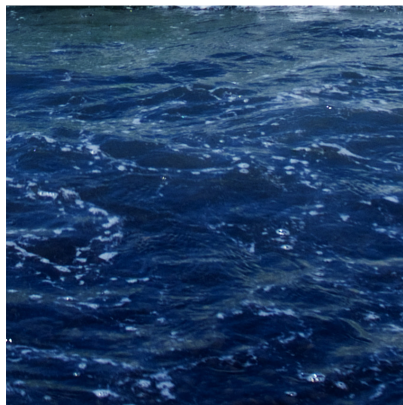


# Irish Coastal Protection Strategy Study Phase 2 - South East Coast

Work Packages 2, 3 & 4A - Appendix 7 - Flood Mapping

IBE0104/June 2010







**Office of Public Works**

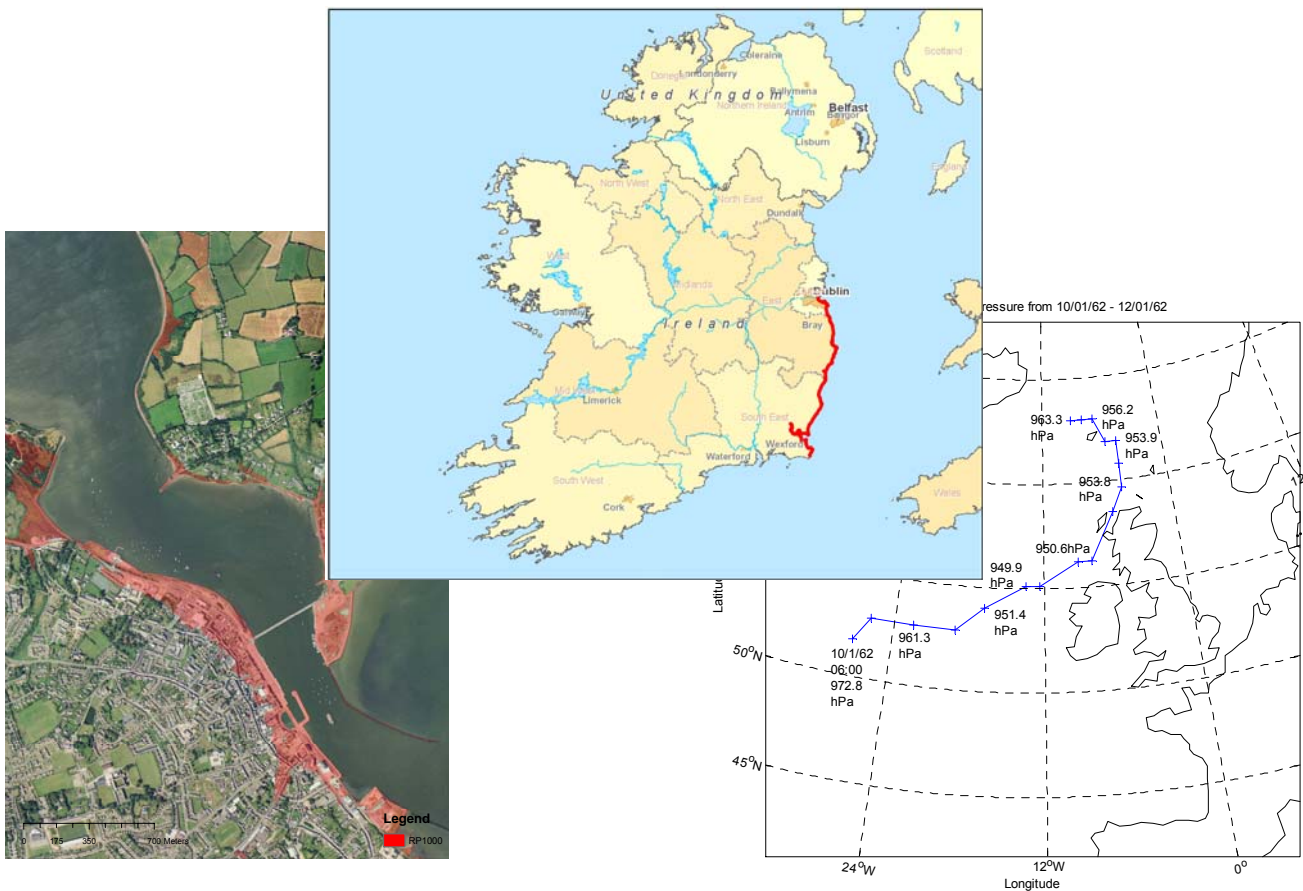
**Irish Coastal Protection Strategy Study - Phase II**

**Work Packages 2, 3 & 4A**

**Strategic Assessments of Coastal Flooding and Erosion Extents**

**Dalkey Island to Carnsore Point Pilot Area**

Appendix 7 Extreme Flood Outline and Flood Plain Mapping – June 2010







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**Irish Coastal Protection Strategy Study - Phase II**

**Work Packages 2, 3 & 4A**

**Strategic Assessments of Coastal Flooding and Erosion Extents**

**Dalkey Island to Carnsore Point Pilot Area**

Appendix 7 Extreme Flood Outline and Flood Plain Mapping – June 2010

**DOCUMENT CONTROL SHEET**

Client	Office of Public Works					
Project Title	Irish Coastal Protection Strategy Study, Phase II, Work Package 2, 3, & 4A					
Document Title	Strategic Assessments of Coastal Flooding and Erosion Extents					
Document No.	IBE0104/EFORev05_APP7					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
	1	-	6	-	-	1

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
01	Draft	CR	BE	AKB	Belfast	July 08
02	Revised draft	CR	BE	AKB	Belfast	Aug 08
03	Revised Draft	CR	BE	AKB	Belfast	Dec 08
04	Draft Final	CR	BE	AKB	Belfast	Aug 09
05	Final	CR	MB	AKB	Belfast	June 10



## IMPORTANT DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE FOR FLOOD MAPS

Please read the disclaimer, guidance notes and conditions of use below carefully to avoid incorrect interpretation of the information and data provided on the maps contained in this volume. The maps must be used only in conjunction with these notes, and must not be used in isolation.

### PURPOSE OF THE MAPS

The maps contained within this bound volume were prepared under the following project:

- ***Project Name: Irish Coastal Protection Strategy Study (ICPSS)***
- ***Project Period: 2005 – 2010***

The maps were prepared for the purpose of assessing the degree of flood hazard and risk to assist in the identification and development of measures for managing the flood risk. They may, however, also be of use to the public, Local Authorities and other parties as indicative maps of flood-prone areas for a range of purposes, including raising awareness of flood hazard and risk, preparedness and response planning for flood events, assisting in planning and development decisions, etc.

### DISCLAIMER

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## GUIDANCE NOTES

This bound volume contains a number of different types of map. How these maps have been derived, and what they do and do not present, is described below.

### *Derivation of Maps*

The maps included within this bound volume are ‘predictive’ flood maps, as they provide predicted flood extent and other information for a ‘design’ flood event that has an estimated probability of occurrence (e.g., the 1% AEP event – see below), rather than information for floods that have occurred in the past (which is presented on ‘historic’ flood maps).

The predicted extents are based on analysis and modelling. This includes:

- Numerical Modelling of combined storm surges and tide levels which was used to estimate extreme water levels along the coastline
- Statistical extreme value analysis and joint probability analysis to both historic recorded tide gauge data and data generated by numerical modelling, which allowed an estimation of the extreme water levels of defined annual exceedance probability (AEP) to be established along the coastline
- Definition of the plan extent of the predictive floodplain, by use of a Digital Terrain Model (DTM) developed by the Office of Public Works. The predictive flood outlines and depths shown on these maps were calculated by combining the results of the surge and tide level modelling, the statistical analysis, and the DTM using GIS technology.

The maps have been produced at a strategic level to provide an overview of coastal flood hazard and risk in Ireland, and minor or local features may not have been included in their preparation. A DTM is used to generate the maps, which is a ‘bare earth’ model of the ground surface with the digital removal of man-made and natural landscape features such as vegetation, buildings, bridges and embankments. The mapping process can show some of these man-made features, such as bridges and embankments, as flooded on the flood maps, when in reality they do not flood. In addition, ‘cleansing’ is undertaken during flood map production, which involves various processes such as the removal of very small areas of flooding that is remote and isolated, the removal of very small islands within the flooded area, etc. Therefore, the maps should not be used to assess the flood hazard and risk associated with individual properties or point locations, or to replace a detailed local flood risk assessment. Local factors such as flood defence schemes, structures in or around river channels (e.g. bridges), buildings and other local influences, which might affect a coastal flood, have not been accounted for.

