



# Ayrshire Shoreline Management Plan

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# Ayrshire Shoreline Management Plan

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# TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY.....</b>	<b>IV</b>
INTRODUCTION.....	IV
STRATEGIC ENVIRONMENTAL ASSESSMENT .....	V
BASIS FOR DEVELOPMENT OF THE PLAN .....	V
SHORELINE MANAGEMENT POLICIES AND MEASURES .....	V
POLICY STATEMENTS.....	VI
ACTION PLAN .....	VI
MITIGATION & MONITORING.....	VII
NEXT STEPS .....	VII
<b>1 INTRODUCTION .....</b>	<b>1</b>
1.1 THE SHORELINE MANAGEMENT PLAN .....	1
1.2 STRUCTURE OF THE SMP .....	5
1.3 THE PLAN DEVELOPMENT PROCESS.....	6
<b>2 STRATEGIC ENVIRONMENTAL ASSESSMENT .....</b>	<b>8</b>
2.1 INTRODUCTION.....	8
2.2 METHODOLOGY AND CONSULTATIONS .....	10
<b>3 BASIS FOR DEVELOPMENT OF THE PLAN .....</b>	<b>13</b>
3.1 OVERVIEW OF THE AYRSHIRE COASTLINE .....	13
3.2 SUB-CELL 6B1: CLOCH POINT – HUNTERSTON ORE TERMINAL.....	19
3.3 SUB-CELL 6B2: HUNTERSTON ORE TERMINAL – FARLAND HEAD .....	22
3.4 SUB-CELL 6C1: FARLAND HEAD - ARDROSSAN .....	24
3.5 SUB-CELL 6C2: ARDROSSAN - TROON .....	27
3.6 SUB-CELL 6C3: TROON - AYR.....	31
3.7 SUB-CELL 6C4: AYR - DUNURE.....	34
3.8 SUB-CELL 6C5: DUNURE - TURNBERRY.....	37
3.9 SUB-CELL 6C6: TURNBERRY – BENNANE HEAD .....	39
3.10 SUB-CELL 6D1: BENNANAE HEAD – CURRARIE PORT.....	43
3.11 SUB-CELL 6D2: CURRARIE PORT – MILLEUR POINT .....	46
3.12 SUB-CELL A1: LOCHRANZA – CLAUCHLANDS POINT.....	49

3.13	SUB-CELL A2: CLAUCHLANDS POINT – KINGSCROSS POINT .....	53
3.14	SUB-CELL A3: KINGSCROSS POINT – DRUMADOON POINT .....	56
3.15	SUB-CELL A4: DRUMADOON POINT - LOCHRANZA.....	59
3.16	SUB-CELL: GREAT CUMBRAE .....	62
<b>4</b>	<b>SHORELINE MANAGEMENT POLICIES AND MEASURES .....</b>	<b>66</b>
4.1	SHORELINE MANAGEMENT POLICIES .....	66
4.2	SHORELINE MANAGEMENT MEASURES .....	66
<b>5</b>	<b>POLICY STATEMENTS .....</b>	<b>69</b>
5.1	INTRODUCTION.....	69
5.2	POLICY STATEMENTS .....	73
<b>6</b>	<b>ACTION PLAN .....</b>	<b>214</b>
6.1	INTRODUCTION.....	214
6.2	SUB-CELL 6B1 ACTION PLAN: CLOCH POINT – HUNTERSTON ORE TERMINAL ....	215
6.3	SUB-CELL 6B2 ACTION PLAN: HUNTERSTON ORE TERMINAL – FARLAND HEAD .	218
6.4	SUB-CELL 6C1 ACTION PLAN: FARLAND HEAD – ARDROSSAN .....	221
6.5	SUB-CELL 6C2 ACTION PLAN: ARDROSSAN – TROON.....	224
6.6	SUB-CELL 6C3 ACTION PLAN: TROON – AYR .....	228
6.7	SUB-CELL 6C4 ACTION PLAN: AYR – DUNURE .....	231
6.8	SUB-CELL 6C5 ACTION PLAN: DUNURE – TURNBERRY .....	234
6.9	SUB-CELL 6C6 ACTION PLAN: TURNBERRY – BENNANE HEAD .....	236
6.10	SUB-CELL 6D1 ACTION PLAN: BENNANE HEAD – CURRARIE PORT.....	239
6.11	SUB-CELL 6D2 ACTION PLAN: CURRARIE PORT – MILLEUR POINT .....	241
6.12	SUB-CELL A1 ACTION PLAN: LOCHRANZA – CLAUCHLANDS POINT .....	243
6.13	SUB-CELL A2 ACTION PLAN: CLAUCHLANDS POINT – KINGSCROSS POINT .....	246
6.14	SUB-CELL A3 ACTION PLAN: KINGSCROSS POINT – DRUMADOON POINT.....	249
6.15	SUB-CELL A4 ACTION PLAN: DRUMADOON POINT – LOCHRANZA .....	252
6.16	SUB-CELL GREAT CUMBRAE ACTION PLAN.....	254
<b>7</b>	<b>MITIGATION AND MONITORING .....</b>	<b>257</b>
7.1	MITIGATION.....	257
7.2	MONITORING.....	258
<b>8</b>	<b>NEXT STEPS .....</b>	<b>259</b>

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8.1 APPLICATION OF THE SMP IN SPATIAL PLANNING .....259

8.2 FURTHER ACTIONS TO FACILITATE MEDIUM/LONG TERM POLICIES .....260

8.3 MANAGEMENT OF SMP UNTIL NEXT REVIEW .....261

**9 REFERENCES .....262**

**LIST OF APPENDICES:**

- APPENDIX A: SMP DEVELOPMENT (METHODOLOGY OF ASSESSMENT)
- APPENDIX B: STAKEHOLDER ENGAGEMENT
- APPENDIX C: DATA GAP ANALYSIS – COASTAL PROCESSES
- APPENDIX D: POLICY & ACTIONS ASSESSMENT
- APPENDIX E: ECONOMIC APPRAISAL

## EXECUTIVE SUMMARY

### INTRODUCTION

A shoreline management plan (SMP) is a broad-scale assessment of the risks associated with coastal processes and helps to inform the management of these risks to people and the developed, historic and natural environment. In preparing a SMP the lead Authorities, are fulfilling an important part of the accepted UK national strategy for managing flooding and coastal erosion.

The administrative boundaries of the Ayrshire SMP extend from the northern boundary of the North Ayrshire Council area to the southern boundary of the South Ayrshire Council area. The islands of Great Cumbrae and Arran are also included within the scope of the Ayrshire SMP. Other smaller offshore islands are excluded from the scope of the Plan due to the low level of assets present. The Plan extent is shown in Figure 1.1.

The implications of relevant suggested management measures have been considered for the adjacent council areas of Inverclyde and Dumfries & Galloway, however policy for these areas is not set by the Ayrshire SMP.

Four high level SMP policies are available to shoreline managers as defined by national guidance:

- **Advance the existing defence line:** allow new defences to be built on the seaward side of the original defences.
- **Hold the existing defence line:** allow maintenance or improvement of the standard of protection presently afforded.
- **Managed Realignment:** this represents a policy of allowing the shoreline to move backwards or forwards, with management to control or limit movement.
- **No Active Intervention:** whereby there is no investment in coastal defences or operations and the shoreline is either allowed to remain in a natural state or to revert to a natural state.

It is recognised that wholesale changes to existing defence management may not be appropriate in the very short-term. Consequently, the Ayrshire SMP provides a 'route map' for decision makers to move from the present situation towards the future in a sustainable manner. Consequently the SMP considers objectives, policies and shoreline management actions for a range of timescales: short-term, medium-term and long-term. These correspond broadly to time periods of 0 to 20 years, 20 to 50 years and 50 to 100 years respectively.

Shorelines are extremely dynamic and social, environmental and economic pressures and priorities constantly change over time, therefore it is essential that the SMP is reviewed and updated periodically. This regular review process will also ensure that the SMP can be adapted to account for changes in the appreciation of climate change effects and National policies relating to flood risk management.

## **STRATEGIC ENVIRONMENTAL ASSESSMENT**

A Strategic Environmental Assessment (SEA) was prepared in accordance with the Environmental Assessment (Scotland) Act 2005. The full detail of the SEA is provided in a separate document “SEA Environmental Report - IBE1107Rp00003”.

The purpose of this Environmental Report was to provide a formal and transparent assessment of the likely significant impacts on the environment arising from the implementation of the Ayrshire Shoreline Management Plan (SMP), including consideration of reasonable alternatives.

## **BASIS FOR DEVELOPMENT OF THE PLAN**

In order to facilitate the identification of appropriate shoreline management policies the Ayrshire coast was sub-divided into a number of smaller geographic sections. A strategic assessment of sediment transport potential was undertaken using computational modelling techniques to inform this process. The coastline was subsequently divided at locations across which there was little or no sediment transport potential, for example at headlands or other prominent features. A total of 15 ‘sub-cells’ were thus identified as shown in Figure 3.2.

In some areas, sub-cells were further sub-divided into policy units in order to allow a shoreline management policy to be proposed for appropriate sections of shoreline. This was based on consideration of the geographic extent of applicability of a particular management policy, ownership of assets at risk and the extent of administrative responsibilities. Policy units as defined for the Ayrshire SMP always lie within a single sub-cell.

## **SHORELINE MANAGEMENT POLICIES AND MEASURES**

There are principally four high level Shoreline Management Policies available to shoreline managers, however a much wider range of measures are available to implement these policies. A brief outline of the typical range of shoreline management measures available to achieve the desired policy for any particular section of the coastline is presented in Section 4, further information on measures is contained in the publication ‘Shoreline Management Guidelines’, Mangor et al. (2017).

## POLICY STATEMENTS

Section 5 contains a series of statements and maps presenting the preferred policy and setting out any associated implications for each Policy Unit. These statements provide local detail and consider locally-specific issues and objectives.

Each Policy Statement contains the following:

- **Location reference:** This is the general name used to reference each policy unit and a number identifier which is sequential along the shoreline from north to south and clockwise round the shoreline of the Isle of Arran.
- **Summary of the preferred Plan recommendation and justification:** A statement summarising the preferred Plan recommendation for a particular section of coastline and describing the rationale behind it. The focus of this is the definition of a long-term Plan, but any short-term requirements are also noted.
- **Preferred policies to implement the Plan:** These statements identify the plan policy and management measures anticipated for the short-term, medium-term and long-term. Any uncertainties in long-term policy / caveats that require resolution are detailed in the policy statement.
- **Predicted implications of the preferred Plan for this location:** This summarises the consequences at this location resulting from the preferred policy in the short, medium and long-term. These are categorised under the headings “Property & Land Use”, “Nature Conservation”, “Landscape”, “Historic Environment” and “Amenity & Recreational Use”.

It is important to note that while the Ayrshire coast has been sub-divided into policy units, many of the erosion and flooding issues occur on such a local scale that it is impractical to consider each location as a separate policy unit in a strategic level Plan. Consequently where a particular management policy is recommended for a Policy Unit this does not purport to imply that the policy needs to be implemented across the full extent of the Policy Unit. Measures should only be implemented where these can be justified on the basis of risk and are socially, environmentally and technically sustainable.

## ACTION PLAN

The Ayrshire SMP identifies policies for each section of shoreline along the Ayrshire coast for the short (0 – 20 years), medium (20 – 50 years), and long-term (50 – 100 years). An action plan is presented in Section 6 that sets out the methods by which these policies may be implemented. The objectives of the action plan are to:

- Facilitate implementation of the SMP policies;



- Identify and/or promote studies to further improve understanding where this is required to resolve policy and/or implementation;
- Promote use of the SMP recommendations in spatial planning;
- Identify procedures for the management of the SMP until its next review; and
- Establish a framework to monitor progress against the action plan and initiate future SMP review.

## **MITIGATION & MONITORING**

Mitigation measures are recommended in Section 7 where potential negative impacts have been considered likely to result from implementation of a proposed shoreline management policy. The mitigation measures are detailed in the SEA Environmental Report “IBE1107Rp00003”, and aim to prevent, reduce and as fully as possible offset any significant adverse effects on the environment due to the implementation of the Plan.

The principal mitigation recommendation is that the predicted negative effects should be considered further at the next stage of policy development, when details of the physical shoreline management measures (e.g. visual appearance and alignment of hard engineering works) can be optimised through detailed feasibility studies and design in order to limit potential identified impacts on sensitive receptors. Where feasible, natural flood management and soft / green engineering methods should be incorporated into the detailed planning to reduce the negative environmental impacts of any scheme.

The SEA Directive requires that the implementation of a plan is monitored in order to identify at an early stage any unforeseen adverse effects to facilitate undertaking appropriate remedial action. For the environmental monitoring of the SMP the proposed indicators, data and responsible authorities are recommended in section 8.2 of the SEA Environmental Report - IBE1107Rp00003. These are based on the Targets and Indicators established in the SEA Objectives. This monitoring will be undertaken in the course of the SMP adoption. However detailed monitoring for specific policies proposed should be re-scoped in consultation with the appropriate authorities at the detailed feasibility and design stages. This agreed detailed monitoring should then be undertaken before, during and after construction, where and when appropriate.

## **NEXT STEPS**

The risk management policies set out in the Ayrshire SMP cannot be implemented through engineering or coastal management alone. Consequently, the final section of the Ayrshire SMP sets out actions which should be undertaken to ensure the Ayrshire SMP policies are appropriately reflected in regional and local spatial planning.

There is also a need for some activities to be progressed which require consideration over the whole Ayrshire SMP area or even beyond the scale of the Ayrshire SMP. These include formal adoption of the SMP and development of exit strategies where current management practices are unsustainable.

The Action Plan should be published and updated at regular intervals in order to track progress of each action and to communicate progress to stakeholders.

The Ayrshire SMP should be reviewed at regular intervals in order to assess if the policies and actions proposed are still appropriate, particularly as the understanding of the rate of sea level rise resulting from global climate change becomes better understood.

# 1 INTRODUCTION

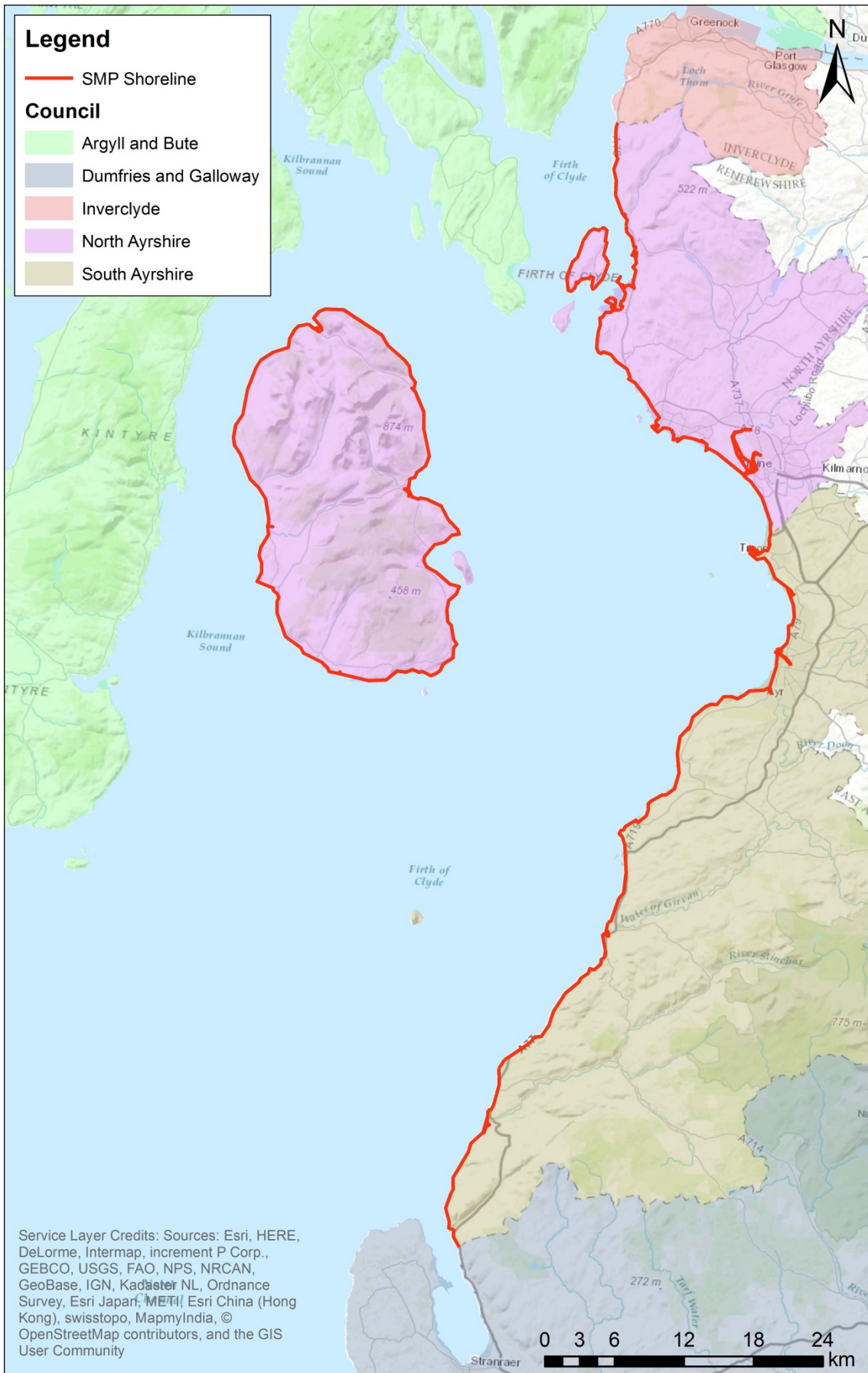
## 1.1 THE SHORELINE MANAGEMENT PLAN

A Shoreline Management Plan (SMP) is a large-scale assessment of the risks associated with coastal processes and helps to inform the management of these risks to people and the developed, historic and natural environment. In preparing an SMP the lead Authorities, are fulfilling an important part of the accepted UK national strategy for managing flooding and coastal erosion.

The administrative boundaries of the Ayrshire SMP extend from the northern boundary of the North Ayrshire Council area to the southern boundary of the South Ayrshire Council area. This is approximately from the town of Skelmorlie to the outlet of the Galloway Burn on the north-eastern edge of Loch Ryan. The islands of Great Cumbrae and Arran are also included within the scope of the Ayrshire SMP. Other smaller offshore islands are excluded from the scope of the Plan due to the low number of assets present.

Coastal processes are not restricted by the presence of these administrative boundaries, therefore the implications of the suggested management measures have been considered for the adjacent council areas of Inverclyde and Dumfries & Galloway, insofar as coastal sub-cells (refer to Section 3.1) extend into these Council areas, even though policy for these areas is not set by the Ayrshire SMP.

The length of coastline covered by the Ayrshire SMP is illustrated graphically in Figure 1.1. The Ayrshire SMP relates to the shoreline and all lands identified to be a flood or erosion risk by the reference datasets. In essence the area of applicability can therefore be broadly considered to include all lands within circa 1km of the present shoreline, including estuaries.



**Figure 1.1 Ayrshire SMP Area**

### 1.1.1 Objectives

A Shoreline Management Plan provides the basis for developing management policies for a length of coast and sets the framework for managing risks along a particular coastline in the future. (Defra, 2006)

The objectives of an SMP include:

- Setting out the risks from flooding and erosion to people and the developed, historic and natural environment within the SMP area;
- Identifying opportunities to maintain and improve the environment by managing the risks from floods and coastal erosion;
- Identifying the preferred policies for managing risks from flooding and erosion over the next century;
- Identifying the consequences of putting the preferred policies into practice;
- Setting out procedures for monitoring how effective these policies are;
- Informing others so that future land use, planning and development of the shoreline takes account of the risks and the preferred policies;
- Discouraging inappropriate development in areas where the flood and erosion risks are high; and
- Ensuring compliance with international and national nature conservation legislation and aiming to achieve the biodiversity objectives.

### 1.1.2 General Principles

An SMP is a non-statutory policy document for coastal defence management planning. The requirement for an SMP covering the Ayrshire coastline was identified by SEPA through the development of the Ayrshire Local Flood Risk Management Strategy and implementation of the strategy is detailed in the Ayrshire Local FRM Plan.

The preparation of the Ayrshire SMP has taken due cognisance of appropriate guidance, including the Defra document 'Shoreline Management Plan Guidance Volume 1 & 2' (2006). Other existing planning initiatives and legislative requirements have also been considered, as the SMP is intended to inform wider strategic planning.

The Ayrshire SMP does not set policy for anything other than coastal defence management; however, as there can be significant social, economic and environmental implications associated with the policies delivered by an SMP, stakeholder engagement has formed a significant element of the development process.

Whilst the SMP sets out policy that is adopted and agreed by the participating organisations, this does not represent any commitment to future funding or implementation. Funding for the

implementation of the SMP policies needs to be sought individually through implementation of the recommendations of the Action Plan and will be subject to the proposed measures satisfying relevant environmental, social and economic criteria.

### 1.1.3 Policies

The four high level SMP policies available to shoreline managers as defined by national guidance are listed below:

- **Advance the existing defence line:** allow new defences to be built on the seaward side of the original defences. Use of this policy is generally limited to those policy units where significant land reclamation is considered likely / desirable. It should be noted that setting this policy for a section of shoreline does not represent a requirement that actions must be taken to advance the defence line, rather it indicates that these actions are considered acceptable, however it is important to note that lesser actions which will hold the existing defence line are also acceptable.
- **Hold the existing defence line:** allow maintenance or improvement of the standard of protection presently afforded. In addition to covering situations where the existing defence structures need to be maintained, this policy also covers those situations where work or operations are carried out in front of the existing defences (such as beach recharge, rebuilding the toe of a structure, building offshore breakwaters and so on) to improve or maintain the standard of protection provided by the existing defence line. This policy also includes other policies that involve operations to the rear of existing defences (such as building secondary floodwalls) where they form an essential part of maintaining the current coastal defence system.
- **Managed Realignment:** this represents a policy of allowing the shoreline to move backwards or forwards, with management to control or limit movement (such as reducing erosion or building new defences on the landward side of the original defences).
- **No Active Intervention:** whereby there is no investment in coastal defences or operations and the shoreline is either allowed to remain in a natural state or to revert to a natural state.

### 1.1.4 Sustainable Shoreline Management

The Ayrshire SMP seeks to identify 'sustainable shoreline management policies', however 'sustainability' can mean different things depending upon the individual viewpoint. The conflicting pressures on the coast and constraints upon its management therefore are an

important consideration in the development of an optimised plan which provides 'balanced sustainability'.

The Ayrshire SMP promotes management policies for the coastline into the 22<sup>nd</sup> century, thus the adopted policies must achieve long-term objectives without committing to unsustainable defence practices. It is, however, recognised that due to present-day objectives and acceptance, wholesale changes to existing defence management may not be appropriate in the very short-term. Consequently, the Ayrshire SMP provides a 'route map' for decision makers to move from the present situation towards the future in a sustainable manner based on present understanding of climate change impacts.

The SMP considers objectives, policies and shoreline management actions for a range of timescales: short-term, medium-term and long-term. These correspond broadly to time periods of 0 to 20 years, 20 to 50 years and 50 to 100 years respectively.

## **1.2 STRUCTURE OF THE SMP**

The Ayrshire SMP consists of three main parts; a non-technical Executive Summary, the shoreline management plan and a series of supporting appendices.

### **1.2.1 Non-Technical Executive Summary**

This document is a brief summary of the Ayrshire SMP and is intended for a wide and predominantly non-technical audience. The document contains the objectives and main findings of the SMP, without recourse to significant technical detail.

### **1.2.2 Shoreline Management Plan**

The Ayrshire SMP sets out the plan for the future management of the Ayrshire shoreline and is intended for a general audience. Policy statements for each section of the coast and an action plan for implementing these policies is defined. The SMP is presented in eight parts as follows:

1. Gives an introduction to the SMP including the study area and how the plan was developed.
2. Details of how the SMP complies with the requirements for a Strategic Environmental Assessment (SEA).
3. Provides the basis for development of the Plan including a description of the Ayrshire shoreline and the various pressures influencing the coast.
4. Provides detail on the various shoreline management options which are available and their potential implications.

5. Provides a series of statements presenting the preferred policy and implications for individual sections of the coastline (Policy Units). These statements provide local detail and consider locally-specific issues and objectives.
6. Provides a 'route map' to implementation for each shoreline management activity identified as part of the Plan.
7. Gives details of the mitigation and monitoring requirements identified by the SEA.
8. Gives details of the next steps in the SMP process including how the policies should influence planning decisions and how the Plan will be reviewed and updated.

### 1.2.3 Supporting Documents (Appendices)

A series of supporting documents are provided with the Ayrshire SMP. These provide technical detail to support the Plan.

- A. **SMP Development:** This provides detail on the methodology of the assessment and the history of the development of the SMP, describing more fully the plan and policy decision-making process. The remaining documents effectively provide appendices to this report.
- B. **Stakeholder Involvement:** All communications from the stakeholder engagement process are provided here, together with information arising from the consultation process.
- C. **Baseline Processes:** Provides details of the baseline coastal processes around the Ayrshire coastline and assessment of long term issues associated with undertaking a 'No Active Intervention' baseline.
- D. **Policy / Options Assessment:** Provides information on the policy / option assessment process. This includes details of the environmental, social, technical and economic issues which have been considered for each Policy Unit.
- E. **Economic Appraisal:** Provides information on the high level economic review of risk in each sub-cell and the potential economic benefits associated with managing this risk.

## 1.3 THE PLAN DEVELOPMENT PROCESS

The requirement for an SMP covering the Ayrshire coastline was identified by SEPA through the development of the Ayrshire Local Flood Risk Management Strategy. The Ayrshire SMP was developed in partnership between the operating authorities and other organisations with key roles in shoreline management. The project was led by a Project Steering Group, with detailed management being undertaken by a Technical Group. These groups included members of the following organisations:



- North Ayrshire Council (involving their engineering and planning departments);
- South Ayrshire Council (involving their engineering and planning departments);
- Scottish Environment Protection Agency (SEPA);
- Scottish Natural Heritage (SNH); and
- Historic Scotland.

Further meetings were held with engineering and planning representatives from North and South Ayrshire Councils in order to identify and understand local shoreline issues and identify appropriate management strategies for each Policy Unit.

The main activities in producing the SMP have been:

- Collation and review of all available information relating to the shoreline in the study area. This included existing coastal study reports, flood risk assessments, asset survey reports etc.
- Identification of gaps in the knowledge of coastal processes based on a review of existing information.
- Analysis of baseline coastal processes to allow the coastline to be sub-divided into manageable sections for reporting based on a consistent understanding of coastal processes.
- Division of the Ayrshire coastline in to a series of sediment sub-cells based on limiting the potential for shoreline management activities in one area to interact with coastal processes in adjoining areas.
- Consultation with Council representatives to establish the coastal flooding and erosion issues and local priorities and plans for each section of the coast.
- Agreement of high level shoreline management strategy for each coastal cub-cell with the wider Project Team.
- Consultation with a wider stakeholder group and the public on the policies and measures identified by the Project Team
- Strategic Environmental Appraisal of the SMP.
- Incorporation of consultation feedback and production of the final SMP.

The SMP considers objectives, policies and shoreline management actions for a range of timescales up to approximately 100 years into the future. Shorelines are extremely dynamic, and social, environmental and economic pressures and priorities constantly transform over time. Therefore it is essential that the SMP is reviewed and updated periodically in order to best manage the Ayrshire shoreline.

## 2 STRATEGIC ENVIRONMENTAL ASSESSMENT

### 2.1 INTRODUCTION

A Strategic Environmental Assessment (SEA) has been prepared in accordance with the Environmental Assessment (Scotland) Act 2005, which implements European Union Directive 2001/42/EC on the Assessment of the Effects of Certain Plans and Programmes on the Environment. The full detail of the SEA is provided in a separate document “SEA Environmental Report - IBE1107Rp00003”.

The purpose of this Environmental Report was to provide a formal and transparent assessment of the likely significant impacts on the environment arising from the implementation of the Ayrshire Shoreline Management Plan (SMP), including consideration of reasonable alternatives.

#### 2.1.1 Screening for SEA

On behalf of North Ayrshire Council and South Ayrshire Council, RPS carried out an SEA Screening for the Ayrshire SMP in September 2016 to demonstrate how:

- North Ayrshire Council and South Ayrshire Council are together the Responsible Authority for the development and implementation of the Ayrshire Shoreline Management Plan.
- The Responsible Authority determined that the Ayrshire Shoreline Management Plan required an SEA, as the likelihood existed for significant environmental effects to arise as a result of the Plan. The Plan falls within Section 5(3) of the Environmental Assessment (Scotland) Act 2005.
- The Responsible Authority identified that the Ayrshire Shoreline Management Plan sets the framework for future shoreline works along the Ayrshire coast, that there was the potential for significant impacts as a result of the scale and duration of works and that sensitive receptors along the Ayrshire coast include SAC, SPA, SSSIs and LNRs.

Responses to the SEA Screening from the Scottish Environment Protection Agency (SEPA), Scottish Government, Scottish Natural Heritage and Historic Environment Scotland can be found in **Appendix A** of the SEA Environmental Report - IBE1107Rp00003.

### 2.1.2 Scoping for SEA

The SEA Scoping for the Plan took place from January 2017 to April 2017. A Scoping Report was produced to provide sufficient information on the Plan to enable consultees to form an opinion on the appropriateness of the scope, format, level of detail, methodology for assessment and the consultation period proposed for the Environmental Reports.

The issuing of a draft Scoping Report to consultees is recommended as good practice and can inform stakeholders about the key environmental issues and the key elements of the Plan. In addition, the Scoping Report can be used as a tool to generate comments from stakeholders on the scope and approach of the SEA.

A table of SEA Topics and Environmental Awareness Issues was created to generate discussion during the scoping process and consultation in relation to the SEA receptors. This table, along with responses received in relation to the Scoping for this SEA can be found in the SEA Environmental Report - IBE1107Rp00003.

### 2.1.3 Statutory Consultees for SEA

Under Article 6 of the SEA Directive, the competent authority (in this case North Ayrshire Council and South Ayrshire Council) preparing the plan or programme is required to consult with specific 'environmental authorities' (statutory consultees) on the scope and level of detail of the information to be included in the Environmental Report.

The statutory consultees established within Scottish SEA legislation are:

- Scottish Environment Protection Agency (SEPA)
- Scottish Natural Heritage (SNH)
- Historic Environment Scotland

### 2.1.4 Appropriate Assessment

The Habitats Directive (Council Directive 92/43/EEC) on the conservation of natural habitats and of wild fauna and flora obliges member states to designate, protect and conserve habitats and species of importance in a European Union context. Article 6(3) of the Habitats Directive requires that "*Any plan or project not directly connected with or necessary to the conservation of a site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives.*" This Directive was initially transposed into Scottish Law through the Habitats Regulation 1994 as amended in 2004, 2007, 2008, 2011 and 2012. Any proposed plan or project that has the potential to

result in a significant effect on a designated European site requires an Appropriate Assessment (AA). Case law has determined that the likelihood need not be great, merely possible, and that the precautionary principle must apply as set out in European Commission Guidance and as required by CJEU case law (i.e. C 127/02 'Waddenzee').

An Appropriate Assessment for the Ayrshire SMP has been carried out in parallel with the SEA process. The output of this was a Habitats Regulations Appraisal (HRA) Record, which was prepared to influence the development of the Plan and to provide Scottish Natural Heritage (SNH) with information on the Plan, the process undertaken for the HRA Record and to establish whether or not the Ayrshire SMP was likely to have a significant effect upon any European sites(s). The full findings of the HRA Record can be found in "Habitats Regulations Appraisal Record - IBE1107Rp00004" and have been integrated into the "SEA Environmental Report - IBE1107Rp00003" and subsequently into the Plan.

## **2.2 METHODOLOGY AND CONSULTATIONS**

An SEA has been undertaken to assess the environmental impacts of the measures proposed as part of the Ayrshire SMP. It also aimed to provide environmental guidance to ensure that the Plan was more sustainable. In conjunction with this, a Plan level HRA Record was also prepared to inform the decision making process, in terms of the potential for the proposed measures to impact upon the integrity of any European sites in view of their conservation objectives. Both environmental assessments were central to the development of the Final Plan.

### **2.2.1 Methodology**

The proposed measures were assessed in terms of their potential positive and negative impacts and the significance of these impacts on the environment against the SEA objectives. The purpose of this was to predict and evaluate, as far as possible, the environmental effects of the Plan, highlighting any significant environmental problems and / or benefits that were likely to arise from the implementation of the Plan. Where possible, this assessment was quantitative, with a graphical output to aid public appreciation and understanding of the implications of each proposed measure in the Plan.

The Ayrshire SMP was assessed via a Baseline Led Assessment. This method involves the assessment of each option available in the enactment of the Ayrshire SMP against each of the following headings/subjects:

- Biodiversity, Flora & Fauna (BFF)
- Population & Human Health (PHH)
- Geology, Soils and Landuse (S)

- Water (W)
- Climatic Factors (C)
- Material Assets & Infrastructure (MA)
- Cultural, Architectural & Archaeological Heritage (H)
- Landscape & Visual Amenity (L)

Each alternative available in the Ayrshire SMP was assessed in the short, medium and long term for likely effects, the significance of the effects, and whether they were positive or negative effects. Other impacts that were assessed for significance were; secondary effects, cumulative effects, synergistic effects, temporary and permanent effects, and the inter-relationship of effects. The scenario of “The Evolution of the Environment without the Ayrshire SMP” was also assessed in the same format. This is considered the Do-Nothing Scenario.

### 2.2.2 SEA Objectives

The Strategic Environmental Objectives (SEOs) were developed and consulted on with the environmental consultees. This assessment was relatively strategic, with the aim of reporting likely impacts at the coastal cell and sub-cell level to reflect the scale at which the options were being planned. A summary of the SEOs is given below.

Criteria	Objective
<b>Biodiversity, Flora &amp; Fauna</b>	<b>1</b> Avoid damage to, and where possible enhance, the biodiversity, flora and fauna in the vicinity of the shoreline.
<b>Population &amp; Human Health</b>	<b>2</b> Protect the public from risk of flooding and coastal erosion.
<b>Geology, Soils and Landuse</b>	<b>3</b> Maintain or improve areas of existing functional soil and land resource.
<b>Water</b>	<b>4</b> Protect and enhance the state of the water environment.
<b>Climatic Factors</b>	<b>5</b> Adaptation to potential climatic change.
<b>Material Assets &amp; Infrastructure</b>	<b>6</b> Protect material assets and infrastructure from risk of flooding and coastal erosion.
<b>Cultural, Architectural &amp; Archaeological Heritage</b>	<b>7</b> Protect or enhance historic environment features and their settings.
<b>Landscape &amp; Visual Amenity</b>	<b>8</b> Protect, and where possible enhance the landscape character and visual amenity of the Ayrshire shoreline.

The outcomes of the assessments have been incorporated into Section 5 of this SMP where the potential positive and negative impacts of the shoreline management policies are acknowledged.

Mitigation and monitoring was proposed in the SEA and HRA Record to prevent, reduce and as fully as possible offset any significant adverse effects on the environment due to implementation of the Plan. This mitigation and monitoring has been incorporated into section 7 of this SMP.

### **2.2.3 Consultation**

In addition to the scoping consultations, a stakeholder consultation report was produced in May 2017 to provide early engagement with non-statutory stakeholders from the Ayrshire coastline who were considered to possibly have an interest in the study.

The detailed responses received from this early stakeholder consultation can be found in **Appendix C** of the SEA Environmental Report - IBE1107Rp00003 and have been taken into consideration in the development of the Plan where feasible.

Consultation on the draft Plan, SEA Environmental Report and the HRA Record commenced in January 2018 and ran for 12 weeks. The consultation activities took the form of Public Consultation Days and the release of a web based consultation questionnaire. The documents were made available at North Ayrshire Council and South Ayrshire Council premises in hard copy and digitally via their websites.

## **3 BASIS FOR DEVELOPMENT OF THE PLAN**

### **3.1 OVERVIEW OF THE AYRSHIRE COASTLINE**

In line with the project brief the majority of the information on the nature of the Ayrshire coast and associated flood and erosion risk presented in the following sections has been derived from available studies and reports. Where additional research or specific studies were completed to inform the preparation of the SMP this is stated in the text.

#### **3.1.1 Sub-cells**

In order to facilitate the development and presentation of appropriate shoreline management policies for the Ayrshire coastline it was considered essential to sub-divide the full extent of the Ayrshire coastline into a number of smaller geographic sections. Previous work undertaken by HR Wallingford in 1997 had identified four coastal sub-cells within the Firth of Clyde as shown in Figure 3.1. The Ayrshire coastline falls at least partly within sub-cells 6b, 6c and 6d, however this level of sub-division was considered too broad scale for effective determination and reporting of shoreline management policies. The review of available studies indicated that there was an inconsistent level of reported knowledge of the coastal processes throughout the study area. Consequently an assessment of sediment transport potential was undertaken using computational modelling techniques to provide a coherent dataset to inform the sub-division of the Ayrshire coastline in to suitable geographic areas for reporting of policies and measures.

A total of 15 sub-cells were identified based on defining areas within which various measures could be applied without affecting adjoining sections of the coast as shown in Figure 3.2. That is a policy applied in any individual sub-cell should not affect coastal processes in an adjoining cell, thus, the sub-cells also define the geographic boundaries for future studies associated with the detailed design of the wide range of coastal management measures with potential to impact on coastal sediment dynamics. For consistency the original coastal cell naming convention adopted by Wallingford (1997) has been maintained, with further divisions within an existing sub-cell identified by appending a number to the existing cell name e.g. 6b1, 6b2 etc.

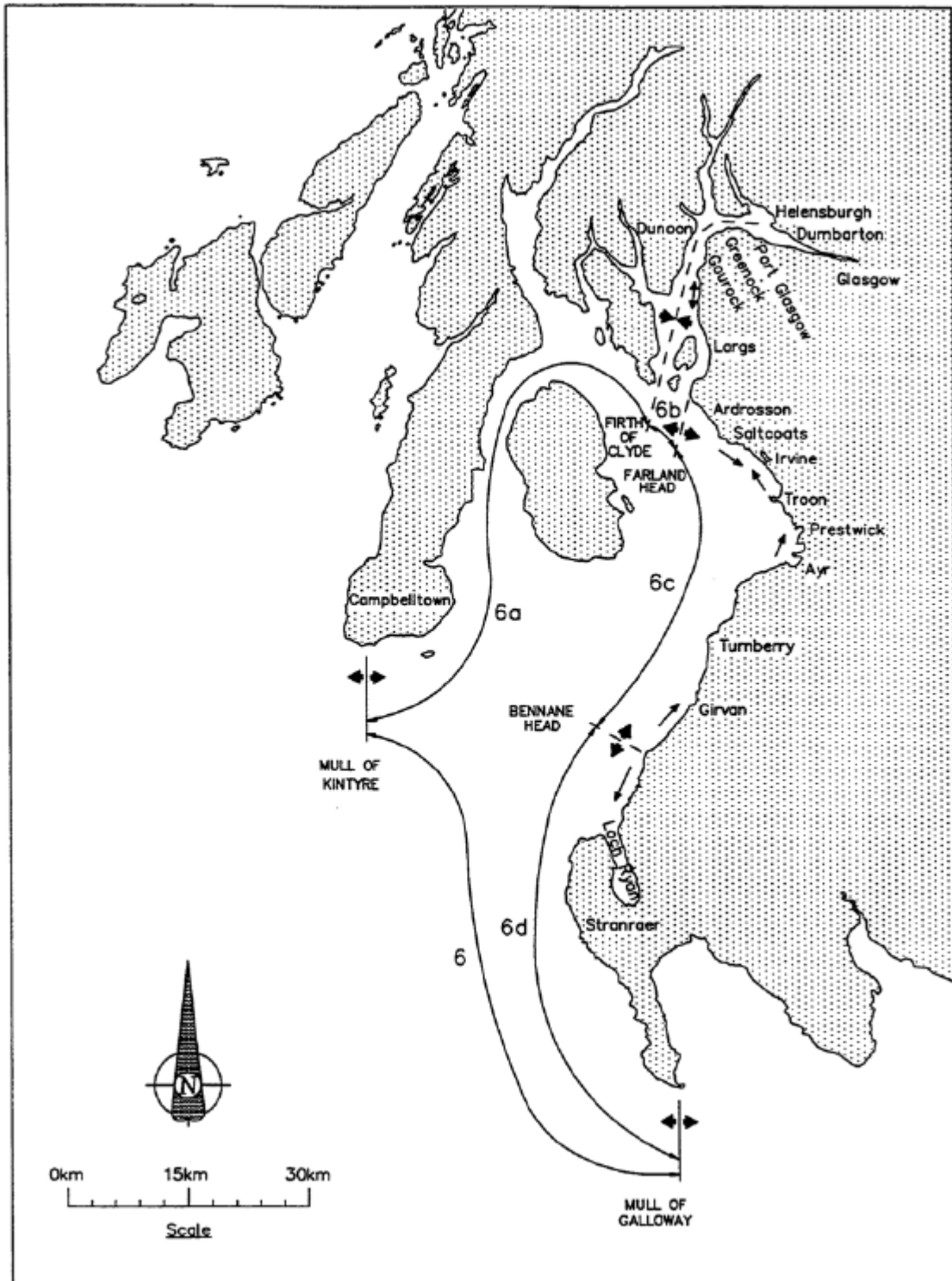
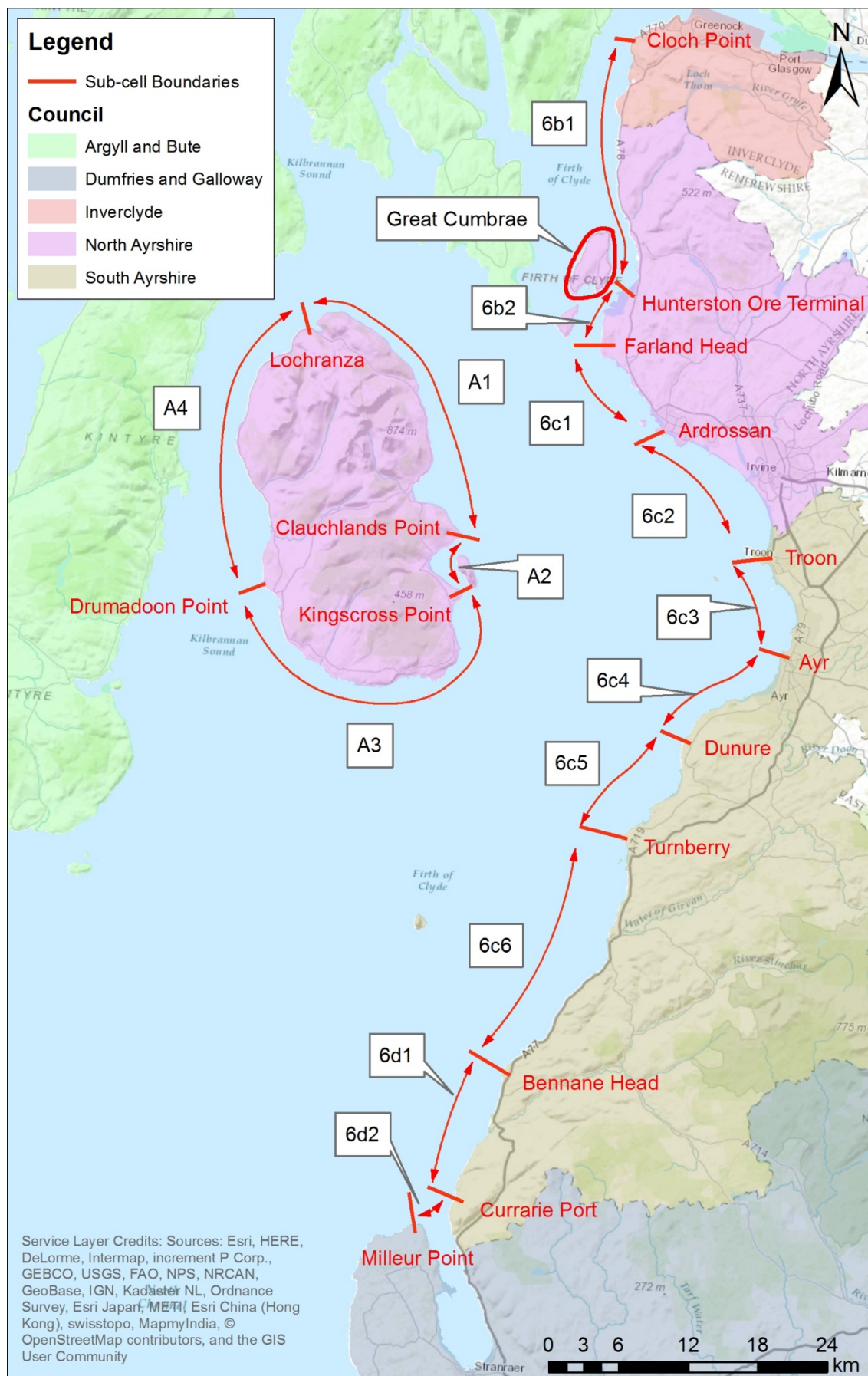


Figure 3.1 Coastal sub-cells between Mull of Kintyre and Mull of Galloway





**Figure 3.2 Coastal sub-cell boundaries for the Ayrshire and Arran coastlines**

The characteristics of each of the sub-cells in terms of the nature of the coastline, geomorphology, the flooding and erosion risk and the existing shoreline management measures as derived from previous reports and studies are summarised under separate headings below.

