

Blessington eGreenway

Flood Risk Assessment

Wicklow County Council

Quality information

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1. Introduction

Wicklow County Council has commissioned AECOM to prepare a Flood Risk Assessment (FRA) to accompany a planning application for the proposed Blessington eGreenway. This new Greenway will cover approximately 33 kms through the forest and woodlands taking in some spectacular scenery adjacent to the shoreline of Poulaphouca Reservoir – more commonly known as Blessington Lakes.

1.1 Scope of Services

In accordance with the *'The Planning System and Flood Risk Management – Guidelines for Planning Authorities'* there is a requirement to undertake a Flood Risk Assessment Report, which will accompany the planning application. This FRA study has been undertaken in consideration of the following guidance document: *'The Planning System and Flood Risk Management – Guidelines for Planning Authorities'* DOEHLG 2009.

The assessment will demonstrate that the proposed Greenway development will:

1. Not increase flood risk elsewhere and, if practicable, will reduce overall flood risk.
2. Include measures to minimise flood risk to people, property, the economy, and the environment as far as reasonably possible.
3. Include 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 and implementation of any future flood risk management measures and provisions for emergency services access.

2. Site Information

2.1 Site Description

The Greenway will link the historic town of Blessington to the Palladian mansion of Russborough House and continue through other tourism facilities and local villages, Vallemount, Ballyknockan and Lacken, in a 'loop' for walkers and cyclists around the lakes and back to Blessington as illustrated in Figure 1 below.

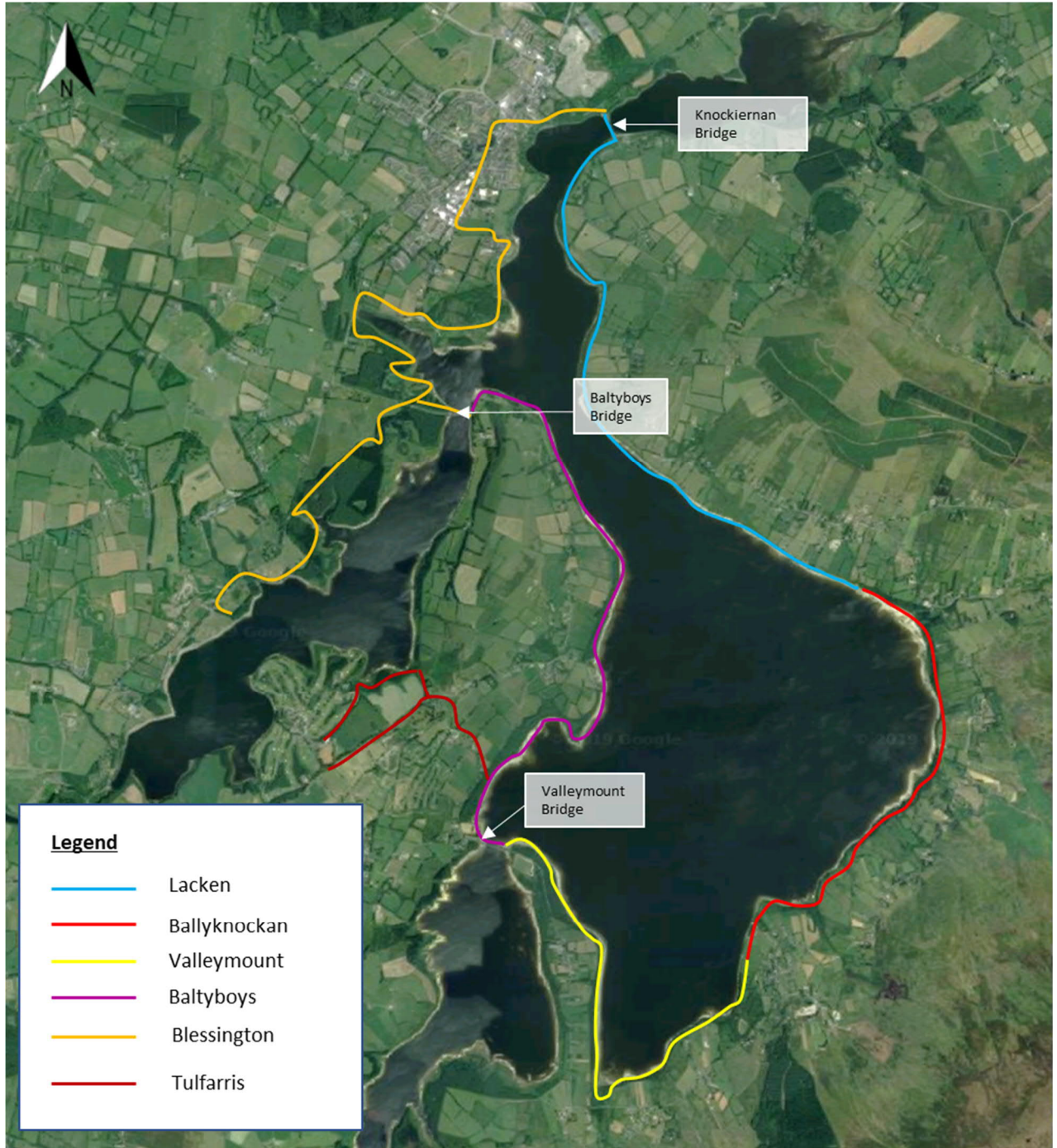


Figure 1. Site Overview

2.2 Proposed Development

The scheme is proposed to provide a predominately off-road shared use path for pedestrians and cyclists. The scheme involves the provision and upgrading of a greenway mostly through forest and woodlands adjacent to the shoreline of the Blessington Lake/Poulaphouca Reservoir SPA.

Traffic lights are proposed at three existing bridge crossings (Knockiernan Bridge, Baltyboys Bridge and Valleymount Bridge) to manage a new shuttle system for vehicular traffic. This will create space within the existing bridge cross section for the provision of a shared use path to accommodate users of the eGreenway.

The greenway surface construction is proposed to consist of a machine laid, bound pavement. A 20mm surface course is proposed to be laid on a 40 mm to 55 mm base course on 150mm Clause 804 subbase on a geotextile layer as required. Construction works will require shallow excavation (maximum depth of 200 mm - 300 mm), tree removal and replacement, placement of culverts, single span bridges over larger streams, fencing and minor landscaping.

The project involves the following (as shown in Figure 1):

1. Blessington – The Blessington section of the Proposed Development extends from the Wicklow County Council boundary at Russellstown to Blessington. The section comprises 9.2km in length. This section is proposed to consist of new greenway and the upgrade of existing sections along the route with a connection to Russborough House via an existing underpass of the N81. It is proposed to extend the capacity of the Russellstown car park with an additional 50 car spaces. Works to both the Russellstown Car Park and the Blessington eGreenway Hub and Car Park will provide electric vehicle charging points, bicycle parking, bins, seating areas, drinking water stations and CCTV. There is 1 no. new watercourse crossing included in this section while several existing crossings are to be retained.
2. Baltyboys – The Baltyboys section of the Proposed Development extends from the Blessington section to the Valleymount section. This section comprises 5.3km in length. Works to the Valleymount West Car Park and Baltyboys car park will provide electric vehicle charging points, bike parking, bins, seating, drinking water stations and CCTV. Precast box culverts and gabion retaining walls will be required within this section to construct the Proposed Development. There are approximately 5 no. small watercourses/ditches crossings along this section.
3. Tulfarris – The Tulfarris section of the Proposed Development connects the Baltyboys section to Tulfarris via the R758. This section comprises 3.7km in length. This section is proposed to consist of new greenway and share the existing road to connect with the Tulfarris Hotel & Golf Resort. There are approximately 2 no. new small watercourse/ditch crossings along its length.
4. Valleymount – The Valleymount section of the Proposed Development extends from Baltyboys to Ballyknockan. This section comprises 5.2km in length commencing at the Valleymount carpark, which is located adjacent to Valleymount GAA Club. Works to the two carparks in Valleymount East and West will provide electric vehicle charging points, bicycle parking, bins, seating areas, drinking water stations, and CCTV. Precast box culverts and gabion retaining walls will be required within this section. There are approximately 3 no. small watercourses/ditches crossed by the Proposed Development in this section as well as a crossing of the Annacarney Stream.
5. Ballyknockan – The Ballyknockan section of the Proposed Development extends from Ballyknockan to Lacken. This section comprises 4.3km in length. Gabion retaining walls will be required within this section. Due to the high ground to the east there are a few small tributaries on this section with approximately 13 no. small watercourses/ditches requiring to be accommodated by the Proposed Development.
6. Lacken – The Lacken section of the Proposed Development extends from Lacken to Knockiernan Bridge. This section comprises 5.6km in length. The section involves new greenway construction. Precast box culverts, concrete underpasses, and gabion retaining walls will be required within this section. It is proposed to extend the capacity of the Knockiernan car park with an additional 50 car spaces. Works to both Knockiernan and Lacken car park will provide electric vehicle charging points, bicycle parking, bins, seating areas, drinking water stations, and CCTV. The eastern side of

the lake has many small tributaries which will require the Proposed Development to accommodate approximately 7 no. small watercourses/ditches.

Signage will be provided to incorporate visitor information, way-finding information, heritage information and advisory/regulatory information in proximity to road crossings. All signage will be subject to full specification at detailed design stage of the project in accordance with national technical standards and guidance.

2.3 Local Hydrology, Land Use and Existing Drainage

The local hydrology is dominated by Poulaphouca Reservoir or the “Blessington Lakes” as it is more commonly known. The reservoir was formed by the damming of the River Liffey at Poulaphouca with filling beginning on 3rd March 1940. The construction of the dam began in 1937 as was part of the second hydroelectric project in Ireland after the Shannon scheme which was constructed in the 1920s. It was led by the Electricity Supply Board (ESB) and they still own and operate the dam. It is also one of two major water supplies to the Dublin region. Figure 2 below is a picture of the dam.



Figure 2. Poulaphouca Dam & Reservoir

The reservoir encompasses two river valleys, the Liffey, which enters at the north of the reservoir, and also the King’s River which forms the larger southern section of the lake. The River Liffey has a catchment area of circa 156km² at its historic confluence with the King’s River and rises in the northern Wicklow Mountains. The King’s River has a catchment area of circa 143km² at its confluence with the River Liffey. It rises in the central Wicklow Mountains near the “Wicklow Gap” and historically would have confluenced with the Annacarney Stream, Ballynastockan Brook and the Templeboodin Stream upstream of the confluence with the River Liffey prior to the construction of the dam. A number of smaller watercourses also discharge to the reservoir giving a total direct catchment area at Poulaphouca Dam of circa 320km².

Figure 3 shows the reservoir outline imposed on historical mapping illustrating the watercourses encompassed by the lake and Figure 4 provides an annotated illustration of the watercourses mentioned in the preceding paragraphs.

