreciable off-site flood impact risk.

7.3 Vulnerability Classification

The proposed development consists of a mix of 'Less Vulnerable', 'Highly Vulnerable' and 'Water Compatible' developments. The section of the site located within the 1% AEP fluvial flood extent consists of an access footpath that is considered water compatible and therefore, appropriate for development in Flood Zone A. All highly and less vulnerable developments are proposed significantly above the 0.1% AEP fluvial flood extent.

7.4 Sequential Approach and Justification Test

As the areas of the proposed development that are considered 'Less Vulnerable' and 'Highly Vulnerable' are located within Flood Zone C, and areas that are located within Flood Zone A/B are considered appropriate developments within these zones, a justification test is not required.

8. Conclusion

The site is at low risk of pluvial and groundwater flooding. Fluvial risk is limited to a small southern section of the site located nearest to the River Blackwater. Within this section of the proposed development, a low

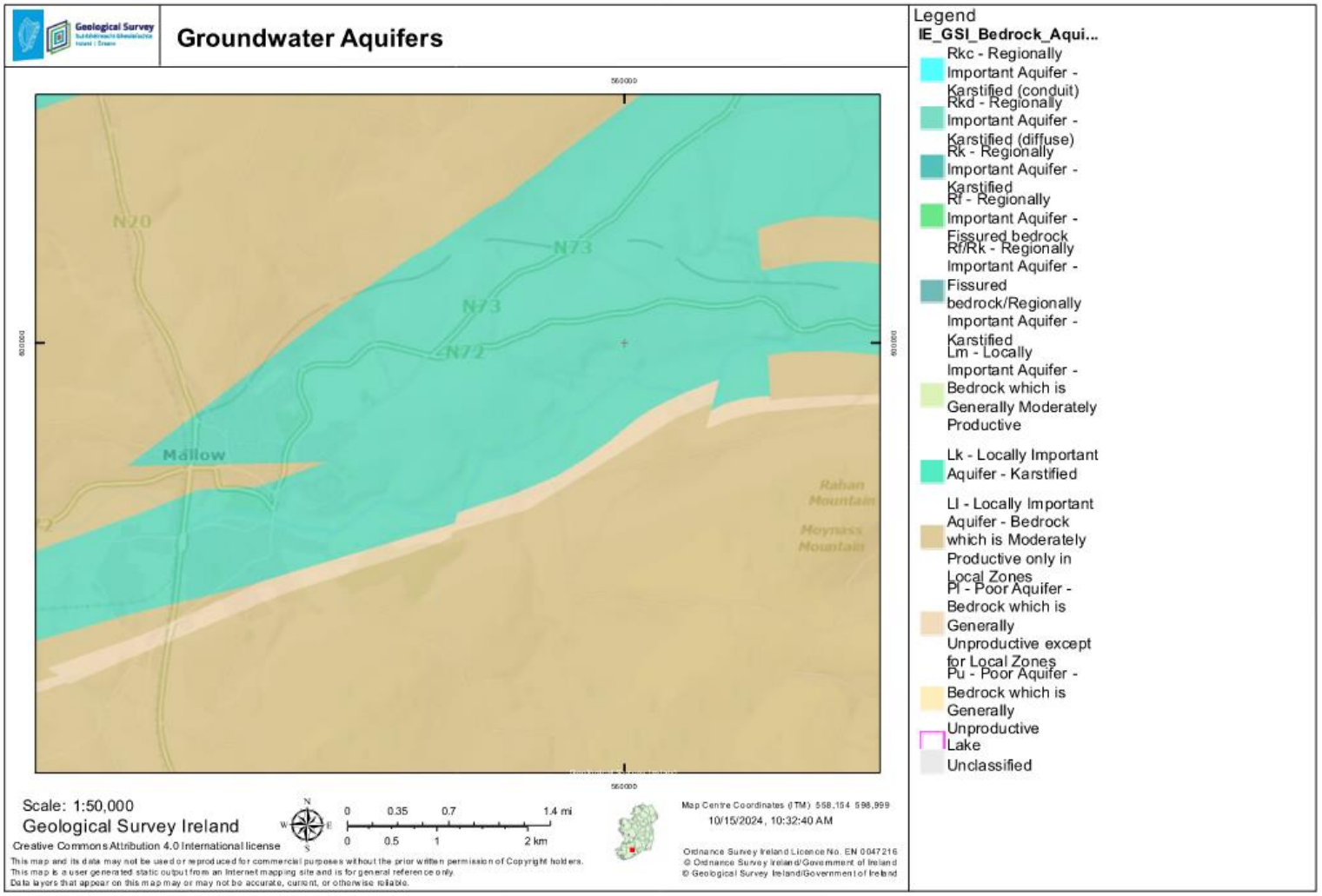
vulnerability link path from the residential development to the riverside amenity path is proposed. This is considered a water compatible use and, as such, appropriate for development in Flood Zone A. All highly and less vulnerable development is proposed outside the current 0.1% AEP year flood extents. Additionally, the minimum FFL within the proposed development is significantly above the 0.1% AEP flood extents at 61.75mOD (approximately a minimum of 15m above at the lowest FFL). This will provide the development with a high standard of protection against flood risk.

