

MAP USER GUIDANCE NOTES

Understanding the Flood maps

These maps are 'predictive' flood maps showing areas predicted to be inundated during a theoretical or 'design' flood event with an estimated probability of occurrence, rather than information for actual floods that have occurred in the past, which is presented, where available, on 'historic' flood maps.

The maps refer to flood event probabilities in terms of a percentage Annual Exceedance Probability, or 'AEP'. This represents the probability of an event of this, or greater, severity occurring in any given year. These probabilities may also be expressed as odds (e.g. 100 to 1) of the event occurring in any given year. They are also commonly referred to in terms of a return period (e.g. the 100-year flood), although this period is not the length of time that will elapse between two such events occurring, as, although unlikely, two very severe events may occur within a very short space of time. Table 1 sets out a range of flood event probabilities for which fluvial and coastal flood hazard maps are typically developed, expressed in terms of Annual Exceedance Probability (AEP), and identifies their parallels under other forms of expression.

Table 1 - Flood Event Probabilities

Annual Exceedance Probability (%)	Odds of Occurrence in any Given Year	Return Period (yrs)
10 (High probability)	10 : 1	10
1 (Medium Probability - Fluvial / River Flood Maps)	100 : 1	100
0.5 (Medium Probability - Coastal Flood Map)	200 : 1	200
0.1 (Low Probability)	1000 : 1	1000

Maps have been produced for the 'Areas of Further Assessment' (AFA), as required by the EU 'Floods' Directive [2007/60/EC].

Purposes of the Maps

Public Consultation:

The draft flood maps are being displayed for the purposes of Public Consultation.

Public Awareness:

Flood maps, and in particular flood extent maps and flood depth maps, are intended to inform the public, home owners, business owners, landowners, landlords and tenants about the likely risk of flooding in their areas, including the likely frequency of occurrence and depth.

Planning & Development Management:

The flood maps are intended to inform the Spatial Planning processes and to support Planning Development decisions, in line with the 2009 Guidelines on The Planning System and Flood Risk Management (DoEHLG/OPW 2009).

Emergency Response Management:

The flood maps are intended to aid in Emergency Response Decision Support, by providing information on areas prone to flooding, the potential depths of flooding and what might be at risk in the event of a flood.

Flood Risk Management Decision Support:

Flood maps, and in particular various flood risk maps, are intended to be used as a decision support tool in the identification, planning, development, costing, assessment and prioritisation of flood risk management options, such as flood defence schemes, flood warning systems, public awareness campaigns etc.

Contents

There are a series of three map types:

(i) Flood Extent Maps

These maps indicate the extents, peak water levels and flows associated with flooding from only those river reaches, estuaries and coastlines that have been modelled. River reaches that have been modelled are indicated with a thick orange line along the centre-line of the river. Flooding from other reaches of river may occur, but has not been mapped. Areas that are not shown as being within a flood extent may therefore be at risk of flooding from unmodelled rivers (as well as one of the other sources referred to below).

There are many other possible sources of flooding, such as from surcharged urban drainage systems, ponding rainwater, groundwater, overtopping or breaching of water retaining structures (e.g. reservoirs). Flooding from these other sources has typically not been mapped, and so areas that are not shown as being within a flood extent may therefore be at risk from flooding from one or more of these other sources.

(ii) Flood Depth Maps

These indicate the estimated depth of flooding at a given location, for a flood event of a particular probability. The flood depths are calculated by subtracting the ground levels, from the predicted water level. The flood depths are mapped as constant depths over grid squares (of 5-10m for the AFA flood maps), whereas in reality depths may vary within a given square.

(iii) Flood Risk Maps:

These maps show:

- The indicative number of inhabitants potentially affected by floods, which provides an indication of risk to human health and the community
- The types of economic activity potentially affected by the flooding
- Protected areas of environmental value and potential sources of pollution (IED sites) that may be prone to flooding

Legends

The following datasets are shown and appear on the legend of the flood maps:

Model Nodes – Nodes at which estimates of design event flood flows and flood levels are reported on the maps.

Modelled River Centreline – An indicator of the channels that have been included in the river network model and from which the resultant fluvial flood extents are derived.

AEP Flood Extents – The areas that are estimated to be inundated at some point during a flood with the respective Annual Exceedence Probabilities (AEPs). Three extents are typically shown on the flood extent maps – Low Probability (0.1% AEP); Medium Probability (1% AEP fluvial or 0.5% AEP coastal); and, where appropriate, High Probability (10% AEP).

Area for Further Assessment (AFA) – The outer bounds of the AFA where, based on the Preliminary Flood Risk Assessment, the risks associated with flooding are potentially significant, and where further, more detailed assessment has been undertaken to determine the degree of flood risk.