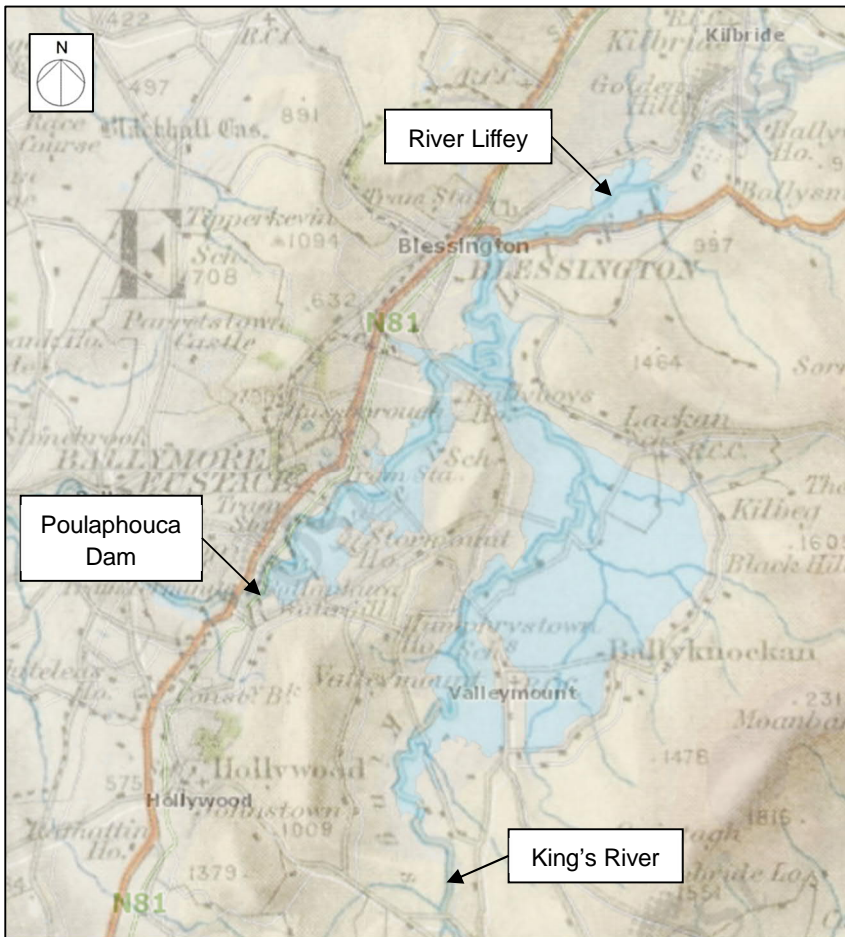


Figure 3. Historic Mapping with Reservoir Overlay

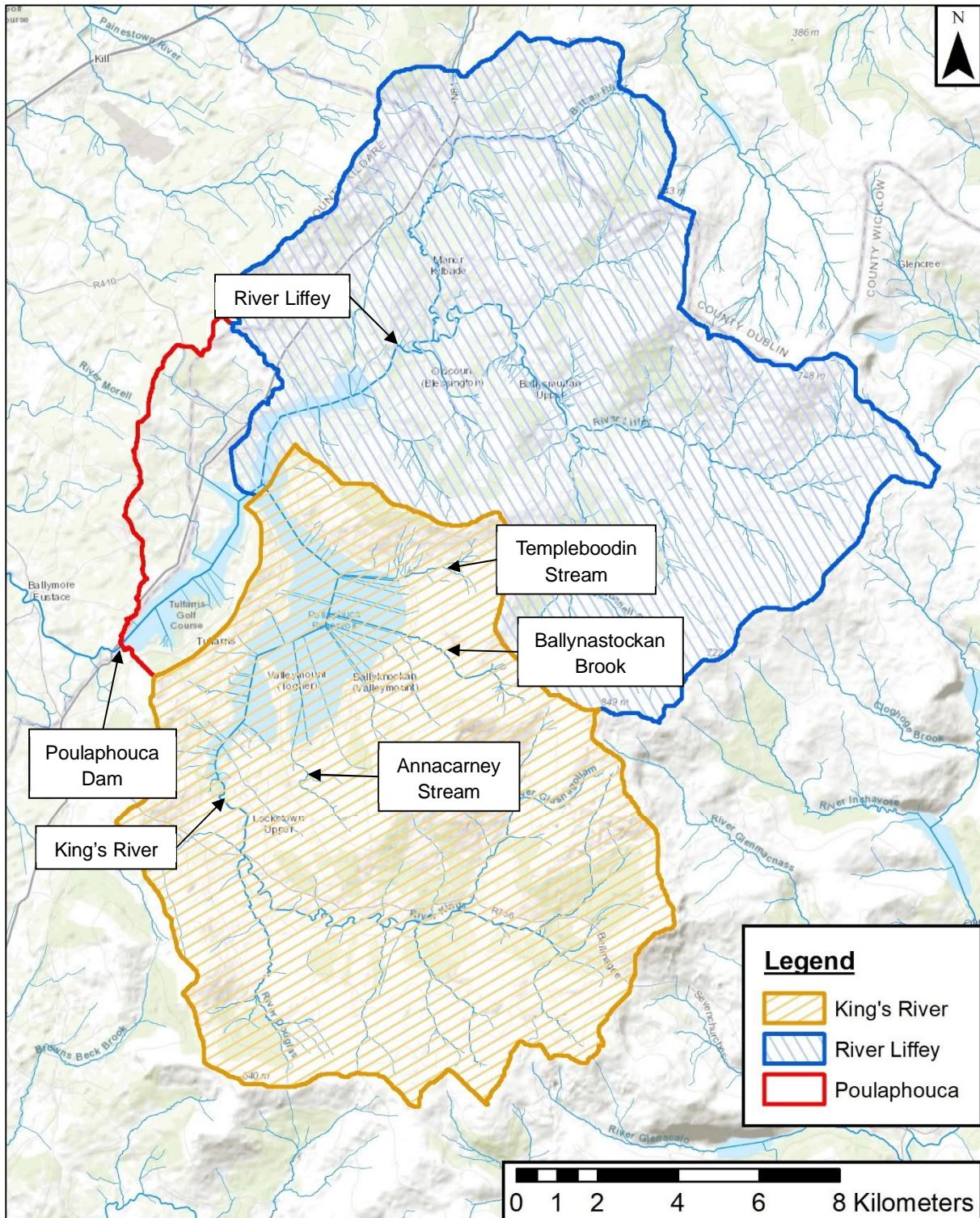


Figure 4. Watercourses

Presently the majority of the land is used for agricultural purposes. As could be expected in an upland area there many small ditches located on field boundaries etc to aid with drainage. Tourism and amenity usage are also present within the study area including the use of the lakes for water sports such as sailing.

2.3.1 Reservoir Water Level Control

The level of reservoir is controlled by ESB to ensure sufficient water levels are maintained for both power generation and water supply purposes. Flow from the dam is limited which, during times of prolonged rainfall, can lead to the water level in the reservoir increasing. ESB publish the water levels for the reservoir on their website and this is updated on a daily basis (<https://esb.ie/our->

[businesses/generation-energy-trading-new/hydrometric-information/river-liffey](#)). Figure 5 below is an extract of the ESB data for Poulaphouca Headrace from 19th November 2020 which shows the water level variation over the past twelve months. Note that ESB report the water levels for the Liffey Dams to Poolbeg Datum.



Figure 5. Poulaphouca Headrace Water Levels

The graph suggests the water level is normally within a 1.5m window between a level of circa 184.2 and 185.7mOD Poolbeg (which equates to 181.5 to 183.0mOD Malin).

Over the past twelve months it shows an increase in water level during the wet end to winter in February during which 16 stations across Ireland had their wettest February on record. This is followed by a subsequent fall in level during the sustained dry spell which occurred in April and May 2020 with only 24% of the long term average (LTA) rainfall experienced at Dublin Airport in April and 14% of the LTA rainfall experienced at Phoenix Park, Dublin in May. It also shows that the water level can rise quite quickly at times following substantial rainfall events such as those of Storm Francis on 24th & 25th August 2020.

AECOM have consulted with ESB in relation to the speed of rise of the water level and while it is difficult to give a typical value, rises of circa 1m have been experienced in an 8-12hr window in the past following extreme rainfall events.

2.3.1.1 Reservoir Operations

The current ESB document for the operation of the Liffey Reservoirs is “Regulations and Guidelines for the control of the River Liffey, Water Management Document” and is dated October 2017. The three reservoirs on the River Liffey are Poulaphouca, Golden Falls and Leixlip. Golden Falls is circa 2km downstream of Poulaphouca with Leixlip a further 56km downstream and circa 20km upstream of Dublin City Centre.

Poulaphouca Reservoir is generally operated to guideline target levels, which are in place to provide for adequate storage for water supply. Irish Water abstracts water for the Ballymore Eustace Water Treatment Plant such that gravitational water intake is possible down to a TWL of 179.9mOD Poolbeg, for an abstraction of 318MLD. Flows from Poulaphouca are normally released via the turbines to the Golden Falls impoundment when the turbines are available. The main control levels on Poulaphouca are provided in Table 1 below:

Table 1. Poulaphouca Control Levels

	Level (mOD, Poolbeg)	Level (mOD, Malin)
Maximum Crest Level	189.59	186.89
Maximum Normal Operating Level	186.30	183.60
Minimum Normal Operating Level	179.90	177.20
Zero Storage Level	174.00	171.30
Normal Operating Range	186.30 – 179.90	183.60 – 177.20

The control structures (3No. spillway gates) regulating the flows can be operated by electromotor and manually. Gate movements can be monitored in the Turlough Hill Control Room. The discharge through the Kaplan turbines can also be fully controlled from the Turlough Hill Control Room. The water level gauges located at the dam and at the tailrace send signals to the Turlough Hill Control Room via SCADA and are monitored locally at the Poulaphouca Control Room.

The flood period operation begins when the conditions require spilling of excessive flood waters until normal operating conditions are re-established. This flood period operation occurs when the Poulaphouca Reservoir level is greater than 186.30mOD Poolbeg (183.6mOD Malin) and/or the inflow to the Leixlip reservoir is greater than 50m³/s or beforehand if a large inflow is expected into Poulaphouca or Leixlip reservoirs. During this period, the top priority is flood management to avoid any risk to dam safety. All other reservoir operation objectives, such as efficiency of electric power generation, system requirements, environmental, social, legal and economic considerations are secondary.

Poulaphouca Reservoir has a substantial flood storage capacity which approximates to 50% of the average annual inflow and it is designed to safely discharge floods having an expected annual probability of occurrence of 1 in 10,000 years in order to ensure the safety of the Liffey Hydro Scheme. The use of this storage capacity during floods also provides a flood benefit to areas downstream in Kildare and Dublin. However, it is not possible to control flows from the Middle Liffey Catchment.

2.4 Existing Topography

The topography is an important factor in terms of assessing and understanding the flood risk associated with the site. Online sources, such as Topographic Map.com (<https://en-ie.topographic-map.com/maps/5h/Ireland/>) can provide a baseline of information which can assist the flood risk identification process.

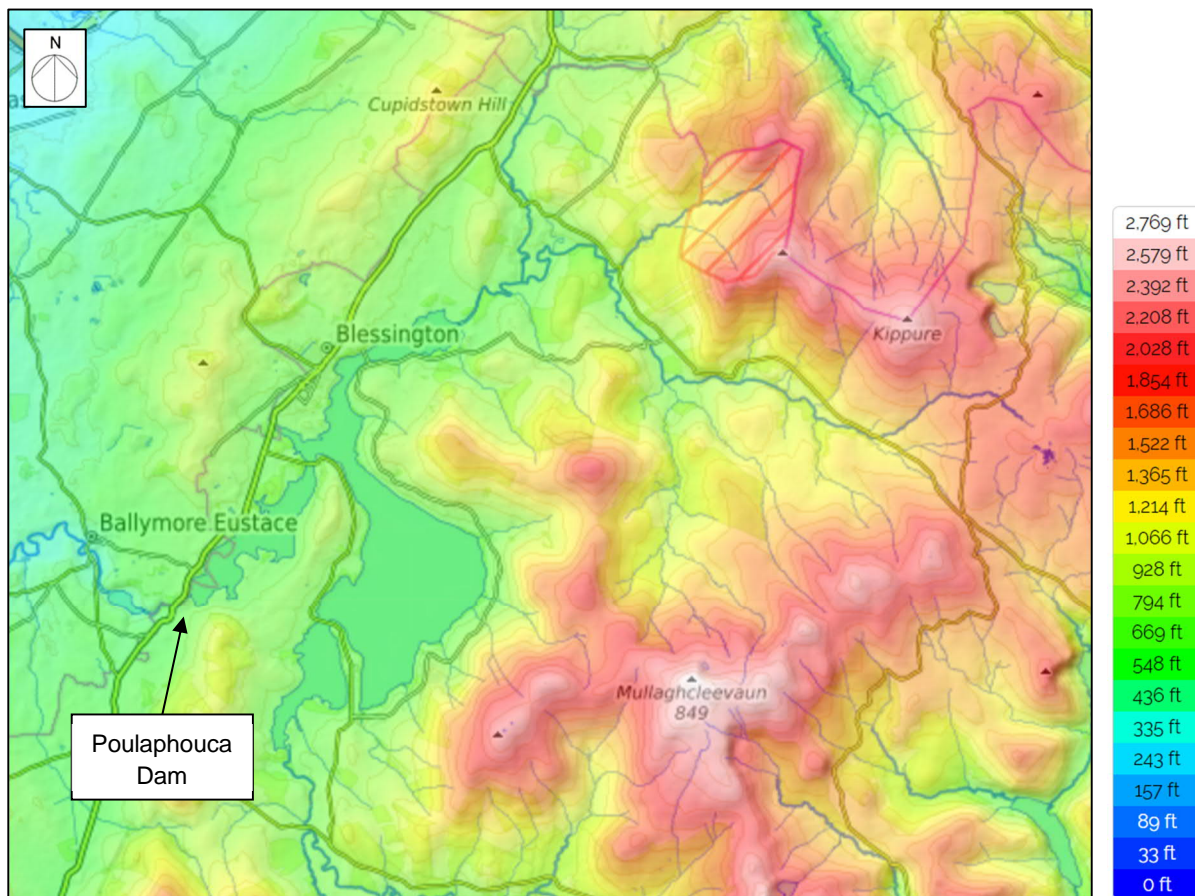


Figure 6. Site Topography

Figure 6 illustrates a sharp change in elevation to the east of the reservoir with land rising to a peak of 849mOD/2,785ft at the summit of Mullaghcleevaun from a reservoir surface level of circa 183mOD Malin. Figure 6 also illustrates the watershed around the reservoir and how narrow the gap in the topography is at the location of Poulaphouca Dam.

3. Stage 1 – Flood Risk Identification

The purpose of Stage 1 is to establish whether a flood-risk issue exists or may exist in the future. If there is a potential flood risk issue then, in accordance with 'The Planning System and Flood Risk Management – Guidelines for Planning Authorities (DOEHLG 2009)', the flood risk assessment procedure should move to 'Stage 2 – Initial Flood Risk Assessment'. If no potential flood risk is identified during Stage 1 then the overall flood risk assessment can be concluded.

The following information and data have been collated as part of the screening assessment for the proposed Blessington EGreenway.

3.1 Ordnance Survey Historic Mapping

Historic mapping for the area was assessed for evidence of historical flooding incidents within the site. The historic maps assessed were the pre-1900's 25inch and 6inch mapping (<http://map.geohive.ie/>). An extract of the historical mapping has been provided previously in Figure 3. The historic mapping did not specifically identify any area liable to flood however it does show significant amounts of marsh/bog. These would appear to be most prevalent on the eastern side of the former alignment of the King's River with some of the areas named including Sallyhole, Killough and Red Bog.

It should be noted however that with the damming of the Liffey at Poulaphouca, the vast majority of these areas are now inundated by the reservoir and do not present any flood risk.

3.2 Hydrometric Data

Existing sources of hydrometric data from the OPW (www.waterlevel.ie) were investigated with no OPW gauges present in the vicinity of the study area. The EPA website has also been interrogated which has identified a significant number of gauges both upstream and downstream of the study area. Figure 7 and Figure 8 below illustrate the locations of these with more details of the gauges provided in Table 2 below.