Access and egress to the site will be provided via Kingsford Avenue on the western boundary of the proposed development. Kingsfort Avenue provides access to St Joseph's Road where access/egress to the N72 is provided.

Based on the sequential approach, a Justification Test is not required for the proposed development. It has been demonstrated that the proposed development satisfies the vulnerability class appropriate to each zone.

This FRA demonstrates that the sources of flood risk identified within the Castlepark development can be managed to acceptable levels in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities (2009).

A.1 GSI Maps


Groundwater Aquifers
Legend
IE_GSI_Bedrock_Aqui...
Rkc - Regionally Important Aquifer - Karstified (conduit)
Rkd - Regionally Important Aquifer - Karstified (diffuse)
Rk - Regionally Important Aquifer - Karstified
Rf - Regionally Important Aquifer - Fissured bedrock
Rf/Rk - Regionally Important Aquifer - Fissured bedrock/Regionally Important Aquifer - Karstified
Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
Lk - Locally Important Aquifer - Karstified
Ll - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
Pl - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
Pu - Poor Aquifer - Bedrock which is Generally Unproductive
Lake
Unclassified
N20
N73
N73
N72
Mallow
Rahan Mountain
Moynass Mountain
560000
600000
Scale: 1:50,000
Geological Survey Ireland
Creative Commons Attribution 4.0 International license
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0 0.5 1 2 km
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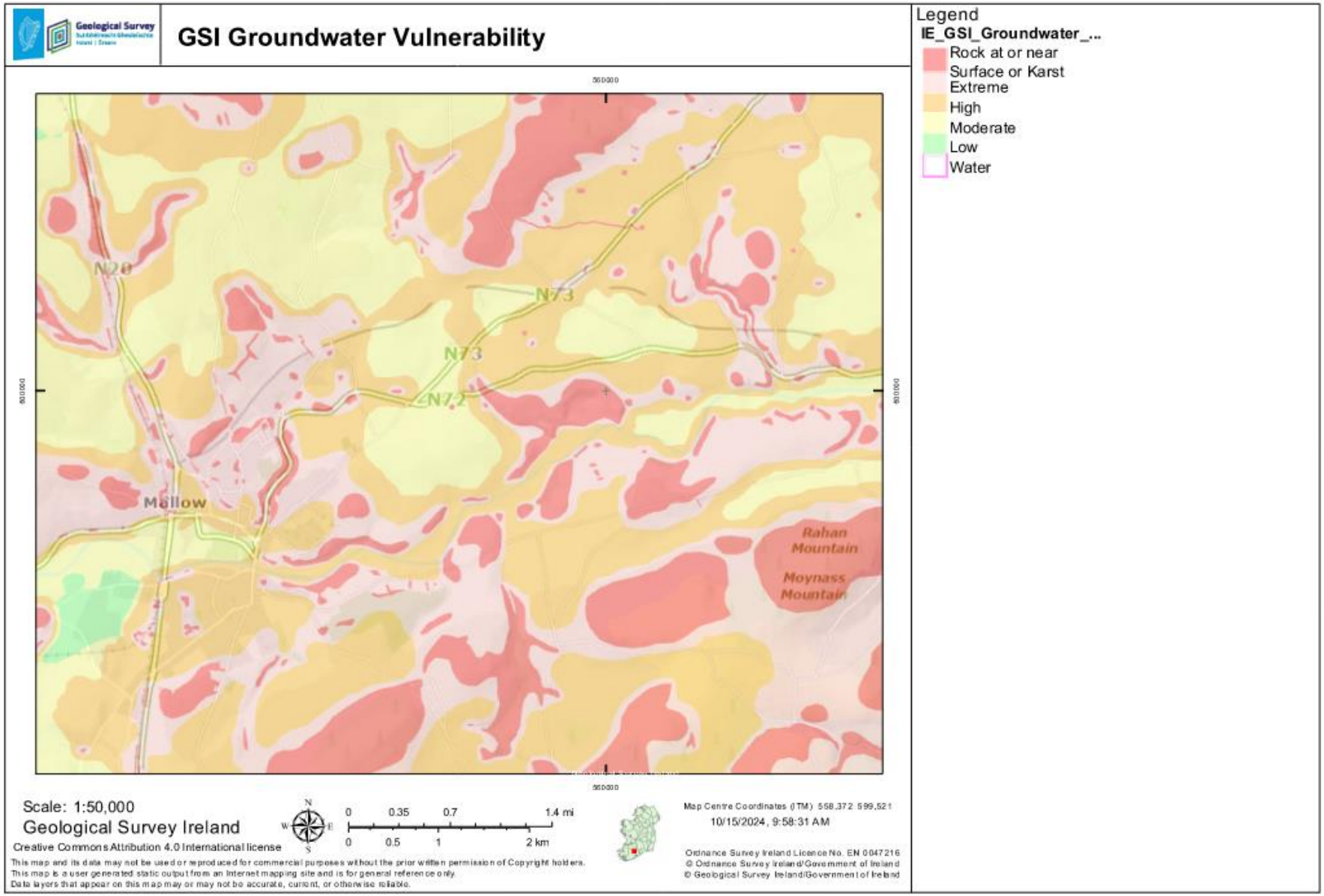
GSI Groundwater Vulnerability
Legend
IE_GSI_Groundwater_...
Rock at or near
Surface or Karst
Extreme
High
Moderate
Low
Water
N20
N73
N73
N72
Mallow
Rahan Mountain
Moynass Mountain
560000
610000
Scale: 1:50,000
Geological Survey Ireland
