



Eastern CFRAM Study

Final Report

Unit of Management 08

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Table 3.1 Summary of Flood Risk Management Measures - UoM08

ABBREVIATIONS

AEP	Annual Exceedance Probability
AFA	Area for Further Assessment
BCR	Benefit Cost Ratio
CFRAM	Catchment Flood Risk Assessment and Management
FEM FRAM	Fingal East Meath Flood Risk Assessment and Management
FHRC	Flood Hazard and Research Centre
FRA	Flood Risk Assessment
FRM	Flood Risk Management
FRMP	Flood Risk Management Plan
HEFS	High end future scenario
ICM	Integrated Catchment Management
KMM	Kirk McClure Morton
MCM	Multi Coloured Manual
MPW	Medium Priority Watercourse
MRFS	Mid range future scenario
OPW	Office of Public Works
OSi	Ordnance Survey Ireland
PFRA	Preliminary Flood Risk Assessment
POR	Preliminary Options Report
PVb	Present Value benefit
PVd	Present Value damage
RBD	River Basin District
SEA	Strategic Environmental Assessment
SI	Statutory Instrument
SoP	Standard of Protection
SSA	Spatial Scale of Assessment
SUDS	Sustainable Urban Drainage Systems
UoM	Unit of Management

1 INTRODUCTION

1.1 UNIT OF MANAGEMENT 08

The Eastern CFRAM Study covers an area of approximately 6,250 km² and includes and includes four River Basins or Units of Management (UoMs) the Boyne (UoM07), Nanny – Delvin (UoM08), Liffey-Dublin Bay (UoM09) and Avoca-Vartry (UoM10).

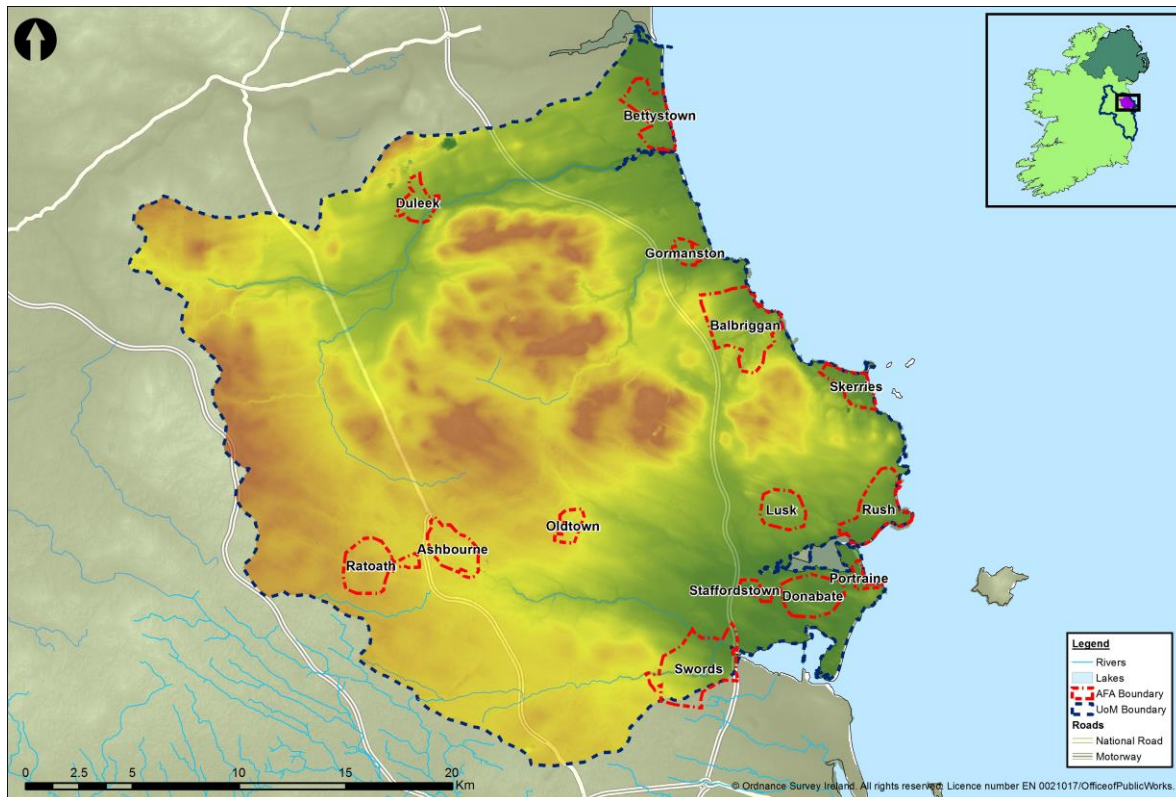


Figure 1.1: Nanny-Delvin RBD Location Map

All of the Nanny-Delvin River Basin (UoM08), and small adjoining areas of Liffey-Dublin Bay (UoM09) and the Boyne (UoM07), were primarily addressed under the previous Fingal East Meath Flood Risk Assessment and Management (FEM FRAM) Study which was a pilot for Flood Directive implementation. Under the Eastern CFRAM Study, the scope of works in relation to Nanny-Delvin River Basin (UoM08) entailed:

