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Sophia Housing Association

Site Specific Flood Risk Assessment

Convent Lands, Portlaoise

For Information

ROD
ROUGHAN & O'DONOVAN

Convent Lands, Portlaoise

Site Specific Flood Risk Assessment

Document No: 18.167/FRA

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Convent Lands, Portlaoise
Site Specific Flood Risk Assessment

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1. INTRODUCTION

Roughan & O'Donovan (ROD) Consulting Engineers have carried out a Site specific Flood Risk Assessment for the residential development at the Convent Lands Portlaoise. This report has been prepared to assess the flood risk to the subject site and adjacent lands as a result of the proposed development.

1.1 Description of Study Area

The development site is the grounds of the decanted Sacred Heart Primary School and the adjacent grounds including the existing derelict convent and other ancillary buildings and prefabs. The site located at Church Avenue, Portlaoise, Co. Laois and is bounded to the south-west by the Church Avenue and to the north-east by River Triogue. There are private buildings to the north and south.

The proposed development site is classified as a highly vulnerable development As per the OPW Guidelines (2009).

The site has been vacant for some time and has become overgrown and densely vegetated.

The topography of the site shows a slightly sloping site from the south-west 92.85m OD falling to the north-east 89.33m OD. The slope of the site from north to south portion of site is 1:33 (3.03%).

The River Triogue flows adjacent to the north-east boundary of the site. The EPA Envision website indicates that this river rises at Cullenagh Mountain approximately 12km to the south of the subject site.

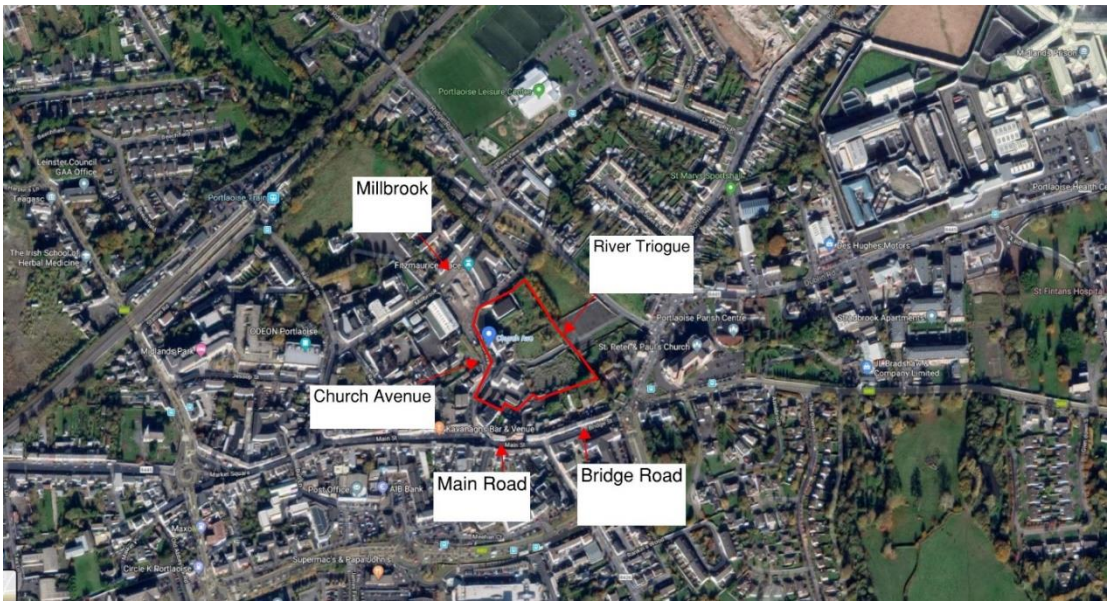


Figure 1: Convent Lands (map underlay source: Google Maps)

1.2 Development Description

The development is a conversion of the decanted Sacred Heart Primary School and the adjacent grounds and buildings from their current use to residential. This involves the alteration and refurbishment of the school and convent buildings and the demolition of the ancillary buildings and prefabs.

To the south-west of the site a new three-storey apartment block will replace the ancillary buildings while to the north of the convent the prefabs will be replaced by a 5-unit terrace and a three-storey apartment block.

Another new three-storey apartment block will be constructed to the rear of the school and convent buildings and will extend towards the River Triogue.

The minimum finished floor level throughout the development is proposed to be 91.350mOD. Compensatory flood storage will be provided “level for level” in an area of the western bank of the River Triogue within the subject site.

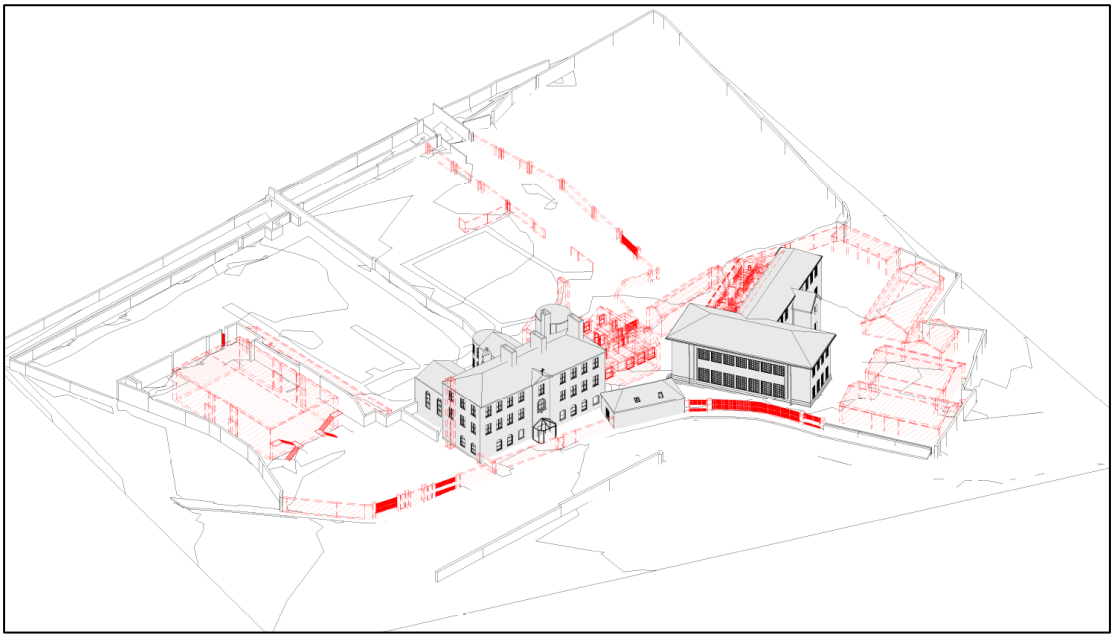


Figure 2: Proposed Demolition Site Plan

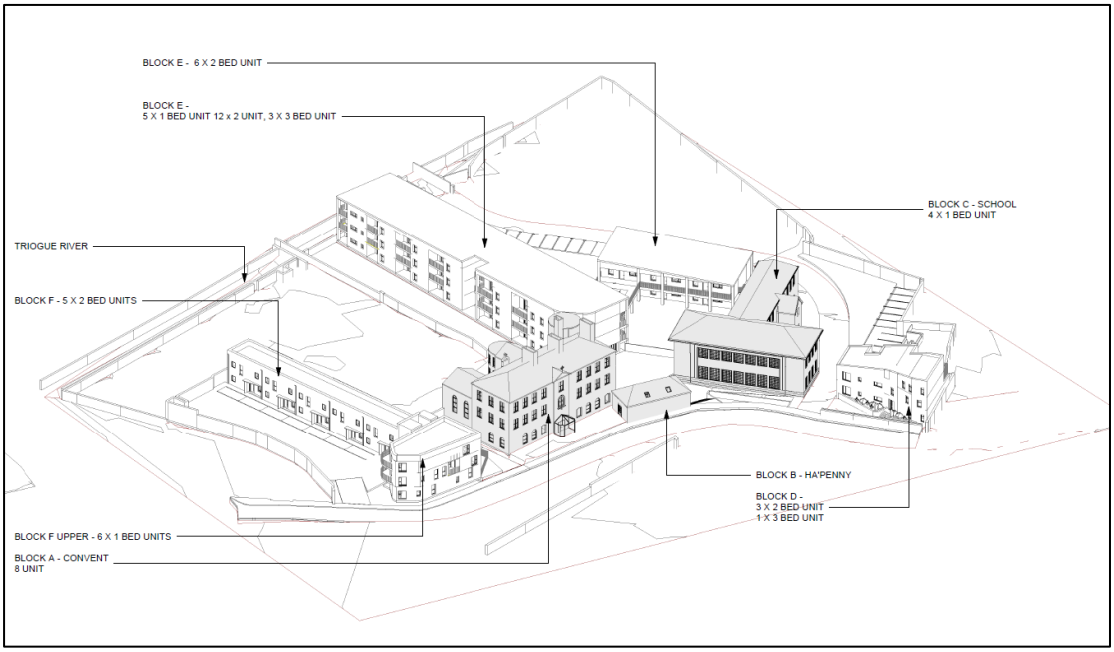


Figure 3: Proposed Site Plan

2. FLOOD RISK

2.1 Introduction

This report has been prepared in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' herein referred to as 'The Guidelines' as published by the Office of Public Works (OPW) and Department of Environment, Heritage and Local Government (DoHLG) in 2009.

2.2 Identification of Flood Risk

Flood risk is a combination of the likelihood of a flood event occurring and the potential consequences arising from that flood event and is then normally expressed in terms of the following relationship:

Flood risk = Likelihood of flooding x Consequences of flooding.

To fully assess flood risk an understanding of where the water comes from (i.e. the source), how and where it flows (i.e. the pathways) and the people and assets affected by it (i.e. the receptors) is required. Figure 4 below shows a source-pathway-receptor model reproduced from 'The Guidelines' (DEHLG-OPW, 2009).

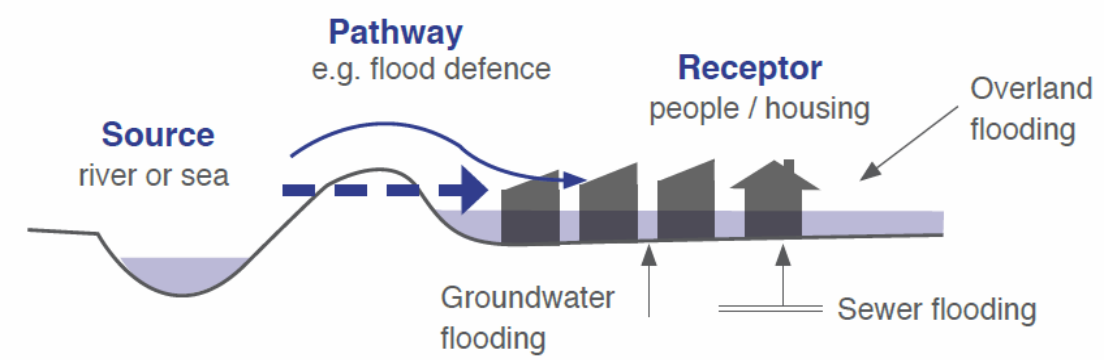


Figure 4: Sources, Pathways and Receptors of Flooding

The principal sources of flooding generally are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains. The receptors can include people, their property and the environment. All three elements as well as the vulnerability and exposure of receptors must be examined to determine the potential consequences.

The Guidelines set out a staged approach to the assessment of flood risk with each stage carried out only as needed. The stages are listed below:

- *Stage I Flood Risk Identification* – to identify whether there may be any flooding or surface water management issues.
- *Stage II Initial Flood Risk Assessment* – to confirm sources of flooding that may affect an area or proposed development, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative flood zone maps.
- *Stage III Detailed Flood Risk Assessment* – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

2.3 Likelihood of Flooding

The Guidelines define the likelihood of flooding as the percentage probability of a flood of a given magnitude or severity occurring or being exceeded in any given year. It is generally expressed as a return period or annual exceedance probability (AEP). A 1% AEP flood indicates a flood event that will be equalled or exceeded on average once every hundred years and has a return period of 1 in 100 years. Annual Exceedance probability is the inverse of return period as shown Table 2.1 below.

Table 2.1: Correlation Between Return Period and AEP

Return Period (years)	Annual Exceedance Probability (%)
1	100
10	10
50	2
100	1
200	0.5
1000	0.1

2.4 Definition of Flood Zones

Flood zones are geographical areas within which the likelihood of flooding is in a particular range. These are split into three categories in The Guidelines:

Flood Zone A

Flood Zone A where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal/tidal flooding);

Flood Zone B

Flood Zone B where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 or 0.5% or 1 in 200 for coastal/tidal flooding);

Flood Zone C

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/tidal flooding. Flood Zone C covers all plan areas which are not in zones A or B.