It should be noted that the described coastal geomorphology associated with the sub-cells summarised below, is typical of an emergent coastline. The relict cliff line, raised beaches and raised rock platform associated with the majority of sub-cells described below, are attributed to regressive relative sea-level change. Following the last glaciation, the termination of ice cover resulted in the rebound of land and fluctuating relative sea level. Since the mid-Holocene (approx. 5000ya); isostatic rebound has been greater than eustatic rise, resulting the emergent coastal geomorphology associated with this coastline of Scotland. In recent times, studies have shown that sea level changes attributed to global climate change may be counteracting this trend.

### **3.1.2 Policy units**

While the sub-division of the coastline into sub-cells based on sediment transport and geomorphological consideration was a useful first step in determining manageable coastline sections for assigning policies and reporting, as the development of the SMP progressed it became apparent that some further sub-division was required. Thus where appropriate the sub-cells have been further sub-divided into policy units based on the geographic extent of applicability of a particular management policy, ownership of assets at risk and the extent of administrative responsibilities in order to allow a defined shoreline management policy to be proposed for appropriately scaled sections of shoreline.

Even where policy units have been defined the inclusion of a specific management policy does not imply or provide a commitment that this policy has to be applied uniformly over the full extent of the policy unit. The actual implementation of measures at any particular location will only be progressed if all relevant criteria are met at detailed design stage.

Policy units as defined for the Ayrshire SMP always lie within a single sub-cell, even though there may be locations where the recommended management policies are the same in adjacent sub-cells.

### **3.1.3 Sources of base information**

Reported information on the susceptibility of the shoreline to coastal erosion was drawn from the outputs of The National Coastal Change Assessment (NCCA). This study was a national study undertaken by SNH to quantify the amount and rate of coastal change around the Scottish Coast. Data for the Ayrshire coast in the form of derived erosion rates, and potential

coastline set-back lines, was made available in GIS format by the SNH team. Similarly, reported information on the coastal flood risk was drawn from the information developed by SEPA as part of the process of implementing the EU Floods Directive in Scotland. Data in the form of flood risk extents was made available in GIS format by SEPA for this study. Thus, both the erosion and flood risk data was derived from nationally consistent datasets.

Whilst the use of such spatially consistent datasets is important in developing a strategic plan, it is important to note that such datasets have certain limitations that may have implication for the robustness of the resulting SMP. In the case of the Ayrshire SMP the NCCA dataset for example assumes no increase in erosion rate as a result of relative sea level rise, thus future erosion risk may be under estimated. Similarly the SEPA flood risk information does not include consideration of the flood risk associated with wave over-topping which may again result in an underestimation of risk in some areas. However these issues can be addressed at a local level during the detailed studies necessary to progress any measures through the consenting process.

Information from coastal asset inspection and survey reports has been used to summarise the shoreline management assets currently in place along the Ayrshire coast. Inspection Reports from surveys carried out for North Ayrshire by AECOM between October 2013 and February 2014 adopted the methodology described in the Condition Assessment Manual (Environment Agency, 2006) to determine the overall condition of structures, with defences identified as being in Very Good, Good, Fair, Poor or Very Poor condition. A Coastal Protection Study incorporating inspections of the shoreline was carried out for South Ayrshire in 1999 by White Young Green with further coastal inspections undertaken for South Ayrshire in 2015. Condition classification in these studies was based on BA 63/94 for each element of the structures and the extent and severity of any defects was also noted.

Information on sediment dynamics in some specific areas, where data was available was also collated from various previous studies in the North Ayrshire Council area dating from 2002 to 2007.

#### **3.1.4 Coastal Flood and Erosion Risk**

The base datasets described in Section 3.1.3 were used to estimate the level of risk associated with each sub-cell along the Ayrshire coast as summarised below. It is important to note the limitations associated with the reference datasets, such as the omission of flood risk associated with over-topping from the SEPA flood risk information and influence of existing erosion protection measures on the assessment of erosion risk in the NCCA. Thus caution needs to be exercised if comparing these figures to those in other SMPs that have potentially used different datasets to determine the level of risk.

Sub-Cell Ref	Name	Properties at Risk (Erosion)	AAD (Flooding)
6b1	Cloch Point - Hunterston	6	£146,050
6b2	Hunterston – Farland Point	0	£1,045
6c1	Farland Point - Ardrossan	0	£8,721
6c2	Ardrossan - Troon	2	£309,713
6c3	Troon - Ayr	0	£177,588
6c4	Ayr - Dunure	0	£166,406
6c5	Dunure - Turnberry	0	£9,153
6c6	Turnberry – Bennane Head	0	£19,600
6d1	Bennane Head – Currarie Port	2	£2,178
6d2	Currarie Port – Milleur Point	0	£1,050
A1	Lochranza – Clauchlands Point	12	£80,543
A2	Clauchlands Point – Kingscross Pt	12	£115,359
A3	Kingscross Point – Drumadoon Pt	0	£95,214
A4	Drumadoon Point - Lochranza	2	£23,655
GG	Great Cumbrae	0	£80,676
Total for Ayrshire SMP area		36	£1,236,951

### 3.2 SUB-CELL 6B1: CLOCH POINT – HUNTERSTON ORE TERMINAL

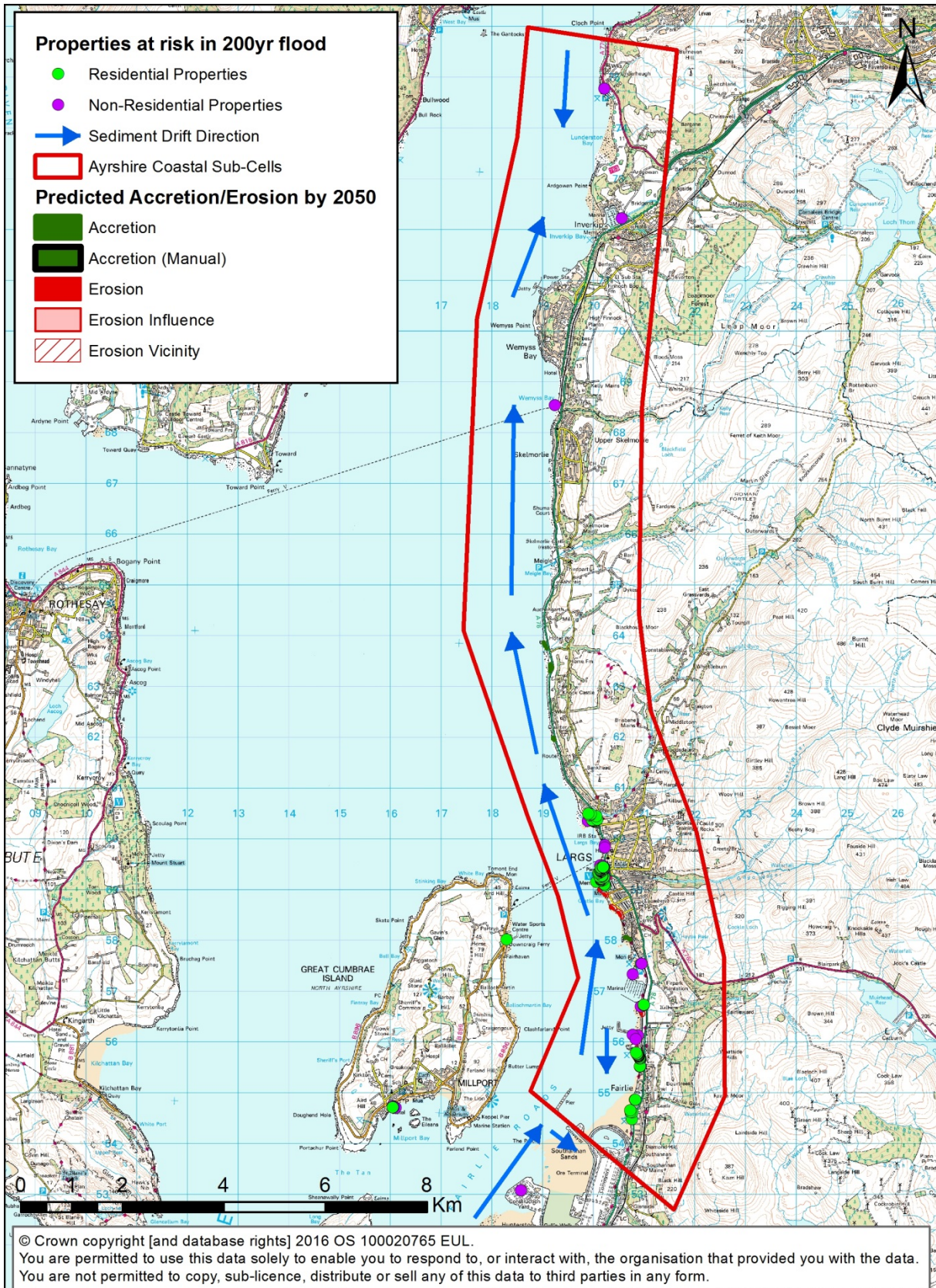


Figure 3.3 Sub-cell 6b1

Sub-cell 6b1 extends from Cloch Point to Hunterston Ore Terminal and includes approximately 35km of shoreline, of which circa 22km lies within the North Ayrshire Council area. The remainder of the shoreline in sub-cell 6b1 is located within the Inverclyde Council Area.

The majority of the shoreline within sub-cell 6b1 is composed of hard or artificial material, with less than 25% of the shoreline classified as soft. Sediment movement within this sub-cell is relatively limited, with the net drift being in a northerly direction and only a minor element of southerly drift movement between Cloch Point and Ardgowen Point.

The coastline of this sub-cell is widely urbanised. The natural coastline generally consists of a raised rock platform, in a setting of raised beach and relict cliff-line morphology. Along this sub-cell there are instances where small beaches comprised of unconsolidated sediment exist within small embayments. These are typically defined by outcropping headlands and rest upon raised rock platforms. The most extensive area of unconsolidated sediment is located to the south of this sub-cell. At Southannan and Fairlie Sands, the intertidal zone is characterised by the presence of wide tidal sandflats. Landwards of the contemporary coastline, instances of a relict raised cliff line are present.

Wave action throughout sub-cell 6b1 is relatively low, with maximum significant wave heights during a typical force 8 gale of less than 1.0m.

### **Flood Risk**

The main areas of flood risk within sub-cell 6b1 are located at Largs and Fairlie. From the SEPA data it was estimated that circa 250 residential properties and 80 non-residential properties were presently at risk of coastal flooding during a 1 in 200 year coastal flood event within this sub-cell. When predicted potential changes due to climate change were considered, this rose to circa 400 residential properties and 140 non-residential properties estimated to be at risk. In addition, approximately 1.3km of roads and 0.275km<sup>2</sup> of SSSI were considered to be at risk of flooding during a present day 1 in 200 year coastal flood event. This increased to 3.2km of road and 0.279km<sup>2</sup> of SSSI when potential changes due to climate change were considered.

### **Erosion Risk**

The main area of coastal erosion risk within sub-cell 6b1 is located at Largs. Based on the NCCA data no assets were predicted to be directly affected by erosion by 2050; however 2 non-residential properties and approximately 0.2km of roads were predicted to be within the zone of concern. By 2100, it was estimated that 0.05km of road would be directly affected by erosion. One residential property, two non-residential properties and approximately 0.4km of road would also be within the zone of concern.

## Shoreline Management Assets

Significant coastal defence measures are present within sub-cell 6b1. To the north of Largs, the A78 is protected by a combination of walls, groynes and rock armour revetments where the road edge forms the coastline. There are also some limited rock armour works to land at Boathouse Avenue, while a series of gabion baskets protect the south bank of the Noddsdale Water where it discharges to the sea at Largs. These gabion baskets provide protection to a public footpath and amenity/playpark.

South of the Noddsdale Water outflow, coastal defences include a series of concrete seawalls with a mix of sand/shingle/cobble beach frontage. Immediately north of Largs Ferry Terminal there is a sloping dressed stone revetment with a low level precast concrete recurved wall along the crest. These structures provide protection to both residential and non-residential properties situated in the hinterland.

South of Largs Ferry Terminal the coastal defences comprise of a series of concrete seawalls/wave return walls and rock armour revetments extending to the mouth of the Gogo Water. These structures provide protection to a substantial number of residential and non-residential properties in Largs. Immediately south of the mouth of the Gogo Water coastal defences comprise concrete/cobble revetments with some lengths of low level concrete retaining wall.

Largs Yacht Haven is protected by a series of rock armour revetments. South of Largs Yacht Haven there is a short length of vertical sea wall with a coarse shingle/cobble beach at the top of the wall. To the north of Fairlie, the railway is protected by a combination of rock armour revetments, concrete revetments and 'grasscrete' faced embankments with rock armour toe protection.

Further south, a combination of masonry property boundary walls and concrete/masonry seawalls provide coastal defence. The mouth of the Fairlie Burn is protected by a vertical masonry wall and low level rock armour on the north bank, with gabion baskets and rock armour revetments embedded in concrete on the south bank.

## Policy Units

Sub-cell 6b1 has been divided into two policy units:

- 6b1.1 Skelmorlie to Largs
- 6b1.2 Largs to Hunterston Ore Terminal

Policy unit 6b1.1 contains a single at risk asset, the A78 which is managed by Transport Scotland. Policy unit 6b1.2 contains multiple assets at risk with multiple owners.

### 3.3 SUB-CELL 6B2: HUNTERSTON ORE TERMINAL – FARLAND HEAD

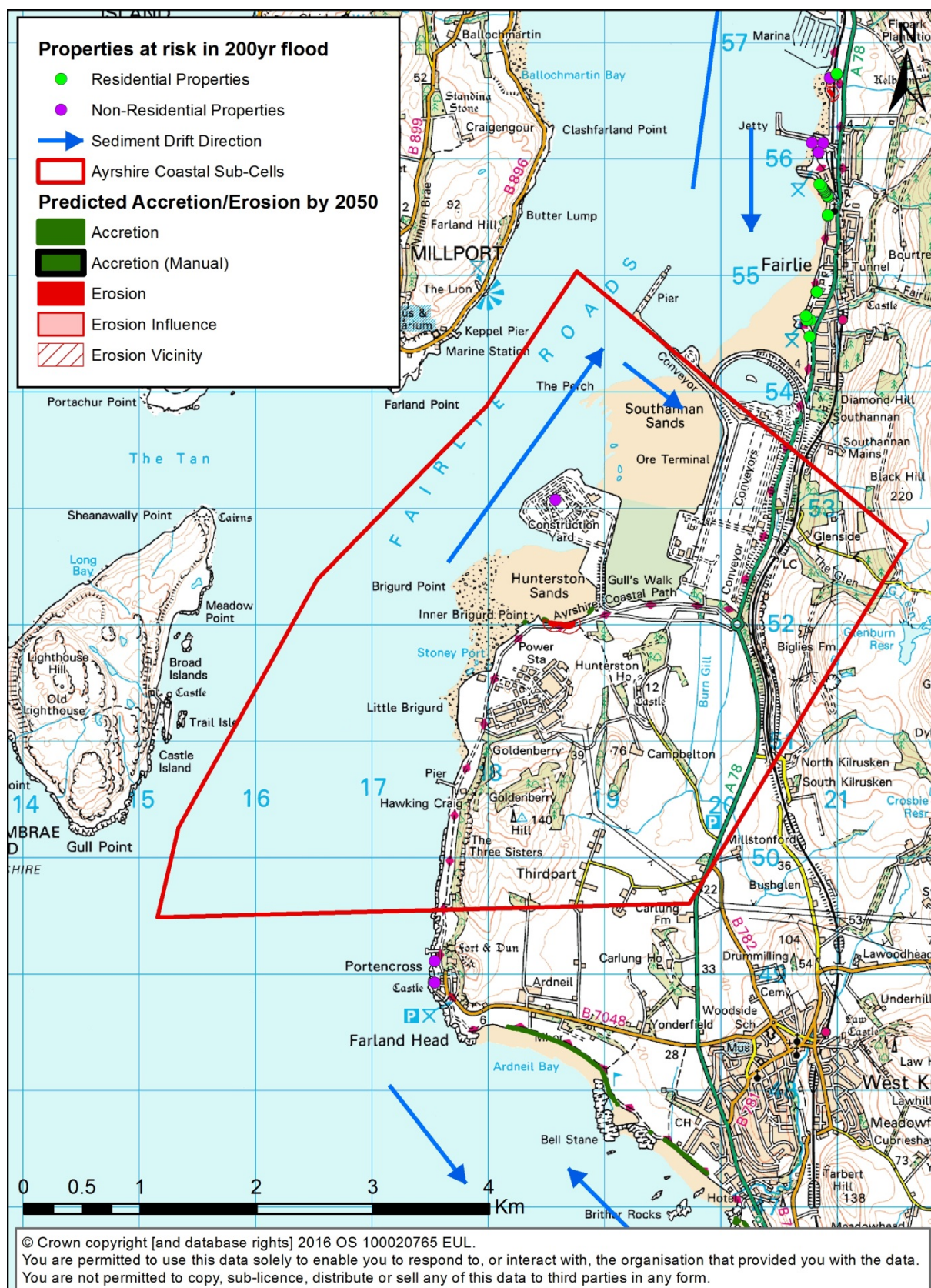


Figure 3.4 Sub-cell 6b2



Sub-cell 6b2 extends from Hunterston Ore Terminal to Farland Head (Portencross) and is approximately 11.5km in length. This sub-cell lies entirely within the North Ayrshire Council area and includes the coastal frontage to Hunterston Power Station. The shoreline in sub-cell 6b2 is predominantly composed of hard or artificial material, with less than 15% of the shoreline classified as soft. Sediment drift within this sub-cell is in a northerly direction, with a sediment sink at Hunterston Sands.

The southern extent of this sub-cell is characterised by a raised rock platform that is backed by a steep raised relict cliff line. This relict cliff line can be traced from Portencross to Hunterston in the north. Also at Hunterston, the occurrence of soft sediment within the intertidal zone increases to form an area of tidal sandflats. The most exposed section of sub-cell 6b2 is the shoreline at Hawking Craig where force 8 gales can typically produce maximum significant wave heights of 1.0 to 1.5m.

### **Flood Risk**

The main area of flood risk in sub-cell 6b2 is located at Hunterston. During a 1 in 200 year coastal flood event, the Hunterston construction yard and approximately 0.348km<sup>2</sup> of SSSI were estimated to be at risk of flooding. When potential changes due to climate change were considered, there was no change in the number of properties at risk however the area of SSSI at risk increased slightly to approximately 0.400km<sup>2</sup>.

### **Erosion Risk**

The main area of erosion risk in sub-cell 6b2 is located at Hunterston although no properties were found to be directly affected by erosion in this sub-cell. By 2050 approximately 0.05km of road and 0.002km<sup>2</sup> of SSSI were predicted to be directly affected by erosion, along with approximately 0.3km of road and 0.003km<sup>2</sup> of SSSI within the zone of concern. By 2100 approximately 0.15km of road and 0.002km<sup>2</sup> of SSSI were estimated to be directly affected by erosion, with little change in the extents of assets within the zone of concern.

### **Shoreline Management Assets**

Much of the shoreline in sub-cell 6b2 is defended with extensive rock armour revetments around the Hunterston Ore Terminal and former rig construction yard.

### **Policy Units**

Sub-cell 6b2 has been divided into two policy units:

- 6b2.1 Hunterston
- 6b2.2 Hunterston to Farland Head

Policy unit 6b2.1 contains multiple assets at risk of flooding and erosion while Policy unit 6b2.2 contains no assets at risk.

### 3.4 SUB-CELL 6C1: FARLAND HEAD - ARDROSSAN

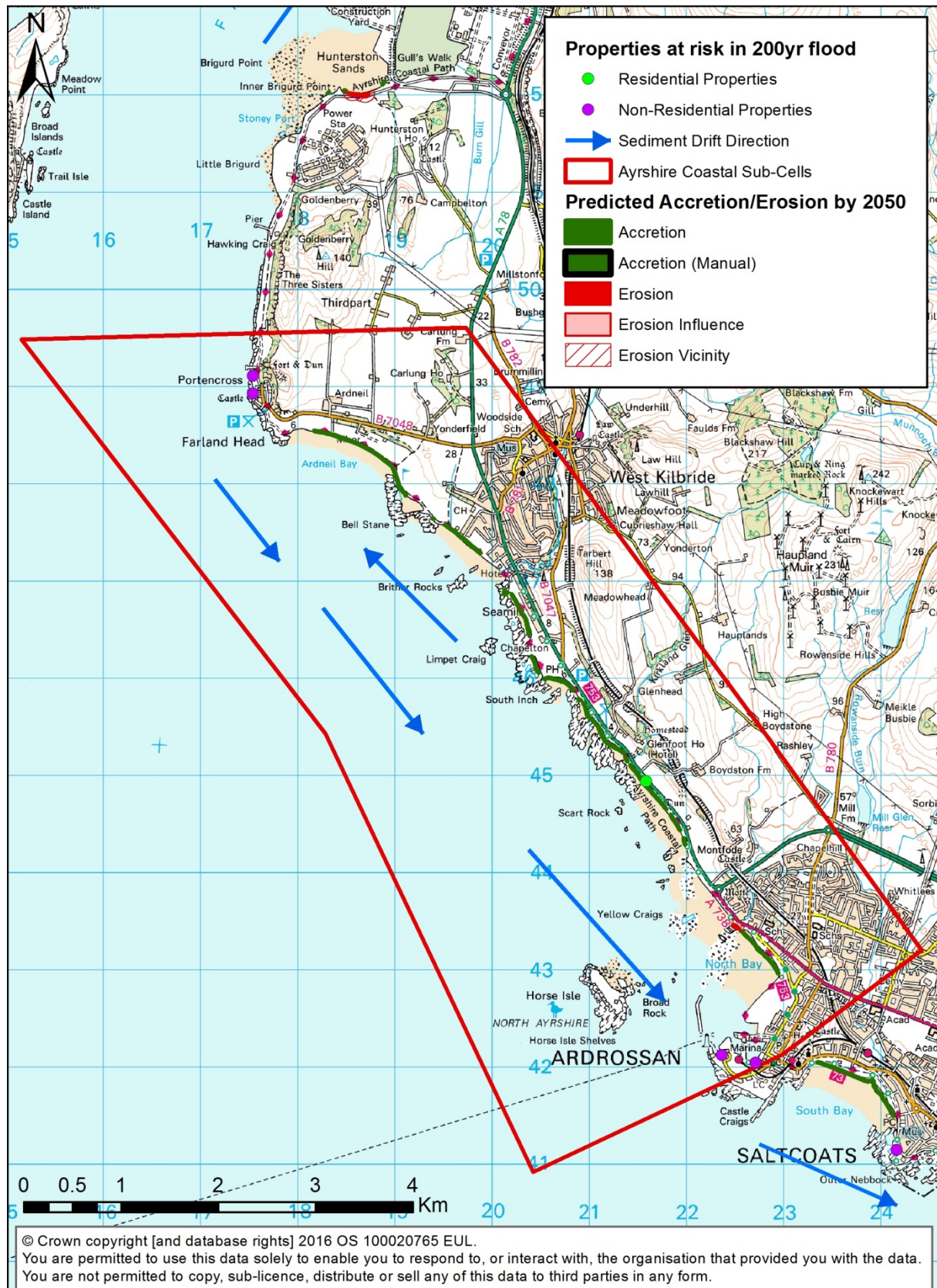


Figure 3.5 Sub-cell 6c1

Sub-cell 6c1 extends from Farland Head to Ardrossan Harbour and is approximately 14.5km in length. This sub-cell lies entirely within the North Ayrshire Council area and includes the communities of West Kilbride and part of Ardrossan.

Approximately 50% of the shoreline in sub-cell 6c1 consists of hard or artificial material. The net sediment drift in this sub-cell is in a southerly direction with sediment sinks located at Ardrossan and Ardneil Bay.

From Farland Craigs to Castle Craigs, this coastline is characterised by the presence of discontinuous sand and gravel beaches, intersected by sandstone outcrops. Landwards of the beach, the terrain is relatively flat rising up to the late-glacial shoreline ridge. In the north of this sub-cell, a small beach-dune system is present landwards of Ardneil Bay. Dune morphology along this section of the coastline is narrow and linear.

Wave action in sub-cell 6c1 is generally low; however a Force 8 gale can generate waves with a significant wave height of between 1.5-2.0m at the coast at Farland Head, Portencross and 1.0-1.5m significant wave height at Ardrossan.

### **Flood Risk**

The main areas of flood risk in sub-cell 6c1 are located at Ardrossan and Portencross. During a 1 in 200 year coastal flood event, one residential and 5 non-residential properties were predicted to be at risk of flooding. This increased significantly when the effect of climate change was considered to circa 325 residential and 75 non-residential properties. Approximately 0.10km of road was also estimated to be at risk during a present day 1 in 200 year event, however, when climate change was accounted for, approximately 2km of road and 0.017km<sup>2</sup> of SSSI were estimated to be at risk.

### **Erosion Risk**

The main area of erosion risk in sub-cell 6c1 is located at Ardrossan, however no receptors were found to be either directly affected or within the zone of concern by either 2050 or 2100.

### **Shoreline Management Assets**

At West Kilbride Golf Club there are a series of rock armour revetments and a short section of concrete training wall. Continuing south the coastal defences in the vicinity of Seamill consist of a rock armour revetment surrounded by well-established sand dunes. This leads into a reinforced earth embankment with gabions and in the area immediately north of the Kilbride Burn a mixture of vertical/battered face masonry and concrete walls.

South of the Kilbride Burn the coastal defences consist of a stone faced sloping revetment with rock armour toe protection, followed by a rock armour revetment.

A series of rock armour revetments occur intermittently between Glenfoot and Ardrossan.

North of Ardrossan Marina are a series of concrete, stone/cobble revetments with sections of rubble, brick and broken concrete present.

### **Policy Units**

Sub-cell 6c1 contains a single policy unit:

- 6c1.1 Farland Head to Ardrossan

This policy unit contains assets at risk of coastal flooding including properties and roads, in addition to Scottish Water assets at risk from coastal erosion.

### 3.5 SUB-CELL 6C2: ARDROSSAN - TROON

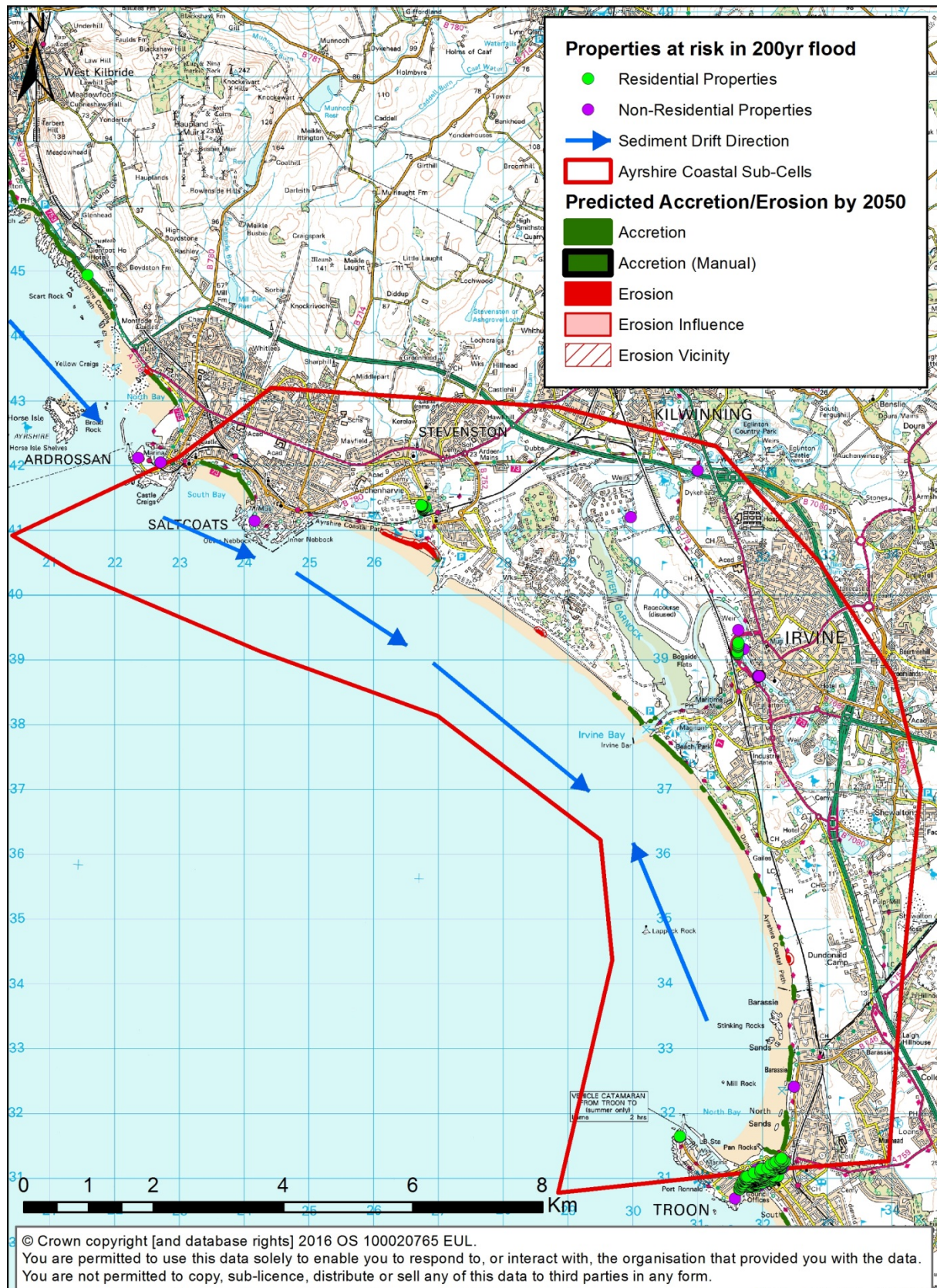


Figure 3.6 Sub-cell 6c2

Sub-cell 6c2 extends from Ardrossan Harbour to Troon and is approximately 42.5km in length (including the inlet at the mouth of the River Irvine). This sub-cell is mostly located within the North Ayrshire Council area, however approximately 8km of the shoreline from Barassie south is located within the South Ayrshire Council area.

The shoreline in sub-cell 6c2 is predominantly comprised of soft material (70%), with only 30% comprised of hard and artificial material.

The mouth of the River Garnock acts as a sediment sink within sub-cell 6c2, with net sediment drift towards this point from both north and south. This assessment is corroborated by reference to the formation of a sand bar at the entrance to Irvine Harbour and a historic need to dredge this is previous reports.

Irvine Bay accommodates a near continuous beach-dune system that is intersected by outflow from the Rivers Irvine and Garnock. Ridge and runnel beach morphology is mainly associated with the beach to the south of this outlet, with up to three or four ridges exposed at low tide. South Bay is located to the north of Irvine Bay; this small embayment is separated by the presence of two prominent headlands that define the extent of this bayhead setting. Coastal dune morphology landwards of the beach is difficult to distinguish as this area has been vastly modified through human activity. The frontal dune ridge is characterised by the presence of a dune cliff-line with exposed sediment and clumping. To the south, the frontal dune ridge is eroded by the presence of beach orientated footpaths. Areas of estuarine saltmarsh and mudflat are located at the point where the Rivers Garnock and Irvine meet.

Wave action along the shoreline of sub-cell 6c2 is relatively low, with the maximum significant wave height during a typical Force 8 gale less than 1.0m throughout the sub-cell.

### **Flood Risk**

The main areas of flood risk in sub-cell 6c2 are at Stevenston and Irvine. During a 1 in 200 year coastal flood event circa 135 residential and 120 non-residential properties were estimated to be at risk of flooding. When potential effects of climate change were considered this increased to circa 705 residential and 310 non-residential properties being estimated to be at risk. In addition, 1.5km of road and 1.101km<sup>2</sup> of SSSI were estimated to be at risk of flooding during a 1 in 200 year coastal flood event. This increased to 4.3km of road and 1.253km<sup>2</sup> of SSSI when potential changes due to climate change were considered.

### **Erosion Risk**

The main areas at risk of erosion in sub-cell 6c2 are located at Saltcoats and at Western Gailes Golf Course. One non-residential property was predicted to be at risk from coastal

erosion by 2050. By 2100, both this non-residential property and approximately 0.27km of road were predicted to be at risk.

### **Shoreline Management Assets**

Around Ardrossan Harbour coastal defences consist of a mix of masonry and concrete seawalls. At the north end the coastal defences continue round the foreshore as a sloping revetment constructed from broken concrete/demolition rubble.

Continuing east, tipped rubble fronts what appears to be made ground occupied by industrial premises as a form of coastal defence.

At the South Beach there is a mix of concrete seawalls with brick crest wall extension and gabion basket toe protection and vertical or near vertical concrete seawalls founded on the foreshore or exposed rock head.

Towards the eastern extent of South Beach, Saltcoats, the coastal defences consist of concrete seawalls and rock armour founded on foreshore/exposed rock head. A series of tidal pools are located seaward of the defences on the foreshore.

Continuing eastwards, a concrete seawall runs around the inner bay at Saltcoats to the Pier. Two rock groynes protrude from this section of seawall.

Saltcoats pier consists of a mix of masonry/concrete seawalls founded on exposed rock head. The mix of masonry/ concrete seawalls founded on exposed rock head continues east of the pier along the frontage occupied by the railway, terminating in a rock armour ramp approximately one third of the way across the bay.

Ardeer/Stevenson promontory is a man-made headland comprising a stone revetment on the north side which merges into a rock armour revetment at the head and along the south face. There is also a concrete wall topped with a series of precast concrete anchor blocks on the south side.

Continuing south east the coastal defences in sub-cell 6c2 include a mix of concrete revetment/seawall and rock armour.

At the mouth of the River Irvine coastal defences include concrete and grouted stone faced revetments, river training structures and a roundhead on the south side of the River Irvine. The south bank of the River Irvine is protected by sections of steel sheet piling with sloping grouted stone lower revetment supported on a timber piled toe and other quay type structures. Training walls, rock armour to the north and a combination of rock armour and masonry to the south constrain the discharge of the Irvine as it enters the sea in order to enhance scouring and ensure continued discharge.

North of Barassie the coastline generally consists of a sloping sandy beach with a marram grass covered dune system behind. There is a steeper dune face towards the northern end which is indicative of erosion. Rock armouring is present at some locations along the shoreline particularly approaching the pumping station, along with a section south of Barassie.

At Barrasie beach South Ayrshire Council undertake a programme of dune restoration in the Beach Road area as part of their beach management operations.

North of Troon Harbour, adjacent to North Shore Road, a concrete seawall and shingle beach form the shoreline. South and west of this rock armouring continues to tie in to the structures at Troon Harbour.

### **Policy Units**

Sub-cell 6c2 has been divided into four policy units:

- 6c2.1 Ardrossan to Stevenston
- 6c2.2 Stevenston to Irvine Bay
- 6c2.3 Irvine Bay to Gales Burn
- 6c2.4 Gales Burn to Troon

Policy unit 6c2.1 contains properties at risk of flooding and erosion.

Policy unit 6c2.2 contains land belonging to a private landowner.

Policy unit 6c2.3 is located in North Ayrshire and contains a number of properties and roads at risk of coastal flooding, and sand dunes at Barassie at risk of coastal erosion.

Policy unit 6b2.4 is located in South Ayrshire and contains properties at risk of coastal flooding.



### 3.6 SUB-CELL 6C3: TROON - AYR

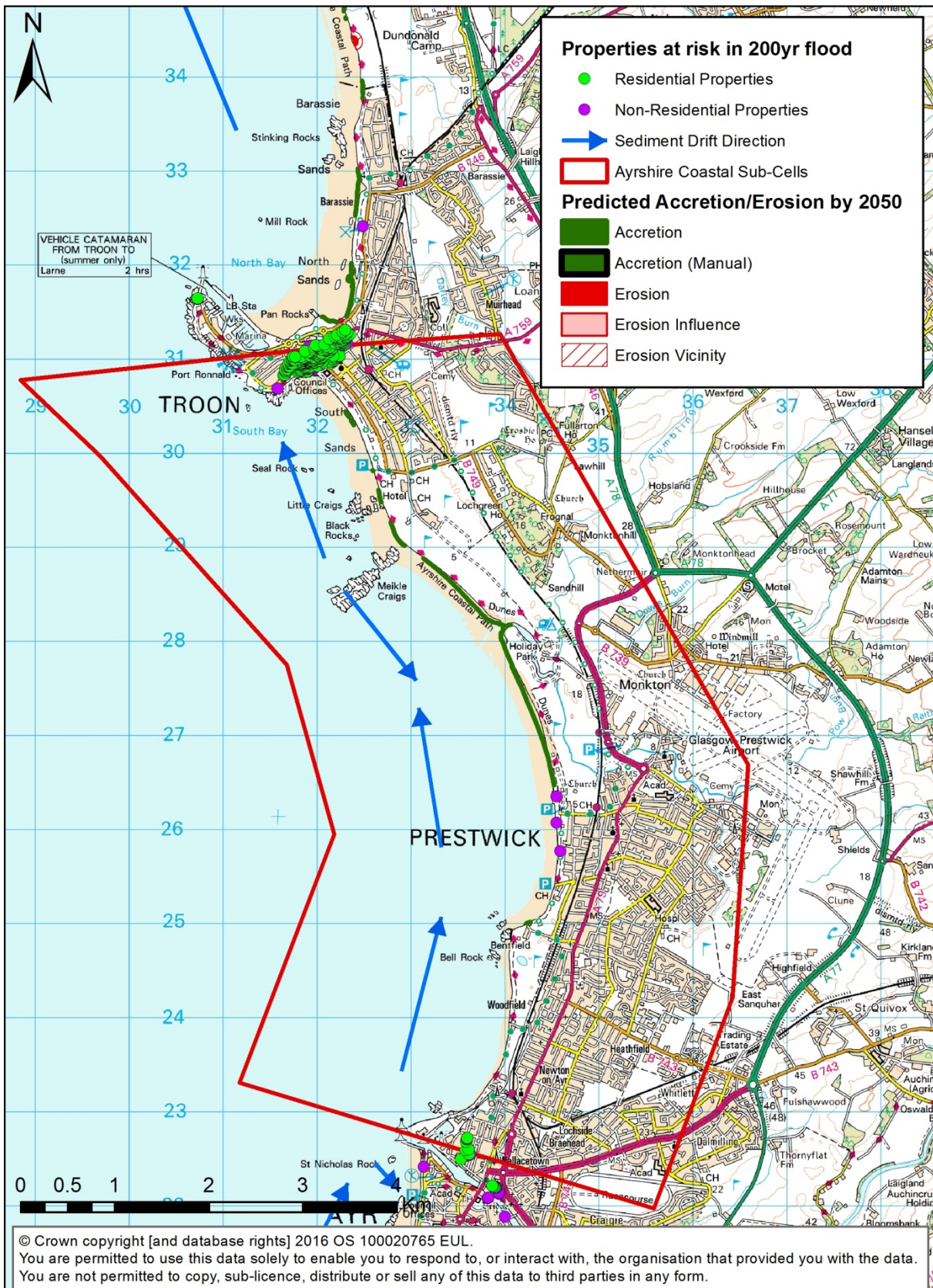


Figure 3.7 Sub-cell 6c3

Sub-cell 6c3 extends from Troon to Ayr and is approximately 13km in length. This sub-cell is located entirely within the South Ayrshire Council area

Approximately 55% of the shoreline in sub-cell 6c3 is composed of hard or artificial material, with the remaining shoreline composed of soft material.

This near continuous coastal embayment accommodates a sandy beach, fronting dune morphology. The continuation of the beach is interrupted by rock outcrops including Meikle Craigs and Bell Rock. A recurved spit feature is located midway between Troon and Prestwick where the Pow Burn flows into the sea. This location represents the widest part of the beach, before it thins out towards the south. Coastal dune morphology is found landwards of the beach, with the best examples located close to the spit feature. Dune morphology is mainly linear in form, with crescentic forms located to the north of the spit, where the crest of these features dips N to NNW. These blow-out features are well vegetated and stabilised. Much of the dune surface is disturbed by the presence of beach orientated footpaths.

There is a net northward sediment drift within this sub-cell and a sediment sink at the outlet of the Pow Burn.

The wave action within sub-cell 6c3 is relatively low, with maximum significant wave heights during a Force 8 gale likely to be less than 1.0m throughout.