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

The DTM is derived from airborne laser survey data. The majority of this data is Light Detection and Ranging (LiDAR) data. Where LiDAR data was not available, namely for some coastal areas west of Cork Harbour to Bantry Bay, Interferometric Synthetic Aperture Radar (IfSAR) data has been used to derive the DTM.

Detailed explanations of the methods of derivation, survey data used, etc. are provided in the relevant reports produced for the project under which the maps were prepared. Users of the maps should familiarise themselves fully with the contents of these reports in advance of the use of the maps.

### ***Flood Event Probabilities***

The maps refer to flood event probabilities in terms of a percentage Annual Exceedance Probability, or 'AEP'. This represents the probability of an event of this, or greater, severity occurring in any given year. These probabilities may also be expressed as odds (e.g., 100 to 1) of the event occurring in any given year. They are also commonly referred to in terms of a return period (e.g., the 100-year flood), although it should be understood that this does not mean the length of time that will elapse between two such events occurring, as, although unlikely, two very severe events may occur within a very short space of time.

Table 1 below sets out a range of flood event probabilities expressed in terms of AEP, and identifies their parallels under other forms of expression.

*Table 1: Flood Event Probabilities*

Annual Exceedance Probability (%)	Odds of Occurrence in any Given Year	Return Period (yrs)
50	2 : 1	2
20	5 : 1	5
10	10 : 1	10
5	20 : 1	20
2	50 : 1	50
1	100 : 1	100
0.5	200 : 1	200
0.2	500 : 1	500
0.1	1000 : 1	1000

### ***Uncertainty***

Although great care and modern, widely-accepted methods have been used to prepare the maps, there is a range of inherent uncertainties within the process of preparing the predicted flood extents maps. These include:

- Uncertainty in Flood Levels: This can arise due to uncertainties in topographic and other survey data, meteorological data, assumptions and / or approximations in the hydraulic / hydrodynamic models in representing physical reality, assumptions in the hydraulic / hydrodynamic modelling, and datum conversions, etc.
- Uncertainty in Flood Extents: This can arise due to uncertainties in flood levels, topographic and other survey data, assumptions and / or approximations in the way that flooding spreads over a floodplain, etc.



The flood maps are therefore only indicative, and the potential for inaccuracy should be recognised if these maps are to be used for any purpose. Analysis of the confidence of flood extents has been undertaken and is represented on the flood extent maps (see below).

### ***Types of Flood Map***

There are various types of flood map available, as outlined below. Further details on each type of map, including the methods of derivation, assumptions made, data used, etc. are provided in the relevant project reports.

#### *Flood Extent Maps*

Flood extent maps contained in this volume show the predicted extents of flooding for flood events of two estimated probabilities of occurrence:

- 0.5% AEP flood event
- 0.1% AEP flood event

It should be noted that the flood extent maps indicate the predicted maximum extent of flooding (subject to limitations referred to herein), and flooding in some areas, such as near the edge of the flooded area, might be very shallow. The predicted depth of flooding is indicated on the Flood Depth Maps.

Due to the various uncertainties within the process of preparing the maps (see 'Uncertainty' above), it is not possible to state that the maps are absolutely accurate. An assessment of some of the principal sources of uncertainty has been undertaken to estimate the degree of confidence one may have in the mapped flood extent (refer to relevant project report for details and limitations of method used). The line type (solid, dashed, dotted etc) bounding the flood extent for each flood event probability on the extent maps provides an indication of the degree of confidence, whereby:

- A solid strikethrough line represents a very high degree of confidence, and it is estimated that, based on the confidence estimation method used, there is over 70% confidence in the location of the mapped flood extent line
- A solid line represents a high degree of confidence, and it is estimated that, based on the confidence estimation method used, there is a 60-70% confidence in the location of the mapped flood extent line
- A dashed line represents a medium degree of confidence, and it is estimated that, based on the confidence estimation method used, there is a 50-60% confidence in the location of the mapped flood extent line
- A dotted line represents a low degree of confidence, and it is estimated that, based on the confidence estimation method used, there is a 40-50% confidence in the location of the mapped flood extent line
- A dashed - dotted line represents a very low degree of confidence, and it is estimated that, based on the confidence estimation method used, there is below 40% confidence in the location of the mapped flood extent line

#### *Flood Depth Maps*

The flood depth maps indicate the estimated depth of flooding at a given location, for a flood event of a particular probability ( i.e. 0.5% AEP).

The flood depths are calculated by subtracting the DTM ground level, from the predicted water level. The flood depths are mapped as constant depths over grid squares, whereas in reality depths may vary within a given square.

The flood depth maps also show the extent of the LiDAR DTM used in the flood hazard and risk assessment.

Where no LiDAR DTM has been shown then no flood hazard or risk assessment has been undertaken with the exception of the coastal area west of Cork Harbour to Bantry Bay.

### ***Consideration of Climate and Other Future Changes***

These flood maps have been produced for existing conditions only and do not currently include for projected future changes in climate.

### ***Sources of Flooding Not Mapped***

The maps indicate only the extents and depths associated with flooding from coastal areas and the sea. There are however many other possible sources of flooding, such as fluvial flooding from rivers, surcharged urban drainage systems, ponding rainwater, groundwater, overtopping or breaching of water retaining structures (such as embankments and reservoirs), etc. Flooding from these other sources have not been mapped, and so areas that are not shown as being within a flood extent may therefore be at risk from flooding from one of these other sources.

## **CONDITIONS OF USE**

Please read the following statements and conditions of use of the maps in this bound volume carefully. Use of these maps is conditional upon the following:-

The user of these maps shall be deemed to have agreed to, and unconditionally accepted all of these statements and conditions.

The user is deemed to have read in full, understood and accepted all of the above disclaimer, guidance notes and statements concerning the preparation, limitations and use of the maps in this bound volume.

The user acknowledges that the flood-related data (including flood extents, depths, etc.) presented on the maps contained within this bound volume are copyright of the Office of Public Works.

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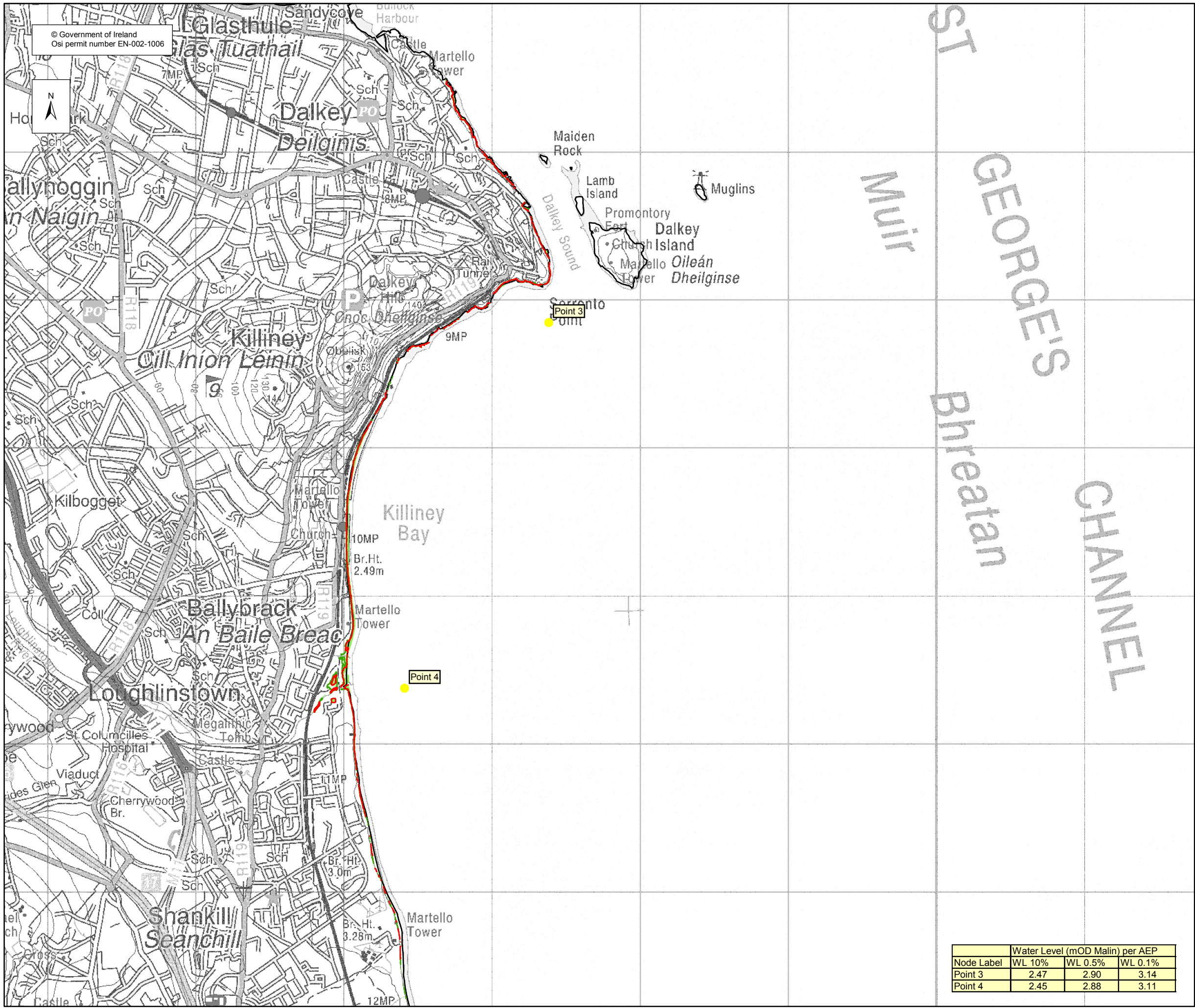
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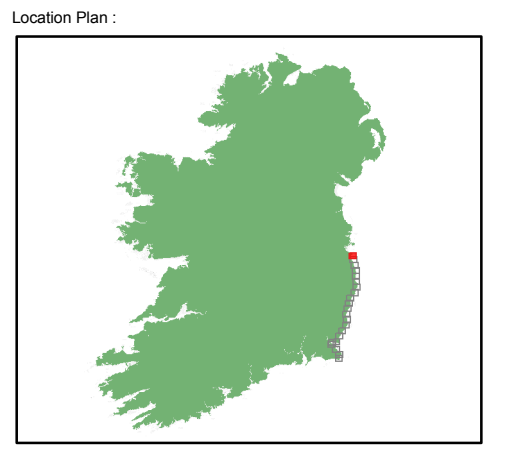
## **CONTACTS REGARDING MAP INFORMATION**