It is important to note that when determining flood zones the presence of flood protection structures should be ignored. This is because areas protected by flood defences still carry a residual risk from overtopping or breach of defences and the fact that there is no guarantee that the defences will be maintained in perpetuity.

2.5 Sequential Approach & 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 5 below. In general, development in areas with a high risk of flooding should be avoided as per the sequential approach. However, this is not always possible as many town and city centres are within flood zones and are targeted for development.

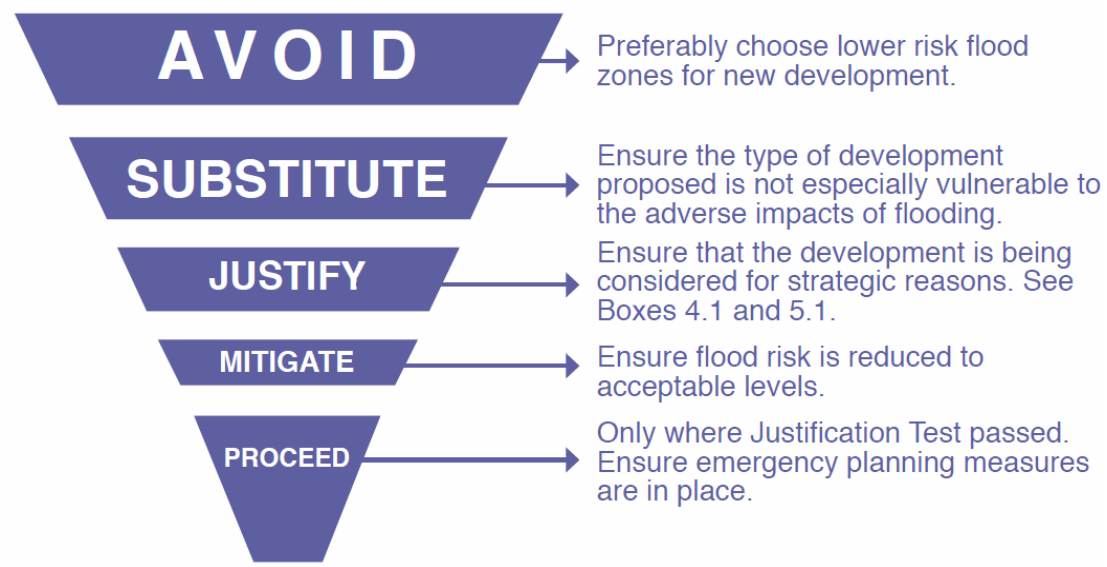


Figure 5: Sequential Approach (Source: The Planning System and Flood Risk Management)

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 2.2: Matrix of Vulnerability Versus Flood Zone to Illustrate Appropriate Development that is Required to Meet the Justification Test (Source: The Planning System and Flood Risk Management)

	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

3. STAGE 1: FLOOD RISK IDENTIFICATION

3.1 General

This Stage 1 Flood Risk Identification includes a review of the existing information and the identification of any flooding or surface water management issues in the study area that may warrant further investigation.

3.2 Information Sources Consulted

The following information sources were consulted as part of the Stage 1 Flood Risk Identification:

Table 3.1: Information Sources Consulted

Source	Data Gathered
OPW Preliminary Flood Risk Assessment (PFRA) maps	Fluvial and Pluvial flooding examined: myplan.ie
Catchment Flood Risk Assessment and Management Study (CFRAM)	Portlaoise Fluvial Flood Extent Mapping. OPW CFRAM Study examined: floodinfo.ie
OPW National Flood Hazard Mapping	Previous history of flooding indicated www.floodmaps.ie
Irish Coastal Protection Strategy Study	No information available for this specific zone on OPW Coastal flood maps.
Geological Survey of Ireland (GSI) Maps	GSI Teagasc subsoils map consulted to identify if alluvial sediments are shown to be present at development site that may indicate the presence of a watercourse and floodplain.
Historical Maps	Previous history maps assessed Historic map 25" (1888-1913) and 6" Cassini mapping assessed http://map.geohive.ie
News Reports	No News published in newspapers or digital websites within or in the vicinity of the site.

3.3 Primary Sources of Baseline Data

(i) Preliminary Flood Risk Assessment

The PFRA is a national screening exercise, based on available and readily derivable information, to identify areas where there may be a significant risk associated with flooding (referred to as Areas for Further Assessment, or AFA's). As part of the PFRA study, maps of the country were produced showing the indicative fluvial, coastal, pluvial and groundwater flood extents.

The PFRA map for this site indicates fluvial flooding within the site area for the 1% AEP (100-year event). No Pluvial flooding within the site area was indicated.

The PFRA Maps for the area are reproduced in Appendix B/1, B/2 and B/3.

(ii) Catchment Flood Risk Assessment and Management Study

The site is covered within the Portlaoise CFRAM study areas. The CFRAM programme led by the OPW, provides a detailed assessment of flooding in areas identified as AFA's (Area for Further Assessment) during the PFRA study. Catchment wide Flood Risk Management Plans were also developed as part of

the programme. The published Final CFRAM (20/07/2016) mapping for Portlaoise indicates fluvial flooding within the site for the 10%, 1% and 0.1% Fluvial AEP Event.

The published CFRAM flood maps are reproduced in Appendix B/4.

(iii) OPW National Flood Hazard Mapping

The OPW National Flood Hazard Mapping Web Site (www.floodmaps.ie) was examined to identify any recorded flood events within the vicinity of the site. Previous flooding has been recorded to adjacent to the site.

The OPW Flood Hazard Mapping is reproduced in Appendix B/5.

(iv) Portlaoise Main Drainage Preliminary Report

The Portlaoise Main Drainage Preliminary Report which was found at the same website (www.floodmaps.ie) reports that the cause of the flooding in (iii) above was a lack of capacity, siltation, blockages and high flows in winter leading to significant out of bank flow at some locations. The report was compiled in 2000 and provides a number of recommendations. The extent of upgrades undertaken since then is unknown.

The report highlights surface flooding over sections of Church Avenue as an issue. This is unlikely to affect the current site due to the vertical alignment of the Church Avenue which falls to the north and the also due to the presence of existing kerbs and footpaths which provide an upstand prevent over-topping of water into the site. The report does not provide any recommendations to deal with this, however, additional gullies can be provided where works to the boundary walls and pavements of this site are being undertaken. The report does recommend upgrades to the surface water pipe network; however, not at any locations in the vicinity of the site.

(v) Secondary Sources of Baseline data

The following sources were also examined to identify areas that may be liable to flooding:

Table 3.2: Secondary Sources of Baseline Data

Source	Data Gathered
GSI Maps	GSI Teagasc subsoils map shows the Portlaoise site is underlain by alluvMIN - alluvial (mineral) and made ground. No evidence of Karst features has been identified within the vicinity of the site. Refer to Appendix B/6 and 7 for GSI maps.
Historical Maps	No areas of the site have been identified as liable to flooding. Refer to Appendix B/8 and 9 for Historical Maps.

3.4 Conclusion of Stage 1 SFRA

In accordance with Stage 1 of the approach outlined in the Guidelines, the possible sources of flooding associated with this development have been identified. These are summarised in **Table 3.3** (taken from Appendix A of the Guidelines).

Table 3.3: Possible Sources of Flooding Associated with the site

Source	Pathway	Receptor	Likelihood	Consequence	Risk
Tidal	Overland flow, out of bank	People/Property within the subject site	Low	High - due to nature of proposed development	**Low** due to site not in close proximity to coastal waterbodies.
Fluvial	Overland flow, out of bank	People/Property within the subject site	Medium-High		**High** due to site being located adjacent to the River Triogue.
Surface Water	Blockage overflow	People/Property within the subject site	Medium		**Low** if appropriate drainage systems are incorporated in development and maintained appropriately.
Groundwater	Rising levels	People/Property within the subject site	Low		**Low.** No evidence of groundwater flooding in consulsted sources.

The information provided in this section indicates that there is potentially a risk of Fluvial flooding arising along the eastern boundary of the site, additionally a section of a proposed building appears to be within the 1% and 0.1% AEP fluvial flood extents, therefore. The Flood Risk Assessment is progressed to a stage 2 assessment below.

4. STAGE 2 – INITIAL FLOOD RISK ASSESSMENT

4.1 General

A Stage 2 FRA (initial flood risk assessment) was undertaken to:

- Confirm the sources of flooding that may affect the subject site;
- Appraise the adequacy of existing information as identified by the Stage 1 FRA.

4.2 Sources of Flooding

Flooding from Fluvial & Sea Level Rises / Coastal Flooding

Fluvial flooding occurs when watercourses to exceed bank full capacity. Sea rise and coastal flooding can occur due to high tides and storm surges. The site is located directly adjacent to the River Triogue.

The Stage 1 assessment indicates fluvial flooding on the site in 10%, 1% and 0.1% AEP events. The CFRAM flood mapping node 14TRIO.0051, which is located approximately 40m downstream from the site, gives a water level (OD) 0.1% AEP at 89.96mOD. The topographical survey indicates the lowest existing level on site as being 89.33mOD. Site levels are below 89.96mOD approximately 10m from the riverbank. However, as this node is located downstream, the water level is expected to be higher at the site. The water level on site during extreme flood events needs to be confirmed. Therefore, a detailed flood risk assessment with respect to fluvial flooding is required.

Surface Water Flooding

Surface water flooding occurs when the local drainage system cannot convey stormwater flows in extreme rainfall events. Surface water flooding is unpredictable as it depends on a number of factors including ground levels, rainfall and the local drainage network. The drainage network for any development on the site will incorporate Sustainable Drainage Systems (SuDS) for the purpose of managing surface water in terms of both flow and water quality. Therefore, a detailed flood risk assessment with respect to flooding derived from surface water flooding will not be required

Pluvial Flood Risk

Pluvial flooding results from heavy rainfall that exceeds ground infiltration capacity or more commonly in Ireland where the ground is already saturated from previous rainfall events. This causes ponding and flooding at localized depressions. Pluvial flooding is commonly a result of changes to the natural flow regime such as the implementation of hard surfacing and improper drainage design. The sources consulted such as the PFRA mappings show no indication that the site is subject to pluvial derived flooding. Pluvial flooding will be considered in the design of drainage systems as part of the planned development. Therefore, a detailed flood risk assessment with respect to flooding derived from pluvial sources will not be required.

Groundwater Flooding

Ground water flooding is a result of upwelling in occurrences where the water table or confined aquifers rises above the ground surface. This tends to occur after long periods of sustained rainfall and/or very high tides. High volumes of rainfall and subsequent infiltration to ground will result in a rising of the water table. Groundwater flooding tends to occur in low-lying areas, where with additional groundwater flowing towards these areas, the water table can rise to the surface causing groundwater

flooding. The sources consulted such as the CFRAM mapping and GSI records show no indication that the subject site is subject to Groundwater derived flooding. The Convent Lands site is not considered to require a detailed flood risk assessment with respect to groundwater flooding.

4.3 Conclusion of Stage 2 SFRA

The available sources consulted above indicate that the subject site is within the 1 in 100 year fluvial floodplain. A section of the proposed building footprint also appears to be within the 1 in 100 year and 1 in 1000 year fluvial flood extents.

As per the OPW Guidelines, a Stage 3 detailed flood risk assessment is required to be undertaken to confirm flood risk (water levels and flood extents) to the site and determine potential flood mitigation measures.

5. STAGE 3 DETAILED FLOOD RISK ASSESSMENT

5.1 Introduction

Stages 1 and 2 of the flood risk assessment for the Convent lands have indicated that the lands are subject to flooding in medium and low probability exceedance events from fluvial sources. A hydraulic model has been prepared to ascertain the effects of extreme fluvial events. This section outlines the hydrological analysis carried out for River Triogue and the hydraulic modelling methodology.

5.2 Hydrological Analysis

5.2.1 Fluvial Flow Estimation

The River Triogue and tributaries catchment upstream of the subject site is approximately 33km^2 and is shown in Figure 6 below.