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0 0.35 0.7 1.4 mi
0 0.5 1 2 km
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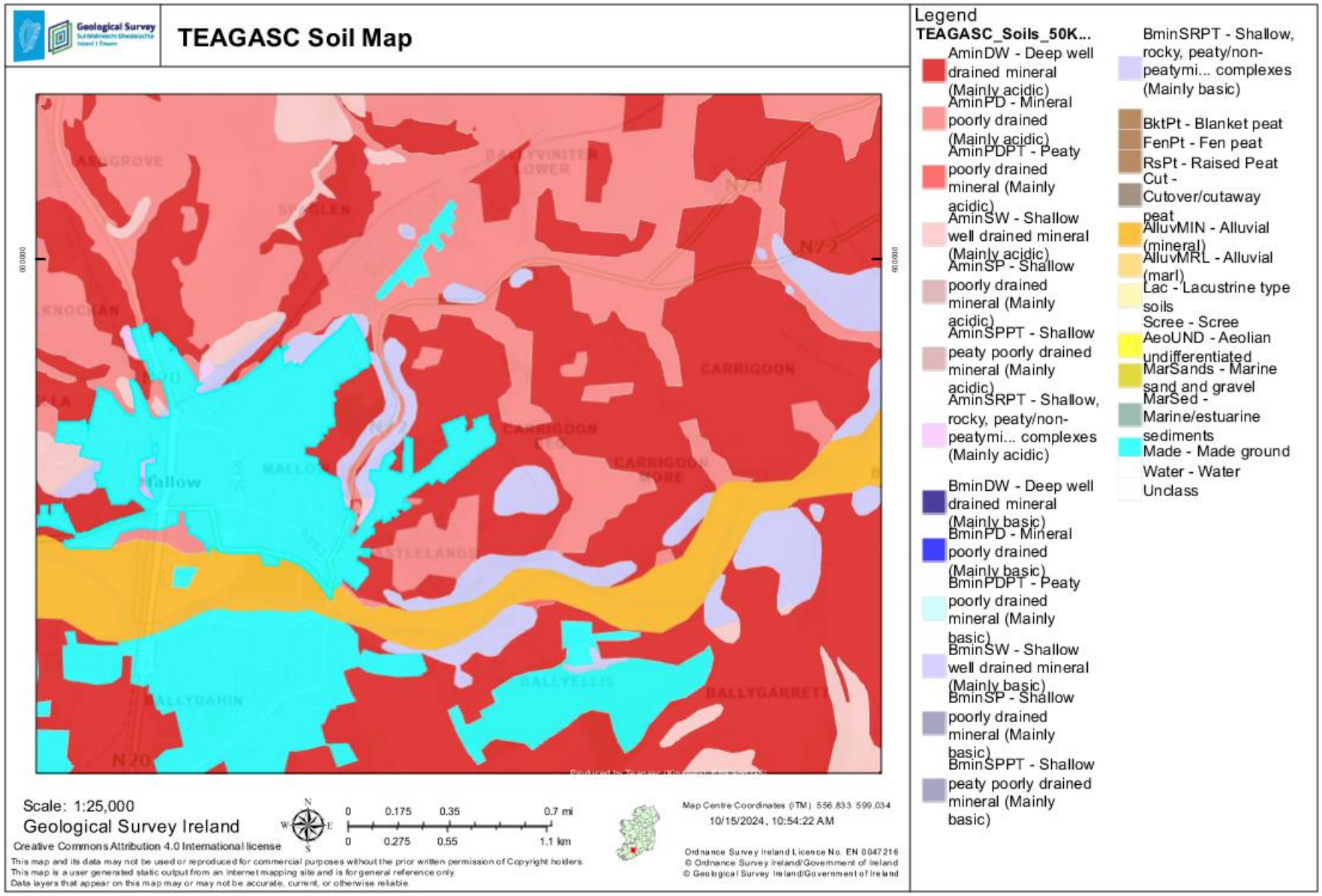
Geological Survey
TEAGASC Soil Map
Legend
TEAGASC_Soils_50K...
AminDW - Deep well drained mineral (Mainly acidic)
AminPD - Mineral poorly drained (Mainly acidic)
AminPDPT - Peaty poorly drained mineral (Mainly acidic)
AminSW - Shallow well drained mineral (Mainly acidic)
AminSP - Shallow poorly drained mineral (Mainly acidic)
AminSPPT - Shallow peaty poorly drained mineral (Mainly acidic)
AminSRPT - Shallow, rocky, peaty/non-peatymi... complexes (Mainly acidic)
BminDW - Deep well drained mineral (Mainly basic)
BminPD - Mineral poorly drained (Mainly basic)
BminPDPT - Peaty poorly drained mineral (Mainly basic)
BminSW - Shallow well drained mineral (Mainly basic)
BminSP - Shallow poorly drained mineral (Mainly basic)
BminSPPT - Shallow peaty poorly drained mineral (Mainly basic)
BminSRPT - Shallow, rocky, peaty/non-peatymi... complexes (Mainly basic)
BktPt - Blanket peat
FenPt - Fen peat
RsPt - Raised Peat
Cut - Cutover/cutaway peat
AlluvMIN - Alluvial (mineral)
AlluvMRL - Alluvial (marl)
Lac - Lacustrine type soils
Scree - Scree
AeoUND - Aeolian undifferentiated
MarSands - Marine sand and gravel
MarSed - Marine/estuarine sediments
Made - Made ground
Water - Water
Unclass
Tallow
CARRIGOON
BALLYGARRET
N72
N20
Scale: 1:25,000
Geological Survey Ireland
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This map is a user generated static output from an Internet mapping site and is for general reference only.
Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.
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0 0.275 0.55 1.1 km
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10/15/2024, 10:54:22 AM
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A.2 National Flood Hazard Map Summary