### **Flood Risk**

The main area of flood risk within sub-cell 6c3 is located at Troon. During a 1 in 200 year coastal flood event circa 320 residential and 265 non-residential properties were estimated to be at risk of flooding. When potential changes due to climate change were considered, this rose to circa 670 residential and 375 non-residential properties. In addition, during a 1 in 200 year flood event approximately 0.8km of road and 0.041km<sup>2</sup> of SSSI was estimated to be at risk of flooding, increasing to 1.6km of road and 0.067km<sup>2</sup> of SSSI when potential changes due to climate change were considered.

### **Erosion Risk**

The NCCA has not identified any significant erosion within sub-cell 6c3, as there has been no observable change in the location of the high water mark. However South Ayrshire Council was aware of ongoing erosion problems at Newton Shore, where rubble, including asbestos was being eroded from behind revetments at the Golf Course.

### **Shoreline Management Assets**

South of the entrance to Troon Harbour, Troon Head, a rock armour slope around 2.5m high extends between the north and south car parks. This slope includes some demolition

material as rock armour at the north end of the south car park. Beyond this the shoreline protection continues as a stone block seawall founded on a rock base. Continuing south eastward a concrete seawall and stonework revetment with concrete infill form the shoreline. A concrete wave wall extends from Titchfield Road Car Park to the Walker Hall before becoming a concrete seawall at the South Beach Esplanade extending to Victoria Drive. The wave wall is founded on rock or shingle beach.

Sands dunes up to 5m high form the shoreline from Victoria Drive to Craigend Road. South of these sand dunes, gabion mattresses with gabion basket topping protect a section of the coastline at Royal Troon Golf Course. The coastline of the Royal Troon frontage, from about Meikle Craigs southwards consists of natural sand dunes, which continue south of the Pow Burn to Prestwick.

At Prestwick Esplanade the shoreline changes from a natural dune system to a concrete wave and seawall that extends southwards to Maryborough Road. Beyond this the shoreline is composed of a series of concrete seawalls and rock armour revetments. The rock armour ends at Saltpans Road beyond which the shoreline continues as a concrete seawall with concrete toe beam until the mouth of the River Ayr.

### **Policy Units**

Sub-cell 6c3 contains a single policy unit:

- 6c3.1 Troon to Ayr

This policy unit contains assets at risk of coastal flooding including properties and roads, in addition to fill material and Scottish Water assets at risk from coastal erosion.

### 3.7 SUB-CELL 6C4: AYR - DUNURE

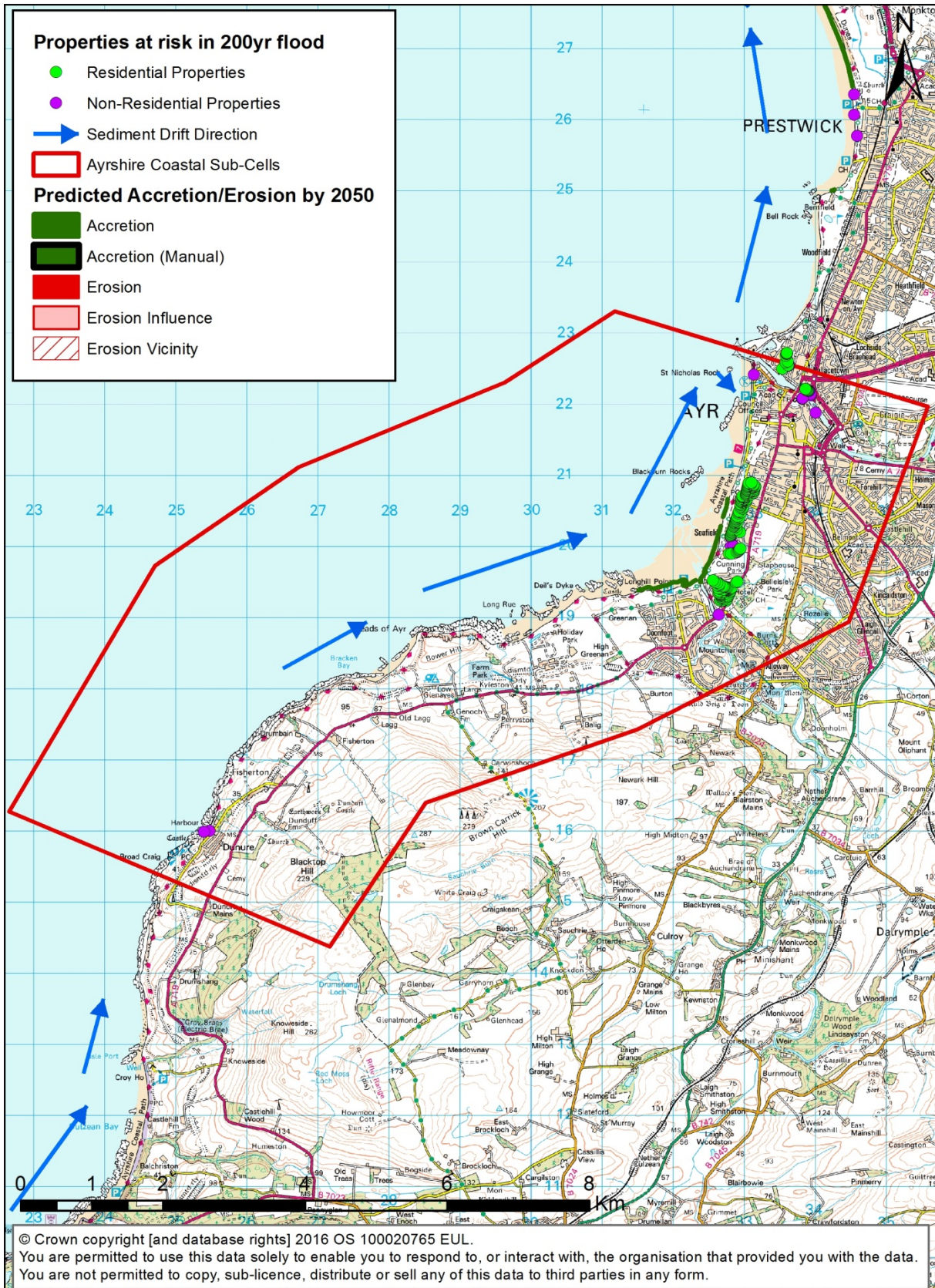


Figure 3.8 Sub-cell 6c4

Sub-cell 6c4 extends from Ayr to Dunure and is approximately 17km in length. Sub-cell 6c4 is located entirely within the South Ayrshire Council area.

The coastline morphology of this sub-cell is comprised of a mixture of rocky cliffs fringed by a rock platform. The extent of unconsolidated sediment deposits increases towards Ayr, where the coastal embayment accommodates the South Beach at Ayr. The continuation of this embayment is dissected by the outflow from the River Doon. The beach at this point is dominated by gravels. At low tide, a series of sand ridges and runnels are exposed. A series of dykes and a rock platform outcrop at the intertidal zone at Greenan. Towards the Heads of Ayr, unconsolidated beach deposits decrease in extent. A series of incised cliffs define the coastal extent of these small beaches. Raised beach deposits are located behind the modern beach deposits, with their landward extent defined by the presence of the coastal cliff line.

The shoreline in sub-cell 6c4 is comprised of an approximately equal mix of hard / artificial material and soft material.

The net sediment drift in sub-cell 6c4 is northwards, with sediment accumulating between Doonfoot and Ayr, particularly immediately to the south of the Pier at Ayr.

Wave heights were found to be greatest at the southern extent of sub-cell 6c4, with a significant wave height of between 1.5-2.0m predicted at Dunure during a Force 8 gale.

### **Flood Risk**

The main areas of flood risk in sub-cell 6c4 are located at Ayr and Seafield. During a 1 in 200 year coastal flood event circa 175 residential and 25 non-residential properties were found to be at risk of flooding. When potential changes due to climate change were considered the flood risk increased to 575 residential and 60 non-residential properties. In addition, approximately 0.6km of road and 0.062km<sup>2</sup> of SSSI were estimated to be at risk during a 1 in 200 year coastal flood event, increasing to 1.6km of road and 0.070km<sup>2</sup> of SSSI when potential changes due to climate change were considered.

### **Erosion**

No significant areas of erosion were identified within sub-cell 6c4.

### **Shoreline Management Assets**

On the south side of the River Ayr there is a concrete pier with a rock armour revetment on the south face. South of the pier, a stone revetment and a concrete seawall with decorative profiled coping extend as far as Pavilion Road. Between Pavilion Road and Seafield Road the defence becomes a sloping concrete seawall.

South of Seafield Road there is a marram grass covered dune at the head of the beach in front of a low concrete wave wall. The marram dune frontage ends at the Slaphouse Burn outfall, north and south of which there are rock armour groynes. Between the Slaphouse Burn and the River Doon the shoreline is composed of rough grass in front of the concrete wall.

Beyond the mouth of the River Doon the coastline continues as a mix of rough grassland and low dunes to Greenan Head. Beyond Greenan Head the coastline continues southward as a series of natural embayments between rocky headlands to the Heads of Ayr.

From the Heads of Ayr to Dunure the coastline is predominantly rocky. At Dunure Harbour a stone wall provides coastal protection. A mass concrete buttress wall with blockwork facing fronts the original stone wall over a short section, with earth fill in between.

### **Policy Units**

Sub-cell 6c4 has been divided into two policy units:

- 6c4.1 Ayr to Greenan Castle
- 6c4.2 Greenan Castle to Dunure

Policy unit 6c4.1 contains a significant number of properties and roads at risk of coastal flooding. Policy unit 6c4.2 contains two non-residential properties at risk of coastal flooding.

### 3.8 SUB-CELL 6C5: DUNURE - TURNBERRY

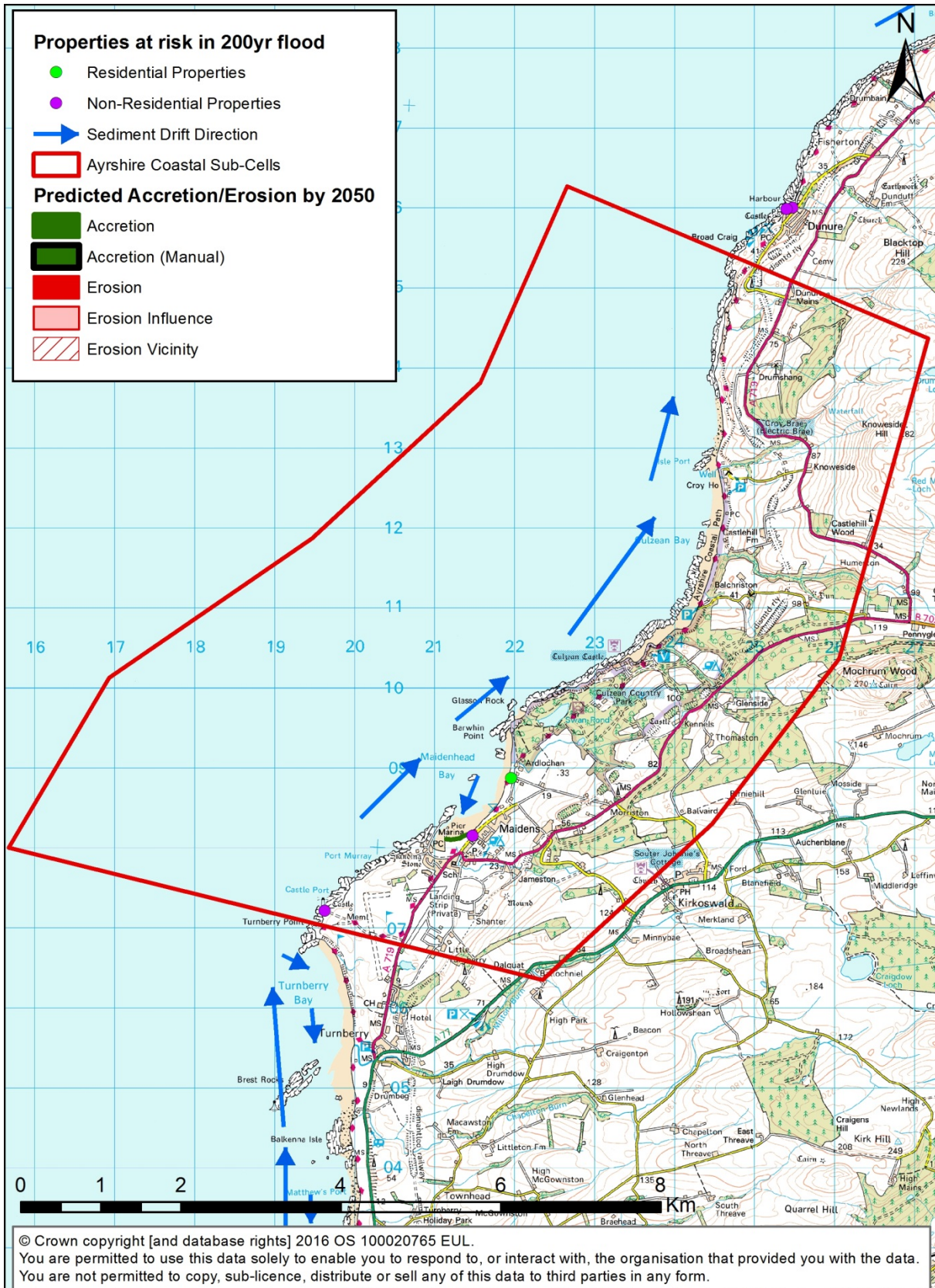


Figure 3.9 Sub-cell 6c5

Sub-cell 6c5 extends from Dunure to Turnberry and is approximately 14.5km in length. This sub-cell is located entirely within the South Ayrshire Council area. The majority of the shoreline in sub-cell 6c5 is composed of hard and artificial material, with only around 40% composed of soft material. The net sediment drift in sub-cell 6c5 is northwards, with sediment sinks at Culzean Bay and Maidenhead Bay.

The coastline morphology of this sub-cell comprises two recurve coastal bays, Culzean and Maidenhead Bay. Both these bays accommodate well-sorted medium sand beaches that are deposited upon the rock platform that dominates the intertidal zone. The landward extent of these bays is defined by the presence of raised beach deposits and a relict cliff-line and rock outcrops.

Wave heights along the entire shoreline of sub-cell 6c5 were found to be substantial. The likely significant wave height at the Maidens during a Force 8 gale was found to be between 1.5m and 2.0m.

### **Flood Risk**

The main area of flood risk within sub-cell 6c5 is located at the Maidens although during a 1 in 200 year coastal flood event only 3 properties were found to be at risk of flooding. When potential changes due to climate change were considered, there was a minor increase in flood risk to 6 properties. In addition, a small length of road and 0.056km<sup>2</sup> of SSSI were found to be at risk during a 1 in 200 year coastal flood event, increasing to approximately 0.1km of road and 0.065km<sup>2</sup> of SSSI when potential changes due to climate change were considered.

### **Erosion Risk**

No significant erosion risk was identified within sub-cell 6c5.

### **Shoreline Management Assets**

Rock armour between 1.5 to 2.5m high provides coastal protection to a section of the shoreline at the Maidens adjacent to Ardlochan Road. South-west of this rock armour there is a low concrete seawall above a sandy beach.

A degree of protection is also afforded by the rubble mound breakwater and concrete jetty that form the entrance to the harbour at the Maidens.

### **Policy Units**

Sub-cell 6c5 contains a single policy unit:

- 6c5.1 Dunure to Turnberry

This policy unit contains a limited number of assets at risk from coastal flooding including properties and roads.



### 3.9 SUB-CELL 6C6: TURNBERRY – BENNANE HEAD

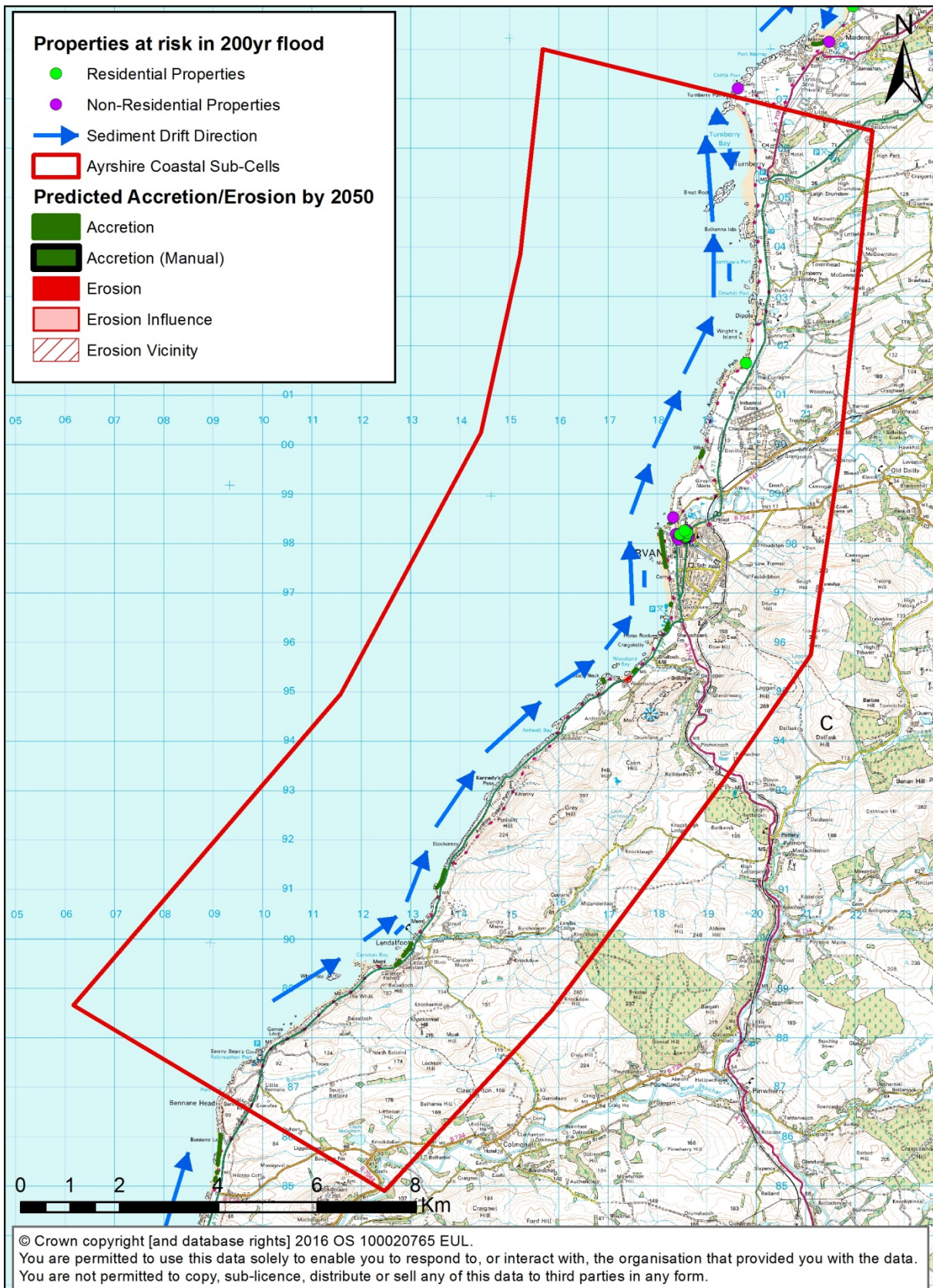


Figure 3.10 Sub-cell 6c6

Sub-cell 6c6 extends from Turnberry to Bennane Head and is approximately 31km in length. This sub-cell is located entirely within the South Ayrshire Council area.

The shoreline in sub-cell 6c6 is roughly equally split between hard or artificial material and soft material.

Exposed rock platform dominates the intertidal zone of this coastal sub-cell, although the presence of unconsolidated beach material increases in extent towards the north and forms a strip of coastal dunes located behind the beach at Turnberry Bay. The morphology of these dunes is mainly linear in form, as represented by an extensive aeolian foredune ridge. Landward of these dunes the area has been developed into a golf course. Along the intertidal zone, towards Girvan, occasional sandy beach deposits interrupt this gravel and boulder dominated coastal fringe. More extensive sand and gravel beach deposits are located to the south of Girvan Harbour. Beyond Woodland Bay, from the south of Girvan beach to Bennane Head the intertidal zone returns to a gravel and boulder dominated coastal fringe, backed by a relict cliff-line.

The net sediment drift in sub-cell 6c6 is in a northerly direction towards the beach at Turnberry Bay.

The largest waves occur towards the north of sub-cell 6c6 at Turnberry. The maximum significant wave height at Turnberry Point was estimated to be between 1.5-2.0m during a Force 8 gale.

### **Flood Risk**

The main area of flood risk within sub-cell 6c6 is located at Girvan. During a 1 in 200 year coastal flood event, circa 10 residential and 15 non-residential properties were predicted to be at risk of flooding. When potential changes due to climate change were considered, this increased to 15 residential and 20 non-residential properties. In addition, approximately 0.33km of road and 0.268km<sup>2</sup> of SSSI were predicted to be at risk of flooding during a 1 in 200 year coastal flood event, increasing to 0.67km of road and 0.292km<sup>2</sup> of SSSI when potential changes for climate change were considered.

### **Erosion Risk**

The main area of erosion risk in sub-cell 6c6 is located at Woodland Bay. By 2050 it was estimated that approximately 0.001km<sup>2</sup> of the SSSI would be directly affected by erosion, along with approximately 0.27km of road and 0.004km<sup>2</sup> of the SSSI which would be at significantly increased risk. By 2100 it was estimated that approximately 0.08km of road and 0.001km<sup>2</sup> of SSSI would be directly affected by erosion, along with approximately 0.21km of road and 0.004km<sup>2</sup> of SSSI being at significantly increased risk. There was also evidence of

localised erosion at Girvan Golf Club although the National Coastal Change Assessment has not identified a significant change in the position of the coastline due to the presence of various coastal protection measures.

### **Shoreline Management Assets**

At Girvan Golf Club the shoreline is protected by a mix of large boulders and rock armouring with a section of timber piles part retaining this armouring. This protection has been overtopped in areas leading to erosion of the banks during storm conditions.

A shingle beach protected by brick, rubble and rock armour connects the southern extent of Girvan Golf Course to the root of the rock armour breakwater north of Girvan Harbour.

Inside Girvan harbour there is a concrete ribbed wall breakwater on the northern side. The northern side of the harbour inside this breakwater is protected with rock armour and a sloping concrete revetment, along with a timber pile retaining wall.

East of the public slipway on the north side of the harbour there are sloping gabion baskets and a steel sheet pile wall.

On the south side of the harbour there is a steel sheet pile wall with a timber jetty extending out from the bank. A series of concrete, stone block and steel sheet pile walls are present on the south side of the harbour before the south pier at the outlet of the harbour. The south pier has a steel pile wall and concrete deck on its northern face, and a concrete wall protected by rock armour on its south face.

At the root of the south pier there is a stonework wall above a stonework revetment. The revetment slope steepens into a vertical wall at the root of the pier.

A concrete seawall extends from the northern extent of the car park to the Old Pool area where there is a concrete column and beam frame with infill brickwork panels and mortar rendering. South of this, there is a concrete sea wall as far as Duncan Street.

At Stair Park there is gabion mattress slope protection and at Doune Cemetery a stone revetment wall with stone blocks in concrete provides protection. South of Doune Cemetery the bank face is protected with a gabion mattress lining which has been covered with topsoil. The shoreline between Doune Street and Cauldshore Road has no apparent protection however gabion mattresses may be buried. South of Cauldshore Road to the car park at the southern extent of Ainslie Park there are signs of gabion baskets exposed at the toe of the grass slope.

Continuing south from Girvan, the A77 is protected by a series of rock armour revetments where the road alignment is close to the shoreline. The most extensive of these are found at Woodland Bay, Kennedy's Pass and to the north and south of Lendalfoot.

## Policy Units

Sub-cell 6c6 has been divided into three policy units:

- 6c6.1 Turnberry to North Girvan
- 6c6.2 Girvan
- 6c6.3 South Girvan to Bennane Head

Policy unit 6c6.1 contains a single property at risk of coastal flooding.

Policy unit 6c6.2 contains a number of properties and roads at significant coastal flood risk. Girvan Golf Course is also at risk of erosion.

Policy unit 6c6.3 contains a single asset at risk, the A77. This asset is managed by Transport Scotland.

### 3.10 SUB-CELL 6D1: BENNANAE HEAD – CURRARIE PORT

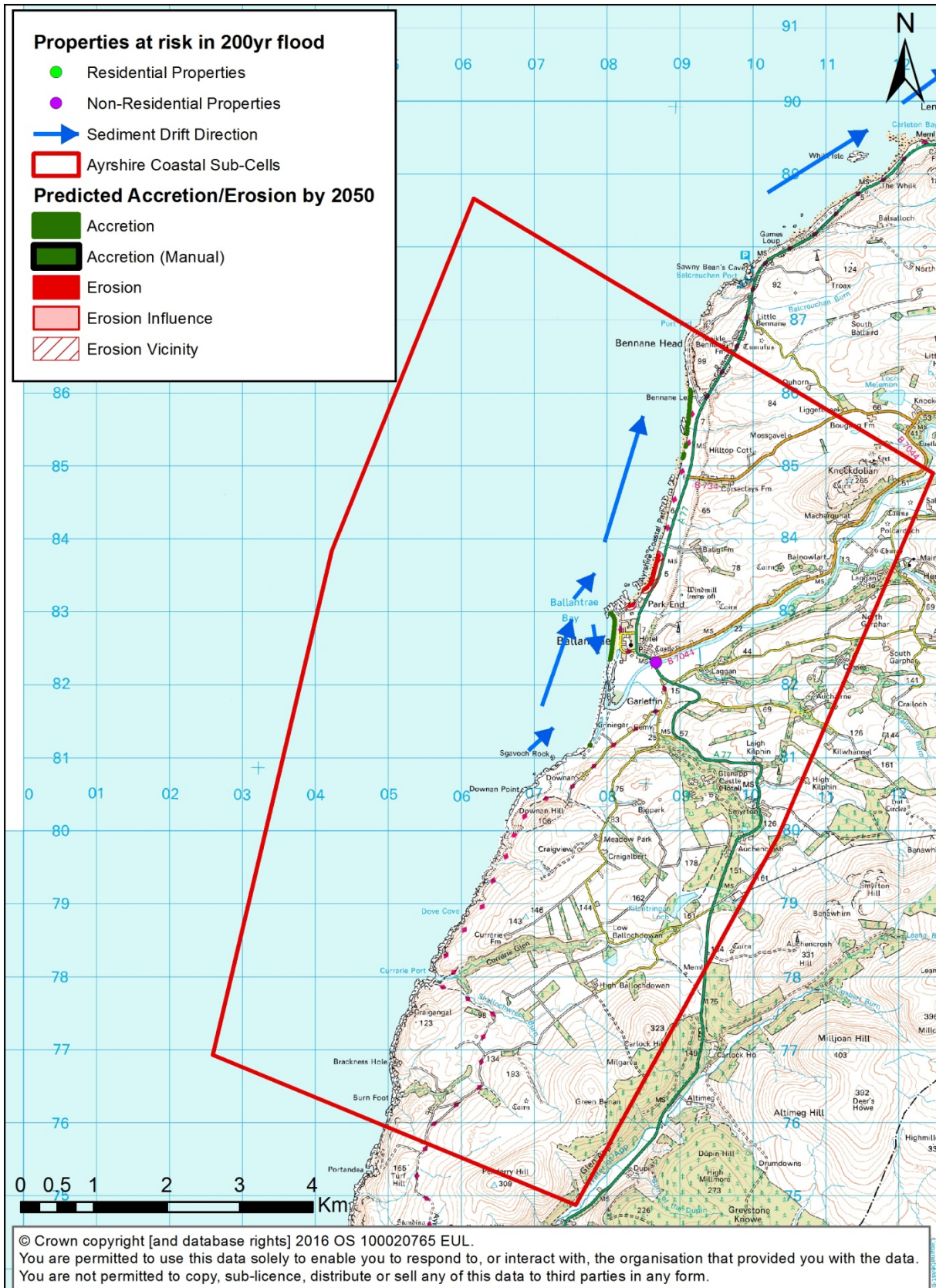


Figure 3.11 Sub-cell 6d1

Sub-cell 6d1 extends from Bennane Head to Currarie Port and is approximately 23km in length (including the inlet of the River Stinchar). This sub-cell is located entirely within the South Ayrshire Council area.

The shoreline of sub-cell 6d1 is mostly comprised of hard material, with only Ballantrae Bay containing a significant length of soft shoreline.

Between Finnarts and Downan Points, the coastline is steep, with the shoreline defined by a steep rocky cliff line. The intertidal zone is marked by the presence of an exposed rock platform. A series of beach ridge deposits are located to the north of Downan Point with a spit located at the mouth of the River Stinchar, and a small area of salt marsh located behind this feature. Beyond the pier at Ballantrae, the sand and gravel dominated linear beach continues on to Bennan Lea. From this point to Bennane Head, the coastline becomes steeper and rocky. Remnants of a former late-glacial to mid-Holocene coastline are located landwards from the present day shoreline. The town of Ballantrae is located in front of a late-glacial marine terrace. While the A77 road runs parallel to the coast with relict storm beach ridges and machair like surface.

The net sediment drift in sub-cell 6d1 is in a northerly direction, with sediment accumulating at Ballantrae Bay and across the mouth of the River Stinchar.

The largest waves within sub-cell 6d1 occur around Downan point, with maximum significant wave heights of between 1.5-2.0m anticipated during Force 8 gale conditions.

### **Flood Risk**

There was very limited flood risk found within sub-cell 6d1, with only one non-residential property presently estimated to be at risk of flooding during a 1 in 200 year coastal event. There was no change to the number of properties at risk when potential changes due to climate change were considered. In addition, approximately 0.04km of road and 0.202km<sup>2</sup> of SSSI were estimated to be at risk during a 1 in 200 year coastal flood event, increasing to approximately 0.07km of road and 0.216km<sup>2</sup> of SSSI when potential changes due to climate change were considered.

### **Erosion Risk**

The main area of erosion risk in sub-cell 6d1 is located at Ballantrae. By 2050 it was estimated that approximately 0.5km of road would be within the erosion risk zone, while by 2100 it was estimated that one residential property and approximately 0.6km of road would be within the erosion risk zone.

## **Shoreline Management Assets**

North of Ballantrae pier the shoreline is defended with a combination of gabions, concrete and rock armour along the rear boundaries of a number of properties. A concrete seawall is also present towards the northern root of Ballantrae pier.

To the south of Ballantrae pier, protection is provided by a cobble storm beach topped with a grass area and intermittent areas of gabions and rock armour.

## **Policy Units**

Sub-cell 6d1 has been divided into two policy units:

- 6d1.1 Bennane Head to Ballantrae
- 6d1.2 Ballantrae to Currarie Port

Policy unit 6d1.1 contains two assets at risk of coastal flooding, the A77 and one non-residential property. The A77 is managed by Transport Scotland.

Policy unit 6d1.2 contains no assets at risk.

### 3.11 SUB-CELL 6D2: CURRARIE PORT – MILLEUR POINT

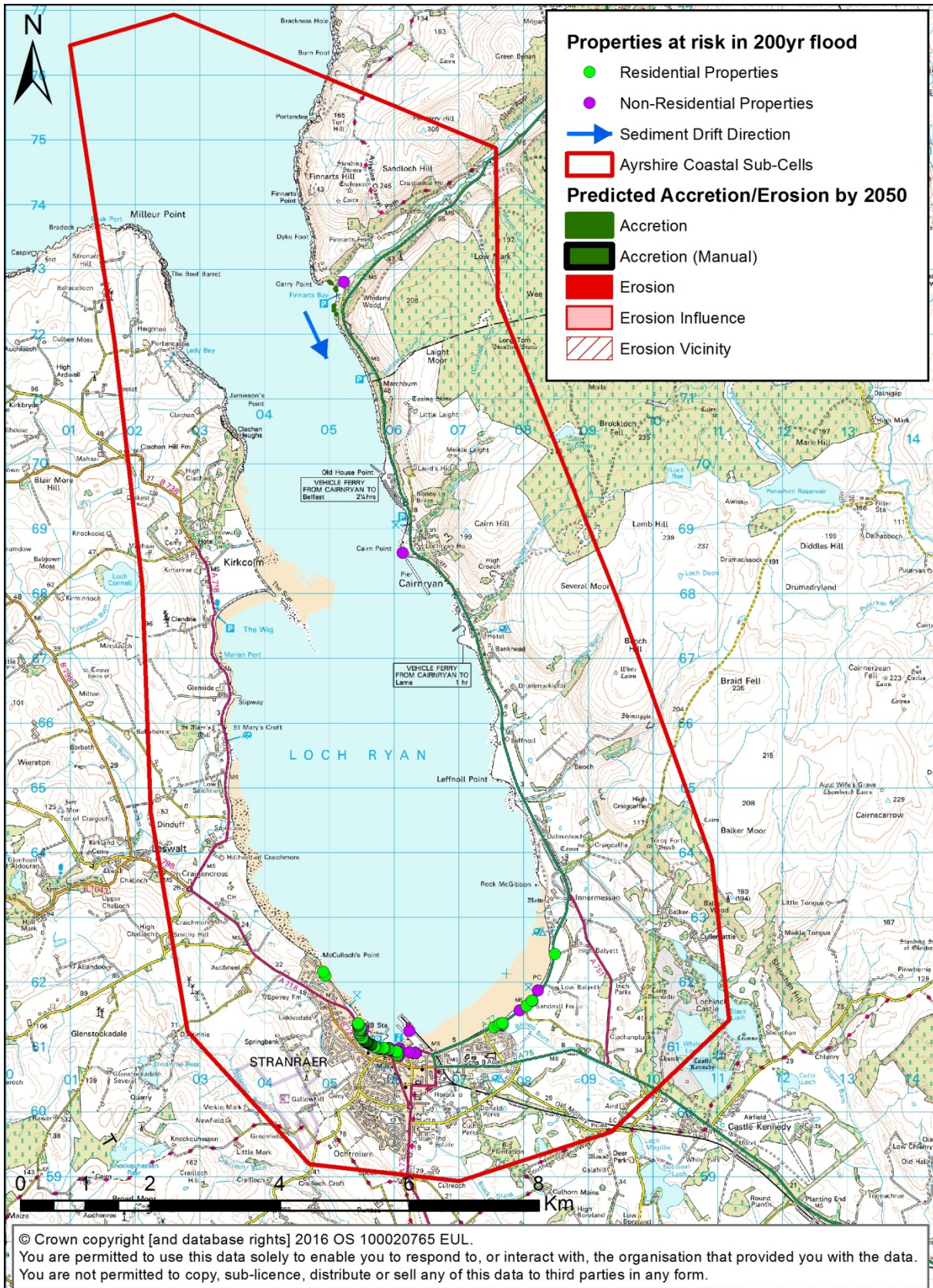


Figure 3.12 Sub-cell 6d2



Sub-cell 6d2 extends from Currarie Port to Milleur Point and is approximately 42km in length, of which approximately 7.5km is located within the South Ayrshire Council area. The remaining shoreline within sub-cell 6d2 is located within the Dumfries and Galloway Council area.

This sub-cell includes the entire coastline of Loch Ryan, from Milleur Point to Finnarts Point. The coastline defining the entrance of Loch Ryan is steep, with the shoreline dominated by a steep emerged rock cliff line. Embayment areas including Finnart and Lady's Bay represent the first sequence of sand and gravel beach deposits located along the Loch Ryan coastline. Both these embayments comprise sand and gravel deposits that back onto relict postglacial raised beaches; the more extensive of these are located on the eastern shoreline. The presence of coastal sand and gravel deposits increases towards the southern shoreline of Loch Ryan, with the most extensive deposits located at Stranraer. Remnants of the former raised shoreline are located landwards of this beach. The continuation of this former shoreline is interrupted by urbanisation.

The shoreline in sub-cell 6d2 lying within the South Ayrshire Council area is predominantly composed of hard material, with less than 15% of the South Ayrshire shoreline composed of soft material.

The shoreline at the entrance to Loch Ryan is steep and virtually sediment free, with a net southerly drift direction into Loch Ryan. Some soft sediment, predominantly cobble is present at Finnarts Bay at the mouth of Glen App.

The most extreme wave climate within sub-cell 6d2 is experienced at Portandea, where maximum significant wave heights of between 1.5-2.0m are likely during a Force 8 gale.

### **Flood Risk**

The main flood risk areas within sub-cell 6d2 are located at Finnarts Bay, Cairnryan and Stranraer. Cairnryan and Stranraer are located within the Dumfries and Galloway Council area, and the risk in these areas was therefore not considered in the Ayrshire SMP. During a 1 in 200 year coastal flood event, circa 140 residential properties and 30 non-residential properties were at risk of flooding in sub-cell 6d2, however there was only one property at risk within the South Ayrshire Council area. When potential changes due to climate change were considered, approximately 260 residential properties and 40 non-residential properties were estimated to be at risk in sub-cell 6d2, however again only one property was located in South Ayrshire. In addition, 5.8km of road was estimated to be at risk of flooding during a 1 in 200 year flood event, however none of this is located in South Ayrshire. This increased to 7.6km of road when potential changes due to climate change were considered, and again none of the road at risk was located within South Ayrshire.

**Erosion Risk**

No significant erosion loss was identified for sub-cell 6d2.

**Shoreline Management Assets**

No formal defences were identified along the shoreline within the section of sub-cell 6d2 lying within the South Ayrshire Council boundary.

**Policy Units**

Sub-cell 6d2 contains a single policy unit:

- 6d2.1 Currarie Port to Galloway Burn

This policy unit contains a single abandoned non-residential property at risk of coastal flooding.

### 3.12 SUB-CELL A1: LOCHRANZA – CLAUCHLANDS POINT

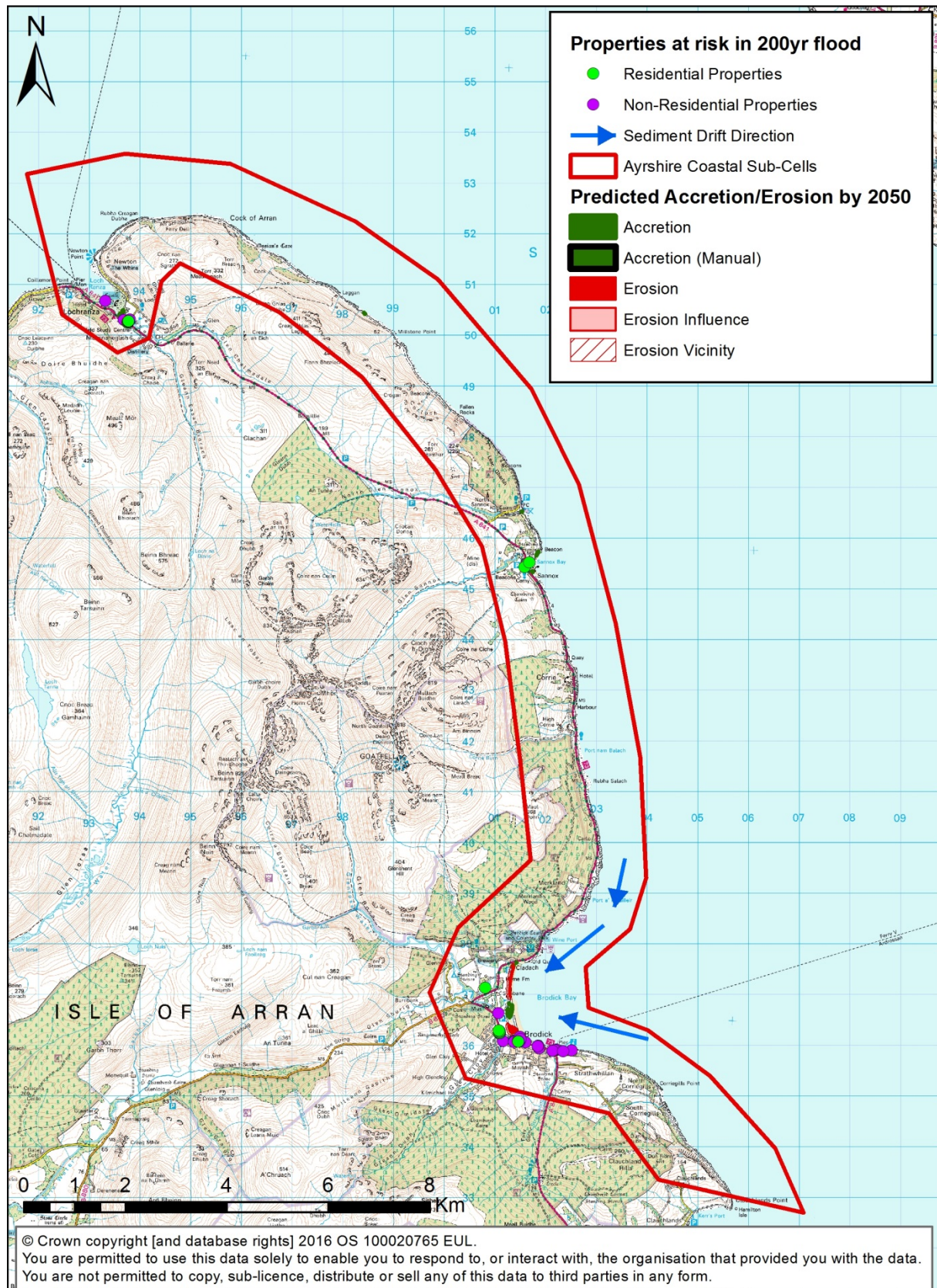


Figure 3.13 Sub-cell A1

Sub-cell A1 encompasses the north eastern section of the Isle of Arran and extends from Lochranza to Clauchlands Point and includes the communities of Lochranza, Sannox, Corrie and Brodick. The shoreline of sub-cell A1 is approximately 41km in length, and lies entirely within the North Ayrshire Council area.

This shoreline of sub-cell A1 is predominantly composed of hard and artificial material, with less than 25% of the shoreline being composed of soft material.

The shoreline of sub-cell A1 is dominated by a narrow shingle and boulder dominated fringe, with rock outcrops and rock platform. This rugged shoreline is backed with a relatively steep backshore showing late-glacial raised beach incisions. The northern extent of A1 is marked by the presence of Loch Ranza, a small sheltered sea lough. For the remainder of this sub-cell the almost continuous narrow rugged coastal fringe is interrupted by the presence of Sannox Bay and the larger Brodick Bay on the east of the Island, which is dominated by the presence of a sandy beach backed by machair-like surface.

Most of the shoreline within sub-cell A1 is virtually free of mobile sediments. Brodick Bay and Loch Ranza are the principal sediment sinks within this sub-cell.

Sub-cell A1 is relatively sheltered from wave attack, with the maximum significant wave height approaching the shore typically less than 1.0m.

### **Flood Risk**

The main flood risk areas within sub-cell A1 are located at Lochranza, Sannox and Brodick. During a 1 in 200 year coastal flood event circa 40 residential and non-residential properties were found to be at risk of flooding. When potential changes due to climate change were considered this increased to circa 80 properties at risk. In addition, approximately 2.0km of road and 0.096km<sup>2</sup> of SSSI we found to be at risk of flooding during a 1 in 200 year coastal flood event, increasing to approximately 4.0km of road and 0.111km<sup>2</sup> of SSSI when potential changes due to climate change were considered.