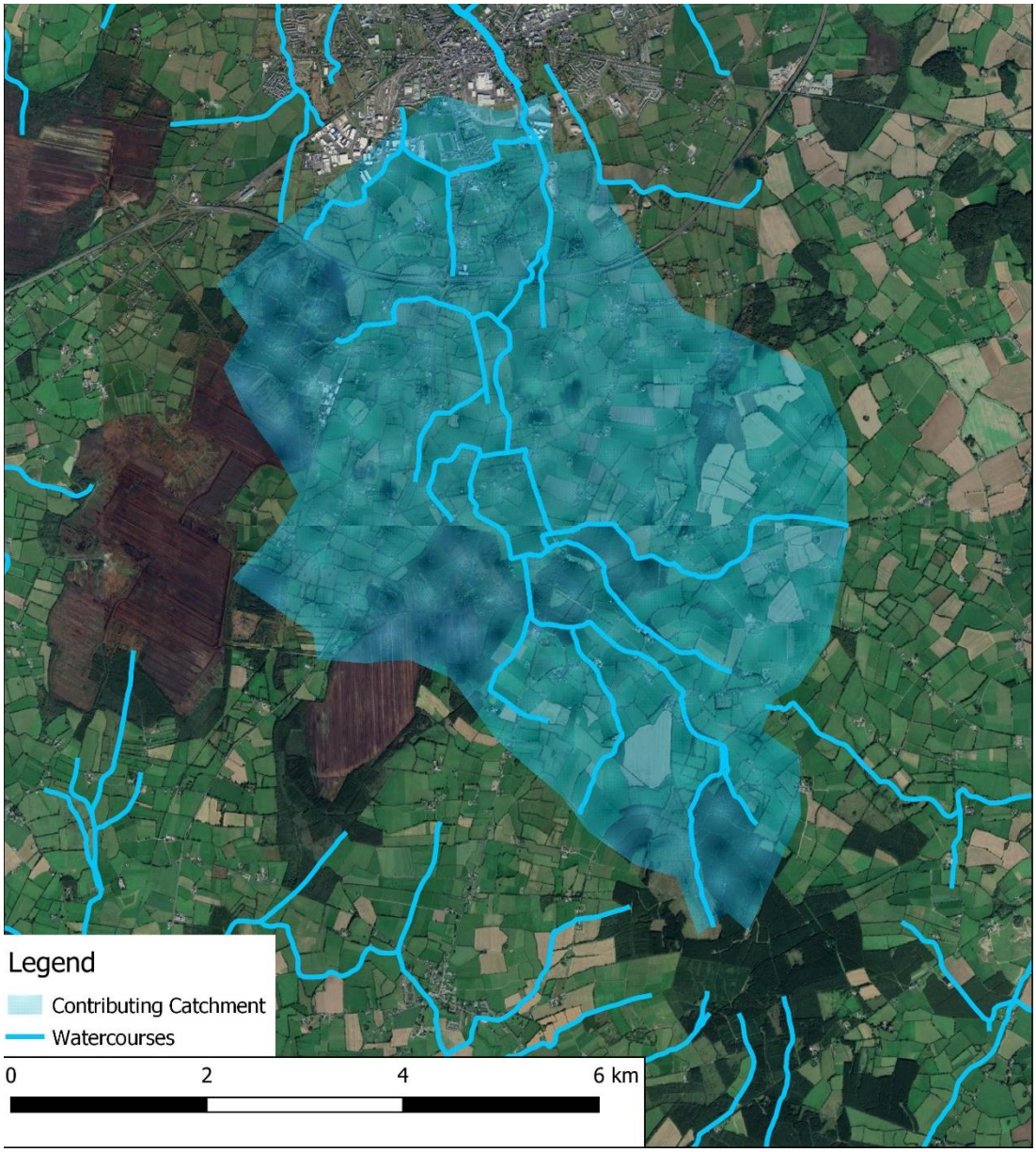


Figure 6: River Triogue and Tributaries Upstream Catchment

The peak fluvial flows for the 1 in 100 year and 1 in 1000 year events were estimated for the River Triogue catchment using the industry standard OPW Flood Studies Update (FSU) flow estimation method. This was compared against the flows derived as part of the CFRAMs flood study. The results are stated below in Table 5.1.

Table 5.1: River Triogue Flow Estimation

Return Period Current Scenario (1:x year)	CFRAMS derived flows (m^3/s)	OPW FSU (m^3/s)
100	9.67	15.24
1000	12.83	21.95

The comparison above is supportive of the OPW FSU generated flows. The FSU methodology is generally regarded as the most appropriate methodology for flow estimation for medium to large catchments (>25km^2). It is noted that the flows inputted

as part of the CFRAMs are significantly less than the FSU figures, as per a precautionary approach, the OPW FSU flow estimation figures have been adopted for this assessment.

In addition to the current climate scenario, flows were estimated for the Mid-Range Future Scenario (MRFS) as stated in the OPWs Climate Change Sectoral Adaptation Plan - Flood Risk Management (2019). The FSU calculated flows plus climate change allowances are shown in Table 5.2 below.

Table 5.2: Summary of ROD Hydrological Assessment

Return Period (1:x year)	Peak flow Current Scenario (m^3/s)	Peak flow MRFS Scenario (m^3/s)
100	15.24	18.288
1000	21.95	26.34

5.3 Hydraulic Model

A 1D-2D hydraulic model of the River Triogue was developed using the Jacobs Flood Modeller software v4.4. A digital terrain model (DTM) of the subject lands was created using LiDAR data. The DTM was linked to the 1D model using a series of link lines that allow water to pass from the 1D domain to the 2D domain when the water level in the channel exceeds the bank levels.

A site visit was conducted on the 24th July 2019. Significant features within the channels and in the floodplains were recorded. It was noted that the channels through the Convent lands were significantly overgrown with vegetation in places. The site visit aided in determining the manning's roughness values attributable to the reach. A roughness grid shapefile was used in the model to represent the effects of different surfaces on overland flow. Manning's N values ranged from 0.02 for pavement to 0.3 to simulate the permeability of flooded buildings.

5.4 Hydraulic Modelling Scenarios

Variations of this hydraulic model were constructed to simulate the existing site conditions and post-development characteristics for 1 in 100 and 1 in 1000 year events respectively. These Scenarios are as follows:

5.4.1 Scenario 1 – Existing Topography – Current Climate Conditions -1 in 100 and 1 in 1000 Year Events

Scenario 1 simulates the current site development. The hydraulic model was run for the 1 in 100 and 1 in 1000 year fluvial events with current climate conditions.

5.4.2 Scenario 2 – Existing Topography – Mid-Range Future Climate Conditions -1 in 100 and 1 in 1000 Year Events

Scenario 2 simulates the current site development. The hydraulic model was run for the 1 in 100 and 1 in 1000 year fluvial events with Mid-Range Future climate conditions.

5.4.3 Scenario 3 – Post Development – Mid-Range Future Climate Conditions -1 in 100 and 1 in 1000 Year Events

Scenario 3 simulates the effect of the proposed development within the subject site. All building floor levels are simulated to be 91.35mOD. The concrete floor slabs are supported on 350mm thick party walls approximately 4.5m apart. Compensatory flood storage will be provided "level for level" in an area of the left bank of the River Triogue within the subject site. Compensatory Storage volumes are stated in Table 5.3 below.

Table 5.3: Compensatory Storage Volumes

Flood Event	Compensatory Storage Volume required (m^3)
1 in 100 year	41.45
1 in 1000 year	81.70

5.5 Hydraulic Modelling Summary

The findings from the hydraulic model are that there are significant areas of flooding adjacent the River Triogue within Portlaoise Town. Currently out of bank flooding occurs both upstream and downstream of the site in extreme events. A large portion of the subject site is within Flood Zone A and the majority of the subject site is within Flood Zone B. The footprint of the proposed development buildings is also within Flood Zone A. Flood extent mapping generated as part of this Hydraulic assessment is shown in the Appendix C. Maximum flood levels extracted from the hydraulic model are stated in Table 5.4 below.

Table 5.4: Maximum Flood Levels (all levels include for climate change factor

Return Period	Existing Development		Proposed Development		Difference (Existing-Proposed)	
Location:	1 in 100 year (WL mOD)	1 in 1000 year (WL mOD)	1 in 100 year (WL mOD)	1 in 1000 year (WL mOD)	1 in 100 year (WL mOD)	1 in 1000 year (WL mOD)
Bridge Street Culvert Downstream	90.665	91.093	90.683	91.116	0.018	0.023
Site Boundary Upstream	90.524	91.057	90.549	91.104	0.025	0.047
Centre of Site	90.403	90.957	90.378	90.918	-0.025	-0.039
Laois Library Car Park (Downstream)	90.334	90.882	90.336	90.855	0.002	-0.027

The proposed minimum finished floor level for buildings on the site is 91.35mOD, this is ~250mm above the maximum flood level on site (in the 1 in 1000 year + climate change flood event) of 91.104mOD. The flood levels stated in the table above indicate that there is negligible impact due to the proposed development. Variations between the existing and proposed development scenarios are less than 50mm both upstream and downstream of the site. As per the sequential approach, a justification test is required for the proposed development.

6. JUSTIFICATION TEST

The flood risk assessment carried out for the purposes of the proposed residential development determined that the subject site is within lands at risk of flooding. In this context, the proposed development satisfies the Justification Test as outlined below:

7.1 The subject lands have been zoned or otherwise designated for the use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines.

The subject site is zoned Town Centre (Primary / Core Retail Area) as per the Portlaoise Local Area Plan 2018-2024. Town Centre (Primary / Core Retail Area) purpose is described as:

"To enhance the vitality and viability of the town centre through the promotion of retail, residential, commercial, office, cultural, public facilities and other uses appropriate in the urban core.

To prioritise the development of town centre lands in order to consolidate the development of the town.

To encourage the use of buildings and backlands, in particular the full use of upper floors, preferably for residential purposes. "

The proposed development achieves these purposes as it provides medium-high density residential units in currently underused lands close to the town centre. Therefore, the proposed development is suitable for the subject site.

7.2. The proposal has been subject to an appropriate flood risk assessment that demonstrates:

7.2.1. The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk;

The hydraulic model produced as part of this assessment indicates that the proposed development will have a negligible impact on flood extents and water levels upstream and downstream of the subject site. The minor increase of development footprint within the floodplain will be mitigated by the provision of "level for level" compensatory storage. Therefore, there will not be any overall increase in flood water displacement or increased flood risk within the site or adjacent lands.

7.2.2 The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible;

The proposed development shall be defended to the 1 in 1000 year fluvial flood level as per the OPW Guidelines. ROD proposes that the finished floor level shall be minimum level of 91.35mOD this is ~250mm above the maximum flood level on site of 91.104mOD. The proposed finished floor level was derived from the hydraulic modelling undertaken for this assessment, the includes an allowance for climate change and an appropriate freeboard as per OPW Guidance.

Evacuation routes from all proposed residential units remain useable in extreme flood events. The emergency response plan in case of flooding shall be included as part of the welcome pack for all new occupants of the proposed development.

7.2.3 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 proposed development has been designed with regard to flood resilient construction measures and materials. The proposed development will be subject to a maintenance plan, the maintenance of the proposed development will be undertaken by the relevant competent authority.

7.2.4 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 proposed residential development will facilitate compact and sustainable urban growth. Other sites of this size are only available at the periphery of Portlaoise town, a considerable distance from the urban core. The proposed development will reinforce Portlaoise's compact urban centre which will assist in achieving strategic planning objectives in the immediate vicinity and Laois as a whole. The proposed development is in keeping with the surrounding areas visuals and uses within Portlaoise Town.

6.1 Justification Test Conclusions

The proposed development has been determined to have satisfied all requirements of the justification test.

7. CONCLUSIONS

This SSFRA has considered the local hydrological conditions pertaining to the Convent Lands Portlaoise site and found that the site is subject to flooding for 1 in 100 and 1 in 1000 year fluvial events. The findings of this SSFRA indicate that flood risk to the site can be managed without increasing flood risk elsewhere. The proposed development satisfies the requirements of the Justification Test (as described in the OPW's "The Planning System and Flood Risk Management Guidelines for Planning Authorities") and is therefore deemed appropriate for the site.

APPENDIX A

GLOSSARY OF TERMS

GLOSSARY OF TERMS

Catchment: The area that is drained by a river or artificial drainage system.

Catchment Flood Risk Assessment and Management Studies (CFRAMS): A catchment-based study involving an assessment of the risk of flooding in a catchment and the development of a strategy for managing that risk in order to reduce adverse effects on people, property and the environment. CFRAMS precede the preparation of Flood Risk Management Plans (see entry for FRMP).

Climate change: Long-term variations in global temperature and weather patterns, which occur both naturally and as a result of human activity, primarily through greenhouse gas emissions.

Core of an urban settlement: The core area of a city, town or village which acts as a centre for a broad range of employment, retail, community, residential and transport functions.