- Services for background and general activities, flood event response, flood risk review, plan preparation and reporting;
- Hydrology, hydraulic and flood mapping review and update recommendations;
- Flood risk management options review, update and alignment with overall strategies; and

- Incorporation of materials into a Flood Risk Management Plan for Nanny-Delvin River Basin (UoM08).

The (FEM FRAM) area comprises a group of 23 rivers and streams, three estuaries and the Fingal and Meath coastline. The study area (shown in Figure 1.1), is approximately 772km² in plan area. The study area is bounded by the River Boyne & Mornington River catchment areas to the north and west, the Tolka and Santry River catchments to the south, and by the Irish Sea to the east. All watercourses in the study area flow to the Irish Sea either directly or via the three estuaries (Baldoyle, Broadmeadow and Rogerstown).

The principal urban areas in the study area include Portmarnock, Swords, Balbriggan, Ashbourne, Dunshaughlin, Malahide, Rush, Skerries and Duleek. Important infrastructure includes the M1 motorway, Dublin Airport, Gormanstown Military camp and Fairyhouse racecourse.

The following Arterial Drainage Schemes and Drainage Districts have been completed, and are maintained by the OPW or local authority respectively, in UoM08.

- Broadmeadow & Ward ADS
 - Unit of Management (Hydrometric Area): 08
 - Scheme Name: Broadmeadow and Ward
 - Years of Works: Started 1961 Completed 1964
 - Length of Channel: 158 Km
 - Length of Embankment: 0 Km
 - Benefitting Area (km²): 29.81
- Matt ADS
 - Unit of Management (Hydrometric Area): 08
 - Scheme Name: Matt
 - Years of Works: Started 1964 Completed 1965
 - Length of Channel: 13 Km
 - Length of Embankment: 0 Km
 - Benefitting Area (km²): 1.91
- Ward DD
- Curragha DD
- Garristown & Devlin DD
- Bartramstown DD
- Nanny DD
- Nanny Upper DD and
- Mornington DD.

1.2 OBJECTIVE OF THIS REPORT

The principal objective of report, in accordance with Section 12.2 of the CFRAM Studies Stage 1 Project Brief, is to; provide a summary of the relevant reports prepared for Nanny-Delvin River Basin (UoM08) as part of the Eastern CFRAM Study, and; detail the development of the UoM08 Flood Risk Management Plan (FRMP) consulted on during the second half of 2016 and the finalisation of the UoM08 Plan in 2017.

This report also aims to identify any issues that may influence the proposed methodologies or programme going forward into the second cycle of Floods Directive implementation.

1.3 ACCOMPANYING AND SUPPORTING REPORTS

This report accompanies the Final UoM08 Flood Risk Management Plan containing the following volumes:

- VOLUME I Flood Risk Management Plan
- VOLUME II SEA Screening Report and Appropriate Assessment Screening Report.

This final report is also supported by a suite of FEM FRAM project deliverables, including key technical reports on hydrology, hydraulics, preliminary options and a draft FEM FRAM Flood Risk Management Plan, which were reviewed under the Eastern CFRAM Study (as summarised in Section 2 of this report).

The development of the Flood Risk Management Plan (FRMP) is summarised in Section 3 of this report.

The full list of project reports to date, which also include a series of relevant consultation and environmental reports and specific assessments of flood risk, survey data, rainfall and blockage within the Eastern CFRAM Study area, are listed in Table 1.1.

Table 1.1: List of Reports – Eastern CFRAM Study Overall & UoM08 Specific Reports