Defended Areas - Hatched polygons on the flood extent maps show areas protected by existing flood defences. The defended area denotes the area which should be protected in the event of a flood. The Standard of Protection (SoP) for the defended area is also noted on the flood defence on the map, e.g. a 1% AEP SoP describes a defence that will protect an area defended for the 100 year flood.

Flood Depth (in metres or “m”) – The maximum depth estimated to occur at some point during a

flood with the respective Annual Exceedence Probability (AEP) at the mapped location.

Scale

The PDF versions of the flood maps are produced at between 1:5 000 and 1:10 000 scale at A3 size within the AFA, as shown on the map. This scale has been selected to permit users to view individual properties, streets, infrastructure assets, etc., and as it is compatible with the scale of the cadastral background mapping.

For maps showing the General Environmental Risks for each AFA, the PDF map scale is 1:50,000 at A3 size.

Maps showing the Specific Types of Economic Activity across Units of Management vary in scale depending on the size of each Unit of Management.

Accuracy

For fluvial flood levels, calibration and verification of the models make use of the best available data including hydrometric records, photographs, videos, press articles and anecdotal information. Subject to the availability of suitable calibration data, models are verified in so far as possible to vertical water level accuracies of approximately 0.2m for areas within the AFAs.

All fluvial models are run, and maps produced, assuming clear flow through culverts and bridges, and the models and flood maps do not account for blockage of such structures.

For coastal flood levels, the accuracy of the predicted annual exceedance probability (AEP) of combined tide and surge levels depends on the accuracy of the various components used in deriving these levels i.e. accuracy of the tidal and surge model, the accuracy of the statistical data and the accuracy for the conversion from marine datum to land levelling datum. The output of the water level modelling, combined with the extreme value analysis undertaken as detailed above is generally within $\pm 0.2\text{m}$ for confidence limits of 95% at the 0.1% AEP. Lower return period events are expected to have tighter confidence limits.

Date of Preparation

The date the maps were prepared is indicated in the title box of the maps.

Responsible authorities

The Office of Public Works (OPW), as the lead agency for flood risk management in Ireland, is the authority responsible for the publication of the flood maps shown here.

Local Authorities provide support to the OPW as partners on the CFRAM and capital flood risk management programme, contributing to, or in some instances commissioning, the development of the flood maps.

Links to further information

<http://maps.opw.ie/fhrm/>

<http://www.cfram.ie>

<http://www.opw.ie/en/floodriskmanagement/>

<http://www.floodmaps.ie>

<http://epa.ie/water/wm/hydrometrics/>

FLOOD MAPPING TECHNICAL DATA

Identification, Assessment or Calculation of Flooding probabilities or return periods

The maps refer to flood event probabilities in terms of a percentage Annual Exceedance Probability (AEP). This represents the probability of an event of this, or greater, severity occurring in any given year. These probabilities are also commonly referred to in terms of a return period (e.g., the 100-year flood), although it should be understood that this period is not the length of time that will elapse between two such events occurring, as, although unlikely, two very severe events may occur within a very short space of time.

These probabilities were selected to cover the range of event probabilities that could cause flooding and provide the range of information necessary to fully assess the flood risk for each AFA and hence develop appropriate flood risk management measures; up to a nominal extreme event (the 0.1% AEP flood event - equivalent to an event with return period of 1000-years) that is significantly beyond the range of reliable statistical event projections.

Flood risk maps are produced for a Low Probability (the 0.1% AEP flood event), a Medium Probability (the 1% (fluvial & pluvial) or 0.5% (coastal) AEP flood events) and, where appropriate, a High Probability (the 10% AEP flood event), although risk analysis is undertaken across the wider range of flood events to provide detailed flood risk data.

Identification, Assessment or Calculation of Flooding extent

Flood maps show predicted extents and depths of flooding for existing conditions. The flood extent maps indicate the estimated maximum extent of flooding (subject to limitations referred to herein) and flooding in some areas, such as near the edge of the flooded area, might be very shallow.

Fluvial and coastal flood maps are developed using hydrodynamic modelling, based on calculated design river flows and extreme sea levels, surveyed channel cross-sections, in-bank / bank-side / coastal structures, Digital Terrain Models, and other relevant datasets (e.g. land use, data on past floods for model calibration, etc.). Technical Hydrology and Hydraulics and Flood Mapping Reports (available through the National CFRAM Programme website; www.cfram.ie) set out full technical details on the derivation of the flood maps. Users of the maps should familiarise themselves fully with the contents of these reports in advance of the use of the maps. A summary of the process is provided below.

