



## Shannon Catchment-based Flood Risk Assessment and Management (CFRAM) Study

### Inception Report – Unit of Management 28

### Final Report



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	Originator	Checked by	Reviewed by	Approved by
<b>ORIGINAL</b>	NAME	NAME	NAME	NAME
<b>v0_0</b>	<b>James Murray</b>	<b>Iain Blackwell</b>	<b>Peter Smyth</b>	<b>Mike Hind</b>
DATE	SIGNATURE	SIGNATURE	SIGNATURE	SIGNATURE
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<b>REVISION</b>	NAME	NAME	NAME	NAME
<b>V0_A</b>	<b>Soon Hock Lee</b>	<b>Iain Blackwell</b>	<b>Iain Blackwell</b>	<b>Peter Smyth</b>
DATE	SIGNATURE	SIGNATURE	SIGNATURE	SIGNATURE
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<b>REVISION</b>	NAME	NAME	NAME	NAME
<b>V1_0</b>	<b>Iain Blackwell</b>	<b>James Murray</b>	<b>James Murray</b>	<b>Peter Smyth</b>
DATE	SIGNATURE	SIGNATURE	SIGNATURE	SIGNATURE
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## Glossary

<b>CAR</b>	Community at Risk	A location considered to have a probable significant flood risk, based on the understanding of the location, prior to the Flood Risk Review.
<b>AFRR</b>	Area for Flood Risk Review	A location considered to have a possible significant flood risk, based on the understanding of the location prior to the Flood Risk Review.
<b>APSR</b>	Area of Potential Significant Risk	An area at potentially significant risk, taking account of both likelihood of flooding and consequence.
<b>UoM</b>	Unit of Management	The division of the study area into major catchments and their associated coastal areas.
<b>RBD</b>	River Basin District	The natural geographical and hydrological units for water management, as defined during the implementation of the Water Framework Directive.
<b>PFRA</b>	Preliminary Flood Risk Assessment	A high level screening exercise that identified areas of potentially significant flood risk from all sources, and summarises the probability and harmful consequences of past (historical) and future (potential) flooding.
<b>CFRAM Study</b>	Catchment-based Flood Risk Assessment and Management Study	The five year study covering the whole River Shannon catchment area which gives a picture of past flooding and areas at risk of future flooding, and set out a prioritised set of specific measures for reducing and managing flood risk.

## 1

## Introduction

## 1.1 Scope

The specification for the Inception Report is set out in Section 2.4.2 of the Stage I Project Brief (June 2010) with a separate Inception Report required for each Unit of Management.

The overriding purpose of the Inception Report is to provide a summary of the findings in the study to date, with specific reference to the data collected, its analysis, and how these early study findings are likely to influence the methodology used in the study for the various tasks required under the Shannon CFRAM study.

Based on the extract from the Project Brief (as included in Appendix A) the focus of the Inception Report is on the following key items:

- Detailed Methodology – including constraints and any amendments to the methodology for each key task or discipline;
- Data and Data requirements;
- Survey Requirements; and
- Preliminary Hydrological Assessment and Method Statement.

The Inception Report provides a summary of the project status as at the end of July 2011, six months into the study. It should be noted that this snapshot in time is maintained for the Draft Final and Final Inception Reports, as inevitably, many aspects move on in the intervening period.

## 1.2 Structure of the Inception Report

The structure of the Inception Report is based on the specific items identified in Section 2.4.2 of the Stage I Project Brief as follows.

**Section 1 – Introduction**

This section provides the introduction and background to the National Flood Risk Assessment and Management Programme project, the Shannon CFRAM study and specifically to this Unit of Management.

**Section 2 - Detailed Methodology**

This section covers each of the major discipline areas involved on the project, and for each discipline includes identification of any critical constraints, data problems and other issues that might give rise to opportunities or risks to the Project, and further detail of, or proposed amendments to, the methodologies proposed for use in delivery of the Project.

**Section 3 - Data and Data Requirements**

This section includes details covering:

- data identified, collected, provided and reviewed and a description of the quality, fitness-for-purpose and interpretation of such data;

- a list of outstanding data required, including data sources, critical dates, likely data costs, and the potential detrimental impacts on the Project in the event of this data not being made available; and
- a description of the data which is, and will be, unavailable, the impacts of this absence of data on the Project, and how it is proposed to overcome the problems arising.

## **Section 4 - Survey Requirements**

This section includes preliminary details of the flood defence assets within the Study Area including maps, and provides reference to the survey specifications for channel, structures and defence asset geometric surveys in the Study Area.

## **Section 5 - Preliminary Hydrological Assessment & Method Statement**

This section includes a brief introduction to the context for the Preliminary Hydrological Assessment and Method Statement.

## **Section 6 Inception Phase Conclusions and Summary**

This section includes the main conclusions and summary points for each of the project tasks.

Within the Shannon CFRAM Study, there are a series of five Inception Reports, each covering a different Unit of Management. As each of the Inception Reports needs to be a stand-alone document, there are a significant number of common sections to the reports as the issues or the approach adopted for the study are the same across the entire RBD.

Section 1.6 of the Inception Report is specific to the Unit of Management to which the report relates.

Throughout the rest of the Inception Report, those sections of the report that have issues, methodology, or other aspects that are specific to the Unit of Management, are identified through the use of a single black line to the right of the paragraphs of interest, as indicated for this paragraph.

It is noted that this Inception Report refers to Areas of Potential Significant Risk (APSR). During the Inception Stage of the Shannon CFRAM study this term was redefined as Area for Further Assessment (AFA). For future activities on this study it should be noted that the term APSR will be replaced by the term Area for Further Assessment (AFA). Within the context of the Inception Stage, and this report specifically, the term APSR has been maintained throughout for consistency with other documents prepared during the Inception Stage, notably the Flood Risk Review Report.

## **1.3 National Flood Risk Assessment and Management Programme**

Flood risk in Ireland has historically been addressed through the use of engineered arterial drainage schemes and/or flood relief schemes. In line with internationally changing perspectives, the Government adopted a new policy that has shifted the emphasis in addressing flood risk towards:

- a catchment-based context for managing risk;
- pro-active flood hazard and risk assessment and management; and
- increased use of non-structural and flood impact mitigation measures.

A further influence on the management of flood risk in Ireland is the EU Floods Directive (2007/60/EC) which aims to reduce the adverse consequences of flooding on human health, the environment, cultural heritage and economic activity.

To implement the flood-related Government policy and legislative requirements, CFRAM Studies will be undertaken for those RBDs defined for the purpose of the EU Water Framework Directive which contain catchments within the Republic of Ireland.

Each CFRAM Study will focus on areas known to have experienced **fluvial** and/or **coastal** flooding in the past and areas subject to significant development pressure both now and in the future in each river catchment area.

By 2015, Ireland must establish Flood Risk Management Plans (FRMPs) focused on **prevention, protection and preparedness** for areas identified to be at significant risk of flooding.

#### 1.4 Shannon CFRAM Study and Flood Risk Management Plans

The OPW has commissioned the Shannon CFRAM Study to assess and develop FRMPs. The FRMPs will help to manage the existing flood risk in the Study Area, taking account of the potential future significant increases in this risk due to climate change, ongoing development and other pressures that may arise in the future.

This study will deliver upon many of the principal requirements of the EU Floods Directive; in particular the requirements set out in Articles 6, 7 and 8 and Annex A relating to flood mapping and flood risk management plans.

The objectives of the Shannon CFRAM Study are to:

- Identify and map the existing and potential future flood hazard within the Study Area;
- Assess and map the existing and potential future flood risk within the Study Area;
- Identify viable structural and non-structural options and measures for the effective and sustainable management of flood risk in APSRs and within the catchment as a whole; and
- Prepare a set of FRMPs for the Study Area and associated Strategic Environmental Assessment and, as necessary, Habitats Directive (Appropriate) Assessment.

The FRMPs will set out the policies, strategies, measures and actions that should be pursued by the relevant bodies (including the OPW, local authorities and other stakeholders) to achieve the most cost-effective and sustainable management of existing and potential future flood risk within the Study Area. This in turn will take account of potential environmental effects, environmental plans, objectives and legislative requirements and other statutory plans and requirements.

## 1.5 Shannon CFRAM Study Area

The Shannon RBD (the “Study Area”) is the largest RBD in Ireland, covering approximately 17,800 km<sup>2</sup> and more than 20% of the island of Ireland. The RBD includes the entire catchment of the River Shannon and its estuary as well as some catchments in North Kerry and West Clare that discharge directly to the Atlantic.

The Shannon River rises in the Cuilcagh Mountains, at a location known as the Shannon Pot in the counties of Cavan and Fermanagh. The river flows in a southerly direction before turning west and discharging through the Shannon Estuary to the Atlantic Ocean between counties Clare and Limerick. While the River Shannon is 260 km long from its source to the head of the Shannon Estuary in Limerick City, over its course the river falls less than 200 m in elevation. The Shannon RBD is characterised as an ‘International RBD’ as it extends into Northern Ireland. However, there are no areas identified as being at significant flood risk in the Shannon RBD within Northern Ireland, and no significant cross-border issues.

Significant tributaries of the Shannon include the Inny, Suck and Brosna. There are several lakes in the RBD, including Lough Ree, Lough Derg and Lough Allen.

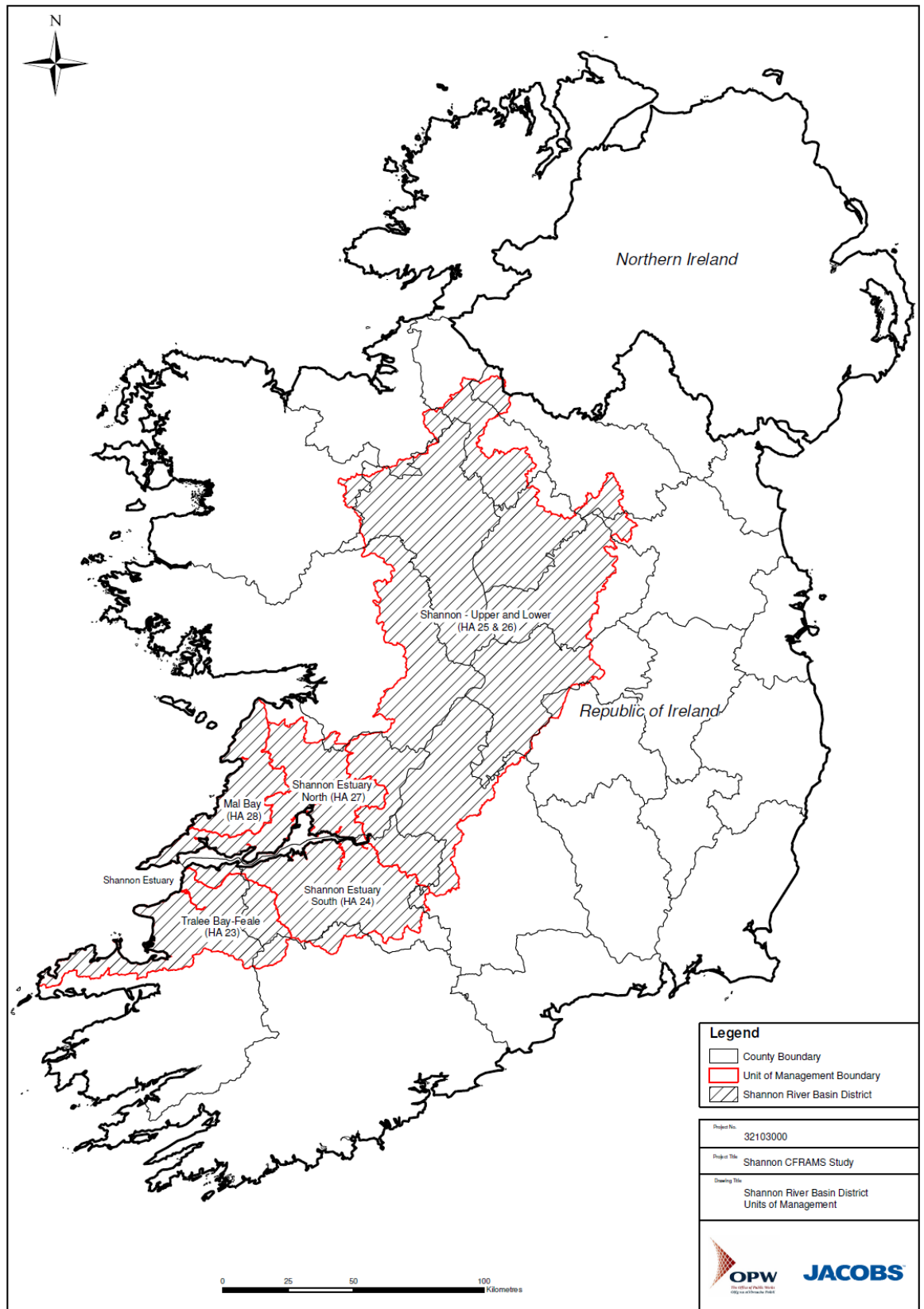
Other important rivers within the RBD include the Maigue, Deel and Feale discharging into the Shannon Estuary from the south, and the Fergus, Owenogarney (or Ratty) and Cloon discharging into the estuary from the north.