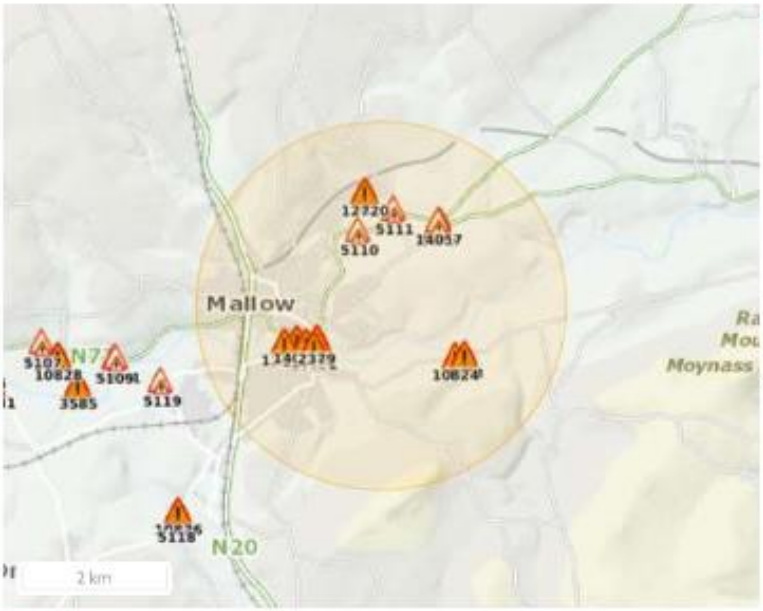
Past Flood Event Local Area Summary Report

OPW

Report Produced: 7/10/2024 15:12

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.

This report has been downloaded from www.floodinfo.ie (the "Website"). The users should take account of the restrictions and limitations relating to the content and use of the Website that are explained in the Terms and Conditions. It is a condition of use of the Website that you agree to be bound by the disclaimer and other terms and conditions set out on the Website and to the privacy policy on the Website.



Map Legend

- Single Flood Event
- Recuring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