Ref.	Document Title
Rp0001	IBE0600Rp0001_Flood Risk Review
Rp0002	IBE0600Rp0002_Communications Plan, Implementation Programmes & Event Plans <ul style="list-style-type: none"> • Initial Scoping Phase • Mapping Phase • Options Phase • Draft Plan Phase
Rp0003	IBE0600Rp0003_Potential Flood Risk to Environmental Receptors
Rp0006	IBE0600Rp0006_HA08 Inception Report
Rp0009	IBE0600Rp0009_Initial Scoping Phase Synthesis Report Stakeholders Workshop
Rp0011	IBE0600Rp0011_Initial Scoping Phase Synthesis Report Public Open Evening
Rp0017	IBE0600Rp0017 Review: FEM FRAM, Dodder & Tolka Studies Phase 1
Rp0023	IBE0600Rp0023_Culvert blockage analysis
Rp0033	IBE0600Rp0033_Mapping Phase Synthesis Report
Rp0034	IBE0600Rp0034_E_SEA_Scoping_Report
Rp0035	IBE0600Rp0035_E_SEA_Constraints_Report
Rp0036	IBE0600Rp0036_Eastern_HDA_Screening
Rp0044	IBE0600Rp0044 Review: FEM FRAM, Dodder & Tolka Studies Phases 2 & 3
Rp0048	E08_FRMP_PART01 draft Flood Risk Management Plan
Rp0052	IBE0600Rp0052_UoM08 draft final report
Rp0055	IBE0600Rp0055_Option Phase Synthesis Report
Rp0069	IBE0600Rp0069_UoM08_SEA_Screening_Report
Rp0073	E08_FRMP_PART01
Rp0079	IBE0600Rp0079_UoM08 Final Report (<i>this report</i>)

1.4 HEALTH & SAFETY ROLE

RPS have a role to advise the OPW on CFRAM Study related matters of Health and Safety; however within UoM08, due to the works already progress under the FEM FRAM Study, RPS were not required to undertake either duties in the management of the Survey Contractor or those as Project Supervisor Design Process (PSDP) under the Safety, Health and Welfare and Work (Construction Regulations) 2006 - updated 2013.

2 THE UoM08 INCEPTION REPORT & REVIEW OF PREVIOUS STUDIES

2.1 INCEPTION REPORT

In early 2012, an inception report was prepared for UoM08. Its principal objective was to provide an update on the relevant datasets identified for use in the Nanny-Delvin River Basin as part of the Eastern CFRAM Study, and also to provide a scope for the previous study reviews for that data.

The inception report identified any issues that had been encountered in sourcing data and flagged any that were considered to potentially affect the proposed methodologies or programme going forward. The data requested, received or outstanding was detailed in the document, together with progress with data analysis.

At the time of preparing the report RPS had not identified any significant data gaps that would impact on the completion of the Eastern CFRAM Study however this statement was made without having fully reviewed the previous study documentation and without full data returns for the information requested from the Local Authorities.

The inception report set out a phased methodology for review of the FEM FRAM Study deliverables which is detailed further in Section 3 of this report.

Key findings:

RPS adopted an ongoing data collection and quality assurance exercise, to incorporate additional or updated data, as the Eastern CFRAM Study evolved through its subsequent phases.

The risk of updates to measures during the study and additional data becoming available, for example via flow gauging was identified.

Thus, the flood risk management process must be considered as “live” and it is not possible at any given point in time to categorically conclude that there are no data gaps which will impact in some way on the future stages of the Eastern CFRAM Study.

Throughout the Eastern CFRAM Study a register of datasets received was maintained, this is available with the project’s progress reporting for reference. Metadata provided with final project GIS deliverables is also available to confirm the versions of datasets utilised in the CFRAM Study analysis.

2.2 HYDROLOGICAL ANALYSIS

Hydrological analysis is the determination of flows in rivers based on the type and characteristics of the catchment and the analysis of available rainfall and water level data. The hydrological analysis forms the basis for subsequent hydraulic modelling and flood risk mapping stages of the FEM FRAM study.

The overall hydrological analysis of the study area was undertaken in two stages, namely, preliminary hydrological analysis and detailed hydrological analysis. The preliminary hydrological analysis involved the collection and analysis of the available data (hydrometric, historic flood, rainfall, soil and geology, land-use, tidal datasets etc), and the results are included in the Preliminary Hydrology Report (February, 2009).

The detailed hydrological analysis involved the review of the rating at the gauging stations and refined the hydrological analysis of the preliminary hydrological study using revised flow data at the gauges. The study applied the Flood Studies Report (FSR), Flood Estimation Handbook (FEH) and Irish Flood Studies Update (FSU) methodologies to enable the determination of design hydrological inputs (flow and water level) for the current scenario as well as for the future scenarios which may arise due to future climate changes likely to influence flood risk. The results of the detailed hydrological analysis are presented in the Hydrology Report (April 2010). Thus the two reports (Preliminary Hydrology Report and Hydrology Report) detail the overall hydrological analysis undertaken for the FEM FRAM study.