The RBD includes parts of 17 counties: Limerick, Clare, Tipperary, Offaly, Westmeath, Longford, Roscommon, Kerry, Galway, Leitrim, Cavan, Sligo, Mayo, Cork, Laois, Meath and Fermanagh. While much of the settlement in the RBD is rural there are six significant urban centres within the RBD - Limerick City, Ennis, Tralee, Mullingar, Athlone and Tullamore.

As defined under the Water Framework Directive (WFD) where the study area comprises a RBD, this is divided further into Units of Management (UoM). The UoMs constitute major catchments or river basins (typically greater than 1000km<sup>2</sup>) and their associated coastal areas, or conglomerations of smaller river basins and their associated coastal areas. The Shannon RBD (and by definition the Shannon CFRAM Study Area) and the Units of Management within the Shannon RBD are shown in Figure 1. There are five Units of Management (UoM) within the Study Area, as marked on Figure 1:

- Tralee Bay – Feale (Hydrometric Area 23 – ‘HA23’) – UoM 23
- Shannon Estuary South - (Hydrometric Area 24 – ‘HA24’) – UoM 24
- Shannon Upper and Lower (Hydrometric Area 25 & 26 – ‘HA25-26’) – UoM 25-26
- Shannon Estuary North (Hydrometric Area 27 – ‘HA27’) – UoM 27
- Mal Bay (Hydrometric Area 28 – ‘HA-28’) – UoM 28

FRMPs and associated flood mapping will be developed for the whole of the Shannon RBD and reported to the European Commission as required under the EU Flood Directive..



**Figure 1 Shannon RBD and its Units of Management**



## 1.6 Unit of Management HA28

### 1.6.1 Catchment Description

This Inception Report is for the 'Mal Bay' Unit of Management. Separate Inception Reports are prepared for each of the other four Units of Management. The 'Mal Bay' Unit of Management (or UoM 28), covers part of West County Clare (Figure 2).

The area is bounded to the west by the Atlantic Ocean. The boundary to the east is the topographic divide between those rivers and streams that eventually flow into the Shannon Estuary (located in UoM 27) and those which flow to the west discharging to the Atlantic Coast (located in UoM 28). To the south, the boundary is the generally low lying area that also forms the divide between UoM 27 and 28.

This Unit of Management is variable in nature comprising:

- the upland limestone area in the western part of The Burren in the north;
- the lowland area drained by the Inagh (or Cullenagh) River and the upland area between Ennis and Milltown Malbay in the centre; and
- low lying land towards the south.

UoM 28 is characterised by numerous small to medium sized catchments, with the rivers flowing predominantly east to west. The largest rivers in this Unit of Management, all discharging to the Atlantic Ocean, are:

- the Aille River - discharging near Doolin;
- the Aughyvackeen River and the Inagh (Cullenagh) River – discharging between Lehinch and Liscannor;
- the Doonbeg River – discharging at Doonbeg.

The coastal reach within this area is variable, including rocky steep, high cliffs as well as extensive sand dune systems and natural shingle ridges. Some inland areas behind the natural coastal defences are low lying, with extensive land drainage networks which can be tidally influenced.

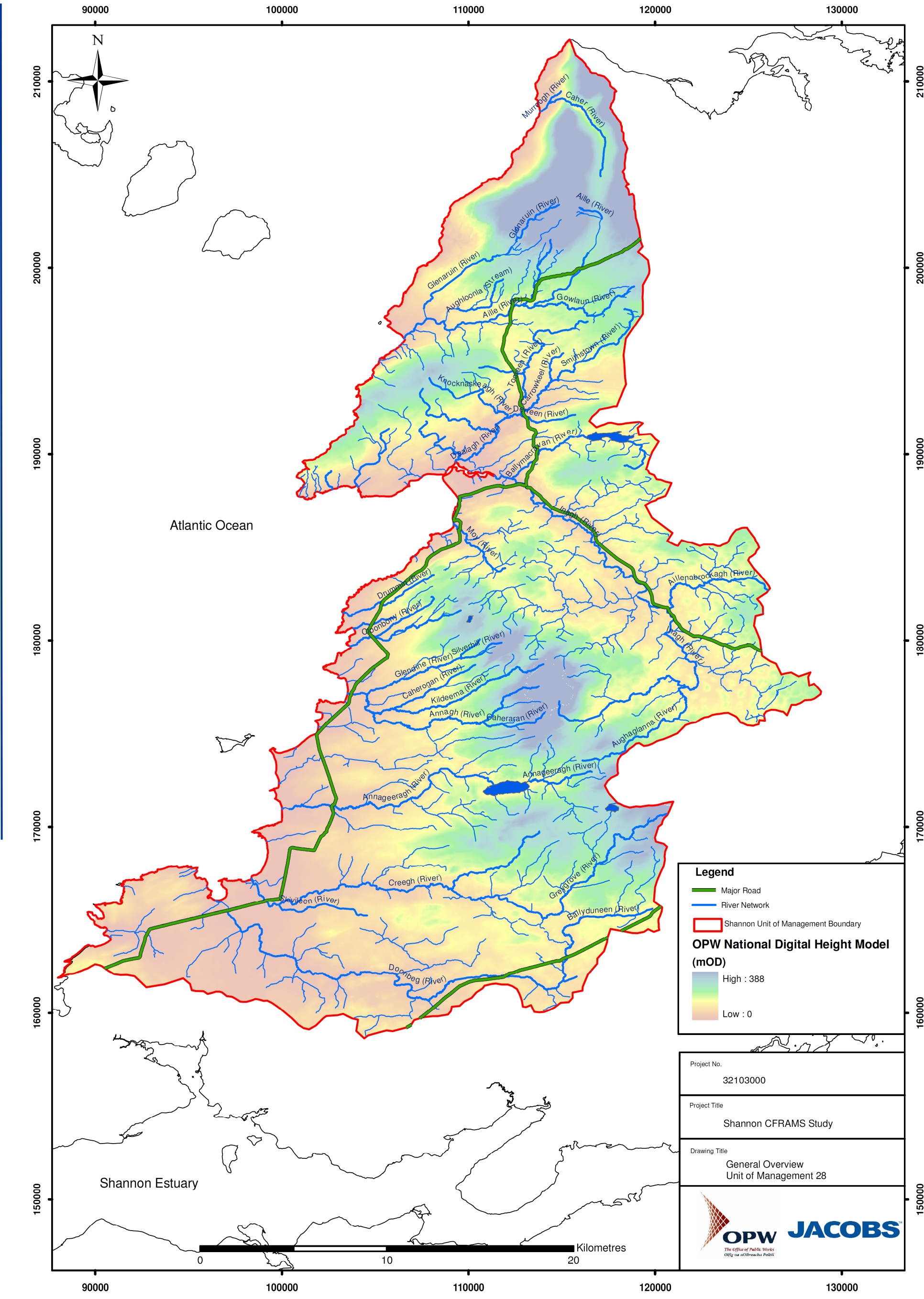


Figure 2 Mal Bay Unit of Management

### 1.6.2 Areas of Potential Significant Risk

The Stage II Project Brief identified Communities at Risk (CAR) and Areas for Flood Risk Review (AFRR). One of the early activities on the Shannon CFRAM Study has been to undertake a Flood Risk Review for all of these locations, as well as several additional locations, not included in the Stage II Project Brief. Full details are given in the Draft Flood Risk Review Report.

One of the primary objectives of the Flood Risk Review has been to identify which of the CAR and AFRR should be designated as Areas of Potential Significant Risk (APSR). The Draft Flood Risk Review Report (June 2011) does not recommend any sites within UoM 28 to be designated as APSRs, as shown in Table 1-A. The locations of the CARs and AFRRs are shown on Figure 3.

Site ID	Name	County	CAR or AFRR in Brief	Recommendation from Draft Flood Risk Review
CAR 17	Carrowmore	Clare	CAR	Not APSR
AFRR 40	Tromracastle	Clare	AFRR	Not APSR

**Table 1-A Summary of APSR Recommendations for UoM 28 from the Draft Flood Risk Review**

The recommendation from the Draft Flood Risk Review Report that no sites should be designated as APSRs has implications for the future activities on the project with regard to the scale and nature of various tasks within UoM 28. These issues are described within Sections 2.4 to 2.12 as it affects each task, with additional details included, as necessary in relation to: Data (Section 3); Surveys (Section 4) and Hydrology (Section 5).

### 1.6.3 Individual Risk Receptors

A number of assets within the Shannon RBD have been identified as Individual Risk Receptors (IRRs). These assets are located outside of an Area of Potential Significant Risk and if flooded, would give rise to significant detrimental impact or damage.

There are no individual risk receptors located within UoM 28.

### 1.6.4 Consideration of UoM 28 with UoM 27

It is noted that the recommendation from the Flood Risk Review is that there are no APSRs within UoM 28 (Table 1-A). In relation to the EU Floods Directive, and its transposition into Irish Law under Statutory Instrument No. 122 (2010), a Flood Risk Management Plan (and associated maps) are only required for areas identified as being at potentially significant flood risk. This is outlined below based on extracts from SI 122 (2010):

#### Section 15(1):

*Flood risk management plans.*

*15. (1) On the basis of the maps referred to in Section 11, the Commissioners shall establish flood risk management plans co-ordinated at the level of the river basin district, or unit of management referred to in Section 4(2)(a), for the areas identified under Section 10(1) in accordance with subsections (2) and (3) of this section.*

**Section 10(1):**

*Areas of potential significant flood risks.*

*10. (1) On the basis of a preliminary flood risk assessment as referred to in Section 7 the Commissioners shall, for each river basin district, or unit of management referred to in Section 4(2)(a), or portion of an international river basin district lying within the territory of the State, identify those areas for which they conclude that potential significant flood risks exist or might be considered likely to occur.*

Whilst it is apparent that a FRMP may not be required for UoM 28 if there are no APSRs within UoM 28, from the National Flood Policy Review, and the subsequent development of the National CFRAM Programme, there is a drive to develop FRMPs covering the entire country. In this regard it would not be acceptable to have no strategic plan (delivered through the FRMP) for any individual Unit of Management.

Taking the above into account it is recommended that UoM 28 should be considered jointly with UoM 27 to form a single, larger Unit of Management. This recommendation is made primarily in the event that there are no APSRs within UoM 28. However, in the event that there are only a small number of APSRs within UoM 28, this approach should be considered to deliver efficiencies in undertaking specific tasks.