Any user who has reason to believe that these maps contain an error, or who wishes to contribute additional information, is requested to contact the Office of Public Works Engineering Services Section at the following address:

Flood Mapping Queries  
Engineering Services  
Office of Public Works  
17-19 Lower Hatch Street  
Dublin 2



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**EXTENT MAP**

- Legend:
- 0.5% AEP FLOOD EXTENT (1 in 200 chance in any given year)
  - 0.1% AEP FLOOD EXTENT (1 in 1000 chance in any given year)
  - Very High Confidence (0.1% AEP)
  - High Confidence (0.1% AEP)
  - Medium Confidence (0.1% AEP)
  - Low Confidence (0.1% AEP)
  - Very Low Confidence (0.1% AEP)
  - Very High Confidence (0.5% AEP)
  - High Confidence (0.5% AEP)
  - Medium Confidence (0.5% AEP)
  - Low Confidence (0.5% AEP)
  - Very Low Confidence (0.5% AEP)
  - High Water Mark (HWM)
  - Node Point
  - Point 34 Node Label (refer to table)

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74 Boucher Road  
Belfast  
BT 12 6RZ  
Northern Ireland



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Ireland

Project :  
**IRISH COASTAL PROTECTION STRATEGY STUDY - PHASE II**

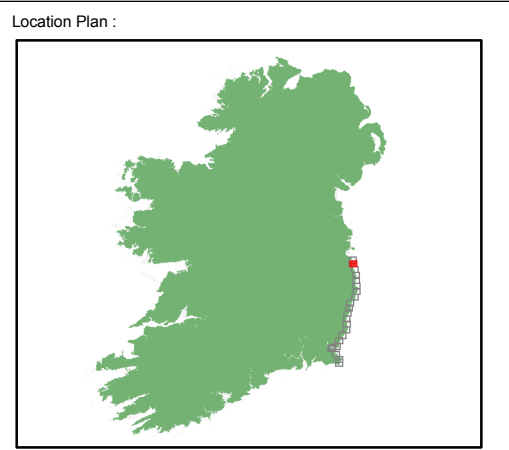
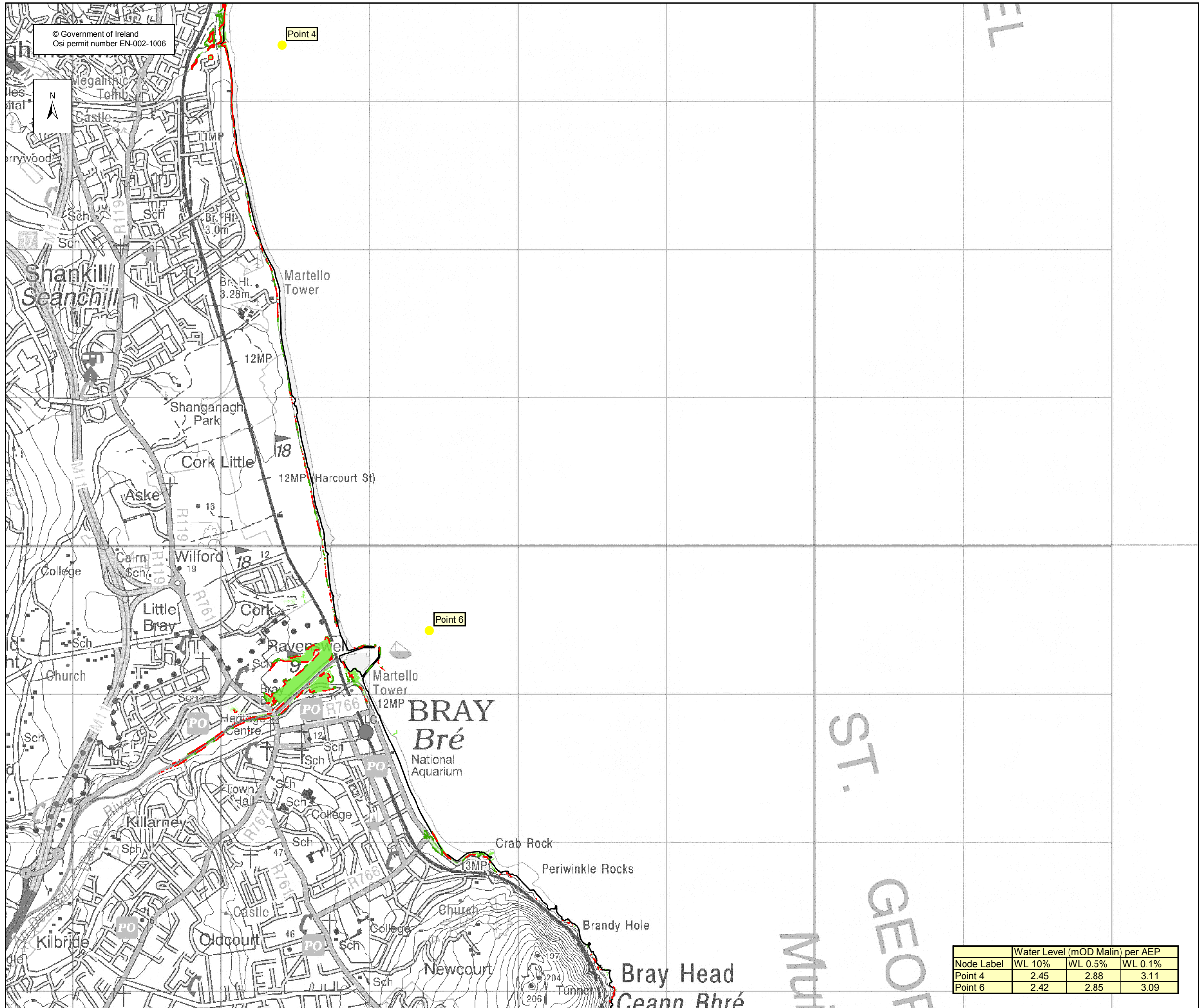
Map :  
**SOUTH EAST COAST FLOOD EXTENT MAP**

Map Type : FLOOD EXTENT  
Source : TIDAL FLOODING  
Map area : RURAL AREA  
Scenario : CURRENT