Detailed flood risk assessment: A methodology to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of flood hazard and potential risk to an existing or proposed development, of its potential impact on flood elsewhere and of the effectiveness of any proposed measures.

Estuarial (or tidal) flooding: Flooding from an estuary, where water level may be influenced by both river flows and tidal conditions, with the latter usually being dominant.

Flooding (or inundation): Flooding is the overflowing of water onto land that is normally dry. It may be caused by overtopping or breach of banks or defences, inadequate or slow drainage of rainfall, underlying groundwater levels or blocked drains and sewers. It presents a risk only when people, human assets and ecosystems are present in the areas that flood.

Flood Relief Schemes (FRS): A scheme designed to reduce the risk of flooding at a specific location.

Flood Defence: A man-made structure (e.g. embankment, bund, sluice gate, reservoir or barrier) designed to prevent flooding of areas adjacent to the defence.

Flood Risk Assessment (FRA): FRA can be undertaken at any scale from the national down to the individual site and comprises 3 stages: Flood risk identification, initial flood risk assessment and detailed flood risk assessment.

Flood Risk Identification: A desk- based study to identify whether there may be any flooding or surface water management issues related to a plan area or proposed development site that may warrant further investigation.

Flood Hazard: The features of flooding which have harmful impacts on people, property or the environment (such as the depth of water, speed of flow, rate of onset, duration, water quality, etc.).

Floodplain: A flood plain is any low-lying area of land next to a river or stream, which is susceptible to partial or complete inundation by water during a flood event.

Flood Risk: An expression of the combination of the flood probability, or likelihood and the magnitude of the potential consequences of the flood event.

Flood Storage: The temporary storage of excess run-off, or river flow in ponds, basins, reservoirs or on the flood plain.

Flood Zones: A geographic area for which the probability of flooding from rivers, estuaries or the sea is within a particular range.

Fluvial flooding: Flooding from a river or other watercourse.

Groundwater flooding: Flooding caused by groundwater escaping from the ground when the water table rises to or above ground level.

Initial flood risk assessment: A qualitative or semi-quantitative study to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information, to provide a qualitative appraisal of the risk of flooding to development, including the scope of possible mitigation measures, and the potential impact of development on flooding elsewhere, and to determine the need for further detailed assessment.

Freeboard: Factor of safety applied for water surfaces. Defines the distance between normal water level and the top of a structure, such as a dam, that impounds or restrains water.

Justification Test: An assessment of whether a development proposal within an area at risk of flooding meets specific criteria for proper planning and sustainable development and demonstrates that it will not be subject to unacceptable risk nor increase flood risk elsewhere. The justification test should be applied only where development is within flood risk areas that would be defined as inappropriate under the screening test of the sequential risk-based approach adopted by this guidance.

Likelihood (probability) of flooding: A general concept relating to the chance of an event occurring. Likelihood is generally expressed as a probability or a frequency of a flood of a given magnitude or severity occurring or being exceeded in any given year. It is based on the average frequency estimated, measured or extrapolated from records over a large number of years and is usually expressed as the chance of a particular flood level being exceeded in any one year. For example, a 1-in-100 or 1% flood is that which would, on average, be expected to occur once in 100 years, though it could happen at any time.

Ordnance Datum (or OD) Malin: is a vertical datum used by an ordnance survey as the basis for deriving altitudes on maps. A spot height may be expressed as AOD for “above ordnance datum”. Usually mean sea level (MSL) is used for the datum. In the Republic of Ireland, OD for the Ordnance Survey of Ireland is Malin Ordnance Datum: the MSL at Portmoor Pier, Malin Head, County Donegal, between 1960 and 1969. Prior to 1970, Poolbeg Ordnance Datum was used: the low water of spring tide at Poolbeg lighthouse, Dublin, on 8 April 1837. Poolbeg OD was about 2.7 metres lower than Malin OD.

Management Train/Treatment Train: the sequence of drainage components that collect, convey, store and treat runoff as it drains through the site.

Mitigation: The term is used to describe an action that helps to lessen the impacts of a process or development on the receiving environment. It is used most often in association with measures that would seek to reduce negative impacts of a process or development.

Pathways: These provide the connection between a particular source (e.g. high river or tide level) and the receptor that may be harmed (e.g. property). In flood risk management, pathways are often ‘blocked’ by barriers, such as flood defence structures, or otherwise modified to reduce the incidence of flooding.

Pluvial flooding: Usually associated with convective summer thunderstorms or high intensity rainfall cells within longer duration events, pluvial flooding is a result of rainfall-generated overland flows which arise before run-off enters any watercourse or sewer. The intensity of rainfall can be such that the run-off totally overwhelms surface water and underground drainage systems.

Regional Planning Guidelines (RPG): These provide the regional context and priorities for applying national planning strategy to each NUTS III region and encourage greater co-ordination of planning policies at the city/county level. RPGs are an important part of the flood policy hierarchy as they can assist in co-ordinating flood risk management policies at the regional level.

Resilience: Sometimes known as "wet-proofing", resilience relates to how a building is constructed in such a way that, although flood water may enter the building, its impact is minimised, structural integrity is maintained, and repair, drying and cleaning and subsequent reoccupation are facilitated.

Receptors: Things that may be harmed by flooding (e.g. people, houses, buildings or the environment).

Residual risk: The risk which remains after all risk avoidance, substitution and mitigation measures have been implemented, on the basis that such measures can only reduce risk, not eliminate it.

Sequential Approach: The sequential approach is a risk-based method to guide development away from areas that have been identified through a flood risk assessment as being at risk from flooding. Sequential approaches are already established and working effectively in the plan-making and development management processes.

Sustainable Drainage System (SuDS): Drainage systems that are considered to be environmentally beneficial, causing minimal or no long-term detrimental impact.

Site-specific Flood Risk Assessment: An examination of the risks from all sources of flooding of the risks to and potentially arising from development on a specific site, including an examination of the effectiveness and impacts of any control or mitigation measures to be incorporated in that development.

Source: Refers to a source of hazard (e.g. the sea, heavy rainfall).

Strategic Flood Risk Assessment: The assessment of flood risk on a wide geographical area against which to assess development proposed in an area (Region, County, Town).

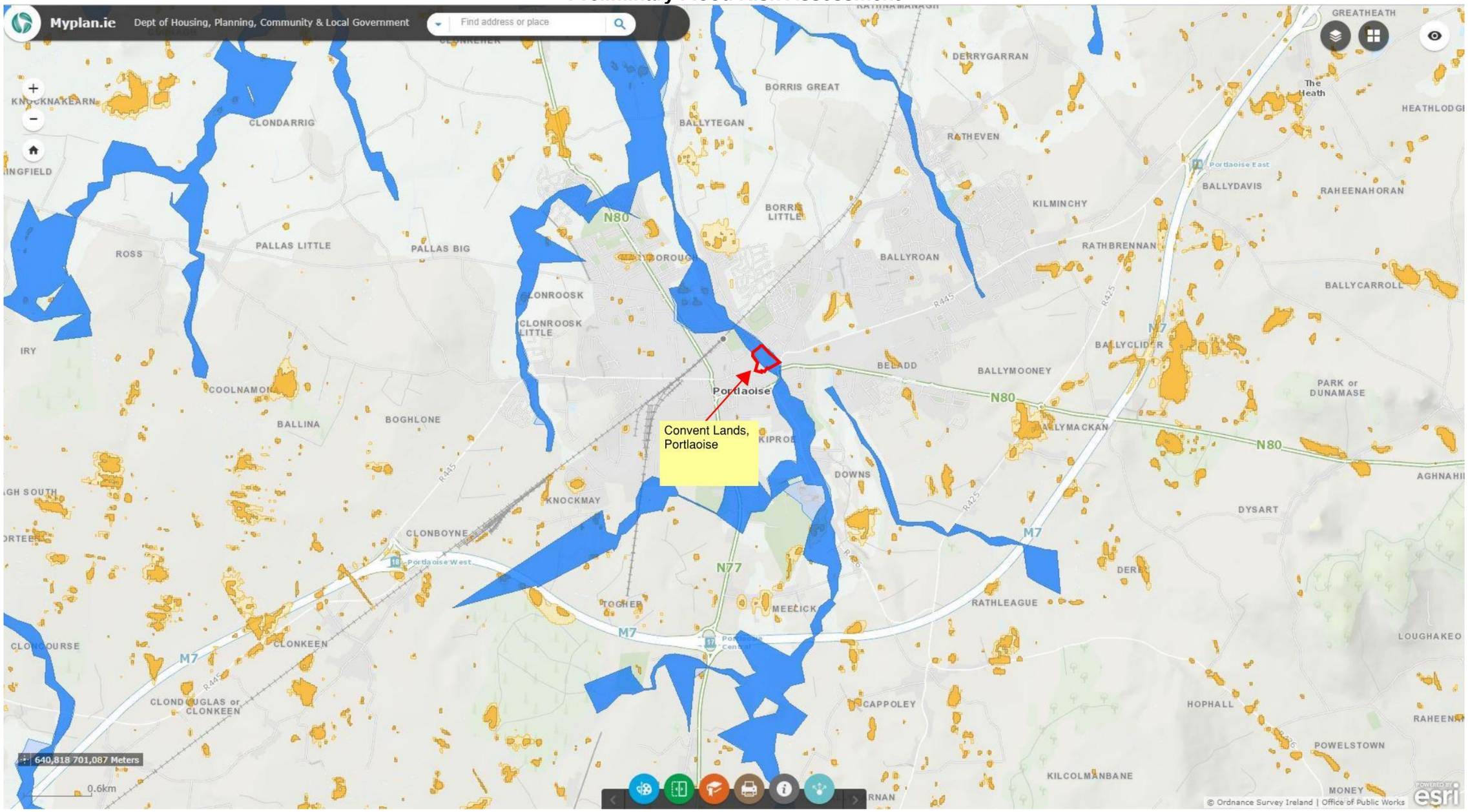
Vulnerability: The resilience of a particular group of people or types of property or habitats, ecosystems or species to flood risk, and their ability to respond to a hazardous condition and the damage or degree of impact they are likely to suffer in the event of a flood. For example, elderly people may be more likely to suffer injury, and be less able to evacuate, in the event of a rapid flood than younger people.

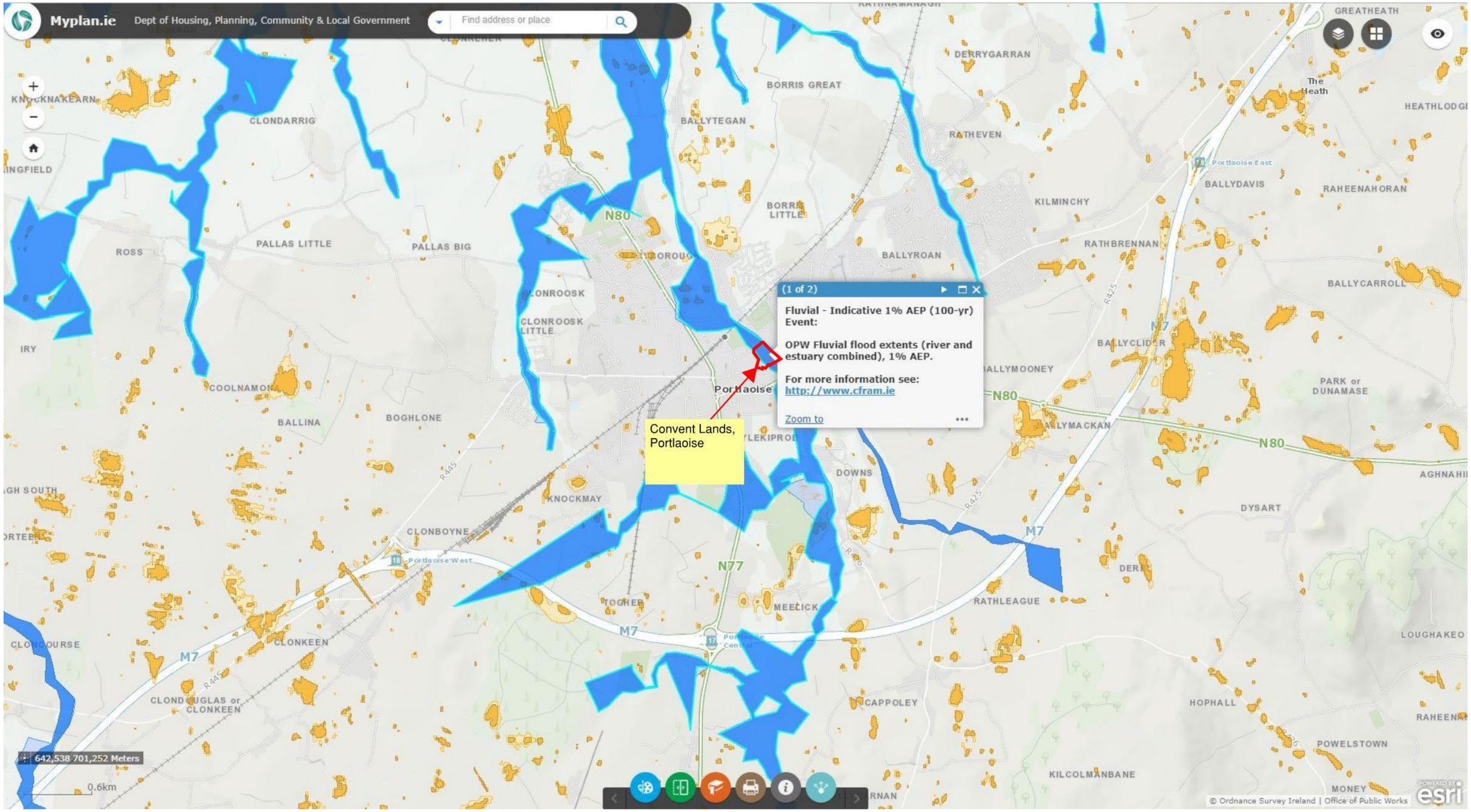
Source: *The definitions above are sourced from the DoEHLG Guidelines for Planning Authorities on 'The Planning System and Flood Risk Management, 2009' and Ciria 753 "the SuDS Manua*