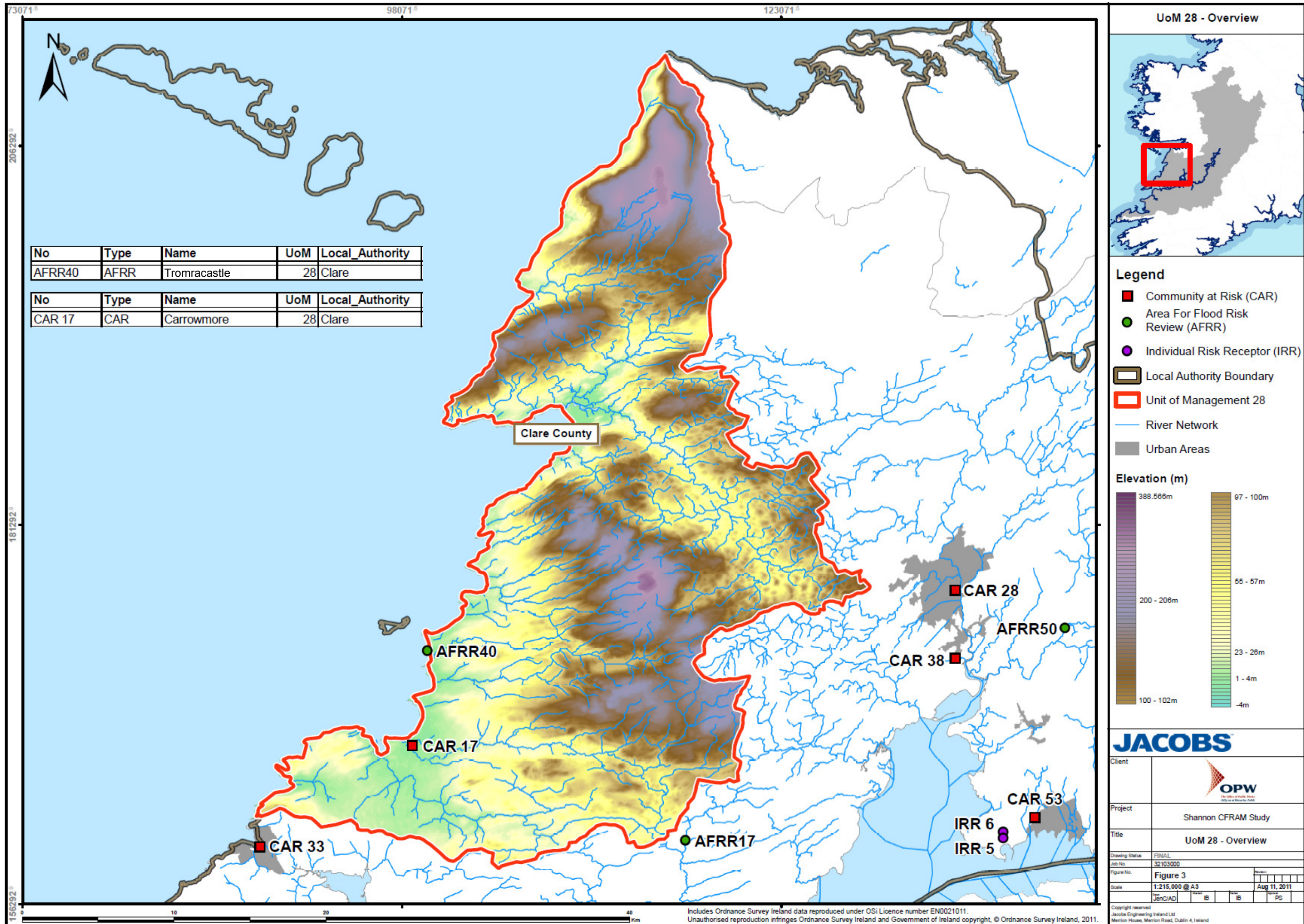


Figure 3 Unit of Management Overview

**2****Detailed Methodology****2.1 Introduction**

For each of the main tasks and technical discipline areas involved in the study, each of the following sub-sections summarises:

- any critical constraints, data problems or other issues that have been identified that might give rise to opportunities for, or risks to, the Project; and
- further detail of, or proposed amendments to, the methodologies proposed for use in delivery of the Project based on the enhanced familiarity with the Study Area and with the data collected over the start-up period of the Project.

The disciplines covered are based on the Stage I Project Brief and cover the following:

- Project Management
- Data Collection
- Flood Risk Review
- Surveys
- Hydrological Analysis
- Hydraulic Analysis
- Flood Risk Assessment
- Environmental Assessment
- Consultation and Engagement
- Development of Flood Risk Management Options
- Preparation of a Flood Risk Management Plan

This section of the report is intended to give a brief overview in relation to each task. Subsequent sections of the report give greater detail on some of the main tasks that have been a particular focus of the early stages of the Shannon CFRAM study, namely Data, Surveys, and Hydrological Analysis.

**2.2 Project Management**

Our general approach to Project Management is the implementation of a programme based philosophy supported by tools such as Risk and Opportunities Register, Organisational Chart, Issues Chart and Meeting Actions. All this information is available to OPW for viewing on the web based platform; Sharepoint.

Details included below apply across all Units of Management within the Shannon RBD, and provide the context for some specific comments in relation to this Unit of Management.

**2.2.1 Management Arrangements**

We have adopted a matrix approach to the management of our Shannon CFRAM Study commissions. Discipline Leads have responsibility for technical delivery of



tasks, with co-ordination and commercial responsibility shared as shown in Table 2-A below.

Title - Name	Description	Area
Project Director	Ultimate responsibility for the delivery of the project, with a particular focus on quality.	All
Project Manager	Primary point of contact and lead on our 'programme management' approach.	All
Area FRMP delivery lead (South)	Area leads are responsible for delivery of aspects within their designated UoMs. They are also responsible for developing an understanding and familiarity with issues specific to the individual UoM.	UoM 23, 24, 27 and 28
Area FRMP delivery lead (North)		UoM 25/26

**Table 2-A Co-ordination and commercial responsibility**

### 2.2.2 Web-Based Work Platform: Sharepoint

A web-based portal for the distribution of documents and information to Jacobs, OPW and Local / Regional Authority staff has been developed utilising the Microsoft Sharepoint package.

The portal is located at <http://ipe.jacobs.com/ShannonCFRAM> and is accessible to all named OPW, Jacobs and Local / Regional Authority staff.

Permissions vary according to the organisation and the document being viewed. The portal has been structured such that documents may be restricted to Jacobs staff only and/or Jacobs and OPW staff only, as well as being open to all named accounts. The organisations with access to Sharepoint (in addition to Jacobs and OPW) are listed Table 2-B.

Organisation	
Mid-West Regional Authority	Limerick County Council
South-west Regional Authority	Longford County Council
Midlands Regional Authority	Meath County Council
Clare County Council	Offaly County Council
Galway County Council	Roscommon County Council
Kerry County Council	Sligo County Council
Laois County Council	Tipperary North County Council
Leitrim County Council	Westmeath County Council
Limerick City Council	

**Table 2-B Organisations with Access to Sharepoint**



### 2.2.3 Project Website

We have developed a Project Website an extract of which is shown in Figure 4.



**Figure 4** Screen shot of Project Website

### 2.2.4 Health and Safety

Our approach to Health and Safety has been as outlined in our Tender Stage 1 submission. We can confirm that, to date, there have been no incidents or injuries during delivery of this project.

We have been appointed PSDP for the project by OPW. It was agreed with OPW that the gauging station survey contract did not require a PSDP appointment.

Team members have undergone working near / on water health and safety training which is relevant to most of the on-site work that will be carried out over the course of this project.

Our method statements and risk assessments for our extensive site visits during the first six months of the study have been updated to reflect new risks identified as the study has progressed.

### 2.2.5 Technical Training

A Technical Note, reference 32103000/TD23 V0.0, was issued to OPW on the 9<sup>th</sup> June 2011. This Note outlines our proposed approach to enhance technical understanding and capacity and facilitate effective engagement of those involved with the Project. We shall develop, prepare and deliver a programme of technical training which will be applicable for the Shannon CFRAM Study but can also be applied generically for other CFRAM Studies.

See Technical Note 32103000/TD23 V0.0 for further details.

## 2.3 Data Collection

An overview of the data collection completed to date is presented in the following sections. Further detail is given in Section 3 of this report.

The progress and issues related to Data Collection, as outlined below, is best considered within the context of the entire Shannon RBD.

### 2.3.1 Summary of Work Completed

Consultations have been undertaken with OPW and other stakeholders to obtain data relevant to the study. Consultations have been completed via:

- Gap analysis of datasets provided by OPW following the Inception Meeting of the 26<sup>th</sup> January 2011;
- Submission of External Data Requests to stakeholders including OPW, Local Authorities, Regional Authorities, ESB, Met Eireann and Waterways Ireland; and
- Stakeholder meetings, following up on External Data Requests where necessary.

### 2.3.2 Constraints, Data Problems and Other Issues

Data quality and outstanding data issues affecting each particular discipline are detailed for each specific discipline within Section 2 and are also summarised in Section 3.

### 2.3.3 Amendments to Methodology

No amendments have been made to the proposed methodology outlined at tender stage.

## 2.4 Flood Risk Review

The specification for the Flood Risk Review is set out in Section 4 of the Stage I Project Brief (June 2010) and Section 2.11 of the Stage II Shannon CFRAM Study Project Brief (October 2010).

The Flood Risk Review site visits are now complete and the draft report has been submitted to OPW for review, which contains details of all Units of Management.

### 2.4.1 Summary of Work Completed

The Draft Flood Risk Review Report recommends locations in the Shannon RBD that are considered to be Areas of Potential Significant Risk (APSR). OPW, in consultation with the Local Authorities, will use the findings of this Draft Flood Risk Review Report to confirm the final APSR list, following which the extent and direction for all future activities on the project will be set.

In total, 107 locations were considered in the Draft Flood Risk Review Report. This comprised 57 Communities at Risk (CAR) and 50 Areas for Flood Risk Review (AFRR), as defined in the Project Brief and through subsequent minor additions. These locations were identified by OPW based on a national Preliminary Flood Risk Assessment.

The Flood Risk Review has included a desk-based assessment of each location taking account of the Preliminary Flood Risk Assessment findings, and a range of readily available datasets. A visit to each location has further informed the assessment.

The findings from the PFRA have been reviewed both in terms of the desk-based study and a ground truthing site visit. In general, verification of receptors and flood hazard extents was found to be good, although some areas of uncertainty at specific locations have been identified.

The desk-based assessment combined with the site visit for each location has been the basis for concluding whether the location should be identified as an APSR or not.

For this UoM, the sites visited under the Flood Risk Review activity, and the recommended designation of each location (as an APSR or not) are listed in Table 1-A in Section 1.6.2 of this Inception Report.

#### **2.4.2 Constraints, Data Problems and Other Issues**

The Draft Flood Risk Review Report is now completed and there are no outstanding constraints, data problems or other issues related to our current scope. However, it is recognised that there is a possibility that we may be requested by OPW to undertake further Flood Risk Review assessments, and these would be an addition to the current scope.

The site visits undertaken highlighted some important considerations around the watercourses identified in the EPA “Blue Line” network. Issues include watercourses identified by the “Blue Line” that are not considered to pose a fluvial flood risk, as well as other watercourses not identified by the “Blue Line” that are considered to give a fluvial flood risk. This is important in terms of the significant cost of survey of these channels, and to ensure that the watercourses which will be hydraulically modelled are appropriate.

#### **2.4.3 Amendments to Methodology**

Our approach was based on the proposals we have set out in our Stage I and Stage II tender responses to meet the requirements of the Project Brief. This approach was further reiterated and outlined in the Technical Note; Flood Risk Review Method Statement; reference 32103000/TD3 V0.0.

While there were no significant amendments to the Methodology described in our Stage I and Stage II tender responses and the Note referred to above there were some minor revisions to the Desktop Review and Site Visit Evaluation Pro-forma. These amendments were based on improving presentation as the review developed, the only noteworthy change being the removal of the Threshold Site Visit Review Score (SRVS).

Initially the Threshold SRVS was proposed as a cut off point above which a site would be considered for designation as an APSR. This was removed following discussions which confirmed that the SRVS was appropriate for informing designation but the final decision on designation would ultimately come down to engineering judgment by our FRR Team leads.

## 2.5 Surveys

Survey is considered in further detail in Section 4 of this report.

In the sections below, the specific requirements of this UoM are, in several respects, linked to wider survey considerations across the rest of the RBD. Where necessary, specific reference is made to this UoM within the context of these wider considerations.

### 2.5.1 Summary of Work Completed

#### (a) Methodology Summary

Our methodology has been reviewed and refined in the context that all the survey works are on the critical path of the project. We have elected to adopt a different approach to the works we directly manage so as to minimise possible disruption due to the delay in topographic survey information. Our approach is detailed in (c) below.