Figure By : PJW Date : May 2009  
Checked By : JMC Date : May 2009

Node Label	Water Level (mOD Malin) per AEP		
	WL 10%	WL 0.5%	WL 0.1%
Point 3	2.47	2.90	3.14
Point 4	2.45	2.88	3.11

Figure No. : SE / RA / EXT / 1 Revision 0  
Drawing Scale : 1:25,000 Plot Scale : 1:1 @ A3



**EXTENT MAP**

Legend:

- 0.5% AEP FLOOD EXTENT (1 in 200 chance in any given year)
- 0.1% AEP FLOOD EXTENT (1 in 1000 chance in any given year)
- Very High Confidence (0.1% AEP)
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- High Confidence (0.5% AEP)
- Medium Confidence (0.5% AEP)
- Low Confidence (0.5% AEP)
- Very Low Confidence (0.5% AEP)
- High Water Mark (HWM)
- Node Point
- Point 34 Node Label (refer to table)

**USER NOTE :**

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Project:  
**IRISH COASTAL PROTECTION STRATEGY STUDY - PHASE II**

Map:  
**SOUTH EAST COAST FLOOD EXTENT MAP**

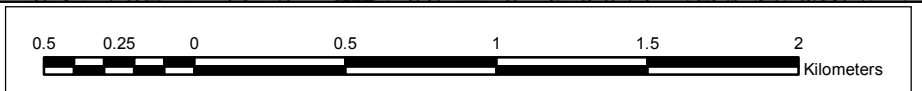
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Source: TIDAL FLOODING  
Map area: RURAL AREA  
Scenario: CURRENT

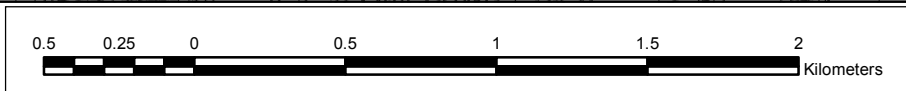
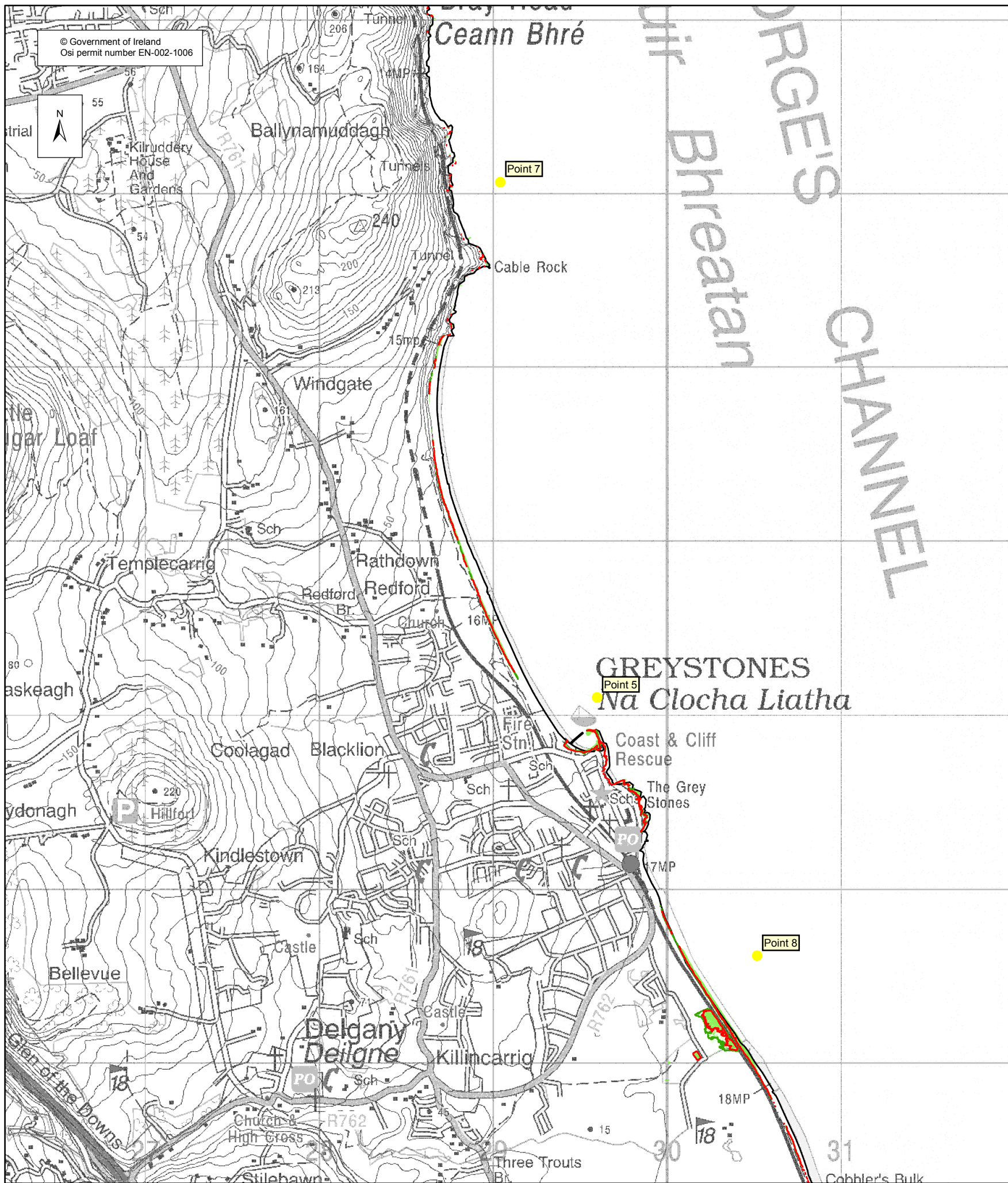
Figure By: PJW Date: May 2009  
Checked By: JMC Date: May 2009

Node Label	Water Level (mOD Malin) per AEP		
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Point 4	2.45	2.88	3.11
Point 6	2.42	2.85	3.09

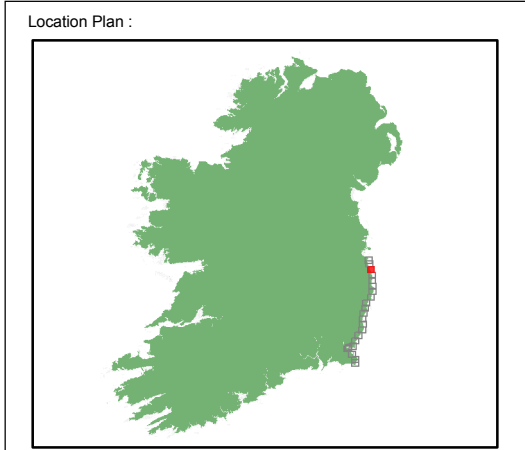
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Drawing Scale: 1:25,000 Plot Scale: 1:1 @ A3





Node Label	Water Level (mOD Malin) per AEP		
	WL 10%	WL 0.5%	WL 0.1%
Point 5	2.33	2.76	2.99
Point 7	2.37	2.80	3.02
Point 8	2.30	2.73	2.96



**EXTENT MAP**

Legend:

- 0.5% AEP FLOOD EXTENT (1 in 200 chance in any given year)
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- Very High Confidence (0.1% AEP)
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- Very Low Confidence (0.1% AEP)
- Very High Confidence (0.5% AEP)
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- Low Confidence (0.5% AEP)
- Very Low Confidence (0.5% AEP)
- High Water Mark (HWM)
- Node Point
- Point 34 Node Label (refer to table)

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Dublin 2  
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Project: IRISH COASTAL PROTECTION STRATEGY STUDY - PHASE II