Key findings:

- ***The EPA has split Ireland into 40 different hydrometric areas based on river catchments. The FEM FRAM study area is in Irish Hydrometric Area 08 and some of Hydrometric Area 09 & 07;***
- ***Daily rainfall data from ten meteorological stations in the study area and four stations in the neighbouring catchments. These have been operational for a variety of years varying from 9 to 67 years. The rainfall data was reviewed to determine the relationship between the depth of rainfall and the duration of the rainfall event (called depth duration frequency curves).***
- ***Hydrometric data from 12 gauges in the study area and further 12 in neighbouring catchments was available. A detailed rating review was undertaken for nine hydrometric stations in the study area which provided information on the flow in the rivers for the various design flood events. This information was also compared to historic information on flooding such as photographs/ surveys of actual flood events.***

- ***The rivers were divided into smaller sub-catchments and the flows in the rivers were estimated based on the characteristics of the catchments e.g. catchment area, slope of the river, degree of urbanisation (using the FSSR 16 and Institute of Hydrology Report No. 124 Unit Hydrograph (UH) methods).***

The results of the estimation of the flows using the calculation method were compared with the statistical analysis at the gauging stations and a scaling factor was determined. This scaling factor was then applied to each sub-catchment to determine the flows.

The main factors for future flood risks were considered to be climate change and increasing urbanisation. The results of the hydrological analysis were then used in the hydraulic modelling of the various rivers and tributaries in the study area are available at www.opw.ie/FloodPlans.

2.3 HYDRAULIC MODELLING

Flood extents are influenced by the floodplain's topography and the volume of water in it. The volume of water in the floodplain is influenced by the magnitude of the flood event and the flooding mechanisms that are taking place.

Different magnitudes of flooding have different probabilities of occurring. Probability of flooding is defined by annual exceedance probability (AEP). This is the likelihood of a particular magnitude flood occurring or being exceeded in any given year. Thus, a 1% AEP event describes a flood event which has a 1% (or 1 in 100) chance of occurring or being exceeded in any given year. Flood events with a lower probability of occurrence result in more extreme flooding. For example, a 1% AEP flood event will result in more flooding than a 50% AEP event. It should be noted that the likelihood of a flood event occurring in the future, whatever its probability, is independent of the time since the last flood of similar magnitude. In order to understand the flood generation process, and hence assess flood hazard, we must identify issues and processes specific to the catchment. Computer modelling can be used to replicate natural processes and help understand the extent and nature of fluvial and tidal flooding issues.

To assess existing and future flood hazard twenty computer models were developed to represent the river and estuarine systems. The river models were built using detailed river channel and ground level information, plus estimated river flows and tidal levels (i.e. the hydrological analysis described above). The model calculates where the water would flow based on the ground levels and in doing so simulates the movement of floodwater within the catchment.

Coastal modelling to simulate flooding from the sea has also been undertaken for the FEM FRAM study area coastline. The OPW provided digital terrain model (DTM) survey data of the coastline. The survey data was augmented with the topographic survey of the coastal defence assets.

The extreme sea levels were obtained from DAFF's Strategic Coastal Flood Risk and Erosion Study. The OPW provided historic tide data at Dublin Port and at Port Oriel, Clogherhead. This information was used to determine the design event tide levels for the range of AEPs. The modelling has considered the coastal defences (including high ground and coastal dunes) in place to protect the coastline. The flood extents from the coastal model have been merged with flood extents of the river models to produce flood extents for the coasts, estuaries and tidally dominated reaches of the rivers.

Both the fluvial and the coastal models provide flood extents as well as flood depths and velocities. Floodwater depth and velocity are important as they have a direct effect on potential for loss of life and damage to property, infrastructure and the environment.

The depth of flood waters in the floodplains is affected by a number of factors including the scale of the flood event, the width and shape of the floodplain, the floodplain land use, and the presence of structures. Deeper flood waters will accumulate on the floodplain where the speed of flow is reduced or restricted due to the roughness of the ground surface and the presence of structures. Depressions or 'bowls' in the floodplain will cause deep pools of floodwaters to build up.

The velocity of flood flow in the rivers is controlled by the gradient of the channel, the size, shape and roughness of the channel and the river valley, the restrictions posed by bridges and other structures, and the operation of pumps, gates and weirs.

Key findings:

The models have been used to assess the impact of flooding for the current situation as well as for future scenarios. A range of annual exceedance probability floods have been modelled for each scenario, varying from 50% to 0.1% AEP in any given year. The modelling considers the joint probability of fluvial events and tidal events occurring at the same time.

Using this flood hazard information the number of properties prone to flooding can be estimated and used to measure the social impact of flooding and the economic damage to property and the environment (for example, impacts on designated sites). The results of the hydraulic analysis in the study area are available at www.opw.ie/FloodPlans.

2.4 REVIEW OF PREVIOUS STUDIES

RPS undertook a detailed review of each of three previous catchment-based flood risk management studies which had been carried out within the Eastern CFRAM Study area (namely the FEM FRAM, Tolka and Dodder catchments). The FEM FRAM study relates to UoM08 and a small part of UoM09, whilst the Dodder and Tolka catchments lie within UoM09.

The purpose of the reviews was to ascertain the compatibility of these pilot study outputs with a view towards updating and incorporating the relevant study findings into the Eastern CFRAM Flood Risk Management Plans.