### **Erosion Risk**

The main area of erosion in sub-cell A1 is located at Brodick where it was estimated that by 2050, 3 non-residential properties would be at risk from coastal erosion. By 2100 one residential and 5 non-residential properties were estimated to be at high risk from erosion.

### **Shoreline Management Assets**

West of Lochranza Ferry Pier the shoreline is protected by a small section of gabion baskets and a rock armour revetment. The pier at the ferry terminal comprises a solid structure with tarmac surfacing bounded with masonry walls at the landward end. At the seaward end the concrete deck is supported on steel sheet piling.

East of Lochranza Ferry Pier, coastal defences include a concrete wall, a gabion seawall, a concrete foreshore slipway and small concrete walls adjacent to the root of the pier.

Further east there is a floating foreshore jetty extending from a concrete pier and a concrete foreshore access slipway with a small section of masonry wall in between.

A series of concrete and masonry walls provide coastal protection along the edge of the A841 as far as the sloping masonry revetment extending to Lochranza Castle.

A further series of masonry and concrete walls are situated south east of the revetment extending to Lochranza Castle.

On the north side of Lochranza the coastal defences include a combination of rock armour revetments, concrete and masonry walls and gabions.

At Sannox Bay, coastal protection is provided by a series of masonry and concrete walls with a concrete decked pier protected by a rock armour revetment also present.

At Corrie there are an intermittent series of masonry, concrete and gabion basket walls providing coastal protection, some of which are property walls. A rock armour revetment with gabions on top is also present at the existing pier/harbour.

South of Corrie a concrete revetment provides coastal protection at a layby on the A841.

A series of shallow concrete walls are located along the A841 North of Merkland. At Merkland car park a rock armour revetment provides protection.

The coastline adjacent to Brodick Castle is defended by a series of gabion, concrete and masonry walls. There is also an old masonry pier/ harbour along this section of coastline.

At the northern extent of Brodick Golf Course a rock armour revetment provides coastal protection. South of the outlet of the Glenrosa Water there is another rock armour revetment leading into coastal protection formed of sand bags and timber post fencing.

The coastline along the Brodick Frontage is protected by a combination of masonry and concrete walls along with concrete and rock armour revetments. Some of the revetments have gabions to provide additional stabilisation. The Ferry terminal comprises a pier structure and a breakwater to the east protected by a rock armour revetment.

## **Policy Units**

Sub-cell A1 has been divided into five policy units:

- A1.1 Lochranza
- A1.2 Lochranza to Sannox
- A1.3 Sannox to Brodick

- A1.4 Brodick
- A1.5 Brodick to Clauchlands Point

Policy unit A1.1 contains multiple properties and roads at risk of coastal flooding.

Policy unit A1.2 contains no assets at risk.

Policy unit A1.3 contains two residential properties at risk of coastal flooding and the A841 road at risk of coastal flooding and coastal erosion.

Policy unit A1.4 contains significant coastal flood and erosion risk to properties and roads. A landfill site is also at risk due to coastal erosion.

Policy unit A1.5 contains no assets at risk.

### 3.13 SUB-CELL A2: CLAUCHLANDS POINT – KINGSCROSS POINT

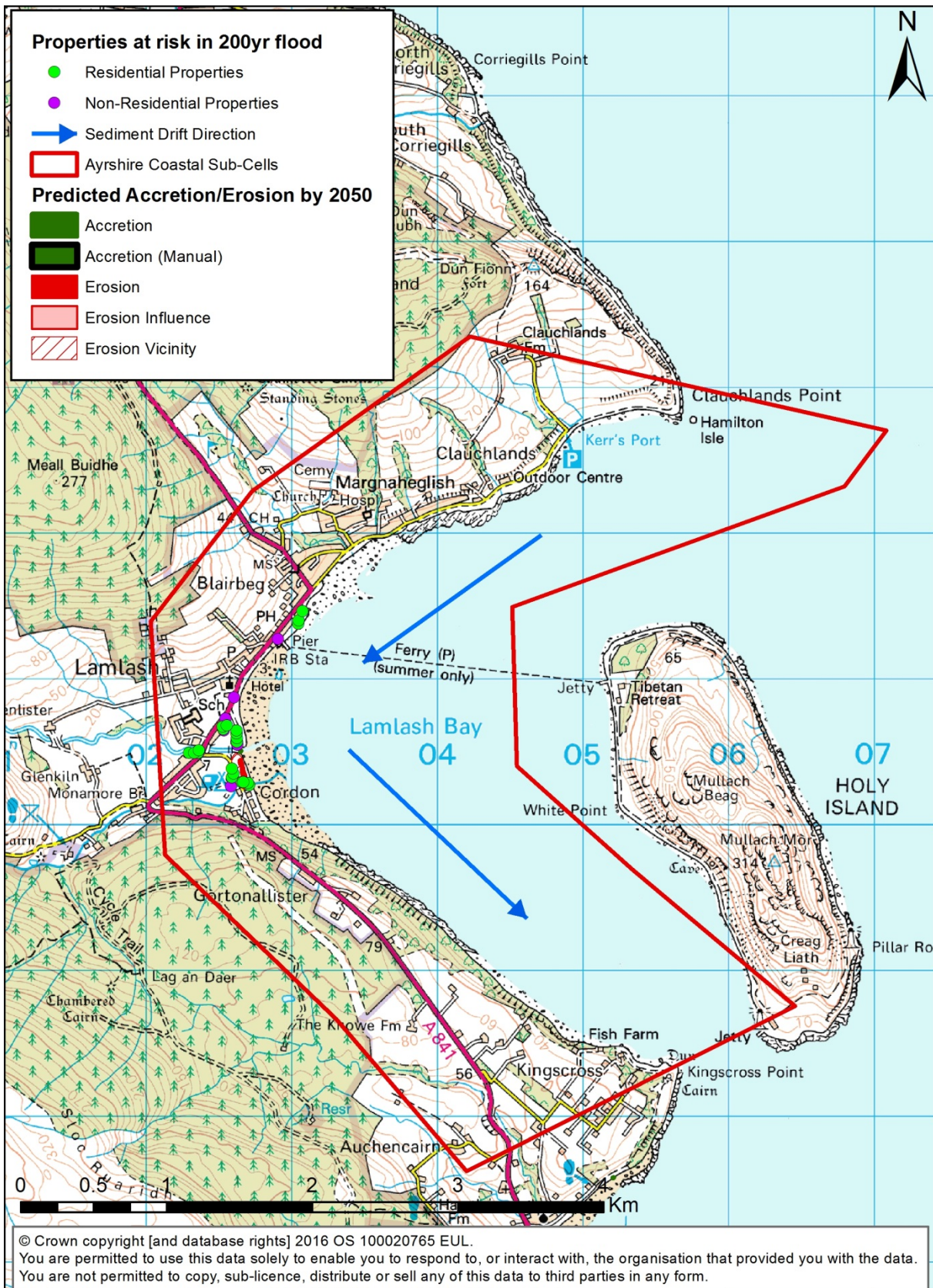


Figure 3.14 Sub-cell A2

Sub-cell A2 extends from Clauchlands Point to Kingscross Point and includes the community of Lamlash. This section of shoreline is approximately 9km in length (excluding Holy Isle) and is located entirely within the North Ayrshire Council area.

The shoreline of sub-cell A2 is mainly comprised of hard material, with less than 15% of the shoreline identified as soft material.

Lamlash Bay is the largest coastal embayment on the Island of Arran and is relatively sheltered by the presence of Holy Island. Starting in the north of this sub-cell, the shoreline at Clauchlands Point is dominated by rock outcrops and the presence of boulders, with the largest boulders (>1m) present at Kerrs Point. To the south of this location, towards the village of Lamlash the shoreline is dominated by shallow sand and gravel beach deposits. Landwards of this beach, extensive valley systems produce a relatively lowland area that extends inland for approximately 2km. Raised beach morphology located at the head of this valley is indicative of higher late & post-glacial relative sea-levels. To the south of this location towards Kingscross Point (marking the southerly extent of sub-cell A2), the relict beach morphology contrasts with the narrow incised raised beach morphology, defining the coastal margin of Lamlash Bay.

Lamlash Bay acts as a sediment sink, with little sediment movement beyond the headlands north and south of the bay.

The shoreline within Lamlash Bay is relatively sheltered from wave action, with the maximum significant wave height during Force 8 gales estimated to be less than 1.0m.

### **Flood Risk**

The main area of flood risk within sub-cell A2 is located at Lamlash. During a 1 in 200 year coastal flood event circa 20 residential and 10 non-residential properties were estimated to be at risk of flooding. When changes due to climate change were considered, the flood risk increased to approximately 40 residential and 15 non-residential properties. In addition, approximately 1.0km of road and 0.012km<sup>2</sup> of SSSI were estimated to be at risk of flooding during a present day 1 in 200 year coastal flood event. This increased to 1.8km of road and 0.014km<sup>2</sup> of SSSI when potential changes due to climate change were considered.

### **Erosion Risk**

The main area of erosion risk within sub-cell A2 is also located at Lamlash. By 2050 it was estimated that 4 residential properties and 0.13km of road would be at risk from erosion. By 2100 it was estimated that this would increase to 6 residential properties and 0.21km of road being at risk from erosion.



## Shoreline Management Assets

East of Arran Outdoor Centre, shoreline protection is provided to a carpark by a rock armour revetment. West of this revetment, there are a series of masonry, concrete and gabion basket walls alongside the public road. At Arran Outdoor Centre, there is a short section of rock armour revetment and a 5m wide concrete slipway extending into the sea.

Coastal protection to the public road in the north of Lamlash Bay is provided by a series of gabion basket, masonry and concrete walls, along with rock revetments. Some rock revetments have gabions at ground level for extra stabilisation.

At Lamlash Yacht Club, coastal defence is provided by a two layer gabion basket wall, a rock armour revetment, a section of gabion baskets installed to stabilise the ground at the southern end of the revetment, a masonry pier with concrete roundhead, two foreshore access slipways and a rock armour revetment with a concrete upstand wall.

South of Lamlash Yacht Club there is an old concrete jetty, two sets of beach access stairs surrounded by rock armour, a series of gabion basket walls and a number of rock armour revetments. Some of the gabion baskets have concrete infill. The south bank of the Monamore Burn is protected by a gabion basket wall.

## Policy Units

Sub-cell A2 has been divided into three policy units:

- A2.1 Clauchlands Point to Lamlash
- A2.2 Lamlash
- A2.3 Lamlash to Kingscross Point

Policy unit A2.1 contains a single asset at risk of coastal flooding, a minor road close to the Outdoor Centre.

Policy unit A2.2 contains significant coastal flood and erosion risk to properties and roads. Scottish Water assets run along the beach and are also at risk due to coastal erosion.

Policy unit A2.3 contains no assets at risk.

### 3.14 SUB-CELL A3: KINGSCROSS POINT – DRUMADOON POINT

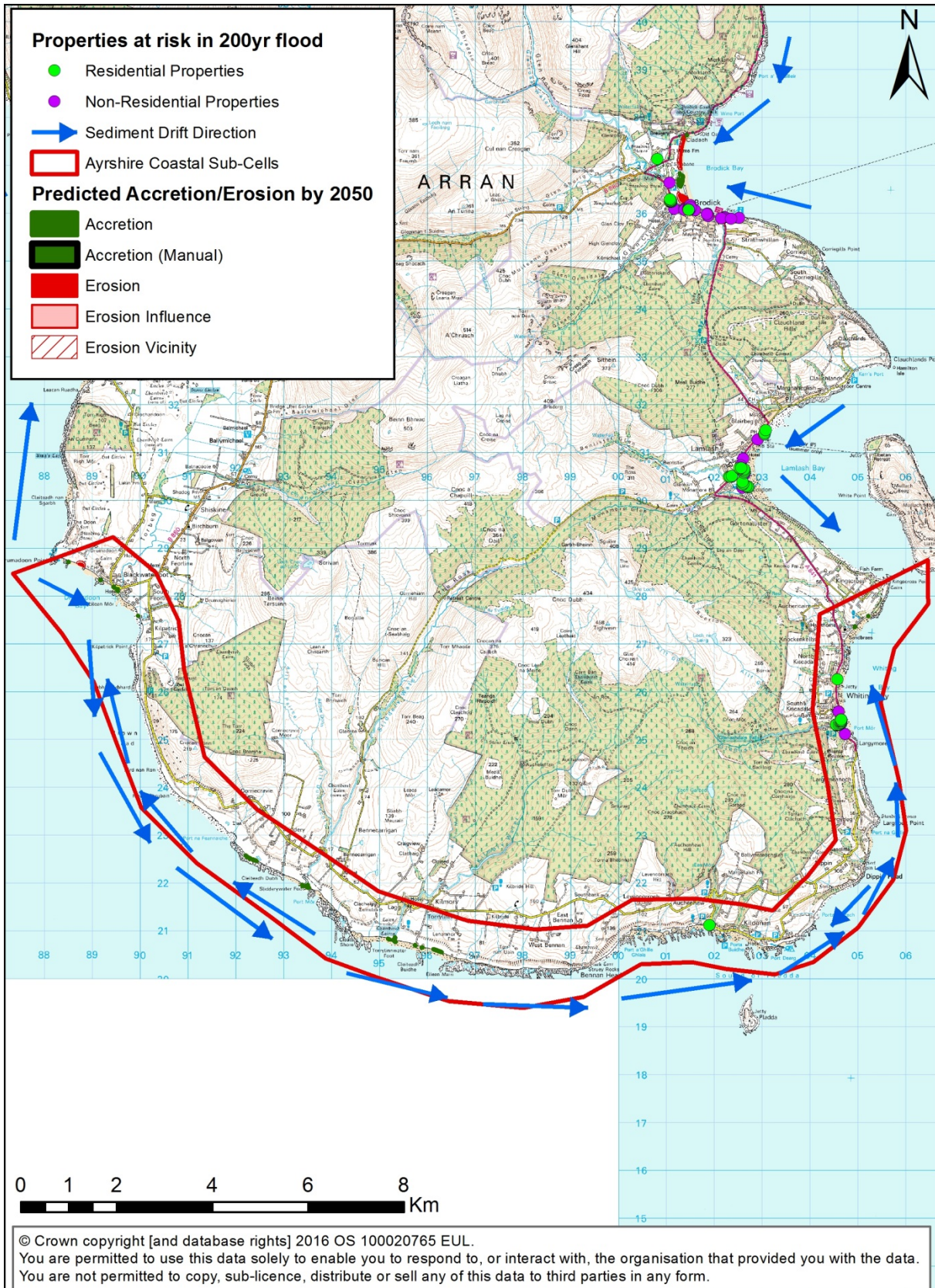


Figure 3.15 Sub-cell A3

Sub-cell A3 extends from Kingscross Point to Drumadoon Point and includes the communities of Whiting Bay, Kildonan and Blackwaterfoot. This section of the Ayrshire shoreline is approximately 33.5km in length and is located entirely within the North Ayrshire Council area.

The shoreline within sub-cell A3 is predominantly composed of hard material, with only approximately 25% identified as soft material.

This sub-cell encompasses the southern coast of the Isle of Arran. Whiting Bay located towards the north of this sub-cell contains a beach characterised by a mix of sands and gravels, which is accommodated within a narrow and slightly curved bay area. The landward extent of this beach is restricted by the presence of a relict beach terrace, upon which the modern road (A841) runs from this point to Largeymore. From Largeymore to Kilpatrick Point, the shoreline consists of a narrow gravel and boulder dominated fringe deposited on a rock platform. Beyond Kilpatrick Point, the presence of marine sand increases towards Drumadoon Point. An area of dune morphology is located at Blackwaterfoot and Lenamhor Farm. This area is bounded by a low-marine terrace, backed with steep cliffs. A series of Tertiary Dykes outcrop along the intertidal zone, particularly at the southern extent of the island.

Mobile sediment is present along most of the shoreline within sub-cell A3. There are two main sediment sinks at either end of the sub-cell, Whiting Bay and Drumadoon Bay.

The maximum significant wave heights along this section of shoreline during a typical Force 8 gale are predicted to be less than 1.0m.

### **Flood Risk**

The main area of flood risk within sub-cell A3 is located at Whiting Bay. During a 1 in 200 year coastal flood event, circa 20 residential and 5 non-residential properties were considered at risk of flooding. When potential changes due to climate change were taken into account this increased to 35 residential and 10 non-residential properties being at risk. In addition, approximately 1.3km of road and 0.221km<sup>2</sup> of SSSI were at risk during a present day 1 in 200 year coastal flood event. This increased to approximately 1.7km of road and 0.254km<sup>2</sup> of SSSI when potential changes due to climate change were considered.

### **Erosion Risk**

The main area of erosion risk within sub-cell A3 is located at Blackwaterfoot, however no receptors were found to be at risk by 2100.

## Shoreline Management Assets

Coastal defences along the A841 to the north of Whiting Bay Primary School include a series of gabion basket, concrete and masonry walls along with a concrete slipway and rock revetment.

South of Whiting Bay Primary School, coastal defences include a series of breeze block, masonry, concrete and gabion basket walls. Continuing southwards the coastline is defended by a rock armour revetment with a thin layer of concrete at ground level and a series of masonry, concrete and gabion basket seawalls. Some of the gabion basket walls have concrete toes.

At Largymore the coastline is defended by a concrete seawall tying into a small section of gabion basket wall. A single layer rock groyne is located at the southern extent of the gabion wall.

At Kildonan, the coastal defences include a series of concrete, masonry and gabion basket seawalls.

At Blackwaterfoot, the coastal defences consist of a combination of masonry and concrete walls as well as gabion baskets with rock armour protection adjacent to the Kinloch Hotel. On the southern bank of the outlet of the river Black Water, there are a series of masonry sea and harbour walls. On the northern bank there is a concrete/masonry wall with steel balustrade.

West of this concrete/masonry wall, there are a combination of rock armour revetments with gabion baskets on top and a masonry wall with rock armour revetment up to Shiskine Golf Course. At Shiskine Golf Course, there is a 6 layer gabion basket wall.

## Policy Units

Sub-cell A3 has been divided into two policy units:

- A3.1 Whiting Bay
- A3.2 Largymore to Drumadoon Point

Policy unit A3.1 contains a significant number of properties and roads at risk due to coastal flooding.

Policy unit A3.2 contains a single residential property at risk due to coastal flooding and localised sections of road.

### 3.15 SUB-CELL A4: DRUMADOON POINT - LOCHRANZA

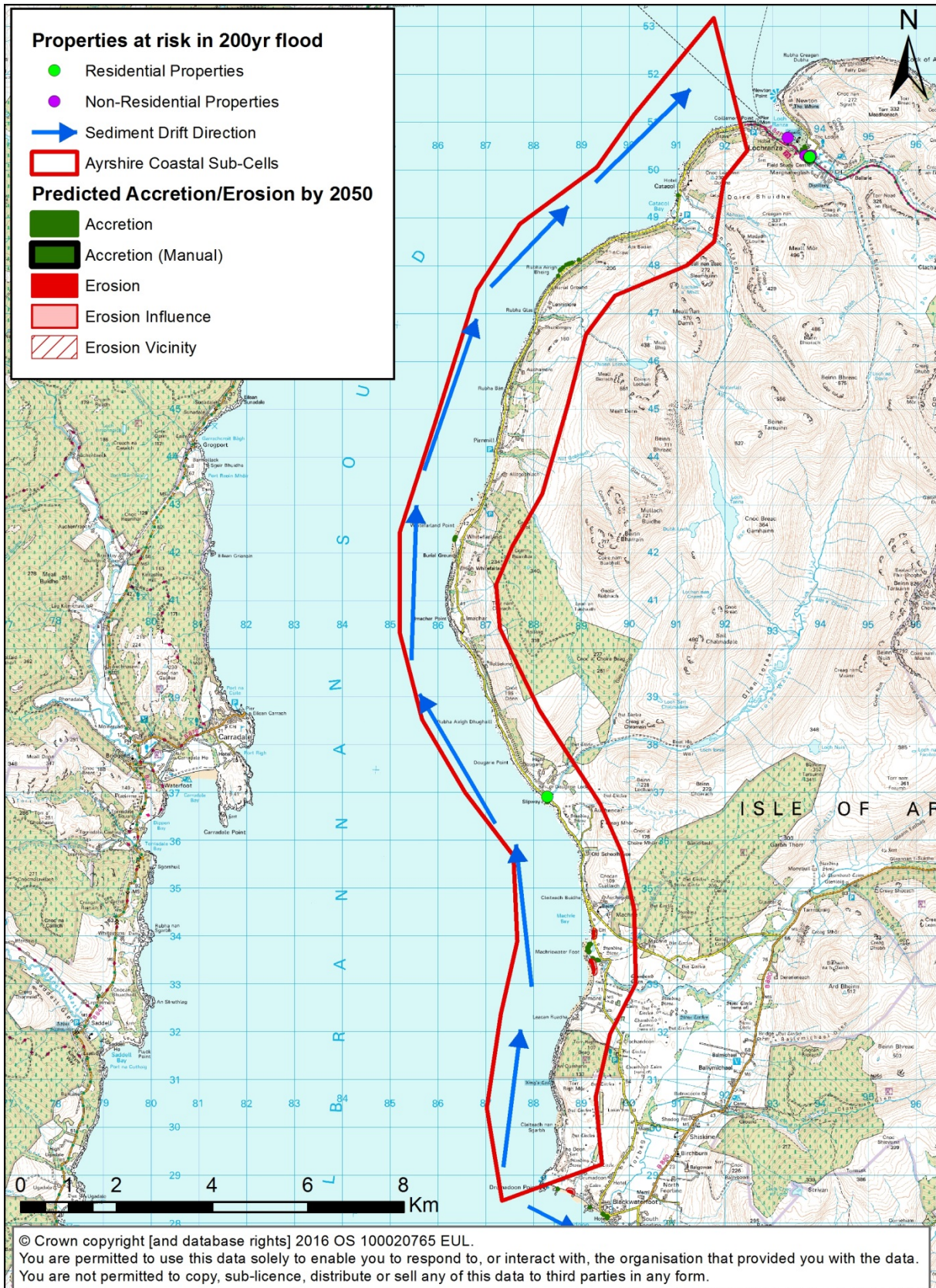


Figure 3.16 Sub-cell A4

Sub-cell extends A4 from Drumadoon Point to Lochranza and is approximately 30km in length. This sub-cell is located entirely within the North Ayrshire Council area.

The coastline of sub-cell A4 is mostly composed of hard material, with only approximately 25% of the shoreline classified as soft.

Mobile sediment is present along most of the shoreline of sub-cell A4, with a net northward drift direction.

This sub-cell covers the west coast of the Isle of Arran and is dominated by the presence of steep cliffs and post glacial raised beaches. This continuation of emergent landforms is interrupted by the presence of Machrie and Catacol Bays, where more extensive unconsolidated deposits are located. Machrie Bay, the larger of the two areas, is backed by a considerable lowland area. A series of relict gravel beach ridges are located inland from the coastline up to the position of the present road. A sand and gravel spit feature is located at the mouth of the Machrie Burn. From Dougarie, moving in a northerly direction, the coastline becomes steeper and is defined by the presence of a cliff line, until Whitefarland and Pirmill, where small strips of sandy beach are located.

Wave exposure along this section of shoreline is relatively limited, with significant wave heights of less than 1.0m during force 8 gales.

### **Flood Risk**

The main area of flood risk within sub-cell A4 is located at Dougarie. During a 1 in 200 year coastal flood event one property was identified as being at risk of flooding. The flooding risk to property did not change when the potential effects of climate change were considered. Approximately 2.3km of road and 0.055km<sup>2</sup> of SSSI were at risk of flooding during a 1 in 200 year flood event. This increased to approximately 5.3km of road and 0.067km<sup>2</sup> of SSSI when potential changes due to climate change were considered.

### **Erosion Risk**

The main area of erosion risk within sub-cell A4 is Machrie Bay. By 2050, it was estimated that one property and approximately 0.2km of road would be at risk from erosion. By 2100 no additional properties and only slightly more road would be at risk from erosion.

### **Shoreline Management Assets**

North of the outlet of the Machrie Water there is a rock armour revetment.

Further north as far as the outlet of the Iorsa Water at Dougarie, a series of concrete, masonry and gabion basket walls and a section of rock armour revetment provide protection to the A841.

North of the outlet of the Iorsa Water as far as Imachar the A841 is protected by a series of short concrete, masonry and gabion basket walls and a section of rock armour revetment.

South of Pirnmill, protection to the A841 and the Arran coastline is provided by two sections of short concrete, masonry and gabion basket walls, along with a section of rock armour revetment with gabions above.

Between Pirnmill and Thundergay the A841 is protected by a further series of short concrete, masonry and gabion basket walls. There is also a single layer rock armour revetment at Thundergay.

North of Thundergay, coastal protection continues in the form of a series of concrete, masonry and gabion basket walls and a small section of rock armour revetment.

At Craw, coastal defences include sections of rock armour protection along the toe and face of the A841 embankment which shows evidence of erosion.

At Catacol the coastal defences include a gabion basket wall, rock armour revetment and masonry wall.

West of Lochranza the coastal defences include a small section of gabion baskets and a series of concrete/masonry walls.

### **Policy Units**

Sub-cell A4 has been divided into two policy units:

- A4.1 Drumadoon Point to Tormore
- A4.2 Machrie Bay to Lochranza

Policy unit A4.1 contains no assets at risk.

Policy unit A4.2 contains properties and roads at risk due to both coastal flooding and coastal erosion.





The Great Cumbrae sub-cell includes the entire coastline of the island of Great Cumbrae. The shoreline of this island is approximately 21km in length and lies entirely within the North Ayrshire Council area.

The shoreline of Great Cumbrae is almost entirely composed of hard material, with one small section of soft shoreline at Kames Bay, accounting for approximately 1% of the overall shoreline length.

The coastline of Great Cumbrae is bounded by a near continuous presence of raised beaches that are backed by an incised cliff line. There are small strips of sand and gravel beach deposits located around the island, with the most extensive located at Kames Bay, Millport. On the west coast of Great Cumbrae, narrow marginal beaches including Sherriff's Port, Bell Bay and Fintray are present. White Bay is another small beach, located on the north of the island.

The majority of the shoreline around Great Cumbrae is relatively free of mobile sediments, although Kames Bay is a sediment sink.

The largest waves around the shoreline of Great Cumbrae occur at Millport, with a maximum significant wave height between 1.0-1.5m expected during a typical force 8 gale.

### **Flood Risk**

The main area of flood risk within the Great Cumbrae sub-cell is located at Millport. During a 1 in 200 year coastal flood event, approximately 10 properties were identified as being at risk of direct tidal flooding. When potential changes due to climate change were considered this increased to 85 properties. In addition, approximately 4.6km of road and 0.048km<sup>2</sup> of SSSI were shown to be at risk during a 1 in 200 year coastal flood event. This increased to 6.0km of road and 0.050km<sup>2</sup> of SSSI when potential changes due to climate change were considered.

There is a known significant flood risk due to wave overtopping at Millport. A Coastal Flood Risk Assessment for this area to analyse the risk due to wave overtopping was undertaken by Royal HaskoningDHV in 2015. This study indicated that 700+ properties were considered to be at risk of flooding as a consequence of wave over-topping.

### **Erosion Risk**

No significant erosion risk was identified for the Great Cumbrae sub-cell.

### **Shoreline Management Assets**

There are numerous coastal defences along the shoreline of Great Cumbrae. Starting at the Cumbrae – Largs ferry terminal to the north-east of the island and moving clockwise around

the island, there is a length of concrete sloping revetment with a concrete/masonry toe. Further south at the Cumbrae national water sports centre, the coastal structures include a concrete slipway and a sloping concrete revetment at an adjacent layby. Downcraig Jetty is composed of a series of masonry walls founded on made ground and bedrock to form a pier structure.

South of Downcraig Jetty adjacent to Downcraig junction, coastal defence to the B896 is provided by a masonry stone retaining wall with a concrete balustrade.

Continuing southwards intermittent sections of the B896 are protected by lengths of concrete sloping revetment with a concrete/masonry toe.

At the Marine Station Pier there is a small section of concrete revetment leading onto a masonry retaining wall on either side of the pier.

On the western side of Farland Point, adjacent to Marine Parade, coastal defences include rock armour and sloping concrete revetments. This section of coastline also includes a rock pool bounded by masonry revetments while the remainder of the frontage to the north comprises masonry revetments and vertical masonry seawalls.

At Kames Bay there is a sloping concrete revetment, while east of Kames Bay two sections of stone/cobble faced revetment are separated by an outcrop of bedrock. The revetments extend as far west as College Street. A section of concrete seawall is also located west of Kames Bay.

West of College Street vertical concrete and masonry seawalls provide coastal defence as far as Millport Harbour.

At Millport Harbour there are a series of masonry quay walls.

West of Millport Harbour, the coastal defences include masonry, brick and concrete property walls either founded on rock or constructed between rock outcrops, followed by a section of sloping concrete and masonry.

West of Millport Police Station, coastal defences include concrete and masonry walls and sloping revetments. Further west, there is an intertidal rock pool formed by masonry revetments.

West of Portachur Point, there are intermittent short lengths of concrete, or concrete faced blockwork, sloping revetments with a concrete/masonry toe founded on bedrock or beach material. In places there is a concrete wall on top of the revetment and to the north there is a short section of vertical masonry wall.

At Fintray Bay there is a masonry seawall and rock armour revetment adjacent to the public toilet block.

Further intermittent short lengths of concrete, or concrete faced blockwork and sloping revetments are present along the coastline north of Fintray Bay.

A short length of gabion basket protection is present at Stinking Bay.

Short lengths of concrete sloping revetments with a concrete/masonry toe founded on bedrock or beach material are present at Wine Bay.

Further east, at White Bay, the coastal defences include a short length of gabion baskets, short lengths of concrete sloping revetment and vertical concrete/masonry seawalls.

### **Policy Units**

The Great Cumbrae sub-cell contains a single policy unit, Great Cumbrae. This policy unit contains assets at risk of coastal flooding including properties and roads.

## 4 SHORELINE MANAGEMENT POLICIES AND MEASURES

### 4.1 SHORELINE MANAGEMENT POLICIES

Four high level Shoreline Management Policies are available to shoreline managers:

- Advance the existing defence line
- Hold the existing defence line
- Managed realignment
- No active intervention

In determining the appropriate management policy for each Policy Unit the four high level policy options have been considered as a hierarchy with the highest level of protection that was considered acceptable in terms of impact on coastal process and environment being selected for each Policy Unit. For example where the policy for a particular Policy Unit is “Hold the Line” this does not mean that measures have to be applied unilaterally along the entire frontage to hold the line, rather that subsequent consenting processes that build on the SMP should not presume against an application for measures to hold the line in this area. Thus in essence “No active intervention” is always an option, whereas the more intrusive policies that provide greater protection to vulnerable assets near the coast are only applicable where such measures are permitted by the SMP policy and are demonstrated to be justified and acceptable in terms of all other applicable criteria.

### 4.2 SHORELINE MANAGEMENT MEASURES

A wide range of shoreline management measures are available to achieve the desired policy for any particular section of the coastline. Examples of these measures and their potential implications are given below. Further information on potential shoreline management measures is available in various publications including ‘Shoreline Management Guidelines’, Mangor et al. (2017). It should be noted that the list below is not exhaustive and further shoreline management measures are available.

#### 4.2.1 Hard Protection

There are a wide variety of hard protection measures used in a coastal environment.

- Seawalls – These are typically of concrete, masonry or gabion construction. They are typically sloped but can also be near-vertical. The face can be smooth, stepped or curved. Seawalls protect against both erosion and flooding.

- Revetments – A sloping structure with a facing of typically stone, concrete units or cobble. Revetments protect against erosion; however they do not normally protect against flooding.
- Embankments – A sloping sea defence structure of typically earthen/sand construction. These structures protect the coast from flooding; however they do not normally provide erosion protection unless used in combination with a revetment.

Hard protection methods are often good for holding or advancing the existing defence line as they are able to prevent erosion and/or flooding at the location they are implemented. These methods are often high-cost and can have high maintenance requirements. Careful consideration of the longshore effects these structures have on the shoreline is required as many hard defences have potential to exacerbate leeside erosion.

#### **4.2.2 Mixed Coastal/Shore Protection**

Mixed coastal and shore protection measures combine hard structures with initial nourishment. This method employs hard structures to directly protect a section of coast but also makes use of the littoral processes in order to support and maintain the beach. By careful selection and design of the structures the requirement for external beach nourishment can be minimised. These methods are effective for protecting against erosion and can reduce wave over-topping; however they do not normally offer protection against flooding. As these methods alter the littoral processes, leeside erosion is a common side effect.

- Groynes – These are normally straight structures perpendicular to the shoreline. They block part of the littoral drift and trap sand on their upstream side.
- Detached breakwaters – These are straight shore-parallel structures which partly provide direct coastal protection as the shoreline in the lee of the structure is sheltered. Littoral transport in the lee of the structure is also reduced, trapping sand.
- Headlands – These are smooth structures which extend out on the shoreface from the coastline. They block part of the littoral transport and have similar effects on the shoreline to groynes and detached breakwaters; however some of the disadvantages of groynes and detached breakwaters are minimised, such as leeside erosion.
- Perched beaches – These are natural or nourished beaches at locations with a steep shoreface where a submerged structure supports the lower part of the beach.
- Cove – This is a semi-protected sandy bay. Two curved breakwaters which connect to the shore are used to form a cove.

### 4.2.3 Soft Protection

Soft protection measures aim to protect, preserve or restore the natural beach and the dynamic coastal landscape, while protecting against coastline retreat as far as possible.

- Dune stabilisation – Dunes are a natural coastal feature formed by sand which blows inland from the beach and is deposited behind the coastline. Dunes act as a flexible buffer zone, moving backwards with an eroding coastline as long as there is space for this to occur. This process protects the hinterland from erosion and flooding. The ability of dunes to recover after a storm event can be affected if the dune vegetation is damaged. Planting marram grass and setting up spruce fascines, or similar, to trap sand can stabilise the dune thereby encouraging accretion and build up. This needs to be carried out in a sensitive manner, as over-use of this technique may completely stabilise the dune, interrupting the natural cycle of dune initiation and sediment redistribution.
- Managed Realignment – In areas where significant coastal defence works have been undertaken, relaxing the requirements for fixing the coastline position to allow Managed Realignment may be feasible. If housing or infrastructure facilities are very close to the coastline, this option will only be feasible if these can be abandoned or moved landward. Where Managed Realignment is implemented, the coast is given back to natural processes, thereby potentially enhancing the environmental and recreational quality of the area. The rate of realignment can be managed by combining this measure with nourishment if required. If implemented successfully, Managed Realignment can be effective against both erosion and flooding.
- Nourishment – This is a very natural way of combating erosion, as sediment is added to artificially replace a deficit in the sediment budget. This measure does not remove the cause of erosion, so erosion will continue to occur along the nourished section. Continual maintenance is required as the nourished sand is gradually sacrificed. This measure generally does not prevent flooding, except in the case of dune nourishment which can offer additional flood protection.
- Beach drain – In this system a drain is installed running parallel to the beach in the wave up-rush zone. The drain lowers the groundwater table in this localised area. This decreases the strength of the down-rush of the wave and increases the strength of the beach sand, thereby reducing erosion. This measure does not protect against flooding.

## 5 POLICY STATEMENTS

### 5.1 INTRODUCTION

This section contains a series of statements and maps presenting the preferred policy and setting out any associated implications for each Policy Unit. These statements provide local detail and consider locally-specific issues and objectives. The suggested policy for each Policy Unit was established following consideration of the degree of risk within the Policy Unit, the geomorphology of the coastline, sediment transport regime and potential impact on receptors and other plans and policies. Workshops with Planners from both North and South Ayrshire Councils formed a key stage in the setting of management policy for each Policy Unit in order to ensure that intangible matters such as visual considerations and strategic local objectives were fully considered in this process.

Each of the Policy Statements contains the following:

- **Location reference:** This is the general name used for reference to each policy unit and a number identifier which is sequential along the shoreline from north to south and clockwise round the shoreline of the Isle of Arran.
- **Summary of the preferred Plan recommendations and justification:** A statement summarising the preferred Plan recommendation for a particular section of coastline and describing the rationale behind it. The focus of this is the definition of a long-term Plan, but any short-term requirements are also noted.
- **Preferred policies to implement the Plan:** These statements identify the plan policy and management measures anticipated for the short-term, medium-term and long-term. Any uncertainty in long-term policy/caveats that require resolution are detailed in the policy statement.
- **Predicted implications of the preferred Plan for this location:** This summarises the consequences at this location resulting from the preferred policy in the short, medium and long-term. These are categorised under the headings “Property & Land Use”, “Nature Conservation”, “Landscape”, “Historic Environment” and “Amenity & Recreational Use”.

### 5.1.1 Policy unit summary

A summary of the policy defined for each policy unit in the short, medium and long-term is given in Table 5.1 where:

- HTL – Hold the Line
- ATL – Advance the line
- NAI – No active intervention
- MR – Managed Realignment

**Table 5.1 Policy unit summary table**

Sub-cell	Policy unit	Short-term policy	Medium-term policy	Long-term policy
6b1	6b1.1 Skelmorlie to Largs	HTL	HTL	HTL
	6b1.2 Largs to Hunterston Ore Terminal	HTL	HTL	HTL
6b2	6b2.1 Hunterston	ATL	ATL	ATL
	6b2.2 Hunterston to Farland Head	NAI	NAI	NAI
6c1	6c1.1 Farland Head to Ardrossan	HTL	HTL	HTL
6c2	6c2.1 Ardrossan to Stevenston	HTL	HTL	HTL
	6c2.2 Stevenston to Irvine Bay	HTL	HTL	HTL
	6c2.3 Irvine Bay to Gailles Burn	HTL	HTL	HTL
	6c2.4 Gailles Burn to Troon	HTL	HTL	HTL
6c3	6c3.1 Troon to Ayr	HTL	HTL	HTL
6c4	6c4.1 Ayr to Grenan Castle	HTL	HTL	HTL
	6c4.2 Grenan Castle to Dunure	NAI	NAI	NAI
6c5	6c5.1 Dunure to Turnberry	NAI	NAI	NAI
6c6	6c6.1 Turnberry to North Girvan	NAI	NAI	NAI
	6c6.2 Girvan	HTL	HTL	HTL
	6c6.3 South Girvan to Bennane Head	HTL	HTL/ MR	HTL/ MR
6d1	6d1.1 Bennane Head to Ballantrae	HTL	HTL/ MR	HTL/ MR



Sub-cell	Policy unit	Short-term policy	Medium-term policy	Long-term policy
	6d1.2 Ballantrae to Currarie Port	NAI	NAI	NAI
6d2	6d2.1 Currarie Port to Galloway Burn	NAI	NAI	NAI
A1	A1.1 Lochranza	HTL	HTL	HTL
	A1.2 Lochranza to Sannox	NAI	NAI	NAI
	A1.3 Sannox to Brodick	HTL	HTL/ MR	HTL/ MR
	A1.4 Brodick	HTL	HTL	HTL
	A1.5 Brodick to Clauchlands Point	NAI	NAI	NAI
A2	A2.1 Clauchlands Point to Lamlash	NAI	NAI	NAI
	A2.2 Lamlash	HTL	HTL	HTL
	A2.3 Lamlash to Kingscross Point	NAI	NAI	NAI
A3	A3.1 Whiting Bay	HTL	HTL	HTL
	A3.2 Largymore to Drumadoon Point	NAI	NAI	NAI
A4	A4.1 Drumadoon Point to Tormore	NAI	NAI	NAI
	A4.2 Machrie Bay to Lochranza	HTL	HTL/ MR	HTL/ MR
Great Cumbrae	Great Cumbrae	HTL	HTL/ MR	HTL/ MR

It is important to note the whilst there is reasonable confidence in the sustainability of the recommended short term policies, the present incomplete understanding of effects of climate change, particularly the rate of sea level rise, means there is progressively less confidence in the sustainability of the medium and long term policies. Consequently the Ayrshire SMP needs to be seen as a live document subject to regular review as climate change predictions are updated and the actual rate of future sea level rise becomes better understood. This is particularly true for those policy units along the Ayrshire coast where the long-term strategy is hold the line, as while this has been considered sustainable based on the current recommendations for sea level rise there are alternative models that predict much greater rates of sea level change and if these prove to be correct this policy may not be sustainable.

In developing the recommended policies for each policy unit it was recognised that the highly developed nature of the Ayrshire coastline could result in significant social impact if a policy that does not hold the line for the longer term was adopted for such areas. Consequently both North or South Ayrshire Council representatives were opposed to the promotion of policies such as managed realignment or no active intervention in such areas if a hold the line option was considered technically feasible until a central policy for the management of relocation of at risk properties in Scotland is established.

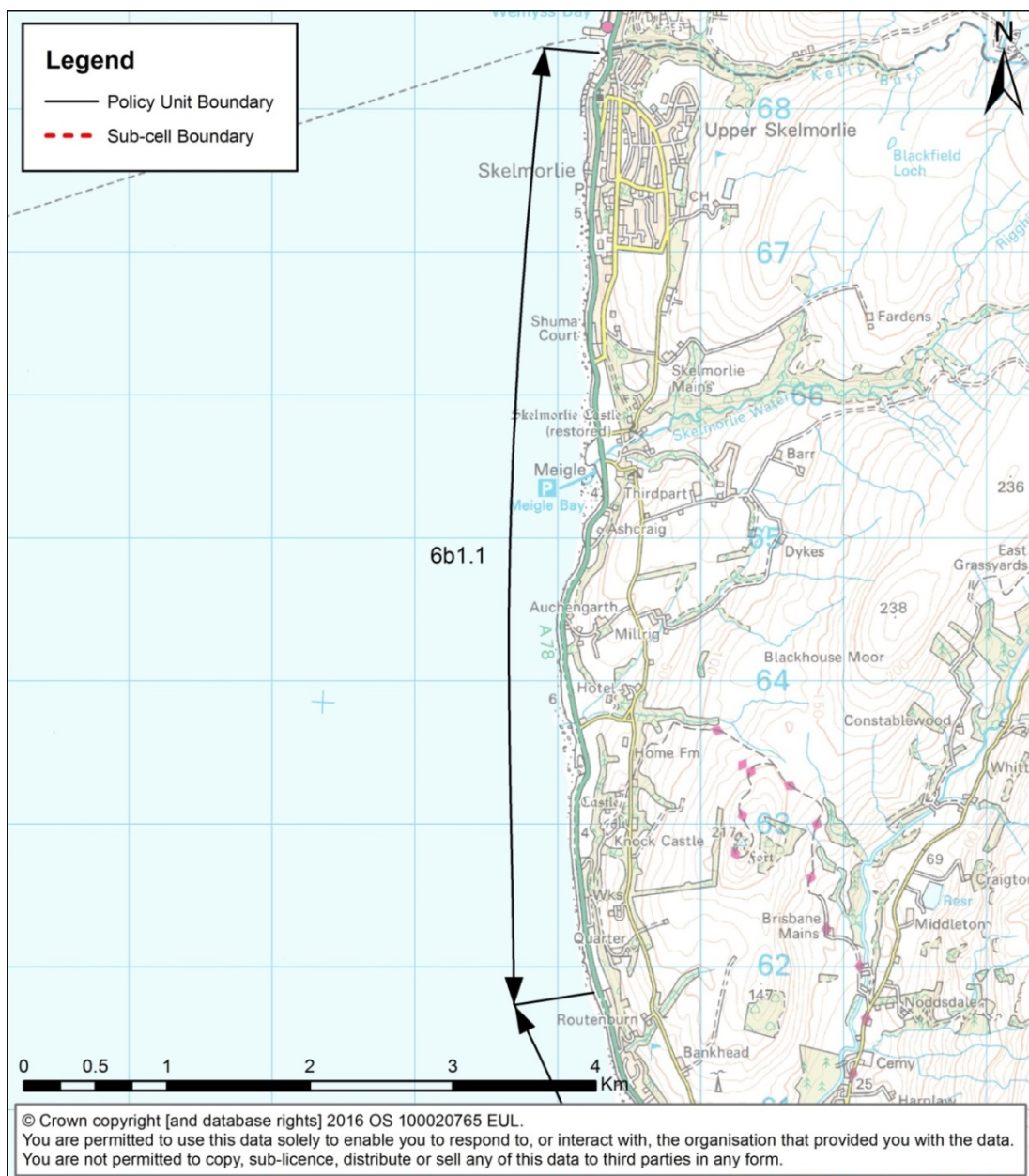
## 5.2 POLICY STATEMENTS

### 5.2.1 Sub-cell 6b1: Cloch Point - Hunterston Ore Terminal

Sub-cell 6b1 includes Policy Units 6b1.1 and 6b1.2.