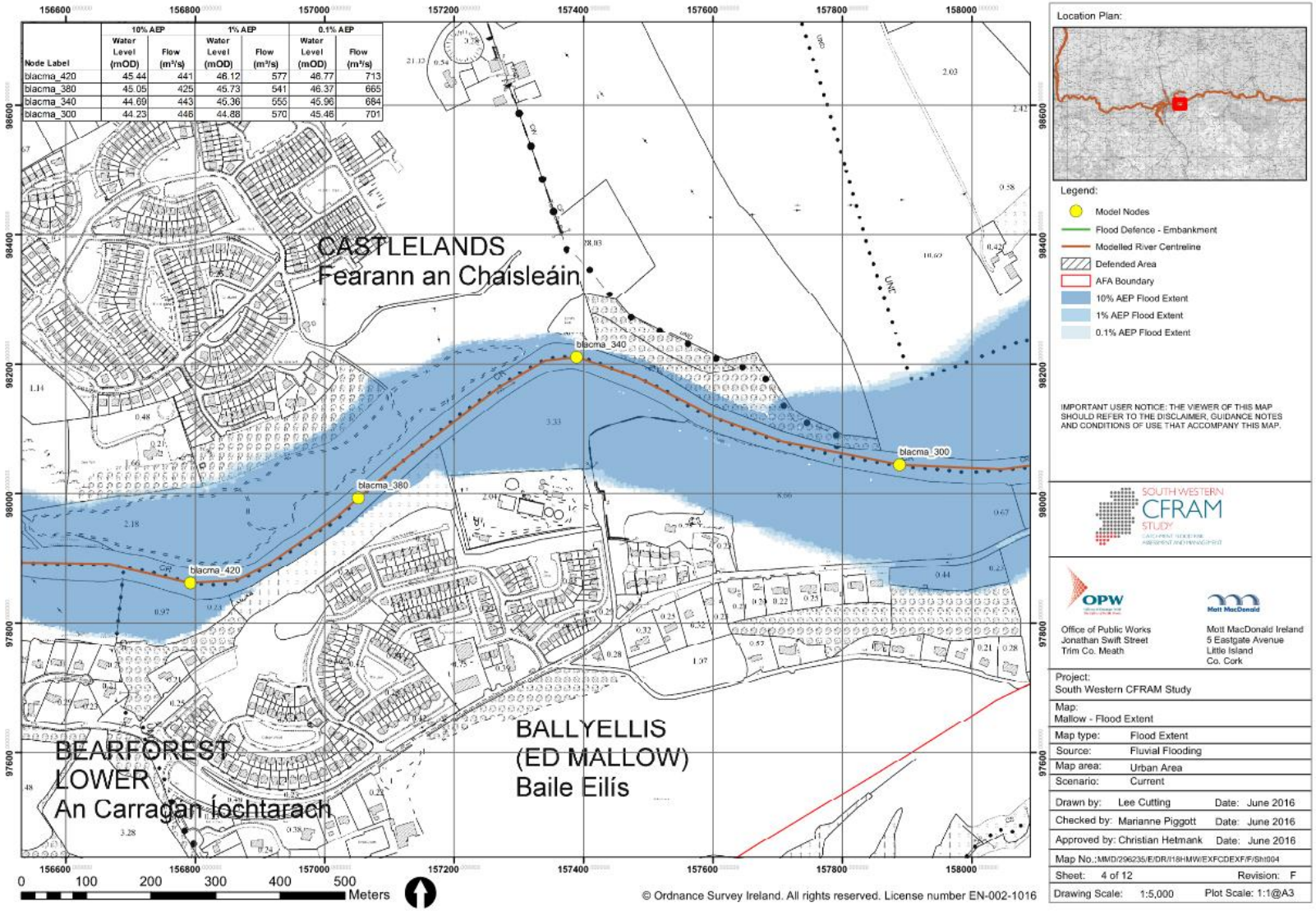
* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

23 Results

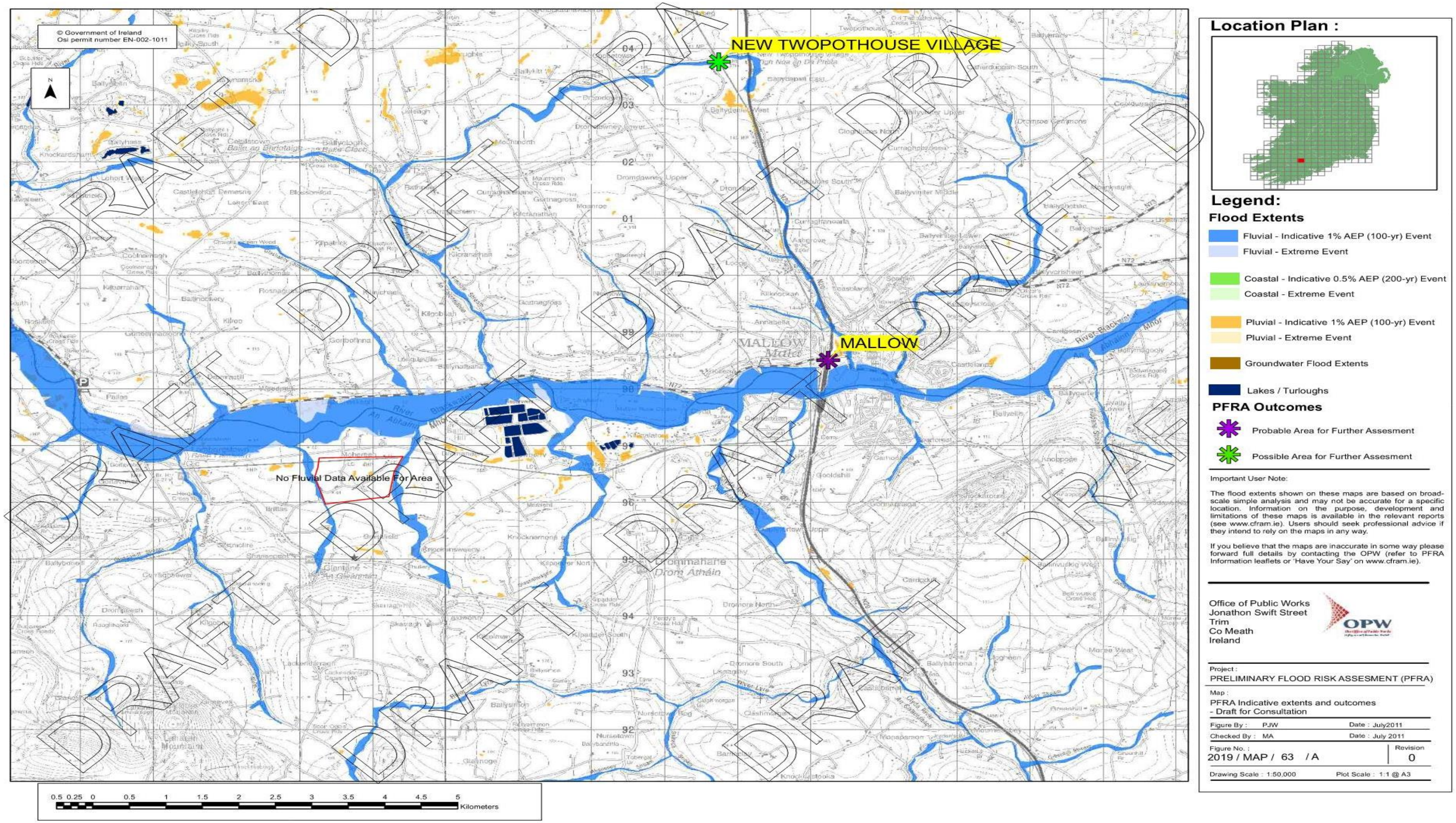
	Name (Flood_ID)	Start Date	Event Location
1.	Spa Stream N72 Keatleys Close recurring (ID-5110)	n/a	Approximate Point
	Additional Information: Reports (2) Press Archive (0)		
2.	Spa Stream N72 Parkadallane junct Mallow recurring (ID-5111)	n/a	Approximate Point
	Additional Information: Reports (2) Press Archive (0)		
3.	Clonmore Estate, Mallow Co. Cork on 28th.June 2012 (ID-12720)	27/06/2012	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
4.	Flooding at Ballyellis, Co Cork November 2009 (ID-10824)	19/11/2009	Area
	Additional Information: Reports (1) Press Archive (0)		
5.	Flooding at Mallow on 28/06/2012 (ID-12880)	28/06/2012	Approximate Point
	Additional Information: Reports (0) Press Archive (0)		
6.	Blackwater Mallow Nov 1853 (ID-2379)	02/11/1853	Approximate Point
	Additional Information: Reports (3) Press Archive (0)		