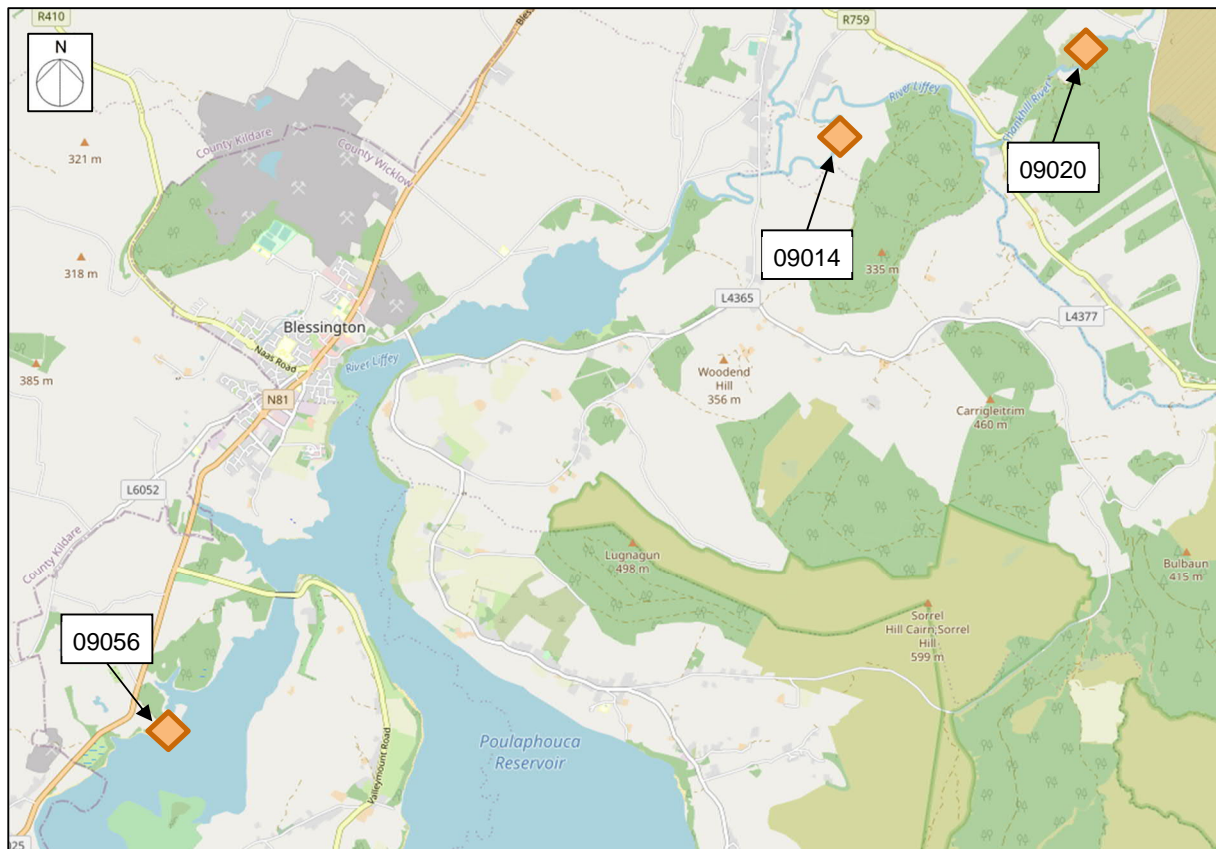


Figure 7. Gauging Stations (Northern study area)



Figure 8. Gauging Stations (Southern study area)

Table 2. Hydrometric Gauging Stations

Station No.	Name	Status	Owner	Available Data
09020	Cloghleagh	Inactive	Wicklow County Council	Spot flow measurements only - No continuous water level or flow records available.
09014	Ballyward	Active	Electricity Supply Board	Water Level Only
09056	Burgage Br.	Inactive	Electricity Supply Board	Water Level Only
09007	Golden Falls	Active	Electricity Supply Board	Water Level and Flow
09032	Poulaphouca	Active	Electricity Supply Board	Water Level and Flow
09017	Lockstown Br.	Active	Electricity Supply Board	Water Level Only
09057	Bawnoge	Inactive	Wicklow County Council	Spot flow measurements only - No continuous water level or flow records available.
09059	Knocknaroose	Inactive	Wicklow County Council	Spot flow measurements only - No continuous water level or flow records available.
09025	Ballinagee Br.	Inactive	Wicklow County Council	Spot flow measurements only - No continuous water level or flow records available.
09058	Oakwood	Inactive	Wicklow County Council	Spot flow measurements only - No continuous water level or flow records available.
09026	Annalecka Br.	Active	Wicklow County Council	Spot flow measurements only - No continuous water level or flow records available.

The presence of all the gauging stations are noted at this stage and further consideration will be given at later stages in the project if required. The data from the Poulaphouca gauge has already been outlined in Section 2.3.1 of this report.

3.3 OPW Flood Maps – Past Flood Events

The OPW Flood Maps Website (www.floodinfo.ie/map/floodmaps) was consulted in relation to available historical or anecdotal information on any flooding incidences or occurrence in the vicinity of the proposed development area. Figure 9 below shows the location of recorded historic flood events around the Blessington Lakes.

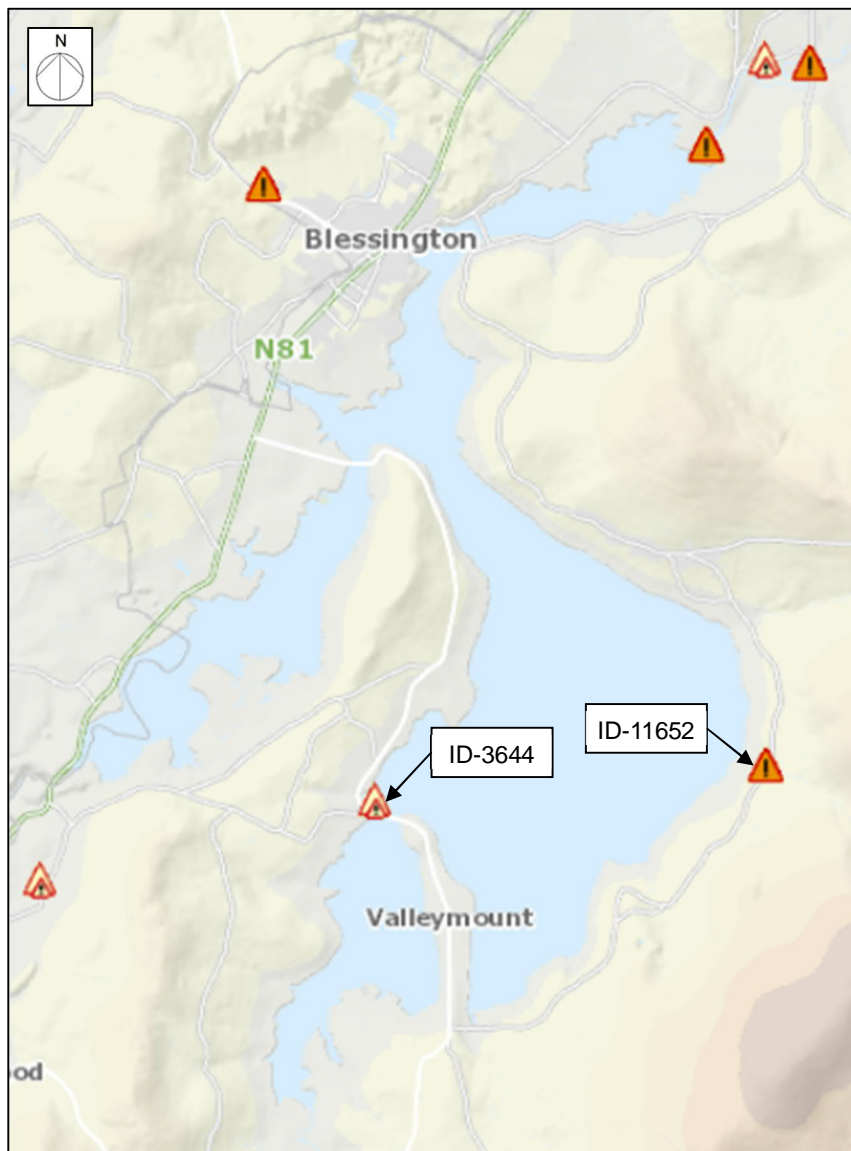


Figure 9. Past Flood Events

Figure 9 shows multiple past flood events around the perimeter of the reservoir however only two, as annotated, are of interest to this FRA. The remaining areas have been deemed to be at a great enough distance from the project to not be of significant interest.

3.3.1 Past Flood ID-3644

Past Flood ID-3644 is recorded as a recurring flood incident with the source of flooding being “Lake” (i.e. Poulaphouca Reservoir). Minutes of a meeting held on 7th November 2005 as part of the OPW Flood Hazard Mapping Programme are linked to the report. This meeting had input from the Area Engineer – Blessington for Wicklow CC and the Search Manager – ESBI. The notes of the meeting are also accompanied by a map. The content gives little information and only states “Valleymount,

Poulaphouca Reservoir - High lake level floods part of car park.” Works are proposed to this car park as part of the Baltyboys section of the greenway.

3.3.2 Past Flood ID-11652

Past Flood ID-11652 is recorded as a “Flood Event” which occurred on 24th October 2011 on the Ballynastockan Brook. The flood event caused significant damage to the “Lacken Falls Bridge” leading to its subsequent replacement with the cause of the flooding given as “extremely heavy rainfall”. It also states flooding occurred in several areas of Co. Wicklow in the Liffey catchment and that 86.1mm of rainfall was recorded as Casement Aerodrome on this occasion.

Photos are included in the report showing material recently deposited and dislodged during the flood event with Figure 10 below reproduced from the report showing the channel upstream of the structure.



Figure 10. Ballynastockan Brook – October 2011 Flood Record

Works are proposed downstream of this location as part of the Ballyknockan section of the greenway.

3.4 Groundwater Wells and Springs

An investigation into the rise and abstraction of water from underground wells and springs around the site was taken from the Department of Communications, Climate Change and Environment (<http://dcenr.maps.arcgis.com>). This was to identify if there are any areas of rising groundwater that could contribute to flooding.

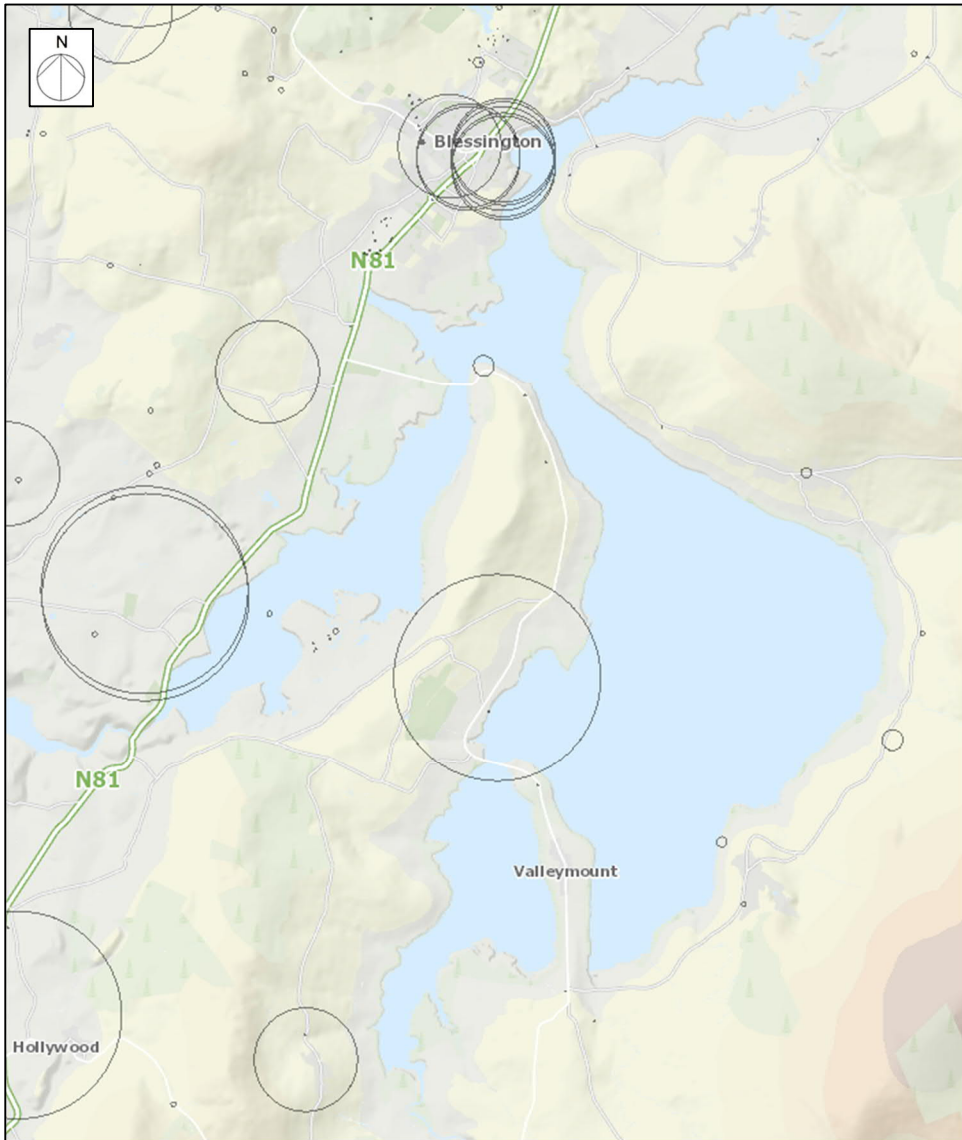


Figure 11. GSI Viewer Groundwater Wells and Springs

Figure 11 shows that there are multiple springs or wells in close proximity to the proposed greenway route. There have been no recorded issues with these groundwater sources contributing to flooding within the area.

3.5 OPW CFRAM Mapping

OPW CFRAM mapping was consulted in relation to potential flooding at the proposed site. Limited mapping information was available for the area around Blessington Town, see Figure 12.