#### (b) Defence Asset Condition Survey

We have gathered relevant data and undertaken an overview of the extent of Defence Assets within proposed APSRs across the Shannon RBD and in locations outside any potential APSRs.

As discussed in Section 1.6.2 of this Report, the Draft Flood Risk Review Report recommends no APSR locations within UoM 28. A consequence of this, in the event that it is confirmed that there are no APSRs, is that there would be no APSR asset inspections undertaken for this Unit of Management. It is, however, recognised that the Stage II Project Brief specifies the inspection of a non-APSR asset upstream of Carrowmore.

We will be developing more detailed survey requirements in the coming months. Further information is included in Section 4 of this report.

#### (c) Channel and Structure Survey

We identified in our tender submission that we considered the gathering of survey information as a critical programme aspect of this project. We have focused on various measures to try to reduce this risk as well as identifying areas where information gathering can be accelerated.

Initially we agreed with OPW that the most efficient approach would be to adopt the contract documents that OPW had commissioned from JBA for the survey requirements for (amongst other areas) Units of Management 25 and 26.

On receipt of the draft survey contract document in early May 2011, we put forward various suggestions regarding the approach to the procurement in our Technical Note No. 32103000/TD016 V0.0, issued on the 20<sup>th</sup> April 2011.

Following issue of this Technical Note and further discussions with OPW, it was agreed that the survey contracts for which Jacobs were responsible for managing on behalf of OPW, should adopt the Department of Finance Conditions of Engagement for Consultancy Services (Technical) (CoE1) as the survey contract. It is considered that these conditions are more robust for managing contractors within

tight timescales and strict provisions for payment based on final acceptable deliverables have been introduced along with Liquidated Damages for late delivery. A programme for delivery will be included in the contract that dovetails into the model build programme so as to allow efficient use of modelling resources. Our Technical Note 32103000/TD030 V0.0 provides further details of our approach.

We are proposing that two main OJEU survey contracts should be procured for UoMs 23, 24, 27 and 28, to increase the rate of delivery of surveying services. We were concerned that in the current depressed market, resources are severely depleted and the programme might be influenced by the performance of a single survey contractor.

We have proposed small advance contracts for undertaking surveys of the 16 gauging stations in UoMs 23, 24 and 27 (note; there are no specified gauging stations for UoM 28) and the Ballylongford APSR (in UoM 24). The former is to give early access to the hydrologists of gauging information and production of calibration curves for out of bank flows; the latter is part of proposals to advance Unit of Management 24 as a pilot study for the wider project, as well as undertaking the survey of various gauging stations. This work will be procured from tenderers who have responded to a PQQ process designed and implemented by Jacobs. The details of the PQQ responses and our recommendations are included in our Technical Note 32103000/TD029 V0.0. Two contracts will be awarded, although neither of these survey contracts is of specific relevance to UoM 28. It is anticipated that survey work on these advance contracts could start in late September 2011 with deliverables available by Christmas 2011.

The procurement process for the two main OJEU contracts has been slightly delayed by the need to develop contracts to maximise the value obtained from the survey work and reduce the risk of much greater programme delays, during delivery. It is anticipated that these two main OJEU survey contracts will begin issuing draft deliverables in January 2012.

Our Technical Notes 32103000/TD016 V0.0 and 32103000/TD030 V0.0 proposed a strategic procurement approach as well as proposing a variety of measures to minimise the risk of delay in the provision of survey information to the main project.

In summary our approach to date has been based on minimising the risk of delays to the overall project by maximising the access to survey resource, developing robust conditions of contract to manage the performance of the survey contractors and bringing forward specific requirements into small contracts in advance of the two main OJEU survey contracts.

#### **(d) Floodplain Survey**

The majority of the floodplain survey will be undertaken by LiDAR under a contract to be let by OPW. In the channel survey contracts we have proposed extended cross-sections beyond the minimum 20m specified requirement where necessary to provide an accurate tie-in to the LiDAR information.

#### **(e) Property Survey**

We have yet to identify vulnerable properties that may require threshold level information.

## 2.5.2 Constraints, Data Problems and Other Issues

We have noted that there will be a substantial number of photographs generated by the survey specification requirements and we have raised the issue as to how these should be referenced for future access. We would propose that the cross section photographs should be included within Table D6.2 of Appendix D of the specification.

## 2.5.3 Amendments to Methodology

In relation to UoM 28, all of the generic amendments described in Items (a) to (e) below would equally apply to whatever survey is undertaken in UoM 28. However, given that there may be no APSRs identified within UoM 28, there would be no hydraulic modelling or flood risk assessment requirement, and therefore no channel and structure survey requirement to support these activities. However, there would remain a need to undertake the defence asset condition survey of the small number of existing assets near Carrowmore, the exact location of which is discussed further in Section 4.1.3 of this report.

### (a) Methodology Summary

We have agreed that the Southern gauging stations (in UoMs 23, 24 and 27 – note there are no gauging stations for review in UoM 28) and Balllylongford APSR (in UoM 24) should be procured as advance survey contracts to give early access to the model build teams. This will allow them to develop the appropriate protocols in advance of the two main OJEU survey works being delivered.

### (b) Defence Asset Condition Survey

We are reviewing the information obtained during the flood risk reviews to ascertain the best way of undertaking these surveys.

### (c) Channel and Structure Survey

We do not envisage any substantial change in the channel and structure survey other than contractual options to accelerate progress.

### (d) Floodplain Survey

We do not envisage any substantial change in the floodplain survey pending the delivery of the LiDAR information.

### (e) Property Survey

We anticipate that the survey approach where required will be developed once flood levels have been established.

## 2.6 Hydrological Analysis

The hydrological analysis forms a major part of the Inception Report, as indicated in the Inception Report requirements listed in Section 2.4.2 of the Stage I Project Brief.

In the early part of the Shannon CFRAM Study, a major emphasis has been placed on the hydrological aspects as this has a fundamental bearing on the future



approaches to be used on the study in terms of developing suitable flood flow estimates to feed in to the hydraulic model, which ultimately leads to the preparation of one of the key study deliverables – the flood extent and flood hazard maps.

The work undertaken for the hydrological analysis to date will form the basis of a significant part of the Hydrological Report, scheduled for delivery in 2012. For this reason the hydrological aspects of the Inception Report are developed as a stand alone report – the **Preliminary Hydrological Assessment and Method Statement** - which is included as Appendix B to this Inception Report.

This has the advantage of providing a solid basis for agreeing the content of the Hydrological Report, which is to be confirmed through the National Technical Co-ordination Group.

The specific requirements of this section of the Inception Report are covered in detail in Appendix B with delivery of the **Preliminary Hydrological Assessment and Method Statement**. These requirements are:

- Identification of critical constraints, data problems and other issues that may give rise to opportunities or risks to the project; and
- Detail of, or proposed amendments to, the methodologies proposed for use in delivery of the study.

## 2.7 Hydraulic Analysis

### 2.7.1 Summary of Work Completed

We have divided the reaches requiring modelling into model groups. In some cases we propose to use a single model to represent an entire river catchment. However, for larger catchments we have divided the model reaches into separate models, based on an assessment of the number of cross sections, structures and likely areas of 2D modelling required. The area of likely 2D model extent is an indicative estimate based on the area of existing flood map present within an APSR boundary. The groupings have been selected so that the predicted model run times are computationally manageable.

A total of 44 models have been planned for the whole Shannon RBD, numbered N1-N21 in the North (UoM 25/26) and S1 – S23 in the South (UoM 23, 24, 27 and 28).

There are currently no hydraulics models planned for UoM 28 as no APSRs have been recommended from the Flood Risk Review for this Unit of Management. In the event that this changes as a result of new sites being added for consideration in the Flood Risk Review, an associated hydraulic modelling model plan will be developed accordingly.

### 2.7.2 Constraints, Data Problems and Other Issues

Requests have been made for any hydraulic models in the Unit of Management to be provided. We have not received any associated existing hydraulic models and are proceeding on the assumption that there are none available.



### 2.7.3 Amendments to Methodology

There are no envisaged amendments to the proposed methodology, although, as outlined in Section 2.7.1 no hydraulic modelling activities are envisaged for UoM 28, as no APSRs have been recommended by the Draft Flood Risk Review Report.

## 2.8 Flood Risk Assessment

The flood risk assessment activity is centred on assessing flood risk for key flood risk receptor groups covering:

- **Social risk** – location and number of residential properties; social infrastructure covering highly vulnerable sites (such as children's residential homes, homes for the elderly etc.) and high value assets (such as Garda stations, fire stations, hospitals, schools etc.); and social amenity sites (such as parks and leisure facilities).
- **Risk to the Environment** – areas related to integrated pollution prevention and control (IPPC) sites; locations identified under the Water framework Directive; and other environmentally valuable sites such as Special Areas of Conservation (SAC).
- **Risk to Cultural Heritage** – sites of cultural value at risk.
- **Risk to the Economy** – based on type of residential and commercial properties at risk in different magnitude events; transport infrastructure assets (such as roads, railways, ports and airports); utility assets (such as power, water and wastewater, oil and gas facilities etc.).

This will be mapped on a series of Flood Risk Maps.

### 2.8.1 Summary of Work Completed

No work has formally commenced on the Flood Risk Assessment activity. However, notwithstanding the conclusions for the Draft Flood Risk Review Report, the site visits undertaken to date have confirmed the identification of the location of many critical receptors in the four categories identified above. Additionally, as part of the data collection for the Flood Risk Review and Environmental Assessment, much of the data required for this activity has been collected.

### 2.8.2 Constraints, Data Problems and Other Issues

The data gathered to date has provided significant information to inform each of the four receptor groups outlined above.

For the data not yet obtained and used on activities to date, we do not envisage there being any significant data difficulties. In terms of requesting the data, we would anticipate that the vast majority, if not all, of the data required for this activity will have been requested for other activities and these requests will be made at an appropriate stage in the project to ensure that the latest datasets are used.

Notwithstanding the conclusions of the Draft Flood Risk Review Report, the main data issue in relation to the Flood Risk Assessment is likely to be the provision of up to date data in the Geo-Directory database. We have noted at various locations that there are recently constructed properties that are not shown in the Geo-Directory

database. These will need to be included in the overall economic appraisal, and will affect the mapping and analysis related to Social Risk and Risk to the Economy.

### 2.8.3 Amendments to Methodology

There are no specific amendments to the methodology proposed at tender stage and emphasise that the outputs for this stage will be largely GIS-driven, with receptors grouped into the four principal risk receptor categories, in combination with the flood mapping output from the hydraulic modelling activity.

It is noted that in the absence of any APSRs or IRRs in UoM 28, there would not be any Flood Risk Assessment.

## 2.9 Environmental Assessment

There are two distinct environmental assessment processes applicable to the Shannon CFRAM Study: Strategic Environmental Assessment (SEA) and Appropriate Assessment (AA). Both processes will be integral to a number of Study tasks, namely:

- Flood Risk Assessment;
- Consultation and Engagement;
- Development of Flood Risk Management Options; and
- Flood Risk Management Plan preparation.

### 2.9.1 Strategic Environmental Assessment

The FRMP for UoM 28 will be subject to a SEA whether delivered as a stand alone Report or incorporated with UoM 27 (refer to Section 1.6.4 of this Report). The SEA process can be defined by four stages, all of which include some level of consultation with stakeholders and the public. We are currently at Stage 2 of the SEA process – **Scoping**. Figure 5 illustrates the links between the SEA stages and the SEA deliverables associated with the FRMP for UoM 28.