Map: SOUTH EAST COAST FLOOD EXTENT MAP

Map Type: FLOOD EXTENT

Source: TIDAL FLOODING

Map area: RURAL AREA

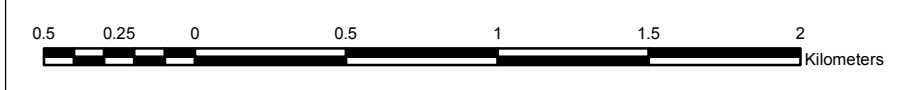
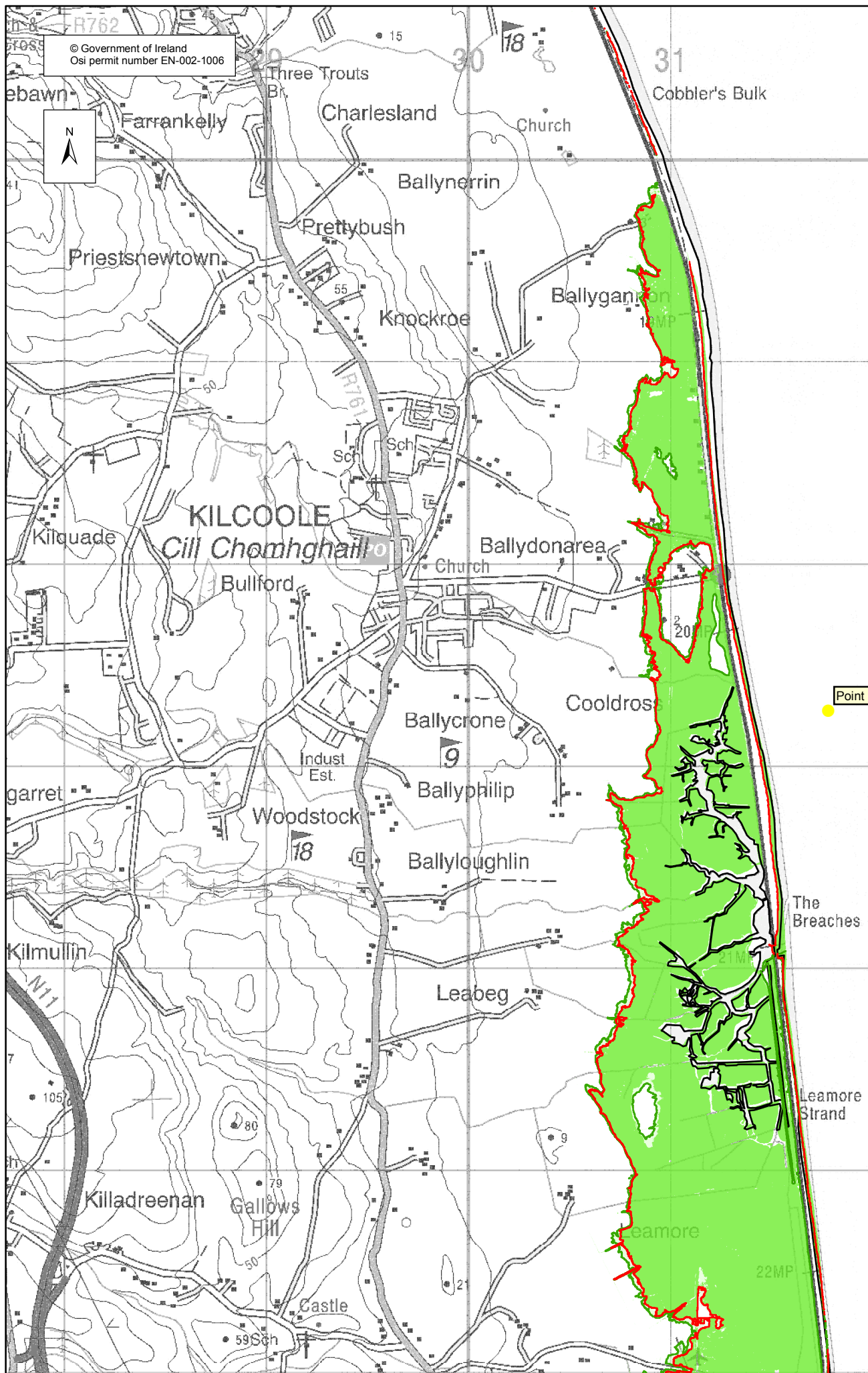
Scenario: CURRENT

Figure By: PJW Date: May 2009

Checked By: JMC Date: May 2009

Figure No.: SE / RA / EXT / 3 Revision: 0

Drawing Scale: 1:25,000 Plot Scale: 1:1 @ A3



	Water Level (mOD Malin) per AEP		
Node Label	WL 10%	WL 0.5%	WL 0.1%
Point 9	2.13	2.56	2.80



**EXTENT MAP**

- Legend:
- 0.5% AEP FLOOD EXTENT (1 in 200 chance in any given year)
  - 0.1% AEP FLOOD EXTENT (1 in 1000 chance in any given year)
  - Very High Confidence (0.1% AEP)
  - High Confidence (0.1% AEP)
  - Medium Confidence (0.1% AEP)
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  - Node Point
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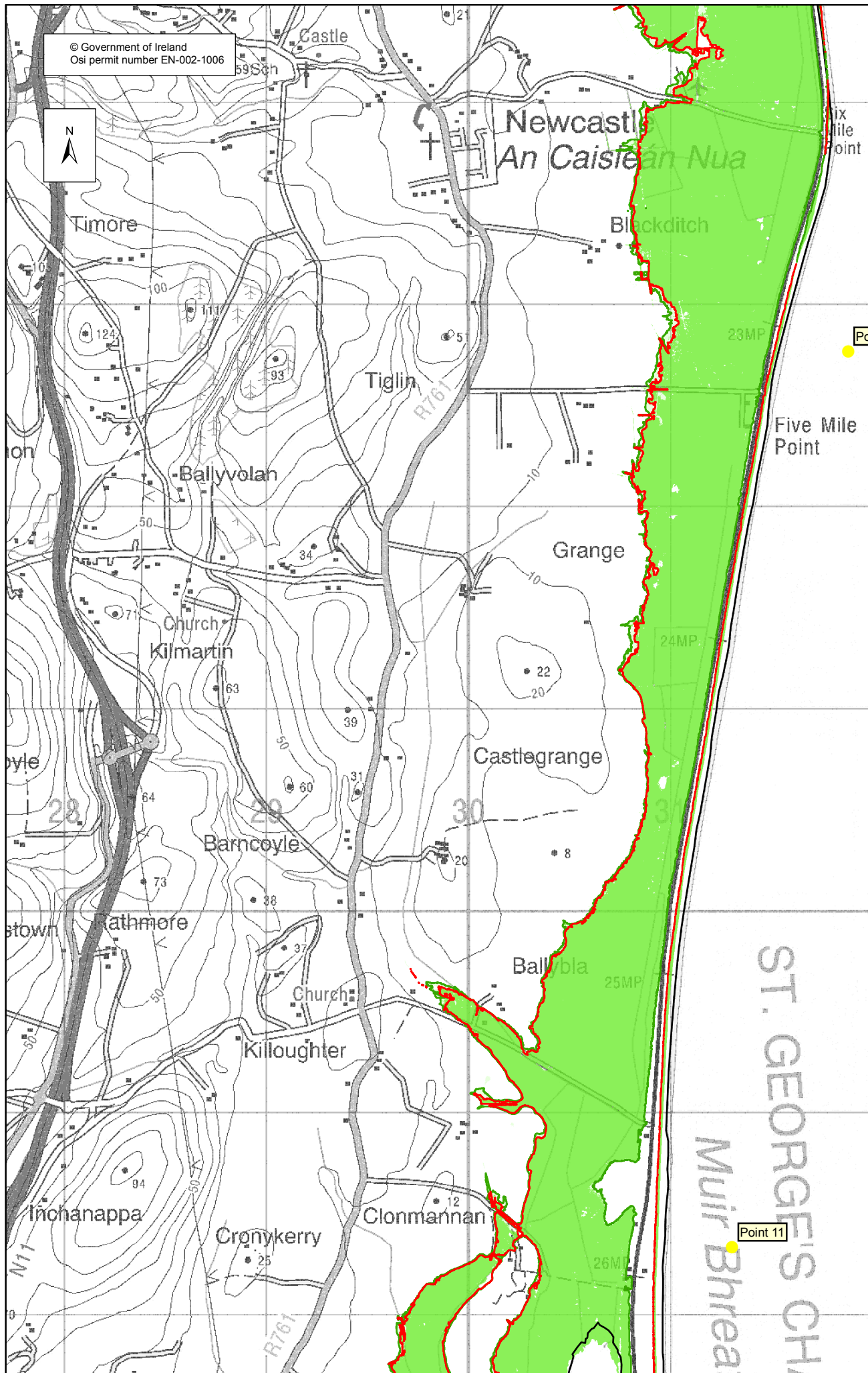
Project :  
 IRISH COASTAL PROTECTION STRATEGY  
 STUDY - PHASE II