Phase 1 - Review of Hydrology, Hydraulics and Flood Mapping

In 2013, RPS commenced the Phase 1 review of previous studies. The Phase 1 review's principal objectives were to summarise the previous reporting and present recommendations regarding any additional work to address significant issues identified by the review. In relation to UoM08 this focused on the FEM FRAM Study's hydrology and hydraulic reporting and associated flood mapping which was supplemented by an update on catchment changes since the previous study.

Key Findings of Phase 1 Review:

Based on the detailed hydrological review it was concluded that there are no significant causes for concern or potential inconsistencies within the FEM FRAM study and the analysis was suitable to be taken forward alongside the Eastern CFRAM Study.

The detailed hydraulic review also concluded that there are no significant causes for concern or potential inconsistencies between the FEM FRAM and Eastern CFRAM studies. The findings for UoM08 were concluded to be suitable to be taken forward alongside the Eastern CFRAM Study.

However, the detailed flood mapping review, identified that the most significant gap between the FEM FRAM pilot study and the National CFRAM Study specification was the lack of risk mapping which the Phase 1 review recommended should be addressed, in order that the mapping is suitable to be taken forward alongside the Eastern CFRAM Study. The core risk mapping was subsequently developed by the OPW for statutory mapping consultation in 2015.

Phase 2 – Review of Proposed Flood Risk Management Options (Implementation, Methods and Processes)

RPS undertook a review of the recommended flood risk management options for the FEM FRAM study area. This Phase 2 review was initiated alongside the Phase 1 review by updating the

recommendations of the FEM FRAM Preliminary Options Report and draft Flood Risk Management Plan and was then revisited in parallel with the development of flood risk management options and draft plans for the remaining areas of the Eastern River Basin District.

In terms of the status of measures implementation, the review reflected the work undertaken since the publication of the FEM FRAM Study reports, and other changes in timings or prioritisations to the recommendations as required by OPW and / or Local Authorities.

RPS also reviewed the consistency between the methods considered for flood risk management identified in the FEM FRAM and Eastern CFRAM studies and found these to be compatible. Furthermore the review examined the methodology under which options were assessed under the FEM FRAM study. It was confirmed that the FEM FRAM pilot study applied a similar optioneering process to that applied in the Eastern CFRAM Study (supported by multi-criteria analysis against flood risk management objectives). It was noted that whilst a similar process was applied, the MCA scores for the pilot studies are not to be transferred from the pilot FRMPs into the CFRAM template and it is OPW's intention that the MCA scores for FEM FRAMS AFAs will be updated between draft and final Plans, so consistent scores for ranking of non-constructed projects can be carried out in an appropriate way for consideration within the National Prioritisation of schemes/works.

Key Findings of Phase 2 Review:

Based on the detailed review of the status of measures implementation, it was concluded that elements of the FEM FRAM Study and other minor works had been progressed and no further measures or recommendations had emerged since the interim update was collated from the Local Authorities and OPW Regional team in 2013.

The ongoing elements of the FEM FRAM draft plan were therefore assessed for their compatibility to be taken forward alongside the Eastern CFRAM Study. It was also concluded that, since the previous studies and the Eastern CFRAM study applied comparable methods and processes to develop options and identify preferred options, then suitable options would have not been omitted or overlooked during the previous studies, and therefore the identified outstanding options were considered robust with no additions required.

With regard to the measures to be completed (i.e. certain FEM FRAM measures), since the FEM FRAM Study MCA was consistently applied across the AFAs considered (although it differs from the National CFRAM weightings) RPS consider that the selection of the preferred options is robust and should be retained within the UoM08 and UoM09 draft plans.

Phase 3 – Review of Recommendations and Proposed Measures

The final phase of the review, reported in June 2016 along with the Phase 2 review, aimed to ensure that recommendations and proposed measures from the FEM FRAM Study (reviewed and updated as necessary) were in line with the overall strategy for UoM08 and the Eastern CFRAM where relevant.

Key Findings of Phase 3 Review:

RPS incorporated findings, recommendations and proposed measures and other material as necessary into the relevant sections of the Flood Risk Management Plan developed for UoM08 (and where relevant UoM09) within the Eastern River Basin District.

3 THE DEVELOPMENT OF THE UoM08 FLOOD RISK MANAGEMENT PLAN

3.1 DRAFT FLOOD RISK MANAGEMENT PLAN

The development of the draft flood risk management plans, which are the statutory output of the CFRAM studies, was led by the OPW. The OPW produced a template and undertook a series of consultations within the OPW, with other relevant government departments, national groups and the CFRAM Study Consultants.