	Name (Flood_ID)	Start Date	Event Location
7.	Blackwater Mallow Sept 1875 (ID-2380) Additional Information: Reports (3) Press Archive (0)	26/09/1875	Approximate Point
8.	Blackwater Mallow Nov 1916 (ID-2382) Additional Information: Reports (3) Press Archive (5)	17/11/1916	Approximate Point
9.	Munster Blackwater Mallow Nov 2000 (ID-3559) Additional Information: Reports (5) Press Archive (14)	01/11/2000	Exact Point
10.	Munster Blackwater Ballygarrett Nov 2000 (ID-3568) Additional Information: Reports (2) Press Archive (0)	01/11/2000	Exact Point
11.	Flooding at Mallow on 23/02/2021 (ID-14056) Additional Information: Reports (0) Press Archive (0)	23/02/2021	Approximate Point
12.	Flooding at Olivers Cross Mallow on 23/02/2021 (ID-14057) Additional Information: Reports (0) Press Archive (0)	23/02/2021	Approximate Point
13.	Blackwater Mallow, 30 Dec, 1998 (ID-464) Additional Information: Reports (6) Press Archive (0)	30/12/1998	Approximate Point
14.	Blackwater Mallow August 1946 (ID-465) Additional Information: Reports (4) Press Archive (1)	11/08/1946	Approximate Point
15.	Blackwater Mallow Dec 1948 (ID-467) Additional Information: Reports (4) Press Archive (0)	02/12/1948	Approximate Point
16.	Blackwater Mallow Nov 1980 (ID-468) Additional Information: Reports (4) Press Archive (0)	02/11/1980	Approximate Point
17.	Blackwater Mallow 6 August, 1986 (ID-469) Additional Information: Reports (6) Press Archive (0)	05/08/1986	Approximate Point
18.	Blackwater Mallow Oct, 1988 (ID-470) Additional Information: Reports (3) Press Archive (0)	10/10/1988	Approximate Point
19.	Blackwater Mallow Feb 1990 (ID-472) Additional Information: Reports (3) Press Archive (0)	05/02/1990	Approximate Point
20.	Oliver's cross roads near Mallow recurring (ID-5145) Additional Information: Reports (2) Press Archive (1)	n/a	Approximate Point
21.	Blackwater River Mallow Nov 19th 2009 (ID-11326) Additional Information: Reports (1) Press Archive (0)	n/a	Approximate Point
22.	Flooding at Mallow, Co Cork November 2009 (ID-10832) Additional Information: Reports (2) Press Archive (0)	19/11/2009	Approximate Point
23.	Flooding at Mallow on 30/12/2015 (ID-13495) Additional Information: Reports (0) Press Archive (0)	30/12/2015	Approximate Point