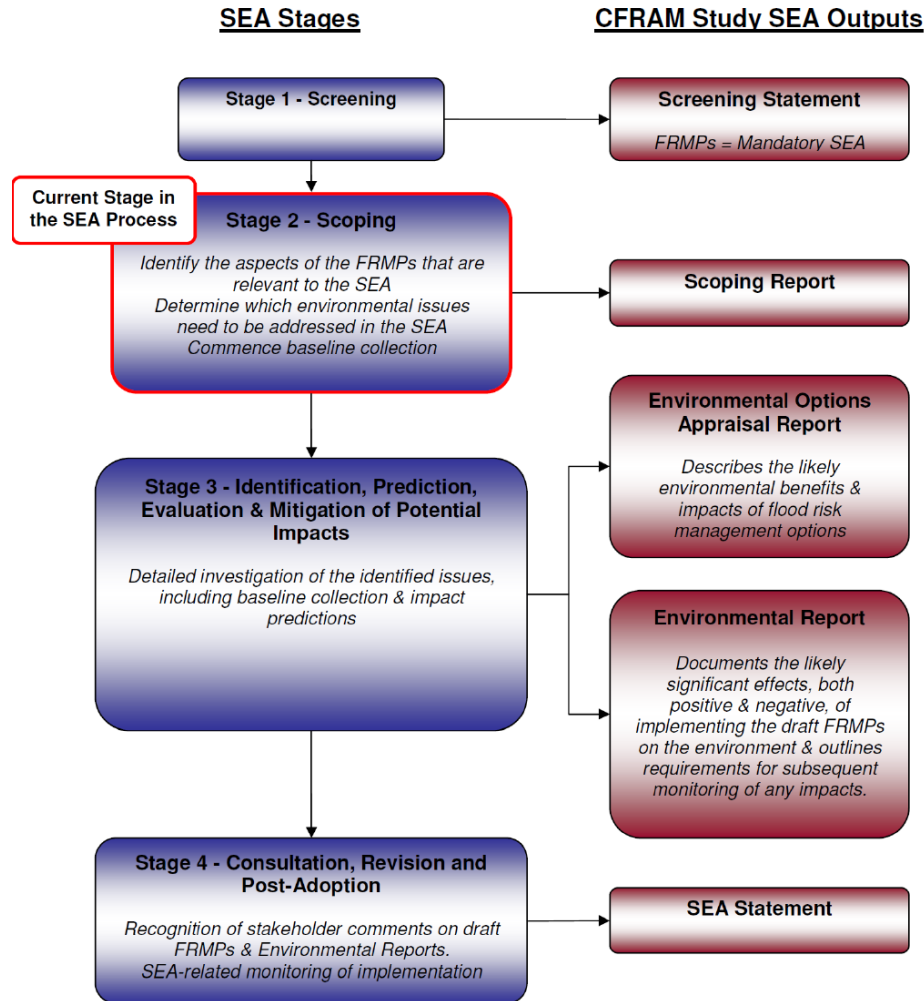


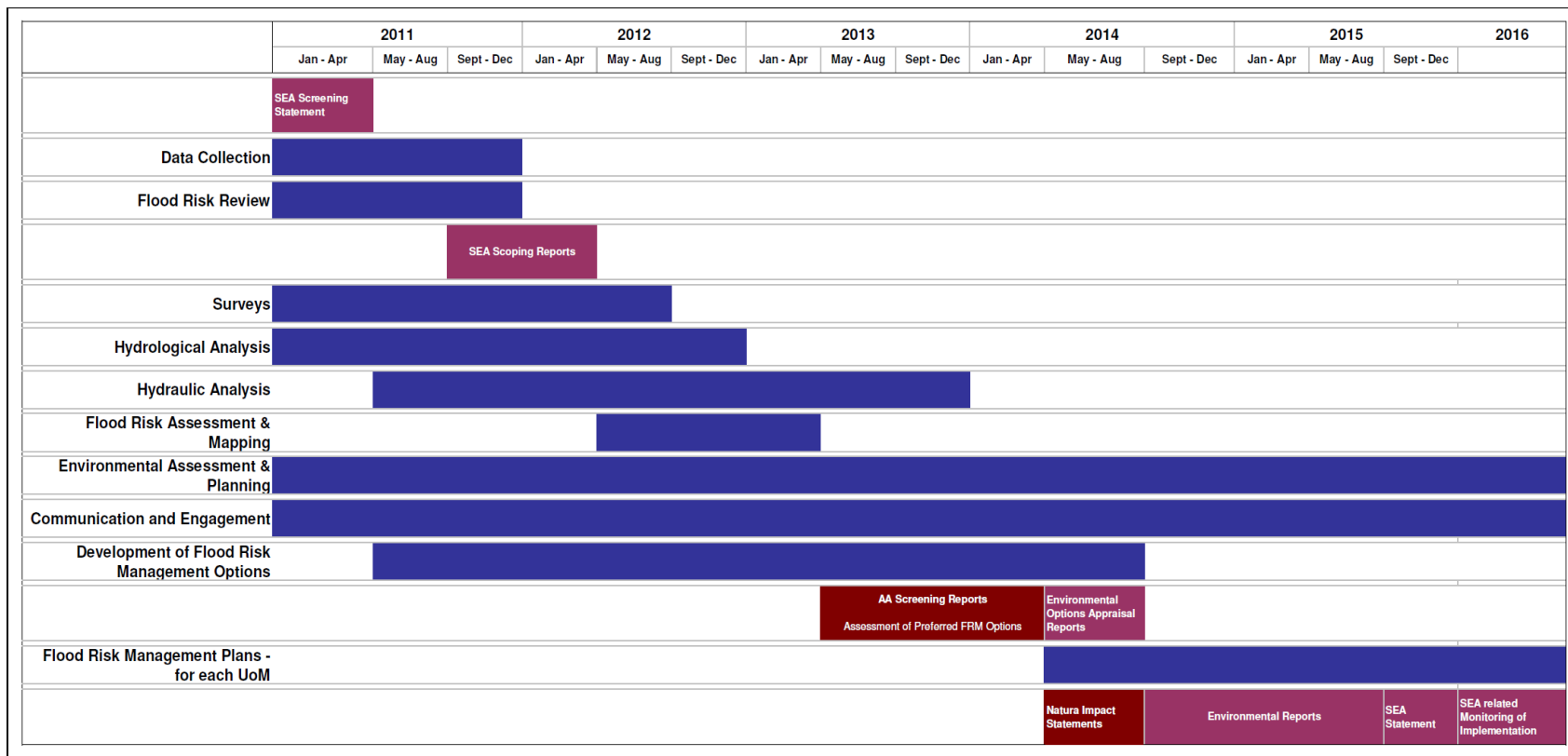
Figure 5 Stages of the SEA associated with the development of the FRMP

## 2.9.2 Appropriate Assessment

An AA will be undertaken to identify and address any potential impacts the flood risk management options and the FRMP might have on areas designated as *Natura 2000* sites as well as any associated candidate sites.

Work associated with the AA will be undertaken concurrently with the SEA, but both processes will be clearly distinguished and the AA will result in the production of an AA Screening Statement and, if appropriate, a *Natura Impact Statement (NIS)* for the UoM 28 FRMP. The NIS will establish whether or not a FRMP is likely to have a significant impact on any *Natura 2000* site in the context of their conservation objectives and on the habitats and species for which a *Natura 2000* site have been designated.

Using the provisional Study programme, Figure 6 illustrates how the Study tasks relate with the outputs of both the SEA and AA processes. It is emphasised that this is a high level programme with the timing of activities shown within 4-month periods, such that the start or end of an activity bar does not indicate the actual start or completion date of that activity.



**Figure 6 Relationship between the Study tasks and Outputs of the SEA and AA processes**

### 2.9.3 Summary of Work Completed

The following tasks have been completed, covering all Units of Management:

- Initial literature review to inform the identification and engagement of SEA / AA related stakeholders;
- Identification and register of key stakeholders:
  - Statutory consultees (Environmental Authorities) for the SEA, namely:
    - Environmental Protection Agency (EPA);
    - Department of Communication, Energy and Natural Resources (DCENR) (to include Inland Fisheries Ireland (IFI));
    - Department of Arts, Heritage and Gaeltacht (DAHG) (with regards archaeological, architectural and natural heritage); and
    - Department of Agriculture, Marine and Food (DAMF) (with regard to marine fisheries).
  - Primary and Secondary stakeholders.
- Strategic Environmental Issues Paper relevant to all UoMs. This document provides an overview of the Shannon CFRAM Study and proposed FRMPs and also summarises initial thoughts on issues relating to flood risk management and the wider environment. This will be used to consult with and engage stakeholders; and
- Presentations/meetings with the EPA and IFI as well as tele-communication and written correspondence with other Environmental Authorities and Primary Stakeholders to scope and arrange an Environmental Pre-Scoping Workshop (held on 27<sup>th</sup> July 2011).

The following tasks are in progress:

- Data collection and detailed literature review to establish the environmental baseline;
- Preparation of documentation such as presentations, workshop materials and maps, to facilitate consultation and engagement of key stakeholders;
- Development of the Environmental Scoping Report; and
- Preparation of environmental training material (as required by Section 2.10 of the Stage 1 Brief).

### 2.9.4 Constraints, Data Problems and Other Issues

No significant issues have been identified to date. Initial thoughts on the key issues have been outlined in the Environmental Issues Paper, and as the SEA process develops, we will investigate and report further on existing and future environmental characteristics of the Study Area which can influence the risk and repercussions of flooding and constrain or provide opportunities for the implementation of strategic flood risk management options.

Data collection for the SEA and AA has been limited to date as it is considered more appropriate to first seek input from the Environmental Authorities at the Environmental Pre-Scoping Workshop (held in July 2011). This will help facilitate a more focused, efficient approach to data collection. Also, it is acknowledged that some datasets may become out-dated as the study progresses over its 5-year programme, and guidance from the Environmental Authorities will help establish an effective method of data collection and maintenance.

## 2.9.5 Amendments to Methodology

There are no amendments to the methodology outlined in the Stage 1 Brief. The SEA and AA will be undertaken in accordance with Section 9 and Appendix K of the Stage I Brief, and the relevant EU Directives and transposing regulations.

Whilst there are no specific amendments to the methodology employed, it is recognised that in the event that there are no APSRs within UoM 28, the requirements for SEA will be limited, and the need for AA will be removed if there are no options to assess impacting on Natura 2000 sites (or associated candidate sites). Therefore, as outlined in Section 1.6.4 of this Report, it is recommended that the SEA related activities for UoM 28 are considered jointly with UoM 27, with deliverables under this activity covering both Units of Management.

## 2.10 Consultation and Engagement

The communications and engagement activities are relevant to the whole of the Shannon RBD. However, in the sections below, where necessary, specific reference is made to activities related to this Unit of Management within the context of the wider communications and engagement processes.

### 2.10.1 Summary of Work Completed

A Communications and Engagement Plan has been produced (reviewed and approved by OPW) which:

- Outlines the approach to be taken in fulfilling the Project Brief (Appendix L) and supporting the communications and engagement objectives;
- Presents our team organogram and communications governance roles and responsibilities; and
- Presents initial stakeholder identification and mapping, and how we plan to work with stakeholders and communities.

The Communication and Engagement Action Plan and Stakeholder Database are critical components of the 'live' Communications and Engagement Plan. It will be updated throughout the life of the project to provide a complete log of stakeholder communications and intelligence, and a robust record of engagement activities undertaken and with whom. Maintenance of the Action Plan and Stakeholder Database is ongoing.

We are currently in the second stage of our four phase approach to communications and engagement:

1. **Set up and planning** (established tools for ongoing communications e.g. newsletters, media relations, website, progress group and advisory group meetings).
2. **Engagement** (linked to SEA Scoping and FRM Objectives stages) – includes stakeholder workshops and public information and engagement programme.
3. **Deliberation** (linked to draft Flood Map and Preliminary Options Report stages) – includes stakeholder workshops and public consultation and discussion programme.

4. **Feedback** (linked to development and publication of draft Flood Risk Management Plans) – includes stakeholder workshops and public feedback programme.

The following communications and engagement activities are currently being carried out or are planned for the SEA Scoping phase over the next eight months:

- Pre-scoping engagement with statutory consultees (Environmental Authorities) in the form of one-to-one meetings and a one day Pre-Scoping Workshop (*Part 1*), to gather comments on and develop the Environmental Issues Paper (June / July 2011);
- Pre-scoping consultation with primary and secondary stakeholders (in written format) to gather comments on the Environmental Issues Paper and contribute to the draft Environmental Scoping Report (July / August 2011);
- Further engagement with Environmental Authorities and primary stakeholders in the form of a one day Scoping Workshop (*Part 2*) (October 2011).
- A rolling public consultation programme (including Public Consultation days) (September 2011 – March 2012); and
- Statutory public consultation on the final Draft Environmental Scoping Report, in line with legislative requirements (January – March 2012).