#### 5.2.1.1 Policy unit 6b1.1: Skelmorlie to Largs

Sub-cell:	6b1
Location reference:	Skelmorlie to Largs
Policy Unit reference:	6b1.1



**Figure 5.1 Policy Unit 6b1.1**

<b>Sub-cell:</b>	<b>6b1</b>
<b>Location reference:</b>	<b>Skelmorlie to Largs</b>
<b>Policy Unit reference:</b>	<b>6b1.1</b>
<b>Summary of the preferred Plan recommendations and justification</b>	<p>This Policy Unit extends from the administrative boundary between the North Ayrshire and Inverclyde Councils at Skelmorlie south to the town of Largs. This section of shoreline is heavily defended by seawalls, revetments, rock armour and groynes. The A78 road is an important asset within this policy unit which runs along the coast. This road was found to be at risk of flooding and may also be at risk of erosion if the current defences are not maintained.</p> <p>Due principally to the strategic importance of the A78 and the constrained corridor through which both it and the railway pass the long-term plan for this Policy Unit is to hold the existing line in order to provide protection to these assets. Implementation of the plan will therefore require maintenance of the current defences and potential extension and improvement of the defences in the medium to long-term. This will have minimal impact on the sediment regime within sub-cell 6b1 as it is essentially a continuation of the present practice.</p>
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> - The policy for this area is to permit development necessary to hold the existing defence line by maintaining and if necessary extending the existing defence assets.
<b>Medium-term</b>	<b>Hold the Line</b> - Continual maintenance of defence assets will be necessary and further upgrades to the coastal defences may be required in the medium term.
<b>Long-term</b>	<b>Hold the Line</b> - Maintenance, upgrades to and replacement of the existing defence assets will be required in order to protect the assets located behind the defence line.

<b>Sub-cell: 6b1</b>					
<b>Location reference: Skelmorlie to Largs</b>					
<b>Policy Unit reference: 6b1.1</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to the Inner Clyde SPA and Ramsar site and Southannan Sands SSSI from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	No significant impact. No heritage features directly impacted within this policy unit.	Potential for temporary slight negative impacts during the construction phase due to disturbance to the A78 road.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc	Potential moderate negative impacts to the Inner Clyde SPA and Ramsar site and Southannan Sands SSSI from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	No significant impact. No heritage features directly impacted within this policy unit.	Potential for temporary slight negative impacts during the construction phase due to disturbance to the A78 road.
<b>Long-term</b>	No significant impact. No properties are predicted to be at risk	Potential moderate negative impacts to the Inner Clyde SPA and Ramsar site and	No significant impact on the overall landscape and	No significant impact. No heritage features directly impacted	Positive impact to the A78 road as this infrastructure benefits from flood and

	within this policy unit.	Southannan Sands SSSI from construction or rehabilitation of hard defences.	seascape anticipated.	within this policy unit.	erosion protection.
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5.2.1.2 Policy unit 6b1.2: Largs to Hunterston Ore Terminal

Sub-cell: 6b1

Location reference: Largs to Hunterston Ore Terminal

Policy Unit reference: 6b1.2



Figure 5.2 Policy Unit 6b1.2

<b>Sub-cell:</b> 6b1	
<b>Location reference:</b> Largs to Hunterston Ore Terminal	
<b>Policy Unit reference:</b> 6b1.2	
<b>Summary of the preferred Plan recommendations and justification</b>	<p>This Policy Unit includes the towns of Largs and Fairlie. There is significant coastal flood risk within this policy unit, especially around the ferry terminal at Largs, the mouth of the Noddsdale Water and at Allanton Park Terrace. Feedback from North Ayrshire Council also indicated that anecdotal evidence suggests a high level of flood risk due to wave overtopping within this policy unit, however this is at present unquantified as the SEPA coastal flood hazard modelling was based on still water levels and did not account for wave overtopping. A number of properties at Mackerston Place are also at risk due to coastal erosion.</p> <p>The long-term plan for this Policy Unit is to hold the existing line to protect properties and roads from coastal flooding and erosion. Significant coastal defences are already present along this section of shoreline so the long-term implementation of the Plan in this Policy Unit will likely consist of extending and improving the existing defences. This will therefore have minimal impact on the sediment regime within sub-cell 6b1.</p>
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> - The policy for this area is to hold the existing defence line by maintaining and if necessary extending the existing defence assets.
<b>Medium-term</b>	<b>Hold the Line</b> - Continual maintenance of defence assets will be necessary and further upgrades to the coastal defences may be required in the medium term.
<b>Long-term</b>	<b>Hold the Line</b> - Maintenance, upgrades to and replacement of the existing defence assets will be required in order to protect the assets located behind the defence line.



<b>Sub-cell: 6b1</b>					
<b>Location reference: Largs to Hunterston Ore Terminal</b>					
<b>Policy Unit reference: 6b1.2</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to the Inner Clyde SPA and Ramsar site and Southannan Sands SSSI from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors due to augmentation of the existing shoreline management measures.	Potential temporary negative impacts on the setting of several listed buildings during the construction phase.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road and rail infrastructure.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to the Inner Clyde SPA and Ramsar site and Southannan Sands SSSI from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors due to augmentation of the existing shoreline management measures.	Potential temporary negative impacts on the setting of several listed buildings during the construction phase.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road and rail infrastructure.
<b>Long-term</b>	Positive impact as a significant number of properties will benefit from flood and	Potential moderate negative impacts to the Inner Clyde SPA and Ramsar site and	No significant impact on the overall landscape and	Potential for positive impacts to several listed buildings as they will benefit from	Potential positive impact to several roads including the A78, in addition to

	erosion protection.	Southannan Sands SSSI from construction or rehabilitation of hard defences. Potential for slight positive impacts through creation of habitat for local flora and fauna should soft shoreline protection measures be used.	seascape anticipated.	flood and erosion protection.	Largs Ferry Terminal, Largs Yacht Haven and Fairlie Quay Marina as this infrastructure is likely to benefit from flood and erosion protection.
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### 5.2.1.3 Sub-cell 6b1: Opportunities for integrated shoreline management

<b>Sub-cell:</b> 6b1	
<b>Location reference:</b> Skelmorlie to Hunterston Ore Terminal	
<b>Policy Unit reference:</b> 6b1.1 - 6b1.2	
<b>Opportunities for integrated shoreline management</b>	<p>The policy identified for each policy unit within sub-cell 6b1 is <b>hold the line</b>. In each policy unit, this is likely to consist of maintaining and extending existing defences in the short-term, and constructing new defences in the medium-term which may include beach nourishment in policy unit 6b1.2. Transport Scotland will be primarily responsible for implementing this policy in policy unit 6b1.1, whereas North Ayrshire Council will be responsible for policy unit 6b1.2. Significant advantages are likely to be achieved by North Ayrshire Council and Transport Scotland adopting an integrated approach to implementing shoreline management policy within this sub-cell.</p> <p>It will be beneficial for feasibility studies to be carried out at sub-cell level to ensure a holistic view of this section of shoreline is obtained.</p> <p>Timing of the implementation of shoreline management within this sub-cell will be important in order to reduce potential cumulative environmental impacts associated with the construction phase of the works.</p>

### 5.2.2 Sub-cell 6b2: Hunterston Ore Terminal – Farland Head

Sub-cell 6b2 includes policy units 6b2.1 and 6b2.2.

#### 5.2.2.1 Policy unit 6b2.1: Hunterston

Sub-cell:	6b2
Location reference:	Hunterston
Policy Unit reference:	6b2.1



Figure 5.3 Policy Unit 6b2.1

<b>Sub-cell:</b>	6b2
<b>Location reference:</b>	Hunterston
<b>Policy Unit reference:</b>	6b2.1
<b>Summary of the preferred Plan recommendations and justification</b>	<p>This Policy Unit includes Hunterston and Southanan Sands. Hunterston is a Strategic Site under the National Planning Framework. The reclaimed construction yard at Hunterston extends from the coast at this location. A localised section of minor road is at risk due to coastal erosion.</p> <p>The long-term plan for this Policy Unit is to allow the existing line to be advanced. This will require hard shoreline management to establish the new line if the existing line is to be advanced. Significant coastal defences are already present along this section of shoreline and land reclamation has previously been undertaken so the long-term implementation of the Plan in this Policy Unit will likely consist of extending and improving the existing defences. The effect of this on the sediment regime within sub-cell 6b2 will require careful study prior to implementing any works, however this area has already been shown to be accreting thus a policy of advance the line is equitable with its present status.</p>
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Advance the line</b> - The policy for this area is to hold the existing line and to allow the existing line to be advanced by maintaining and extending the existing defence assets.
<b>Medium-term</b>	<b>Advance the line</b> - Continual maintenance of defence assets will be necessary and further upgrades to the coastal defences may be required in the medium term.
<b>Long-term</b>	<b>Advance the line</b> - Maintenance, upgrades to and replacement of the existing defence assets will be required in order to protect the assets located behind the defence line.

<b>Sub-cell: 6b2</b>					
<b>Location reference: Hunterston</b>					
<b>Policy Unit reference: 6b2.1</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts to one NRP during construction phase due to noise, vibration, traffic etc.	Potential significant negative impacts to the Southannan Sands SSSI and on local habitats from construction or rehabilitation of hard defences and reclamation of land.	Potential moderate negative impact due to advancing the line, however the industrial nature of this policy unit and small number of receptors should be noted.	No significant impact. Advancing the line will not affect any known heritage features.	Potential for slight negative impact to road infrastructure due to disturbance during construction phase.
<b>Medium-term</b>	Potential positive impact for one NRP benefiting from flood and erosion protection.	Potential significant negative impacts to the Southannan Sands SSSI and on local habitats from construction or rehabilitation of hard defences and reclamation of land.  Potential positive impacts due to habitat creation if soft shoreline protection	Potential moderate negative impact due to advancing the line, however the industrial nature of this policy unit and small number of receptors should be noted.	No significant impact. Advancing the line will not affect any known heritage features.	Potential for positive impact to road infrastructure as this will benefit from erosion protection.

		measures are incorporated.			
<b>Long-term</b>	Potential positive impact for one NRP benefiting from flood and erosion protection.	<p>Potential significant negative impacts to the Southannan Sands SSSI and on local habitats from construction or rehabilitation of hard defences and reclamation of land.</p> <p>Potential positive impacts due to habitat creation if soft shoreline protection measures are incorporated.</p>	Potential moderate negative impact due to advancing the line, however the industrial nature of this policy unit and small number of receptors should be noted.	No significant impact. Advancing the line will not affect any known heritage features.	Potential for positive impact to road infrastructure as this will benefit from erosion protection.

5.2.2.2 Policy unit 6b2.2: Hunterston to Farland Head

Sub-cell: 6b2

Location reference: Hunterston to Farland Head

Policy Unit reference: 6b2.2



Figure 5.4 Policy Unit 6b2.2



<b>Sub-cell:</b>	6b2
<b>Location reference:</b>	Hunterston to Farland Head
<b>Policy Unit reference:</b>	6b2.2
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term policy for this Policy Unit is no active intervention. This section of coast is composed of natural rock at present and is unlikely to require intervention in order to hold the existing defence line. No assets were found to be at risk due to coastal flooding or erosion in this policy unit.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>No Active Intervention</b> - The short term policy is to allow the natural rocky coastline to evolve as it presently does and provide the coastal defence.
<b>Medium-term</b>	<b>No Active Intervention</b> – As per the short-term policy, the medium-term policy is to allow the natural coastline to continue to evolve and provide the coastal defence. The effect of sea level rise on this policy unit is anticipated to be relatively minor due to the topography and lack of properties.
<b>Long-term</b>	<b>No Active Intervention</b> – As per the short and medium-term policies, the long-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effects of sea level rise will need to be monitored to ensure that no flood path is created that could affect Hunterston Power Station in the adjacent Policy Unit.

<b>Sub-cell:</b> 6b2					
<b>Location reference:</b> Hunterston to Farland Head					
<b>Policy Unit reference:</b> 6b2.2					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	No significant impact. No properties within the immediate vicinity of the shoreline.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. No disturbance or benefit to infrastructure anticipated.
<b>Medium-term</b>	No significant impact. No properties within the immediate vicinity of the shoreline.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. No disturbance or benefit to infrastructure anticipated.
<b>Long-term</b>	No significant impact. No properties within the immediate vicinity of the shoreline.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. No disturbance or benefit to infrastructure anticipated.

### 5.2.2.3 Sub-cell 6b2: Opportunities for integrated shoreline management

<b>Sub-cell:</b> 6b2	
<b>Location reference:</b> Hunterston Ore Terminal to Farland Head	
<b>Policy Unit reference:</b> 6b2.1 - 6b2.2	
<b>Opportunities for integrated shoreline management</b>	Two different policies have been identified for the policy units within sub-cell 6b2, <b>advance the line</b> and <b>no active intervention</b> . Sub-cell wide implications of measures for policy unit 6b2.1 on sediment transport should still be considered when planning shoreline management actions. Feasibility studies should also be carried out at sub-cell scale and implementation of shoreline management within policy unit 6b2.1 should be well planned and timed to minimise cumulative or in-combination environmental impacts.

### 5.2.3 Sub-cell 6c1: Farland Head – Ardrossan

Sub-cell 6b1 contains a single policy unit 6c1.1.

#### 5.2.3.1 Policy unit 6c1.1: Farland Head to Ardrossan

Sub-cell: 6c1

Location reference: Farland Head to Ardrossan

Policy Unit reference: 6c1.1



**Figure 5.5 Policy Unit 6c1.1**

<b>Sub-cell:</b> 6c1	
<b>Location reference:</b> Farland Head to Ardrossan	
<b>Policy Unit reference:</b> 6c1.1	
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. The SEPA coastal flood maps indicate a medium to high likelihood of flooding within this Policy Unit with a number of properties shown to be at risk of coastal flooding during a 1 in 200 year coastal flood event in the vicinity of Portencross Castle, along Eglinton Road and at Ardrossan Marina. West Kilbride Golf Club occupies a significant part of the shoreline within this policy unit. Significant coastal defences are already present along this section of shoreline so the short-term implementation of the Plan in this Policy Unit will likely consist of maintaining the existing defences. This will therefore have minimal impact on the sediment regime within sub-cell 6c1. In the medium-term, additional shoreline defence measures may be required. This may consist of extending or improving the existing the existing hard defences.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> - Significant coastal defences are already present in this policy unit and these are generally sufficient to protect coastal assets from flooding and erosion in the short term. Continual inspection and maintenance will be required.
<b>Medium-term</b>	<b>Hold the Line</b> - It may be required to construct new and extend existing coastal defences. Continual inspection and maintenance will be required.
<b>Long-term</b>	<b>Hold the Line</b> - It may be required to construct new and extend existing coastal defences. Continual inspection and maintenance will be required.

<b>Sub-cell:</b> 6c1					
<b>Location reference:</b> Farland Head to Ardrossan					
<b>Policy Unit reference:</b> 6c1.1					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential slight negative impacts to local habitats from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	No significant impact. It is not anticipated construction of shoreline management measures will impact on the setting of heritage features including listed buildings.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road infrastructure.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential slight negative impacts to local habitats from construction or rehabilitation of hard defences. Potential slight positive impacts due to habitat creation if soft shoreline protection measures are incorporated.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	No significant impact. It is not anticipated construction of shoreline management measures will impact on the setting of heritage features including listed buildings.  Potential for positive impacts to several	Potential for temporary slight negative impacts during the construction phase due to disturbance to road infrastructure.  Potential positive impact to several roads, West Kilbride Golf Club and Scottish Water assets as these are likely to benefit

				listed buildings as they will benefit from flood protection incorporating the effects of climate change.	from flood and erosion protection.
<b>Long-term</b>	Positive impact as a number of properties will benefit from flood protection.	Potential slight negative impacts to local habitats from construction or rehabilitation of hard defences. Potential slight positive impacts due to habitat creation if soft shoreline protection measures are incorporated.	No significant impact on the overall landscape and seascape anticipated.	Potential for positive impacts to several listed buildings as they will benefit from flood protection incorporating the effects of climate change.	Potential positive impact to several roads, West Kilbride Golf Club and Scottish Water assets as these are likely to benefit from flood and erosion protection.

### 5.2.3.2 Sub-cell 6c1: Opportunities for integrated shoreline management

<b>Sub-cell:</b> 6c1	
<b>Location reference:</b> Farland Head to Ardrossan	
<b>Policy Unit reference:</b> 6c1.1	
<b>Opportunities for integrated shoreline management</b>	There is a single policy unit within sub-cell 6c1, which has the policy <b>hold the line</b> . Scottish Water assets are at risk along this section of shoreline so there is scope for integrated working between North Ayrshire Council, West Kilbride Golf Club and Scottish Water. Feasibility studies should be carried out at sub-cell scale and implementation of shoreline management within the sub-cell should be well planned and timed to minimise cumulative or in-combination environmental impacts.



### 5.2.4 Sub-cell 6c2: Ardrossan – Troon

Sub-cell 6c2 includes policy units 6c2.1, 6c2.2, 6c2.3 and 6c2.4.

#### 5.2.4.1 Policy unit 6c2.1: Ardrossan to Stevenston

Sub-cell: 6c2

Location reference: Ardrossan to Stevenston

Policy Unit reference: 6c2.1



**Figure 5.6 Policy Unit 6c2.1**

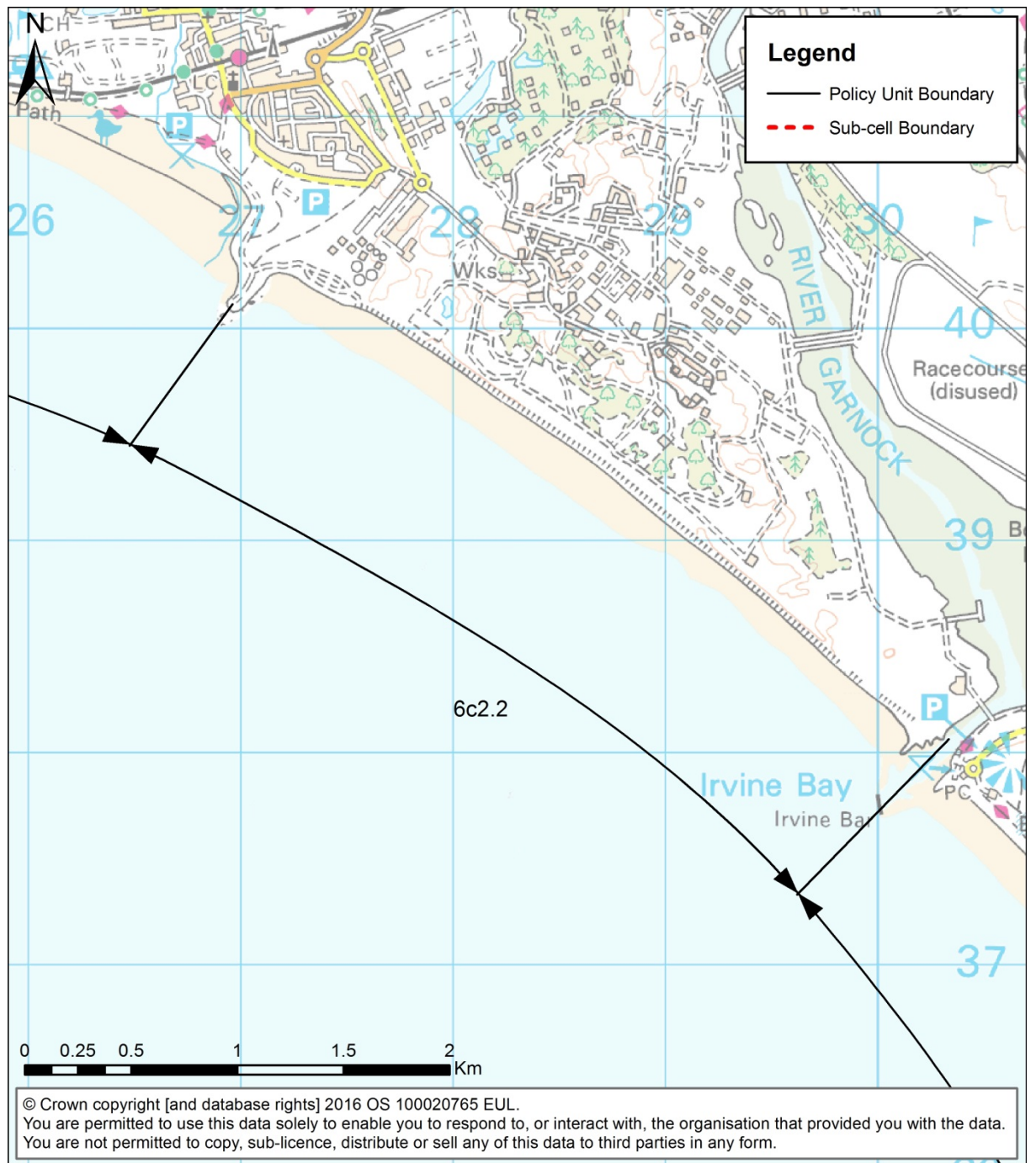
<b>Sub-cell:</b> 6c2	
<b>Location reference:</b> Ardrossan to Stevenston	
<b>Policy Unit reference:</b> 6c2.1	
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. The SEPA coastal flood maps show a medium likelihood of coastal flooding to properties at Canal Crescent. Available photographic evidence also showed the railway line at Sandylands Promenade to be potentially at risk due to wave overtopping, however recent works to the seawall at this location may have addressed this issue. Significant coastal erosion is predicted at Stevenston beach, affecting one non-residential property. Auchendarvie Golf Club is located along the shore within this policy unit. Significant coastal defences are already present along much of this section of shoreline so the long-term implementation of the Plan in this Policy Unit will likely consist of extending and improving the existing defences. The Plan in this Policy Unit is also to manage erosion at Stevenston beach, which will require soft engineering methods to be implemented in this area.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> - Significant coastal defences are already present in this policy unit. These may need to be extended and/or improved in the short term to protect properties currently at risk due to coastal flooding. Soft engineering measures may also be required at Stevenston beach in order to manage coastal erosion. Continual inspection and maintenance will be required.
<b>Medium-term</b>	<b>Hold the Line</b> - A significant number of additional assets are predicted to be at risk due to coastal flooding during the climate change scenario so it is likely that new coastal defences will be required. The impact of these defences on the sediment regime should be carefully considered. Continual inspection and maintenance will be required.
<b>Long-term</b>	<b>Hold the Line</b> - As per the medium-term policy the significant additional number of assets at risk due to coastal flooding during the climate change scenario will need to be protected. It is likely that new coastal defences will be required and the impact of these defences on the sediment regime should be carefully considered. Continual inspection and maintenance will be required.

<b>Sub-cell: 6c2</b>					
<b>Location reference: Ardrossan to Stevenston</b>					
<b>Policy Unit reference: 6c2.1</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to nationally protected sites and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of several listed buildings.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road and rail infrastructure.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.  Positive impact as a number of properties will benefit from flood and erosion protection.	Potential moderate negative impacts to nationally protected sites and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.  Potential soft engineering works at Stevenston beach may improve local	Potential slight negative impacts on the setting of several listed buildings.  Potential slight negative impacts on the setting of several listed buildings. Potential for direct positive impacts as they will benefit from flood protection.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road and rail infrastructure.  Potential positive impact to several roads as these are likely to benefit from flood and erosion protection.

		due to habitat creation if soft shoreline protection measures are incorporated.	views to receptors, with a slight positive impact.		
<b>Long-term</b>	Positive impact as a number of properties will benefit from flood and erosion protection.	Potential moderate negative impacts to nationally protected sites and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.	Potential soft engineering works at Stevenston beach may improve local views to receptors, with a slight positive impact.	Potential slight negative impacts on the setting of several listed buildings. Potential for direct positive impacts as they will benefit from flood protection.	Potential positive impact to several roads as these are likely to benefit from flood and erosion protection.

**5.2.4.2 Policy unit 6c2.2: Stevenston to Irvine Bay**

Sub-cell: 6c2  
 Location reference: Stevenston to Irvine Bay  
 Policy Unit reference: 6c2.2



**Figure 5.7 Policy Unit 6c2.2**

<b>Sub-cell:</b>	6c2
<b>Location reference:</b>	Stevenston to Irvine Bay
<b>Policy Unit reference:</b>	6c2.2
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. A number of assets are predicted to be at risk due to coastal flooding adjacent to the River Irvine and there is believed to be significant potential for a range of unquantified contaminants to be present in the lands along the shoreline of this policy unit with potential for contamination if erosion was to occur. The existing defences are sufficient to prevent erosion at this section of shoreline in the short-term, however it is important that this is monitored and additional erosion protection is implemented in the medium to long-term if required.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> - Significant coastal defences are already present in this policy unit. These appear to be sufficient in the short-term to manage the erosion risk to the shoreline in this policy unit; however inspection and maintenance will be required.
<b>Medium-term</b>	<b>Hold the Line</b> – Additional erosion protection along the shoreline may be required in order to ensure contamination does not occur in the medium to long-term. If this is required, detailed design will need to be undertaken and soft engineering measures such as dune stabilisation would be preferred.
<b>Long-term</b>	<b>Hold the Line</b> - As per the medium-term policy additional erosion protection such as dune stabilisation may be required to prevent contamination.

<b>Sub-cell:</b> 6c2					
<b>Location reference:</b> Stevenston to Irvine Bay					
<b>Policy Unit reference:</b> 6c2.2					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to nationally protected sites and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential reduction in negative impacts due to reduced mobilisation of contaminated fill.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	No significant impact. Shoreline protection measures will not affect any known heritage features.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road infrastructure.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc. Positive impact as a number of properties	Potential moderate negative impacts to nationally protected sites and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	No significant impact. Shoreline protection measures will not affect any known heritage features.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road infrastructure. Potential positive

	will benefit from flood protection.	defences. Potential reduction in negative impacts due to reduced mobilisation of contaminated fill. Potential slight positive impacts on local habitats and species due to habitat creation through soft shoreline protection measures.			impact to several roads as these are likely to benefit from flood protection. Potential positive impact for recreation at Ardeer beach due to erosion protection.
<b>Long-term</b>	Positive impact as a number of properties will benefit from flood protection.	Potential moderate negative impacts to nationally protected sites and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential reduction in negative impacts due to reduced mobilisation of contaminated fill. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.	No significant impact on the overall landscape and seascape anticipated.	No significant impact. Shoreline protection measures will not affect any known heritage features.	Potential positive impact to several roads as these are likely to benefit from flood protection. Potential positive impact for recreation at Ardeer beach due to erosion protection.



**5.2.4.3 Policy unit 6c2.3: Irvine Bay to Gales Burn**

Sub-cell: 6c2

Location reference: Irvine Bay to Gales Burn

Policy Unit reference: 6c2.3



**Figure 5.8 Policy Unit 6c2.3**

<b>Sub-cell:</b>	<b>6c2</b>
<b>Location reference:</b>	<b>Irvine Bay to Gales Burn</b>
<b>Policy Unit reference:</b>	<b>6c2.3</b>
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. A number of assets including residential and non-residential properties adjacent to the River Irvine are shown to have a medium likelihood of coastal flooding by the SEPA flood maps. While the NCCA did not indicate any particular erosion risk within this policy unit, North Ayrshire Council indicated there had been a significant loss of sand dune between the confluence of the River Garnock (Irvine Beach) and Barassie. Western Gales Golf Club is situated behind the dune line in this policy unit. The Plan in this Policy Unit will therefore consist of erosion management of the dune system at Irvine Beach and Barassie and flood management to protect assets adjacent to the River Irvine.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> – A natural dune system is present along the shoreline in this policy unit and erosion of these dunes will need to be managed in the short-term. Soft engineering measures including dune stabilisation may be sufficient to achieve this. New hard engineered defences may also be required at the River Irvine to provide coastal flood protection.
<b>Medium-term</b>	<b>Hold the Line</b> – In the medium to long-term, erosion of the dune system will continue to require management. The effects of climate change will create additional pressures and the dune stabilisation measures may need to be updated and extended. Flood defences on the River Irvine may need to be improved and extended also in order to provide adequate flood protection. Continual inspection and maintenance will be required.
<b>Long-term</b>	<b>Hold the Line</b> - As per the medium-term policy, erosion of the dune system will need to be managed and flood defences on the River Irvine may need to be improved and extended due to the effects of climate change. Continual inspection and maintenance will be required.

<b>Sub-cell: 6c2</b>					
<b>Location reference: Irvine Bay to Gales Burn</b>					
<b>Policy Unit reference: 6c2.3</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to nationally protected sites and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of several listed buildings.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road infrastructure.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.  Positive impact as a number of properties will benefit from flood protection.	Potential moderate negative impacts to nationally protected sites and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.  Potential soft engineering works at Barassie/Irvine beach park may improve	Potential slight negative impacts on the setting of several listed buildings  Potential slight negative impacts on the setting of several listed buildings. Potential for direct positive impacts as they will benefit from flood protection.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road infrastructure.  Potential positive impact to several roads as these are likely to benefit from flood protection.

		due to habitat creation if soft shoreline protection measures are incorporated.	local views to receptors, with a slight positive impact.		Potential positive impact for recreation at Barassie/Irvine beach park due to erosion protection.
<b>Long-term</b>	Positive impact as a number of properties will benefit from flood protection.	Potential moderate negative impacts to nationally protected sites and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.	Potential soft engineering works at Barassie/Irvine beach park may improve local views to receptors, with a slight positive impact.	Potential slight negative impacts on the setting of several listed buildings. Potential for direct positive impacts as they will benefit from flood protection.	Potential positive impact to several roads as these are likely to benefit from flood protection. Potential positive impact for recreation at Barassie/Irvine beach park due to erosion protection.

5.2.4.4 Policy unit 6c2.4: Gales Burn to Troon

Sub-cell: 6c2

Location reference: Gales Burn to Troon

Policy Unit reference: 6c2.4



Figure 5.9 Policy Unit 6c2.4

<b>Sub-cell:</b>	<b>6c2</b>
<b>Location reference:</b>	<b>Gailes Burn to Troon</b>
<b>Policy Unit reference:</b>	<b>6c2.4</b>
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. A significant number of assets are at risk due to coastal flooding in this policy unit, especially in the vicinity of Portland Street. No significant erosion risk was identified, however South Ayrshire Council currently undertake dune restoration work in this area so the NCCA erosion assessment may have been influenced by these on-going works. The Plan for this policy unit is to provide flood protection to the assets at risk and maintain this protection in the long-term.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> - Significant coastal defences are already present along the shoreline in this policy unit. These will need to be extended and/or improved in the short term to protect properties currently at risk due to coastal flooding. The impact of additional coastal defence works on the sediment regime should be carefully considered. Dune restoration works by South Ayrshire Council should be continued. Continual inspection and maintenance will be required.
<b>Medium-term</b>	<b>Hold the Line</b> - A significant number of additional assets are predicted to be at risk due to coastal flooding during the climate change scenario so it is likely that coastal defences will need to be extended and/or improved. Erosion risk at North Sands should be continually monitored and dune restoration works by South Ayrshire Council continued if practicable.
<b>Long-term</b>	<b>Hold the Line</b> - As per the medium-term policy the significant additional number of assets at risk due to coastal flooding during the climate change scenario will need to be protected. It is likely that coastal defences will need to be extended and/or improved and the impact on the sediment regime should be carefully considered. Erosion risk at North Sands should be continually monitored and dune restoration works by South Ayrshire Council continued if practicable.

<b>Sub-cell: 6c2</b>					
<b>Location reference: Gailes Burn to Troon</b>					
<b>Policy Unit reference: 6c2.4</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to nationally protected sites and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of several listed buildings.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road infrastructure.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.  Positive impact as a significant number of properties will benefit from flood protection.	Potential moderate negative impacts to nationally protected sites and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of several listed buildings. Potential for direct positive impacts as they will benefit from flood protection.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road infrastructure.  Potential positive impact to several roads as these are likely to benefit from flood protection.

		due to habitat creation if soft shoreline protection measures are incorporated.			Potential positive impact for recreation at North Sands beach due to erosion protection.
<b>Long-term</b>	Positive impact as a significant number of properties will benefit from flood protection.	Potential moderate negative impacts to nationally protected sites and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.	No significant impact on the overall landscape and seascape anticipated.	Potential slight negative impacts on the setting of several listed buildings. Potential for direct positive impacts as they will benefit from flood protection.	Potential positive impact to several roads as these are likely to benefit from flood protection. Potential positive impact for recreation at North Sands beach due to erosion protection.



### 5.2.4.5 Sub-cell 6c2: Opportunities for integrated shoreline management

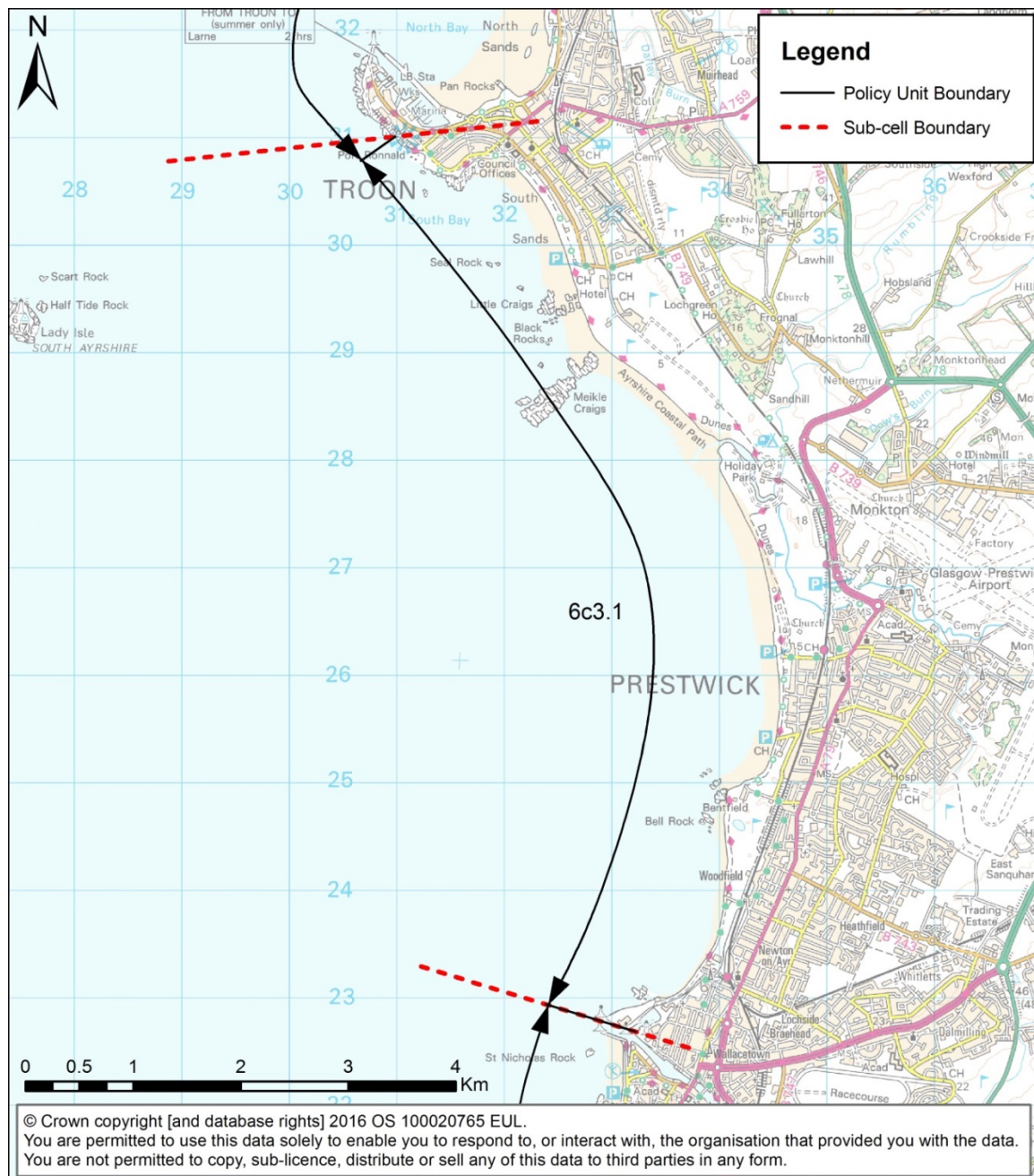
<b>Sub-cell:</b> 6c2	
<b>Location reference:</b> Ardrossan to Troon	
<b>Policy Unit reference:</b> 6c2.1 – 6c2.4	
<b>Opportunities for integrated shoreline management</b>	The policy identified for each policy unit within sub-cell 6c2 is <b>hold the line</b> . There are a range of asset owners within this sub-cell including North Ayrshire Council, South Ayrshire Council, Network Rail, and private landowners. Significant advantages are likely to be achieved by adopting an integrated approach to implementing shoreline management policy within this sub-cell. Feasibility studies should be carried out at sub-cell scale in order to obtain a holistic view and ensure any impacts on the sediment budget are identified and mitigated where possible. Implementation of shoreline management within the sub-cell should be well planned and timed to minimise cumulative or in-combination environmental impacts.

### 5.2.5 Sub-cell 6c3: Troon – Ayr

Sub-cell 6c3 contains a single policy unit 6c3.1.

#### 5.2.5.1 Policy unit 6c3.1: Troon to Ayr

Sub-cell:	6c3
Location reference:	Troon to Ayr
Policy Unit reference:	6c3.1



**Figure 5.10 Policy Unit 6c3.1**

<b>Sub-cell:</b> 6c3	
<b>Location reference:</b> Troon to Ayr	
<b>Policy Unit reference:</b> 6c3.1	
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. A significant number of residential and non-residential properties are predicted to be at risk due to coastal flooding. South Ayrshire Council indicated that the Titchfield Road area is at risk due to wave overtopping, with the road and gardens flooding in recent history. Royal Troon, Prestwick and Prestwick St Nicholas Golf Clubs are all located along the shoreline in this policy unit and both Royal Troon and Prestwick Golf Clubs are predicted to be at risk due to coastal flooding. An area of fill material along a section of shoreline at Newton shore is being eroded by storm wave action. A Scottish Water rising main at Newton shore is also exposed and at risk due to coastal erosion. The Plan for this Policy Unit is to implement defences which will protect these assets from coastal flooding and manage the ongoing coastal erosion at Newton shore.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> – Assets currently at risk of coastal flooding or erosion are to be protected. Significant coastal defences are already present in this policy unit. These will need to be extended and/or improved in the short term to protect properties currently at risk due to coastal flooding. The impact of additional coastal defence works on the sediment regime should be carefully considered.
<b>Medium-term</b>	<b>Hold the Line</b> - A significant number of additional assets are predicted to be at risk due to coastal flooding during the climate change scenario so it is likely that coastal defences will need to be extended and/or improved in the medium to long term. The impact of additional coastal defence works on the sediment regime should be carefully considered. Continual inspection and maintenance will be required.
<b>Long-term</b>	<b>Hold the Line</b> - As per the medium-term policy the significant additional number of assets at risk due to coastal flooding during the climate change scenario will need to be protected. It is likely that coastal defences will need to be extended and/or improved in the medium to long term and the impact of these defences on the sediment regime should be carefully considered. Continual inspection and maintenance will be required.

<b>Sub-cell:</b> 6c3					
<b>Location reference:</b> Troon to Ayr					
<b>Policy Unit reference:</b> 6c3.1					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.  Potential positive impact preventing contamination at Newton shore.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of several listed buildings and Troon and Southwood Heritage Conservation Area.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road infrastructure.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.  Positive impact as a significant number of	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of several listed buildings and Troon and Southwood Heritage Conservation Area.  Potential for direct	Potential for temporary slight negative impacts during the construction phase due to disturbance to road infrastructure.  Potential positive impact to several roads

	properties will benefit from flood protection.	rehabilitation of hard defences. Potential positive impact preventing contamination at Newton shore.	Potential works at Newton shore may improve local views to receptors, with a slight positive impact.	positive impacts as these assets will benefit from flood protection.	along with Royal Troon and Prestwick Golf Clubs as these assets are likely to benefit from flood protection.
<b>Long-term</b>	Positive impact as a significant number of properties will benefit from flood protection.	Potential positive impact preventing contamination at Newton shore.	Potential works at Newton shore may improve local views to receptors, with a slight positive impact.	Potential slight negative impacts on the setting of several listed buildings. Potential for direct positive impacts as these assets will benefit from flood protection.	Potential positive impact to several roads along with Royal Troon and Prestwick Golf Clubs as these assets are likely to benefit from flood protection.

### 5.2.5.2 Sub-cell 6c3: Opportunities for integrated shoreline management

Sub-cell:	6c3
Location reference:	Troon to Ayr
Policy Unit reference:	6c3.1
<b>Opportunities for integrated shoreline management</b>	<p>There is a single policy unit within sub-cell 6c3, which has the policy <b>hold the line</b>. Scottish Water assets are at risk along this section of shoreline so there is scope for integrated working between South Ayrshire Council, private landowners and Scottish Water. Feasibility studies should be carried out at sub-cell scale and implementation of shoreline management within the sub-cell should be well planned and timed to minimise cumulative or in-combination environmental impacts.</p>

### 5.2.6 Sub-cell 6c4: Ayr - Dunure

Sub-cell 6c4 includes policy units 6c4.1 and 6c4.2.