Map :  
 SOUTH EAST COAST FLOOD EXTENT MAP

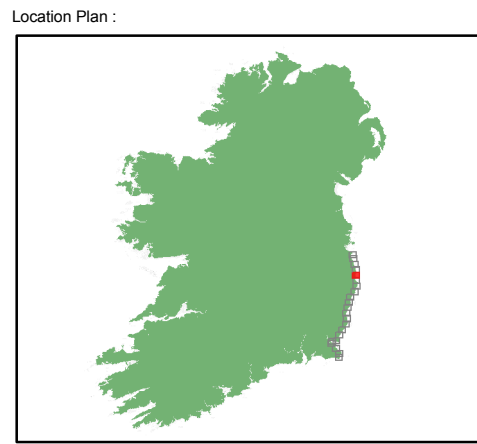
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 Source : TIDAL FLOODING  
 Map area : RURAL AREA  
 Scenario : CURRENT

Figure By : PJW Date : May 2009  
 Checked By : JMC Date : May 2009

Figure No. : SE / RA / EXT / 4 Revision : 0  
 Drawing Scale : 1:25,000 Plot Scale : 1:1 @ A3



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**EXTENT MAP**

- Legend:
- 0.5% AEP FLOOD EXTENT (1 in 200 chance in any given year)
  - 0.1% AEP FLOOD EXTENT (1 in 1000 chance in any given year)
  - Very High Confidence (0.1% AEP)
  - High Confidence (0.1% AEP)
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  - Very High Confidence (0.5% AEP)
  - High Confidence (0.5% AEP)
  - Medium Confidence (0.5% AEP)
  - Low Confidence (0.5% AEP)
  - Very Low Confidence (0.5% AEP)
  - High Water Mark (HWM)
  - Node Point
  - Point 34 Node Label (refer to table)

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Ireland

Project :  
**IRISH COASTAL PROTECTION STRATEGY STUDY - PHASE II**

Map :  
**SOUTH EAST COAST FLOOD EXTENT MAP**

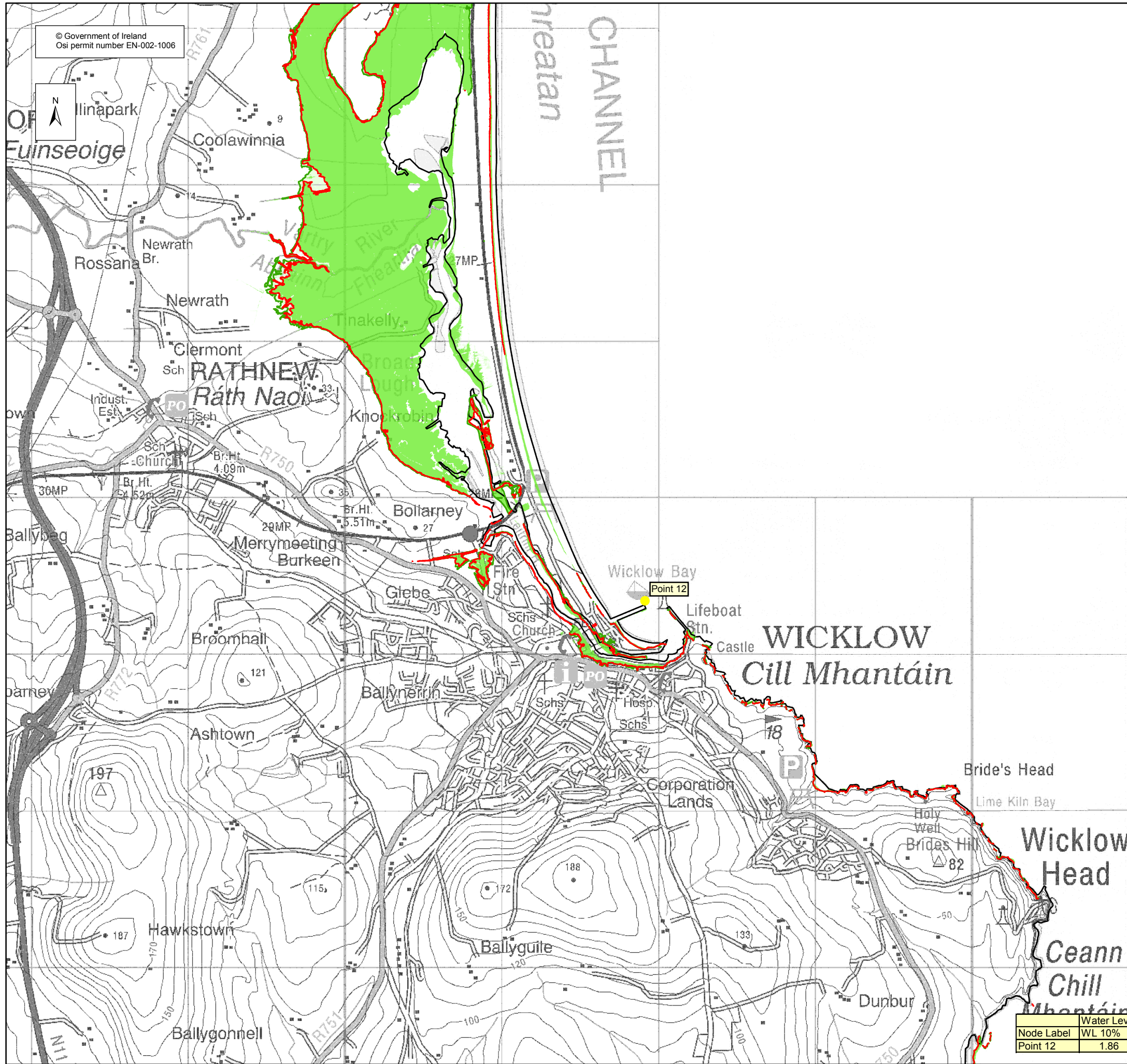
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Source : TIDAL FLOODING  
Map area : RURAL AREA  
Scenario : CURRENT

Figure By : PJW Date : May 2009  
Checked By : JMC Date : May 2009

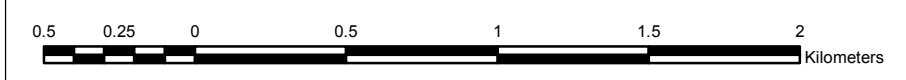
Node Label	Water Level (mOD Malin) per AEP		
	WL 10%	WL 0.5%	WL 0.1%
Point 10	2.01	2.43	2.65
Point 11	1.91	2.32	2.53

Figure No. : SE / RA / EXT / 5 Revision : 0  
Drawing Scale : 1:25,000 Plot Scale : 1:1 @ A3

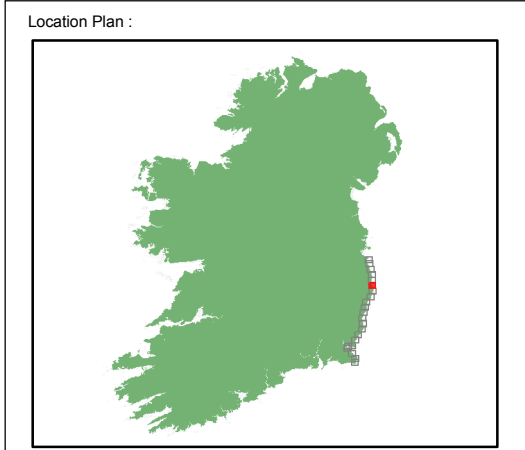




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Node Label	Water Level (mOD Malin) per AEP		
	WL 10%	WL 0.5%	WL 0.1%
Point 12	1.86	2.26	2.48



**EXTENT MAP**

- Legend:
- 0.5% AEP FLOOD EXTENT (1 in 200 chance in any given year)
  - 0.1% AEP FLOOD EXTENT (1 in 1000 chance in any given year)
  - Very High Confidence (0.1% AEP)
  - High Confidence (0.1% AEP)
  - Medium Confidence (0.1% AEP)
  - Low Confidence (0.1% AEP)
  - Very Low Confidence (0.1% AEP)
  - Very High Confidence (0.5% AEP)
  - High Confidence (0.5% AEP)
  - Medium Confidence (0.5% AEP)
  - Low Confidence (0.5% AEP)
  - Very Low Confidence (0.5% AEP)
  - High Water Mark (HWM)
  - Node Point
  - Point 34 Node Label (refer to table)

USER NOTE:  
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Belfast  
BT 12 6RZ  
Northern Ireland