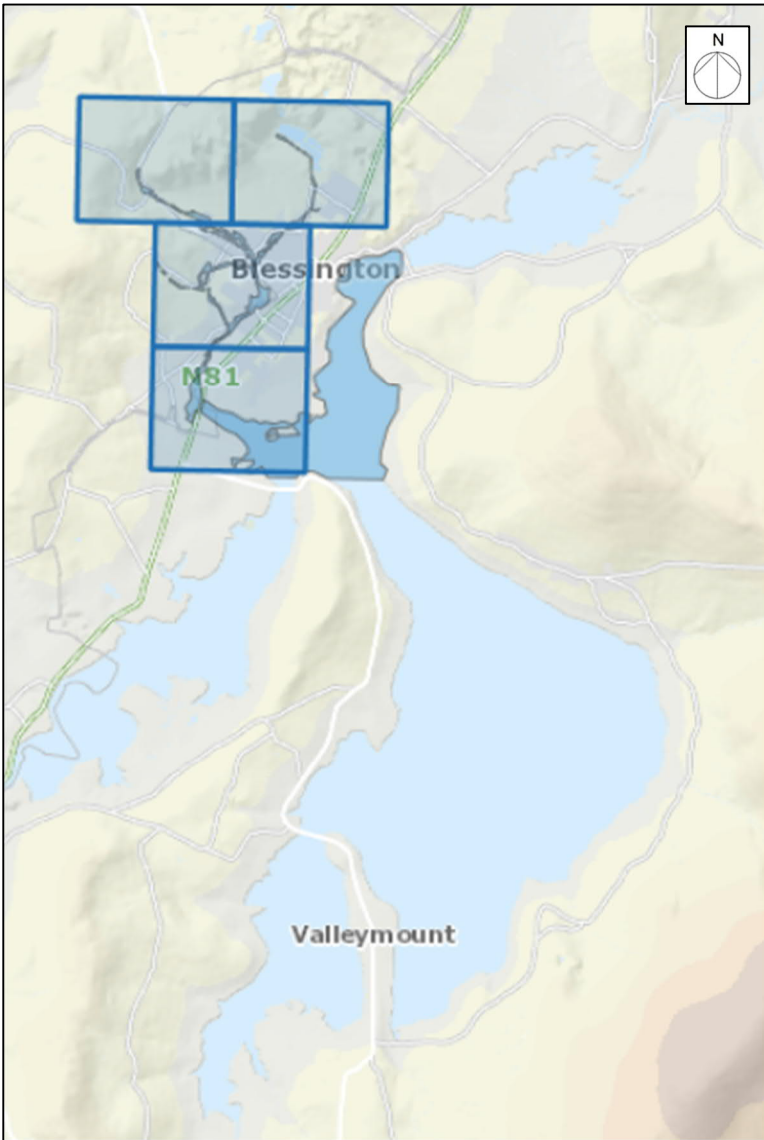


Figure 12. CFRAM Fluvial Flood Maps

The CFRAM 1% AEP present day extents have been overlaid for the Blessington Town area to check for any impacts on the proposed greenway route, as shown in Figure 13. It should be noted that the majority of the greenway route in the Blessington section is upgrades to the existing pathways. Only the northern end from Blessington to Knockieran Bridge is new pathway. The full CFRAM maps are provided in Appendix A.

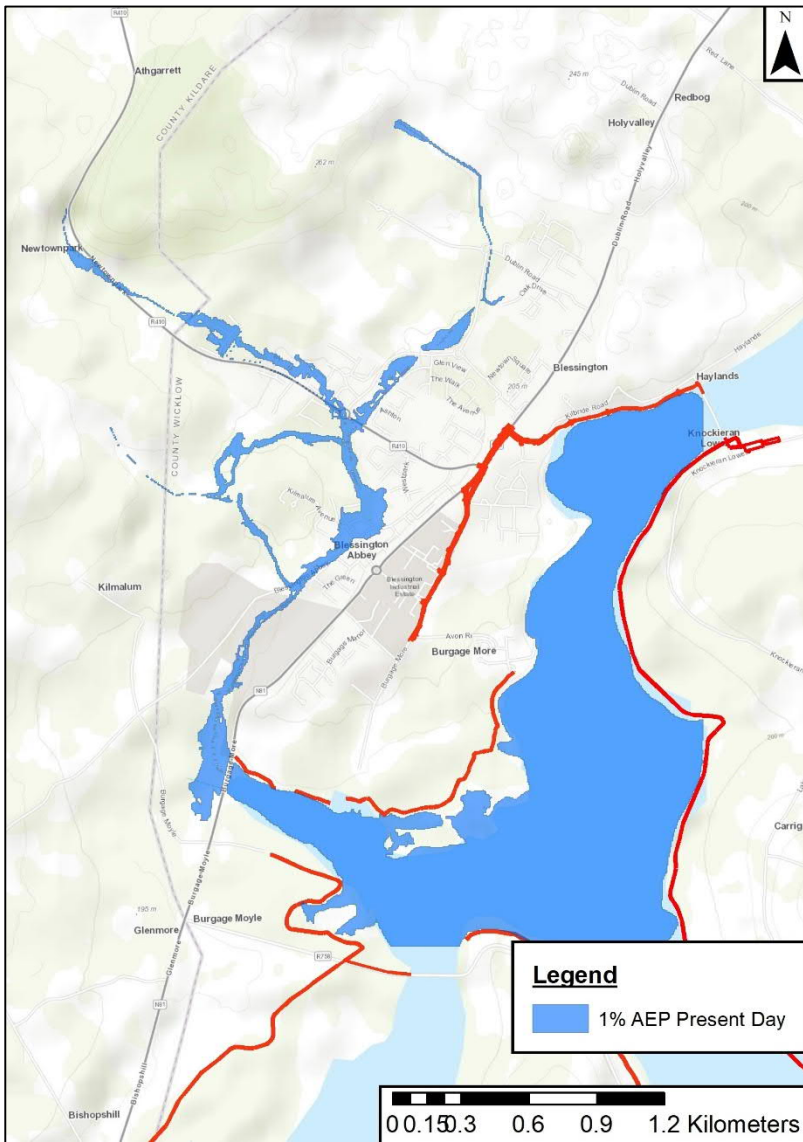


Figure 13. CFRAM 1% AEP Present Day Flood Extents – Blessington Town

3.6 ESB Dams and Embankments PFRA

ESB undertook a PFRA of their dams and embankments in June 2011 from which Table 3 below has been extracted. Three major flood events are reported on in this report; June 1993, November 2000 and November 2009. Due to the monitoring of flow and levels, records are available for the water level that was reached in the reservoir for these events.

Table 3. Poulaphouca Peak Flood Levels

Land Acquisition Level (mOD, Poolbeg)	June 1993 Level (mOD, Poolbeg)	November 2000 Level (mOD, Poolbeg)	November 2009 Level (mOD, Poolbeg)
189.30	187.51	187.53	187.41

The report mentions that ESB acquired lands at the time of construction of the reservoirs up to the maximum expected reservoir water level during design floods. However, estimated peak levels during the design 10,000-year flood would exceed the ESB’s land acquisition level. Such an extreme flood event could lead to flooding of roads and possibly a small number of properties. A number of ESB and council carparks have had to be closed and there has been road flooding during previous flood events.

AECOM have consulted with ESB in relation to more recent peak water levels experienced from June 2011 to the present day with a further event of significance having occurred during Winter 2015/16. The

Winter 2015/16 floods are somewhat different in that the duration of high water levels in the reservoir was over a very long period, circa 6-8 weeks. The level for this event is given below in Table 4.

Table 4. Poulaphouca Peak Flood Levels, Post 2011

**Winter 2015/16 Level
(mOD, Poolbeg)**

187.41

3.7 Blessington Local Area Plan 2013-2019

The Blessington Local Area Plan 2013-2019 included a flood risk assessment which was prepared in accordance with ‘The Guidelines for Planning Authorities ‘The Planning System and Flood Risk Management’. This FRA however pre-dated the CFRAM study. This study is focused on the development lands within the town and does not consider flood risk from the reservoir. The flood zone map has been re-produced below in Figure 14 with the full report provided in Appendix C.

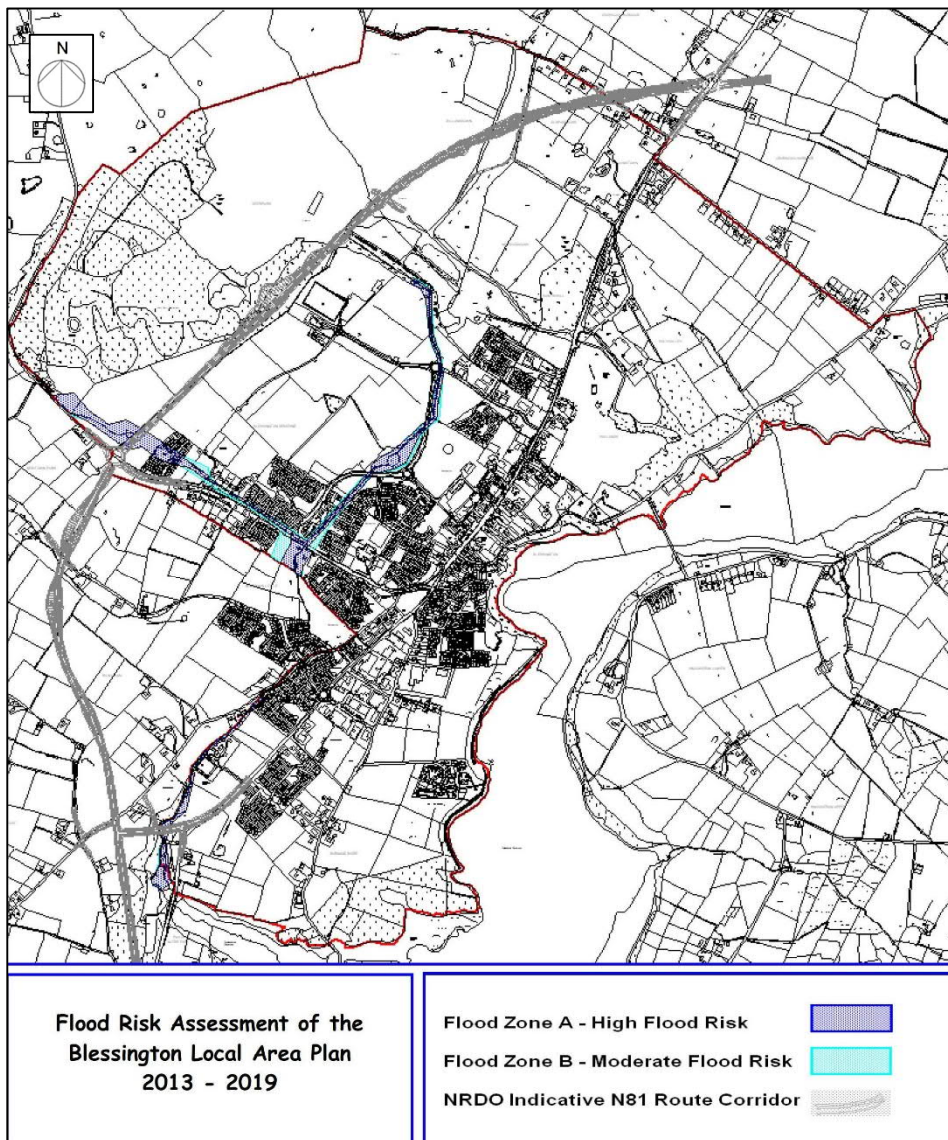


Figure 14. LAP Flood Zone Map

The proposed greenway is out with the above flood zone map and therefore the information provided is of limited benefit to this FRA.

3.8 Screening Assessment Conclusion

The possible flooding mechanisms in consideration of the proposed greenway route are summarised in Table 5 below.

Table 5. Possible Flood Mechanisms

Source of Flooding	Significant?	Comment / Reason
Tidal / Coastal	No	No; the site is not in a coastal location
Fluvial	Potential	Flooding may occur locally at watercourse crossing locations; structures should be adequately sized to vent the design flow including an allowance for freeboard and climate change.
Reservoir / Lake	Potential	Flooding may occur in extreme circumstances due to elevated water levels in Poulaphouca Reservoir.
Pluvial (Urban Drainage)	No	The existing site is a greenfield site for the most part and is also mainly rural. There are no records and no known instances of failure of drainage systems along the route.
Pluvial (Overland Flow)	Potential	The steep topography, particularly to the eastern side of the reservoir, could generate significant overland flows.
Groundwater	No	There are springs and groundwater discharges recorded in the immediate vicinity of the site, but no recorded flood risk.

The purpose of this screening assessment was to identify whether a potential risk of flooding exists and to what extent along the proposed greenway route. This assessment is based on the collation and analysis of existing current information, historical information and data which may indicate the level or extent of any flood risk.

In consideration of the data sources assessment, this flood risk assessment is required to proceed to 'Stage 2 - Initial Flood Risk Assessment'. The screening assessment shows that there is a flooding risk to the proposed greenway route from Poulaphouca Reservoir and at watercourse crossing points. There is also a risk from overland flow generated on steep land, particularly to the east of the reservoir.

4. Stage 2 – Initial Flood Risk Assessment

To undertake the initial flood assessment a determination of the flood zone in which the site is located along with a determination of the vulnerability of the proposed works is required.

4.1 Determination of Vulnerability

The vulnerability of the proposed works is classified into three classes as given below in Table 6.

Table 6 Classification of Vulnerability

Vulnerability class	Land uses and types of development*
Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
Less vulnerable development	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping (subject to specific warning and evacuation plans); Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
Water-compatible development	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).

* Uses not listed here should be considered on their own merits

Source: *The Planning System and Flood Risk Management - Guidelines for Planning Authorities*

The guidelines would initially indicate that the site, as it is amenity open space, should be considered to be water-compatible development.

4.2 Determination of Flood Zone

In accordance with 'The Planning System and Flood Risk Management – Guidelines for Planning Authorities (DOEHLG 2009)', there are three flood zones designated in the consideration of flood risk to a particular site. The three flood zones are described in Table 7 below.

Table 7. Flood Zone Description

Flood Zone	Description
Flood Zone A	Where the probability of flooding from watercourses is the highest (greater than 1% or 1 in 100 year for watercourse flooding or 0.5% or 1 in 200 for coastal flooding)
Flood Zone B	Where the probability of flooding from watercourses is moderate (between 0.1% or 1 in 1000 year and 1% or 1 in 100 year for watercourse flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding)
Flood Zone C	Where the probability of flooding from watercourses and the sea is low or negligible (less than 0.1% or 1 in 1000 year for both watercourse and coastal flooding). Flood Zone C covers all areas which are not in Zones A or B.

Source: *The Planning System and Flood Risk Management - Guidelines for Planning Authorities*

The planning implications for each of the flood zones are:

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

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

Zone C - Low probability of flooding. Development in this zone is appropriate from a flood risk perspective (subject to assessment of flood hazard from sources other than rivers and the coast) but would need to meet the normal range of other proper planning and sustainable development considerations.

In consideration of the above guidelines, the 1% AEP and 0.1% AEP fluvial event is to be taken into account in order to assess whether the site is located within Flood Zone 'A' or Flood Zone 'B'.