#### 5.2.6.1 Policy unit 6c4.1: Ayr to Grenan Castle

Sub-cell: 6c4  
 Location reference: Ayr to Grenan Castle  
 Policy Unit reference: 6c4.1

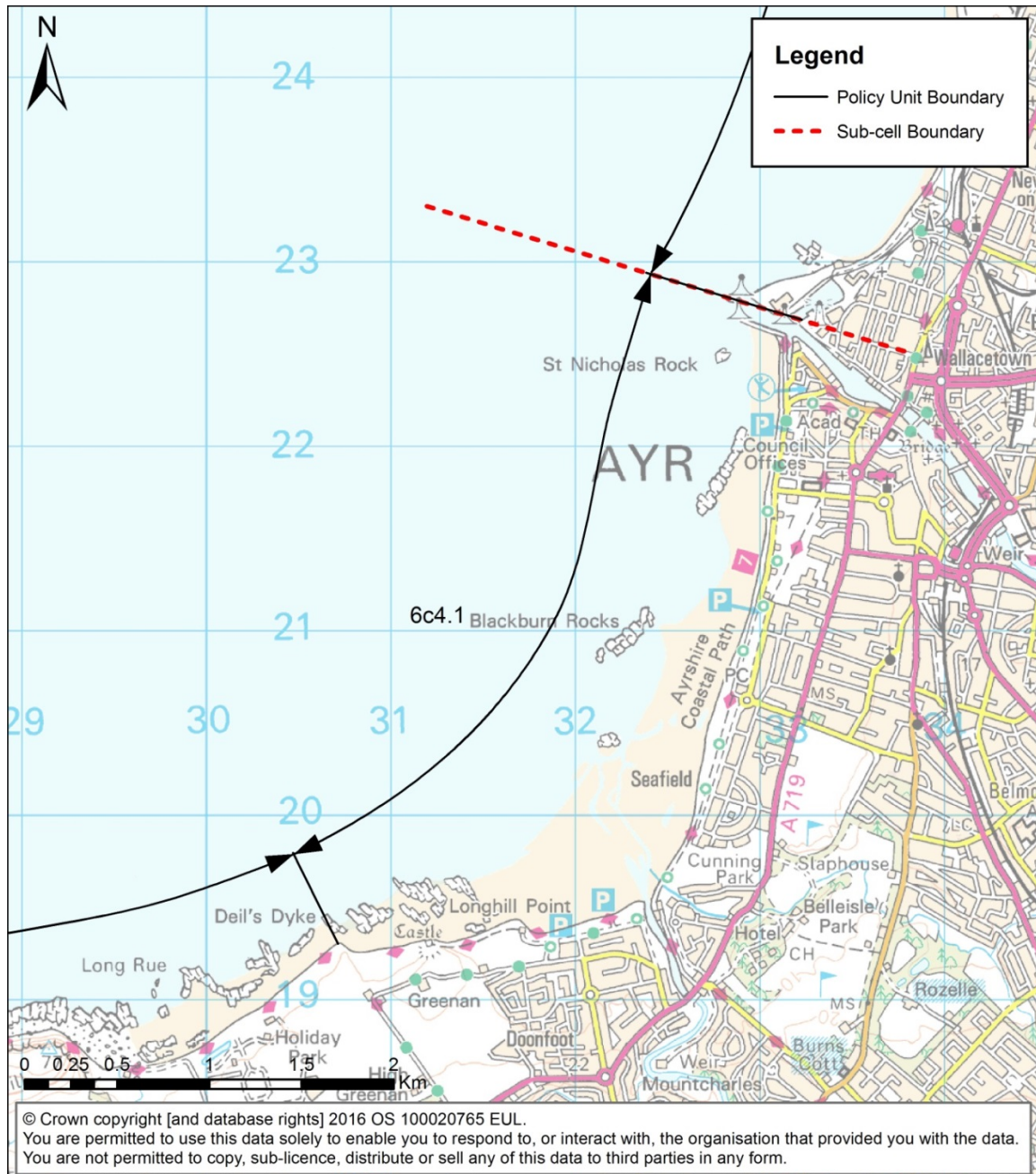


Figure 5.11 Policy Unit 6c4.1

<b>Sub-cell:</b> 6c4	
<b>Location reference:</b> Ayr to Grenan Castle	
<b>Policy Unit reference:</b> 6c4.1	
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. A significant number of residential and non-residential properties are predicted to be at risk due to coastal flooding at Ayr, Seafield and Doonfoot. The promenade to the south of Ayr is known to be at risk due to wave overtopping. The South Pier at Ayr is important for maintaining the viability of the port at Ayr and is also contributing to the retention of sand on the south beach. The Plan for this Policy Unit is to defend assets from coastal flooding, manage the wave overtopping risk and maintain the South Pier. Management measures may include soft engineering measures to enhance the natural sand deposition and provide enhanced protection, particularly towards the less developed southern end of this policy unit.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> - Significant coastal defences are already present in this policy unit. These will need to be extended and/or improved in the short term to protect properties currently at risk due to coastal flooding. The wave overtopping risk should be assessed through a detailed study. The South Pier should be maintained. The impact of additional coastal defence works on the sediment regime should be carefully considered.
<b>Medium-term</b>	<b>Hold the Line</b> - A significant number of additional assets are predicted to be at risk due to coastal flooding during the climate change scenario so it is likely that new coastal defences will be required. It is likely that these defences will need to also protect against wave overtopping. The impact of these defences on the sediment regime should be carefully considered. Continual inspection and maintenance will be required and maintenance of the South Pier should be continued.
<b>Long-term</b>	<b>Hold the Line</b> - As per the medium-term policy the significant additional number of assets at risk due to coastal flooding during the climate change scenario will need to be protected. It is likely that new coastal defences will be required and these will need to protect against wave overtopping. The impact of these defences on the sediment regime should be carefully considered. Continual inspection and maintenance will be required and maintenance of the South Pier should be continued.



<b>Sub-cell:</b> 6c4					
<b>Location reference:</b> Ayr to Grenan Castle					
<b>Policy Unit reference:</b> 6c4.1					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of several listed buildings and the Ayr II Heritage Conservation Area.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road infrastructure.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc  Positive impact as a significant number of properties will benefit from flood protection.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.  Potential slight	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of several listed buildings and the Ayr II Heritage Conservation Area.  Potential for direct positive impacts as these assets will benefit from flood	Potential for temporary slight negative impacts during the construction phase due to disturbance to road infrastructure.  Potential positive impact to several roads as these assets are likely to benefit from

		positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.		protection.	flood protection.
<b>Long-term</b>	Positive impact as a significant number of properties will benefit from flood protection.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.	No significant impact on the overall landscape and seascape anticipated.	Potential slight negative impacts on the setting of several listed buildings and the Ayr II Heritage Conservation Area. Potential for direct positive impacts as these assets will benefit from flood protection.	Potential positive impact to several roads as these assets are likely to benefit from flood protection.

5.2.6.2 Policy unit 6c4.2: Grenan Castle to Dunure

Sub-cell: 6c4

Location reference: Grenan Castle to Dunure

Policy Unit reference: 6c4.2

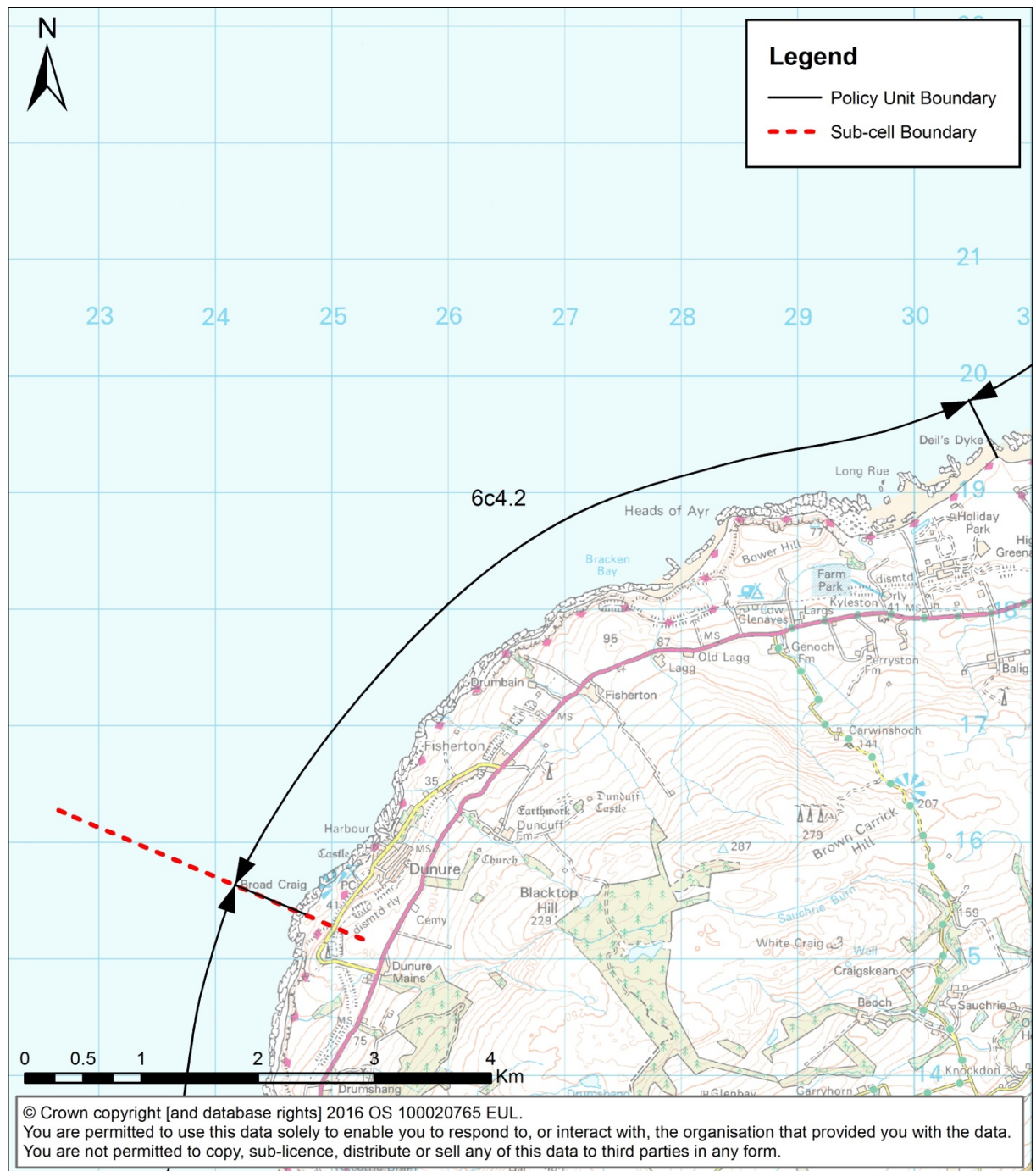


Figure 5.12 Policy Unit 6c4.2

<b>Sub-cell:</b>	<b>6c4</b>
<b>Location reference:</b>	<b>Grenan Castle to Dunure</b>
<b>Policy Unit reference:</b>	<b>6c4.2</b>
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to allow the shoreline to function naturally with no active intervention. Two non-residential properties are predicted to be at risk due to coastal flooding at Dunure. An undefended natural beach is located adjacent to Craig Tara Holiday Park, while Dunure Castle is also located along the shoreline at a natural rocky section of shoreline in this policy unit.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>No Active Intervention</b> – The short-term policy is to allow the shoreline to evolve naturally and provide the coastal defence.
<b>Medium-term</b>	<b>No Active Intervention</b> – As per the short-term policy, the medium-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. Beach lowering and dune erosion would be expected due to rising sea levels.
<b>Long-term</b>	<b>No Active Intervention</b> - As per the short and medium-term policies, the long-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. Beach lowering and dune erosion would be expected due to rising sea levels.

<b>Sub-cell: 6c4</b>					
<b>Location reference: Grenan Castle to Dunure</b>					
<b>Policy Unit reference: 6c4.2</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Slight negative impact. Two NRPs at risk in Dunure will not be protected as a result of the proposed policy. These low lying properties at Dunure Harbour may however be more resilient to coastal flood risk as are related to harbour activities.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. No construction of shoreline management measures anticipated.	Potential slight negative impacts to Dunure Castle, Dunure Harbour and the Dunure conservation area as these assets will not be protected from coastal flood risk, however these features may be more resilient to coastal flood risk.	No significant impact. No construction of shoreline management measures anticipated.
<b>Medium-term</b>	Slight negative impact. Two NRPs at risk in Dunure will not be protected as a result of the proposed policy. These low lying properties at Dunure Harbour may however be more resilient to coastal	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. No construction of shoreline management measures anticipated.	Potential slight negative impacts to Dunure Castle, Dunure Harbour and the Dunure conservation area as these assets will not be protected from coastal flood risk, however these	No significant impact. No construction of shoreline management measures anticipated.

	flood risk as are related to harbour activities.			features may be more resilient to coastal flood risk.	
<b>Long-term</b>	Slight negative impact. Two NRPs at risk in Dunure will not be protected as a result of the proposed policy. These low lying properties at Dunure Harbour may however be more resilient to coastal flood risk as are related to harbour activities.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. No construction of shoreline management measures anticipated.	Potential slight negative impacts to Dunure Castle, Dunure Harbour and the Dunure conservation area as these assets will not be protected from coastal flood risk, however these features may be more resilient to coastal flood risk.	No significant impact. No construction of shoreline management measures anticipated.

### 5.2.6.3 Sub-cell 6c4: Opportunities for integrated shoreline management

<b>Sub-cell:</b> 6c4	
<b>Location reference:</b> Ayr to Dunure	
<b>Policy Unit reference:</b> 6c4.1 – 6c4.2	
<b>Opportunities for integrated shoreline management</b>	Two different policies have been identified for the policy units within sub-cell 6c4, <b>hold the line</b> and <b>no active intervention</b> . No significant opportunities for integrated shoreline management within this sub-cell have been identified. Due to the predominant northward sediment drift the provision of enhanced coastal protection measures in policy unit 6c4.1 should not impact on the no active intervention policy for 6c4.2.

### 5.2.7 Sub-cell 6c5: Dunure - Turnberry

Sub-cell 6c5 contains a single policy unit 6c5.1.

#### 5.2.7.1 Policy unit 6c5.1: Dunure to Turnberry

Sub-cell: 6c5  
 Location reference: Dunure to Turnberry  
 Policy Unit reference: 6c5.1

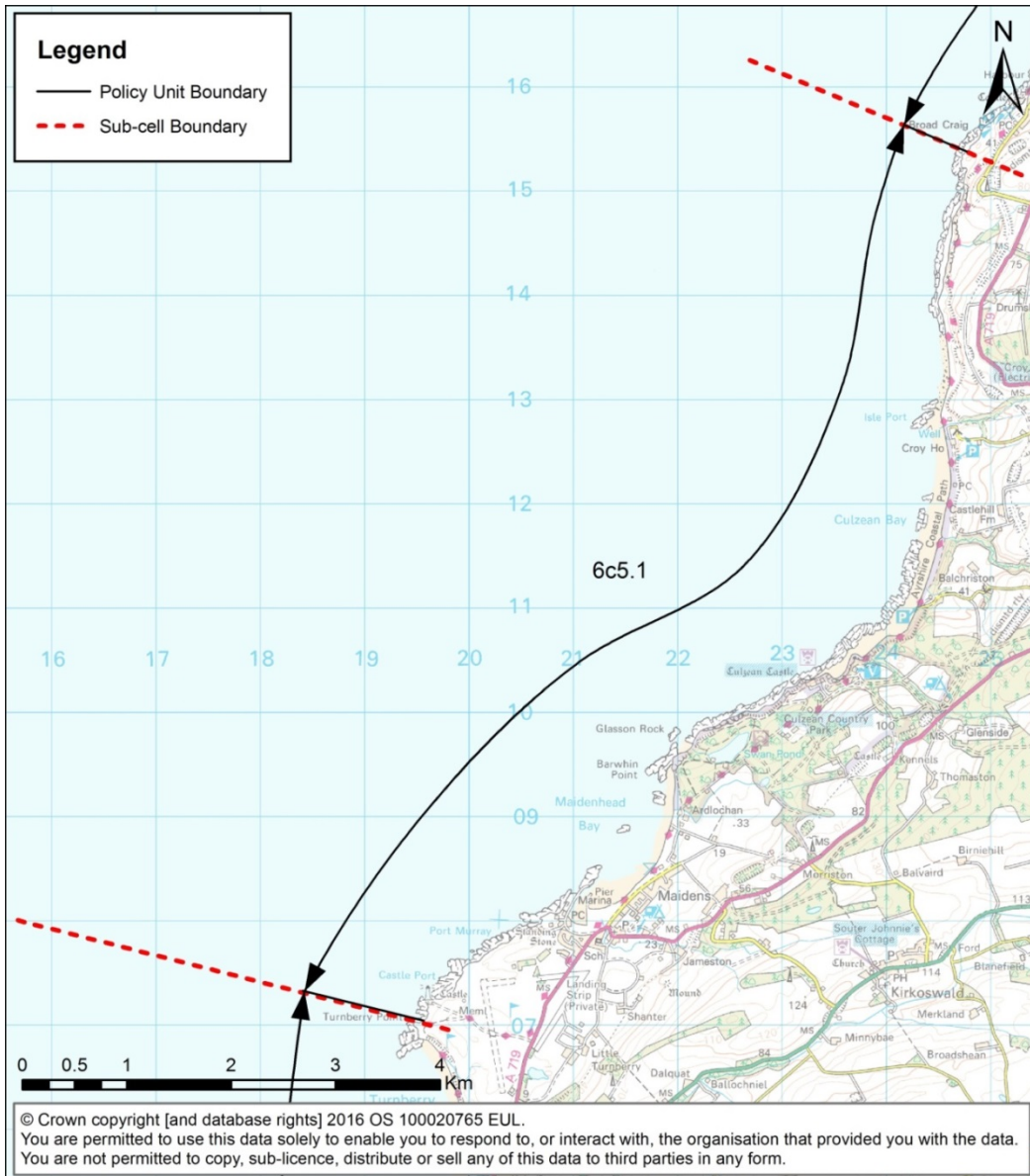


Figure 5.13 Policy Unit 6c5.1



<b>Sub-cell:</b>	<b>6c5</b>
<b>Location reference:</b>	<b>Dunure to Turnberry</b>
<b>Policy Unit reference:</b>	<b>6c5.1</b>
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to allow the shoreline to function naturally with no active intervention. One residential and two non-residential properties are predicted to be at risk due to coastal flooding at Maidenhead Bay and Turnberry Lighthouse. Turnberry Golf Course is located along an undefended section of shoreline in this policy unit that was shown to be accreting. Culzean Castle is also located along a rocky section of the shoreline in this policy unit. A number of beaches with limited rock armour reinforcement adjacent to holiday parks are present in this policy unit.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>No Active Intervention</b> - The short-term policy is to allow the shoreline to evolve naturally and provide the coastal defence.
<b>Medium-term</b>	<b>No Active Intervention</b> - As per the short-term policy, the medium-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. Beach lowering and dune erosion would be expected due to rising sea levels.
<b>Long-term</b>	<b>No Active Intervention</b> - As per the short and medium-term policies, the long-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. Beach lowering and dune erosion would be expected due to rising sea levels.

<b>Sub-cell:</b> 6c5					
<b>Location reference:</b> Dunure to Turnberry					
<b>Policy Unit reference:</b> 6c5.1					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential slight negative impacts as one RP and two NRPs will continue to be at risk of coastal flooding.	No significant impact. No potential for disturbance or displacement of local habitats or species.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. Three heritage sites (Turnberry Castle, Turnberry Lighthouse and Culzean Castle Gardens) may continue to be at risk of coastal flooding, however the risk at these sites is quite low.	Potential for slight negative impacts to a short section of road which will continue to be at risk of coastal flooding. No erosion risk to Turnberry Golf Course identified.
<b>Medium-term</b>	Potential slight negative impacts as one RP and up to five NRPs will continue to be at risk of coastal flooding due to the effects of climate change.	No significant impact. No potential for disturbance or displacement of local habitats or species.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. Three heritage sites (Turnberry Castle, Turnberry Lighthouse and Culzean Castle Gardens) may continue to be at risk of coastal flooding, however the risk at these sites is quite low.	Potential for slight negative impacts to a short section of road which will continue to be at risk of coastal flooding. No erosion risk to Turnberry Golf Course identified.

<b>Long-term</b>	Potential slight negative impacts as one RP and up to five NRPs will continue to be at risk of coastal flooding due to the effects of climate change.	No significant impact. No potential for disturbance or displacement of local habitats or species.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. Three heritage sites (Turnberry Castle, Turnberry Lighthouse and Culzean Castle Gardens) may continue to be at risk of coastal flooding, however the risk at these sites is quite low.	Potential for slight negative impacts to a short section of road which will continue to be at risk of coastal flooding. No erosion risk to Turnberry Golf Course identified.
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### 5.2.7.2 Sub-cell 6c5: Opportunities for integrated shoreline management

<b>Sub-cell:</b>	6c5
<b>Location reference:</b>	Dunure to Turnberry
<b>Policy Unit reference:</b>	6c5.1
<b>Opportunities for integrated shoreline management</b>	There is a single policy unit within sub-cell 6c5, which has the policy <b>no active intervention</b> . No significant opportunities for integrated shoreline management within this sub-cell have been identified.

### 5.2.8 Sub-cell 6c6: Turnberry – Bennane Head

Sub-cell 6c6 includes policy units 6c6.1, 6c6.2 and 6c6.3.

#### 5.2.8.1 Policy unit 6c6.1: Turnberry to North Girvan

Sub-cell: 6c6

Location reference: Turnberry to North Girvan

Policy Unit reference: 6c6.1

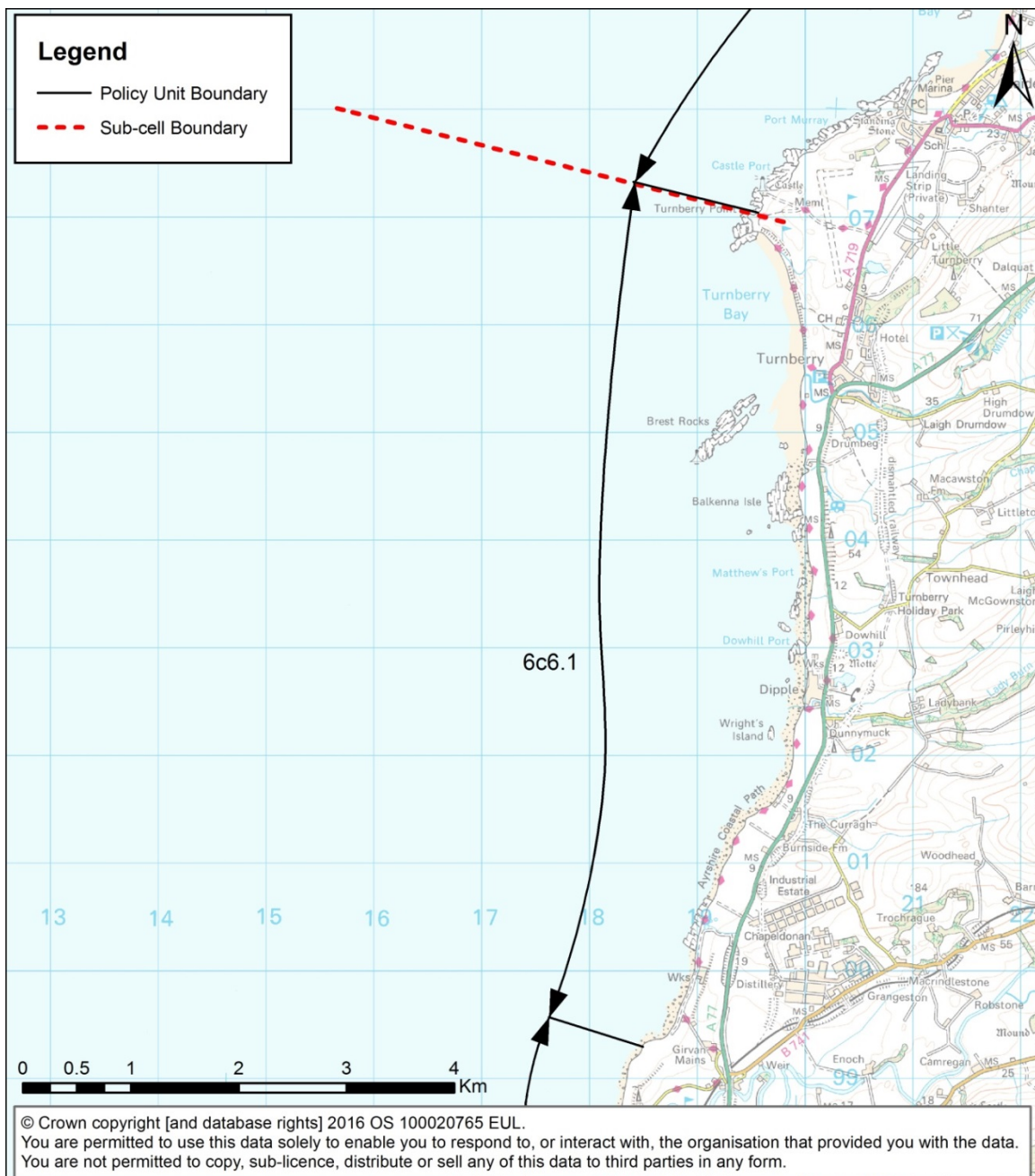


Figure 5.14 Policy Unit 6c6.1

<b>Sub-cell:</b>	6c6
<b>Location reference:</b>	Turnberry to North Girvan
<b>Policy Unit reference:</b>	6c6.1
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to allow the shoreline to function naturally with no active intervention. One residential property is predicted to be at risk due to coastal flooding at Dipple. A section of Turnberry Golf Course is located in this policy unit. This section of Turnberry golf course is defended by natural dunes that were shown to be stable.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>No Active Intervention</b> - The short-term policy is to allow the shoreline to evolve naturally and provide the coastal defence.
<b>Medium-term</b>	<b>No Active Intervention</b> - As per the short-term policy, the medium-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. Beach lowering and dune erosion would be expected due to rising sea levels.
<b>Long-term</b>	<b>No Active Intervention</b> - As per the short and medium-term policies, the long-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. Beach lowering and dune erosion would be expected due to rising sea levels.

<b>Sub-cell:</b> 6c6					
<b>Location reference:</b> Turnberry to North Girvan					
<b>Policy Unit reference:</b> 6c6.1					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential slight negative impacts as one RP will continue to be at risk of coastal flooding.	No significant impact. No potential for disturbance or displacement of local habitats or species.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. No known heritage features at risk of coastal flooding or erosion.	Potential for slight negative impacts to a short section of the A77 road which will continue to be at risk of coastal flooding. No erosion risk to Turnberry Golf course identified.
<b>Medium-term</b>	Potential slight negative impacts as up to two RPs will be at risk of coastal flooding due to the effects of climate change.	No significant impact. No potential for disturbance or displacement of local habitats or species.	No significant impact. No construction of shoreline management measures anticipated.	No significant impact. No known heritage features at risk of coastal flooding or erosion.	Potential for slight negative impacts to a short section of the A77 road which will continue to be at risk of coastal flooding. No erosion risk to Turnberry Golf course identified.
<b>Long-term</b>	Potential slight negative impacts as up to two RPs will continue to be at risk	No significant impact. No potential for disturbance or displacement of local	No significant impact. No construction of shoreline management	No significant impact. No known heritage features at risk of coastal flooding or	Potential for slight negative impacts to a short section of the A77 road which will

	of coastal flooding due to the effects of climate change.	habitats or species.	measures anticipated.	erosion.	continue to be at risk of coastal flooding. No erosion risk to Turnberry Golf course identified.
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5.2.8.2 Policy unit 6c6.2: Girvan

Sub-cell:	6c6
Location reference:	Girvan
Policy Unit reference:	6c6.2



Figure 5.15 Policy Unit 6c6.2

<b>Sub-cell:</b>	<b>6c6</b>
<b>Location reference:</b>	<b>Girvan</b>
<b>Policy Unit reference:</b>	<b>6c6.2</b>
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. A number of residential and non-residential properties are predicted to be at risk due to coastal flooding adjacent to the Water of Girvan. Girvan Golf Course is located in this policy unit was shown to be at risk due to coastal erosion and flooding from the Water of Girvan. Rock armour reinforcement is present along the shore at Girvan Golf Course. South Ayrshire Council reported that the harbour at Girvan regularly requires dredging due to sedimentation. The long-term implementation of the Plan in this Policy Unit will be to provide flood protection to the properties at risk and to defend Girvan Golf Course from coastal erosion.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> – This would involve maintenance of the current rock armour defence at Girvan Golf Course. Additional flood defences along the Water of Girvan may be required in order to protect properties at risk. Dredging of the harbour at Girvan should continue. Using the dredged material to nourish nearby beaches to the north should be considered as an alternative to offshore disposal.
<b>Medium-term</b>	<b>Hold the Line</b> – Coastal defences at Girvan Golf Course are likely to require upgrading in the medium to long-term in order to defend against coastal erosion. Flood defences protecting properties along the Water of Girvan may need to be extended or upgraded due to sea level rise. Sedimentation of the harbour should continue to be monitored and dredged when required.
<b>Long-term</b>	<b>Hold the Line</b> - Coastal defences at Girvan Golf Course are likely to require upgrading in the medium to long-term in order to defend against coastal erosion. Flood defences protecting properties along the Water of Girvan may need to be extended or upgraded due to sea level rise. Sedimentation of the harbour should continue to be monitored and dredged when required.

<b>Sub-cell:</b> 6c6					
<b>Location reference:</b> Girvan					
<b>Policy Unit reference:</b> 6c6.2					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to a European site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	No significant impact anticipated to known heritage features.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road infrastructure. Potential positive impact managing erosion at Girvan Golf Course.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.  Significant positive impact as a number of properties will benefit from flood protection.	Potential moderate negative impacts to a European site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.  Potential slight	Potential for slight negative impacts on local views due to the extension of defences.	No significant impact anticipated to known heritage features.	Potential positive impact to several roads and Girvan Golf Course as these assets are likely to benefit from flood protection.

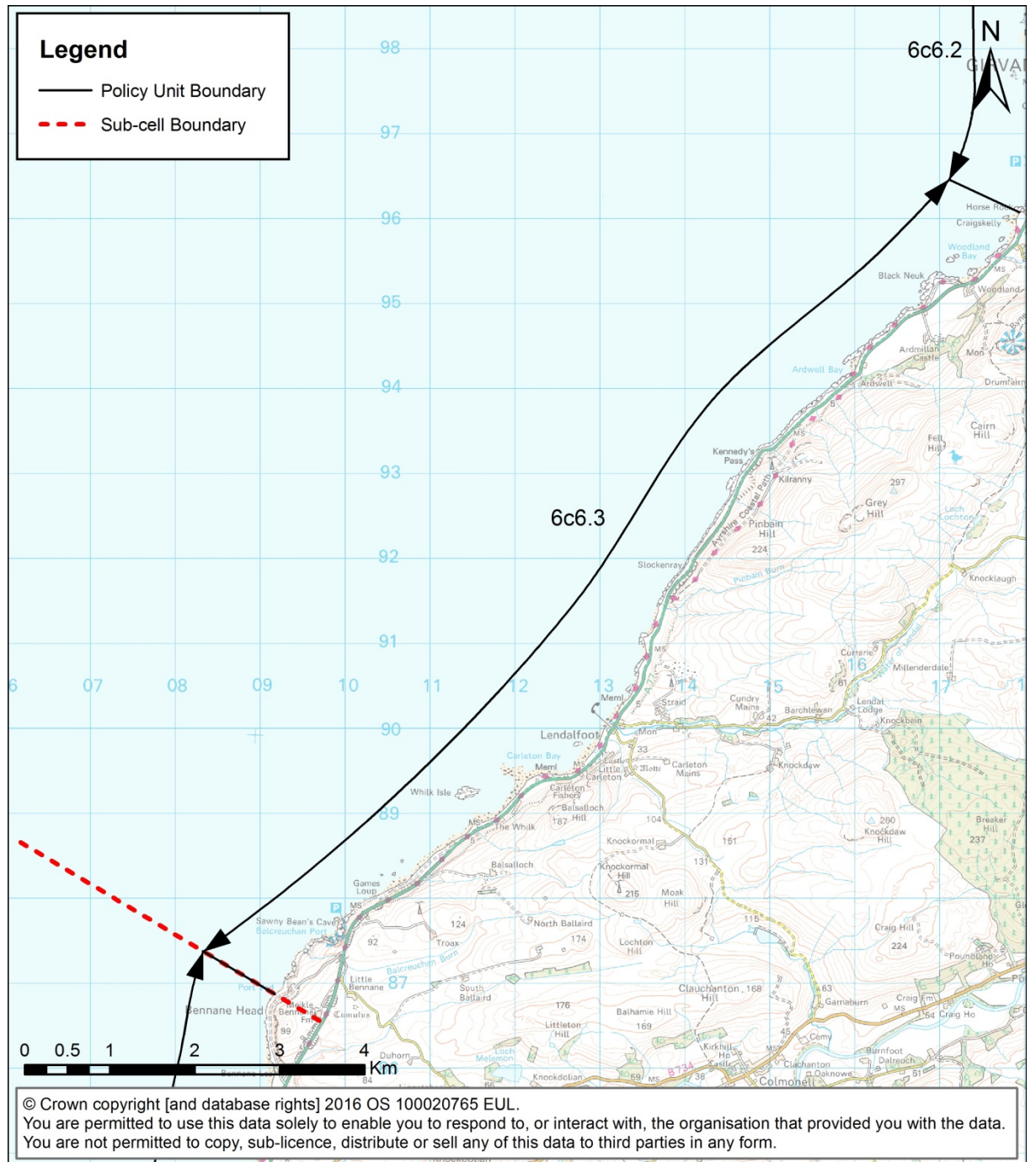
		positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.			
<b>Long-term</b>	Significant positive impact as a number of properties will benefit from flood protection.	Potential moderate negative impacts to a European site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.	Potential for slight negative impacts on local views due to the extension of defences.	No significant impact anticipated to known heritage features.	Potential positive impact to several roads and Girvan Golf Course as these assets are likely to benefit from flood protection.

**5.2.8.3 Policy unit 6c6.3: South Girvan to Bennane Head**

Sub-cell: 6c6

Location reference: South Girvan to Bennane Head

Policy Unit reference: 6c6.3



**Figure 5.16 Policy Unit 6c6.3**

<b>Sub-cell:</b>	6c6
<b>Location reference:</b>	South Girvan to Bennane Head
<b>Policy Unit reference:</b>	6c6.3
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. The A77 is a significant transport link and is predicted to be at risk due to both coastal flooding and coastal erosion in this policy unit. The Plan in this policy unit is to maintain this transport link.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> - Significant coastal defences including rock armour revetments are already present in this policy unit. The existing defences should be maintained and additional defences may be required.
<b>Medium-term</b>	<b>Hold the Line/ Managed Realignment</b> – The existing defences should be maintained to protect the A77 road against coastal flooding and erosion if feasible. Additional defences may be required to provide sufficient protection in the medium to long-term due to sea level rise. Consideration should also be given to the alternative of diverting the road and undertaking a managed realignment of the coast if holding the existing line is overly onerous in the medium to long-term.
<b>Long-term</b>	<b>Hold the Line/ Managed Realignment</b> – The existing defences should be maintained to protect the A77 road against coastal flooding and erosion if feasible. Additional defences may be required to provide sufficient protection in the medium to long-term due to sea level rise. Consideration should also be given to the alternative of diverting the road and undertaking a managed realignment of the coast if holding the existing line is overly onerous in the medium to long-term.

<b>Sub-cell:</b> 6c6					
<b>Location reference:</b> South Girvan to Bennane Head					
<b>Policy Unit reference:</b> 6c6.3					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	No significant impact. No properties identified at coastal flood or erosion risk.	Potential moderate negative impacts to a European site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	No significant impact anticipated to known heritage features.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road infrastructure.
<b>Medium-term</b>	Potential positive impact to one NRP identified to be at coastal flood risk due to climate change which may benefit from flood protection.	Potential moderate negative impacts to a European site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.  Potential slight positive impacts on	Potential for slight negative impacts on local views due to the extension of defences and/or Managed Realignment.	Potential for direct positive impacts to a listed building at Woodland from holding the line in this area as this asset will benefit from flood protection. However if the policy of Managed Realignment is taken forward this building may be at risk due to	Potential positive impact to the A77 road as this asset will benefit from flood and erosion protection.

		local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.		coastal erosion, leading to slight negative impacts.	
<b>Long-term</b>	Potential positive impact to one NRP identified to be at coastal flood risk due to climate change which may benefit from flood protection.	Potential moderate negative impacts to a European site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.	Potential for slight negative impacts on local views due to the extension of defences and/or Managed Realignment.	Potential for direct positive impacts to a listed building at Woodland from holding the line in this area as this asset will benefit from flood protection. However if the policy of Managed Realignment is taken forward this building may be at risk due to coastal erosion, leading to slight negative impacts.	Potential positive impact to the A77 road as this asset will benefit from flood and erosion protection.



#### 5.2.8.4 Sub-cell 6c6: Opportunities for integrated shoreline management

Sub-cell:	6c6
Location reference:	Turnberry to Bennane Head
Policy Unit reference:	6c6.1 – 6c6.3
<b>Opportunities for integrated shoreline management</b>	<p>Two different policies have been identified for the policy units within sub-cell 6c6, <b>hold the line</b> and <b>no active intervention</b>. There are a range of asset owners within this sub-cell including South Ayrshire Council, Transport Scotland and Girvan Golf Course. Significant advantages are likely to be achieved by adopting an integrated approach to implementing shoreline management policy within this sub-cell. Feasibility studies should be carried out at sub-cell scale in order to obtain a holistic view and ensure any impacts on the sediment budget are identified and mitigated where possible. Implementation of shoreline management within the sub-cell should be well planned and timed to minimise cumulative or in-combination environmental impacts.</p>

### 5.2.9 Sub-cell 6d1: Bennane Head – Currarie Port

Sub-cell 6d1 includes policy units 6d1.1 and 6d1.2.

#### 5.2.9.1 Policy unit 6d1.1: Bennane Head to Ballantrae

Sub-cell:	6d1
Location reference:	Bennane Head to Ballantrae
Policy Unit reference:	6d1.1

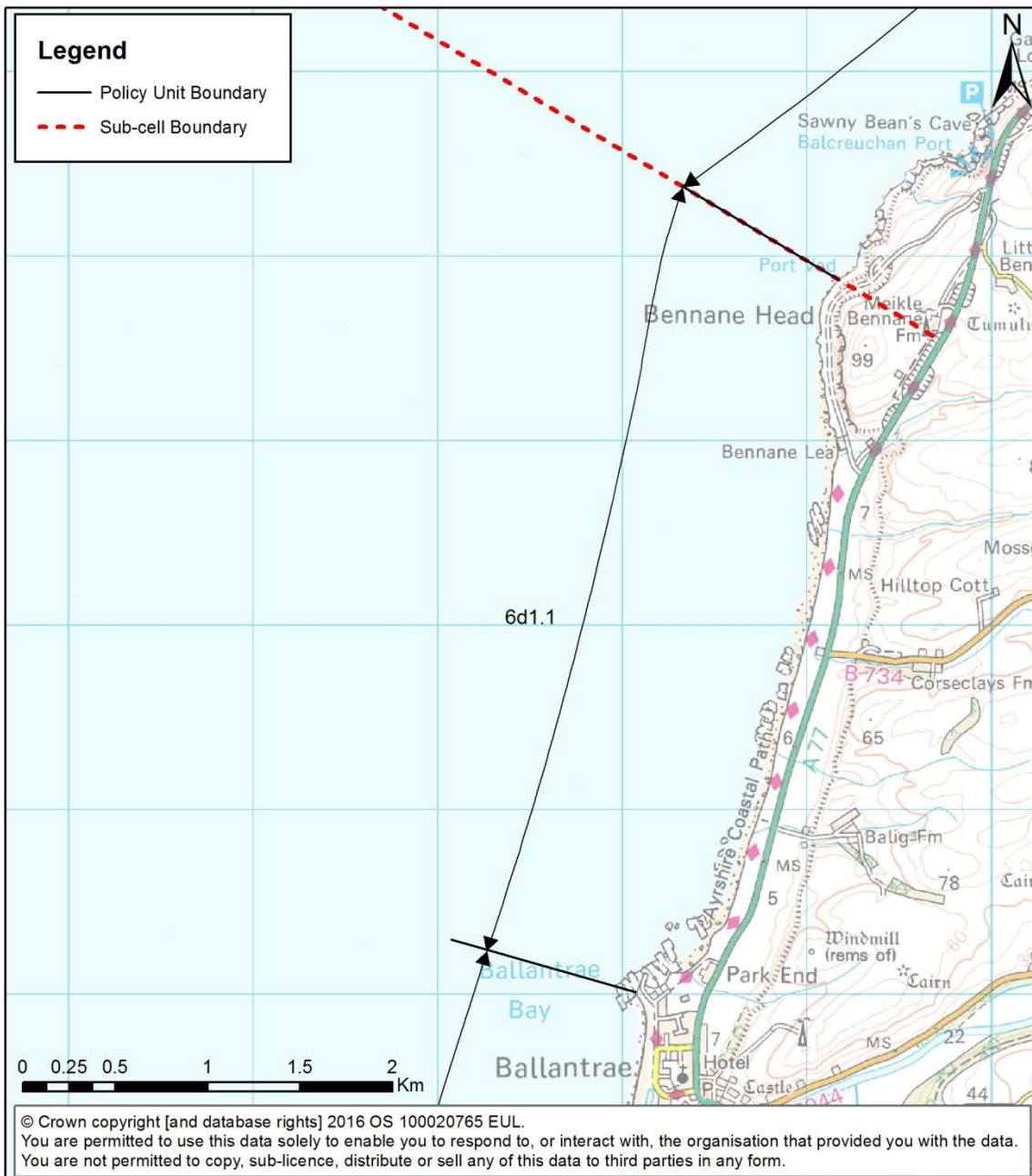


Figure 5.17 Policy Unit 6d1.1

<b>Sub-cell:</b> 6d1	
<b>Location reference:</b> Bennane Head to Ballantrae	
<b>Policy Unit reference:</b> 6d1.1	
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. The A77 is a significant transport link and is predicted to be at risk due to coastal flooding and erosion in this policy unit. The Plan in this policy unit is to maintain this transport link.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> – The shoreline along the A77 is mostly undefended and will require coastal defences to manage the risk due to flooding and erosion.
<b>Medium-term</b>	<b>Hold the Line/ Managed Realignment</b> - Additional defences may be required to provide sufficient protection to the A77 in the medium to long-term due to sea level rise. Consideration should also be given to the alternative of diverting the road and undertaking a managed realignment of the coast if holding the existing line is overly onerous in the medium to long-term.
<b>Long-term</b>	<b>Hold the Line/ Managed Realignment</b> - Additional defences may be required to provide sufficient protection to the A77 in the medium to long-term due to sea level rise. Consideration should also be given to the alternative of diverting the road and undertaking a managed realignment of the coast if holding the existing line is overly onerous in the medium to long-term.