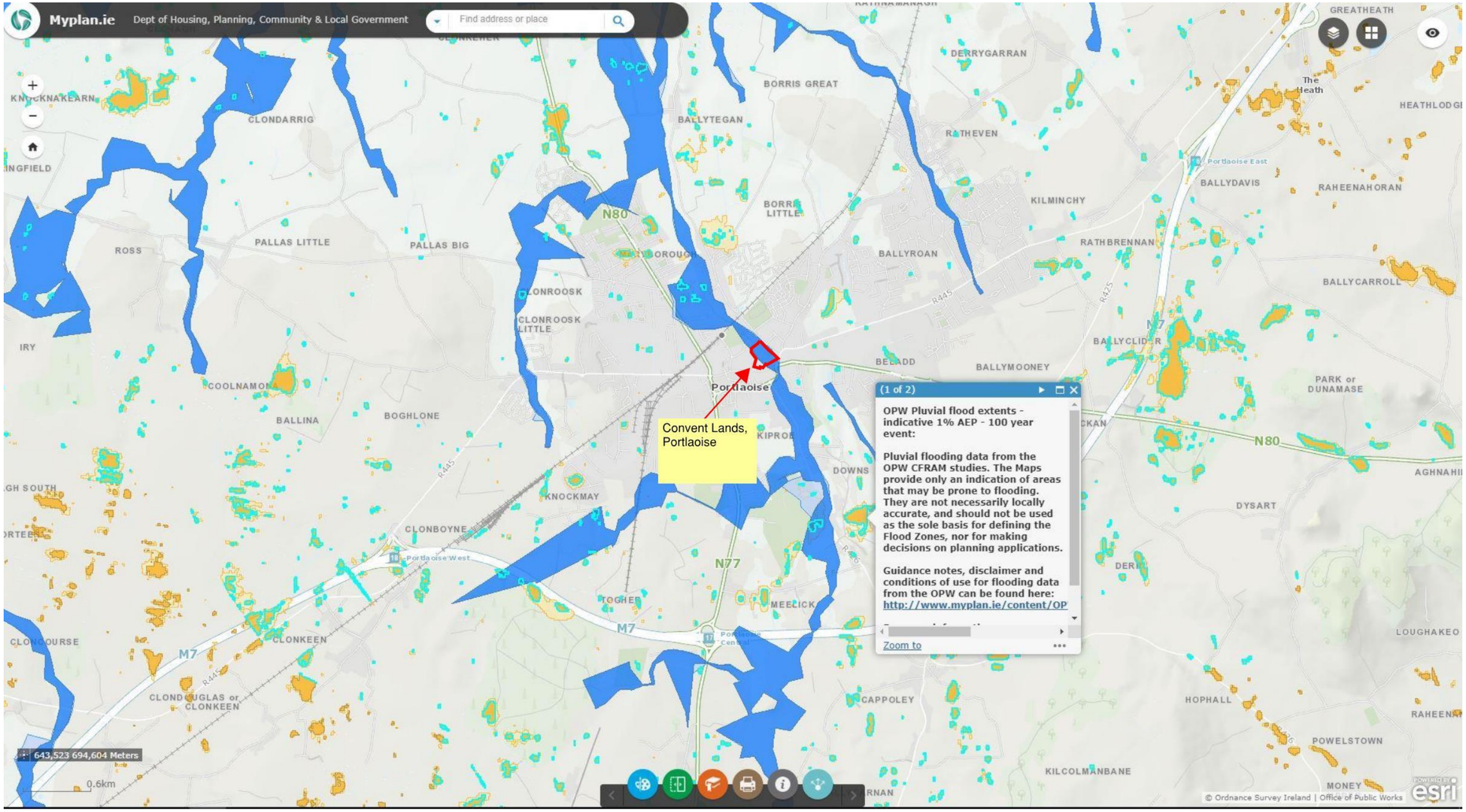
APPENDIX B

INDICATIVE FLOOD SOURCES

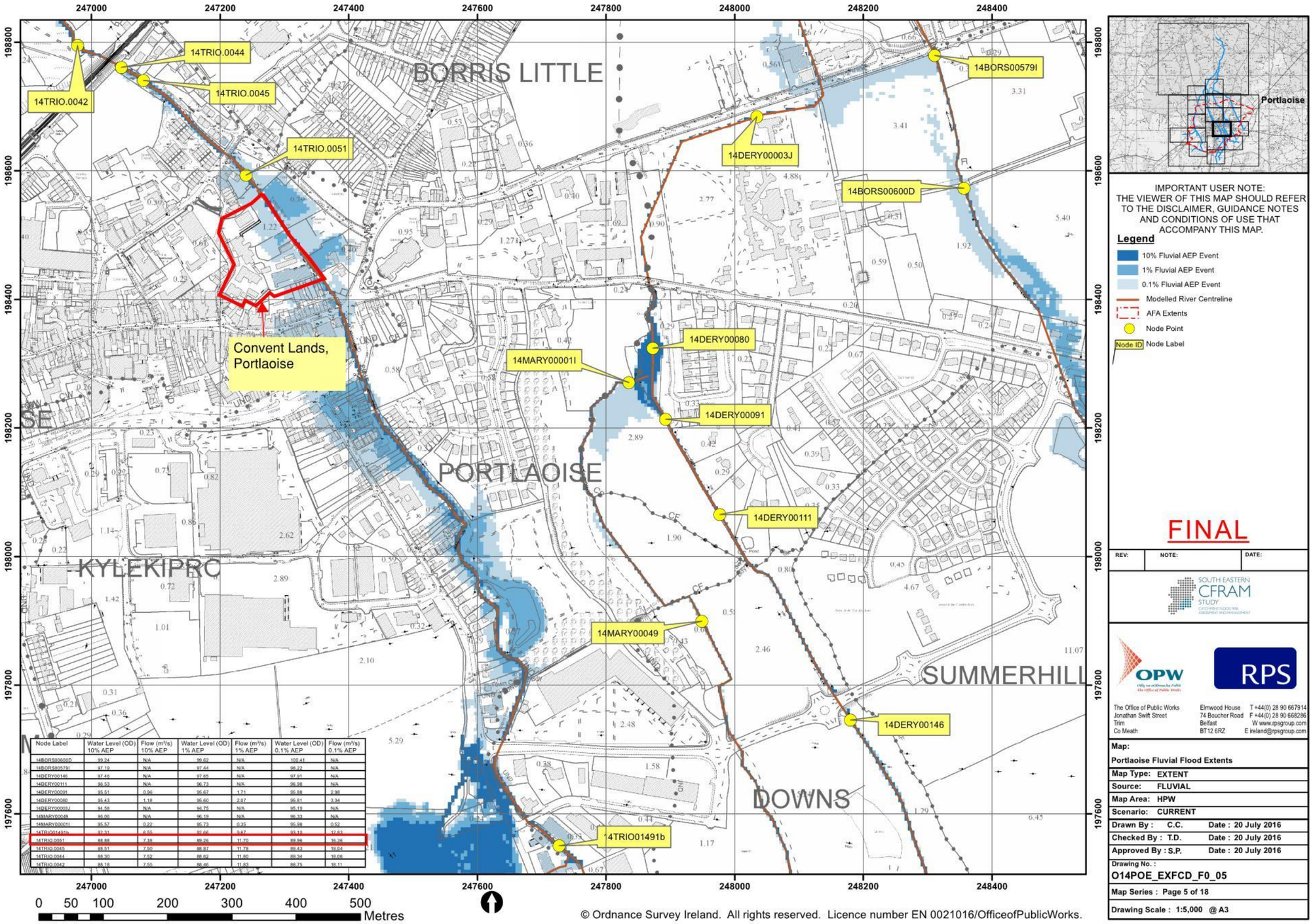
Preliminary Flood Risk Assessment




Myplan.ie
Dept of Housing, Planning, Community & Local Government
Find address or place
(1 of 2)
Fluvial - Indicative 1% AEP (100-yr) Event:
OPW Fluvial flood extents (river and estuary combined), 1% AEP.
For more information see:
http://www.cfram.ie
Zoom to
Convent Lands, Portlaoise
N80
N77
M7
N7
R445
R425
Portlaoise
Portlaoise West
Portlaoise East
Portlaoise Central
KNOCKNAKEARN
CLONDARRIG
BORRIS GREAT
BALLYTEGAN
DERRYGARRAN
RATHEVEN
GREATHEATH
The Heath
HEATHLODGE
BALLYDAVIS
RAHEENAHORAN
KILMINCHY
BORRIS LITTLE
BALLYROAN
RATHBRENNAN
BALLYCARROLL
ROSS
PALLAS LITTLE
PALLAS BIG
CLONROOSK
CLONROOSK LITTLE
BALLYCLIDER
BALLYMOONEY
PARK or DUNAMASE
COOLNAMONA
BALLINA
BOGHLONE
BALLYMACKAN
DOWNS
KNOCKMAY
CLONBOYNE
DYSART
RATHLEAGUE
TOGHER
MEELICK
CLONGOURSE
CLONKEEN
CLONDUGLAS or CLONKEEN
CAPPOLEY
HOPHALL
LOUGHAKEO
POWELSTOWN
KILCOLMANBANE
MONEY
642,538 701,252 Meters
0.6km
© Ordnance Survey Ireland | Office of Public Works
esri


Myplan.ie
Dept of Housing, Planning, Community & Local Government
Find address or place
Convent Lands, Portlaoise
(1 of 2)
OPW Pluvial flood extents - indicative 1% AEP - 100 year event:
Pluvial flooding data from the OPW CFRAM studies. The Maps provide only an indication of areas that may be prone to flooding. They are not necessarily locally accurate, and should not be used as the sole basis for defining the Flood Zones, nor for making decisions on planning applications.
Guidance notes, disclaimer and conditions of use for flooding data from the OPW can be found here:
http://www.myplan.ie/content/OP
Zoom to
643,523 694,604 Meters
0.6km
© Ordnance Survey Ireland | Office of Public Works
esri
N80
N77
M7
N7
R445
R425
Portlaoise
Portlaoise East
Portlaoise West
Portlaoise Central
GREATHEATH
The Heath
HEATHLODGE
DERRYGARRAN
BORRIS GREAT
BALLYTEGAN
RATHEVEN
KILMINCHY
BALLYDAVIS
RAHEENAHORAN
BORRIS LITTLE
BALLYROAN
RATHBRENNAN
BALLYCARROLL
BALLYCLIDER
BELADD
BALLYMOONEY
PARK or DUNAMASE
KNOCKNAKEARN
CLONDARRIG
ROSS
PALLAS LITTLE
PALLAS BIG
CLONROOSK
CLONROOSK LITTLE
COOLNAMONA
BALLINA
BOGHLONE
KIPROE
DOWNS
KNOCKMAY
CLONBOYNE
TOGHER
MEELICK
CLONKEEN
CLONDUGLAS or CLONKEEN
CAPPOLEY
HOPHALL
DYSART
AGHNAHI
LOUGHAKEO
POWELSTOWN
KILCOLMANBANE
MONEY
RAHEENA