A.3 South Western CFRAM Maps

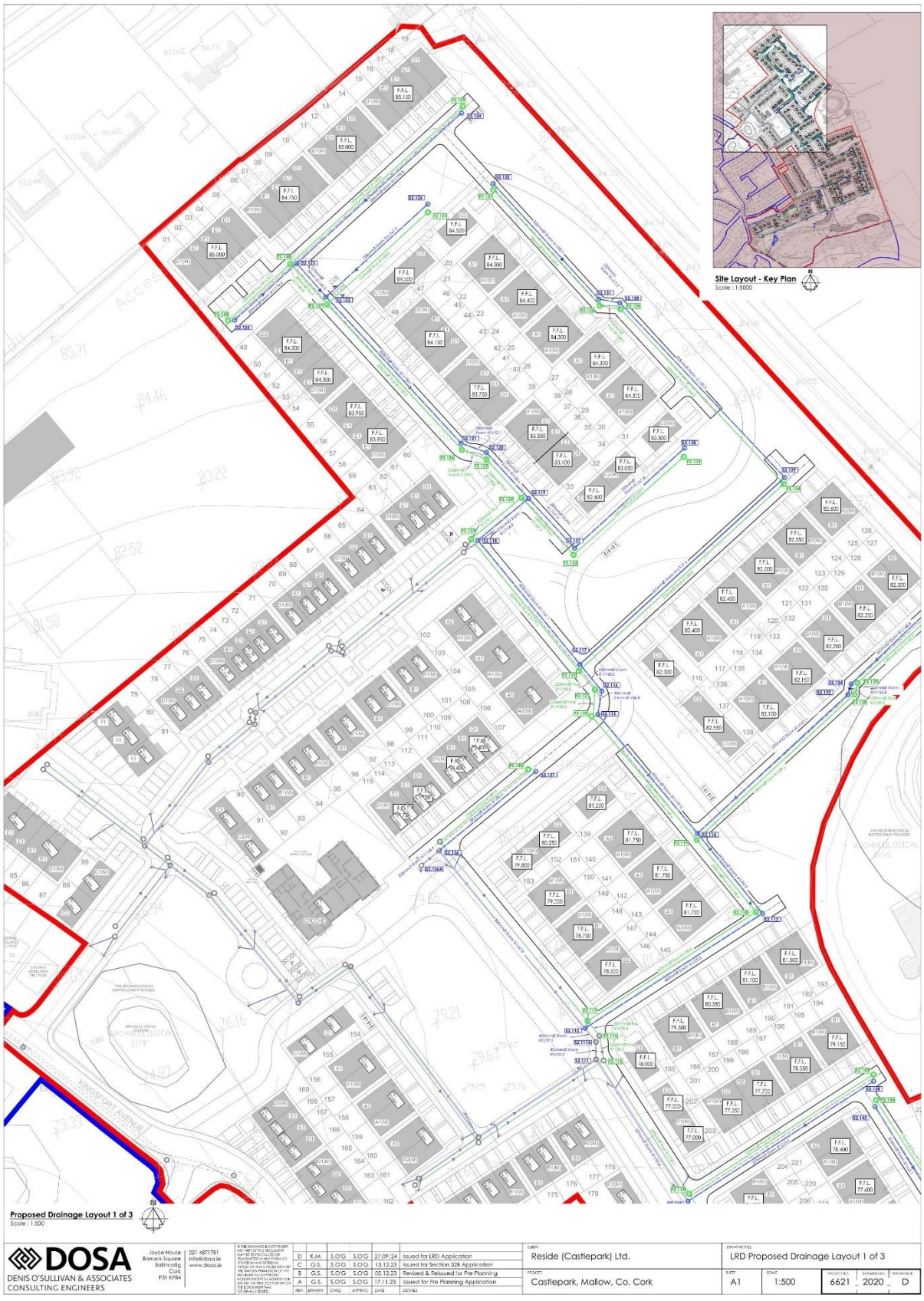


A.4 OPW PFRA Map



A.5 Architect's Drawings – Site Layout Plan

A.6 Surface Water Network




Site Layout - Key Plan
Scale : 1:5000
Proposed Drainage Layout 2 of 3
Scale : 1:500
DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS
Joyce House
Barrack Square
Ballincollig
Cork
P31 K784
021 4871781
info@dosa.ie
www.dosa.ie
D K.M. S.O'G S.O'G 27.09.24 Issued for LRD Application
C G.S. S.O'G S.O'G 13.12.23 Issued for Section 32B Application
B G.S. S.O'G S.O'G 02.12.23 Revised & Reissued for Pre Planning
A G.S. S.O'G S.O'G 17.11.23 Issued for Pre Planning Application
REV. DRAWN CHKD APPRVD DATE DETAILS
CLIENT
Reside (Castlepark) Ltd.
PROJECT
Castlepark, Mallow, Co. Cork
DRAWING TITLE
LRD Proposed Drainage Layout 2 of 3
SHEET
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SCALE