The zero draft of the template was produced for comment in July 2015. It was intended to indicate the overall format of the draft FRMP, and in particular, to identify the sections to be completed by the Consultants, and the structure of some template tables and forms that the OPW required to be used in order to facilitate reporting to the European Union, Common Implementation Strategy Working Group. A workshop with relevant FRAM Project Managers and RPS personnel was held in early May 2016 to discuss an initial version of the UoM07 draft FRMP and agree the level of detail required.

Revision C of the draft FRMP was produced by the OPW in May 2016, this version, incorporating later additions and policy updates, formed the basis of the draft plans that were consulted on during the second half of 2016.

The UoM specific material (text, maps and datasets) were populated by the CFRAM Study consultants drawing largely on the supporting technical studies on hydrology, hydraulics and the preliminary options assessments and the FEM FRAM draft Flood Risk Management Plan. As the FEM FRAM Study MCA differs, in some instances, from the National CFRAM methodology, these scores were not presented within the draft Flood Risk Management Plan, however, RPS consider that the selection of the preferred options is robust and should be retained within the UoM08 and UoM09 draft plans.

The OPW reviewed the draft plans at project level and also with regard to consistency at national level. The progress group members also reviewed the draft FRMPs providing information about relevant plans and programmes, previous projects and influenced the selection of the preferred measures identified within the draft plans.

Within the draft plans some Areas of Further Assessment (AFAs) were found to have low predicted levels of risk to properties. The Preliminary Options Reports contain detail of minor localised works for some of these low-risk AFAs that were not considered significant enough for inclusion in the draft FRMP, but that may be examined further and developed through, for example, the Minor Works programme. It should be noted that a low level of predicted risk to existing property does not equate to there being no predicted flooding in an AFA, and the requirements of the Planning System and Flood Risk Management Guidelines should still be applied to ensure future development takes account of the predicted flood hazard present. Within UoM08 eight such AFAs were identified:

- Donabate
- Duleek
- Gormanston
- Lusk
- Oldtown
- Portrane
- Staffordstown/Turvey
- Swords.

The draft plans are supported by the final core hazard and risk mapping (Volume I) and also the plan's statutory environmental assessments under the Strategic Environmental Assessment (SEA) Directive and the Habitats Directive (Volume II). The FEM FRAM environmental reports were not revisited by RPS under the Eastern CFRAM Study; however, the OPW provided a FEM FRAM Environmental Statement and preface for publication alongside the original environmental material in support of the SEA and Habitats Directives.

The FEM FRAM Study's previous environmental assessment process had influenced:

- the development and assessment of measures,
- the selection of preferred measures,
- the identification of mitigation measures and
- an environmental monitoring programme during the Plan's implementation.

Key Findings:

The draft FRMP was a consultation document which provides a nationally consistent roadmap to manage flood risk on a proactive basis.

The draft plan incorporates a suite of certain prevention and preparedness measures related to flood risk management that form part of wider Government policy. These measures, set out below, should be applied across the whole of UoM08, including all AFAs:

- ***Sustainable Planning and Development Management***
- ***Sustainable Urban Drainage Systems***
- ***Voluntary Home Relocation***
- ***Local Adaptation Planning***
- ***Land Use Management and Natural Flood Risk Management Measures***
- ***Maintenance of Arterial Drainage Schemes***
- ***Maintenance of Drainage Districts***
- ***Flood Forecasting and Warning***
- ***Review of Emergency Response Plans for Severe Weather***

- **Promotion of Individual and Community Resilience**
- **Individual Property Protection**
- **Flood-Related Data Collection**
- **Minor Works Scheme**
- **Proactive maintenance.**

No measures were identified at Sub-Catchment scale however the following AFA specific measures were identified either under the FEM FRAM Study or as part of existing works being undertaken by the OPW or Local Authorities:

- **Progression of the Ashbourne Flood Relief Scheme**
- **Progression of the Northlands Flood Relief Scheme**
- **Maintenance of the Duleek Flood Relief Scheme under the 1945 Arterial Drainage Act as amended by the Arterial Drainage (Amendment) Act, 1995**
- **Maintenance of the Broadmeadow and Ward Arterial Drainage Scheme**
- **Maintenance of the Matt Arterial Drainage Scheme**
- **Bettystown Flood Relief Scheme: Option 1 - Hard defences**
- **Rush Flood Relief Scheme: Option 1a - Improvement of Channel Conveyance and Hard defences**
- **Skerries Flood Relief Scheme: Option 2 - Improvement of Channel Conveyance**
- **Ratoath Flood Relief Scheme: Option 1 – Improvement of Channel Conveyance**
- **Progression of works for Individual Risk Receptors identified in the FEM FRAM Study.**

A common theme throughout the CFRAM Study consultation process was the need for a programme of when the measures would be implemented. The draft plans did not have such an overall programme as this is dependent on the outcome of the consultation process, however, it was intended that the final plan will contain a finalised and prioritised implementation programme of measures.