4.2.1 Coastal Flooding

The site is not at risk of coastal flooding as the waterbodies within the site and surrounding the site are not tidally influenced, thus no further assessment will be carried out. The site is within Flood Zone 'C' from a coastal flood risk perspective.

4.2.2 Fluvial Flooding

There is limited data available on potential fluvial flooding along the greenway route; CFRAM maps only cover a very small part of the route and show no impact. The Blessington LAP 2013-2019 FRA does not designate any lands in the vicinity of the greenway route as either Flood Zone 'A' or Flood Zone 'B'.

It is expected that small localised bands of Flood Zone 'A' and Flood Zone 'B' would be encountered at each of the watercourse crossings along the route. Given the steep topography of the area, these bands will be locally confined to the watercourse. A hydrological study will be undertaken as part of the culvert and structure design process to establish the extents of any floodplain and also to adequately size the structure. Watercourse crossings will also be subject to Section 50 Approvals from OPW.

4.2.3 Reservoir / Lake Flooding

As outlined in earlier sections, Poulaphouca Reservoir has a substantial flood storage capacity which approximates to 50% of the average annual inflow and it is designed to safely discharge floods having an expected annual probability of occurrence of 1 in 10,000 years in order to ensure the safety of the Liffey Hydro Scheme. This flow restriction subsequently causes a rise in the water level in the reservoir. Past significant storm events in June 1993, November 2000, November 2009, January 2016 and February 2016 saw the water level reach 184.81, 184.83, 184.71, 184.63 and 184.14mOD Malin respectively.

The definition of the 'normal' flood zones is not applicable to man-made and level controlled features such as Poulaphouca Reservoir. The vertical design of the greenway will take into consideration the historic water levels reached in the reservoir and the possible levels that could be reached in very extreme situations along with mitigation measures such as access control for events above such a level.

4.2.4 Pluvial Flooding (Urban Drainage)

As the route of the greenway is primarily rural, limited amounts of urban drainage systems are encountered. There are no known past instances of flooding in the area from pluvial (urban drainage) sources. Flood zones are not applicable to pluvial flooding.

The proposed greenway will drain by “over the edge” methods and normally into the reservoir. The greenway will be surfaced with bitmac/asphalt. No formal drainage or attenuation measures are proposed for the greenway given the small change in surface area with more than adequate attenuation volumes available in the reservoir.

Improvement works to car parks will be assessed on a case by case basis. Where there is a need for the provision of formal drainage and/or a likely increase in runoff due to extensions etc., suitable attenuation and pollution control measures will be provided.

4.2.5 Pluvial Flooding (Overland Flow)

The steep topography, particularly to the east side of Poulaphouca Reservoir, could lead to generation of significant overland flows during extreme rainfall events with certain catchment saturation conditions.

In order to meet gradient standards, parts of the route may be on embankment or in cutting but the height of these will be kept to a minimum. If the scheme is on embankment across a topographic depression, interceptor ditches will be provided on the upstream side and, if necessary, additional overland flow culverts will be provided to ensure overland flow does not pond.

Interceptor ditches will also be provided at the top of cutting slopes where the adjacent ground falls towards the route. This will provide an alternative pathway for overland flows to prevent long-term stability issues occurring on the slope.

4.2.6 Groundwater

While there are springs and groundwater discharges recorded in the immediate vicinity of the site, these present a negligible flood risk.

4.3 Justification Test Requirement

The requirement for a justification test was reviewed for this study to determine whether the proposed works would be considered acceptable in terms of flood risk. The conclusion of ‘Stage 1 – Flood Risk Identification’ shows that there is a flooding risk to the proposed greenway route from Poulaphouca Reservoir and at watercourse crossing points. There is also a risk from overland flow generated on steep land, particularly to the east of the reservoir.

The requirement for a Justification Test is determined based on the type of development and flood zone designation as indicated in Table 8 below.

Table 8. Justification Test Matrix

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

Source: *The Planning System and Flood Risk Management - Guidelines for Planning Authorities*

Given the determination of the flood zone as a combination of Flood Zone ‘A’, ‘B’ and ‘C’ for the greenway and the determination of the development as ‘Water-Compatible Development’ a justification test is not required to be passed as the development is seen as appropriate.

4.4 Stage 2 Flood Assessment Conclusion

In order to fulfil the Justification Test there is a requirement to quantify the flood risk at the proposed site, and where necessary mitigate the flood risk.

The purpose of the scoping stage is to identify possible flood risks and to implement the necessary level of detail required to assess these possible flood risks, and to ensure these can be adequately addressed in the FRA. The scoping exercise should also identify that sufficient quantitative information is already available to complete an FRA appropriate to the scale and nature of the development.

The conclusion of 'Stage 1 – Flood Risk Identification' shows that there is a flooding risk to the proposed greenway route from Poulaphouca Reservoir and at watercourse crossing points. There is also a risk from overland flow generated on steep land, particularly to the east of the reservoir.

The vertical design of the greenway will take into consideration the historic water levels reached in the reservoir and the possible levels that could be reached in very extreme situations along with mitigation measures such as access control for events above such a level. Access and egress during flood events are of critical importance and this needs to be a key consideration going forward, particularly given how rapidly the water level in the reservoir can rise. It is therefore recommended that flood forecasting is used to ensure Health and Safety remains a key priority in terms of management and operation of the greenway.

Wicklow County Council should continue to engage with ESB in relation to the water levels, current and predicted, of the reservoir given the significant volumes of data already held by ESB in relation to the operation of the Liffey Dams. If deemed necessary, Wicklow County Council should also consider the installation of water level alert stations around the lake to provide additional warning of increasing levels which may necessitate the closure of parts of the greenway.

A hydrological study will be undertaken as part of the culvert and structure design process to establish the extents of any floodplain and also to adequately size the structure. Watercourse crossings will also be subject to Section 50 Approvals from OPW.

Suitable interception measures and, if necessary, additional overland flow culverts, will be included as part of the design to prevent flooding from overland flows.

5. Conclusion

Wicklow County Council has commissioned AECOM to prepare a Flood Risk Assessment (FRA) to accompany a planning application for the proposed Blessington eGreenway, Co. Wicklow.

The information collated during Stage 1 – Flood Risk Identification and the subsequent Stage 2 – Initial Flood Risk Assessment was deemed as sufficient to assess the potential flood risk to the proposed greenway. The proposals have been classified as ‘Water-Compatible Development’ and therefore their construction within either Flood Zone ‘A’ or Flood Zone ‘B’ is seen as appropriate subject to suitable mitigation measures.

The vertical design of the greenway will take into consideration the historic water levels reached in the reservoir and the possible levels that could be reached in very extreme situations along with mitigation measures such as access control for events above such a level. Access and egress during flood events are of critical importance and this needs to be a key consideration going forward, particularly given how rapidly the water level in the reservoir can rise. It is therefore recommended that flood forecasting is used to ensure Health and Safety remains a key priority in terms of management and operation of the greenway.

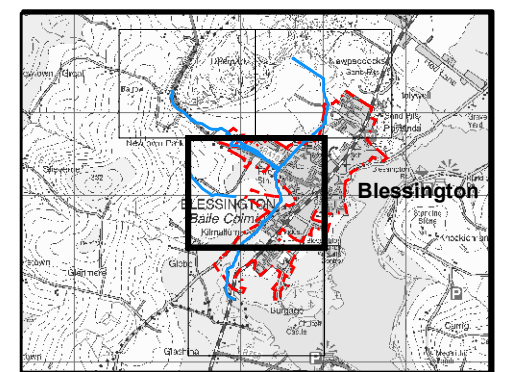
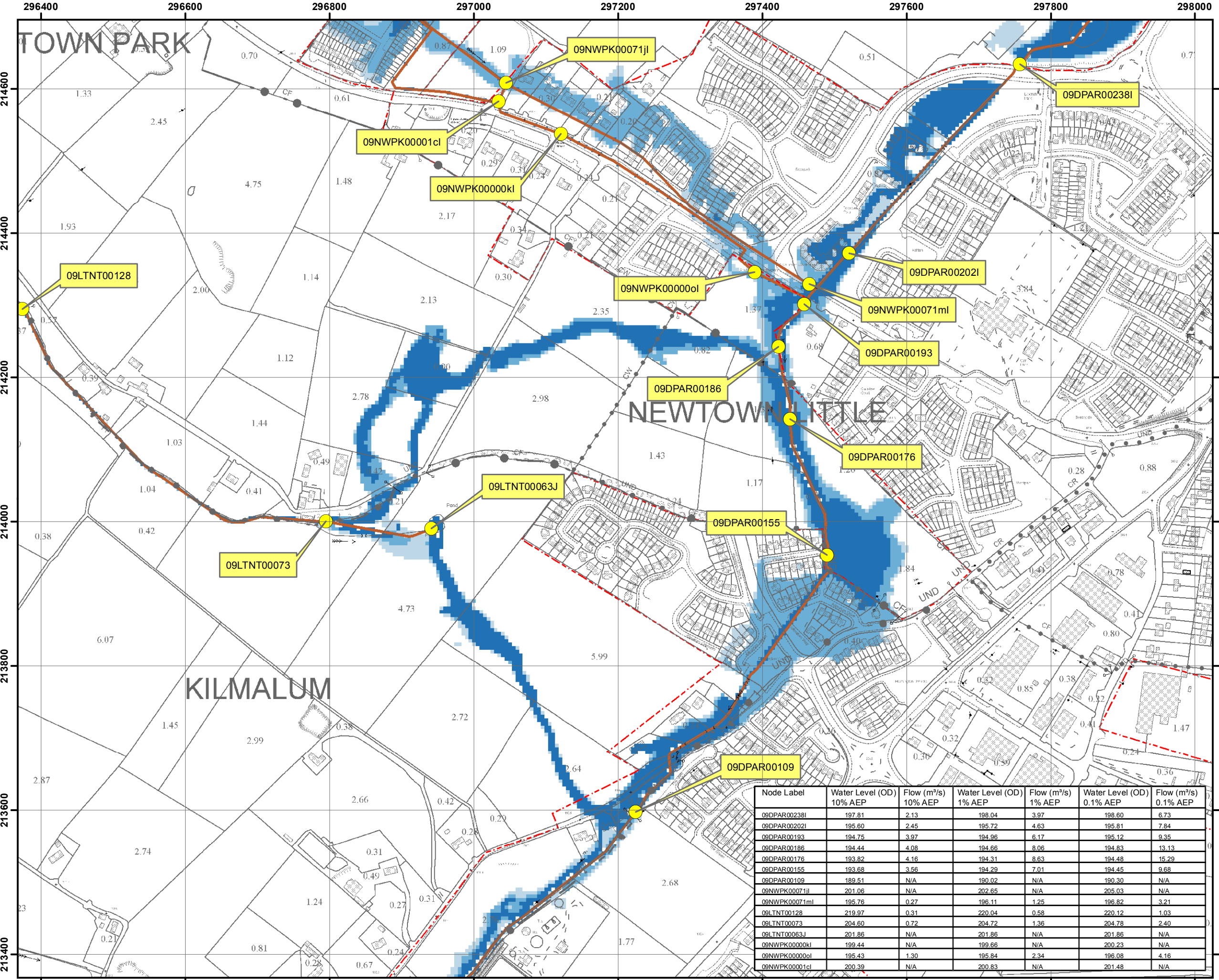
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Appendix A CFRAM Maps



IMPORTANT USER NOTE:
 THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

Legend

- 10% Fluvial AEP Event
- 1% Fluvial AEP Event
- 0.1% Fluvial AEP Event
- Modelled River Centreline
- AFA Extents
- Node Point
- Node ID

FINAL

REV:	NOTE:	DATE:
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Map:
 Blessington Fluvial Flood Extent Maps

Map Type: EXTENT

Source: FLUVIAL

Map Area: HPW

Scenario: CURRENT

Drawn By: F.M.C. **Date:** 26 July 2016

Checked By: T.D. **Date:** 26 July 2016

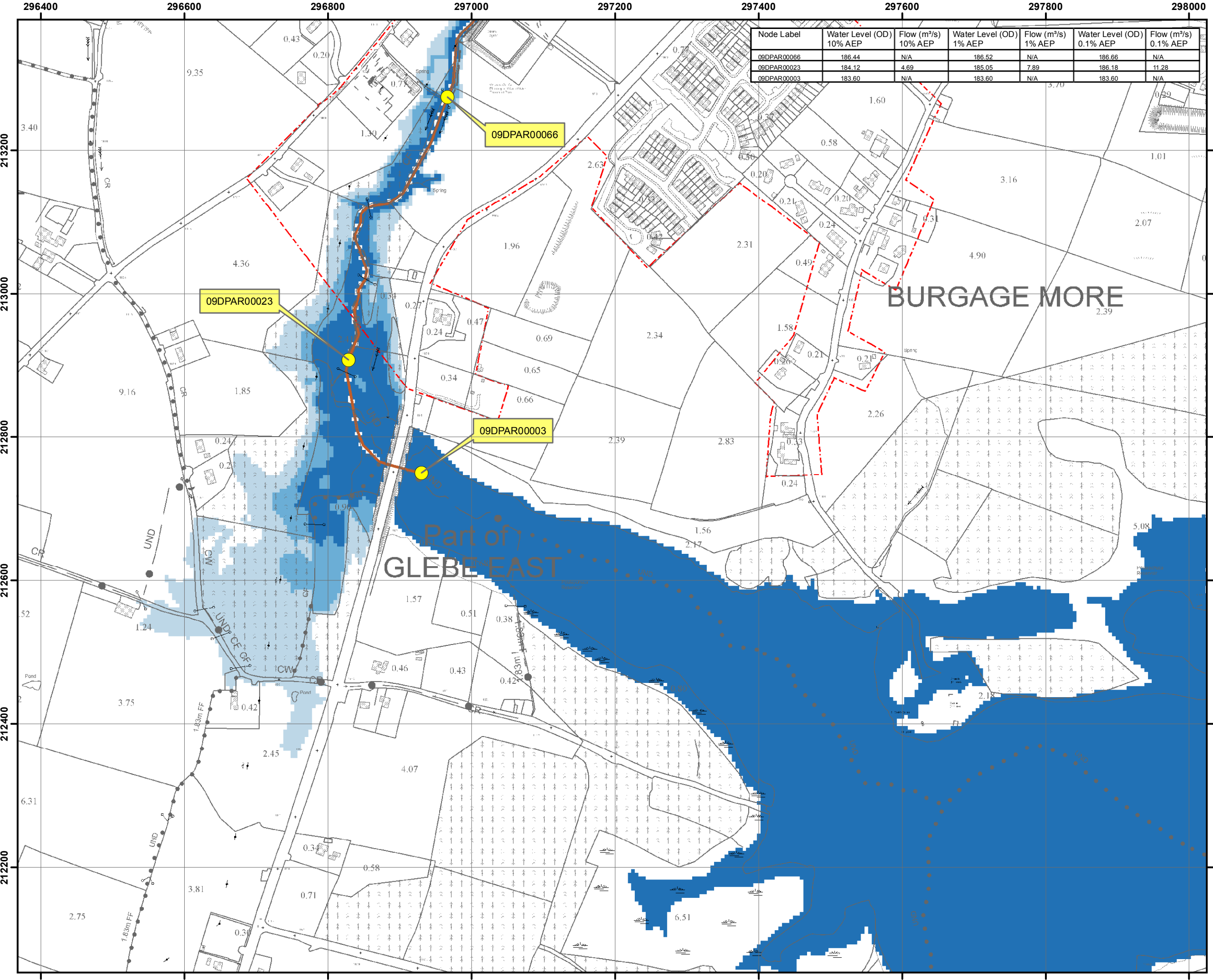
Approved By: S.P. **Date:** 26 July 2016