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PROJECT NO.
6621
DRAWING NO.
2021
STATUS/ISSUE
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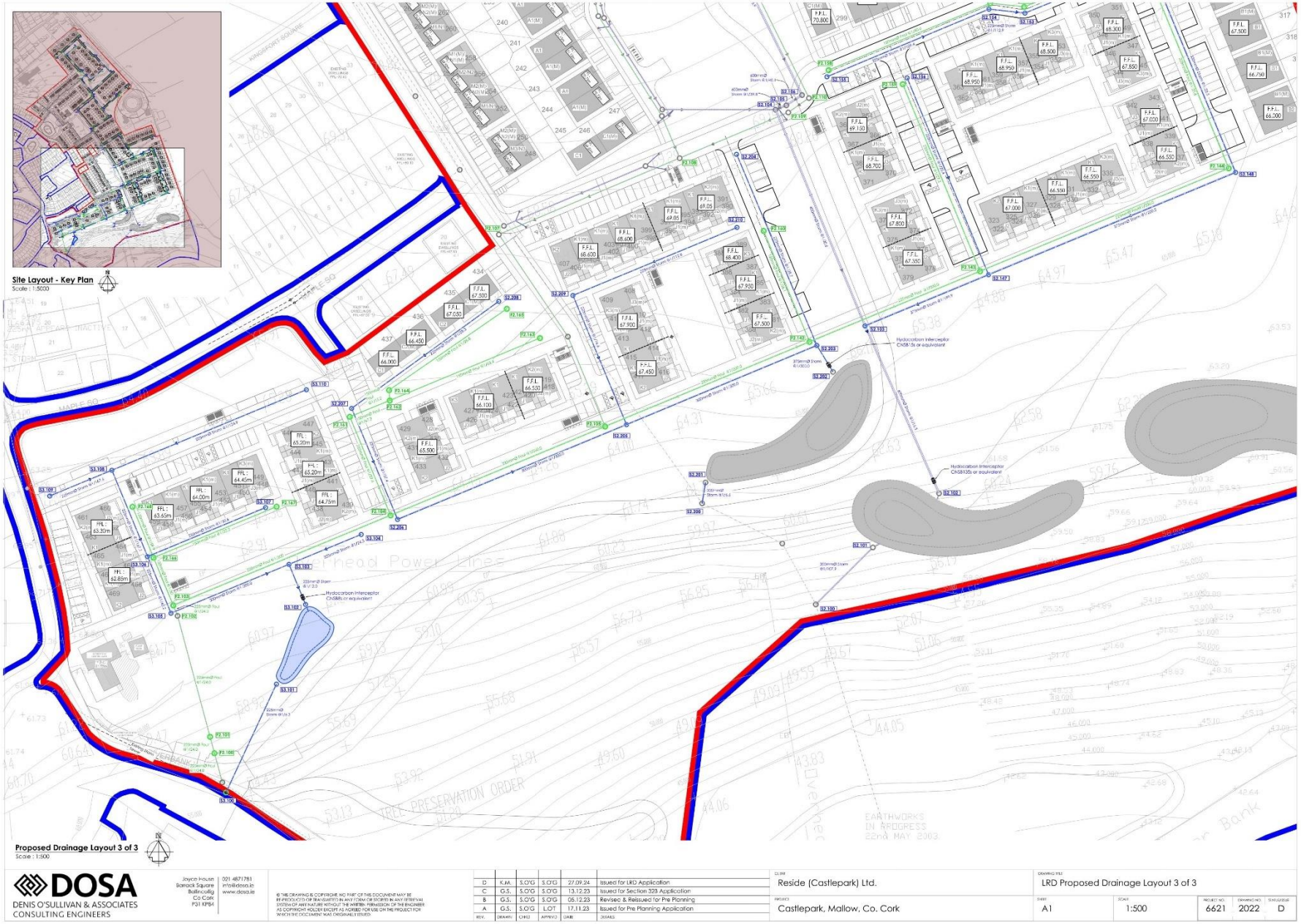
Site Layout - Key Plan
Scale : 1:5000
Proposed Drainage Layout 3 of 3
Scale : 1:500
DOSA
DENIS O'SULLIVAN & ASSOCIATES
CONSULTING ENGINEERS
Joyce House
Barrack Square
Ballincollig
Co Cork
P31 KP84
021 4871781
info@dosa.ie
www.dosa.ie
D K.M. S.O'G S.O'G 27.09.24 Issued for LRD Application
C G.S. S.O'G S.O'G 13.12.23 Issued for Section 329 Application
B G.S. S.O'G S.O'G 06.12.23 Revisec & Reissued for Pre Planning
A G.S. S.O'G LOT 17.11.23 Issued for Pre Planning Application
REV. DRAWN CHKD APPROVD DATE DESCRIPTION
CLIENT
Reside (Castlepark) Ltd.
PROJECT
Castlepark, Mallow, Co. Cork
DRAWING TITLE
LRD Proposed Drainage Layout 3 of 3
SHEET
A1
SCALE
1:500
PROJECT NO.
6621
DRAWING NO.
2022
STATUS/REV
D