Table 2-D shows a list of meetings that have been held with OPW, Local Authorities, and other stakeholders during the early stages of the project (excluding the Progress Group Meetings). These have been primarily to inform the Flood Risk Review and Environmental Assessment related activities. All of these meetings are logged on the Stakeholder Database. Where appropriate, follow up telephone discussions have supplemented these meetings. The meetings which are of specific relevance to this Unit of Management are highlighted in Table 2-D.



Organisation	Meeting Location	Meeting Date
Office of Public Works	Mungret, Co. Limerick	23 <sup>rd</sup> March 2011
Office of Public Works	Mungret, Co. Limerick	9 <sup>th</sup> May 2011
Office of Public Works	Mullingar, Co. Westmeath	13 <sup>th</sup> April 2011
Office of Public Works	Headford, Co. Galway	1 <sup>st</sup> June 2011
Office of Public Works	Dublin, Co. Dublin	1 <sup>st</sup> June 2011
Project Advisory Group Members	Athlone, Co. Westmeath	8 <sup>th</sup> March 2011
Kerry County Council	Listowel, Co. Kerry	4 <sup>th</sup> May 2011
Kerry County Council	Tralee, Co. Kerry	4 <sup>th</sup> May 2011
Limerick County Council	Dooradoyle, Co. Limerick	10 <sup>th</sup> May 2011
Clare County Council	Ennis, Co. Clare	7 <sup>th</sup> June 2011
Roscommon County Council	Roscommon, Co. Roscommon	11 <sup>th</sup> May 2011
Leitrim County Council	Carrick on Shannon, Co. Leitrim	19 <sup>th</sup> May 2011
Galway County Council	Ballinasloe, Co. Galway	24 <sup>th</sup> May 2011
Longford County Council	Longford, Co. Longford	25 <sup>th</sup> May 2011
Westmeath County Council	Athlone, Co. Westmeath	31 <sup>st</sup> May 2011
Offaly County Council	Tullamore, Co. Offaly	7 <sup>th</sup> June 2011
North Tipperary County Council	Nenagh, Co. Tipperary	10 <sup>th</sup> June 2011
Electricity Supply Board	Dublin, Co. Dublin	29 <sup>th</sup> March 2011
Waterways Ireland	Carrick on Shannon, Co. Leitrim	30 <sup>th</sup> March 2011
Environmental Protection Agency	Dublin, Co. Dublin	2 <sup>nd</sup> June 2011
Inland Fisheries Ireland	Athlone, Co. Westmeath	10 <sup>th</sup> June 2011
Irish Farmers Association	Athlone, Co. Westmeath	20 <sup>th</sup> April 2011

**Table 2-D Summary of Stakeholder Meetings**

In addition to the planned communications and engagement activities, the communications and engagement team are undertaking ongoing correspondence in response to stakeholder and public queries. To date on the Shannon CFRAM Study we have received a small amount of correspondence from stakeholder organisations, Teachtaí Dála (TDs), County Councils and interested residents expressing their interest in the Study and asking to be involved as work progresses.

A **Communications Protocol** has been implemented in the Jacobs Dublin office to ensure that incoming communications from stakeholders and the public are recorded and passed to the correct person in a timely manner, and that all staff are aware of the importance of dealing with phone calls, letters and emails appropriately.

### 2.10.2 Constraints, Data Problems and Other Issues

The Project Brief requires a total of five workshops to be held over the course of the project; one at each of the five project stages – this constraint in terms of the number of communications and engagement activities that can be undertaken in the

process, and the suggested approach for overcoming this constraint, is detailed in section 2.10.3.

The communications and engagement team will be in a position to undertake further more detailed stakeholder identification and mapping as the project progresses and as the project team's confidence in terms of defined areas of flood risk increases.

Issues may arise where communications with stakeholders and engagement events are not designed and delivered according to the overarching Communications and Engagement Plan. When engagement is *ad hoc* and reactive, there is the risk that stakeholders become frustrated and disengage from the process altogether. All meetings, presentations, workshops and written communications to stakeholders should adhere to the principles and approach outlined in the Communications and Engagement Plan to ensure a consistent and considered message is given and to reduce the risk of stakeholder fatigue and confusion.

An extra stakeholder meeting was requested by OPW which falls outside of the current scope. This was the Ministerial Workshop held on 26<sup>th</sup> July 2011 in Ballinasloe.

### 2.10.3 Amendments to Methodology

The Project Brief requires a total of five stakeholder workshops to be held over the course of the project; one at each of the five project stages. However, based on previous experience on similar projects, to be successful and deliver the most benefits the approach to communications and engagement should be:

- **Appropriate** - it is often not appropriate to involve all stakeholders at the same time during one event. Stakeholders have varying degrees of influence and interest and in order to be useful and cost-effective the engagement process should be designed to inform, engage and provide feedback in the most appropriate ways. A staged approach is often required to ensure that statutory and political stakeholders are engaged before local stakeholder groups and communities – this could mean more than one event per stage is necessary.
- **Flexible** – as our relationships with stakeholders develops and our knowledge of their priorities and issues grows, we will have a better understanding of how and to what extent they want to be involved. Some stakeholders might want to be actively involved in attending (and shaping the format and content of) our engagement events, whereas others might prefer to be kept informed and provided with feedback at the end of the project. We will need to design our communications and engagement programmes around this.

We will need to plan stakeholder and public activities **as appropriate** at each stage in the context of wider project activity and any influencing political, economic or media related factors at that time; and also, **be flexible** to stakeholder requests and preferences in light of intelligence gathered and relationships developed.

An example of this flexibility is the possibility of changes to the invitee list and format of the SEA Scoping Workshop originally proposed for October 2011, in the light of the findings from the Pre-Scoping Workshop held on 27<sup>th</sup> July, and requests from stakeholders at the Ministerial Workshop on 26<sup>th</sup> July 2011 for earlier involvement in the SEA process. The proposed alternative approach applied to all UoMs, as amended from the original plan outlined in section 2.10.1, is as follows:

- Pre-scoping engagement with statutory consultees (Environmental Authorities) in the form of one-to-one meetings and a one day Pre-Scoping Workshop (*Part 1*), to gather comments on and develop the Environmental Issues Paper (June / July 2011);
- Scoping consultation with Environmental Authorities, primary and secondary stakeholders - in the form of a one day Scoping Workshop (*Part 2*) (October 2011) - to gather comments on the final Environmental Issues Paper which will be used to develop the draft SEA Scoping Report (December 2011);
- A rolling public consultation programme (including Public Consultation days) (October 2011 – March 2012); and
- Statutory public consultation on the final draft SEA Scoping Report, in line with legislative requirements (January – March 2012).

## **2.11 Development of Flood Risk Management Options**

The development of FRM options at each APSR requires consideration of a range of structural and non-structural options, as different spatial scales of assessment (SSA) as identified in the Project Brief. These need to be integrated with the SEA, and will be developed through consultation process, and tested as necessary through the use of hydraulic modelling. The identification of preferred options also needs to be temporally cohesive – taking account of changing flood risk over time with respect to increased development pressure and climate change impacts.

### **2.11.1 Summary of Work Completed**

No work has been undertaken with specific regard to the developing FRM options. However, the Flood Risk Review activity, in particular the site visits for this task, provided a good insight into the likely flood mechanisms, which has been used to identify potential FRM options.

The Flood Risk Review forms summarise the potential FRM options (for each site visited, these are listed in Section 2.8 of the forms in the Draft Flood Risk Review Report). The purpose of this has been to consider what may be technically feasible, and does not necessarily imply that the options identified are economically viable, or environmentally acceptable. It is also emphasised that no options have been ruled out at this stage.

### **2.11.2 Constraints, Data Problems and Other Issues**

There have been no particular constraints to date with regard to provision of data. However, it is known that at various sites, there is information held by the OPW or by the relevant Local Authority. Some of this data has already been collected, while the location of other information is known.

As the study progresses and the final list of APSRs is confirmed, further specific information from Local Authorities is likely to be required. It is critical for this activity – in relation to valuable data that could inform the development of options – that the Local Authority identifies suitable resources to supply this data in a suitable format for incorporation into the study.

The provision of specific information on known flooding problems and solutions has been of particular value in the early stages of the project, as this enabled the Flood Risk Review to focus on these issues, without losing the strategic view of flood risk within the study area for each location considered (the CARs and AFRRs). This

information has typically been provided by the OPW regional teams and the Local Authorities, and has demonstrated the value of meeting with these teams as part of the Flood Risk Review process, to inform subsequent stages of the study – such as the development of FRM options.

### **2.11.3 Amendments to Methodology**

There are no specific amendments to the proposed methodology for the development of FRM options. However, the following key points are noted that will inform this activity:

- The preliminary identification of possible options included as part of the Flood Risk Review will inform the High Level Screening Multi-Criteria Analysis, as proposed in the methodology at tender stage.
- In many locations, where there are not a significant number of properties or assets at high risk of flooding, the development of options below the preferred design standard (1%AEP for fluvial flooding and 0.5% AEP for tidal flooding) is likely to provide the highest benefit-cost ratio. These may well take the form of Do Minimum options or maintenance options.
- Small scale capital options are likely to take the form of multiple minor elements grouped together as a composite option, rather than discrete options covering, for example: upstream storage; embankments; walls; diversion channel etc. A typical composite option may comprise: construction of a short length of flood defence wall; increasing the height of a section of embankment; closing a gap in an informal flood defence (e.g. with a flood gate); placing flap valves on unflapped outfalls. These may be supported by development control measures, flood warning and improved maintenance regime.
- Specifically for UoM 28, if the Flood Risk Review recommendation for no APSRs within the Unit of Management is accepted, then there will be no options required to manage flood risk. However, it is noted that aside from the need for any options, there are some flood defence assets within UoM 28 (see Section 4) which should be taken into account as appropriate.

## **2.12 Flood Risk Management Plan Preparation**

The preparation of the Flood Risk Management Plan is the culmination of all the previous tasks on the project. As such, any data constraints, project risks and opportunities are incorporated within each of those discipline sections (Section 2.3 to 2.11) of this Inception Report.

On the basis of the early work completed on the project to date, at this stage there are no amendments to the proposed methodology for preparing the FRMP.

As noted in Sections 1.6.4 and 2.9 of this Report, in the event that there are no APSRs identified within UoM 28, it is recommended that UoM 28 should be considered in conjunction with UoM 27, to form a single, larger Unit of Management.

## 3 Data and Data Requirements

### 3.1 Objectives

The objectives of the data collection exercise, in accordance with the brief, are to search, locate and register all potentially relevant information in the following fields:

- Flood Relief / Risk Management;
- Historical Flooding;
- Hydrometry;
- Meteorology;
- Land Uses;
- Soils and Geology;
- Planning and Development;
- Defence and Coastal Protection Assets;
- Existing Survey and Geotechnical Information;
- Environmental; and
- Flood Risk Receptor Information.

Upon receipt of data, the brief requires that the data be reviewed, formatted as necessary, interpreted and made use of.

### 3.2 Data Collection Methodology

Data collection during the Shannon CFRAM Study Inception Phase has been intensive in order to collect as much relevant data for each technical discipline as possible. Data collection shall however continue throughout the project to ensure that the technical teams utilise as comprehensive and up-to-date information as possible.

The methodology employed in order to obtain relevant data during the Inception Phase is outlined in the following sections. The current Data Register, detailing all information obtained prior to the submission of the Inception Report, is included as Appendix C in accordance with the requirements of Section 2.4.2 Item 2a) of the Stage I Project Brief.

#### 3.2.1 OPW Datasets

Following the Inception Meeting on the 26<sup>th</sup> January 2011, OPW provided a large dataset which comprised the majority of the information that OPW hold in relation to the Shannon River Basin District.

This data was reviewed and logged, and compared to both specific data requirements of the technical teams and the suggested data requirements specified by OPW within the Stage 2 project brief.

#### 3.2.2 External Data Requests

In order to obtain additional data over and above that supplied by OPW, a total of 44 External Data Requests were submitted to relevant organisations. The complete set of External Data Requests is included as Appendix D. A summary of the

organisations contacted is provided in Table 3-A below. Those organisations contacted with information specifically related to UoM 28 are highlighted.