Catchment Flood Risk Assessment and Management 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
14BORS00600D	99.24	N/A	99.62	N/A	100.41	N/A
14BORS00579I	97.19	N/A	97.44	N/A	98.22	N/A
14DERY00146	97.45	N/A	97.65	N/A	97.91	N/A
14DERY00111	96.53	N/A	96.73	N/A	96.98	N/A
14DERY00091	95.51	0.96	95.67	1.71	95.88	2.98
14DERY00080	95.43	1.18	95.60	2.07	95.81	3.34
14DERY00003J	94.58	N/A	94.75	N/A	95.19	N/A
14MARY00049	95.05	N/A	96.19	N/A	96.33	N/A
14MARY00001I	95.57	0.22	95.73	0.35	95.98	0.52
14TRIO01491b	92.31	6.55	92.66	9.67	93.10	12.83
14TRIO.0051	88.88	7.38	89.26	11.70	89.96	16.36
14TRIO.0045	88.51	7.50	88.87	11.78	89.43	18.04
14TRIO.0044	88.30	7.52	88.62	11.80	89.34	18.06
14TRIO.0042	88.18	7.55	88.46	11.83	88.75	18.11

OPW Flood Hazard Mappin

OPW *National Flood Hazard Mapping*

Summary Local Area Report

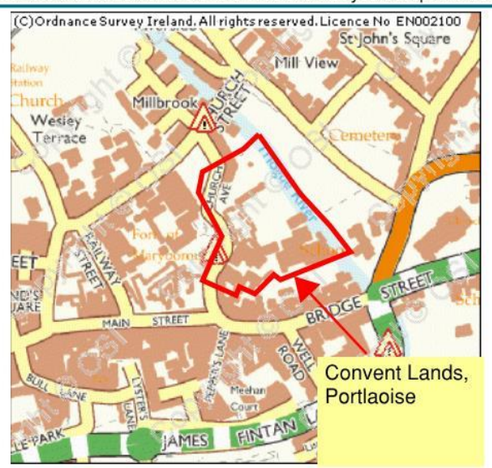
This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

The map centre is in:

County: Laois

NGR: S 472 984

This Flood Report has been downloaded from the Web site www.floodmaps.ie. The users should take account of the restrictions and limitations relating to the content and use of this Web site that are explained in the Disclaimer box when entering the site. It is a condition of use of the Web site that you accept the User Declaration and the Disclaimer.



Map Scale 1:5,886

Map Legend
Flood Points
Multiple / Recurring Flood Points
Areas Flooded
Hydrometric Stations
Rivers
Lakes
River Catchment Areas
Land Commission *
Drainage Districts *
Benefiting Lands *

* Important: These maps do not indicate flood hazard or flood extent. Thier purpose and scope is explained in the Glossary.

12 Results

1. Harpur's Lane Portlaoise Recurring — Start Date: — County: Laois — Flood Quality Code: 2
Additional Information: Reports (2) Press Archive (4) More Mapped Information

2. Mountmellick Road, Portlaoise Recurring — Start Date: — County: Laois — Flood Quality Code: 3
Additional Information: Reports (1) Press Archive (44) More Mapped Information

3. Station Road, Portlaoise Recurring — Start Date: — County: Laois — Flood Quality Code: 3
Additional Information: Reports (1) More Mapped Information

4. Cork Road Portlaoise Recurring — Start Date: — County: Laois — Flood Quality Code: 3
Additional Information: Reports (1) Press Archive (1) More Mapped Information

5. Church Street, Portlaoise Recurring — Start Date: — County: Laois — Flood Quality Code: 3
Additional Information: Reports (1) More Mapped Information

Report Produced: 18-Jul-2019 9:48

Additional Information: Reports (1) More Mapped Information

6. Timahoe Road, Portlaoise Recurring — Start Date: — County: Laois — Flood Quality Code: 3
Additional Information: Reports (1) Press Archive (2) More Mapped Information

7. Beladd, Portlaoise Recurring — Start Date: — County: Laois — Flood Quality Code: 3
Additional Information: Reports (1) Press Archive (2) More Mapped Information

8. Stradbally Road, Portlaoise Recurring — Start Date: — County: Laois — Flood Quality Code: 3
Additional Information: Reports (2) More Mapped Information

9. Church Avenue, Portlaoise Recurring — Start Date: — County: Laois — Flood Quality Code: 3
Additional Information: Reports (1) More Mapped Information

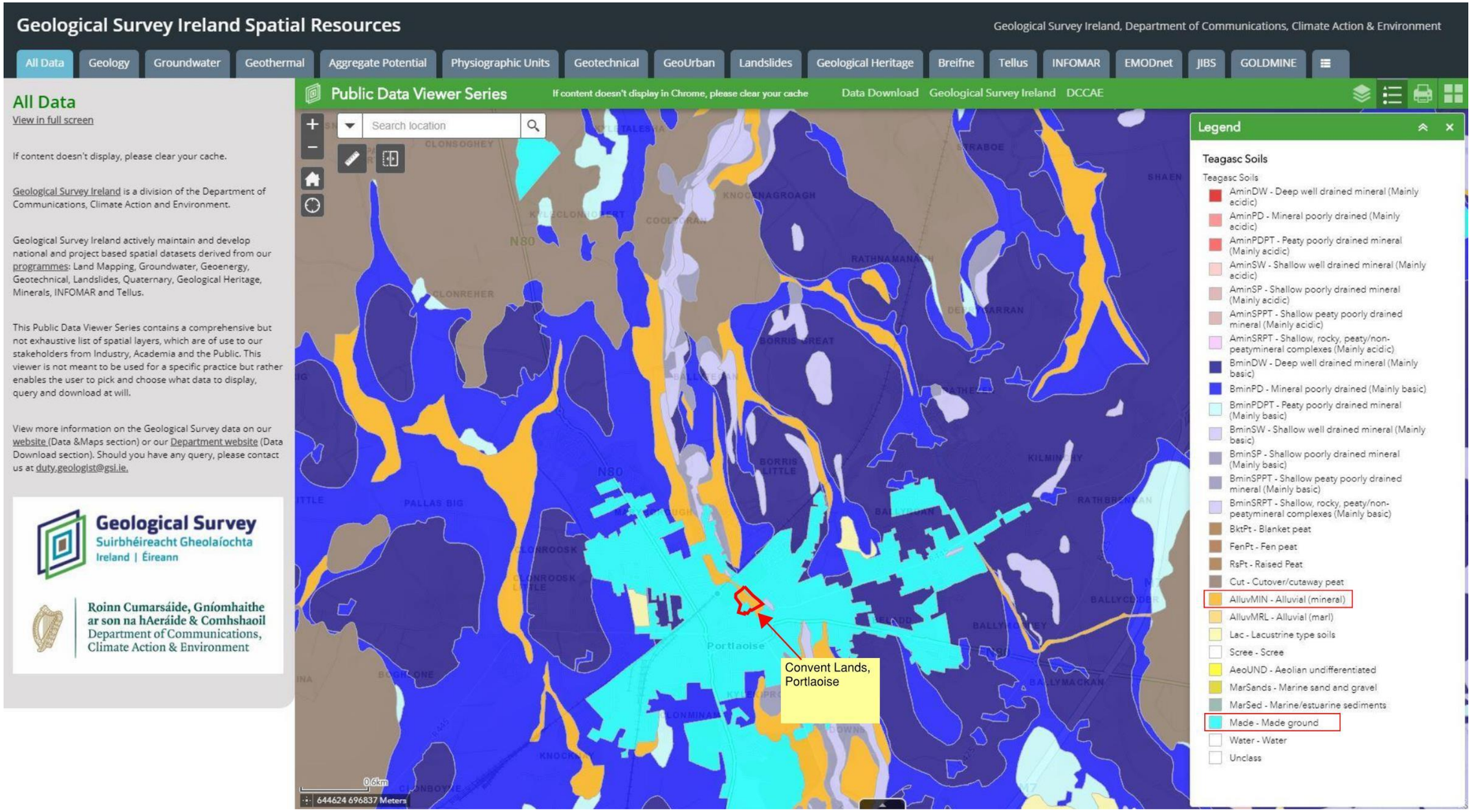
10. Well Road, Portlaoise Recurring — Start Date: — County: Laois — Flood Quality Code: 3
Additional Information: Reports (1) More Mapped Information

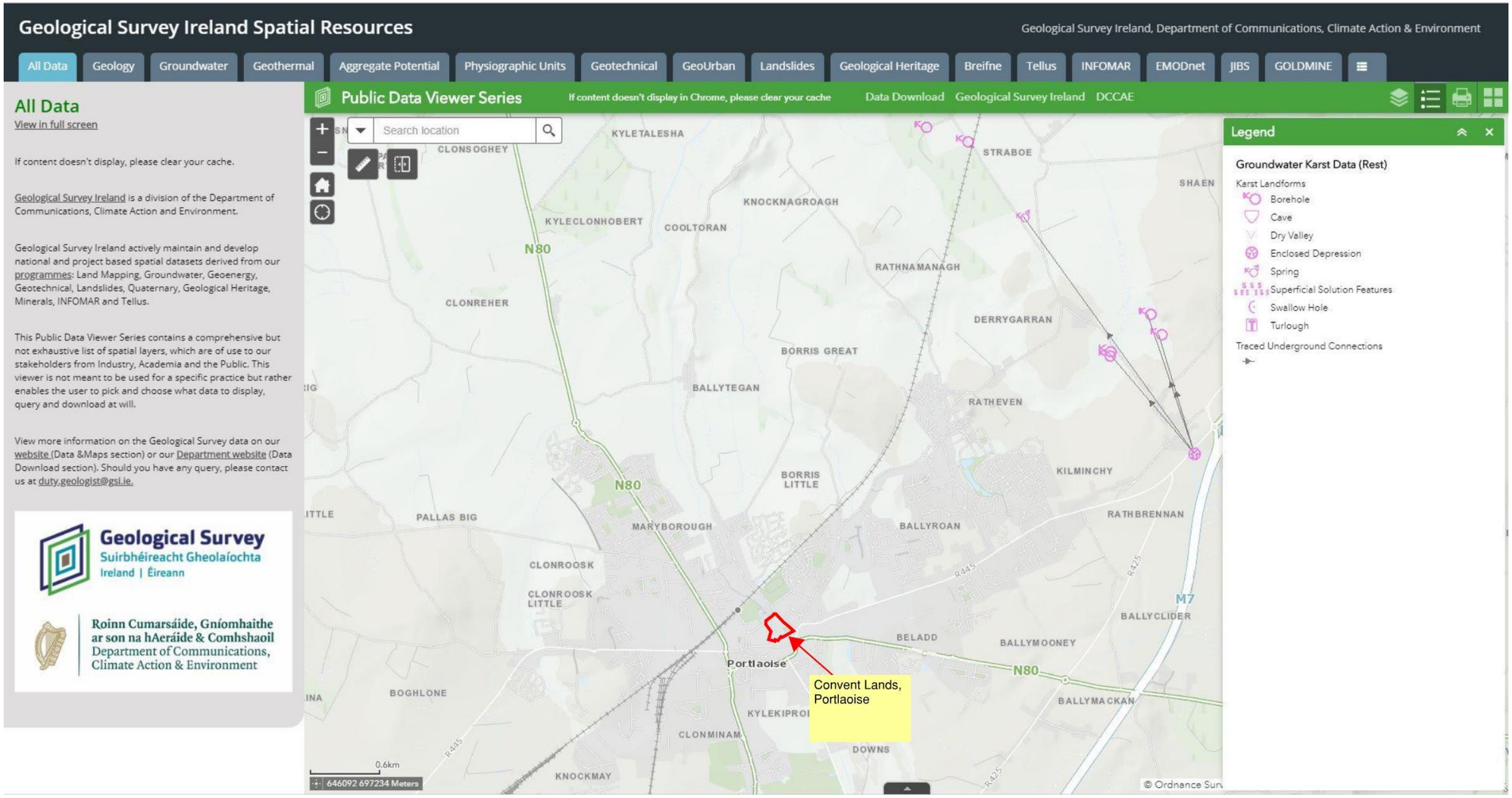
11. Triogue Bridge Street, Portlaoise Recurring — Start Date: — County: Laois — Flood Quality Code: 4
Additional Information: Reports (1) More Mapped Information

12. Triogue Timahoe Road, Portlaoise Recurring — Start Date: — County: Laois — Flood Quality Code: 4
Additional Information: Reports (1) More Mapped Information