<b>Sub-cell: 6d1</b>					
<b>Location reference: Bennane Head to Ballantrae</b>					
<b>Policy Unit reference: 6d1.1</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to a European site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of the Ballantrae Conservation Area.	Potential for temporary slight negative impacts during the construction phase due to disturbance to road infrastructure.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to a European site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.	No significant impact on the overall landscape and seascape anticipated.	Potential positive impact to Ballantrae Conservation Area near Park End as this asset may benefit from erosion protection.	Potential positive impact to the A77 road as this asset will benefit from flood and erosion protection.
<b>Long-term</b>	Potential for temporary negative	Potential moderate negative impacts to a	No significant impact on the overall	Potential positive impact to Ballantrae	Potential positive impact to the A77

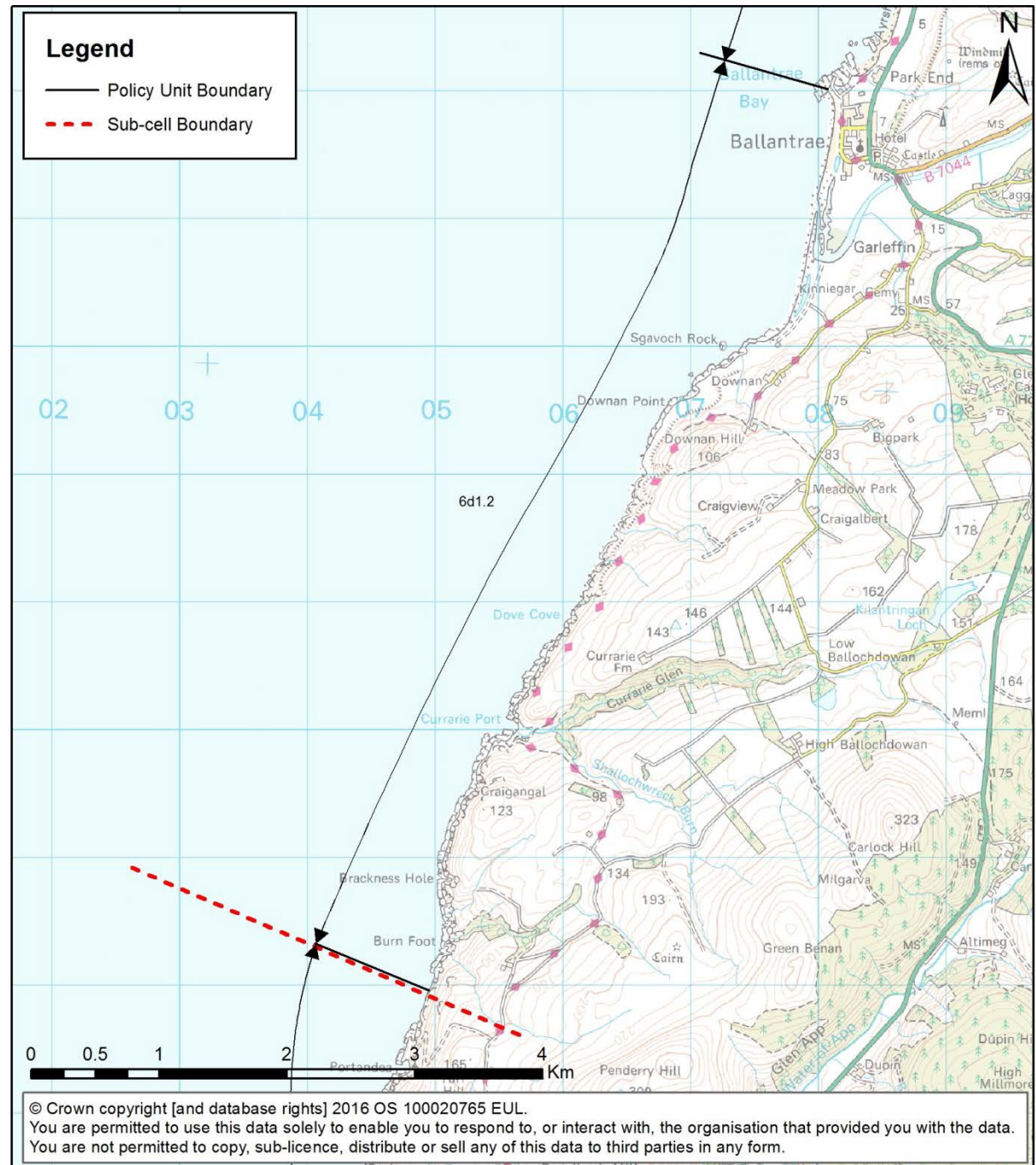
	impacts during construction phase due to noise, vibration, traffic etc.	European site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.	landscape and seascape anticipated.	Conservation Area near Park End as this asset may benefit from erosion protection.	road as this asset will benefit from flood and erosion protection.
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**5.2.9.2 Policy unit 6d1.2: Ballantrae to Currarie Port**

Sub-cell: 6d1

Location reference: Ballantrae to Currarie Port

Policy Unit reference: 6d1.2



**Figure 5.18 Policy Unit 6d1.2**

<b>Sub-cell:</b>	6d1
<b>Location reference:</b>	Ballantrae to Currarie Port
<b>Policy Unit reference:</b>	6d1.2
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to allow the shoreline to function naturally with no active intervention. One non-residential property is predicted to be at risk due to coastal flooding at the southern extent of Ballantrae.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>No Active Intervention</b> - The short-term policy is to allow the shoreline to evolve naturally and provide the coastal defence.
<b>Medium-term</b>	<b>No Active Intervention</b> - As per the short-term policy, the medium-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on much of this policy unit is expected to be relatively minor due to the steep topography. At Ballantrae significant areas of farmland and the village are located on a low lying coastal terrace protected by the Shingle Beach the effectiveness of which may be compromised as a result of sea level rise. Consequently this should be monitored and the recommended policy reviewed as the actual impact of sea level rise becomes better understood.
<b>Long-term</b>	<b>No Active Intervention</b> - As per the short and medium-term policies, the long-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on much of this this policy unit is expected to be relatively minor due to the steep topography. At Ballantrae significant areas of farmland and the village are located on a low lying coastal terrace protected by the Shingle Beach the effectiveness of which may be compromised as a result of sea level rise. Consequently this should be monitored and the recommended policy reviewed as the actual impact of sea level rise becomes better understood.

<b>Sub-cell:</b> 6d1					
<b>Location reference:</b> Ballantrae to Currarie Port					
<b>Policy Unit reference:</b> 6d1.2					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Slight negative impact as one NRP will not benefit from flood protection.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.
<b>Medium-term</b>	Slight negative impact as one NRP will not benefit from flood protection.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	Potential for slight negative impact to a short section of road at risk of coastal flooding due to the effects of climate change.
<b>Long-term</b>	Slight negative impact as one NRP will not benefit from flood protection.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	Potential for slight negative impacts to a short section of road at risk of coastal flooding due to the effects of climate change.



### 5.2.9.3 Sub-cell 6d1: Opportunities for integrated shoreline management

Sub-cell:	6d1
Location reference:	Bennane Head to Currarie Port
Policy Unit reference:	6d1.1 – 6d1.2
<b>Opportunities for integrated shoreline management</b>	Two different policies have been identified for the policy units within sub-cell 6d1, <b>hold the line</b> and <b>no active intervention</b> . No significant opportunities for integrated shoreline management within this sub-cell have been identified.

### 5.2.10 Sub-cell 6d2: Currarie Port – Milleur Point

Sub-cell 6d2 contains a single policy unit 6d2.1.

#### 5.2.10.1 Policy unit 6d2.1: Currarie Port to Galloway Burn

Sub-cell: 6d2

Location reference: Currarie Port to Galloway Burn

Policy Unit reference: 6d2.1

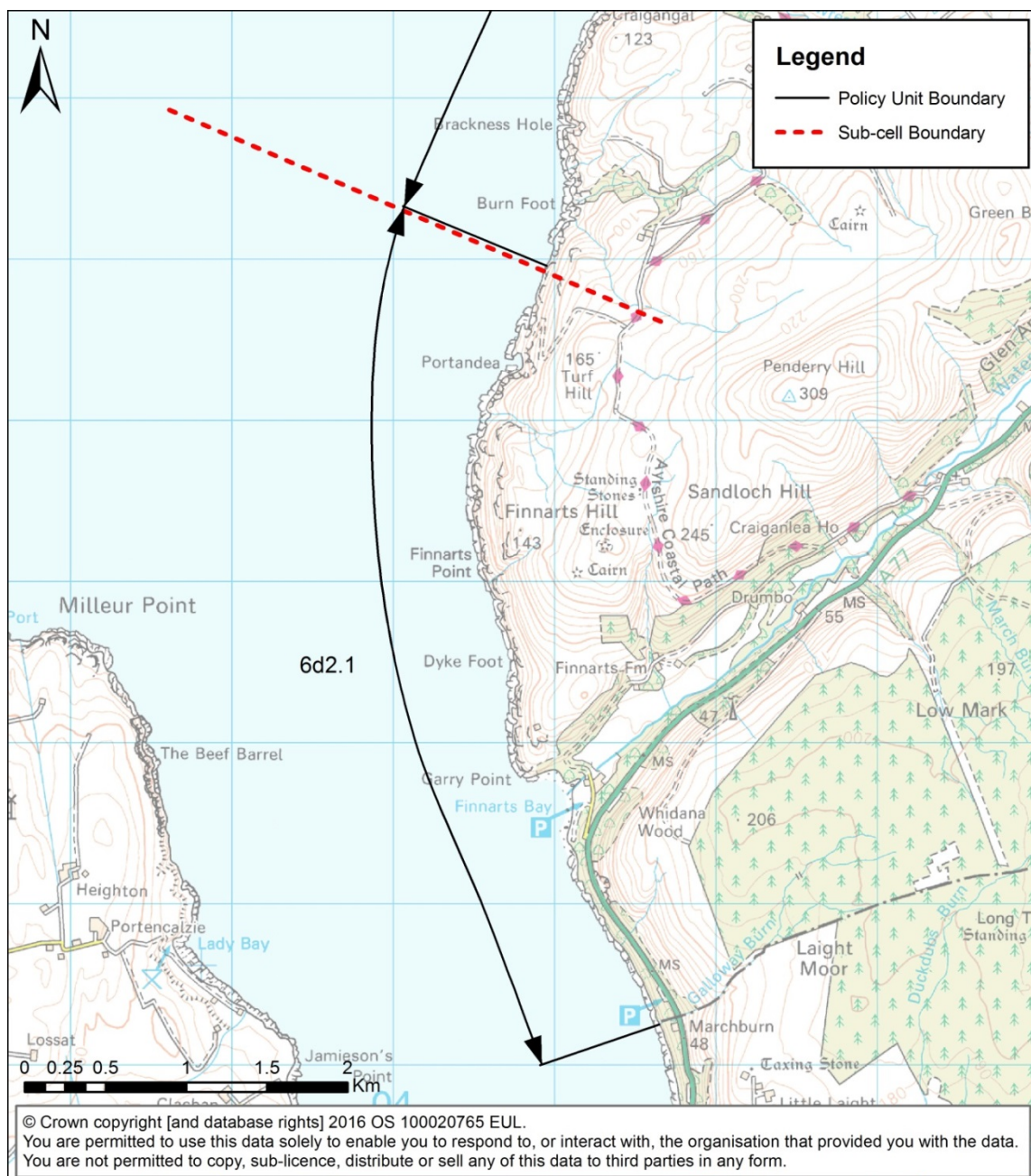


Figure 5.19 Policy Unit 6d2.1

<b>Sub-cell:</b>	6d2
<b>Location reference:</b>	Currarie Port to Galloway Burn
<b>Policy Unit reference:</b>	6d2.1
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to allow the shoreline to function naturally with no active intervention. One presently abandoned non-residential property is predicted to be at risk due to coastal flooding at Finnarts Bay.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>No Active Intervention</b> - The short-term policy is to allow the shoreline to evolve naturally and provide the coastal defence.
<b>Medium-term</b>	<b>No Active Intervention</b> - As per the short-term policy, the medium-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on this policy unit is expected to be relatively minor due to the steep topography.
<b>Long-term</b>	<b>No Active Intervention</b> - As per the short and medium-term policies, the long-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on this policy unit is expected to be relatively minor due to the steep topography.

<b>Sub-cell:</b> 6d2					
<b>Location reference:</b> Currarie Port to Galloway Burn					
<b>Policy Unit reference:</b> 6d2.1					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	No significant impact. One abandoned NRP will continue to be at risk due to coastal flooding.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No heritage features were identified to be at risk due to coastal flooding or erosion.	No significant impact. No infrastructure assets identified to be at risk of coastal flooding or erosion and no construction of shoreline management measures is anticipated.
<b>Medium-term</b>	No significant impact. One abandoned NRP will continue to be at risk due to coastal flooding.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No heritage features were identified to be at risk due to coastal flooding or erosion.	No significant impact. No infrastructure assets identified to be at risk of coastal flooding or erosion and no construction of shoreline management measures is anticipated.
<b>Long-term</b>	No significant impact. One abandoned NRP	No significant impact. No construction of	No significant impact. No construction of	No significant impact. No heritage features	No significant impact. No infrastructure

	will continue to be at risk due to coastal flooding.	shoreline management measures is anticipated.	shoreline management measures is anticipated.	were identified to be at risk due to coastal flooding or erosion.	assets identified to be at risk of coastal flooding or erosion and no construction of shoreline management measures is anticipated.
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### 5.2.10.2 Sub-cell 6d2: Opportunities for integrated shoreline management

<b>Sub-cell:</b>	6d2
<b>Location reference:</b>	Currarie Port to Galloway Burn
<b>Policy Unit reference:</b>	6d2.1
<b>Opportunities for integrated shoreline management</b>	There is a single policy unit within sub-cell 6d2, which has the policy <b>no active intervention</b> . No significant opportunities for integrated shoreline management within this sub-cell have been identified.

### 5.2.11 Sub-cell A1: Lochranza – Clauchlands Point

Sub-cell A1 includes policy units A1.1, A1.2, A1.3, A1.4 and A1.5.

#### 5.2.11.1 Policy unit A1.1: Lochranza

Sub-cell: A1

Location reference: Lochranza

Policy Unit reference: A1.1



Figure 5.20 Policy Unit A1.1

<b>Sub-cell:</b> A1	
<b>Location reference:</b> Lochranza	
<b>Policy Unit reference:</b> A1.1	
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. A number of residential and non-residential properties adjacent to the Newton Road are shown to have a medium likelihood of coastal flooding by the SEPA flood maps. The A841 and Lochranza Golf Club are also predicted to be at risk due to coastal flooding. North Ayrshire Council indicated there is also fluvial and pluvial flood risk within this policy unit. The Plan in this policy unit is to provide flood protection to the assets at risk and this will likely consist of constructing new flood defences.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> – An integrated flood study considering all sources of flooding in this policy unit is recommended in the short-term. The existing coastal defences in this policy unit, listed in section 3.12, may need to be extended and/or improved and new defences may need to be constructed in the short-term to protect properties currently at risk of flooding.
<b>Medium-term</b>	<b>Hold the Line</b> – This policy will provide flood protection to assets at risk. Additional flood defences may be required in the medium to long-term in order to provide a sufficient level of protection due to the effect of sea level rise.
<b>Long-term</b>	<b>Hold the Line</b> – This policy will provide flood protection to assets at risk. Additional flood defences may be required in the medium to long-term in order to provide a sufficient level of protection due to the effect of sea level rise.



<b>Sub-cell: A1</b>					
<b>Location reference: Lochranza</b>					
<b>Policy Unit reference: A1.1</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of heritage features including Lochranza Castle.	Potential for temporary slight negative impacts during the construction phase due to disturbance to the A841 road.  Potential positive impact to Lochranza Golf Club managing flood risk.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.  Potential positive impact as a number of properties will benefit from flood protection.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.  Potential slight positive impacts on	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of heritage features including Lochranza Castle.  Potential positive impact to heritage features including Lochranza Castle as these assets may benefit from flood	Potential for temporary slight negative impacts during the construction phase due to disturbance to the A841 road.  Potential positive impact to the A841 road and Lochranza Golf Club as these assets are likely to benefit from flood

		local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.		protection.	protection.
<b>Long-term</b>	Potential positive impact as a number of properties will benefit from flood protection.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.	No significant impact on the overall landscape and seascape anticipated.	Potential positive impact to heritage features including Lochranza Castle as these assets may benefit from flood protection.	Potential positive impact to the A841 road and Lochranza Golf Club as these assets are likely to benefit from flood protection.

5.2.11.2 Policy unit A1.2: Lochranza to Sannox

Sub-cell: A1

Location reference: Lochranza to Sannox

Policy Unit reference: A1.2

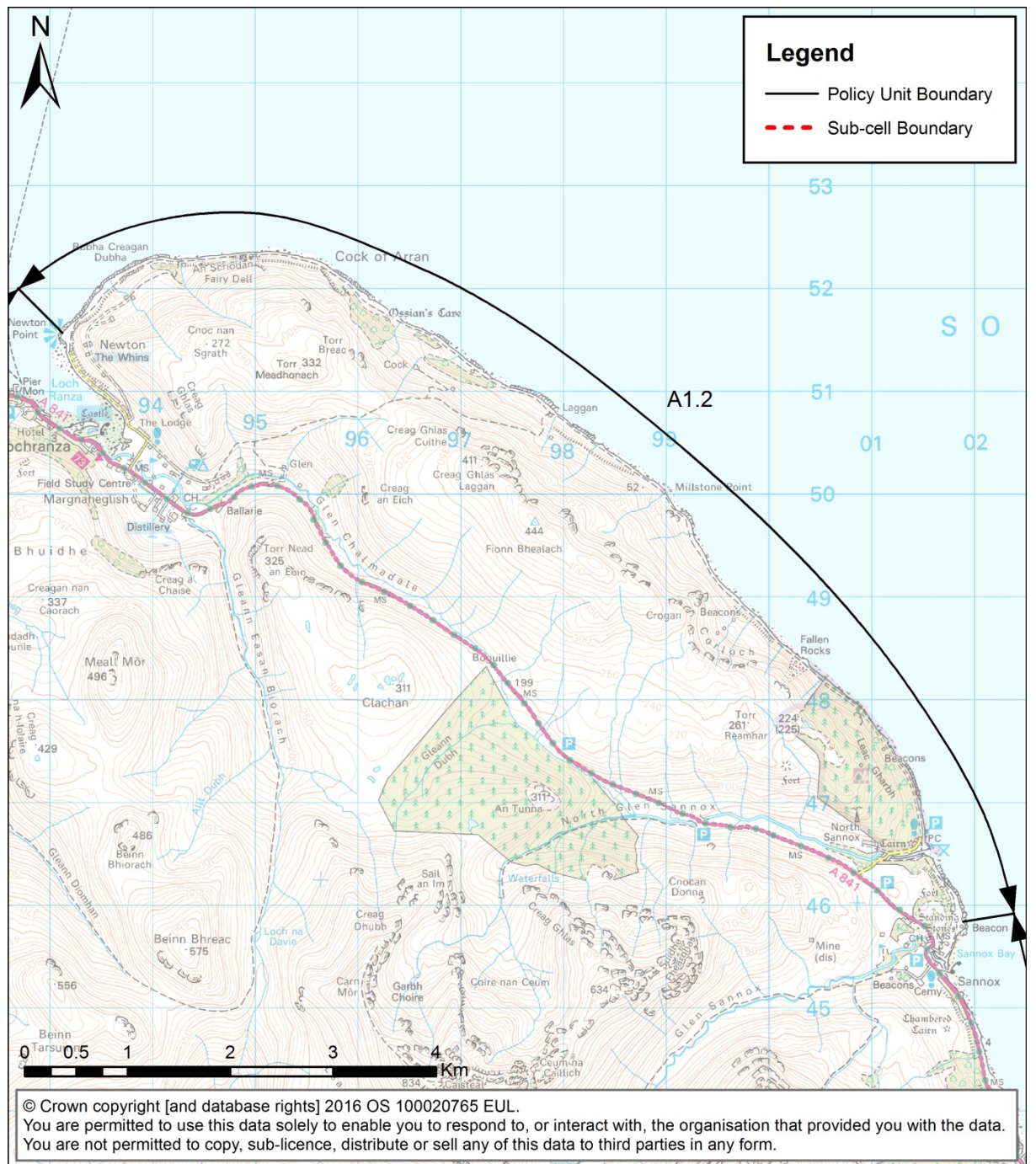


Figure 5.21 Policy Unit A1.2

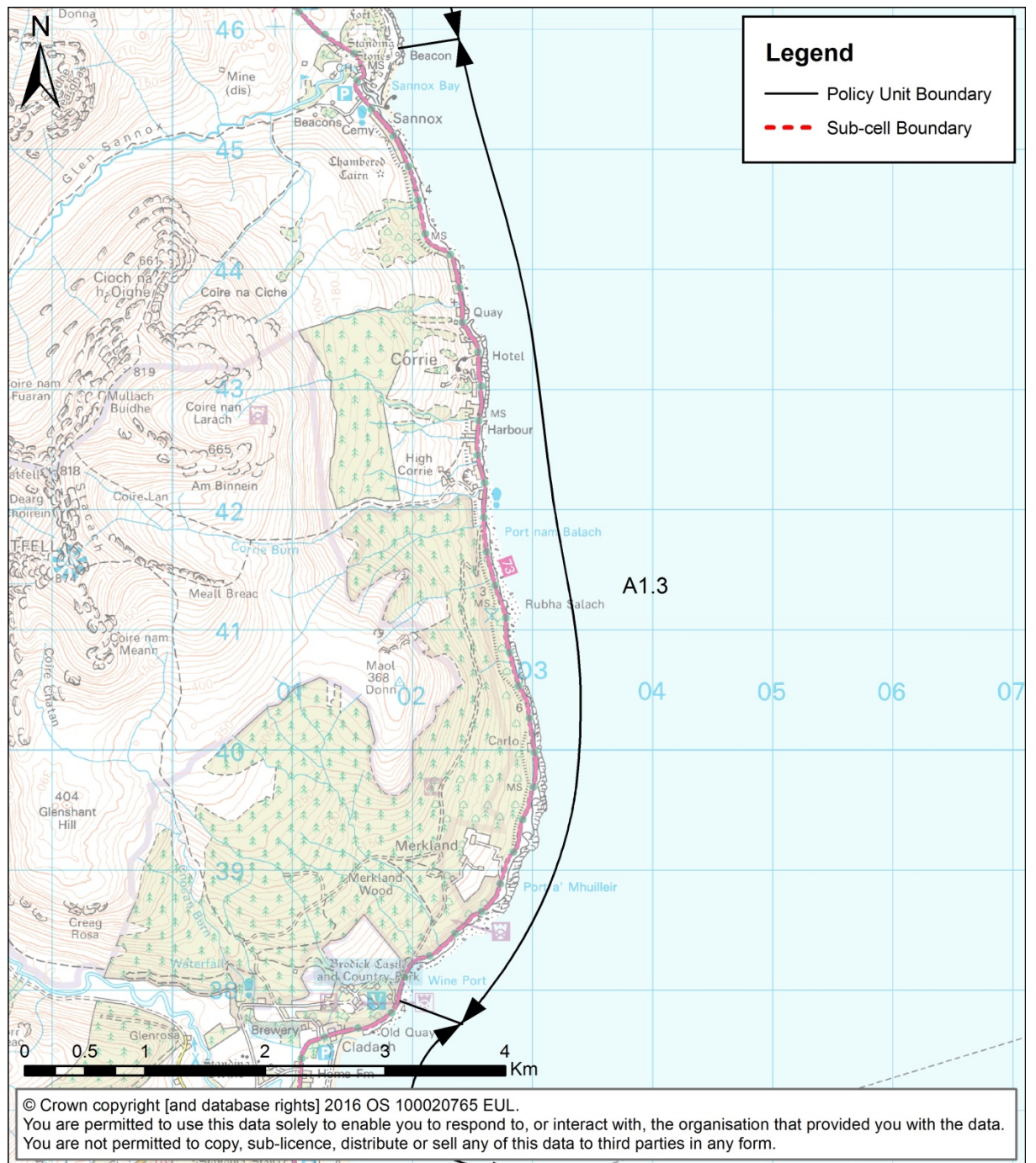
<b>Sub-cell:</b>	A1
<b>Location reference:</b>	Lochranza to Sannox
<b>Policy Unit reference:</b>	A1.2
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to allow the shoreline to function naturally with no active intervention. No assets have been identified to be at risk of coastal flooding or erosion in this policy unit.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>No Active Intervention</b> - The short-term policy is to allow the shoreline to evolve naturally and provide the coastal defence.
<b>Medium-term</b>	<b>No Active Intervention</b> - As per the short-term policy, the medium-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on this policy unit is expected to be relatively minor due to the steep topography.
<b>Long-term</b>	<b>No Active Intervention</b> - As per the short and medium-term policies, the long-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on this policy unit is expected to be relatively minor due to the steep topography.

<b>Sub-cell:</b> A1					
<b>Location reference:</b> Lochranza to Sannox					
<b>Policy Unit A1.2</b>					
<b>reference:</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	No significant impact. No properties are predicted to be at risk and no construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	Potential slight negative impact as two scheduled monuments at risk of coastal flooding will not be protected.	No significant impact. No infrastructure assets identified to be at risk of coastal flooding or erosion and no construction of shoreline management measures is anticipated.
<b>Medium-term</b>	No significant impact. No properties are predicted to be at risk and no construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	Potential slight negative impact as two scheduled monuments at risk of coastal flooding will not be protected.	No significant impact. No infrastructure assets identified to be at risk of coastal flooding or erosion and no construction of shoreline management measures is anticipated.
<b>Long-term</b>	No significant impact. No properties are	No significant impact. No construction of	No significant impact. No construction of	Potential slight negative impact as	No significant impact. No infrastructure

	<p>predicted to be at risk and no construction of shoreline management measures is anticipated.</p>	<p>shoreline management measures is anticipated.</p>	<p>shoreline management measures is anticipated.</p>	<p>two scheduled monuments at risk of coastal flooding will not be protected.</p>	<p>assets identified to be at risk of coastal flooding or erosion and no construction of shoreline management measures is anticipated.</p>
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**5.2.11.3 Policy unit A1.3: Sannox to Brodick**

**Sub-cell:** A1  
**Location reference:** Sannox to Brodick  
**Policy Unit reference:** A1.3



**Figure 5.22 Policy Unit A1.3**

<b>Sub-cell:</b>	<b>A1</b>
<b>Location reference:</b>	<b>Sannox to Brodick</b>
<b>Policy Unit reference:</b>	<b>A1.3</b>
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. Two residential properties at Sannox Bay along with isolated sections of the A841 are shown to have medium likelihood of coastal flooding by the SEPA flood maps. The Plan in this policy unit will be to protect this locally important road against flooding and erosion in the long-term.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> - Intermittent coastal defences are already present in this policy unit. These may need to be extended and new defences may be required in the short-term to protect the A841 road from coastal flooding.
<b>Medium-term</b>	<b>Hold the Line/ Managed Realignment</b> – This will include protecting the A841 from coastal flooding. Additional coastal defence works may be required in the medium to long-term due to the effect of sea level rise. This may take the form of extending the existing defences or constructing new defences. Consideration should also be given to the alternative of diverting the road and undertaking a managed realignment of the coast if holding the existing line is overly onerous in the medium to long-term.
<b>Long-term</b>	<b>Hold the Line/ Managed Realignment</b> – This will include protecting the A841 from coastal flooding. Additional coastal defence works may be required in the medium to long-term due to the effect of sea level rise. This may take the form of extending the existing defences or constructing new defences. Consideration should also be given to the alternative of diverting the road and undertaking a managed realignment of the coast if holding the existing line is overly onerous in the medium to long-term.



<b>Sub-cell: A1</b>					
<b>Location reference: Sannox to Brodick</b>					
<b>Policy Unit reference: A1.3</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of heritage features including Corrie Harbour.	Potential for temporary slight negative impacts during the construction phase due to disturbance to the A841 road.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.  Potential positive impact as a number of properties will benefit from flood protection.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.  Potential slight positive impacts on	No significant impact on the overall landscape and seascape anticipated, however there is potential for slight negative impacts from realignment of the A841 due to raising of the road if this policy is taken forward.	Potential slight negative impacts on the setting of heritage features including Corrie Harbour.  Potential positive impact to heritage features including Corrie Harbour as these assets may benefit from flood protection.	Potential for temporary slight negative impacts during the construction phase due to disturbance to the A841 road.  Potential positive impact to the A841 road as this asset is likely to benefit from flood protection.

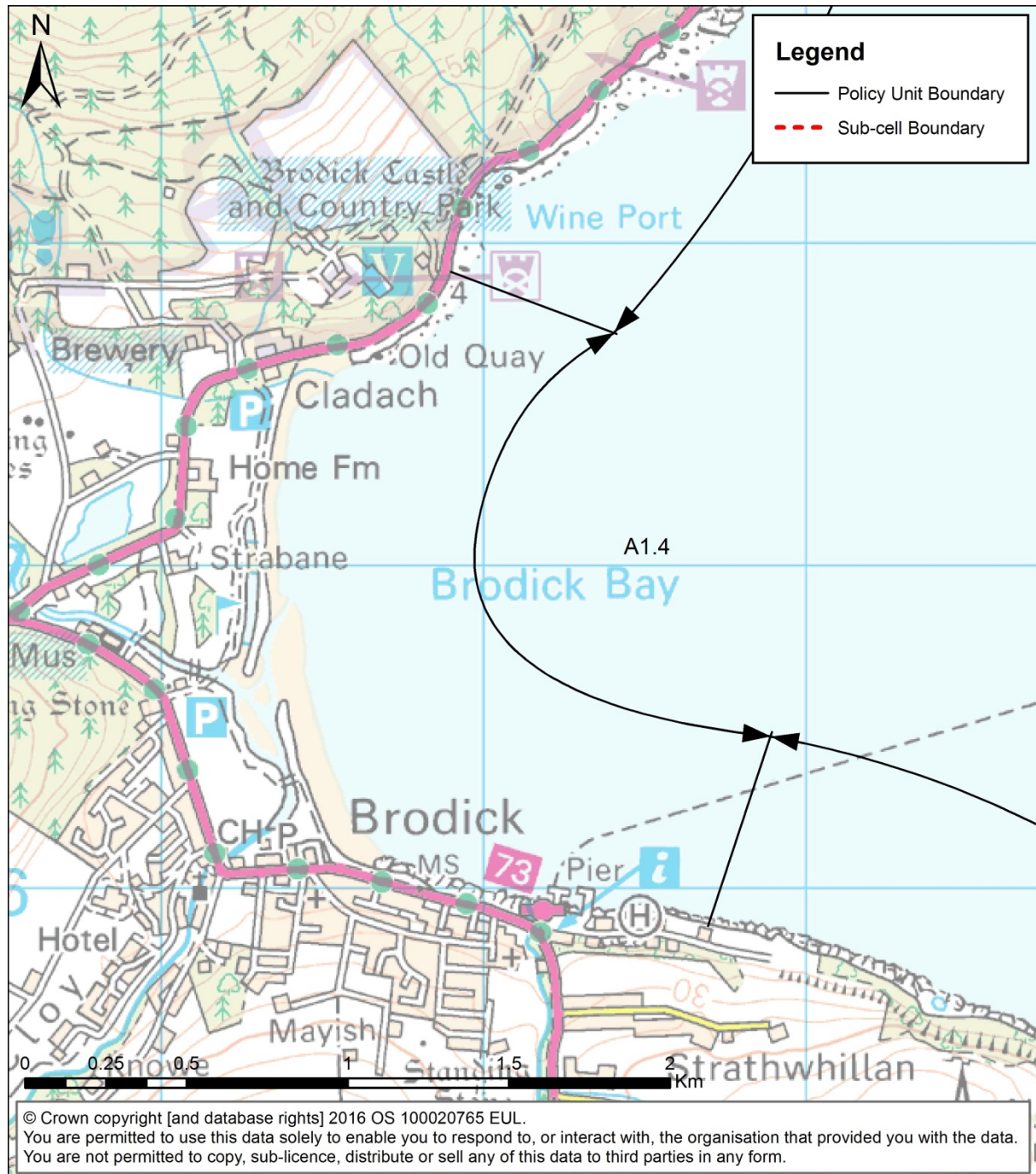
		local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.			
<b>Long-term</b>	Potential positive impact as a number of properties will benefit from flood protection.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.	No significant impact on the overall landscape and seascape anticipated, however there is potential for slight negative impacts from realignment of the A841 due to raising of the road if this policy is taken forward.	Potential positive impact to heritage features including Corrie Harbour as these assets may benefit from flood protection.	Potential positive impact to the A841 road as this asset is likely to benefit from flood protection.

**5.2.11.4 Policy unit A1.4: Brodick**

Sub-cell: A1

Location reference: Brodick

Policy Unit reference: A1.4



**Figure 5.23 Policy Unit A1.4**

<b>Sub-cell:</b>	A1
<b>Location reference:</b>	Brodick
<b>Policy Unit reference:</b>	A1.4
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. A number of residential and non-residential properties are shown to have medium likelihood of coastal flooding by the SEPA flood maps, while there is ongoing coastal erosion in the vicinity of the bowling green. The A841 road is also predicted to be at risk due to coastal flooding during a 1 in 200 year coastal flood event. A former landfill site to the south of the policy unit is predicted to be at risk of coastal erosion, while Brodick Golf Club is predicted to be at risk of both coastal flooding and erosion. The Plan in this policy unit is to provide flood and erosion protection to the assets at risk.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> – Coastal defence works including large sandbags are present in this policy unit. These were placed to protect historic landfill exposed to wave activity however they have been significantly damaged and additional defence measures are required in order to provide continuing defence against coastal flooding and erosion in the short-term. A Coast Protection Optioneering and Design Study for Brodick was undertaken by AECOM in 2015.
<b>Medium-term</b>	<b>Hold the Line</b> – Coastal defences will need to be maintained and potentially extended in this policy unit due to the effect of climate change in the medium to long-term.
<b>Long-term</b>	<b>Hold the Line</b> – Coastal defences will need to be maintained and potentially extended in this policy unit due to the effect of climate change in the medium to long-term. The landfill site may require removal in the long-term as it may be unfeasible to provide coastal protection to this site in the long-term.

<b>Sub-cell: A1</b>					
<b>Location reference: Brodick</b>					
<b>Policy Unit reference: A1.4</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential positive impact from preventing exposure of landfill.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of heritage features including Brodick Castle Gardens.	Potential for temporary slight negative impacts during the construction phase due to disturbance to the A841 road.  Potential positive impact to Brodick Golf Club managing erosion risk.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.  Potential positive impact as a number of properties will	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.  Potential slight	Potential slight negative impacts on the setting of heritage features including Brodick Castle Gardens.  Potential positive impact to heritage features including	Potential positive impact to the A841 road and Brodick Golf Club as these assets are likely to benefit from flood and erosion protection.

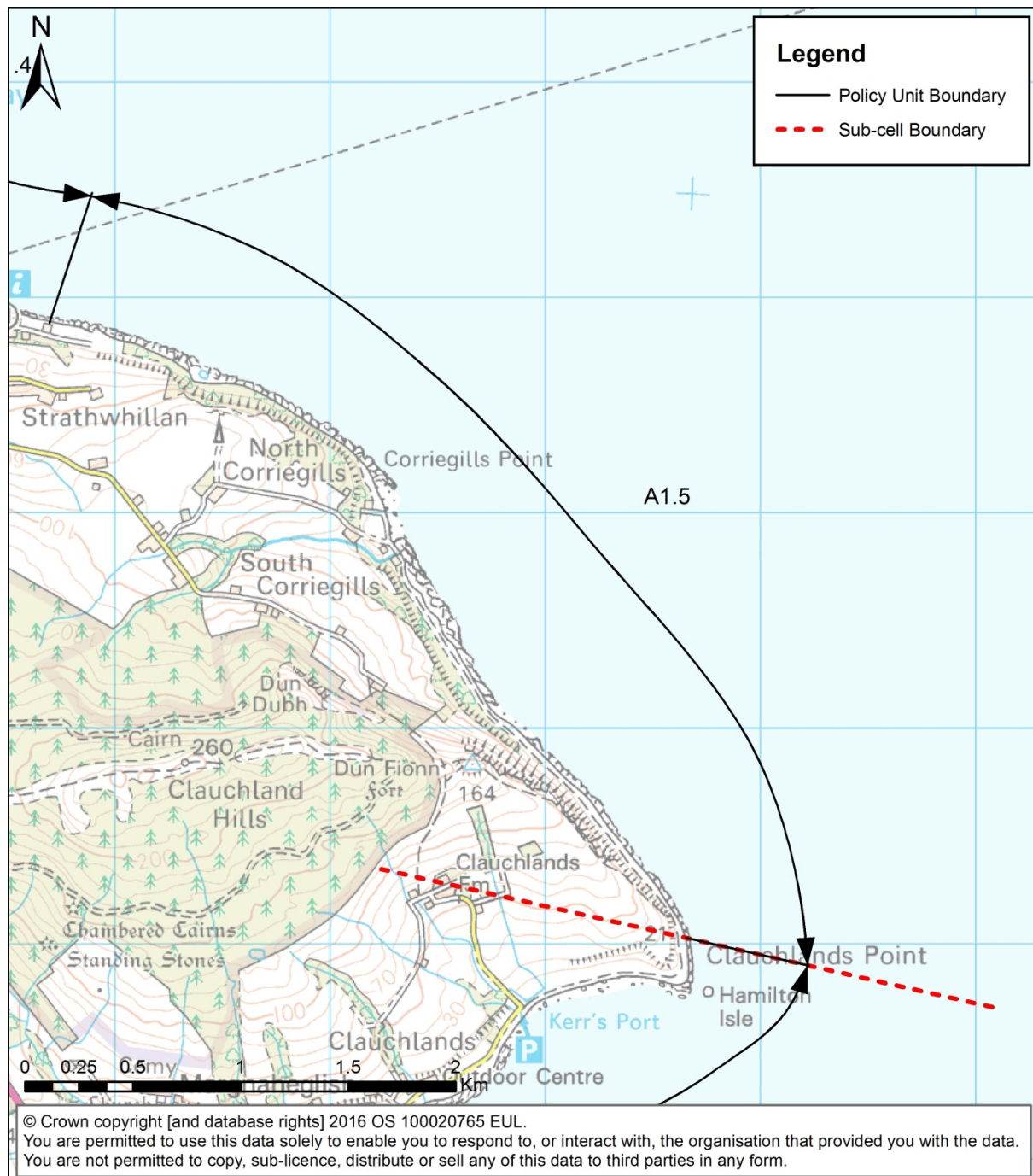
	benefit from flood protection.	defences. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated. Potential positive impact from preventing exposure of landfill.	positive impact to local views if soft engineering works are undertaken.	Brodict Castle Gardens as these assets may benefit from flood protection.	
<b>Long-term</b>	Potential positive impact as a number of properties will benefit from flood protection.	Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated. Potential positive impact preventing exposure of landfill.	No significant impact on the overall landscape and seascape anticipated. Potential slight positive impact to local views if soft engineering works are undertaken.	Potential positive impact to heritage features including Brodict Castle Gardens as these assets may benefit from flood protection.	Potential positive impact to the A841 road and Brodict Golf Club as these assets are likely to benefit from flood and erosion protection.

**5.2.11.5 Policy unit A1.5: Brodick to Clauchlands Point**

Sub-cell: A1

Location reference: Brodick to Clauchlands Point

Policy Unit reference: A1.5



**Figure 5.24 Policy Unit A1.5**

<b>Sub-cell:</b>	<b>A1</b>
<b>Location reference:</b>	<b>Brodick to Clachlands Point</b>
<b>Policy Unit reference:</b>	<b>A1.5</b>
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to allow the shoreline to function naturally with no active intervention. No assets have been identified to be at risk of coastal flooding or erosion in this policy unit.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>No Active Intervention</b> - The short-term policy is to allow the shoreline to evolve naturally and provide the coastal defence.
<b>Medium-term</b>	<b>No Active Intervention</b> - As per the short-term policy, the medium-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on this policy unit is expected to be relatively minor due to the steep topography.
<b>Long-term</b>	<b>No Active Intervention</b> - As per the short and medium-term policies, the long-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on this policy unit is expected to be relatively minor due to the steep topography.



<b>Sub-cell: A1</b>					
<b>Location reference: Brodick to Clauchlands Point</b>					
<b>Policy Unit reference: A1.5</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	No significant impact. No properties are predicted to be at risk and no construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No heritage features were identified to be at risk due to coastal flooding or erosion.	No significant impact. No infrastructure assets identified to be at risk of coastal flooding or erosion and no construction of shoreline management measures is anticipated.
<b>Medium-term</b>	No significant impact. No properties are predicted to be at risk and no construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No heritage features were identified to be at risk due to coastal flooding or erosion.	No significant impact. No infrastructure assets identified to be at risk of coastal flooding or erosion and no construction of shoreline management measures is anticipated.
<b>Long-term</b>	No significant impact. No properties are predicted to be at risk and no	No significant impact. No construction of shoreline management	No significant impact. No construction of shoreline management	No significant impact. No heritage features were identified to be at risk due to coastal	No significant impact. No infrastructure assets identified to be at risk of coastal

	<p>construction of shoreline management measures is anticipated.</p>	<p>measures is anticipated.</p>	<p>measures is anticipated.</p>	<p>flooding or erosion.</p>	<p>flooding or erosion and no construction of shoreline management measures is anticipated.</p>
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### 5.2.11.6 Sub-cell A1: Opportunities for integrated shoreline management

<b>Sub-cell:</b> A1	
<b>Location reference:</b> Lochranza to Clauchlands Point	
<b>Policy Unit reference:</b> A1.1 – A1.5	
<b>Opportunities for integrated shoreline management</b>	Two different policies have been identified for the policy units within sub-cell A1; <b>hold the line</b> and <b>no active intervention</b> . Feasibility studies should be carried out at sub-cell scale in order to obtain a holistic view and ensure any impacts on the sediment budget are identified and mitigated where possible. Implementation of shoreline management within the sub-cell should be well planned and timed to minimise cumulative or in-combination environmental impacts.

### 5.2.12 Sub-cell A2: Clauchlands Point – Kingscross Point

Sub-cell A2 includes policy units A2.1, A2.2 and A2.3.

#### 5.2.12.1 Policy unit A2.1: Clauchlands Point to Lamlash

Sub-cell:	A2
Location reference:	Clauchlands Point to Lamlash
Policy Unit reference:	A2.1



Figure 5.25 Policy Unit A2.1

<b>Sub-cell:</b>	A2
<b>Location reference:</b>	Clauchlands Point to Lamlash
<b>Policy Unit reference:</b>	A2.1
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to allow the shoreline to function naturally with no active intervention. A localised section of minor road was found to be at risk due to coastal flooding close to the Outdoor Centre.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>No Active Intervention</b> - The short-term policy is to allow the shoreline to evolve naturally and provide the coastal defence.
<b>Medium-term</b>	<b>No Active Intervention</b> - As per the short-term policy, the medium-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on this policy unit is expected to be relatively minor due to the steep topography.
<b>Long-term</b>	<b>No Active Intervention</b> - As per the short and medium-term policies, the long-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on this policy unit is expected to be relatively minor due to the steep topography.