3.2 DEVELOPMENT OF THE FINAL FRMP

Project-level consultation activities took place during late 2016 in relation to the draft Flood Risk Management Plans produced by the Eastern Catchment-based Flood Risk Assessment and Management Study. These comprised workshops with the Eastern CFRAM Progress Group, a stakeholder workshop and a series of Public Consultation Days at two venues across the Nanny-Delvin River Basin study area. These Public Consultation Days took place during September 2016, at Navan and Swords.

These events supported the formal consultation process by raising awareness of how submissions on the draft plans could be provided to the OPW for consideration.

Formal, national-level consultation in support of the draft plans and supporting environmental assessments was undertaken in parallel during late 2016 by the OPW, comprising briefings to elected members, a website based portal for access to the draft plans and supporting materials and to make on-line submissions and also statutory consultation in relation to the supporting environmental assessments. A total of 143 elected representatives and members of the public attended.

The formal consultation period was open to the public between 02/12/16 and 23/12/16 (with additional time allowed for Local Authority submission up to 23/12/16). The OPW received formal submission via the portal and also in written format. The observations submitted to the OPW through the public consultation processes were considered and the Plans amended accordingly where appropriate. A synopsis of the observations submitted and amendments made to the Plan arising from the observations is available from the OPW website (www.opw.ie/FloodPlans).

The OPW, with technical support from RPS, collated responses and reported statutory consultation on the draft FRMPs for UoMs 07, 08, 09 and 10 separately within a series of Public Consultation Synthesis Reports relating to each Unit of Management.

The development of the final FRMP was again led by the OPW through the production of a template. The OPW undertook a series of consultations within the OPW, with other relevant government departments, national groups and the CFRAM Study Consultants and considered the submissions made on the national suite of draft FRMPs.

The template was provided for information on the 10/04/17 (revision A-3) with guidance on the key changes and updates required within the final plans, and as near final on the 18/05/17 (revision C-0) noting further updates and insets to be supplied (executive summary and mapping). Version C.1 of the template was received 15/06/17.

The UoM specific material (text, maps and datasets) were again populated by the CFRAM Study consultants where appropriate, updating the material from the draft FRMP.

The OPW undertook consultation and prioritisation of the preferred measures identified within the final plans and published these separately in a National Flood Relief Capital Investment Programme which complements Ireland's final FRMPs.

It should be noted that the final 08 Nanny – Delvin River Basin FRMP represents a stand-alone Plan that supplements the existing Fingal East Meath Flood Risk Management Plan (FEM FRMP) from 2011 with positive Governance & Policy recommendations. The additional measures in the Nanny – Delvin River Basin FRMP, above and beyond the FEM FRMP, are solely Governance & Policy Changes, and these are the only measures to which the Nanny – Delvin River Basin FRMP gives effect. This is akin to a County Development Plan being published, but not giving effect to any measures in already-existing Local Area Plans within its jurisdiction.

The SEA and AA for the FEM FRMP therefore remain valid. The Nanny – Delvin River Basin FRMP supplements the existing FEM FRMP rather than replacing it, hence these supplemental proposals are being screened for requirement of SEA (Volume II), under the Strategic Environmental Assessment (SEA) Directive and the Habitats Directive.

Key Findings:

The final FRMP responded to consultation submissions which related to inter alia, development in national policy, environmental requirements and National Flood Relief Capital Investment Programme.

The final plan noted the actions arising from the final FEM FRAM Plan but contained no new Community-Level (AFA) Measures for the AFAs within UoM08.

The final FRMP measures for UoM08 are presented in Table 3.1, including an update on their current status.

Table 3.1 Summary of Flood Risk Management Measures - UoM08

Measure	Implementation	Funding
Measures Applicable for All Areas		
Application of the Guidelines on the Planning System and Flood Risk Management (DECLG/OPW, 2009)	Planning Authorities	Planning Authorities
Implementation of Sustainable Urban Drainage Systems (SUDS)	Planning Authorities	Planning Authorities
Voluntary Home Relocation	Inter-Dept. Flood Policy Review Group	Homeowners, OPW (2017 Scheme)
Consideration of Flood Risk in Local Adaptation Planning	Local Authorities	Local Authorities
Assessment of Land Use and Natural Flood Risk Management Measures	EPA, OPW, Others	OPW, Others
Minor Works Scheme	OPW, Local Authorities	OPW, Local Authorities
Establishment of a National Flood Forecasting and Warning Service	OPW, D/HPCLG, Met Éireann and local authorities	OPW, D/HPCLG
Ongoing Appraisal of Flood Event Emergency Response Plans and Management Activities	Principal Response Agencies, Regional Steering Groups, National Steering Group	Implementation Bodies
Individual and Community Action to Build Resilience	Public, business owners, farmers and other stakeholders	N/A
Individual Property Protection	Home Owners, Inter-Dept. Flood Policy Review Group	Homeowners
Flood-Related Data Collection	OPW, Local Authorities / EPA, and other hydro-meteorological agencies	Implementation Bodies
Catchment / Sub-Catchment Measures		
No new Sub-Catchment scale measures are proposed under this Plan		
Community-Level (AFA) Measures		
Progress the project-level development and assessment of a Flood Relief Scheme, including environmental assessment as necessary and further public consultation, for refinement and preparation for planning / Exhibition and, if and as appropriate, implementation, for the Communities set out below.		
No new Community-Level (AFA) Measures are proposed under this Plan		

