



South Eastern CFRAM Study

Final Report

Unit of Management 14

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ABBREVIATIONS

AEP	Annual Exceedance Probability
AFA	Area for Further Assessment
BCR	Benefit Cost Ratio
CFRAM	Catchment 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 THE 14 UNIT OF MANAGEMENT – UOM14

The South Eastern CFRAM Study covers an area of 12,857 km² and includes six Units of Management (UoM) each comprised of a single Hydrometric Area (HA). They are UoM11 (Owenavorrhagh & Blackwater RB), UoM12 (Slaney RB), UoM13 (Ballyteigue-Bannow RB), UoM14 (Barrow RB), UoM15 (Nore RB) and UoM17 (Waterford South Coast RB). UoM16 (Suir RB) is covered by the Suir pilot CFRAM Study and covers an area of approximately 3,542 km².

There is a high level of flood risk within UoM14, with significant coastal and fluvial flooding events having occurred in the past. UoM14 covers an area of 3,025km² and includes much of Carlow, portions of south Kildare, east Laois, southeast Offaly, east Kilkenny and small portions of west Wexford and Wicklow.

The principal river in UoM14 is the River Barrow which rises in the Slieve Bloom Mountains in County Laois near the town of Mountmellick. The Barrow flows first in an easterly and then a southerly direction through the towns of Portarlinton, Athy, Carlow and Bagenalstown before discharging to the Barrow Estuary at New Ross. It is joined by the Nore River approximately four kilometres upstream of New Ross and is tidal for about another 13 kilometres upstream to St. Mullins.

The Barrow Navigation, which includes stretches of canal, provides a navigable channel between St Mullins and the main Grand Canal system at Athy. Sub-catchments of the Barrow include the Owenass, Triogue, Cushina, Figile, Slate, Stradbally, Greese, Douglas, Lerr, Burren, Fushoge, Mountain, Duiske and Pollmounty.

Drainage Districts represent areas where the Local Authorities have responsibilities to maintain watercourse channels and therefore contribute to maintaining the existing regime. There are twelve Drainage Districts located within UoM14, consequently virtually all of the modelled main watercourses north of Carlow are contained within Drainage Districts and as such the activities within the Drainage Districts contribute significantly to the maintenance of the existing regime affecting the Daingean, Mountmellick, Portarlinton, Rathangan, Monasterevin, Athy, Castledermot and Carlow AFAs. However, the activities of Drainage Districts do contribute to the maintenance of the existing regime in other parts of UoM14.

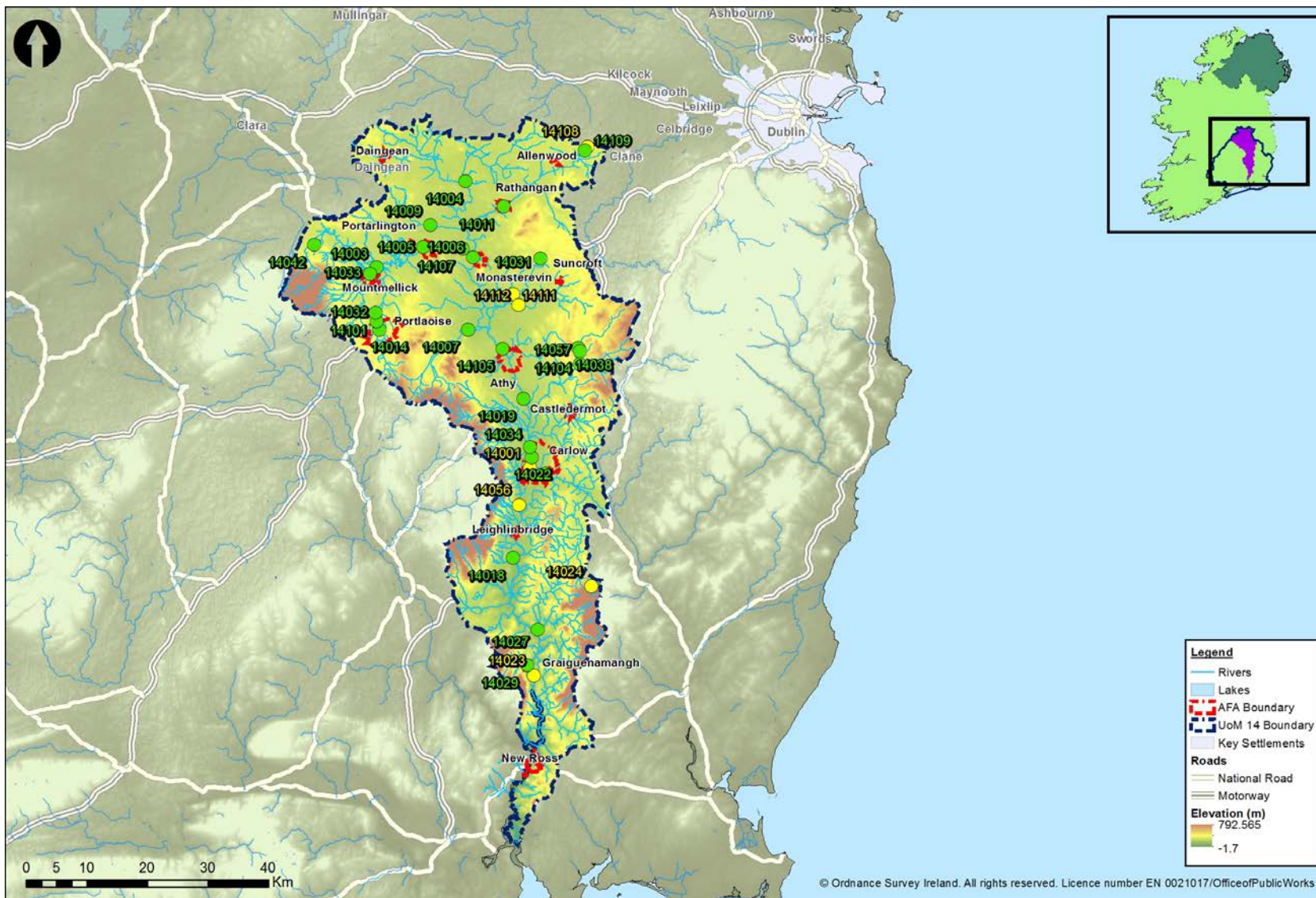


Figure 1.1: UoM14 Location Map

1.2 OBJECTIVE OF THIS REPORT

The principal objective of this 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 UoM14 as part of the South Eastern CFRAM Study, and detail the development of the final UoM14 Flood Risk Management Plan (FRMP) which was consulted on during the second half of 2016 and the finalisation of the UoM14 FRMP in preparation for its adoption 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 UoM14 Final Flood Risk Management Plan containing the following volumes:

- VOLUME I Flood Risk Management Plan
- VOLUME II SEA Environmental Report and Natura Impact Statement.

This report is also supported by a suite of project deliverables, including flood maps and key UoM14 technical reports on inception, hydrology, hydraulics and preliminary options, which are summarised in Sections 2 to 5 of this report respectively. The development of the draft and final Flood Risk Management Plan is summarised in Section 6 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 and rainfall within the South Eastern CFRAM Study area, are listed in Table 1.1.

Table 1.1: Reports – South Eastern CFRAM Study Overall & UoM14 Specific Reports

Ref.	Document Title
Rp0001	IBE0601Rp0001_Communications Plan, Implementation Programmes & Event Plans <ul style="list-style-type: none"> • Initial Scoping Phase • Mapping Phase • Options Phase • Draft Plan Phase
Rp0002	IBE0601Rp0002_Flood Risk Review
Rp0003	IBE0601Rp0003_Initial Scoping Phase Synthesis Report Stakeholders Workshop
Rp0004	IBE0601Rp0004_Initial Scoping Phase Public Open Evening Synthesis Report
Rp0005	IBE0601Rp0005_HA14 (Barrow) Inception Report
Rp0009	IBE0601Rp0009_Radar Rainfall Stage 3
Rp0011	IBE0601Rp0011_HA14 Hydrology Report
Rp0017	IBE0601Rp0017_HA14 Hydraulics Report
Rp0016	IBE0601Rp0016_RPS_CFRAM_SouthEasternCFRAMS_SurveyContractReport_D01
Rp0019	IBE0601Rp0019_Mapping Phase Summary Report
Rp0020	IBE0601Rp0020_SE_SEA Scoping Constraints Report
Rp0021	IBE0601Rp0021_SE_SEA Scoping Report
Rp0022	IBE0601Rp0022_SE_AA_Screening_Report
Rp0024	IBE0601Rp0024_HA14 Preliminary Options Report (POR)
Rp0030	IBE0601Rp0030_SE_SEA_Environmental_Report_UoM14
Rp0033	IBE0601RP0033_UoM14_NIS
Rp0043	IBE0601Rp004243_HA14 draft final report
Rp0045	IBE0601Rp0045_Option Phase Synthesis Report
Rp0047	IBE0601Rp0047_UoM14 Strategic SUDS Report
Rp0051	IBE0601Rp0051_UoM14 Strategic Planning Report
Rp0056	IBE0601Rp0056_UoM14_SEA_Statement_Report
Rp0060	IBE0601Rp0060_UoM14 Defence Asset Database Report_D01
Rp0065	IBE0601Rp0065_UoM14 Health & Safety Report
Rp0071	IBE0601Rp0071_O14_FRMP_PART01 Flood Risk Management Plan
Rp0075	IBE0700Rp0076_UoM14_Final Report (this report)
Rp0078	IBE0601Rp0055_Draft Plan Phase Synthesis Report
OPW	<i>Synthesis report – in preparation</i>

1.4 ACCOMPANYING AND SUPPORTING GIS DELIVERABLES

Table 1.2: GIS Deliverables – South Eastern CFRAM Study Overall & UoM14 Specific

Survey Data	Type	Scale	
Survey Water Channel	Polyline	UoM	
Surveys Cross Sections	Polyline	UoM	
Surveyed Structures	Polyline	UoM	
Floodplain Photo Location	Point	UoM	
Flood Model Datasets	Type	Scale	Scenario (Probability %AEP)
Extent	Polygon	AFA	Current (All)
			Mid-Range Future Scenario (All)
			High End Future Scenario (10, 1, 0.1)
Flood Zones	Polygon	AFA	Current (1, 0.1)
			Mid-Range Future Scenario (1, 0.1)
Depth	Raster	AFA	Current (All)
			Mid-Range Future Scenario (All)
			High End Future Scenario (10,1,0.1)
Velocity	Raster	AFA	Current (All)
Risk to Life	Raster	AFA	Current (10,1 0.1)
Defence Failure Scenario- Extent	Polygon	AFA	Current (2 Scenarios)
Defence Failure Scenario- Depth	Raster	AFA	Current (2 Scenarios)
Defence Failure Scenario-	Raster	AFA	Current (2 Scenarios)
Defence Failure Scenario-Risk to	Raster	AFA	Current (2 Scenarios)
Specific Risk (No. of Inhabitants)	Raster	AFA	Current (10, 1, 0.1)
			Mid-Range Future Scenario (10, 1, 0.1)
Specific Risk (Type of Economic Activity)	Point	UoM	Current (0.1)
			Mid-Range Future Scenario (0.1)
Specific Risk (Risk Density)	Raster	AFA	Current (0.1)
			Mid-Range Future Scenario (0.1)
Other Datasets			
Modelled River Centreline	Polyline	AFA	
Flows and Water Level Nodes	Point	AFA	Current, Mid-Range & High End
Defended Area	Polygon	AFA	Current (If Applicable)
			Mid-Range (If Applicable)
Def. Failure – Breach Time Steps	Polygon	AFA	
Def. Failure – Defence Removal	Polyline	AFA	
Def. Failure – Defence Removal End point	Point	AFA	
Defence Asset Database	Type	Scale	
UoM Asset Menu	Polyline	UoM	
UoM Asset Menu_Point	Point	UoM	
UoM Structure Menu	Polyline	UoM	
UoM Defence Asset Database	Geodatabase	UoM	
Geometry Infill (if Applicable)	CAD Dwg	AFA	
Risk Management	Type	Scale	
Damage Assessment (Baseline)	Point	AFA	
Damage Assessment Benefit	Point	AFA	
Damage Assessment Defended	Point	AFA	

1.5 HEALTH & SAFETY ROLE

RPS have a role to advise the OPW on CFRAM Study related matters of Health and Safety; RPS undertook duties in the management of the Survey Contractor (ensuring compliance with best practice and Health, Safety and Welfare at Work legislation); and RPS was appointed as Project Supervisor Design Process (PSDP) under the Safety, Health and Welfare and Work (Construction Regulations) 2006 - updated 2013.