Organisation	Contact
Office of Public Works	Rosemarie Lawlor John Martin Clare Butler Conor Galvin Peter Newport Joseph McNamara
Office of Public Works - Regional Office (East)	John G. Murphy
Office of Public Works - Regional Office (West)	Michael Collins
Clare County Council	Paul Moroney David Timlin Sean Ward Tom Tiernan Gordon Daly
Cork County Council	Sharon Corcoran M Riordan
Galway County Council	Sean Langan
Kerry County Council	Fergus Dillon
Laois County Council	John Daly Michael O'Hora
Leitrim County Council	Martin Dolan Brian Kenny
Limerick City Council	John O'Shaughnessy
Limerick County Council	Joe Kennedy
Longford County Council	Brian Connaire
North Tipperary County Council	Marie Ryan
Offaly County Council	David Hogan
Roscommon County Council	Majella Hunt
Sligo County Council	Tom Kilfeather
Westmeath County Council	Ray Kenny Barry Kenny
Border Regional Authority	Matt Donnelly
Mid West Regional Authority	John Bradley
Midlands Regional Authority	Martin Daly
South West Regional Authority	John Forde
West Regional Authority	Teresa O'Reilly
National Roads Authority	Vincent O'Malley
Department of the Environment, Heritage and Local Government <sup>(1)</sup>	Seamus Whelan
Coillte	Caroline Wilkie Colm O'Kane
Marine Institute	Guy Westbrook
Port Authorities	Hugh Conlon
Environmental Protection Agency	Micheal MacCarthaigh
Met Eireann	Aidan Murphy Noreen Brennan
Electricity Supply Board	Brian O'Mahony
Waterways Ireland	Ray Dunne

**Table 3-A Summary of Organisations Consulted**

**Notes:** (1) At the time of writing, the government department was DoEHLG. This is now split between the Department of Environment, Community and Local Government, and the Department of Arts, Heritage and the Gaeltacht

### 3.2.3 Stakeholder Meetings

Stakeholder meetings were held with representatives of OPW, various Local Authorities and other stakeholders, for various purposes, but also to inform the data collection exercise.

A list of meetings that have been held with OPW, Local Authorities, and other stakeholders is provided in Section 2.10.1.

### 3.2.4 Future Flood Events

A Flood Event Data Collection Procedure has been developed to ensure that any relevant data is collected following any flood events that occur during the life of project. The procedure comprises a desk-based data collection exercise and, where considered both safe and necessary to do so, a site visit.

The procedure details requirements for the collection of the following datasets:

- Flood event location, timing, duration and extents;
- Source of the flood event;
- Flood water levels and flow data;
- Flood mechanisms;
- Meteorological data;
- Tidal data (where appropriate);
- Damage to property and infrastructure; and
- Emergency response, including mitigation measures employed.

The procedure may be updated as the study progresses by agreement between OPW and Jacobs.

## 3.3 Data Review

In accordance with the requirements of the Stage I Project Brief (2.4.2 Items 2b) and c)), specific data quality and outstanding data issues are summarised for each discipline within Section 2. In addition, summaries of key issues are provided in the following sections.

### 3.3.1 Data Quality

Descriptions of key data items, their quality and their overall fitness for purpose are provided within each specialist discipline's section within Section 2 of this report.

A summary of key data quality issues with respect to currently held data is provided as Table 3-B.

It is noted that there are no APSRs within UoM 28 based on the recommendations from the draft Flood Risk review. However, in the event that new sites are identified for Flood Risk Review and subsequently recommended as APSRs, there are data quality related issues applying generically across all Units of Management, that will be relevant to UoM 28.

For those disciplines not listed in Table 3-B, this indicates that there are no clear current data quality issues.



Further details on hydrology aspects are included in Appendix B (prepared as a separate report).

Discipline	Dataset (with Data Register reference)	Remarks
Flood Risk Assessment	An Post Geo-Directory (E-0007 / L-0011)	We have noted at various locations that there are recently constructed properties that are not shown in the Geo-Directory database. These will need to be included in the overall economic appraisal, and will affect the mapping and analysis related to Social Risk and Risk to the Economy.
Hydrology	Daily flow series	Highest peak on DMF record (3/12/1979) considerably higher than any other peaks on record and not consistent with the OPW AMAX series. Review recommended, involving OPW as necessary.
Hydraulic Analysis	National Digital Terrain Model (J-0002)	<p>The supplied NDTM is partially corrupted and a proportion of the tiles do not open.</p> <p>The data is needed in full by the 30/9/2011 to avoid potential delays to the modelling in some areas, and potential cost implications.</p> <p>This was initially raised by Jacobs in EDR0001 which resulted in OPW resending the NDTM information.</p> <p>Further review has indicated that there are some residual issues remaining which will require a further data request by Jacobs to the OPW.</p>

**Table 3-B Key Data Quality Issues**

### 3.3.2 Outstanding Data

Descriptions of any outstanding datasets are provided within each specialist discipline section within Section 2 of this report.

A summary of the implications of these datasets being outstanding with respect to currently held data is provided as Table 3-C.

It should be noted that this is based on data requests made to date and does not imply that the data collection is now complete. As the study progresses, there will be a need to access additional data which will be requested at the time. This may include, for example, environmental or social datasets that are not required now, but will be at some point in the project life cycle. Rather than specifically requesting these data sets now, it is appropriate to wait such that the most up-to-date dataset is provided as and when necessary.

In view of there being no APSRs identified in UoM 28, there is limited activity anticipated within UoM 28 on several tasks, and therefore at this stage, there is limited outstanding data. However, there are some tasks, notably, hydrology, defence asset survey, and environmental assessment that will require inputs irrespective of whether or not there are any APSRs within UoM 28, and therefore, the issue of outstanding data remains relevant.

For those disciplines not listed in Table 3-C, this indicates that there are no current outstanding data issues.

### 3.3.3 Quality, Adequacy, and Interpretation of Data

At this stage, the main data that has been assessed in detail in terms of its adequacy is that relating to the hydrological tasks. Any apparent inadequacies in the data – either in quality or quantity – are specifically addressed in the Preliminary Hydrological Assessment and Method Statement included in Appendix B.

For other tasks, specific concerns have been identified where these are readily apparent from the initial data review.

Discipline	Dataset	Date Required By	Cost Implications (€)	Potential Implications to the Project / Proposed Solutions
Environmental Assessment and Planning	All	Ongoing	None identified to date	<p>Data collection for the SEA and AA has been limited to date as it is considered more appropriate to first seek input from the Environmental Authorities at the Environmental Pre-Scoping Workshop.</p> <p>This will help facilitate a more focused, efficient approach to data collection. Also, it is acknowledged that some datasets may become out-dated as the study progresses over its 5-year programme, and guidance from the Environmental Authorities will help establish an effective method of data collection and maintenance.</p>
Hydrology	Daily flow/level series Staff Gauge level series	30/9/2011	None identified to date	<p>Daily mean flow series and staff gauge levels have not been received for two key hydrometric stations. OPW to supply information.</p> <p>Confirmation of whether the relevant data series exists has been requested in the first instance.</p> <p>There is unlikely to be a cost implication associated with the lack of provision of this data, however, any lack of data may have an impact on the uncertainty and quality of the derived flood flow estimates, hydraulic model calibration and validation and rating reviews, all of which are programmed to be undertaken in the next phases of the project. Please note, the scope of the hydrological studies will be dependent on the outcome of the Flood Risk Review</p>
Hydraulic Analysis	Existing hydraulic models	30/9/2011	None identified to date	<p>There will be little impact on the project should no existing models be available; however, any existing models would be of use. Any existing models will need to be reviewed and the proposed modelling methodology updated to reflect previous models if appropriate.</p>

**Table 3-C Outstanding Data**

## 4 Survey Requirements

### 4.1 Defence Asset Data

#### 4.1.1 Asset Identification

The Flood Defence Asset Data Collection process involves two stages:

- The broad identification of flood defence assets prior to the defence asset survey being undertaken; and
- The detailed flood defence asset survey which includes a visual condition inspection and entry into the OPW Flood Defence Asset Database.

This two stage approach has been developed following commencement of the study.

The first stage has been completed and identifies, in broad terms, the type and extent of flood defence assets within each CAR and AFRR. The information related to this was gathered during the site visits undertaken as part of the Flood Risk Review. We have concluded that in general the extent of constructed defences is not extensive.

The second stage has not yet been completed due to the critical nature of the topographic survey as discussed under Section 2.5.

Discussions with OPW through the early stages of the study indicated that because the Defence Asset Survey is not on the critical path, whereas the topographic survey is, then the focus for delivering the survey requirements should be on the topographic survey of the channel and structures to enable the hydraulic model construction to commence as early as possible. It was proposed that subsequently, the surveyors remobilise to undertake the geometric survey of the flood defence assets. Whilst this would incur some minor remobilisation costs for the surveyor, this is outweighed by the much greater risk of the delay in the programme for delivering the topographic survey to enable hydraulic model construction to commence. Discussions surrounding this approach are ongoing with OPW to agree a strategy for delivery of the Defence Asset Survey task.

Additionally, the requirement to undertake the Defence Asset Survey required in APSRs can only be completed once the identification of all APSRs has been confirmed. This is not due for confirmation until the delivery of the Final Flood Risk Review Report in September 2011.

Prior to undertaking the defence asset survey we will agree the list and location of flood defence assets to be included in the survey with the Advisory Group, as required under Appendix C, Section C1.2 of the Stage I Project Brief.

It is noted that it is a requirement of the topographic survey contracts that flood defences (top of bank etc.) should be surveyed.

#### 4.1.2 Location of Assets Within CARs and AFRRs

As outlined above, the Defence Asset Survey has not been completed, however, the identification of the asset types within each location has been undertaken. For this Unit of Management, there are no locations recommended for designation as APSRs by the Draft Flood Risk Review Report.

However, there are a number of assets within the CAR and AFRR for UoM 28, and these are listed in Table 4-A. Note that this table is different from the Inception Reports for other Units of Management, which list assets only for sites recommended to be designated as APSRs in the Draft Flood Risk Review Report.

It is emphasised that the assets identified may include both effective and ineffective flood defences.

It is noted from Table 4-A that only Carrowmore has a significant number (or significant scale) of assets.

Flood Defence Related Asset	Carrowmore	Tromracastle
<b>Open Channel Watercourses</b>		
Man-made river channel		x
Flood relief channel		
Canal		
Mill leat		
Drainage channels / back drains	x	x
<b>Bridges and Culvert crossings</b>		
Single Arch bridge		x
Multi-Arch bridge	x	
Single Span bridge		
Multi-Span bridge		
Box culvert(s)		
Pipe culvert(s)	x	
Arch Culvert(s)		
<b>Culverted Watercourses (culvert length is greater than a crossing)</b>		
Box culvert(s)	x	
Pipe culvert(s)		
Arch Culvert(s)		
Irregular Culvert(s)		
<b>Walls and Embankments</b>		
Embankment(s)	x	x
Raised wall(s)		
<b>Control Structures - weirs, gates, dams</b>		
Fixed crest weir		
Adjustable weir		
Dam / Barrage		
Sluice gates		
Lock gates		
Radial gates		
<b>Storage</b>		
On-line storage (natural)	x	x
On-line storage (artificial)		
Off-line storage		
<b>Outfalls (from main watercourse into estuary / sea)</b>		
Flapped outfall(s) into watercourse		
Tidal flap(s)	x	
Tidal sluice(s)		
<b>Other</b>		
Pumping Station		
Erosion Protection		
Sand Dunes	x	x
<b>Level of Flood Defence Assets (1)</b>	<b>S</b>	<b>M</b>

**Table 4-A Potential Flood Defence Assets in UoM 28**

**Notes:** (1) S - Significant assets for potential survey; M - Minor (or no) assets for potential survey.

### 4.1.3 Location of Assets Outside APSRs

In addition to the assets within the CAR and AFRR within UoM 28, the Flood Defence assets noted in Section 2.12 and 2.13 of the Stage II Project Brief are also required to be surveyed. A map showing the extent of these assets is shown in Figure 7. For this Unit of Management, the assets shown are the embankments on the Creegh River (or Skivilleen River) upstream of Carrowmore.