Report Produced: 18-Jul-2019 9:48

Geological Survey of Ireland: Teagasc Subsoil Mapping




Geological Survey Ireland Spatial Resources
Geological Survey Ireland, Department of Communications, Climate Action & Environment
All Data
Geology
Groundwater
Geothermal
Aggregate Potential
Physiographic Units
Geotechnical
GeoUrban
Landslides
Geological Heritage
Breifne
Tellus
INFOMAR
EMODnet
JIBS
GOLDMINE
All Data
View in full screen
If content doesn't display, please clear your cache.
Geological Survey Ireland is a division of the Department of Communications, Climate Action and Environment.
Geological Survey Ireland actively maintain and develop national and project based spatial datasets derived from our programmes: Land Mapping, Groundwater, Geoenergy, Geotechnical, Landslides, Quaternary, Geological Heritage, Minerals, INFOMAR and Tellus.
This Public Data Viewer Series contains a comprehensive but not exhaustive list of spatial layers, which are of use to our stakeholders from Industry, Academia and the Public. This viewer is not meant to be used for a specific practice but rather enables the user to pick and choose what data to display, query and download at will.
View more information on the Geological Survey data on our website (Data &Maps section) or our Department website (Data Download section). Should you have any query, please contact us at duty.geologist@gsi.ie.
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Roinn Cumarsáide, Gníomhaithe ar son na hAeráide & Comhshaoil
Department of Communications, Climate Action & Environment
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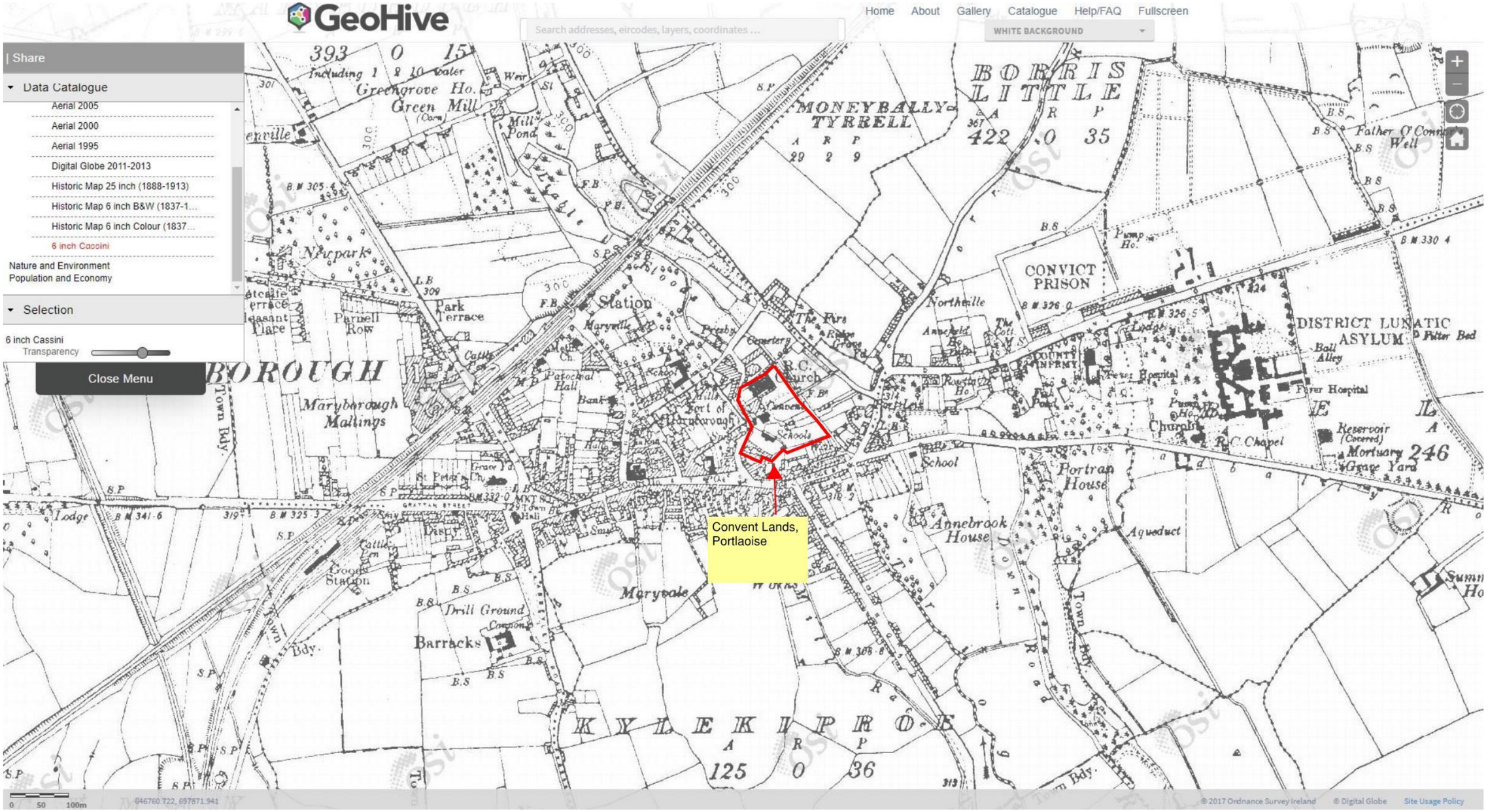
Legend
Groundwater Karst Data (Rest)
Karst Landforms
Borehole
Cave
Dry Valley
Enclosed Depression
Spring
Superficial Solution Features
Swallow Hole
Turlough
Traced Underground Connections
KYLETALESHA
CLONSOGHEY
STRABOE
SHAEN
KNOCKNAGROAGH
KYLECLONHOBERT
COOLTORAN
N80
RATHNAMANAGH
CLONREHER
DERRYGARRAN
BORRIS GREAT
BALLYTEGAN
RATHEVEN
KILMINCHY
BORRIS LITTLE
PALLAS BIG
MARYBOROUGH
BALLYROAN
RATHBRENNAN
CLONROOSK
CLONROOSK LITTLE
M7
BALLYCLIDER
BELADD
BALLYMOONEY
Portlaoise
Convent Lands, Portlaoise
BOGHLONE
BALLYMACKAN
CLONMINAM
DOWNS
KNOCKMAY
0.6km
646092 697234 Meters

Historical Maps: 6" Cassini



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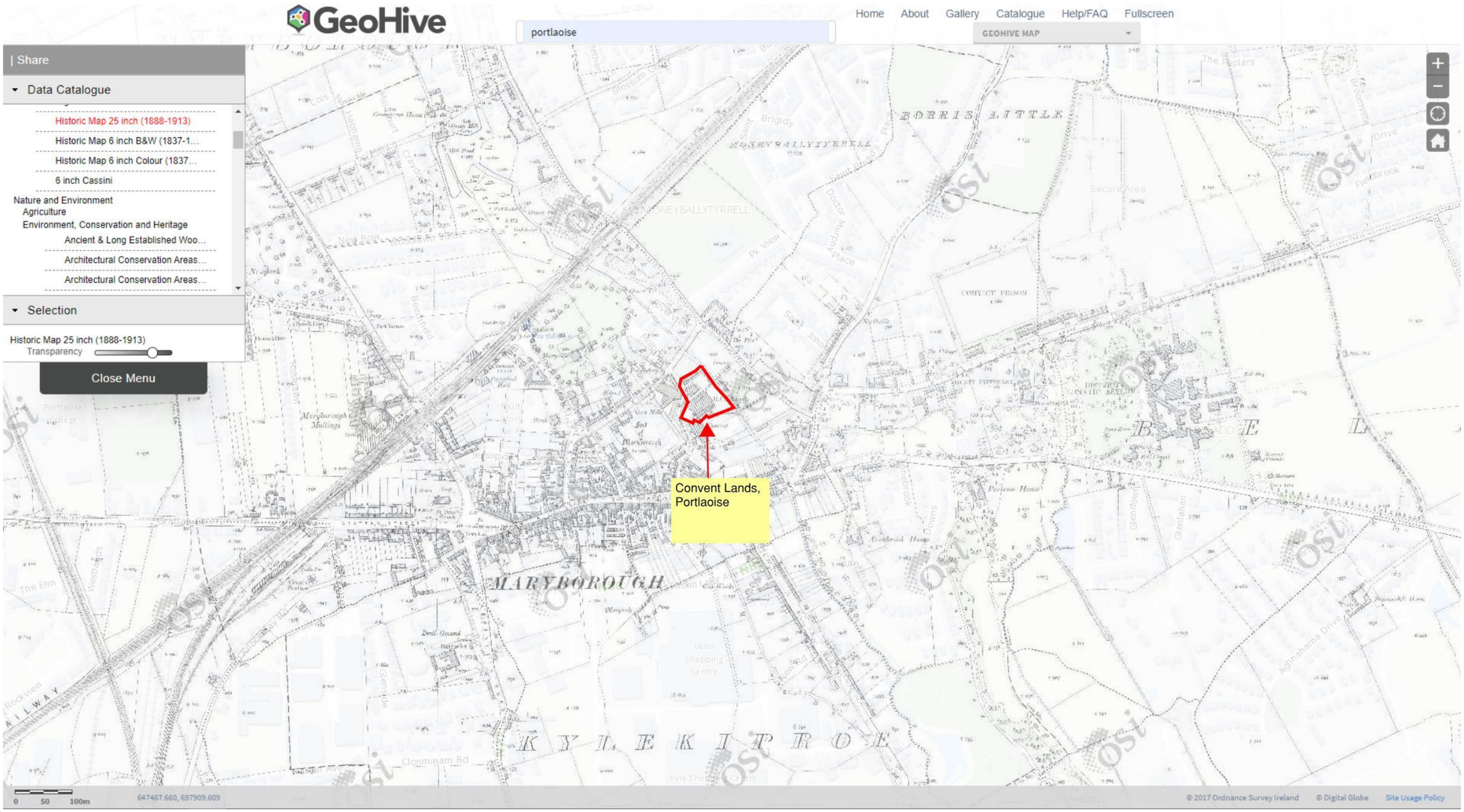
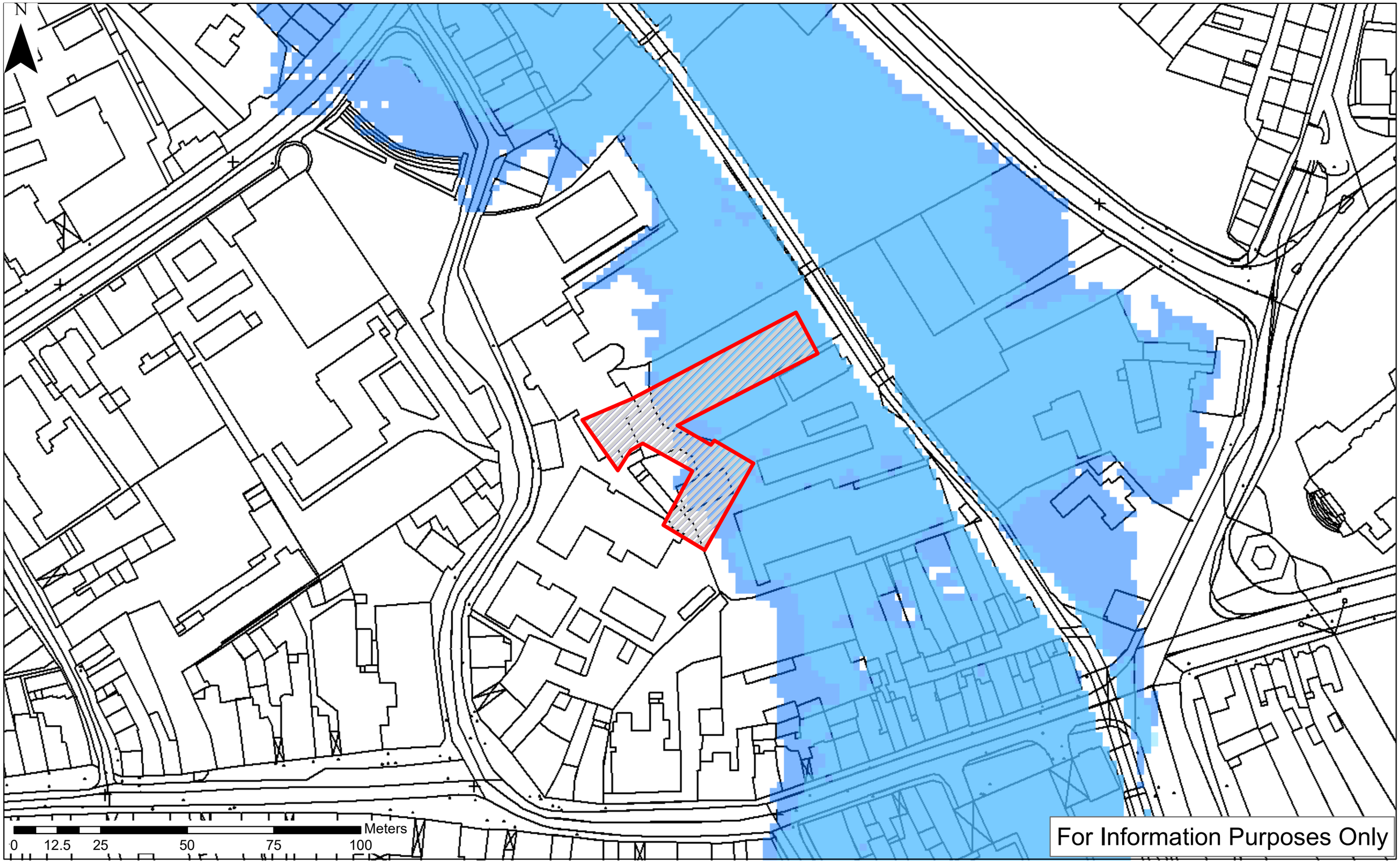