Within the remit of PSDP, RPS have undertaken a preliminary hazard management/risk assessment as part of the multi-criteria analysis of options. This has quantitatively assessed the potential hazards and risks associated with the construction and maintenance of options (for example working near water (construction) & (maintenance); Heavy plant and machinery, working at heights (construction), working at heights (maintenance) etc.). These have been collated into the South Eastern CFRAM Study preliminary Safety File, which has been reviewed by the PSDP and will be provided with the final project deliverables in 2017.

2 THE UOM14 INCEPTION REPORT

In 2012, an Inception Report was prepared for UoM14. Its principal objective was to provide detail on the relevant datasets identified for use in the Barrow catchment as part of the South Eastern CFRAM Study, and also provide an update on the collection and interpretation process to date 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 South Eastern CFRAM Study however; this statement was made without having received any survey information or having full data returns for the information requested from the Local Authorities.

Key findings:

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

For example, when the LiDAR and cross sectional survey data were received and quality checked in comparison with the National Digital Height Model, it became evident that manual data interpolation and correction was required during the hydraulic analysis stage. This ensured linkage between topographical survey and floodplain levels obtained from National Digital Terrain Models or LiDAR survey.

Similarly, population of the defence database remained “live” throughout the study, as, in some cases it was difficult to establish which structures were acting as formal or informal defences, and in others, the effectiveness of the defences required update of their condition due to damage by events or due to recent construction activities.

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 South Eastern CFRAM Study.

Throughout the South 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.

3 THE UoM14 HYDROLOGY REPORT

In 2013, RPS commenced the preparation of the UoM14 hydrology report. Its principal objectives were to build on the Inception Report methodology and to provide detail on the outputs from the processes of hydrological analysis and design flow estimation. The Hydrology Report did not include details of the data collection process, flood history within the Areas for Further Assessment (AFAs) or methodology and results from the historic flood analysis (except where this was used to inform the design flow estimation) as this was already contained within the Inception Report for UoM14.

The Hydrology Report provided a review and summary of the methodologies used as well as details of any amendments to the methodologies since completion of the Inception Report. The report detailed the results of the hydrological analysis and design flow estimation and summarised the outputs from the analysis which were taken forward as inputs to subsequent hydraulic modelling. Discussion was provided on the outputs in terms of the degree of confidence which could be attached to the outputs and the opportunities for providing greater certainty for future studies, including opportunities for improving the observed data used to inform the study.

The Hydrology Report was finalised in 2016 after completion of the hydraulic modelling and in particular the rating reviews. Hydrological analysis and hydraulic modelling activities were interactive and required input from the mapping consultation programme in order that they could be concluded.

The UoM14 catchment can be characterised hydrologically as follows:

- The catchment has a wide range of climatic and physiographic characteristics. The drier, lowland areas to the centre moving towards the coast have SAAR values as low as 753mm while the upper catchment to the north has SAAR values of up to 1256mm.
- Hydrometric data is generally good but of variable quality and availability, mainly focused on the Barrow main channel and significant tributaries. 70% of the hydraulic models have hydrometric data of varying quality to work with.
- Meteorological data is of good quality and availability in the catchment, although the processing of rainfall data from the Dublin and Shannon Airport radar is only of benefit in two AFAs due to beam blockages and areas of non-coverage elsewhere.
- Flood behaviour when defined in terms of the growth curve, i.e. in orders of magnitude greater than the median event, is on average slightly higher than would have been thought based on older methodologies (FSR).
- The 1% AEP flood event ranges from approximately 1.83 (Barrow main channel) to 3.38 times larger than the median flood flow depending on catchment size. This compares to approximately 2 under FSR.

Key Findings:

The primary output of the hydrological analysis was design flow estimation which was based on previous observed data and estimation/modelling techniques. Hydrological analysis required further validation through the calibration of the hydraulic models which is reflective of best practice in hydrology/hydraulic modelling for flood risk assessment. RPS believe that through complementing statistical analysis techniques with rainfall run-off modelling that the design flow estimation has as high a degree of certainty as is possible prior to calibration/validation and that this yielded efficiency and increased accuracy in the hydraulic modelling phase of the CFRAM Study process. However, it should be noted that the interaction between the hydrology and hydraulic analysis and mapping meant that hydrology could not be finalised until mapping consultation was concluded.

Risks - The main potential source of uncertainty in the analysis is due to a lack of hydrometric gauge data in the smaller ungauged catchments which are the main source of fluvial flood risk in many of the AFAs. This has been mitigated as much as possible by the use of a comprehensive range of analysis and estimation techniques from statistical, catchment descriptor based estimates in line with the most recent FSU guidance to the use of rainfall run-off modelling.

After this cycle of the South Eastern CFRAM Study the main potential adverse impact on the hydrological performance of the catchment is the effect of future changes including climate change and urbanisation.

Opportunities - the following potential opportunities to improve the hydrological analysis further in the next cycle of the South Eastern CFRAM Study were identified:

1. Twelve hydrometric gauging stations were identified for rating review in UoM14 yet survey information and hydraulic models are available for a further seven following completion of the study:

- Carlow (Barrow)*
- Kyle (Triogue)*
- Mountmellick (Owenass)*
- Bestfield Lock (Barrow)*
- Kyleclonhobert (Boghlone)*
- Baylough Bridge (Barrow)*
- Boghall Bridge (Finnery)*

These stations located on the modelled watercourses would benefit to some degree by carrying out a rating review using the hydraulic models / survey, if only to bring

confidence to future extreme flood flow measurement. In particular, the uncertainty with the rating to be used at Mountmellick could be addressed through hydraulic modelling. At best it may be possible to estimate historic flows at gauging stations which are currently water level only.

- 2. *Recommending that new gauging stations are installed on all of the ungauged models (or branches of models) is a long term goal but probably unrealistic within the timeframe of this or even the next CFRAM Study cycle. A more focussed exercise to identify the most acutely needed gauging stations more effectively was undertaken following hydraulic modelling and consultation such that the AFAs which are at greatest risk, are most affected by uncertainty in the design flow estimates and which would significantly benefit from additional calibration data were identified as priorities. This exercise was undertaken following the hydraulic modelling and flood risk assessment stages. AFAs and watercourses which are presently ungauged but are considered to have significant flood risk, and as such would significantly benefit from the installation of new gauge stations are identified as follows:***

- Allenwood (Coolearagh watercourse)*
- Athy (Moneen watercourse)*
- Castledermot (Lerr River)*
- Daingean (Ballyowen River)*
- Graiguenamanagh (Duiske West River)*
- Monasterevin (Cassidy's Stream)*
- Mountmellick (Pound watercourse)*
- Portarlinton (Blackstick Drain)*
- Portlaoise (River Borris, Bloomfield Stream and Boghlone watercourse).*

Interim improvements to the existing hydrometric gauge network should focus on improving the ratings through the collection of additional spot flow gaugings during flood flows at existing stations.

- 3. *The rainfall run-off modelling carried out as part of this study has, due to programme and data constraints, been carried out following hydrological analysis of the gauge station data. The run-off modelling has effectively created a layer of additional simulated historic gauge station years for all of the gauge stations. This data has been utilised in the design flow estimation but could potentially be used to provide further statistical confidence to estimates of historic flood frequency or may even be used to inform hydrograph shape generation in future studies.***

4 THE UoM14 HYDRAULICS REPORT

Following delivery of UoM14 survey data in 2012-2013, RPS undertook the development of hydraulic models and hazard mapping throughout 2013. Drafting of the Hydraulic Report in 2014, led to consultation on the draft final deliverables, including core hazard and risk mapping, during 2015. The final hydraulics deliverables were completed during 2016, with reporting finalised in 2017.

UoM14 includes 14 AFAs which has resulted in the development of 14 separate models for flood risk analysis.

The hydraulic analysis utilised computational modelling software informed by detailed topographical survey information (channel cross-sections, in-channel/flood defence structures, bathymetric and floodplain data), combined with hydrological inputs (riverine inflows and sea levels) and water-level control parameters (such as channel-roughness), to determine flood hazard.

The principal modelling software package used was the MIKE FLOOD software shell which was developed by the Danish Hydraulics Institute (DHI). This provided the integrated and detailed modelling required at a river basin scale and provided a 1-dimensional /2-dimensional interface for all detailed hydraulic model development thus enabling seamless integration of fluvial and coastal models in the AFAs for which this was required.

Key flood events, where available, were used in the calibration of each model whereby the model was reviewed in order to make sure historic flooding was accurately represented. The principal model parameters that were reviewed and amended during the model calibration process were:

- Bed and floodplain roughness coefficients;
- Structure roughness and head loss coefficients;
- Timing of hydrographs;
- Magnitude of hydrographs;
- Incorporation of additional survey information (e.g. additional cross-sections or missed structures).

The calibrated models (incorporating relevant updates following the consultation process) were used to simulate present day and future flood hazard conditions for events with a range of AEPs. There are inherent assumptions, limitations and uncertainty associated with hydraulic modelling, which are detailed for each hydraulic model within the hydraulics report. Defence failure scenarios (where relevant) and sensitivity tests have been conducted for each model. The parameters selected for the sensitivity analysis were dependent on the specific model but generally included:

- Roughness coefficients;
- 2D domain grid cell size;
- Critical structure coefficients;
- Flow inputs;
- Operation of dynamic structures.

Key Findings:

A series of flood extent, depth, velocity, zone and risk-to-life maps known collectively as flood hazard maps were generated based on the model results.

The outputs from the hydraulic analysis informed the subsequent stages of the CFRAM Study - the models were used to simulate potential options, facilitating the appraisal of possible flood risk management actions and measures and model outputs also helped to determine and map the degree of flood risk.

The specific findings in relation to the hydraulic modelling of each of the AFAs within UoM14 are summarised as follows:

Allenwood - There has been no detailed account of flooding associated with the Allenwood AFA. The lack of historical accounts was identified as an inherent difficulty associated with calibration of this model. It would have been desirable to calibrate this model with at least 4 historical flood events. Allenwood is subject to fluvial flooding during a 1 % AEP event. On the Coolearagh River, out of bank flooding occurs due to insufficient channel capacity inundating the floodplain. There are two residential properties at risk along with a local road. A social amenity site is also located within the floodplain. This AFA has been considered to be at low risk and consequently the existing maintenance regime should continue in order to maintain the current Standard of Protection.

Athy - The model was well calibrated with the most recent reported flood events and was compared with aerial photographs. Rating reviews were also completed at the Athy and Levitstown gauge stations. Athy is affected by fluvial flooding during a 1% AEP event. There are three areas in and around the town centre which are considered complex as they may influence one another. Out of bank flooding occurs on the River Moneen due to restricted flow through a culvert. In Athy town centre, out of bank flooding from the River Barrow occurs along this floodplain affecting a number of properties. Further upstream of these areas, an overland flood flow path originating from the River Moneen merges with out of bank flooding from the Barrow. There is an additional discrete area, close to the southern extent of the Athy AFA, which is affected by overland flooding originating from the River Barrow. A significant number of both residential and non-residential properties are at risk, concentrated within Athy

town centre. Several local roads and a regional road are also at risk along with a number of cultural heritage assets. As a result, Athy is considered at risk in present day and future scenarios. There are reasonable event damages and risks associated with the Athy AFA in both present day and future scenarios.

Carlow - There were a large number of historic flooding events which have occurred within the Carlow AFA. However, all of these events occurred before the Carlow Flood Relief Scheme was completed and so the modelled flood extents, flows and levels were different making calibration difficult. No major events were found to have occurred since the completion of the flood defences to enable calibration of the defended model. There were no significant instabilities shown in the model results. Checks showed that the model was performing well and was well anchored to the hydrological estimates. In Carlow there are three discrete areas of flooding which occur during a 1% AEP fluvial event. In one location, insufficient channel capacity on the Burren River Millrace and the Burren River, causes inundation of the floodplain. In a separate incident upstream of this, Ballinacarrig Bridge restricts flow leading to flooding of a couple of properties. Further, a critical structure on the Knocknagee Stream restricts flow causing floodplain inundation. There are a number of residential properties at flood risk during a 1% AEP fluvial event along with a few local roads. Some amenity sites are also located within the floodplains. However, this AFA has been agreed as being at low risk and consequently the existing maintenance regime should continue in order to maintain the current SoP. While Carlow has been subject to a previous flood relief scheme this was constructed in phases and at present there is a short section adjacent to the River Burren at Kennedy Street which needs to be investigated. Flood waters in this area had been retained by the wall of an adjacent building which has now been demolished; therefore the Standard of Protection of the embankment at this location needs to be confirmed.