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 TECHNICAL

The Eastern CFRAM Study was a significant and challenging project in terms of the detailed analysis it required, simultaneously across its four River Basins or Units of Management, and in the context of a suite of similar studies nationwide.

The Eastern CFRAM study benefited from the experiences of the OPW, Local Authority and RPS personnel who had been involved on previous pilot studies, in particular the FEM FRAM, Dodder and Tolka studies. As such there are few conclusions and recommendations emerging in relation to UoM08 since the lessons learned from the FEM FRAM pilot Study have already been encompassed within the Eastern CFRAM Study brief.

As there is broad agreement between the PFRA and FEM-FRAMS AFAs, with no additional AFA's being identified in the PFRA for the FEM-FRAMS area, the CFRAM methodology for the Eastern CFRAM Study remains broadly consistent with the FEM-FRAMS process, with no change proposed to the original FEM FRMP and the AFA level measures contained within it.

The final 08 Nanny – Delvin River Basin FRMP represents a stand-alone Plan that supplements the existing Fingal East Meath Flood Risk Management Plan (FEM FRMP) from 2011 with positive Governance & Policy recommendations. The additional measures in the Nanny – Delvin River Basin FRMP, above and beyond the FEM FRMP, are solely Governance & Policy Changes, and these are the only measures to which the Nanny – Delvin River Basin FRMP gives effect. This is akin to a County Development Plan being published, but not giving effect to any measures in already-existing Local Area Plans within its jurisdiction.

4.2 CFRAM IMPLEMENTATION

However, two specific elements that were highlighted through the process of revisiting the FEM FRAM Study materials are:

- the need to have a quality assured set of final deliverables so that these can be updated and reproduced as required; and
- the need to put in place central systems for update as plan implementation occurs such as defence asset databases, so that information is captured as it is available and is accessible at a single point rather than via an ongoing data collection process.

4.3 GENERAL

There are many peripheral, but nevertheless valuable, activities which could have been further explored within the Floods Directive's first cycle assessment; however, due to the number of AFAs

which were being assessed and brought together for catchment-scale analysis, focus had to be maintained on the project's core activities. Whilst other analysis was piloted within various studies (for example culvert blockage, Natural Flood Risk Management and detailed climate change adaptation) these were not able to be implemented across the country due to programme constraints. RPS would recommend that such additions and innovations are taken forward during the Flood Directive's second cycle alongside the implementation of the first cycle's plans. In particular, RPS would recommend trialling/piloting measures, such as Natural Flood Risk Management and wetland/bog restoration, which may be of mutual benefit to the implementation of the Water Framework and Habitats Directives, as these integrated catchment measures are untested in the Irish context but may be relevant tools to help offset the impacts of future changes assessed under the first cycle of CFRAM studies and provide benefit where structural schemes are not financially viable.

The CFRAM studies have enabled the collation and development of a very detailed and valuable dataset of flood risk management information. It has provided a strong evidence base to enable strategic decisions to be taken on how best to manage flood risk within UoM08 and across the Eastern CFRAM Study area. It has also provided sufficient clarity to allow, for the first time, a national prioritisation process to be undertaken for presentation in the final plans and will provide the basis for the short and long term planning for flood risk management expenditure in Ireland. Importantly the project also identified weaknesses, such as where the additional flooding mechanisms are still not fully understood or the risk could not be quantified sufficiently. The next step will be to study these areas in more detail to further inform the planning of flood risk management into the next cycle of the Floods Directive and beyond.

Importantly the project also identified weaknesses, such as where additional flooding mechanisms are still not fully understood or the risk could not be quantified sufficiently. Part of the next step will be to study these areas in more detail to further inform the planning of flood risk management into the next cycle of the Floods Directive and beyond.

The CFRAM studies in this first cycle were ambitious and whilst they had been informed by pilot studies with there were areas where the methodology was untested at a CFRAM Study scale which led to some delays and iteration throughout the process. The methodology and scope for the second cycle should be developed as soon as possible to enable pilot studies and trials to be undertaken and a realistic programme to be developed. This should enable more efficient working in the next cycle.

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