Office of Public Works  
17-19 Lower Hatch Street  
Dublin 2  
Ireland

Project:  
**IRISH COASTAL PROTECTION STRATEGY STUDY - PHASE II**

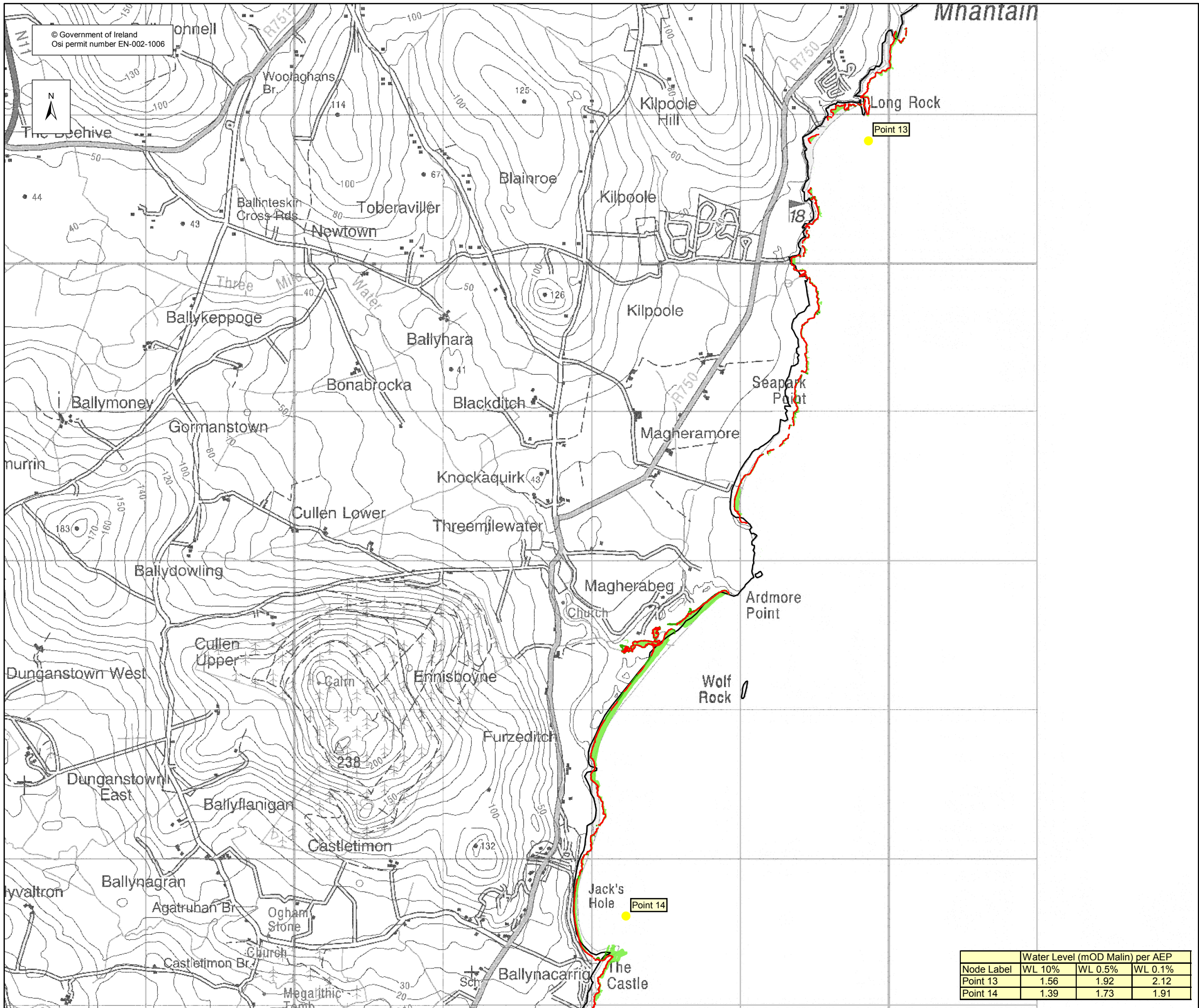
Map:  
**SOUTH EAST COAST FLOOD EXTENT MAP**

Map Type: FLOOD EXTENT  
Source: TIDAL FLOODING  
Map area: RURAL AREA  
Scenario: CURRENT

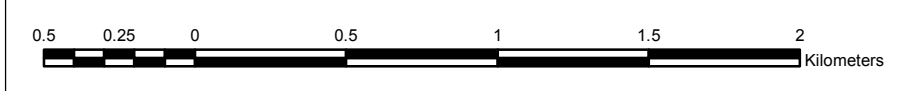
Figure By: PJW Date: May 2009  
Checked By: JMC Date: May 2009

Figure No.: SE / RA / EXT / 6 Revision: 0

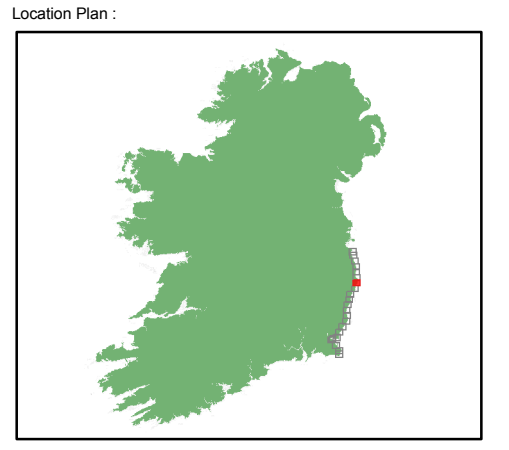
Drawing Scale: 1:25,000 Plot Scale: 1:1 @ A3



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Node Label	Water Level (mOD Malin) per AEP		
	WL 10%	WL 0.5%	WL 0.1%
Point 13	1.56	1.92	2.12
Point 14	1.39	1.73	1.91



**EXTENT MAP**

Legend:

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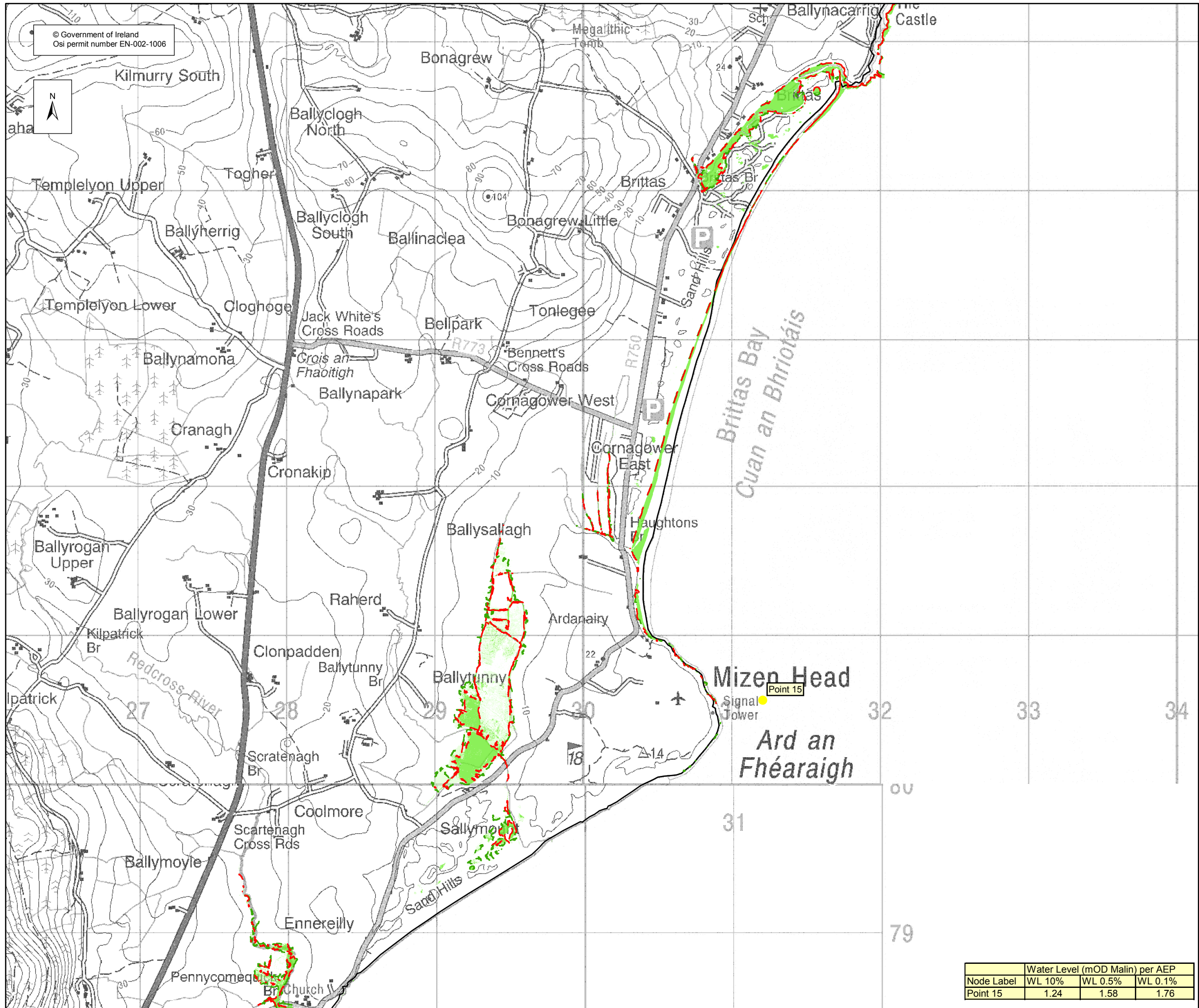
Map:  
**SOUTH EAST COAST FLOOD EXTENT MAP**