Castledermot - There was no historical flood data for specific events or gauging stations on the watercourses affecting this AFA. However, the comments received from Kildare County Council suggested the modelled flood extents relating to the Roscolvin, Graney and the upper extents of the Lerr Rivers are reflective of reality and look correct. The main flood risk in Castledermot originates from the Lerr River during the 1% AEP fluvial flood event. High water levels in the Lerr also back up into the Skenagun watercourse and a flow path from the Vannan also affects receptors within this area. As there are multiple fluvial flood sources in this region, it is considered complex. There is also a discrete area of flooding as water spills from the Garterfarm stream upstream of a long culvert. There are a number of residential and non-residential properties at risk within Castledermot, along with a couple of regional roads, some local roads and three Social Infrastructure assets. As a result, Castledermot has been identified as at risk in present day and future scenarios. There are reasonable event damages and risks associated with the Castledermot AFA in both present day and future scenarios.

Daingean - Several reported historical flooding incidents were compared to the modelled flood extents. Within the Daingean AFA there have been no reports of flooding; all of the flooding references examined related to areas outside of the Daingean AFA. Flooding incidents have been described as 'recurring', with flooding incidence reported every two winters or so following heavy rain. The modelled flood extents have compared reasonably well with the observed flooding extents. Fluvial flooding occurs in Daingean at a single location. At this location the Ballyowen River joins with Daingean Town Centre River and out of bank flooding occurs close to this confluence. Downstream of this the Ballyowen River joins the Phillipstown River. As a flood event progresses, high water levels in the Phillipstown River cause a backwater effect along the channel network leading to the flooding of several properties in the same location as above. There are nine residential properties at risk from flooding during a 1% AEP event along with seven major transport and five infrastructure assets. Daingean has been agreed as a low risk AFA and consequently the existing maintenance regime should continue in order to maintain the current SoP.

Graigenamanagh - Several significant historical flooding events were identified for this AFA. Although the model was developed using contemporary environmental conditions, the spatial extent of flooding produced by the model was validated by actual reported flooding events. Geographical references provided by the historical and photographic evidence, indicated that High Street, Main Street and the Quay areas of Graigenamanagh are mainly affected by flooding. This was reflected in the model outputs. Graigenamanagh is affected by fluvial flooding during a 1% AEP event. As the Duiske West River progresses through the AFA flow is restricted by a series of bridges causing raised water levels. Consequently, out of bank flooding occurs along Main Street and 'The Quay'. A combination of insufficient channel capacity and a bridge restricting flow along the River Barrow also results in out of bank flooding, also putting properties along 'The Quay' at risk. A significant number of residential and business properties are at risk of flooding within Graigenamanagh (including social infrastructure assets such as a community centre and health centres, and social amenity sites). A number of local roads and a regional road are also situated within the floodplain. As a result, this AFA has substantial event damages and risk in present day and future scenarios.

Leighlinbridge –Leighlinbridge has a long history of flooding associated with heavy rain and the River Barrow overtopping its banks. Although the model has been developed using contemporary environmental conditions, the spatial extent of flooding produced by the model was validated by actual reported flooding events. The fluvial component of all the above mentioned flooding events was estimated using flow recorded at the Royal Oak Hydrometric Station. Fluvial flooding affects Leighlinbridge during a 1% AEP event. There are two discrete areas, with one located in the town centre. While the Leighlinbridge Flood Relief Works reduce

the flood risk within the town centre, out of bank flooding still occurs on both banks of the River Barrow due to insufficient channel capacity as it passes through the centre Leighlinbridge. In the north of the AFA, out of bank flooding occurs due to insufficient channel capacity on Rathvinden Lock which inundates the floodplain. There are a number of both residential and non-residential properties affected within the centre of Leighlinbridge, along with a few local and regional roads and some cultural heritage assets. This AFA has been identified as at risk due to the substantial damages and risk in present day and future scenarios.

Monasterevin - At Monasterevin, there is a long history of flooding but limited flood event information was available for use in model calibration. The spatial extent of flooding produced by the model was validated by photographs taken during the August 2008 event. There are three gauging stations along the reach which were used to check flow. The model is well anchored to observed flows at these stations. There are two discrete areas of flooding affected during a 1% AEP fluvial event. One area along the Cassidy stream is inundated due to restrictive culverts raising water levels and insufficient channel capacity. Another area is affected due to the River Barrow having insufficient channel capacity to convey the 1% AEP flows. There are a few residential and non-residential properties at risk of flooding along with some social amenity sites and cultural heritage assets. There are also a few roads affected including two regional roads. This AFA has been agreed as having low risk and consequently the existing maintenance regime should continue in order to maintain the current SoP.

Mountmellick - There is good confidence in both the hydrology and hydraulics of the Mountmellick model due to the presence of several gauging stations and flood extent verification events. Fluvial flooding occurs in Mountmellick during a 1% AEP event in a few areas. Receptors are affected in the south west of the AFA due to a combination of high water levels in the Pound River and overland flow that originates from the Owenass River. This area of flooding is complex as tributaries downstream are connected to the River Barrow and during high flow events, high water levels in the Barrow will cause these tributaries to back up. In the centre of Mountmellick AFA flooding occurs due to insufficient channel capacity and overland flow originating from the Owenass and Wood Rivers. Further, flooding occurs close to where the River Garoon joins with the Pound River again due to insufficient channel capacity and overland flow. There are a significant number of properties affected by flooding, both residential and business. Roads including national, regional and local are located within the floodplains and social amenity sites are also at risk. As a result there are substantial event damages and risk in the present day and future scenarios at Mountmellick.

New Ross - There is moderate confidence in both the hydrology and hydraulics of the New Ross model as there are no gauges within the model domain. A limited verification exercise was undertaken based on the data available, however due to the lack of data full calibration

was not possible. Despite the lack of calibration and verification data, the model was considered to be performing satisfactorily for design event simulation. New Ross is at risk from flooding during a 1% AEP fluvial event and a 0.5% AEP coastal event. The majority of the receptors at risk are adjacent to the River Barrow. There are a number of properties located within the floodplain; however these are being managed under the New Ross Flood Defence Works so are not included in the risk. Several roads are at risk including a few regional and a couple of national roads. Some social amenities have also been identified at risk of flooding. New Ross was agreed as an AFA of low risk due to the ongoing scheme therefore optioneering was not carried out. Consequently, the existing maintenance regime should continue in order to maintain the current Standard of Protection. Comparison of the proposed scheme with CFRAM flood maps and levels was undertaken to confirm its effectiveness before a low risk as assigned to the New Ross AFA.

Portarlington - There were a number of historic flood events to calibrate the model for Portarlington town. There have been no major works (i.e. flood mitigation works) carried out on the model reach. The modelled flood extents matched the recorded flood extents well for all recorded events, showing the model was validated well to the lower return periods (10% AEP). There were no significant instabilities shown in the model results. Overall, the model performed well and was supported by historic information. The model calibrated well with the one event where calibration with recorded gauge data was possible. Portarlington is affected by fluvial flooding during a 1% AEP event when out of bank flooding occurs due to insufficient channel capacity. Receptors are also at risk at the downstream extent of the Blackstick Drain due to a backwater effect from the River Barrow. There are a significant number of residential and business properties affected within this area, including a Health Centre. Also situated within the floodplain are many social amenity sites, several roads including two regional roads and cultural heritage assets. Due to the substantial event damages and risk to properties, Portarlington has been identified as an AFA at risk during present day and future scenarios.

Portlaoise - There is moderate confidence in both the hydrology and hydraulics of the Portlaoise AFA due to the presence of a gauging station and flood extent verification events. However, detailed historical flood information for specific events is limited and therefore only a partial verification exercise has been undertaken based on the data available. Fluvial flooding affects Portlaoise in a number of areas throughout the AFA. A large portion of the risk originates from the Triogue River and just upstream on one of its tributaries, the Clonminam. On the Triogue River a number of receptors are affected due to out of bank flooding. This flooding is exacerbated due to insufficient capacity at a number of bridge structures. Upstream of this, out of bank flooding occurs around the confluence of the Clonminam and the Triogue during a 1% AEP fluvial event. Channel capacity is exceeded in this area due to a large number of critical structures which restrict the flow during a flood event. There are three further discrete areas of flooding around the Togher watercourse, the River Borris and around Colliers

Lane. Flooding in these areas is largely due to insufficient culvert capacity which causes out of bank flooding. Many residential and non-residential properties are at risk during a 1% AEP event including social amenity sites and transport infrastructure assets. National, regional and local roads are all located within the floodplains. As a result, there are significant event damages and risk within Portlaoise in present day and future scenarios.

Rathangan - Flooding reports associated with Rathangan have described the flooding as 'recurring'. The lowest modelled scenario (10% AEP) was compared with these events, for general comparison purposes only, as no other information was available. Overall, there is good confidence in both the hydrology and hydraulics of the Rathangan AFA due to the presence of a gauging station and flood extent verification events. Fluvial flooding occurs during the 1% AEP event, although no properties have been identified as at risk. There are however five social amenity sites, a couple of cultural heritage and one major transport assets at risk during the 1% AEP fluvial event. Rathangan AFA has been agreed as a low risk AFA; consequently, optioneering has not been undertaken. The existing maintenance regime should continue in order to maintain the current SoP.

Suncroft - No data was available for verifying the modelled flood extents, without depths and flows there was insufficient information to calibrate the model. There was no historical flood data for specific events or gauging stations on the reaches. The model was thus verified based on anecdotal evidence received from local authorities and members of the public. Suncroft is affected by fluvial flooding during a 1% AEP event. Receptors are at risk along the Common North River, due to insufficient channel capacity and also due to the presence of a number of hydraulically critical structures. There are a significant number of residential properties at risk, along with a few business properties. A social amenity site and a local and regional road are also located within the floodplain. Suncroft has been identified as at risk due to the high event damages and risk (especially to properties) within the AFA in present day and future scenarios. There are reasonable event damages and risks associated with the Suncroft AFA in both present day and future scenarios.

5 THE UOM14 PRELIMINARY OPTIONS REPORT

After completion of project level consultation on the draft core flood hazard and risk mapping deliverables in early 2015, RPS commenced detailed risk assessment and optioneering. In April 2015, the OPW FRAM project managers attended a two-day workshop in RPS offices in order to review the outcome of the mapping phase public consultation, discuss the detail of the next stages of analysis, confirm the scope of optioneering (in certain areas with previous schemes) and resolve any associated queries.

Risk assessment (including economic analysis) and preliminary optioneering was completed in draft for all AFAs within UoM14 by December 2015, and a series of Progress Group workshops were held (in November, December 2015 and March 2016) to review the outputs and get Local Authority feedback. A further OPW/RPS workshop was held in December 2015 dealing with reporting feedback and final technical inputs (for example climate change analysis). The initial feedback from the workshops was addressed and a series of project level public consultation days held on the preliminary options in early 2016 and the Preliminary Options Report (POR) was completed in mid-2016, in parallel with the draft Flood Risk Management Plan which drew heavily on the POR's findings. It is worth noting that at Preliminary Options Report stage the options are developed to line and level with a significant amount of work required before they can be progressed to construction stage.

The Preliminary Options Report (POR) was accompanied by AFA specific appendices containing supporting technical details on all potential options (whole life costing, multi-criteria analysis and option drawings) and also supporting information such as method screening calculations, GIS layers supporting the risk and options analysis and health and safety information. Some elements of analysis were de-coupled and reported separately, in 2016/2017, namely a strategic Sustainable Urban Drainage Systems (SUDS) analysis and a review of Spatial Planning and Impacts of Development.