Drawing No. :
E09BLE_EXFCD_F0_02

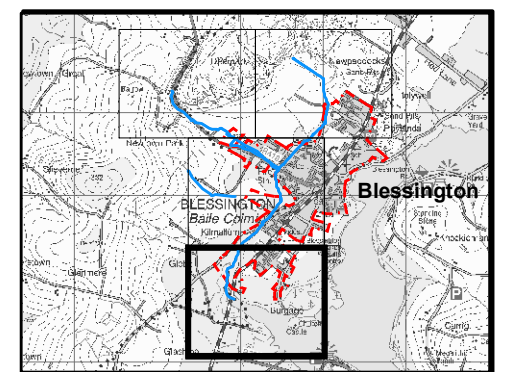
Map Series : 2 of 4

Drawing Scale : 1:5,000 @A3

Node Label	Water Level (OD)		Flow (m³/s)		Water Level (OD)		Flow (m³/s)	
	10% AEP	1% AEP	10% AEP	1% AEP	0.1% AEP	1% AEP	0.1% AEP	
09DPar00238I	197.81	198.04	2.13	3.97	198.60	6.73		
09DPar00202I	195.60	195.72	2.45	4.63	195.81	7.84		
09DPar00193	194.75	194.96	3.97	6.17	195.12	9.35		
09DPar00186	194.44	194.66	4.08	8.06	194.83	13.13		
09DPar00176	193.82	194.31	4.16	8.63	194.48	15.29		
09DPar00155	193.68	194.29	3.56	7.01	194.45	9.68		
09DPar00109	189.51	190.02	N/A	N/A	190.30	N/A		
09NWPk00071I	201.06	202.65	N/A	N/A	205.03	N/A		
09NWPk00071mI	195.76	196.11	0.27	1.25	196.82	3.21		
09LTNT00128	219.97	220.04	0.31	0.58	220.12	1.03		
09LTNT00073	204.60	204.72	0.72	1.36	204.78	2.40		
09LTNT00063J	201.86	201.86	N/A	N/A	201.86	N/A		
09NWPk00000kI	199.44	199.66	N/A	N/A	200.23	N/A		
09NWPk00000oI	195.43	195.84	1.30	2.34	196.08	4.16		
09NWPk00001cI	200.39	200.83	N/A	N/A	201.48	N/A		



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
09DPAR00066	186.44	N/A	186.52	N/A	186.66	N/A
09DPAR00023	184.12	4.69	185.05	7.89	186.18	11.28
09DPAR00003	183.60	N/A	183.60	N/A	183.60	N/A



IMPORTANT USER NOTE:
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- Legend**
- 10% Fluvial AEP Event
 - 1% Fluvial AEP Event
 - 0.1% Fluvial AEP Event
 - Modelled River Centreline
 - AFA Extents
 - Node Point
 - Node ID

FINAL

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Map:	
Blessington Fluvial Flood Extent Maps	
Map Type:	EXTENT
Source:	FLUVIAL
Map Area:	HPW
Scenario:	CURRENT
Drawn By:	F.M.C. Date: 26 July 2016
Checked By:	T.D. Date: 26 July 2016
Approved By:	S.P. Date: 26 July 2016
Drawing No.:	
E09BLE_EXFCD_F0_03	
Map Series: 3 of 4	
Drawing Scale: 1:5,000 @A3	

Appendix B Blessington LAP 2013-2019 FRA

**BLESSINGTON LOCAL AREA
PLAN 2013-2019**

FLOOD RISK ASSESSMENT

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1.0 INTRODUCTION

The Flood Risk Assessment for the Blessington Local Area Plan 2013-2019 has been prepared in accordance with the Guidelines for Planning Authorities 'The Planning System and Flood Risk Management'.

In this plan, the approach is to avoid development in areas at risk of flooding, and where development in floodplains cannot be avoided, to take a sequential approach to flood risk management based on avoidance, reduction and mitigation of risk.

The information about flood risks that has been used in the preparation of this plan has been collated from a number of sources including:

- 'Floodmaps.ie' – The national flood hazard mapping website operated by the Office of Public Works, where information about past flood events is recorded and made available to the public. No 'Flood point' information was available on this site at the time of carrying out this assessment.
- Glen Ding Flood Study 'Review of flood mitigation measures at Glen Ding Stage II' (Barry and Partners April 2012)
- Consultation with the local engineering office in Blessington
- An examination of planning permissions granted in close proximity to the Blessington Stream
- Photographic evidence
- Walk over survey to assess potential sources of flooding
- Examination of the old '6 Inch' maps
- Consultation with the Water Services sections of Wicklow County Council
- An examination of contours.

At present, no CFRAMS¹ are available for the plan area.

The information from the above sources has been amalgamated to form an Indicative Flood Zone Map for the plan area (Flood Zone map attached). This map provides information on two main areas of flood risk: **Zone A** where there is a high probability of flooding, and **Zone B** where there is a moderate probability of flooding.

Flood Zone A includes lands where the probability of flooding from streams and rivers is highest (greater than 1% or 1 in 100 for stream/river flooding).

Flood Zone B includes lands where the probability of flooding from streams and rivers is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for stream/river flooding).

The flood zones described above are indicative of stream and river flooding only. They should not be used to suggest that any areas are free from flood risk, since they do not include the effects of other forms of flooding such as from pluvial flooding, groundwater or artificial drainage systems (e.g. foul or surface water drainage system).

¹ CFRAMS is a Catchment Flood Risk Assessment and Management Study and its purpose is to manage flood risk to the area being studied.

1.1 Definition of Flooding

Flooding is a natural process that can happen at any time in a variety of locations. Flooding from the sea and rivers is best known but prolonged intense and localised rainfall can also cause severe flooding, overland flow and groundwater flooding. Flood risk can be regarded as damage that maybe expected to occur as a result of flooding at a given location. It is a combination of the likelihood or probability of flood occurrence the degree of flooding and the impacts or damage that the flooding would cause. Flood risk is not the same as flood hazard. Flood hazard only describes the features of flooding which have harmful effects on people, property or the environment.

Flood Risk=Probability of Flooding *Consequences of Flooding

There is a need to manage and minimise future flood risk. Land management and spatial planning has a key role to play with respect to flood risk management-in particular to ensure that future development avoids or minimises increases in flood risk. The aim of flood risk management is to minimise the level of flood risk to people, business infrastructure and the environment through the identification and management of existing and potential future flood risks.

1.2 Policy Framework

1.2.1 EU Floods Directive

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

1.2.2 Flood Risk Guidelines

The Planning System and Flood Risk Management – Guidelines for Planning Authorities 2009 provide the policy framework for Local Authorities. These Guidelines were issued by the Minister for the Environment, Heritage and Local Government² under Section 28 of the Planning and Development Act 2000 whereby Planning authorities are required to have regard to the Guidelines in carrying out their functions under the Planning Acts.

The Core Objectives of the Guidelines are to:

- Avoid inappropriate development in areas at risk of flooding;
- Avoid new developments increasing flood risk elsewhere, including that which may arise from surface water run-off;
- Ensure effective management of residual risks for development permitted in flood plains;
- Improve the understanding of flood risk among relevant stakeholders; and
- Ensure that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management.

The key principles that should be adopted by regional and local authorities, developers and their agents should be to:

- Avoid the risk, where possible,
- Substitute less vulnerable uses, where avoidance is not possible, and
- Mitigate and manage risk, where avoidance is not possible, and

Issues raised in the Guidelines include: -

- Need to identify and safeguard flood plains
- Implementation of Sustainable Drainage Systems

² Now recognised as the Department of the Environment, Community and Local Government

- Flood risk to be considered in development and Local Area Plan SEA documents as key environmental criteria.
- The sequential approach to managing flood risks utilizing flood zones is to be undertaken.
- A justification test for development proposed within zones of flooding probability is to be provided.

The Guidelines provide an outline of the stages of a Flood Risk Assessment as follows;

Stage 1 Flood risk identification – To identify whether there may be any flooding or surface water management issues related to a plan;

Stage 2 Initial flood risk assessment – to confirm sources of flooding that may affect a plan area, to appraise the adequacy of existing information and to determine what surveys and modeling approach is appropriate to match the spatial resolution and complexity of the flood risk issues. The extent of the risk of flooding should be assessed which may involve preparing indicative flood zone maps. Where existing river models exist, these should be used broadly to assess the extent of the risk of flooding and potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures; and

Stage 3 Detailed Risk Assessment – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures. This will typically involve use of an existing or construction of a hydraulic model of the river cell across a wide enough area to appreciate the catchment wide impacts and hydrological processes involved.

It should be noted that the study of flooding in Blessington only involved stage 1, flood risk identification and stage 2 initial flood risk assessment to the extent where a flood zone map has been prepared.

1.3 Flood Risk Identification

1.3.1 Fluvial Flooding:

This occurs when the capacity of a stream/river is either extended or the flow of the stream/river becomes blocked or restricted. The excess water spills out from the channel onto adjacent low-lying areas-the flood plain.

1.3.2 Groundwater Flooding:

This type of flooding occurs when the level of water stored in the ground rises as a result of prolonged rainfall and flows out over the ground.

1.4 Mapping Methodology

The mapping methodologies that will be used to formulate the necessary maps come from a range of sources. In accordance with the Planning System and Flood Risk Management Guidelines for Planning Authorities the maps will be developed without regard to any form of flood defence and do not specifically include model interactions with anything other than the land surface and stripped of all man-made features.

2.0 FLOOD RISK ASSESSMENT

Following the Guidelines this flood risk assessment shows the zoning objectives of the plan and their typical permitted uses. In accordance with the Guidelines an assessment was undertaken to determine the appropriateness of land uses (allowed by virtue of land use zoning) to each flood zone. The assessment is undertaken in accordance with tables 3.1 and 3.2 of the guidelines and measures vulnerability to flooding of different types of development, to illustrate appropriate development that is required to meet the justification test. Where the zone is deemed to be appropriate no further action is required here in the FRA. Where the zone requires the justification test to be carried out, it is done so with any necessary mitigation measures recommended.

Zoning	Zoning Objectives	Typical Permitted Uses
RE: Residential	Existing residential. To protect, provide and improve residential amenities of adjoining properties and areas while allowing for infill residential development that reflects the established character of the area in which it is located	Bed & Breakfast/ Guesthouse, Community Facility, Crèche/ Nursery school, Doctor/Dentist etc/Health Centre, Education, Halting Site, Hospital/Nursing Home, Public Services, Residential, Shops (Local) ³ , Residential Institution
R1: New residential	To protect, provide and improve residential amenities	
R2: New residential Low Density	To protect, provide and improve residential amenities at a lower density generally being 20/ha.	Bed & Breakfast/ Guesthouse, Car Parks, Community Facility, Crèche/ Nursery school, Doctor/Dentist etc/Health Centre, Education, Garden Centre, Hospital/Nursing Home, Hotel, Motor Sales Outlet, Offices, Petrol Station, Public House, Public Services, Recreational Building/ Facility, Residential, Residential, Institution, Shops (Other), Service Garage, Shops (Local) ⁴ , Restaurant
TC: Town Centre	To provide for the development and improvement of appropriate town centre uses including retail, commercial, office and civic use, and to provide for 'Living Over the Shop' residential accommodation, or other ancillary residential accommodation.	
NC: Neighbourhood Centre	To provide for retail and non retail services such as grocery shops, newsagents hairdressers, dry cleaners etc and local professional services.	Community Facility, Crèche/ Nursery school, Doctor/Dentist etc/Health Centre, Education, Offices, Petrol Station, Public House, Public Services, Restaurant, Shops (Local) ⁵ , Recreational Building/ Facility
E: Employment	To provide for the development of enterprise and employment	Car Parks, Crèche/ Nursery school, Heavy Vehicle Park, Industry, Motor Sales Outlet, Offices, Petrol Station, Service Garage, Shops

³ A Local Shop is one that primarily serves a local community and does not generally attract business from outside that community.

⁴ A Local Shop is one that primarily serves a local community and does not generally attract business from outside that community.

⁵ A Local Shop is one that primarily serves a local community and does not generally attract business from outside that community.