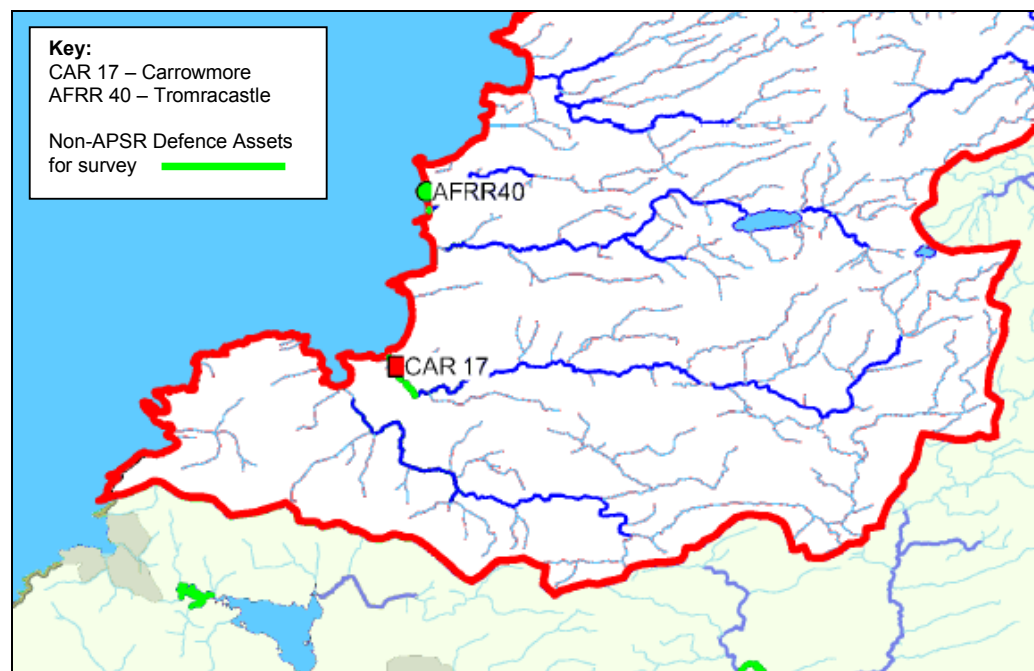


Figure 7 Assets outside of the CAR in UoM 28

## 4.2 Survey Specification

The survey specifications issued on the project to date relate to all other Units of Management within the Shannon RBD. OPW have reviewed the model contracts to be used for the gauging stations (in UoMs 23, 24 and 27) and the Ballylongford APSR (in UoM 24). It is noted that there are no gauging stations in UoM 28 requiring a rating review.

Contracts related to the possible survey for any potential APSRs (none identified at present) and the survey of existing flood defence assets within UoM 28 are currently in preparation.



## 5 Preliminary Hydrological Assessment and Method Statement

The Preliminary Hydrological Assessment and Method Statement has been prepared as a stand alone report and is included as Appendix B to this Inception Report.

The details included in the report fully reflect the scope of the hydrological elements of the Inception Report as set out in Section 2.4.2, sub-section 4, of the Stage I Project Brief as follows:

- a) A preliminary hydrological assessment, including a review of historical floods, catchment boundaries and hydrometric and meteorological data as defined in Sections 6.2, 6.3 and 6.4 (but not including Section 6.4.3).
- b) Discussion of historical flood events, including the dates they occurred, their duration, mechanisms, depths, impacts (e.g. number of properties flooded, infrastructure affected, etc.), severity (e.g. flows, levels, estimated annual exceedance probability), etc.
- c) A preliminary assessment of past floods and flooding mechanisms.
- d) A detailed method statement, setting out the datasets to be used and the approaches to be followed for the hydrometric review as defined in Section 6.4.3, and statistical analysis of data for the estimation of design flows (Section 6.5) for all hydrometric stations (Final reporting of all aspects of the hydrological analysis shall be reported upon in the Hydrology and Hydraulics Report).

The requirements set out in sections 6.2, 6.3 and 6.4 (excluding 6.4.3) specifically cover:

- Review and Analysis of Historic Floods
- Catchment Boundaries
- Analysis of Hydrometric and Meteorological Data (Rainfall Data and a Hydrometric Data Review)

Whilst full details of the hydrology are included in Appendix B, there are some specific implications to note in the event that there are no APSRs within UoM 28, as follows:

- there will be no need to derive Hydrological Estimation Points (HEP) or design flows at the HEPs;
- remaining activities on hydrology will be focused on confirming the catchment boundaries between HA28 and HA27 (to the east and south of HA28 within the Shannon RBD) and between HA28 and HA29 (in the far northeast of HA28 at the boundary with the Western RBD).

## 6

## Inception Phase Conclusions and Summary

The Inception Phase of the Shannon CFRAM study has involved significant activity on several project tasks, applying across all Units of Management, in particular the following:

- Data Collection (Section 3, Stage I Project Brief)
- Flood Risk Review (Section 4, Stage I Project Brief)
- Surveys (Section 5, Stage I Project Brief)
- Hydrological Analysis (Section 6, Stage I Project Brief)
- Hydraulic Analysis (Section 7, Stage I Project Brief)
- Environmental Assessment (Section 9, Stage I Project Brief)
- Consultation and Engagement (Section 10, Stage I Project Brief)

This report provides summary status of all project activities undertaken to date, but with a particular focus on three aspects:

- Data and Data Requirements
- Survey Requirements
- Preliminary Hydrological Assessment and Method Statement

The main conclusions and summary points for each activity are as follows:

#### Data Collection

- An extensive data collection exercise has been undertaken, including requests to OPW, Local Authorities and a range of other stakeholders.
- There are some **data quality** issues related to future activities on Flood Risk Assessment, Hydrological Analysis and Hydraulic Analysis.
- There are some **outstanding data** issues related to Environmental Assessment, Hydrological Analysis and Hydraulic Analysis.
- Data collection will be ongoing and will evolve as the project develops as it becomes apparent that further data is required.
- A Flood Event Data Collection Procedure is being developed to ensure that any relevant data is collected following any flood events that occur during the life of project.
- A Data Register and a Register of External Data Requests has been developed.

#### Flood Risk Review

- The Draft Flood Risk Review Report has been issued to OPW and the Local Authorities for comment.
- For UoM 28, one CAR and one AFRR have been assessed resulting in the (draft) recommendation that none of these sites should be designated as APSRs.
- There is an outstanding issue with regard to the possible addition of further sites to be considered as AFRRs, to be resolved in August 2011.

#### Surveys

- The specifications and contract documents for the topographic surveys for the APSRs, and the gauging stations requiring a rating review are in preparation, covering UoMs 23, 24 and 27. There are no gauging stations requiring such reviews specified for UoM 28.

- The required river, floodplain and asset topographic survey for UoM 23, 24, 27 and 28 is being procured through two main OJEU survey contracts. The geometric information required for the specified flood defence asset outside Carrowmore will be included within one of these contracts.

### **Hydrological Analysis**

- The preliminary hydrological assessment for UoM 28 has been completed (details given in Appendix B). This covers a detailed review of historical floods, catchment boundaries, hydrometric data and meteorological data.
- There are some outstanding data issues associated with flow series and stage gauge levels for two key hydrometric stations.
- In the event that there are no APSRs in UoM 28, the main remaining activity under this task is the confirmation of the catchment boundaries.

### **Hydraulic Analysis**

- There are no hydraulic modelling activities envisaged for UoM 28, as there are no locations recommended in the Draft Flood Risk Review Report for designation as APSRs.

### **Environmental Assessment**

- A register of key environmental stakeholders has been developed including statutory consultees, and primary and secondary stakeholders.
- The Strategic Environmental Issues Paper relevant to all UoMs has been issued. This will be used to consult with and engage stakeholders.
- Presentations and meetings have been held with the EPA and IFI, and the Environmental Pre-Scoping Workshop has been held.

### **Consultation and Engagement**

- A Communications and Engagement Plan has been produced and approved.
- A wide range of meetings have been held with OPW, Local Authorities, and other stakeholders during the early stages of the project, primarily to inform the Flood Risk Review and Environmental Assessment related activities. These have proved to be invaluable as a source of information and to engage in the project.
- There is a need to remain flexible in the consultation and engagement processes, in terms of the format, content, and stakeholder presence. This may warrant more (or different) events to those prescribed in the Project Brief.

### **Other General Conclusions**

- Other project activities that have not commenced yet are Flood Risk Assessment, Development of Flood Risk Management Options, and Preparation of Flood Risk Management Plans. However, there is little expectation of associated work for these activities, as there are no locations within UoM 28 recommended for designation as APSRs, by the Draft Flood Risk Review Report.
- As a consequence of UoM 28 not having any designated APSRs, it is recommended that UoM 28 should now be considered jointly with UoM 27 to form a single, larger Unit of Management. All future contractual deliverables for UoM 28, would be reported under the heading of UoM 27/28.

## Appendix A Extracts from the Project Brief

### Extract from Section 2.4.2 of the Stage I Project Brief (June 2010)

#### 2.4.2. Inception Report

Within six (6) months of Commencement of the Project, and earlier if possible, the Consultant shall submit Inception Reports to the OPW and Steering Group, which shall detail or include all of the following, and which shall be accompanied by all data collected (digital, or hardcopies if not available digitally):

- 1) Detailed Methodology, including:
  - a) Any critical constraints, data problems or other issues that have been identified that might give rise to opportunities for, or risks to, the Project
  - b) Further detail of, or proposed amendments to, the methodologies proposed for use in delivery of the Project (beyond that set out in the tender proposal or agreed at or after the Inception Meeting), based on the enhanced familiarity with the Study Area and with the data collected over the start-up period of the Project
- 2) Data & Data Requirements, including:
  - a) A list of data identified, collected, provided and reviewed and a description of the quality, fitness-for-purpose and interpretation of such data
  - b) A detailed list of all (if any) outstanding data required for completion of the elements of the Project not completed at the time of submission of the Inception Report, including likely data sources (such as members of the Steering Group), dates before which the data shall be required, potential costs that may be incurred in acquiring the data (where relevant), and the potential detrimental impacts on the Project in the event of this data not being made available
  - c) A description of the data which is, and will be, unavailable, the potential impacts of this absence of data on the Project, and how it is proposed to overcome the problems arising
- 3) Survey Requirements
  - a) A list (including identification and type) and accompanying referenced map of all of the flood defence assets within the Study Area (see Appendix C, Section 1)
  - b) Unless delivered in advance of the Inception Report, the Specifications for all of the channel, structures and defence asset geometric surveys in the Study Area (see Section 5.2), to be provided as separate documents accompanying the Inception Report.
- 4) Preliminary Hydrological Assessment & Method Statement, including:
  - a) A preliminary hydrological assessment, including a review of historical floods, catchment boundaries and hydrometric and meteorological data as defined in Sections 6.2, 6.3 and 6.4 (but not including Section 6.4.3).
  - b) Discussion of historical flood events, including the dates they occurred, their duration, mechanisms, depths, impacts (e.g., number of properties flooded, infrastructure affected, etc.), severity (e.g., flows, levels, estimated annual exceedance probability), etc.

Note: To assist with this duty, the Consultant will be provided with the information collated to date by the OPW and other organisations in relation to the Preliminary Flood Risk Assessment, but the Consultant shall undertake their own assessment to build on and further develop this information.

- c) A preliminary assessment of past floods and flooding mechanisms.
- d) A detailed method statement, setting out the datasets to be used and the approaches to be followed for the hydrometric review as defined in Section 6.4.3, and statistical analysis of data for the estimation of design flows (Section 6.5) for all hydrometric stations (Final reporting of all aspects of the hydrological analysis shall be reported upon in the Hydrology and Hydraulics Report).

## Appendix B Preliminary Hydrological Assessment and Method Statement

The Preliminary Hydrological Assessment and Method Statement is provided as a separate document, reference:

*TD\_GNRL\_0141\_V1\_0\_JAC\_HydroAssmtUoM28\_120711.pdf*

## Appendix C Data Register

The Data Register is provided in spreadsheet form;

*Appendix C - Data register 110726.xls*

This register covers all UoMs within the Shannon RBD.



## Appendix D External Data Requests

The External Data Requests Register is provided in spreadsheet form;

*Appendix D - Data Requests 110726.xls*

This register covers all UoMs within the Shannon RBD.