All AFAs within UoM14 were included at POR stage. Identification of a low risk in the AFAs of Allenwood, Carlow, Daingean, Monasterevin, New Ross & Environs and Rathangan at this stage resulted in recommendations within the draft Flood Risk Management Plan (FRMP) to maintain the existing regime or progress options via alternative programmes.

Whilst the project level consultation on the mapping was undertaken in the first quarter of 2015, the formal SI consultation was delayed by an update of the relevant legislation and was not completed until the fourth quarter of 2015. This meant that the optioneering was progressed without having closed out the observations and objections on the mapping, introducing the possibility that model updates may have been required after optioneering has been undertaken. This risk was constrained by the relatively low number of AFAs for which valid formal consultation input was received.

The OPW awarded a specialist contract to develop an analysis tool to support the whole-life costing of the CFRAM Study options, so that these were consistently applied at national level, in order that the resulting options would be comparable for use to develop a nationally prioritised programme of

implementation. Local Authority and the OPW regional team feedback raised concerns regarding the outcome costs of some options developed using this tool, particularly with regard to smaller schemes, and a wider perception that coastal works costing may be generally conservative, whilst culverting works may be less so. Although the database was informed by costs for completed projects, it was considered prudent to respond to these concerns by lowering the benefit cost ratio threshold for potential schemes. A cut-off benefit cost ratio of 0.5 (rather than 1.0) was used so that more potentially viable schemes were retained in the optioneering process. This was further identified within the final plan which required further investigation of potential measures within relevant AFAs.

The risk assessment, and particularly the economics aspects, drew together and analysed a range of datasets in relation to receptors and damages. For consistency, standard base year and versions of data (including Middlesex Flood Hazard Research Centre damage statistics) were utilised across the CFRAM studies. During the analysis it was noted that there were gaps and inconsistencies between the An Post geodatabase and the OSi buildings layers which required significant truthing and update. In addition, datasets on basements were difficult to obtain, and these could not always be seen from external inspection, with many of these identified only at Local Authority feedback stage, resulting in reworking of damages and options in some cases.

Recognising the benefit of the draft mapping Progress Group workshops, RPS again found the addition of workshops with the OPW, on methodology/process, and the progress group, to gain local knowledge, to be useful, and a subsequent workshop on the draft FRMP was held. This engagement process, at least in part, meant that there was less change between the potential options presented in the POR and those in the draft FRMP than might have been expected. The consultation on the options mainly informed stakeholders and the wider public and there was little feedback received in terms of alternatives or modifications that resulted in alteration of the options in the draft FRMP.

Key Findings:

The main deliverables for this report were the AFA specific risk analysis and the assessment of a series of potential flood risk management measures relevant at differing spatial scales of assessment (UoM, Sub-Catchment and AFA). These are presented in the following Tables 5.1 and 5.2 for the risk assessment and potential options for UoM14 respectively.

Table 5.1 Flood Risk Analysis UoM14

Type of Risk	Flood Risk for Design AEP (1% Fluvial & 0.5% Coastal) Event						
	Allenwood AFA	Athy AFA	Carlow AFA	Castledermot AFA	Daingean AFA	Graiguenamanagh AFA	Leighlinbridge AFA
Current Scenario (Present Day)							
Event Damage (€)	16,976	7,978,744	3,146,811	1,345,667	69,133	9,273,976	8,697,463
No. Residential Properties at Risk	2	75	35	12	9	24	42
No. Business Properties at Risk	0	24	0	6	0	40	15
No. Utilities at Risk	0	0	2	0	0	0	0
No. Major Transport Assets at Risk	1	23	22	8	7	11	4
No. Highly Vulnerable Properties at Risk	0	1	1	0	0	0	0
No. of Social Infrastructure Assets at Risk	1	39	33	3	5	23	23
No. Environmental Assets at Risk	1	5	11	2	1	3	2
No. Potential Pollution Sources at Risk	0	0	0	0	0	0	0

Type of Risk	Flood Risk for Design AEP (1% Fluvial & 0.5% Coastal) Event						
	Allenwood AFA	Athy AFA	Carlow AFA	Castledermot AFA	Daingean AFA	Graiguenamanagh AFA	Leighlinbridge AFA
Mid-Range Future Scenario							
Event Damage (€)	131,095	19,179,545	57,802,731	6,633,480	1,137,171	13,794,904	13,388,186
No. Residential Properties at Risk	6	155	593	18	10	39	47
No. Business Properties at Risk	0	53	84	9	2	46	22
No. Utilities at Risk	0	0	3	0	0	0	0
No. Major Transport Assets at Risk	4	23	59	10	7	13	5
No. Highly Vulnerable Properties at Risk	0	1	1	1	0	0	2
No. of Social Infrastructure Assets at Risk	1	42	46	8	5	24	24
No. Environmental Assets at Risk	1	5	11	2	1	4	2
No. Potential Pollution Sources at Risk	0	0	0	0	0	0	0

Type of Risk	Flood Risk for Design AEP (1% Fluvial & 0.5% Coastal) Event						
	Allenwood AFA	Athy AFA	Carlow AFA	Castledermot AFA	Daingean AFA	Graiguenamanagh AFA	Leighlinbridge AFA
High-End Scenario							
Event Damage (€)	2,334,757	61,696,356	174,732,957	7,819,371	1,482,725	20,858,394	21,327,108
No. Residential Properties at Risk	44	324	936	20	12	48	52
No. Business Properties at Risk	6	98	244	10	3	51	26
No. Utilities at Risk	0	0	4	1	0	1	0
No. Major Transport Assets at Risk	6	32	91	12	7	14	7
No. Highly Vulnerable Properties at Risk	0	5	1	1	0	0	4
No. of Social Infrastructure Assets at Risk	1	55	51	16	5	25	25
No. Environmental Assets at Risk	1	5	11	2	1	4	2
No. Potential Pollution Sources at Risk	0	0	0	0	0	0	0

Type of Risk	Flood Risk for Design AEP (1% Fluvial & 0.5% Coastal) Event						
	Monasterevin AFA	Mountmellick AFA	New Ross AFA	Portarlington AFA	Portlaoise AFA	Rathangan AFA	Suncroft AFA
Current Scenario (Present Day)							
Event Damage (€)	469,312	4,551,195	56,884 Fluvial 557,333 Coastal	15,642,032	5,417,478	0	1,459,261
No. Residential Properties at Risk	8	41	0 Fluvial 16 Coastal	102	63	0	19
No. Business Properties at Risk	5	5	1 Fluvial 5 Coastal	42	13	0	2
No. Utilities at Risk	0	1	0 Fluvial 0 Coastal	0	0	0	0
No. Major Transport Assets at Risk	5	13	0 Fluvial 4 Coastal	12	20	1	5
No. Highly Vulnerable Properties at Risk	0	0	0 Fluvial 0 Coastal	0	1	0	0
No. of Social Infrastructure Assets at Risk	11	12	3 Fluvial 10 Coastal	19	21	5	2
No. Environmental Assets at Risk	4	3	5 Fluvial 5 Coastal	8	9	2	2
No. Potential Pollution Sources at Risk	0	0	0 Fluvial 0 Coastal	0	0	0	0

Type of Risk	Flood Risk for Design AEP (1% Fluvial & 0.5% Coastal) Event						
	Monasterevin AFA	Mountmellick AFA	New Ross AFA	Portarlington AFA	Portlaoise AFA	Rathangan AFA	Suncroft AFA
Mid-Range Future Scenario							
Event Damage (€)	1,255,548	15,202,351	7,289,711 Fluvial 44,563,708 Coastal	69,241,293	21,653,558	0	2,032,787
No. Residential Properties at Risk	21	194	31 Fluvial 39 Coastal	258	200	0	27
No. Business Properties at Risk	7	23	61 Fluvial 112 Coastal	72	49	0	3
No. Utilities at Risk	0	1	9 Fluvial 8 Coastal	0	7	0	0
No. Major Transport Assets at Risk	7	24	15 Fluvial 21 Coastal	44	34	1	6
No. Highly Vulnerable Properties at Risk	0	1	0 Fluvial 2 Coastal	0	1	0	0
No. of Social Infrastructure Assets at Risk	12	13	11 Fluvial 33 Coastal	25	23	5	2
No. Environmental Assets at Risk	4	3	5 Fluvial 5 Coastal	8	9	2	2
No. Potential Pollution Sources at Risk	0	0	0 Fluvial 0 Coastal	0	0	0	0

Type of Risk	Flood Risk for Design AEP (1% Fluvial & 0.5% Coastal) Event						
	Monasterevin AFA	Mountmellick AFA	New Ross AFA	Portarlington AFA	Portlaoise AFA	Rathangan AFA	Suncroft AFA
High-End Future Scenario							
Event Damage (€)	3,833,087	33,708,626	55,555,576 Fluvial 72,258,687 Coastal	89,448,151	83,385,407	927,753	3,290,022
No. Residential Properties at Risk	30	390	46 Fluvial 62 Coastal	313	968	6	29
No. Business Properties at Risk	13	41	120 Fluvial 130 Coastal	108	81	7	3
No. Utilities at Risk	0	1	9 Fluvial 8 Coastal	0	15	1	0
No. Major Transport Assets at Risk	9	33	20 Fluvial 26 Coastal	58	72	2	7
No. Highly Vulnerable Properties at Risk	1	3	2 Fluvial 2 Coastal	0	5	0	0
No. of Social Infrastructure Assets at Risk	15	17	18 Fluvial 39 Coastal	30	33	6	2
No. Environmental Assets at Risk	4	3	5 Fluvial 5 Coastal	8	9	2	2
No. Potential Pollution Sources at Risk	0	0	0 Fluvial 1 Coastal	0	0	0	0

Table 5.2 Potential Options UoM14

AFA	Design flood event (AEP)	Number of properties at risk in design flood event	Options	Area NPVd	Option NPVb (capped)	Option Cost (€)	Benefit – Cost Ratio	Total MCA-Benefit Score	MCA-Benefit Score / Cost Ratio	Sensitivity to MRFS	Sensitivity to HEFS
UoM14	-	-	Sustainable Planning and Development Management Public Awareness Campaign	-	-	-	-	-	-	-	-
Allenwood	1% Fluvial	2	Maintain Existing Regime	€ 34,849	€ 2,735	-	-	-	-	Moderate	Moderate
Athy	1% Fluvial	99	Option 1 – Hard Defences	€ 30,278,083	€ 13,544,560	€ 4,112,090	3.29	1642	399.45	High	High
			Option 2 – Hard Defences & Relocation of Properties	€ 30,278,083	€ 13,544,560	€ 4,056,410	3.34	1639	404.89		

AFA	Design flood event (AEP)	Number of properties at risk in design flood event	Options	Area NPVd	Option NPVb (capped)	Option Cost (€)	Benefit – Cost Ratio	Total MCA-Benefit Score	MCA-Benefit Score / Cost Ratio	Sensitivity to MRFS	Sensitivity to HEFS
Carlow	1% Fluvial	35	Option 1 – Hard Defences	€8,482,650	€846,524	€209,259	4.05	651	3108.65	High	High
			Option 2 – Hard Defences & Improvement of Channel Conveyance	€8,482,650	€846,524	€769,106	1.1	473	614.37		
Castledermot	1% Fluvial	18	<ul style="list-style-type: none"> Option 1 – Hard Defences & Improvement of Channel Conveyance 	€1,714,722	€1,140,087	€2,255,294	0.51	-414	-183.68	Moderate	Moderate
			<ul style="list-style-type: none"> Option 2 – Hard Defences 	€1,714,722	€1,140,087	€2,308,752	0.5	-76	-33.027		
Daingean	1% Fluvial	9	<ul style="list-style-type: none"> Land Use Management 	€74,134	€38,322	-	-	-	-	Moderate	Moderate
Graiguenamanagh	1% Fluvial	64	<ul style="list-style-type: none"> Hard Defences 	€35,934,469	€10,260,826	€9,061,944	1.13	1096	120.89	High	High