Key stages:

- Hydrological analysis: Estimation of the flood flows (cubic metres of water per second: m^3/s) for the design flood events
- Hydraulic modelling: Estimation of the flood levels in tidal areas; at intervals along a river; or for locations on a floodplain, based on the design flood flows (river flooding) and local physical and hydraulic conditions
- Analysis of flooding: Estimation of how flooding would propagate from the river, estuary or tidal area over the land, and the associated flood extents, depths, velocities, etc.

Hydrological Analysis:

Fluvial flood flows have been calculated based on analysis of gauged data, and the use of the national methods for determining flows in ungauged catchments, and for calculating statistical peak flow growth curves and hydrograph shapes; namely the Flood Studies Update (see <http://opw.hydronet.com/>).

Coastal extreme sea levels have been determined from 2-D modelling under the Irish Coastal Protection Strategy Study. Extreme value analysis (EVA) was undertaken by fitting theoretical probability distributions to the water level values extracted from the results of the tidal surge model simulations. A partial duration series (peak over threshold model) was used to select the largest events which occurred within the dataset (details available from reports available under the OPW website – see <http://www.opw.ie/en/floodriskmanagement/floodanderosionmapping/icpss/>).

Hydraulic modelling:

For fluvial flood mapping, the hydrodynamic modelling software packages used are the ISIS and MIKE suites and, in some instances Infoworks ICM, according to context, need and preference of the modeller. The fluvial models make use of ground-based survey of channel cross-sections and of in-bank / bank-side structures. Channel cross-section spacing is typically 50-100m through the AFA, and typically 500m in rural areas outside of the AFAs. For coastal flood mapping, the extreme levels and wave over-topping flows are propagated inland using 2-D models.

For the purposes of the production of the flood maps, structures, such as culverts and bridges, have been modelled as surveyed, with no blockage assumed.

Topographical Data:

A Digital Terrain Model (DTM) is used to generate the maps. The DTM is derived from airborne survey data. The majority of this data in AFAs is Light Detection and Ranging (LiDAR) data, which has a vertical and horizontal RMSE of typically less than 0.2m, and a typical grid scale of 5 or 10m. Where LiDAR data was not available, which would typically be rural areas outside of the AFAs, Interferometric Synthetic Aperture Radar (IfSAR) data has been used to derive the DTM, which has a vertical and horizontal RMSE of typically less than 0.7m, and a grid scale of 5m.

The DTM is a 'bare earth' model of the ground surface with man-made and natural landscape features such as vegetation, buildings and bridges digitally removed. In addition, 'cleansing' is undertaken during flood map production, which involves various processes such as the removal of very small areas of flooding that are remote and isolated, the removal of very small islands (areas modelled as not flooding) within the flooded area, etc. Therefore, the maps should not be used to assess the flood risk associated with individual properties or point locations, or to replace a detailed local flood risk assessment.

Buildings and other infrastructure (e.g., bridges, embankments) are reintroduced to the modelling process in an appropriate manner (see hydraulic modelling reports for details) and so are considered in the hydraulic analysis and preparation of the flood maps.

The approach taken to determining the standard of protection (SoP) for flood defences is based on the crest level of the defence relative to the flood levels for the range of event probabilities (where the SoP is taken as the lowest annual exceedence probability that does not overtop). The condition, fragility and likelihood of failure of the defence are not considered for the purpose of mapping the areas defended or determining the SoP.

The maps were produced based on survey data captured prior to, and during the early part of the CFRAM programme. They do not account for changes in development, infrastructure or topography that occurred after the date of survey data capture.

Identification, Assessment or Calculation of Depth

The flood depth maps indicate the estimated depth of flooding at a given location, for a flood event of a particular probability. The flood depths are calculated by subtracting the DTM ground levels, from the predicted water level. The flood depths are mapped as constant depths over grid squares of 5-10m for the AFA flood maps, whereas in reality depths may vary within a given square.

Models used, datasets, uncertainties

Flood levels, depths and velocities are derived from the hydrodynamic models for the various event probabilities and scenarios. The models have been calibrated to information on past floods events where available.

For fluvial flood extents, uncertainties in flood level and extent are assessed based on sensitivity runs of the hydro-dynamic models with varied input or boundary parameters, such as inflow, downstream

boundary, roughness values, structure coefficients, etc.

For coastal maps, uncertainty in flood levels can arise due to uncertainties in topographic, bathymetric and other survey data, meteorological data, assumptions and / or approximations in the hydraulic / hydrodynamic models in representing physical reality, assumptions in the hydraulic / hydrodynamic modelling, and datum conversions, etc. Uncertainty in flood extents can arise due to uncertainties in flood levels, topographic and other survey data, assumptions and / or approximations in the way that flooding spreads over a floodplain, etc.