CE: Community & Education	To provide for civic, community and educational facilities	(Other, Warehousing/ Retail Warehouse/ Cash and Carry Community Facility, Crèche/ Nursery school, Doctor/Dentist etc/Health Centre, Education, Halting Site, Hospital/Nursing Home, Public Services, Recreational Building/ Facility
OS: Open Space	To preserve, provide and improve recreational amenity and passive open space.	Community Facility, Public Services, Recreational Building/ Facility
AOS: Active Open Space	To provide for active recreational open space	Community Facility, Public Services, Recreational Building/ Facility
Park and Ride	To provide for a bus park and ride facility	Car Parks, Public Services
T: Tourism	To facilitate the provision of tourist based activities	Bed & Breakfast/ Guesthouse, Community Facility, Hotel, Public Services, Restaurant, Recreational Building/ Facility
AG	To protect and provide for agriculture and amenity in a manner that protects the physical and visual amenity of the area and demarcates the urban and rural boundary	Community Facility, Halting Site, Public Services, Recreational Building/ Facility
AG – RB: Agriculture within 100m buffer	To provide a 100m buffer from the designated Poulaphuca Reservoir that protects the physical and visual amenity of the area	Community Facility, Recreational Building/ Facility
GD – CZ: Glen Ding Conservation and Amenity Zone	To preserve and protect Glen Ding Wood in its current form as a conservation and Amenity Zone.	N/A
EX – Extractive Industry	To provide for extraction / quarrying and associated activities including processing of extracted materials and land restoration	Industry

2.1 Justification Test

Where, as part of the preparation of the LAP, the planning authority is considering the future development of areas that are at moderate to high risk of flooding, for uses or development vulnerable to flooding that would generally be inappropriate as set out in table 3.2, all of the criteria set out in the justification test must be satisfied. In any case where the justification test is failed, mitigation measures are set out.

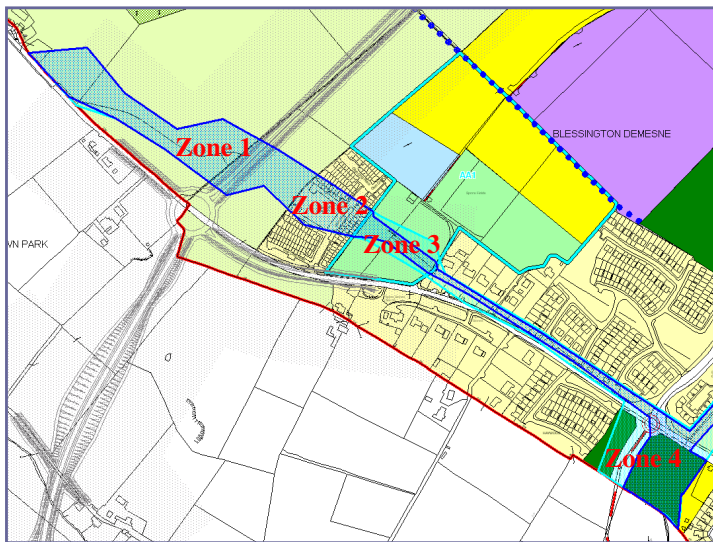
Justification Test for Local Area Plan

	Criteria for area's with a moderate to high risk of flooding	Criteria must be satisfied
1	The urban settlement is targeted for growth under the National Spatial Strategy, regional planning guidelines, Wicklow County Development Plan, statutory plans as defined above or under the Planning Guidelines or Planning Directives provisions of the Planning and Development Act, 2000, as amended.	This test is satisfied for all of the lands within the settlement as Blessington as it is identified as a Moderate Growth Town in accordance with the provisions of the Wicklow County Development Plan 2010-2016. Each plot of land will not be individually tested against this
2	The zoning or designation of the lands for the particular use or development type is required to achieve proper planning and sustainable development of the urban settlement and in particular:	Each plot of land within the land use zone and flood zone that is not appropriate will be assessed against each sub-point accordingly here. √ = Satisfied X = Failed
(i)	Is essential to facilitate regeneration and/or expansion of the centre of the urban settlement	
(ii)	Comprises significantly of under-utilised lands	
(iii)	Is within the core or adjoining the core of an established or designated urban settlement	
(iv)	Will be essential in achieving compact and sustainable urban growth	
(v)	There are no alternative lands for the particular use or development type in areas at risk of flooding within or adjoining the core of the urban settlement	
3	A flood risk assessment to an appropriate level of detail has been carried out as part of the Strategic Environmental Assessment as part of the Local Area Plan preparation process, which demonstrates that flood risk to the development can be adequately managed and the use or development of the lands will not cause unacceptable adverse impacts elsewhere	This test is satisfied for all of the lands within the settlement as a flood risk assessment to an appropriate level has been carried out as part of the SEA. Each plot of land will not be individually tested against this

In order to carry out a detailed assessment the plan area has been divided into 3 appropriate areas with each area assessed in line with the Guidelines. The 3 area's are as follows –

1. The Naas Road Lands (R420) Comprising of Action Area 1, 2. Lands at Blessington Demesne and Egars Field, 3. Lands to the south of the town at Kilmalum. The following assessments of flood risk has been undertaken for the areas:

2.2 Area 1: Lands adjoining the Naas Road (R420)



Flood Zone A: 

Flood Zone B: 

Zone 1: Agricultural Land zoning within flood zone A and B.

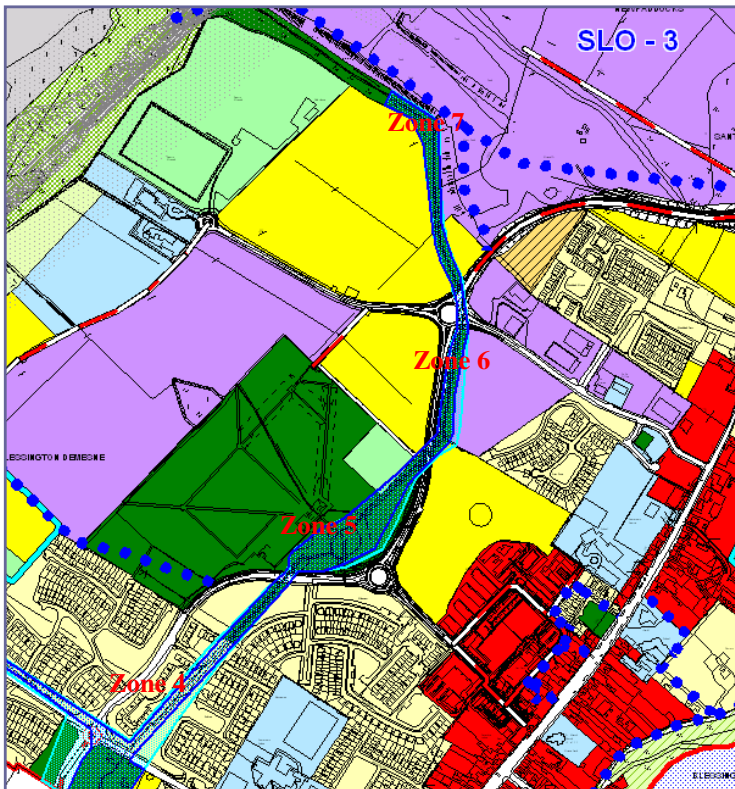
Zone 2: Active Open Space zoning within flood zone A and B.

Zone 3: Open Space zoning within flood zone A and B.

Area	Zonings within Flood Zone	Flood Zone	Vulnerability Vrs Flood Zone	Justification Test															
Zone 1	Open Space	A/B	Appropriate	n/a															
Zone 2	Existing Residential	A/B	Justification Test	<table border="1"> <thead> <tr> <th colspan="5">JUSTIFICATION TEST</th> </tr> <tr> <th>2 (i)</th> <th>2 (ii)</th> <th>2 (iii)</th> <th>2 (iv)</th> <th>2 (V)</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> </tr> </tbody> </table>	JUSTIFICATION TEST					2 (i)	2 (ii)	2 (iii)	2 (iv)	2 (V)	X	X	X	X	X
JUSTIFICATION TEST																			
2 (i)	2 (ii)	2 (iii)	2 (iv)	2 (V)															
X	X	X	X	X															

				<p>Test is not satisfied as these lands do not meet all of the criteria of the justification test.</p> <p>However these lands are developed, therefore should an expansion of existing uses be proposed, mitigation measures are required.</p> <p><i>Objectives S1 and S3 & S4 of the Local Area Plan shall apply.</i></p>
Zone 3	Active Open Space	A/B	<i>Appropriate</i>	<i>n/a</i>
Zone 4	Open Space	A/B	<i>Appropriate</i>	<i>n/a</i>

2.3 Area 2: Lands at Blessington Demesne



Flood Zone A: 

Flood Zone B: 

Zone 4 – Existing Residential Zone with Open Space zoned within the northern/unbuilt area to the north of this area falling within flood zone A and B

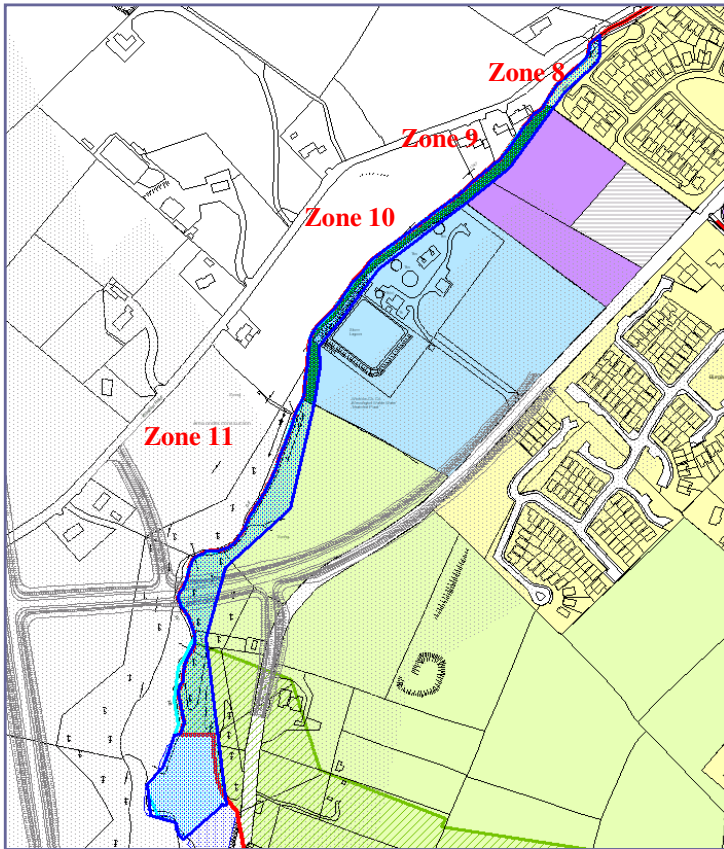
Zone 5 – Lands zoned to provide for a new public park/open space and a small section of Active Open Space falling within flood Zone A and B.

Zone 6 – Land zone for employment and residential use partially falling within Flood zone B with lands falling within flood zone A being zoned Open Space.

Zone 7 – All lands falling within Flood Zone A and B zoned open space.

Area 2	Zonings within Flood Zone	Flood Zone	Vulnerability Vrs Flood Zone	Justification Test															
Zone 4	Existing Residential and Open Space	A/B	Justification Test	<table border="1"> <thead> <tr> <th colspan="5">JUSTIFICATION TEST</th> </tr> <tr> <th>2 (i)</th> <th>2 (ii)</th> <th>2 (iii)</th> <th>2 (iv)</th> <th>2 (V)</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> </tr> </tbody> </table> <p>Test is not satisfied as these lands do not meet all of the criteria of the justification test.</p> <p>However these lands are developed, therefore should an expansion of existing uses be proposed, mitigation measures are required.</p> <p>Objectives S1 and S3 & S4 of the Local Area Plan shall apply.</p>	JUSTIFICATION TEST					2 (i)	2 (ii)	2 (iii)	2 (iv)	2 (V)	X	X	X	X	X
JUSTIFICATION TEST																			
2 (i)	2 (ii)	2 (iii)	2 (iv)	2 (V)															
X	X	X	X	X															
Zone 5	Open Space/Public Park	A/B	Appropriate	n/a															
Zone 6	Open Space within flood Zone A and flood Zone B. A small section of Employment and New Residential within Flood Zone B.	A/B	Justification Test	<table border="1"> <thead> <tr> <th colspan="5">JUSTIFICATION TEST</th> </tr> <tr> <th>2 (i)</th> <th>2 (ii)</th> <th>2 (iii)</th> <th>2 (iv)</th> <th>2 (V)</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>√</td> <td>√</td> <td>√</td> <td>X</td> </tr> </tbody> </table> <p>Test is not satisfied as these lands do not meet all of the criteria of the justification test.</p> <p>However these lands are developed, therefore should an expansion of existing uses be proposed, mitigation measures are required.</p> <p>Objectives S1 and S3 & S4 of the Local Area Plan shall apply.</p>	JUSTIFICATION TEST					2 (i)	2 (ii)	2 (iii)	2 (iv)	2 (V)	X	√	√	√	X
JUSTIFICATION TEST																			
2 (i)	2 (ii)	2 (iii)	2 (iv)	2 (V)															
X	√	√	√	X															
Zone 7	Open Space falling within flood Zone A and flood Zone B	A/B	Appropriate	n/a															

2.4 Area 3: Lands at Blessington Demesne



Flood Zone A: 

Flood Zone B: 

Zone 8 – A small portion of Existing Residential comprising of access road falling within Flood Zone A and B.

Zone 9 – Open Space falling within Flood Zone A and B

Zone 10 – Open Space with a small section of Existing Community and Educational Zoning falling within Flood Zone A and B.

Zoning 11 – Agricultural Zoning falling within Flood Zone A and B.

Area 3	Zonings within Flood Zone	Flood Zone	Vulnerability Vrs Flood Zone	Justification Test															
Zone 8	Existing Residential	A/B	Appropriate	n/a															
Zone 9	Open Space	A/B	Appropriate	n/a															
Zone 10	Open Space alongside existing Community/Educational Zoning falling partly within flood Zone A and flood Zone B	A/B	Justification Test	<table border="1"> <thead> <tr> <th colspan="5">JUSTIFICATION TEST</th> </tr> <tr> <th>2 (i)</th> <th>2 (ii)</th> <th>2 (iii)</th> <th>2 (iv)</th> <th>2 (V)</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>X</td> <td>X</td> <td>X</td> <td>X</td> </tr> </tbody> </table> <p>Test is not satisfied as these do not meet all of the criteria of the justification test However these lands are developed, therefore should an expansion of existing uses be proposed, mitigation measures are required.</p> <p><i>Objective S1, S3 and S4 of the Local Area Plan shall apply.</i></p>	JUSTIFICATION TEST					2 (i)	2 (ii)	2 (iii)	2 (iv)	2 (V)	X	X	X	X	X
JUSTIFICATION TEST																			
2 (i)	2 (ii)	2 (iii)	2 (iv)	2 (V)															
X	X	X	X	X															
Zone 11	Agricultural Zoning falling within flood Zone A and flood Zone B	A/B	Appropriate	n/a															

3.0 Mitigation Objectives to be included in the Local Area Plan

(Note the objectives below include the relevant objectives of the County Development plan which are applicable to the Blessington Local Area Plan in regard to Flooding).