AFA	Design flood event (AEP)	Number of properties at risk in design flood event	Options	Area NPVd	Option NPVb (capped)	Option Cost (€)	Benefit – Cost Ratio	Total MCA-Benefit Score	MCA-Benefit Score / Cost Ratio	Sensitivity to MRFS	Sensitivity to HEFS
Leighlinbridge	1% Fluvial	57	<ul style="list-style-type: none"> Hard Defences 	€28,999,499	€3,905,896	€3,291,151	1.19	805	244.56	High	High
Monasterevin	1% Fluvial	13	<ul style="list-style-type: none"> Individual Property Protection 	€423,815	€56,919	€261,796	0.22	-	-	Moderate	Moderate
Mountmellick	1% Fluvial	46	<ul style="list-style-type: none"> Hard Defences 	€19,867,742	€5,970,819	€3,135,680	1.9	1456	464.38	High	High
New Ross	1% Fluvial 0.5% Coastal	0	<ul style="list-style-type: none"> Maintain Existing Regime 	€1,553,273	€0	-	-	-	-	High	High
Portarlinton	1% Fluvial	144	<ul style="list-style-type: none"> Hard Defences 	€26,063,992	€13,624,398	€5,560,037	2.4	664	119.49	High	High

AFA	Design flood event (AEP)	Number of properties at risk in design flood event	Options	Area NPVd	Option NPVb (capped)	Option Cost (€)	Benefit – Cost Ratio	Total MCA-Benefit Score	MCA-Benefit Score / Cost Ratio	Sensitivity to MRFS	Sensitivity to HEFS
Suncroft	1% Fluvial	21	<ul style="list-style-type: none"> Option 1 – Hard Defences, Storage & Improvement of Channel Conveyance 	€3,065,079	€2,239,096	€2,829,896	0.79	1226	433.26	Moderate	Moderate
Portlaoise	1% Fluvial	76	<ul style="list-style-type: none"> Option 1 – Hard Defences 	€6,681,152	€3,335,332	€5,476,930	0.61	505	92.28	High	High
			<ul style="list-style-type: none"> Option 2 – Hard Defences & Storage 	€6,681,152	€3,335,332	€3,917,903	0.85	376	96.01		
			<ul style="list-style-type: none"> Option 3 – Hard Defences & Improvement of Channel Conveyance 	€6,681,152	€3,335,332	€6,148,118	0.54	341	55.49		
Rathangan	1% Fluvial	0	<ul style="list-style-type: none"> Maintain Existing Regime 	€0	€0	-	-	-	-	Low	Moderate

6 THE DEVELOPMENT OF THE UOM14 DRAFT FLOOD RISK MANAGEMENT PLAN

6.1 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 first 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 (within the Eastern CFRAM Study area) 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. The OPW reviewed the draft FRMPs 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 FRMPs.

Within the draft FRMPs areas of further assessment (AFAs) considered to be at low risk were identified and the measures for such areas were not presented. The relevant measures remain available within the Preliminary Options Report and may be more readily implemented via a minor works programme. Within UoM14 there were six low risk AFAs, namely the Allenwood, Carlow, Daingean, Monasterevin, New Ross & Environs and Rathangan AFAs.

The draft plans were supported by the final core hazard and risk mapping and also the plan's statutory environmental assessments under the Strategic Environmental Assessment (SEA) Directive and the Habitats Directive. The environmental assessment process, which resulted in an SEA Environmental Report and Natura Impact Statement, 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 is a consultation document, its main deliverable being the list of preferred measures. 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 UoM14, 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.**

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

- **Athy Flood Relief Scheme: Hard defences**
- **Carlow Flood Relief Scheme: Hard defences (added post draft plan)**
- **Castledermot Flood Relief Scheme: Hard defences**
- **Graiguenamanagh Flood Relief Scheme: Hard defences & Progression of the Graiguenamanagh/Thomastown IPP Pilot**
- **Leighlinbridge Flood Relief Scheme: Hard defences**
- **Mountmellick Flood Relief Scheme: Hard defences**
- **Portarlinton Flood Relief Scheme: Hard defences**
- **Portlaoise Flood Relief Scheme: Hard defences and Storage**
- **Suncroft Flood Relief Scheme: Storage, Improvement of Channel Conveyance and Hard Defences**
- **Maintenance of the Carlow Flood Relief Scheme**
- **Progression of the New Ross Flood Defence Scheme.**

It should be noted that there were some policy changes for measures between the preliminary option reporting and draft FRMP finalisation, such as mechanisms to support relocation and individual property protection.

Furthermore, whilst public consultation was undertaken on the preliminary options there was little opinion that necessitated revision of the options, RPS considers that this is, in part, due to the good level of engagement with the South Eastern CFRAM Study Progress Group, Stakeholder Group and the OPW representatives who reviewed the options ahead of public consultation.

However, it should be noted that at all stages of CFRAM consultation there was extensive interest regarding rural property and access road flooding, with many landowners advocating drainage and maintenance works on the watercourses outside of the AFAs.

Another common theme throughout the CFRAM Study consultation process was the need for a programme of when the measures would be implemented. The draft FRMPs did not have such an overall programme as this is dependent on the outcome of the consultation process, however, it is intended that the final FRMPs will have addressed the prioritisation of the measures on a national basis and relevant measures will be presented in an implementation programme. The key information fields to be prepared, in order to facilitate the prioritisation process, are presented in **Appendix A**.

6.2 DRAFT FRMP CONSULTATION & DEVELOPMENT OF THE FINAL FRMP

Project-level consultation activities were held during 2016 in relation to the draft Flood Risk Management Plans produced by the South Eastern Catchment-based Flood Risk Assessment and Management (CFRAM) Study. These comprised workshops with the South Eastern CFRAM Progress Group, a stakeholder workshop and a series of Public Consultation Days.

A Public Consultation Day relating to UoM 14 AFAs took place between September and October 2016; these events were held in Athy, Carlow, Wexford and Portlaoise.

In addition to providing a forum for discussion, these events supported the formal consultation process by raising awareness of how submissions on the draft FRMPs could be provided to the OPW for consideration.

Formal, national-level consultation in support of the draft FRMPs 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 FRMPs and supporting materials and to make on-line submissions and also statutory consultation in relation to the supporting environmental assessments.

The formal consultation period was open to the public between 19/08/16 and 28/10/16. The OPW received formal submission via the portal and also in written format and in total received 123 formal submissions.

The OPW, with technical support from RPS, collated responses and reported statutory consultation on the draft FRMPs for UoMs 11, 12, 13, 14, 15 and 17, within a series of Public Consultation Synthesis Reports relating to each Unit of Management.

The OPW hosted an environmental workshop at national technical co-ordination level, on 13th February 2017, to consider the environmental issues raised in the consultation responses on the draft FRMPs and supporting environmental reports with a view to developing standard environmental mitigations.

A workshop at project-level was held with relevant FRAM Section Engineers and RPS personnel in late February 2017 to discuss the South Eastern CFRAM consultation submissions in relation to the UoM14 draft FRMP and agree the actions required to reflect these in the final FRMP.

The development of the final FRMPs 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 Progress Group again reviewed the final FRMPs, with the OPW examining with regard to both project-level detail and also national consistency, while the Local Authority Progress Group members provided local knowledge, and updated information about relevant plans, programmes and previous projects.

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

The final FRMPs are also supported by statutory environmental assessments (Volume II), under the Strategic Environmental Assessment (SEA) Directive and the Habitats Directive and drafts of the final statements for these assessments which remain subject to amendment until formal adoption of the FRMPs.

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. Modifications were also incorporated to make the final FRMPs more nationally consistent.

The final FRMP generally contained a preferred measure for each AFA (unless there were requirements for further study to determine a preferred option). The consultations and submissions on the draft FRMP provided valuable information, which has been noted for detailed design. The final FRMP measures for UoM14 are presented in Table 6.1. A summary of Flood Relief Schemes and Works Progressed or Proposed through Other Projects or Plans are presented in Table 6.2.

Table 6.1 Summary of Flood Risk Management Measures – UoM14

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 Sub-Catchment methods were found to be feasible within UoM14		

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.		
Athy	OPW and/or Kildare County Council	OPW
Graiguenamanagh	OPW and/or Kilkenny/Carlow County Council	OPW
Leighlinbridge	OPW and/or Carlow County Council	OPW
Mountmellick	OPW and/or Laois County Council	OPW
Portarlington	OPW and/or Laois County Council	OPW
Carlow	Carlow County Council	OPW Minor Works
Undertake a Detailed Assessment of the Costs of the Potential Measure for the Communities set out below.		
Castledermot	Kildare County Council	OPW
Portlaoise	Laois County Council	OPW
Suncroft	Kildare County Council	OPW

Table 6.2: Summary of Flood Relief Schemes and Works Progressed or Proposed through Other Projects or Plans

Flood Relief Schemes and Works Progressed or Proposed through Other Projects or Plans		
Community (AFA)	Scheme or Works	Status
<i>Carlow</i>	<i>Carlow Flood Relief Scheme</i>	<i>Completed</i>
<i>Graigenamanagh</i>	<i>Graigenamanagh & Thomastown Community <u>Resilience Project</u></i>	<i>Planning / Design Stage</i>
<i>Leighlinbridge</i>	<i>Leighlinbridge Flood Relief Scheme</i>	<i>Completed</i>
<i>New Ross</i>	<i>New Ross Flood Relief Scheme</i>	<i>Under Construction</i>

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 TECHNICAL

The South Eastern CFRAM Study was a significant and challenging project in terms of the detailed analysis it required, simultaneously across its six Units of Management, and in the context of a suite of similar studies nationwide, including the adjoining Suir CFRAM for UoM16.

The level of ambition to undertake catchment scale studies of this nature created a significant resource demand on many of the parties involved, including the organisations represented on project progress, steering and stakeholder groups. In particular, a shortfall in third party survey resource introduced a programme delay, of over one year, which meant that the final consultation deliverables (draft FRMP and accompanying documentation) were prepared in 2016, rather than 2015 as originally programmed. The pre-contract survey programme was a valid endeavour to try to spread the survey workload, but was not sufficiently progressed ahead of the CFRAM studies, and also allowed there to be a disconnect between the survey specification and the modeller requirements (this meant that a supplementary survey arrangement needed to remain in place until model validation was complete). Notwithstanding the programme constraints identified above RPS was able to review pre-contract specifications and tailor these to reduce survey programme and costs and ultimately progress all of the South Eastern survey under a single tender action. With the benefit of hindsight, RPS would suggest that the main CFRAM studies should have started earlier (in the period when the pre-contract survey arrangements were being progressed) with more programme allowance for the surveys to be distributed, thus allowing staged delivery by Unit of Management of all survey and subsequent deliverables.

In some cases within the Eastern CFRAM Study, the study programme had to be prioritised in response to flood risk or events. This was beneficial in terms of piloting, and agreeing, the detail of methodologies, providing results for particular watercourses or AFAs to allow certain projects to progress, and also dissemination of lessons learned from the process to the South Eastern CFRAM Study. The acceleration also shortened the programme duration for these areas and therefore reduced the risk of further interventions resulting in reworking of analysis which has been an ongoing project challenge. Based on this, RPS would recommend a prioritised approach to subsequent Floods Directive activities so that the completion of analysis for the final areas is not allowed to delay progress for the other areas. Such a staged approach has been adopted for the consultation on the draft FRMPs and offers the benefit of smoothing resource needs for activities such as statutory consultation.

7.2 COMMUNICATIONS

Communications are often a challenge on projects of this complex nature and duration. This is applicable at a number of levels:

- The South Eastern CFRAM Study benefitted from the regular and ongoing communication between the OPW FRAM project management team and RPS with key personnel remaining engaged throughout the study's duration, providing regular updates and participating in focussed workshops.
- The South Eastern CFRAM Study's integrated Progress/Steering Group generally engaged well throughout the study, perhaps benefiting from personnel who were involved together in previous catchment scale flood risk management studies. The resource demands that a study of this nature put on Local Authority partners is acknowledged and there was change of some Local Authority representation during the process.
- Early collaboration via a National Technical Co-ordination group was of some benefit, despite the group's large membership, these two day meetings evolved into targeted workshops on specific topics. RPS would suggest that further such workshops would have been of benefit in the latter stages of the projects and whilst the OPW's production of the draft FRMP template and covers, and their review of the draft FRMPs, ensured a reasonable degree of consistency, this may have been better facilitated by the continuation of the co-ordination group or workshops engendering more of an ethos of partnership and providing more direct communication and access to policy level decision. For example, specific topics could have been; the use of the unit cost database and inputs to the draft FRMP.
- Engagement with stakeholders and the wider public was harder to achieve given the longevity of the studies, initial technical content and the early programme delays, which may have partially disengaged some participants. RPS would endorse our early views that the quality, rather than quantity, of consultation events remains the focus of future consultation phases, that the publicising the events is given a high priority going forward with engagement of national groups under an overall communications strategy, opportunities to tap into similar local engagement programmes are utilised (for example WFD engagement), and, that information be made available using flexible electronic visualisation applications as well as hard copy deliverables.
- It is noted that the OPW are already engaged with a number of relevant groups, for example national stakeholders and cross border fora, which are beyond the remit of the CFRAM studies to review. However, it is considered important that all engagement is maintained.