APPENDIX C

FLOOD MAPPING



Legend

- Proposed Buildings
- 1 in 100 Year Flood Extent - Current Climate Scenario
- 1 in 1000 Year Flood Extent - Current Climate Scenario

No.	Revision	Date	By	Chk'd	App'd
FI01	For Information	10/12/2019	WV	AT	AT
D01	Draft	07/12/2019	WV	--	--

Stage	Date	App'd
PRELIMINARY		
APPROVAL		
TENDER		
CONSTRUCTION		

ROD
ROUGHAN & O'DONOVAN
Consulting Engineers
Civil - Structural - Transportation - Environmental

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Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
Website : www.rod.ie

Designed: WV | Checked: AT | Approved: AT | Status: FOR INFORMATION

Project Title: Convent Lands Portlaoise

Drawing Title: Existing Development
Current Climate Scenario Flood Extent Mapping

Drawn: WV | Job No: 18.167 | Drawing No: 18.167-200-001 | Rev: FI01

Scale: (A1) 1:1,000 (@ A3) | Date: 07/12/2019

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12 December 2019 15:39:57 Drawing Location: J:\2018\18167\18167-02_WIP\08 MODELS\05 GIS\01 MXD\Flood Extents\18.167-200-001 Convent Lands Portlaoise-Flood Extents-CS.mxd

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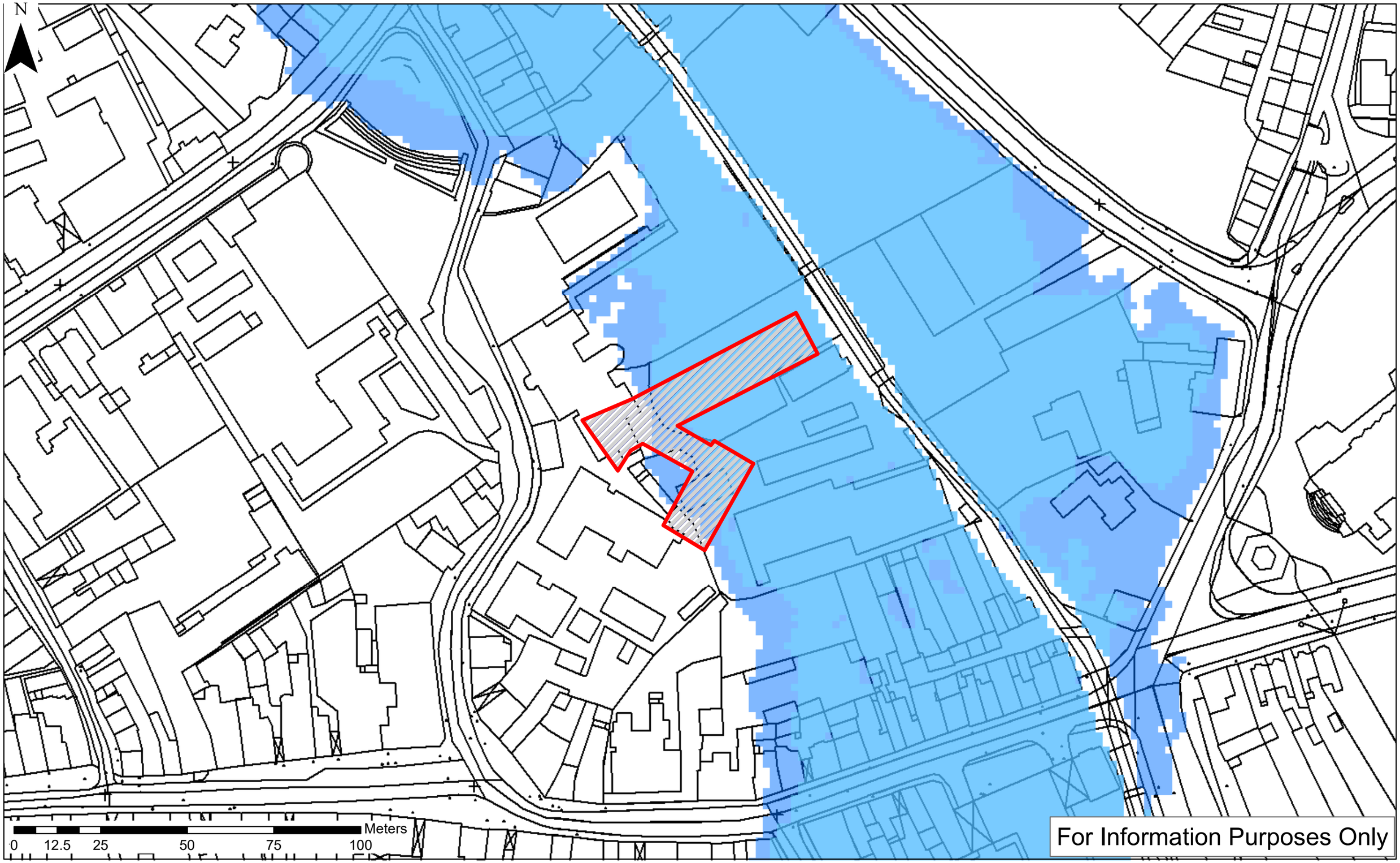

Legend

- Proposed Buildings
- 1 in 100 Year Flood Extent - Mid-Range Future Climate Scenario
- 1 in 1000 Year Flood Extent - Mid-Range Future Climate Scenario

No.	Revision	Date	By	Chk'd	App'd
FI01	For Information	10/12/2019	WV	AT	AT
D01	Draft	07/12/2019	WV	--	--

Stage	Date	App'd
PRELIMINARY		
APPROVAL		
TENDER		
CONSTRUCTION		

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Consulting Engineers
Civil - Structural - Transportation - Environmental

Arena House, Arena Road,
Sandyford, Dublin 18.
Tel : +353 1 294 0800
Fax : +353 1 294 0820
e-mail : info@rod.ie
Website : www.rod.ie

Project Title: Convent Lands Portlaoise

Drawing Title: Existing Development
Mid-Range Future Climate Scenario Flood Extent Mapping

Designed:	Checked:	Approved:	Status:	Drawn:	Job No:	Drawing No:	Rev:
WV	AT	AT	FOR INFORMATION	WV	18.167	18.167-200-002	FI01

Scale: (A1) 1:1,000 (@ A3) Date: 07/12/2019

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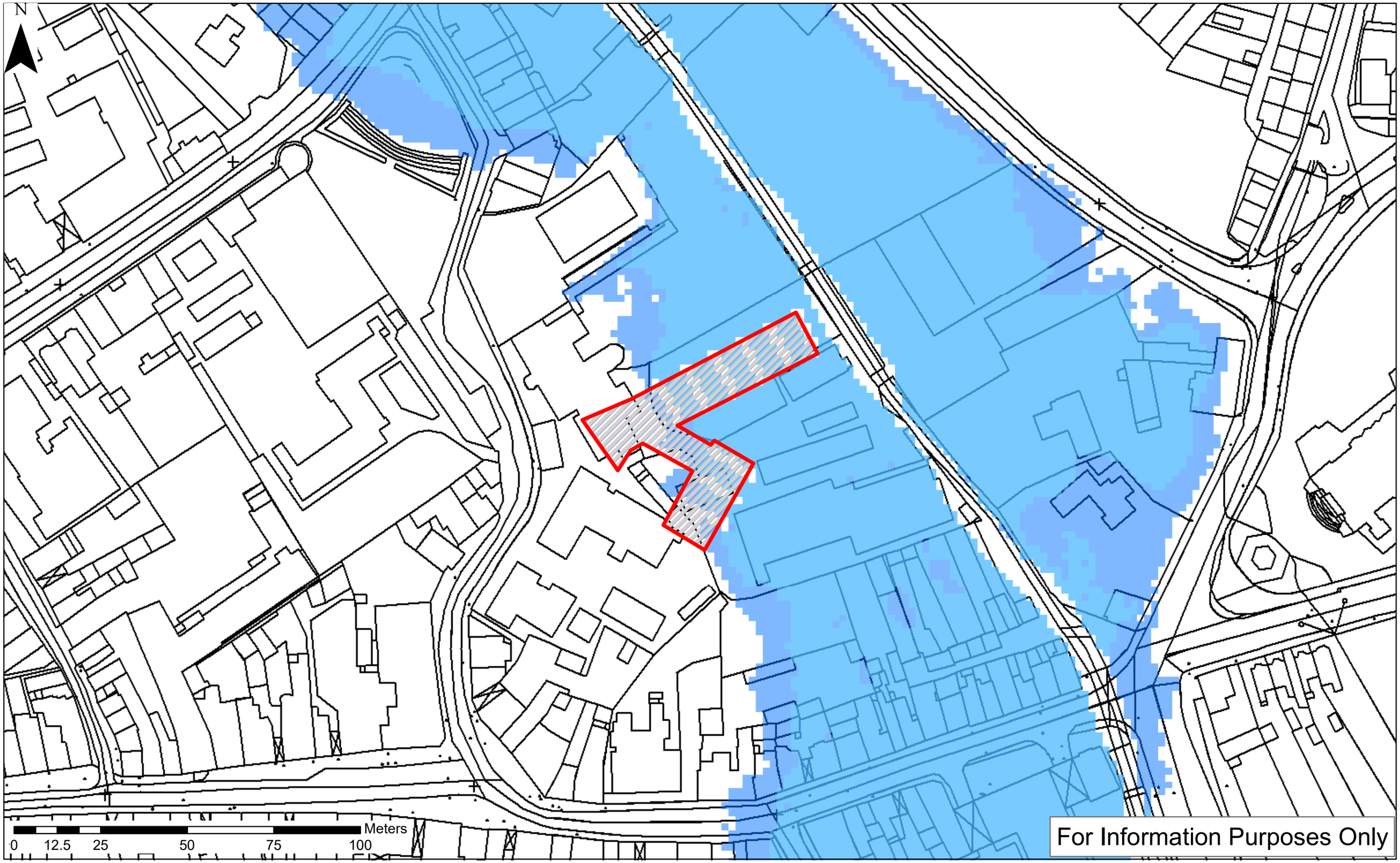

Legend

- Proposed Buildings
- 1 in 100 Year Flood Extent - Mid-Range Future Climate Scenario
- 1 in 1000 Year Flood Extent - Mid-Range Future Climate Scenario

No.	Revision	Date	By	Chk'd	App'd
FI01	For Information Purposes	10/12/2019	WV	AT	AT
D01	Draft	07/12/2019	WV	--	--

Stage	Date	App'd
PRELIMINARY		
APPROVAL		
TENDER		
CONSTRUCTION		

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Consulting Engineers
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Tel : +353 1 294 0800
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e-mail : info@rod.ie
Website : www.rod.ie

Designed: WV | Checked: AT | Approved: AT | Status: FOR INFORMATION

Project Title: Convent Lands Portlaoise

Drawing Title: Post Development
Mid-Range Future Climate Scenario Flood Extent Mapping

Drawn: WV | Job No: 18.167 | Drawing No: 18.167-200-003 | Rev: FI01

Scale: (A1) 1:1,000 (@ A3) | Date: 07/12/2019

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DO NOT SCALE USE FIGURED DIMENSIONS ONLY