- S1** To implement the objectives and development standards of Chapters 11, 12, 13 and 14 of the County Development Plan as applicable to Blessington.
- S3** To have regard to the provisions of the 'The Planning System and Flood Risk Management' Guidelines (DoEHLG 2009) and the Flood Risk Assessment carried out as part of this plan
- S4** Applications for developments in high or moderate flood risk areas (Flood Zones A and B) shall be assessed in accordance with 'The Planning System and Flood Risk Management Guidelines (Nov 2009 DEHLG & OPW)'. Where the planning authority is considering proposals for new development in areas at high or moderate risk of flooding that include types of development that are vulnerable to flooding and that would generally be inappropriate as set out in Table 3.2 of the Guidelines, the planning authority shall be satisfied that the development satisfies all the criteria of the Justification Test for development management, as set out in Box 5.1 of the Guidelines. Flood Risk Assessments shall be in accordance with the requirements set out in the Guidelines.

County Development Plan Objectives relevant to the Blessington Local Area Plan:

- FL2** Land will not be zoned for development in an area identified as being at high or moderate flood risk (as set out in the Guidelines⁴), unless where it is fully justified (through the Justification Test set out in the Guidelines) that there are wider sustainability grounds for appropriate development and unless the flood risk can be managed to an acceptable level without increasing flood risk elsewhere and where possible, reducing flood risk overall.
- FL3** Applications for significant new developments or developments in high or moderate flood risk areas shall follow the sequential approach as set out above.
- FL4** To prohibit development in river flood plains or other areas known to provide natural attenuation for floodwaters except where the development can clearly be justified with the guidelines 'Justification Test'.
- FL5** Excessive hard surfacing shall not be permitted for new, or extensions to, residential or commercial developments and all applications will be required to show that sustainable drainage techniques have been employed in the design of the development.
- FL6** To require all new developments to include proposals to deal with rain and surface water collected on site and where deemed necessary, to integrate attenuation and SUDS measures.
- FL7** For developments adjacent to all watercourses of a significant conveyance capacity or where it is necessary to maintain the ecological or environmental quality of the watercourse, any structures (including hard landscaping) must be set back from the edge of the watercourse to allow access for channel clearing/ maintenance/ vegetation. A minimum setback of up to 10-15m will be required either side depending on the width of the watercourse with riparian vegetation generally being retained in as natural a state as possible.

4.0 Planning Implications for each of the Flood Zones

The initial justification test has been met in the zoning of lands, which are subject to moderate or high risk of flooding as outlined above. The second process is the Development Management Justification Test which will be applied 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. The following table illustrates criteria as outlined in the *Guidelines on the Planning System and Flood Risk Management* that must be adhered to when considering a proposed development in the different flood zones.

The table below illustrates the type of development that would be appropriate to each flood zone and those that would be required to meet the justification test.

Table 1: Classification of vulnerability versus flood zone

	Land Uses and Types of development	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Garda, ambulance, fire stations. Hospitals, Dwelling houses, residential care homes, children's homes and social services homes, Caravans and mobile homes.	Justification Test	Justification Test	Appropriate
Less vulnerable development	Buildings for retail, leisure, warehousing, commercial, industrial and non-residential institutions, Waste treatment, local transport infrastructure, land and buildings used for holiday or short-let caravans and camping. Waste treatment, local transport infrastructure.	Justification Test	Appropriate	Appropriate
Water-compatible development	Docks, marinas, amenity open space, outdoor sports and recreations and changing rooms, water based recreations and tourism (excluding sleeping facilities), essential ancillary sleeping or residential accommodation for staff.	Appropriate	Appropriate	Appropriate

4.1 Reduction and Mitigation of Flood Risk

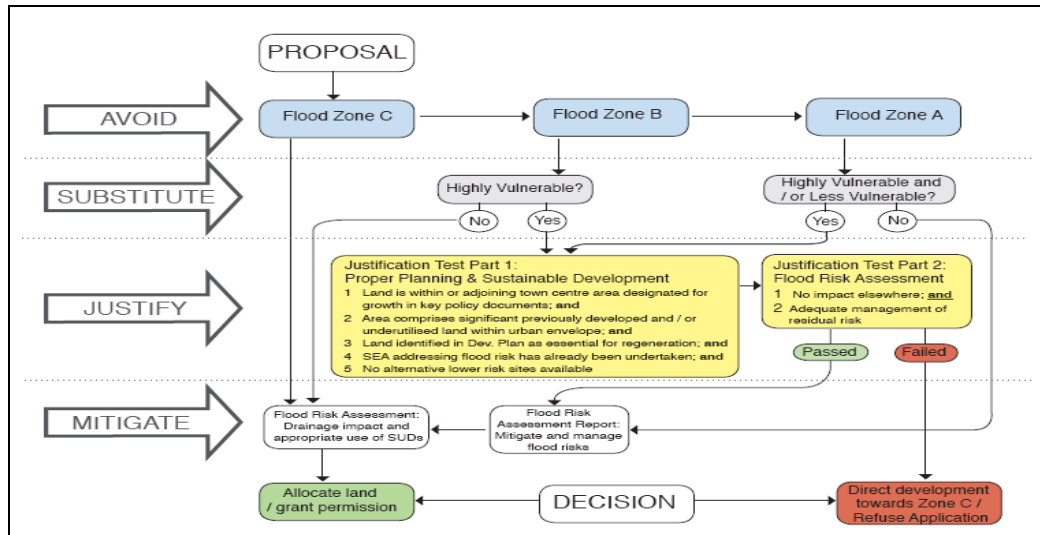
The risks associated with flooding at any particular location can be reduced and mitigated in a number of ways depending on the scale and type of flooding that may be likely, for example:

- Through structural measures that block or restrict the pathways of floodwaters, such as river or coastal defences;
- The provision of attenuation measures (either natural or man made) that hold excess water until it can be released back into the natural water systems;
- Through the proper design of surface water systems, that allow the system to convey away from the site (to an appropriate outfall) the water that may be generated in an extreme event⁶;
- Through the minimisation of 'hard surfacing' in new developments, which prevents waters from seeping into the ground;
- Through 'flood routing' i.e. the integration into the design of a development of escape routes for water;
- Flood resistant and resilient construction;
- Effective emergency planning.

⁶ What constitutes an extreme event will depend on the location of the site and the uses thereon. For urban/built up areas or where developments (existing, proposed or anticipated) are involved, design for a 1 in 100 year event will be required; along estuaries, design for the 200-year tide level will be required.

4.2 Flood Risk Management

Applications for permission will be evaluated following the sequential approach as set out in the guidelines. This is summarised in the flow diagram⁷ to follow:



4.3 Flood Risk Assessment of Development

Where flood risk may be an issue for any proposed development, a flood risk assessment should be carried out that is appropriate to the scale and nature of the development and the risks arising. This shall be undertaken in accordance with the DoE Flood Risk Assessment Guidelines. This shall include proposals for the storage or attenuation of runoff/discharges (including foul drains) to ensure the development does not increase the flood risk in the relevant catchments. Those planning new developments are advised to refer to the OPW National Flood Hazard Mapping Website, the Flood zone map (1), Coastal flood maps and GSI data etc prior to submitting proposals.

4.4 Flooding (Flood Management)

Flooding is a natural phenomenon of the hydrological cycle. Different types of flooding include overland flows, river flooding, coastal flooding, groundwater flooding, estuarial flooding and flooding resulting from the failure of infrastructure. Like any other natural process, flooding cannot be completely eliminated, but its impacts can be avoided or minimised with proactive and environmentally sustainable management and planning.

The Office of Public Works (OPW) is the lead agency for flood risk management in Ireland. This gives the OPW a role in policy advice and coordination in addition to its operational roles, but not responsibility for addressing all issues related to flooding. Local Authorities are required to implement the provisions of 'The Planning System and Flood Risk Management' Guidelines (DoEHLG 2009) in the carrying out of their development management functions.

These guidelines require the planning system at national, regional and local levels to:

⁷ Reproduced with permission from jba Consulting

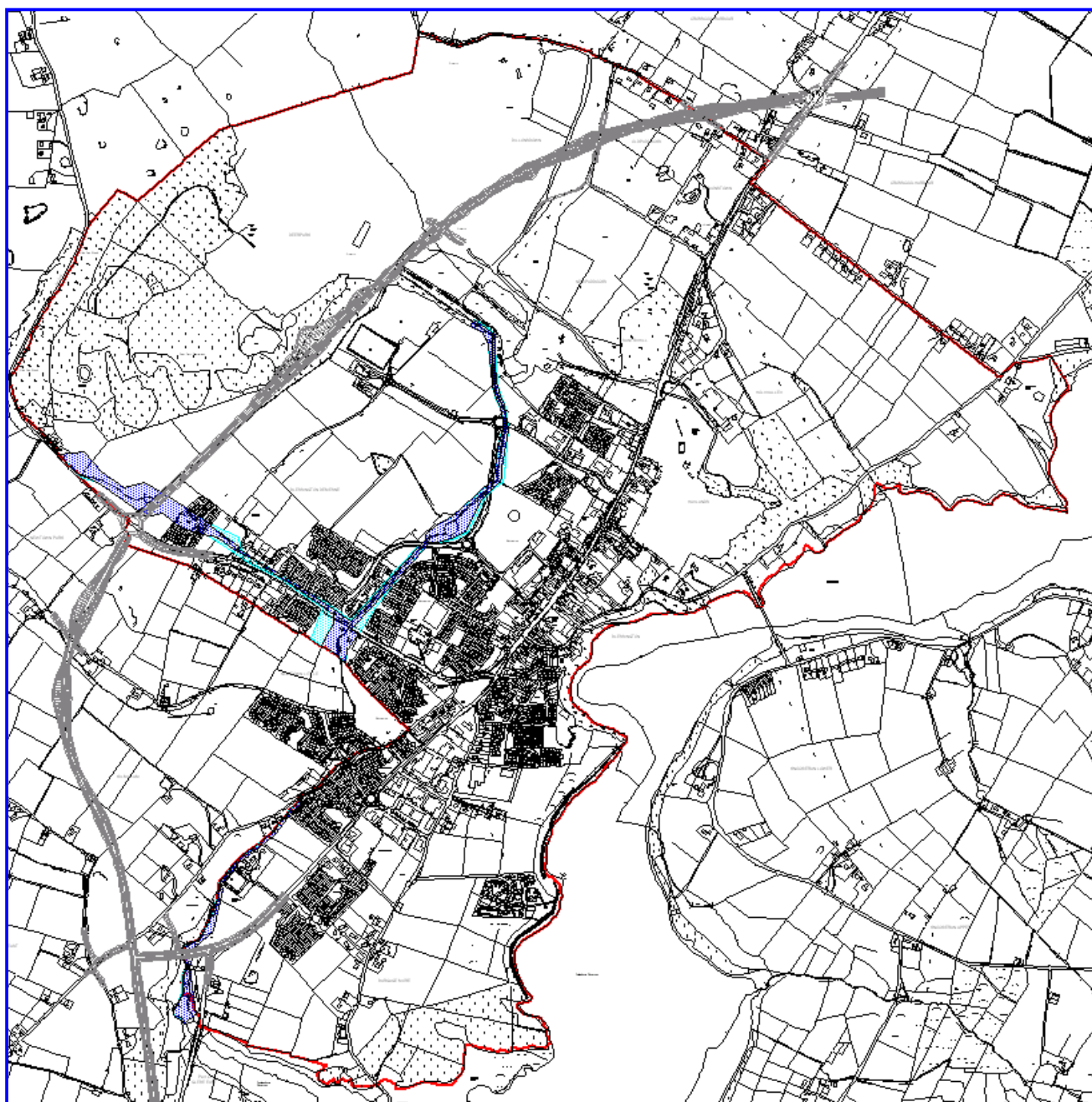
- (1) Avoid development in areas at risk of flooding by not permitting development in flood risk areas, particularly floodplains, unless where it is fully justified that there are wider sustainability grounds for appropriate development and unless the flood risk can be managed to an acceptable level without increasing flood risk elsewhere and where possible, reducing flood risk overall;
- (2) Adopt a sequential approach to flood risk management based on avoidance, reduction and then mitigation of flood risk as the overall framework for assessing the location of new development in the development planning processes; and
- (3) Incorporate flood risk assessment into the process of making decisions on planning applications and planning appeals.

Please Note

It is important to note that compliance with the requirements of The Planning System and Flood Risk Management-Guidelines for Planning Authorities is a work in progress and is currently based on emerging and incomplete data as well as estimates of the locations and likelihood of flooding. In particular, the assessment and mapping of areas of flood risk awaits the publication of the Catchment-based Flood Risk Assessment and Management Plans (CFRAMs). As a result, this Strategic Flood Risk Assessment is based on available information.

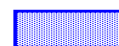
All information in relation to flood risk may be substantially altered in light of future data and analysis. As a result, all landowners and developers are advised that Wicklow County Council can accept no responsibility for losses or damages arising due to assessments of the vulnerability to flooding of lands, uses and developments. Owners, users and developers are advised to take all reasonable measures to assess the vulnerability to flooding of lands in which they have an interest prior to making planning or development decisions.

Flood Zone Map No. 1

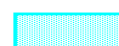


**Flood Risk Assessment of the
Blessington Local Area Plan
2013 - 2019**

Flood Zone A - High Flood Risk



Flood Zone B - Moderate Flood Risk



NRDO Indicative N81 Route Corridor



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