Within the realm of communications RPS found the use of key messages during every formal presentation to be helpful with managing expectations. This was complemented by using less technical language and both addressing, and clearly communicating, the confidences and uncertainties in the process and its outcomes.

In some AFAs or along some watercourses there was insufficient information to provide high confidence in the analysis of flood risk and this can only be redressed by collecting data as and when

events occur. However, the best use of available data was made so that in most cases recommendations could be made to progress flood risk management measures without recourse to further study. In other areas where data was sufficient, and especially where Flood Event Response was undertaken during the study, there was more confidence in the findings and these could readily be displayed to the wider public audience. Communities subject to recent events are understandably sensitive, and must be dealt with sympathetically, however, in every location where flooding had occurred RPS were especially well received once it was known that there had been recording of the event to inform the CFRAM Study process. The Flood Event Response enabled complex mechanisms to be better understood and replicated and this task is a valuable activity for those undertaking the modelling to be involved with.

The “live” nature of some of the tasks was challenging and led to reworking of deliverables and delayed closure of certain tasks. Whilst tasks were initially envisaged as sequential under the specification, for example finalised hydrology available in advance of final hydraulics and mapping consultation, this was not a realistic expectation and RPS advocated this from the study’s outset which led to the establishment of an infill survey contract to allow further data collection if any problems were encountered during hydrological and hydraulic analysis.

In addition, there were competing demands on the time of the group representatives which meant that they could not always provide the information needed or respond to requests to meet the South Eastern CFRAM Study timescales. To try to facilitate engagement with the progress group, in an efficient manner for all parties, RPS held a series of workshops with Local Authority engineering and planning personnel at key study stages. RPS found this addition to be a useful mechanism to ensure the quality of the modelling outputs and the optioneering and would recommend this approach for future stages.

In particular, there was ongoing uncertainty with regard to the defence asset database, which was populated during the study, but is “live” and therefore needs continual review and update, RPS would suggest that this particular task should have preceded the main study (with an update element and surveys included under the South Eastern CFRAM Study). Having populated the database during this cycle to the degree possible, it is important that the database is maintained centrally for future use.

7.3 GENERAL

Throughout the process there was a degree of conflict between maintaining a strategic and plan level of detail, to develop a catchment-scale plan, and the need to address the often localised issues and nuances of particular flooding problems. In all relevant cases, it should be recognised that the subsequent analysis for progressing detailed design will involve some degree of remodelling to account for site investigations, service details, land owner requirements, and consequently this type of study provides “line and level” solutions with variations and refinements to be realistically expected in subsequent stages.

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 project has 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 UoM14 and across the South 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. The prioritised programme for the advancement and implementation of ongoing flood relief projects and also the flood protection measures set out with the FRMPs provides 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 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.

However, it should be noted that at all stages of CFRAM consultation there was extensive interest regarding rural property and access road flooding, with many landowners advocating drainage and maintenance works on the watercourses. These issues could not be adequately addressed under the first CFRAM cycle and will need to be assessed further taking the wider damages and risks into account and possibly considering alternative standards of protection for such rural flooding issues.

The CFRAM studies in this first cycle were ambitious and whilst they had been informed by pilot studies 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.

8 REFERENCES & BIBLIOGRAPHY

1. EC Directive on the Assessment and Management of Flood Risks (2007/60/EC)
2. S.I. No. 122/2010 - European Communities (Assessment and Management of Flood Risks) Regulations 2010
3. S.I. No. 495/2015 - European Communities (Assessment and Management of Flood Risks) (Amendment) Regulations 2015
4. National Flood Risk Assessment and Management Programme, Catchment-based Flood Risk Assessment and Management (CFRAM) Studies, Stage I Tender Documents: Project Brief, Office of Public Works, 2010
5. National Flood Risk Assessment and Management Programme, South Eastern River Basin District Catchment-based Flood Risk Assessment and Management (CFRAM) Study, Stage II Tender Documents: Project Brief, Office of Public Works, 2011
6. South Eastern CFRAM Study, HA14 (Barrow) Inception Report, IBE0601Rp0005 (RPS, 2012)
7. South Eastern CFRAM Study, HA14 Hydrology Report, IBE0601Rp0011 (RPS, 2016)
8. South Eastern CFRAM Study, HA14 Hydraulics Report, IBE0601Rp0017 (RPS, 2016)
9. South Eastern CFRAM Study, UoM14 Preliminary Options Report, IBE0601Rp0024 (RPS, 2016)
10. South Eastern CFRAM Study, UoM14 draft FRMP, IBE0601Rp0039 (RPS, 2016)

APPENDIX A

KEY INFORMATION UOM14

FIELD NAME DESCRIPTION

1 RBD Name of the RBD / IRBD

2 UoM No. The number of the UoM, as per Appendix A of the Note on the Format of Measure Codes (18/05/16)

3 AFA Code If at AFA level, the number of the AFA, as per Appendix C of the Note on the Format of Measure Codes (18/05/16) - If measure is at UoM / Catchment level, insert '-999'

4 AFA Name If at AFA level, the name of the AFA, else leave blank

5 Measure Name The name of the measure

6 Code The Measure Code

7 Measure Description The short description of the measure

8 Implementation The name(s) of the nominated body or bodies responsible for implementation of the measure

9 Funding The name(s) of the nominated body or bodies responsible for funding of the measure

10 Type of Measure Type of Measure Code, as per Appendix B of the Note on the Format of Measure Codes (18/05/16)

11 1.a.i Unweighted MCA score for the Objective (1.a.i) – Social - Human Health

12 1.a.ii Unweighted MCA score for the Objective (1.a.ii) – Social - High Vulnerability Properties

13 1.b.i Unweighted MCA score for the Objective (1.b.i) – Social - Social Infrastructure

14 1.b.ii Unweighted MCA score for the Objective (1.b.ii) – Social - Local Employment

15 2.a Unweighted MCA score for the Objective (2.a) - Economic - Economic Risk

16 2.b Unweighted MCA score for the Objective (2.b) - Economic - Transport

17 2.c Unweighted MCA score for the Objective (2.c) - Economic - Utilities

18 2.d Unweighted MCA score for the Objective (2.d) - Economic - Agriculture

19 3.a Unweighted MCA score for the Objective (3.a) - Environmental - WFD

20 3.b Unweighted MCA score for the Objective (3.b) - Environmental - Natura Sites

- 21 3.c Unweighted** MCA score for the Objective (3.c) - Environmental - Flora and Fauna
- 22 3.d Unweighted** MCA score for the Objective (3.d) - Environmental - Fisheries
- 23 3.e Unweighted** MCA score for the Objective (3.e) - Environmental - Visual Amenity
- 24 3.f.i Unweighted** MCA score for the Objective (3.f.i) - Environmental - Cultural (architectural)
- 25 3.f.ii Unweighted** MCA score for the Objective (3.f.ii) - Environmental - Cultural (archaeological)
- 26 4.a Unweighted** MCA score for the Objective (4.a) - Technical - Operationally Robust
- 27 4.b Unweighted** MCA score for the Objective (4.b) - Technical - Health and Safety
- 28 4.c Unweighted** MCA score for the Objective (4.c) - Technical - Adaptability to Climate Change
- 29 MCA Benefit Score Weighted** total MCA Score (i.e., sum of weighted scores for each objective)
- 30 Cost (€m)** Cost of the proposed measures in €m
- 31 Uncapped NPVd (€m) Uncapped** value of Net Present Value Damages in €m
- 32 NPVb (€m)** Capped Net Present Value of Benefits of measure in €m
- 33 MCA BCR (score/€m)** MCA Benefit - Cost Ratio - **NOTE:** As per GN28, the MCA Score for the purposes of calculating the MCA Benefits **excludes** the scores for Technical Objectives
- 34 Economic BCR** Economic Benefit - Cost Ratio
- 35 No. Residential Properties Protected** No. of Residential Properties that would be protected by the proposed measure
- 36 No. Non-Residential Properties Protected** No. of Non-Residential Properties that would be protected by the proposed measure
- 37 Technical Uncertainty** A ranking of the technical uncertainty as 'High', 'Medium' or 'Low' - This should reflect the uncertainty in technical parameters such as hydrological flows, flood levels, flood extents, etc. A description of each ranking category is provided below.
- High - There is significant uncertainty - Further data capture (e.g., hydrometric monitoring) is strongly required before the measure is advanced
- Medium - There is moderate level of uncertainty - Further should be collected if possible in advance of or during the progression of the development stage of the measure, but this data is not deemed critical before the measure may advance

Low - There is a low level of uncertainty, and, providing a reasonable freeboard / safety factor is allowed, the measure may progress without further data collection

38 Technical Uncertainty Comment A brief (2-3 lines) explanation as to why the Technical Uncertainty ranking assigned was selected

39 Project Risk A ranking of the risks in implementing the measure as 'High', 'Medium' or 'Low' - This should reflect the complexity and nature of the proposed measure, and what level of risk there may be to completing this measure within a defined timeline and the cost indicated. A description of each ranking category is provided below.

High - There are significant risks in progressing the measure, for example, the measure might involve complex construction, and/or, major works in confined urban areas, and/or significant environmental issues in advancing the measure (such as channel / river bank works in a protected Freshwater Pearl Mussel site)

Medium - There are moderate risks in progressing the measure, for example, a major construction project involving some construction in urban areas, or a smaller, but complex construction project, and/or moderate environmental issues in advancing the measure

Low - There are low risks in progressing the measure, for example, a construction project in a green-field site, with no particular environmental issues or risks

40 Project Risk Comment A brief (2-3 lines) explanation as to why the Project Risk ranking assigned was selected

41 Environmental Sensitivity/Impact A ranking of the likely environmental impact in implementing the measure as 'High', 'Medium' or 'Low' - This should reflect the derived from the outcome of the Strategic Environmental Assessment and/or the Appropriate Assessment.

42 Environmental Impact Comment A brief (2-3 lines) explanation as to why the Environmental Sensitivity/Impact ranking assigned was selected

43 AA Screening Required? Whether Appropriate Assessment Screening will be required at Project Level for that Measure / Location.

EXTRACT FROM KEY INFORMATION SPREADSHEET

FIELD NUMBER																		
3	4	5	6	7	8	9	29	30	31	32	33	34	35	36	38	40	42	43
LOCATI ON		MEASURE					Total MCA		Uncapped		MCA BCR	Economic	No. Residential	No. Non- Residential	Technical	Project	Environmental Impact	AA Screening Required ?
AFA Code	AFA Name	Name	Code	Measure Description	Implementation	Funding	Benefit Score	Cost (€m)	NPVd (€m)	NPVb (€m)	(score/€ m)	BCR	Properties Protected	Properties Protected	Uncertainty	Risk	Sensitivity /Impact	
140150	Athy	Progress the development of the Athy AFA Flood Relief Scheme	IE14-140150-0114-M33	Progress the Athy Flood Relief Scheme, to project level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW and/or Kildare County Council.	OPW	1642	4.11	30.28	13.54	399.45	3.29	75	24	High. There is poor data available for Blessington AFA with which to verify the hydrology and hydraulics. Additional data should be recorded and gauging stations on the Deerpark and Newtown Park Streams should be considered.	Medium. Extensive works in an urban area	Medium. The Poulaphouca Reservoir SPA is adjacent to and downstream of the AFA. The Liffey - Kings, Freshwater Pearl Mussel sensitive area with FPM records is over 2km upstream and upcatchment of the Poulaphouca Reservoir. The Poulaphouca Reservoir pNHA is adjacent to and downstream of the AFA. Potential for short term, minimal to moderate negative impacts on biodiversity, water, fisheries and angling from the construction of hard defences on a non-sensitive waterbody. These impacts are mainly construction phase disturbances that could be mitigated for with good planning and management. Potential for medium and long term slight negative impacts on the soil resource as the overall extent of flooding on agricultural lands may increase.	Yes. Potentially 5 European sites to be screened at the project level.
140156	Castledermot	Undertake a Detailed Assessment of the Costs of the Potential Measure for Castledermot	IE14-140156-0114-M25	Undertake a detailed assessment of the costs to determine if an economically viable measure may exist that could justify the progression to full project-level assessment.	OPW and/or Kildare County Council.	OPW	-76	2.3	1.71	1.14	-33.03	0.5	12	6	Low. For the area covering flood cells 1 to 4, there is good confidence in both the hydrology and hydraulics of the Celbridge Hazelhatch AFA due to the presence of gauging stations and flood extent verification events.	Low. Localised works involved improving channel conveyance and a short reach of hard defences.	Medium. The Rye Water Valley / Carleton SAC is over 4km downstream of the AFA. Potential for short term, slight to significant negative impacts on biodiversity, water, fisheries and angling from the construction of hard defences, increasing conveyance with dredging and the creation of a flow diversion, all of which are in non-sensitive waterbodies. These impacts could be mitigated for with good planning, appropriate timing of works and good construction practice, although there is likely to be medium and long term minimal	Yes. Potentially 10 European sites to be screened at the project level.