Map Type: FLOOD EXTENT  
Source: TIDAL FLOODING  
Map area: RURAL AREA  
Scenario: CURRENT

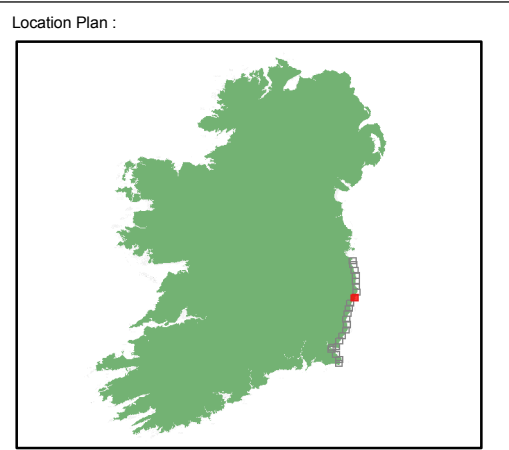
Figure By: PJW Date: May 2009  
Checked By: JMC Date: May 2009

Figure No.: SE / RA / EXT / 7  
Revision: 0

Drawing Scale: 1:25,000 Plot Scale: 1:1 @ A3



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**EXTENT MAP**

- Legend:
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  - 0.1% AEP FLOOD EXTENT (1 in 1000 chance in any given year)
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  - High Water Mark (HWM)
  - Node Point
  - Point 34 Node Label (refer to table)

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**IRISH COASTAL PROTECTION STRATEGY STUDY - PHASE II**

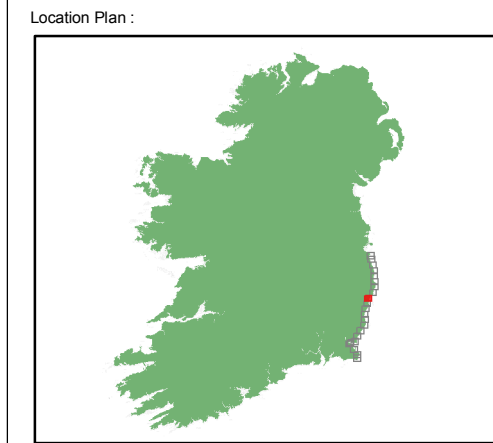
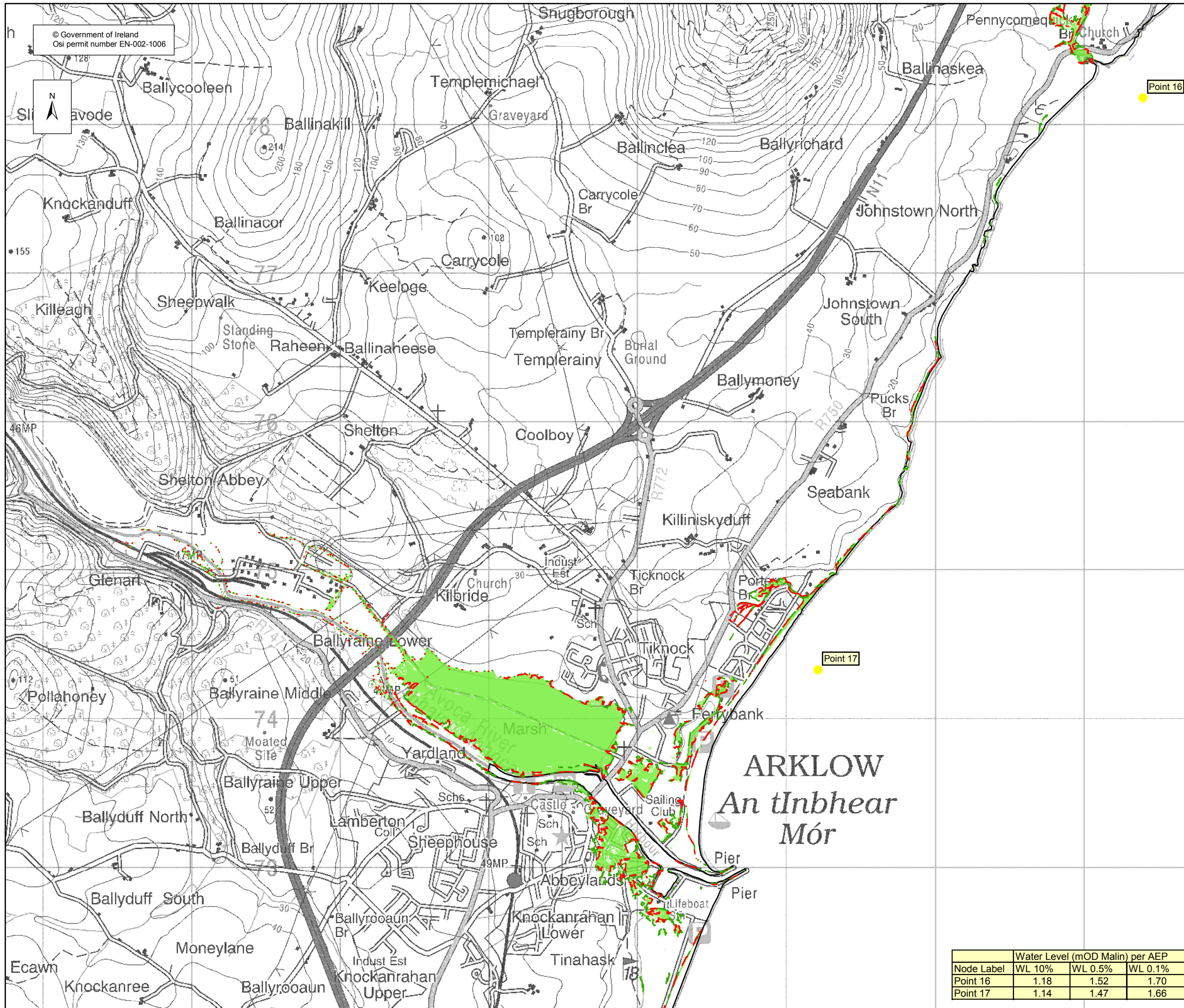
Map:  
**SOUTH EAST COAST FLOOD EXTENT MAP**

Map Type: FLOOD EXTENT  
Source: TIDAL FLOODING  
Map area: RURAL AREA  
Scenario: CURRENT

Figure By: PJW Date: May 2009  
Checked By: JMC Date: May 2009

Node Label	Water Level (mOD Malin) per AEP		
	WL 10%	WL 0.5%	WL 0.1%
Point 15	1.24	1.58	1.76

Figure No.: SE / RA / EXT / 8 Revision: 0  
Drawing Scale: 1:25,000 Plot Scale: 1:1 @ A3



**EXTENT MAP**

Legend:

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- Very High Confidence (0.1% AEP)
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- Low Confidence (0.5% AEP)
- Very Low Confidence (0.5% AEP)
- High Water Mark (HWM)
- Node Point
- Point 34 Node Label (refer to table)

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IRISH COASTAL PROTECTION STRATEGY  
STUDY - PHASE II

Map:  
SOUTH EAST COAST FLOOD EXTENT MAP

Map Type: FLOOD EXTENT  
Source: TIDAL FLOODING  
Map area: RURAL AREA  
Scenario: CURRENT

Figure By: PJW Date: May 2009  
Checked By: JMC Date: May 2009

Node Label	Water Level (mOD Malin) per AEP		
	WL 10%	WL 0.5%	WL 0.1%
Point 16	1.18	1.52	1.70
Point 17	1.14	1.47	1.66

Figure No.: SE / RA / EXT / 9 Revision: 0

Drawing Scale: 1:25,000 Plot Scale: 1:1 @ A3