FIELD NUMBER																			
3	4	5	6	7	8	9	29	30	31	32	33	34	35	36	38	40	42	43	
LOCATI ON		MEASURE					Total MCA		Uncapped		MCA BCR	Economic	No. Residential	No. Non- Residential	Technical	Project	Environmental Impact	AA Screening Required ?	
AFA Code	AFA Name	Name	Code	Measure Description	Implementation	Funding	Benefit Score	Cost (€m)	NPVd (€m)	NPVb (€m)	(score/€ m)	BCR	Properties Protected	Properties Protected	Uncertainty	Risk	Sensitivity /Impact		
																			to slight negative impacts with recurring dredging events on these topic areas. Potential for short, medium and long term slight negative impacts to the setting of several NIAH buildings, and slight to significant short, medium and long term negative visual impacts on local views.
140162	Graiguenamanagh	Progress the development of the Graiguenamanagh AFA Flood Relief Scheme	IE14-140162-0314-M33	Progress of the Graiguenamanagh Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW and/or Kilkenny/Carlow County Councils.	OPW and/or Kildare CoCo - To be confirmed	1096	9.06	35.93	10.26	120.89	1.13	24	40	High. High uncertainty due to complex flooding mechanism including groundwater and pluvial sources.	Low. Further investigation recommended for Hazelhatch.	Low. The Rye Water Valley / Carlton SAC is over 4km downstream of the AFA. No physical works.	No, as no physical works.	
140162	Graiguenamanagh	Progress the Thomastown IPP Pilot	IE14-140162-4914-M43	Progress the Thomastown IPP Pilot through Feasibility Stage to include the design of an Early Flood Warning System along with proposals for individual property protection.	Kilkenny County Council	OPW	-	-	-	-	-	-	-	-	High. There is poor data available for Clane AFA with which to verify the model hydrology and hydraulics. Additional data should be recorded and gauging stations on the Cott Stream, Gollymochy Stream and the River Liffey should be considered.	Low. Localised works, low risk of riparian objections.	Low. Relatively low sensitivity area, with no significant designations. Potential for short term, minimal to slight negative environmental impacts from the construction of hard defences and the improvement of channel conveyance. These impacts are mainly construction phase disturbances that could be mitigated for with good planning and management.	Yes. Potentially 9 European sites to be screened at the project level.	
140166	Leighlinbridge	Progress the Leighlinbridge AFA Flood Relief Scheme	IE14-140166-0414-M33	Progress the Leighlinbridge Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning /exhibition and, as appropriate, implementation.	OPW and/or Carlow County Council.	OPW	805	3.29	29	3.91	244.56	1.19	42	15	High. There is relatively poor confidence in the hydrology and hydraulics of the Carysfort Maretime AFA/HPW due to the lack of gauging information, highly urbanised nature of the catchment with no urban drainage network included in the model and few flood extent verification events.	High. Complex construction works in an urban area including dams and hard defences. Unknown risk of riparian objections and planning constrictions. Possible reconfiguration of storage and defences as detailed design progresses	Medium. South Dublin Bay and River Tolka Estuary SPA, the South Dublin Bay SAC and the Sandymount Strand / Tolka Estuary Ramsar site are directly downstream of the Carysfort Maretime Stream. Potential for short term, minimal negative environmental impacts from the construction of hard defences in a non-sensitive waterbody and the creation of a storage area. Potential for construction phase and permanent minimal negative localised visual impacts.	Yes. Potentially 27 European sites to be screened at the project level.	
140168	Mountmellick	Progress the development of the Mountmellick AFA Flood Relief Scheme	IE14-140168-0514-M33	Progress of Mountmellick Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW and/or Laois County Council.	OPW	1456	3.14	19.87	5.97	464.38	1.9	44	2	Low. There is good confidence in both the hydrology and hydraulics of the Leixlip AFA due to the presence of gauging stations	Low. Localised construction works	Low. The Rye Water Valley / Carlton SAC and pNHA is within and upstream of the AFA on the Rye Water. Potential for short term, minimal to moderate	Yes. Potentially 7 European sites to be screened at the	

FIELD NUMBER																			
3	4	5	6	7	8	9	29	30	31	32	33	34	35	36	38	40	42	43	
LOCATI ON		MEASURE					Total MCA		Uncapped		MCA BCR	Economic	No. Residential	No. Non- Residential	Technical	Project	Environmental Impact	AA Screening Required ?	
AFA Code	AFA Name	Name	Code	Measure Description	Implementation	Funding	Benefit Score	Cost (€m)	NPVd (€m)	NPVb (€m)	(score/€ m)	BCR	Properties Protected	Properties Protected	Uncertainty	Risk	Sensitivity /Impact		
140173	Portarlington	Progress the development of the Portarlington AFA Flood Relief Scheme	IE14-140173-0614-M33	Progress the Portarlington Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW and/or Laois/Offaly County Council.	OPW	664	5.56	26.06	13.62	119.49	2.45	102	42	Low. There is good confidence in both the hydrology and hydraulics of the Lucan to Chapelizod AFA due to the presence of gauging stations (upstream of the model extents) and flood extent verification events.	Medium. Extensive works in an urban area, involving three Local Authorities	Medium. The Rye Water Valley / Carlton SAC is over 2km upstream of the AFA on the Rye Water. The Liffey Valley pNHA is within and upstream of the AFA. Potential for short term, slight negative impacts on biodiversity, water, fisheries and angling with the construction of hard defences set back from the sensitive waterbody. These impacts are mainly construction phase disturbances that could be mitigated for with good planning and management. Potential for medium and long term minimal negative impacts on fisheries and angling as defences may limit access to the river for recreational purposes. Potential for construction phase, moderate negative visual impacts, and medium and long term minimal negative visual impacts on views of the river to those to be protected.	Yes. Potentially 13 European sites to be screened at the project level.	
140174	Portlaoise	Progress the development of the Portlaoise AFA Flood Relief Scheme	IE14-140174-0714-M61	Progress the Portlaoise Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW and/or Laois County Council.	OPW	376	3.92	6.67	3.34	96.01	0.85	75	24	Low. There is good confidence in both the hydrology and hydraulics of the Maynooth AFA due to the presence of a gauging station and flood extent verification events.	Low. Localised construction works, some in urban areas - BCR marginal so potential for cost overruns	Low. The Rye Water Valley / Carlton SAC and pNHA is within and directly downstream of the AFA on the Rye Water. Potential for short term, minimal negative environmental impacts from the construction of hard defences and the creation of a flow diversion channel on the non-sensitive waterbodies. These	Yes. Potentially 6 European sites to be screened at the project level.	

FIELD NUMBER																			
3	4	5	6	7	8	9	29	30	31	32	33	34	35	36	38	40	42	43	
LOCATI ON		MEASURE					Total MCA		Uncapped		MCA BCR	Economic	No. Residential	No. Non- Residential	Technical	Project	Environmental Impact	AA Screening Required ?	
AFA Code	AFA Name	Name	Code	Measure Description	Implementation	Funding	Benefit Score	Cost (€m)	NPVd (€m)	NPVb (€m)	(score/€ m)	BCR	Properties Protected	Properties Protected	Uncertainty	Risk	Sensitivity /Impact		
																	impacts are mainly construction phase disturbances that could be mitigated for with good planning and management. Potential for short term slight negative visual impacts and medium and long term minimal negative visual impacts on the local landscape.		
140178	Suncroft	Undertake a Detailed Assessment of the Costs of the Potential Measure for Suncroft	IE14-140178-0814-M25	Undertake a detailed assessment of the costs to determine if an economically viable measure may exist that could justify the progression to full project-level assessment.	OPW and/or County Council.	OPW	1226	2.83	3.07	2.24	433.26	0.79	12	6	High. There is high uncertainty in relation to the hydrological analysis for the Naas AFA and there is low confidence regarding the hydraulics of the Naas AFA. Whilst anecdotal information and available data has been used to the best extent possible, overall there is little or poor data to base the hydrological analysis on and calibrate the model to. Observation of more events would be necessary to reduce the uncertainty in model results. In light of this it is recommended that further hydrometric data is collected in relation to the watercourses which flow into the Naas and Johnstown areas from the south.	Low. First phase of option is data collection and further study	Medium. Relatively low sensitivity area, with no significant designations. Potential for short term, minimal to significant negative impacts on biodiversity, water, fisheries, soils and angling from the construction of hard defences on non-sensitive waterbodies, the creation of flow diversion, storage and increased conveyance. These impacts are mainly construction phase disturbances that could be mitigated for with good planning and management; however there is the potential for permanent losses of soil resource and permanent impacts on morphology with storage. Potential for short term slight negative visual impacts and medium and long term minimal negative visual impacts on the local landscape.	Yes. Potentially 9 European sites to be screened at the project level.	
140155	Carlow	TBC	TBC	TBC	TBC	OPW	-	-	-	-	-	-	24	40	-	Low. Further study required	Low. Relatively low sensitivity area, with no significant designations. No physical works.	No, as no physical works.	
140150	Athy	Progress the development of the Athy AFA Flood Relief Scheme	IE14-140150-0114-M33	Progress the Athy Flood Relief Scheme, to project level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW and/or County Council.	OPW	1642	4.11	30.28	13.54	399.45	3.29			Medium. There is moderate confidence in both the hydrology and hydraulics of the Newbridge AFA. Very little detailed information is available relating to flooding within the Newbridge AFA. As a result, model	Medium. Localised works involved improving channel conveyance, a reach of hard defences and tanking of two properties. Includes blockage	Medium. Pollardstown Fen SAC and Ramsar Site is adjacent to the AFA. Pollardstown Fen pNHA and the Curragh pNHA are adjacent to the AFA. Potential for short term, minimal to moderate negative impacts on biodiversity, water, fisheries and angling from the	Yes. Potentially 10 European sites to be screened at the project level.	

FIELD NUMBER																			
3	4	5	6	7	8	9	29	30	31	32	33	34	35	36	38	40	42	43	
LOCATI ON		MEASURE					Total MCA		Uncapped		MCA BCR	Economic	No. Residential	No. Non- Residential	Technical	Project	Environmental Impact	AA Screening Required ?	
AFA Code	AFA Name	Name	Code	Measure Description	Implementation	Funding	Benefit Score	Cost (€m)	NPVd (€m)	NPVb (€m)	(score/€ m)	BCR	Properties Protected	Properties Protected	Uncertainty	Risk	Sensitivity /Impact		
															calibration was not possible. Good qualitative support for the model results was achieved however from the limited information available.	analysis.	construction of hard defences and trash screens, and dredging works. These negative impacts may extend to the medium and long term to a lesser extent with recurring dredging events. Potential for short term, slight negative visual impacts along the sensitive River Liffey and medium and long term minimal negative visual impacts with recurring dredging events.		
140156	Castledermot	Undertake a Detailed Assessment of the Costs of the Potential Measure for Castledermot	IE14-140156-0114-M25	Undertake a detailed assessment of the costs to determine if an economically viable measure may exist that could justify the progression to full project-level assessment.	OPW and/or Kildare County Council.	OPW	-76	2.3	1.71	1.14	-33.03	0.5	42	15	Low. There is good confidence in both the hydrology and hydraulics of the Santry AFA/HPW due to the presence of a gauging station and flood extent verification events.	High. Localised works in an urban area, including culvert works across a major road (Swords Road). Includes constricted works in Raheny village	Low. North Dublin Bay SAC, pNHA, Marine Protected Area and North Bull Island SPA, Nature Reserve and Ramsar site are 4km downstream of Santry at the mouth of the River Santry. Potential to be short term, minimal to slight negative impacts on biodiversity, water, fisheries and angling with the construction of flood defences, set back from the waterbody where possible, and a culvert upgrade on a non-sensitive waterbody. These impacts are mainly construction phase disturbances that could be mitigated for with good planning and management.	Yes. Potentially 18 European sites to be screened at the project level.	
140162	Graiguenamanagh	Progress the development of the Graiguenamanagh AFA Flood Relief Scheme	IE14-140162-0314-M33	Progress of the Graiguenamanagh Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW and/or Kilkenny/Carlow County Councils.	OPW	1096	9.06	35.93	10.26	120.89	1.13	44	2	Low. There is good data available for Sutton Howth AFA with which to verify the model hydrology and hydraulics.	Medium. Construction would be required in a tidal environment and borders an environmentally designated area. BCR marginal.	Medium. Baldoyle Bay SAC, SPA and pNHA, North Dublin Bay SAC and pNHA and North Bull Island SPA and Ramsar site are adjacent to the boundary of the AFA. Potential for short term, slight to moderate negative impacts on biodiversity, water, fisheries and angling from the construction of hard defences set back from sensitive coastal waterbodies. These impacts are mainly construction phase disturbances that could be mitigated for with good planning and	Yes. Potentially 18 European sites to be screened at the project level.	

FIELD NUMBER																			
3	4	5	6	7	8	9	29	30	31	32	33	34	35	36	38	40	42	43	
LOCATI ON		MEASURE					Total MCA		Uncapped		MCA BCR	Economic	No. Residential	No. Non- Residential	Technical	Project	Environmental Impact	AA Screening Required ?	
AFA Code	AFA Name	Name	Code	Measure Description	Implementation	Funding	Benefit Score	Cost (€m)	NPVd (€m)	NPVb (€m)	(score/€ m)	BCR	Properties Protected	Properties Protected	Uncertainty	Risk	Sensitivity /Impact		
																		management. Potential for short term highly significant negative visual impacts on the high sensitivity landscape and seascape, and medium and long term slight negative visual impacts on the high value landscape / seascape character	
140162	Graigue namana gh	Progress the Graiguenamagh/Thomastown IPP Pilot	IE14-140162-4914-M43	Progress the Thomastown IPP Pilot through Feasibility Stage to include the design of an Early Flood Warning System along with proposals for individual property protection.	Kilkenny County Council	OPW	-	-	-	-	-	-	102	42	-	Low. Demountable defences	-	-	
140166	Leighlin bridge	Progress the Leighlinbridge AFA Flood Relief Scheme	IE14-140166-0414-M33	Progress the Leighlinbridge Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning /exhibition and, as appropriate, implementation.	OPW and/or Carlow County Council.	-	805	3.29	29	3.91	244.56	1.19	75	24	-	Low. Localised works involving demolition of an unused bridge and construction of an embankment	-	-	
140168	Mountmellick	Progress the development of the Mountmellick AFA Flood Relief Scheme	IE14-140168-0514-M33	Progress of Mountmellick Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW and/or Laois County Council.	OPW/Dublin City Council	1456	3.14	19.87	5.97	464.38	1.9	12	6	Low. Good correlation was achieved between modelled levels and spot gaugings taken at the Killeen Road gauging station, providing good confidence in the model performance up to Qmed. The model also replicated recorded flood levels which occurred during the October 2011 flood event.	Low. Further study	-	-	
140173	Portarlinton	Progress the development of the Portarlinton AFA Flood Relief Scheme	IE14-140173-0614-M33	Progress the Portarlinton Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW and/or Laois/Offaly County Council.	OPW/Dublin City Council	664	5.56	26.06	13.62	119.49	2.45	24	40	-	-	-	-	
140174	Portlaoise	Progress the development of the Portlaoise AFA Flood Relief Scheme	IE14-140174-0714-M61	Progress the Portlaoise Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW and/or Laois County Council.	OPW.	376	3.92	6.67	3.34	96.01	0.85			Low. Maintenance of existing regime	Low. Maintenance of existing regime	-	-	
140178	Suncroft	Undertake a Detailed Assessment of the Costs of the Potential Measure for Suncroft	IE14-140178-0814-M25	Undertake a detailed assessment of the costs to determine if an economically viable measure may exist that could justify the progression to full project-level assessment.	OPW and/or Kildare County Council.	Dublin City Council	1226	2.83	3.07	2.24	433.26	0.79	42	15	-	-	-	-	
140155	Carlow	TBC	TBC	TBC	TBC	OPW/Dublin	-	-	-	-	-	-	44	2	-	-	-	-	

FIELD NUMBER																		
3	4	5	6	7	8	9	29	30	31	32	33	34	35	36	38	40	42	43
LOCATI ON		MEASURE					Total MCA		Uncapped		MCA BCR	Economic	No. Residential	No. Non- Residential	Technical	Project	Environmental Impact	AA Screening Required ?
AFA Code	AFA Name	Name	Code	Measure Description	Implementation	Funding	Benefit Score	Cost (€m)	NPVd (€m)	NPVb (€m)	(score/€ m)	BCR	Properties Protected	Properties Protected	Uncertainty	Risk	Sensitivity /Impact	
						City Council												
140150	Athy	Progress the development of the Athy AFA Flood Relief Scheme	IE14-140150-0114-M33	Progress the Athy Flood Relief Scheme, to project level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW Kildare and/or County Council.	OPW/Dublin City Council	1642	4.11	30.28	13.54	399.45	3.29	102	42	-	-	-	-
140156	Castledermot	Undertake a Detailed Assessment of the Costs of the Potential Measure for Castledermot	IE14-140156-0114-M25	Undertake a detailed assessment of the costs to determine if an economically viable measure may exist that could justify the progression to full project-level assessment.	OPW Kildare and/or County Council.	OPW	-76	2.3	1.71	1.14	-33.03	0.5	75	24	-	-	-	-
140162	Graigue namana gh	Progress the development of the Graigue namana gh AFA Flood Relief Scheme	IE14-140162-0314-M33	Progress of the Graigue namana gh Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW and/or Kilkenny/Carlow County Councils.	OPW/South Dublin County Council/ Dublin City Council	1096	9.06	35.93	10.26	120.89	1.13	12	6	Low. This HPW has no permanent gauging station to provide quantitative hydrometric data to aid the calibration and verification processes. Good correlation was achieved between recorded flood levels for a number of events and the levels generated by the computational model.	High. Complex construction in a highly urbanised environment	-	-
140162	Graigue namana gh	Progress the Graigue namana gh/Thomastown IPP Pilot	IE14-140162-4914-M43	Progress the Thomastown IPP Pilot through Feasibility Stage to include the design of an Early Flood Warning System along with proposals for individual property protection.	Kilkenny County Council	OPW/ Dublin City Council	-	-	-	-	-	-	24	40	-	-	-	-
140166	Leighlin bridge	Progress the Leighlinbridge AFA Flood Relief Scheme	IE14-140166-0414-M33	Progress the Leighlinbridge Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning /exhibition and, as appropriate, implementation.	OPW and/or Carlow County Council.	OPW/Dublin City Council/ TII	805	3.29	29	3.91	244.56	1.19			-	-	-	-
140168	Mountmellick	Progress the development of the Mountmellick AFA Flood Relief Scheme	IE14-140168-0514-M33	Progress of Mountmellick Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW Laois and/or County Council.	OPW/Local Authority	1456	3.14	19.87	5.97	464.38	1.9	42	15	-	-	-	-
140173	Portarlington	Progress the development of the Portarlington AFA Flood Relief Scheme	IE14-140173-0614-M33	Progress the Portarlington Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW and/or Laois/Offaly County Council.	OPW/Local Authority	664	5.56	26.06	13.62	119.49	2.45	44	2	-	-	-	-
140174	Portlaoise	Progress the development of the Portlaoise AFA Flood Relief Scheme	IE14-140174-0714-M61	Progress the Portlaoise Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW Laois and/or County Council.	OPW/ Dublin City Council	376	3.92	6.67	3.34	96.01	0.85	102	42	-	-	-	-
140178	Suncroft	Undertake a Detailed Assessment of	IE14-140178-0814-	Undertake a detailed assessment of the costs to determine if an economically	OPW Kildare and/or County Council.	OPW/DCC	1226	2.83	3.07	2.24	433.26	0.79	75	24	-	-	-	-

FIELD NUMBER																			
3	4	5	6	7	8	9	29	30	31	32	33	34	35	36	38	40	42	43	
LOCATI ON		MEASURE					Total MCA		Uncapped		MCA BCR	Economic	No. Residential	No. Non- Residential	Technical	Project	Environmental Impact	AA Screening Required ?	
AFA Code	AFA Name	Name	Code	Measure Description	Implementation	Funding	Benefit Score	Cost (€m)	NPVd (€m)	NPVb (€m)	(score/€ m)	BCR	Properties Protected	Properties Protected	Uncertainty	Risk	Sensitivity /Impact		
		the Costs of the Potential Measure for Suncroft	M25	viable measure may exist that could justify the progression to full project-level assessment.															
140155	Carlow	TBC	TBC	TBC	TBC	Existing duties	-	-	-	-	-	-	12	6	Low. Maintenance of existing regime	Low. Maintenance of existing regime	-	-	
140150	Athy	Progress the development of the Athy AFA Flood Relief Scheme	IE14-140150-0114-M33	Progress the Athy Flood Relief Scheme, to project level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW Kildare and/or County Council.	Local Authority / Developers	1642	4.11	30.28	13.54	399.45	3.29	24	40	Low. There is good confidence in both the hydrology and hydraulics of the Kilcock AFA due to the presence of a gauging station and flood extent verification events.	Low. Localised works recommended by CFRAMS to protect existing properties	-	-	
140156	Castledermot	Undertake a Detailed Assessment of the Costs of the Potential Measure for Castledermot	IE14-140156-0114-M25	Undertake a detailed assessment of the costs to determine if an economically viable measure may exist that could justify the progression to full project-level assessment.	OPW Kildare and/or County Council.	Existing duties	-76	2.3	1.71	1.14	-33.03	0.5			-	-	-	-	
140162	Graigue namana gh	Progress the development of the Graigue namana gh AFA Flood Relief Scheme	IE14-140162-0314-M33	Progress of the Graigue namana gh Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW and/or Kilkenny/Carlow County Councils.	Existing duties	1096	9.06	35.93	10.26	120.89	1.13	42	15	Low. Maintenance of existing regime	Low. Maintenance of existing regime	-	-	
140162	Graigue namana gh	Progress the Graigue namana gh/Thomastown IPP Pilot	IE14-140162-4914-M43	Progress the Thomastown IPP Pilot through Feasibility Stage to include the design of an Early Flood Warning System along with proposals for individual property protection.	Kilkenny County Council	OPW/D CC.	-	-	-	-	-	-	44	2	-	-	-	-	
140166	Leighlin bridge	Progress the Leighlinbridge AFA Flood Relief Scheme	IE14-140166-0414-M33	Progress the Leighlinbridge Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning /exhibition and, as appropriate, implementation.	OPW and/or Carlow County Council.	Dublin City Council	805	3.29	29	3.91	244.56	1.19	102	42	-	-	-	-	
140168	Mountmellick	Progress the development of the Mountmellick AFA Flood Relief Scheme	IE14-140168-0514-M33	Progress of Mountmellick Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW Laois and/or County Council.	Dublin City Council	1456	3.14	19.87	5.97	464.38	1.9	75	24	Low. Maintenance of existing regime	Low. Maintenance of existing regime	-	-	
140173	Portarlinton	Progress the development of the Portarlinton AFA Flood Relief Scheme	IE14-140173-0614-M33	Progress the Portarlinton Flood Relief Scheme, to project-level development and assessment for refinement and preparation for planning / exhibition and, as appropriate, implementation.	OPW and/or Laois/Offaly County Council.	Dublin City Council	664	5.56	26.06	13.62	119.49	2.45	12	6	Low. Maintenance of existing regime	Low. Maintenance of existing regime	-	-	