<b>Sub-cell: A2</b>					
<b>Location reference: Clauchlands Point to Lamlash</b>					
<b>Policy Unit reference: A2.1</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	No significant impact. No properties are predicted to be at risk and no construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	Potential for slight negative impacts to a section of local road which will continue to be at risk of coastal flooding.
<b>Medium-term</b>	No significant impact. No properties are predicted to be at risk and no construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	Potential for slight negative impacts to a section of local road which will continue to be at risk of coastal flooding.
<b>Long-term</b>	No significant impact. No properties are predicted to be at risk and no	No significant impact. No construction of shoreline management	No significant impact. No construction of shoreline management	No significant impact. No construction of shoreline management	Potential for slight negative impacts to a section of local road which will continue to

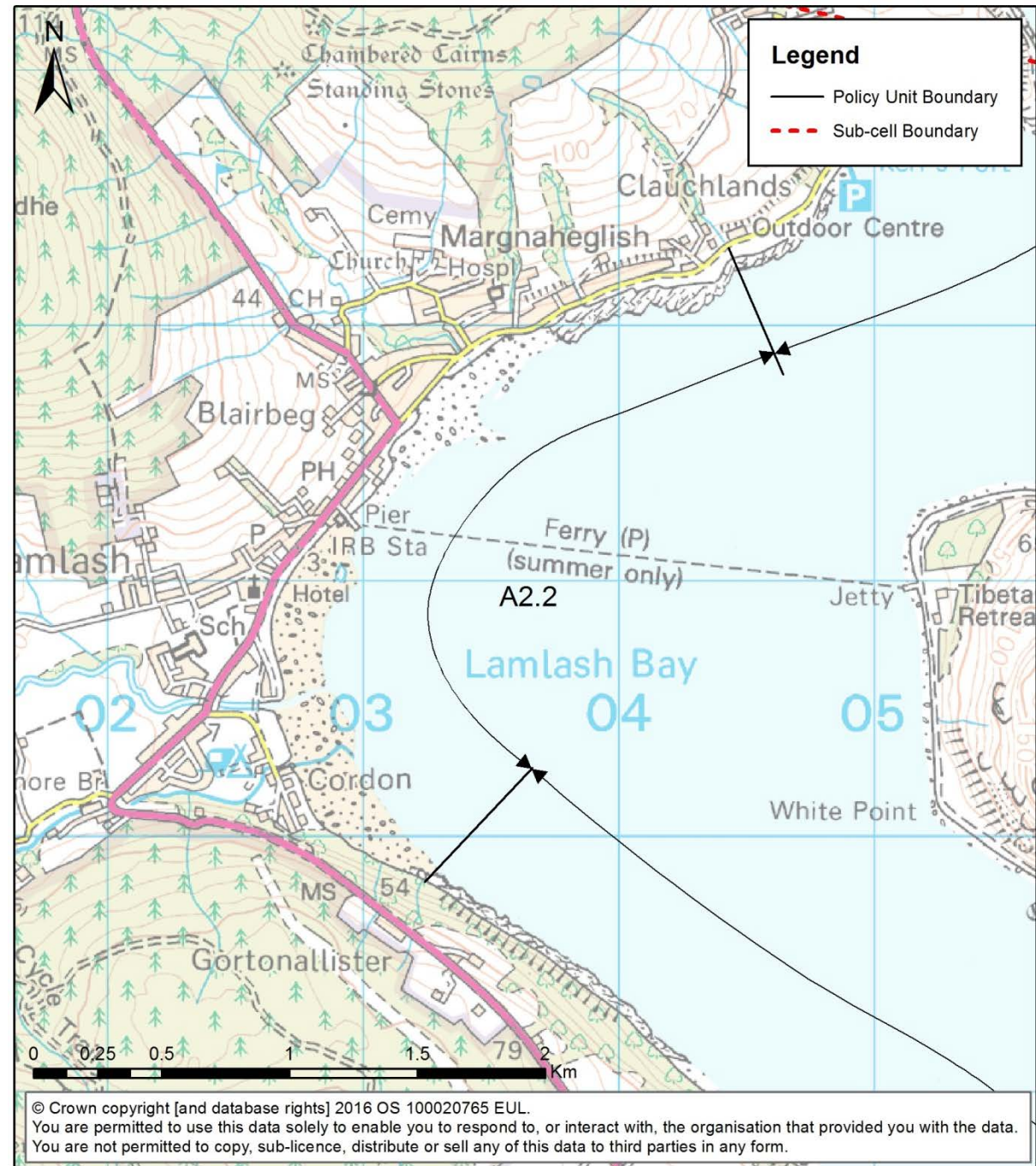
	<p>construction of shoreline management measures is anticipated.</p>	<p>measures is anticipated.</p>	<p>measures is anticipated.</p>	<p>measures is anticipated.</p>	<p>be at risk of coastal flooding.</p>
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**5.2.12.2 Policy unit A2.2: Lamlash**

Sub-cell: A2

Location reference: Lamlash

Policy Unit reference: A2.2



**Figure 5.26 Policy Unit A2.2**



<b>Sub-cell:</b>	A2
<b>Location reference:</b>	Lamlash
<b>Policy Unit reference:</b>	A2.2
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. The SEPA coastal flood maps indicate a medium likelihood of flooding for a number of residential and non-residential properties, sections of the A841 and a minor road at Cuddy Dook and adjacent to the tennis courts. Properties, a former landfill site and the minor road at Cuddy Dook are also predicted to be at risk due to coastal erosion. Scottish Water assets run along the beach and are potentially at risk from erosion. The Plan in this policy unit includes providing flood and erosion protection to the assets at risk. Scottish Water will be responsible for managing the risk to their assets.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> – Coastal defences are already present in this policy unit, however these will need extended in the short-term in order to provide sufficient flood and erosion protection. North Ayrshire Council has implemented revetment works at Lamlash Green and commissioned a flood risk assessment for this area.
<b>Medium-term</b>	<b>Hold the Line</b> – The coastal defences in this policy unit should be maintained and may need to be extended in the medium to long-term in order to provide protection to all assets at risk due to sea level rise.
<b>Long-term</b>	<b>Hold the Line</b> – The coastal defences in this policy unit should be maintained and may need to be extended in the medium to long-term in order to provide protection to all assets at risk due to sea level rise.

<b>Sub-cell:</b> A2					
<b>Location reference:</b> Lamlash					
<b>Policy Unit reference:</b> A2.2					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of heritage features including Lamlash Pier, Sea Gate and Hamilton Terrace.	Potential for temporary slight negative impacts during the construction phase due to disturbance to roads including the A841.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.  Potential positive impact as a number of properties will benefit from flood and erosion protection.	Potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential positive impact to heritage features including Lamlash Pier, Sea Gate and Hamilton Terrace as these assets may benefit from flood protection.	Potential positive impact to roads including the A841 and Scottish Water assets running along the beach as these are likely to benefit from flood and erosion protection.

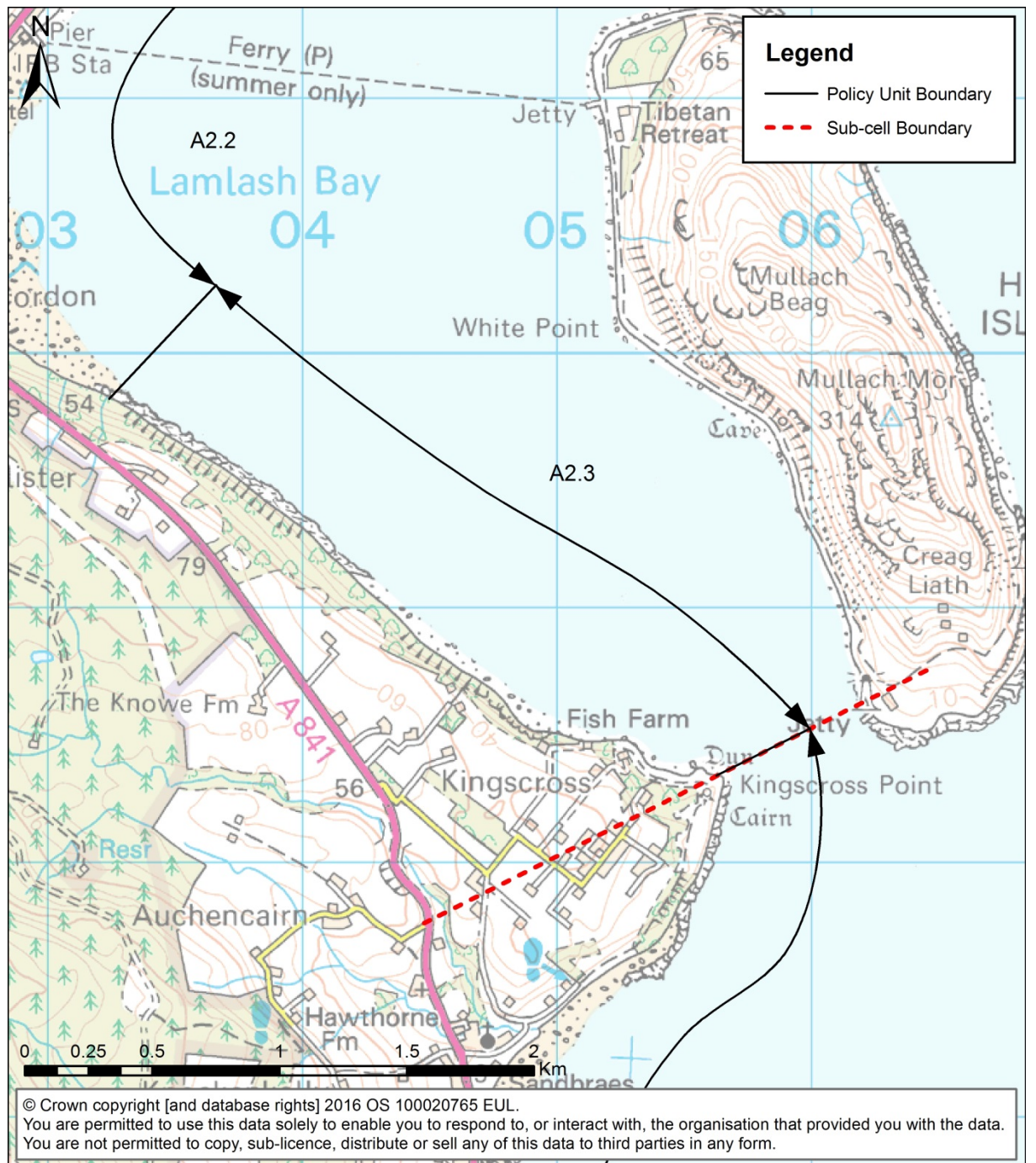
		incorporated.			
<b>Long-term</b>	Potential positive impact as a number of properties will benefit from flood and erosion protection.	Potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.	No significant impact on the overall landscape and seascape anticipated.	Potential positive impact to heritage features including Lamlash Pier, Sea Gate and Hamilton Terrace as these assets may benefit from flood protection.	Potential positive impact to roads including the A841 and Scottish Water assets running along the beach as these are likely to benefit from flood and erosion protection.

**5.2.12.3 Policy unit A2.3: Lamlash to Kingscross Point**

Sub-cell: A2

Location reference: Lamlash to Kingscross Point

Policy Unit reference: A2.3



**Figure 5.27 Policy Unit A2.3**

<b>Sub-cell:</b>	A2
<b>Location reference:</b>	Lamlash to Kingscross Point
<b>Policy Unit reference:</b>	A2.3
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to allow the shoreline to function naturally with no active intervention. No assets have been identified to be at risk of coastal flooding or erosion in this policy unit.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>No Active Intervention</b> - The short-term policy is to allow the shoreline to evolve naturally and provide the coastal defence.
<b>Medium-term</b>	<b>No Active Intervention</b> - As per the short-term policy, the medium-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on this policy unit is expected to be relatively minor due to the steep topography.
<b>Long-term</b>	<b>No Active Intervention</b> - As per the short and medium-term policies, the long-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on this policy unit is expected to be relatively minor due to the steep topography.

<b>Sub-cell: A2</b>					
<b>Location reference: Lamlash to Kingscross Point</b>					
<b>Policy Unit reference: A2.3</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	No significant impact. No properties are predicted to be at risk and no construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No infrastructure assets identified to be at risk of coastal flooding or erosion and no construction of shoreline management measures is anticipated.
<b>Medium-term</b>	No significant impact. No properties are predicted to be at risk and no construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No infrastructure assets identified to be at risk of coastal flooding or erosion and no construction of shoreline management measures is anticipated.
<b>Long-term</b>	No significant impact. No properties are predicted to be at risk and no	No significant impact. No construction of shoreline management	No significant impact. No construction of shoreline management	No significant impact. No construction of shoreline management	No significant impact. No infrastructure assets identified to be at risk of coastal

	<p>construction of shoreline management measures is anticipated.</p>	<p>measures is anticipated.</p>	<p>measures is anticipated.</p>	<p>measures is anticipated.</p>	<p>flooding or erosion and no construction of shoreline management measures is anticipated.</p>
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#### 5.2.12.4 Sub-cell A2: Opportunities for integrated shoreline management

<b>Sub-cell:</b> A2	
<b>Location reference:</b> Clauchlands Point to Kingscross Point	
<b>Policy Unit reference:</b> A2.1 – A2.3	
<b>Opportunities for integrated shoreline management</b>	Two different policies have been identified for the policy units within sub-cell A2; <b>hold the line</b> and <b>no active intervention</b> . Scottish Water assets are potentially at risk along this section of shoreline so there is scope for integrated working between North Ayrshire Council and Scottish Water. Feasibility studies should be carried out at sub-cell scale and implementation of shoreline management within the sub-cell should be well planned and timed to minimise cumulative or in-combination environmental impacts.



### 5.2.13 Sub-cell A3: Kingscross Point – Drumadoon Point

Sub-cell A3 includes policy units A3.1 and A3.2.

#### 5.2.13.1 Policy unit A3.1: Whiting Bay

Sub-cell: A3

Location reference: Whiting Bay

Policy Unit reference: A3.1



**Figure 5.28 Policy Unit A3.1**

<b>Sub-cell:</b>	<b>A3</b>
<b>Location reference:</b>	<b>Whiting Bay</b>
<b>Policy Unit reference:</b>	<b>A3.1</b>
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. SEPA flood maps indicate a medium likelihood of coastal flooding for a number of residential and non-residential properties in the vicinity of Montrose Terrace. The A841 road is also at risk of coastal flooding during a 1 in 200 year coastal flood event and North Ayrshire Council has reported concern about a potential risk of wave overtopping, however this is presently unquantified as the SEPA coastal flood hazard modelling is based on still water levels and does not include wave overtopping. Drainage issues from fluvial and pluvial flooding have also been reported in this policy unit. The Plan for this policy unit will consist of defending assets from coastal flooding and carrying out a detailed investigation of the wave overtopping risk.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> - Coastal defences are already present in this policy unit. These will need to be extended in the short term to protect properties currently at risk due to coastal flooding. A wave overtopping study for this policy unit is recommended in the short-term to evaluate the risk and determine appropriate mitigation measures. Drainage from fluvial and pluvial flooding should be considered when implementing the short-term policy.
<b>Medium-term</b>	<b>Hold the Line</b> – The coastal defences may need to be extended in the medium to long-term in order to defend assets from coastal flooding due to sea level rise. Defences to provide protection from wave overtopping should be implemented based on the outcome of the wave overtopping study.
<b>Long-term</b>	<b>Hold the Line</b> – The coastal defences may need to be extended in the medium to long-term in order to defend assets from coastal flooding due to sea level rise. Defences to provide protection from wave overtopping should be implemented based on the outcome of the wave overtopping study.

<b>Sub-cell: A3</b>					
<b>Location reference: Whiting Bay</b>					
<b>Policy Unit reference: A3.1</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	No significant impact. No heritage features are known to be at risk of coastal flooding or erosion and no proposed shoreline management measures are likely to significantly impact on the setting of any known features.	Potential for temporary slight negative impacts during the construction phase due to disturbance to roads including the A841.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.  Potential positive impact as a number of properties will benefit from flood	Potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species due to habitat	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	No significant impact. No heritage features are known to be at risk of coastal flooding or erosion and no proposed shoreline management measures are likely to significantly impact on the setting of any	Potential positive impact to roads including the A841 as these assets are likely to benefit from flood protection.

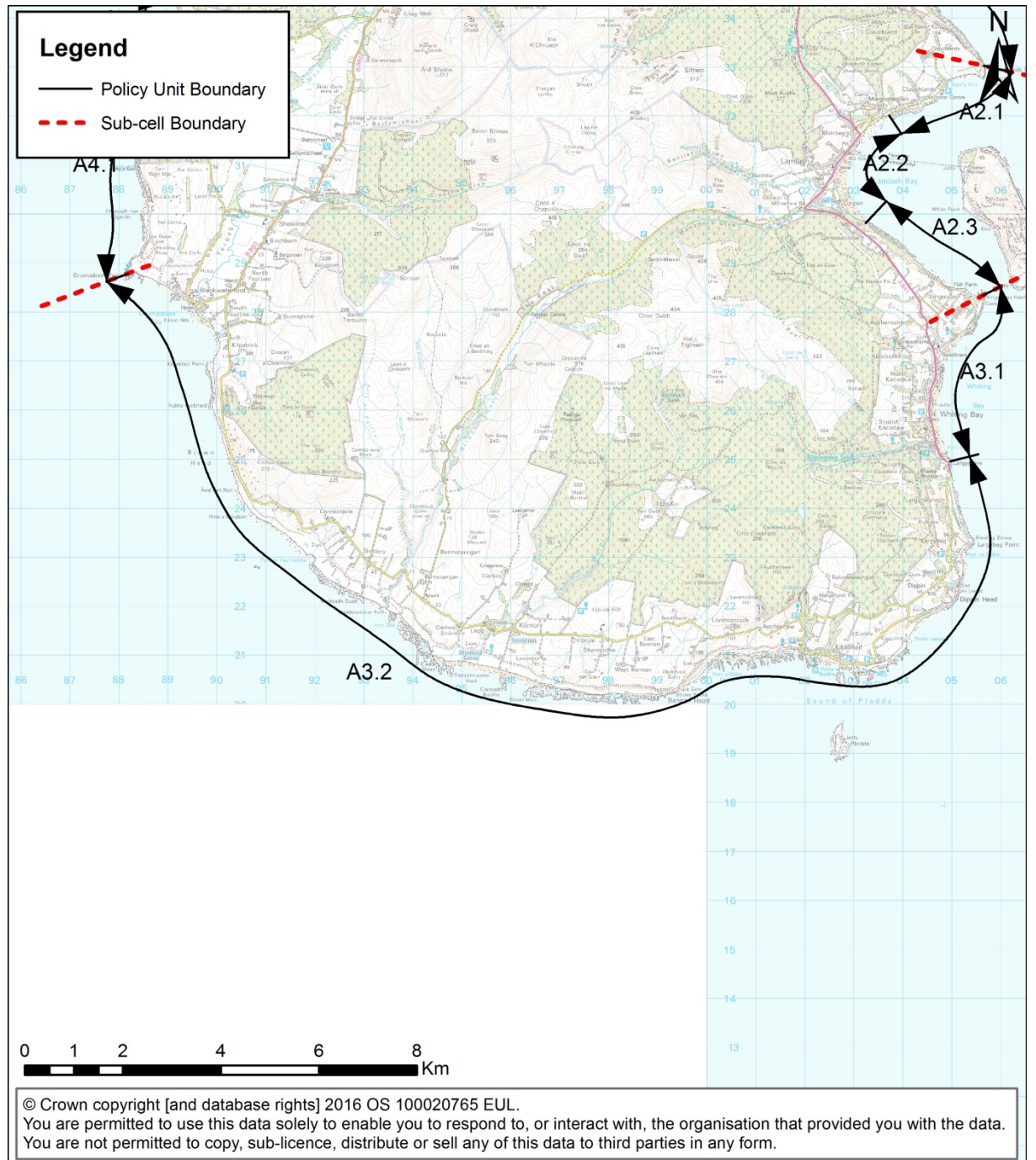
	protection.	creation if soft shoreline protection measures are incorporated.		known features.	
<b>Long-term</b>	Potential positive impact as a number of properties will benefit from flood protection.	Potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.	No significant impact on the overall landscape and seascape anticipated.	No significant impact. No heritage features are known to be at risk of coastal flooding or erosion and no proposed shoreline management measures are likely to significantly impact on the setting of any known features.	Potential positive impact to roads including the A841 as these assets are likely to benefit from flood protection.

**5.2.13.2 Policy unit A3.2: Largymore to Drumadoon Point**

**Sub-cell:** A3

**Location reference:** Largymore to Drumadoon Point

**Policy Unit reference:** A3.2



**Figure 5.29 Policy Unit A3.2**

<b>Sub-cell:</b>	<b>A3</b>
<b>Location reference:</b>	<b>Largymore to Drumadoon Point</b>
<b>Policy Unit reference:</b>	<b>A3.2</b>
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to allow the shoreline to function naturally with no active intervention. One residential property at Kildonan, localised sections of the A841 at Largymore and minor roads at Kildonan and Blackwaterfoot were found to be at risk due to coastal flooding. Part of Shiskine Golf Club is situated along the shoreline in this policy unit; however it is not predicted to be at risk.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>No Active Intervention</b> - The short-term policy is to allow the shoreline to evolve naturally and provide the coastal defence.
<b>Medium-term</b>	<b>No Active Intervention</b> - As per the short-term policy, the medium-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on this policy unit is expected to be relatively minor due to the steep topography.
<b>Long-term</b>	<b>No Active Intervention</b> - As per the short and medium-term policies, the long-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on this policy unit is expected to be relatively minor due to the steep topography.

<b>Sub-cell: A3</b>					
<b>Location reference: Largymore to Drumadoon Point</b>					
<b>Policy Unit reference: A3.2</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential slight negative impact as one RP will continue to be at risk of coastal flooding.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No heritage features are known to be at risk of coastal flooding or erosion and no shoreline management measures are proposed.	Potential for slight negative impacts to localised sections of road which will continue to be at risk of coastal flooding.
<b>Medium-term</b>	Potential slight negative impact as up to 11 RPs and one NRP will continue to be at risk of coastal flooding due to the effects of climate change.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No heritage features are known to be at risk of coastal flooding or erosion and no shoreline management measures are proposed.	Potential for slight negative impacts to localised sections of road which will continue to be at risk of coastal flooding.
<b>Long-term</b>	Potential slight negative impact as up to 11 RPs and one NRP will	No significant impact. No construction of shoreline management	No significant impact. No construction of shoreline management	No significant impact. No heritage features are known to be at risk of coastal	Potential for slight negative impacts to localised sections of road which will

	continue to be at risk of coastal flooding due to the effects of climate change.	measures is anticipated.	measures is anticipated.	flooding or erosion and no shoreline management measures are proposed.	continue to be at risk of coastal flooding.
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### 5.2.13.3 Sub-cell A3: Opportunities for integrated shoreline management

Sub-cell:	A3
Location reference:	Kingscross Point to Drumadoon Point
Policy Unit reference:	A3.1 – A3.2
<b>Opportunities for integrated shoreline management</b>	Two different policies have been identified for the policy units within sub-cell A3, <b>hold the line</b> and <b>no active intervention</b> . No significant opportunities for integrated shoreline management within this sub-cell have been identified.

### 5.2.14 Sub-cell A4: Drumadoon Point – Lochranza

Sub-cell A4 includes policy units A4.1 and A4.2.

#### 5.2.14.1 Policy unit A4.1: Drumadoon Point to Tormore

Sub-cell: A4

Location reference: Drumadoon Point to Tormore

Policy Unit reference: A4.1



Figure 5.30 Policy Unit A4.1

<b>Sub-cell:</b>	<b>A4</b>
<b>Location reference:</b>	<b>Drumadoon Point to Tormore</b>
<b>Policy Unit reference:</b>	<b>A4.1</b>
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to allow the shoreline to function naturally with no active intervention. No assets have been identified to be at risk of coastal flooding or erosion in this policy unit. Part of Shiskine Golf Club is situated along the shoreline in this policy unit; however it is not predicted to be at risk.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>No Active Intervention</b> - The short-term policy is to allow the shoreline to evolve naturally and provide the coastal defence.
<b>Medium-term</b>	<b>No Active Intervention</b> - As per the short-term policy, the medium-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on this policy unit is expected to be relatively minor due to the steep topography.
<b>Long-term</b>	<b>No Active Intervention</b> - As per the short and medium-term policies, the long-term policy is to allow the shoreline to evolve naturally and provide the coastal defence. The effect of rising sea levels on this policy unit is expected to be relatively minor due to the steep topography.

<b>Sub-cell: A4</b>					
<b>Location reference: Drumadoon Point to Tormore</b>					
<b>Policy Unit reference: A4.1</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	No significant impact. No properties are predicted to be at risk and no construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No infrastructure assets identified to be at risk of coastal flooding or erosion and no construction of shoreline management measures is anticipated.
<b>Medium-term</b>	No significant impact. No properties are predicted to be at risk and no construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No construction of shoreline management measures is anticipated.	No significant impact. No infrastructure assets identified to be at risk of coastal flooding or erosion and no construction of shoreline management measures is anticipated.
<b>Long-term</b>	No significant impact. No properties are predicted to be at risk and no	No significant impact. No construction of shoreline management	No significant impact. No construction of shoreline management	No significant impact. No construction of shoreline management	No significant impact. No infrastructure assets identified to be at risk of coastal

	<p>construction of shoreline management measures is anticipated.</p>	<p>measures is anticipated.</p>	<p>measures is anticipated.</p>	<p>measures is anticipated.</p>	<p>flooding or erosion and no construction of shoreline management measures is anticipated.</p>
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5.2.14.2 Policy unit A4.2: Machrie Bay to Lochranza

Sub-cell: A4

Location reference: Machrie Bay to Lochranza

Policy Unit reference: A4.2

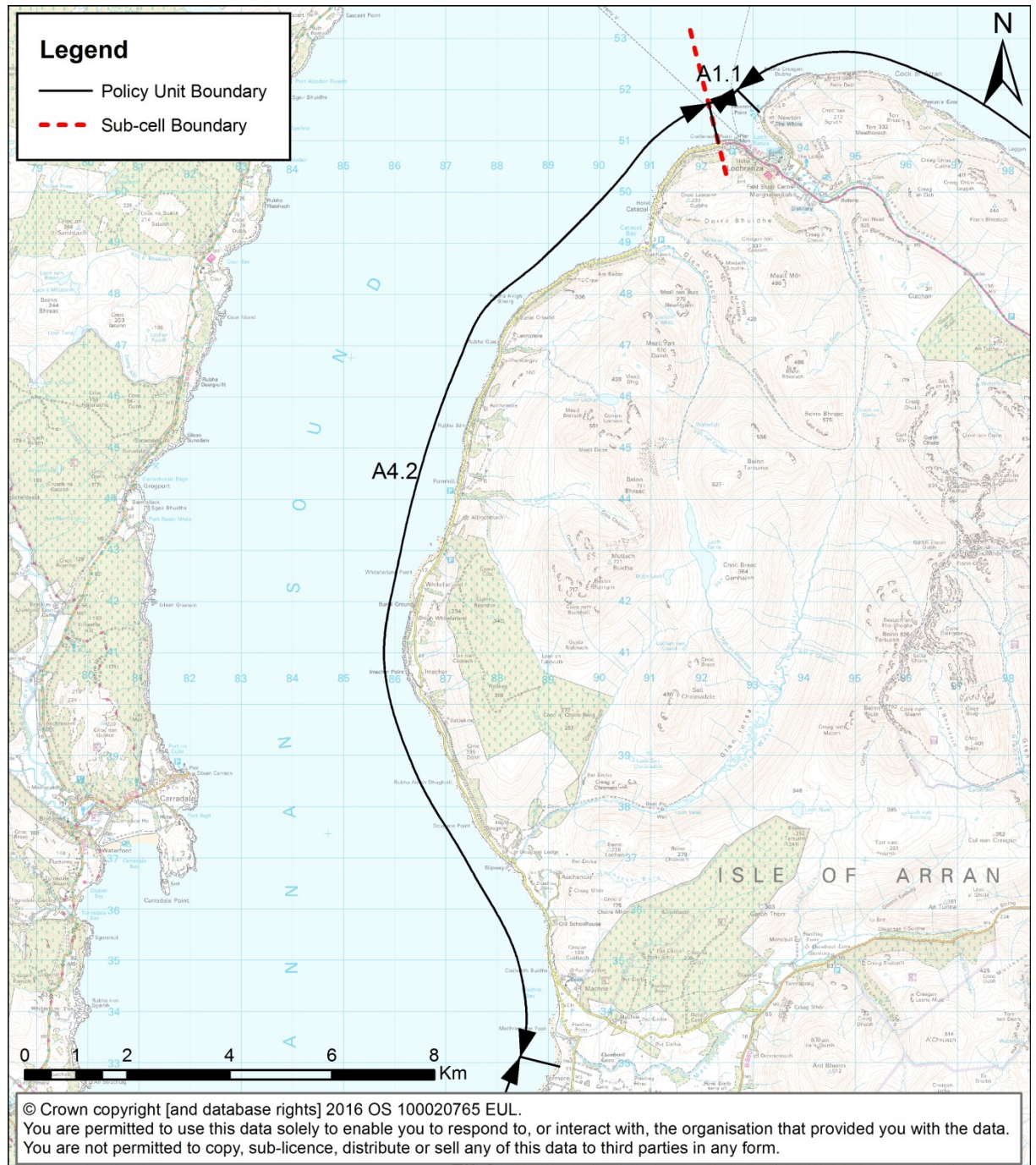


Figure 5.31 Policy Unit A4.2

<b>Sub-cell:</b>	<b>A4</b>
<b>Location reference:</b>	<b>Machrie Bay to Lochranza</b>
<b>Policy Unit reference:</b>	<b>A4.2</b>
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. The SEPA flood maps indicate a medium likelihood of coastal flooding to one residential property at Dougarie, along with significant sections of the A841 at Machrie Bay, Dougarie, Pirnmill, Thundergay and Catacol Bay. One non-residential property and a section of the A841 were also found to be at risk due to coastal erosion at Machrie Bay. Machrie Bay Golf Club is predicted to be at risk from both coastal flooding and coastal erosion. The Plan for this Policy Unit will consist of protecting the assets at risk from flooding and erosion.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> - Coastal defences are already present in this policy unit. The existing defences should be maintained and may need extended in the short term to protect assets at risk.
<b>Medium-term</b>	<b>Hold the Line/ Managed Realignment</b> – The predicted effect of sea level rise on this policy unit is relatively minor, with the most significant impact being an increased length of road subject to flooding and erosion. Coastal defences may need to be extended in order to protect against this increase in sea level. Consideration should also be given to the alternative of diverting the road and undertaking a managed realignment of the coast if holding the existing line is overly onerous in the medium to long-term.
<b>Long-term</b>	<b>Hold the Line/ Managed Realignment</b> - The predicted effect of sea level rise on this policy unit is relatively minor, with the most significant impact being an increased length of road subject to flooding and erosion. Coastal defences may need to be extended in order to protect against this increase in sea level. Consideration should also be given to the alternative of diverting the road and undertaking a managed realignment of the coast if holding the existing line is overly onerous in the medium to long-term.

<b>Sub-cell: A4</b>					
<b>Location reference: Machrie Bay to Lochranza</b>					
<b>Policy Unit reference: A4.2</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of heritage features including the Dougarie Lodge Boat House.	Potential for temporary slight negative impacts during the construction phase due to disturbance to the A841 road. Potential positive impact to Machrie Bay Golf Club managing flood and erosion risk.
<b>Medium-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.  Potential positive impact as one RP will benefit from flood protection.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential positive impact to heritage features including the Dougarie Lodge Boat House as these assets may benefit from flood protection.	Potential positive impact to the A841 road and Machrie Bay Golf Club as these assets are likely to benefit from flood and erosion protection.



		due to habitat creation if soft shoreline protection measures are incorporated.			
<b>Long-term</b>	Potential positive impact as one RP will benefit from flood protection.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.	No significant impact on the overall landscape and seascape anticipated.	Potential positive impact to heritage features including the Dougarie Lodge Boat House as these assets may benefit from flood protection.	Potential positive impact to the A841 road and Machrie Bay Golf Club as these assets are likely to benefit from flood and erosion protection.

### 5.2.14.3 Sub-cell A4: Opportunities for integrated shoreline management

<b>Sub-cell:</b>	A4
<b>Location reference:</b>	Drumadoon Point to Lochranza
<b>Policy Unit reference:</b>	A4.1 – A4.2
<b>Opportunities for integrated shoreline management</b>	Two different policies have been identified for the policy units within sub-cell A4; <b>hold the line</b> and <b>no active intervention</b> . No significant opportunities for integrated shoreline management within this sub-cell have been identified.

### 5.2.15 Sub-cell: Great Cumbrae

The sub-cell of Great Cumbrae contains a single policy unit for the island.

#### 5.2.15.1 Policy unit: Great Cumbrae

Sub-cell: Great Cumbrae

Location reference: Great Cumbrae

Policy Unit reference: Great Cumbrae



Figure 5.32 Policy Unit Great Cumbrae

<b>Sub-cell:</b>	<b>Great Cumbrae</b>
<b>Location reference:</b>	<b>Great Cumbrae</b>
<b>Policy Unit reference:</b>	<b>Great Cumbrae</b>
<b>Summary of the preferred Plan recommendations and justification</b>	The long-term plan for this Policy Unit is to hold the existing line. Properties at Millport and the Water Sports Centre are predicted to be at risk of coastal flooding, as identified by both the SEPA flood maps and a detailed Flood Risk Assessment undertaken for Millport in 2015. The Millport flood study recommended a flood alleviation scheme for Millport including a harbour breakwater, flood walls and shore connected rock breakwaters. This Scheme is currently in the outline design optimisation stage. Roads to the north of the island are also shown to be at risk due to coastal flooding by the SEPA flood maps.
<b>Policies to implement the Plan:</b>	
<b>Short-term</b>	<b>Hold the Line</b> – The Millport Flood Protection Scheme is to be progressed. This will provide protection to people, property and services. Flood risk to the road should also be managed which may require existing defences to be upgraded.
<b>Medium-term</b>	<b>Hold the Line/ Managed Realignment</b> – The flood alleviation scheme at Millport has been designed to provide a standard of protection of 1 in 200 years. Flood defences at Millport may need to be extended in the medium to long-term to provide flood protection to all assets due to sea level rise. Consideration should also be given to the alternative of diverting roads to the north of the island and undertaking a managed realignment of the coast if holding the existing line is overly onerous in the medium to long-term.
<b>Long-term</b>	<b>Hold the Line/ Managed Realignment</b> - The flood alleviation scheme at Millport has been designed to provide a standard of protection of 1 in 200 years. Flood defences at Millport may need to be extended in the medium to long-term to provide flood protection to all assets due to sea level rise. Works may be required to protect the road from flooding. Consideration should also be given to the alternative of diverting roads to the north of the island and undertaking a managed realignment of the coast if holding the existing line is overly onerous in the medium to long-term.

<b>Sub-cell: Great Cumbrae</b>					
<b>Location reference: Great Cumbrae</b>					
<b>Policy Unit reference: Great Cumbrae</b>					
<b>Predicted implications of the preferred Plan for this location:</b>					
<b>Time Period</b>	<b>Property &amp; Land Use</b>	<b>Nature Conservation</b>	<b>Landscape</b>	<b>Historic Environment</b>	<b>Amenity, Recreation &amp; Infrastructure</b>
<b>Short-term</b>	Potential for temporary negative impacts during construction phase due to noise, vibration, traffic etc.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences.	Potential for slight negative impacts to local receptors during construction due to augmentation of the existing shoreline management measures.	Potential slight negative impacts on the setting of Millport Conservation Area during construction.	Potential for temporary slight negative impacts during the construction phase due to disturbance to a number of B roads.
<b>Medium-term</b>	Slight positive impact as a number of properties will benefit from flood protection.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species	No significant impact on the overall landscape and seascape anticipated.	No significant impact providing shoreline management measures are designed to be in keeping with the area.	Potential positive impact to a number of B roads as these assets are likely to benefit from flood protection.

		due to habitat creation if soft shoreline protection measures are incorporated.			
<b>Long-term</b>	Slight positive impact as a number of properties will benefit from flood protection.	Potential moderate negative impacts to a nationally protected site and potential slight negative impacts to local habitats and species from construction or rehabilitation of hard defences. Potential slight positive impacts on local habitats and species due to habitat creation if soft shoreline protection measures are incorporated.	No significant impact on the overall landscape and seascape anticipated.	No significant impact providing shoreline management measures are designed to be in keeping with the area.	Potential positive impact to a number of B roads as these assets are likely to benefit from flood protection.

**5.2.15.2 Sub-cell Great Cumbrae: Opportunities for integrated shoreline management**

<b>Sub-cell:</b>	Great Cumbrae
<b>Location reference:</b>	Great Cumbrae
<b>Policy Unit reference:</b>	Great Cumbrae
<b>Opportunities for integrated shoreline management</b>	There is a single policy unit within sub-cell Great Cumbrae, which has the policy <b>hold the line</b> . No significant opportunities for integrated shoreline management within this sub-cell have been identified.

## **6 ACTION PLAN**

### **6.1 INTRODUCTION**

The Ayrshire SMP identifies policies for each section of shoreline along the Ayrshire coast in the short (0 – 20 years), medium (20 – 50 years), and long-term (50 – 100 years). An action plan has been derived in order to set out the methods by which these policies may be implemented.

The action plan focusses on defining short-term actions as the level of uncertainty is much higher in terms of medium to long-term risks, actions, funding sources and strategy.

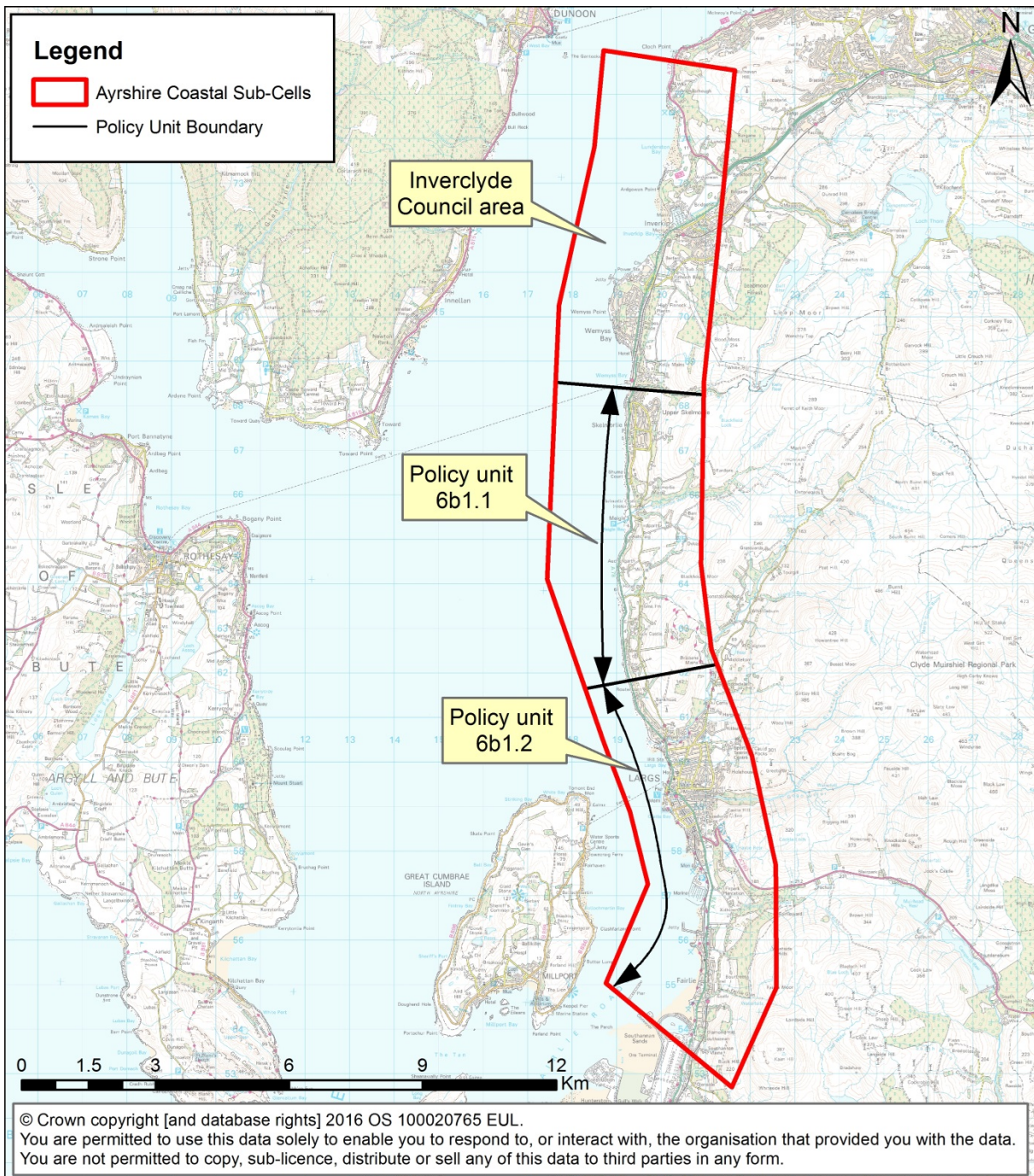
#### **6.1.1 Objectives**

The objectives of the action plan are to:

- Facilitate implementation of the SMP policies;
- Identify and/or promote studies to further/improve understanding where this is required to resolve policy and/or implementation;
- Promote use of the SMP recommendations in spatial planning;
- Identify procedures for the management of the SMP until its next review; and
- Establish a framework to monitor progress against the action plan and initiate future SMP review.



## 6.2 SUB-CELL 6B1 ACTION PLAN: CLOCH POINT – HUNTERSTON ORE TERMINAL



**Figure 6.1 Sub-cell 6b1 and associated policy units**

**Table 6.1 Sub-cell 6b1 Action Plan: Cloch Point – Hunterston Ore Terminal**

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6b1	All	Skelmorlie to Hunterston Ore Terminal	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this sub-cell. Regular condition monitoring should be undertaken and repairs carried out where necessary.	North Ayrshire Council, Scotland Transerv, Network Rail, Scottish Water	H	Ongoing
6b1	All	Skelmorlie to Hunterston Ore Terminal	Detailed flood, erosion and wave overtopping feasibility study.	Evaluate the risk to properties and the A78 within sub-cell 6b1 due to coastal flooding, erosion and wave overtopping. Determine and assess potential shoreline management options.	North Ayrshire Council, Transport Scotland	H	Short-term
6b1	6b1.1	Skelmorlie to Largs	Implement shoreline management to protect A78.	Undertake shoreline management based on feasibility study to protect the A78 from coastal flooding and erosion.	Transport Scotland	M	Short to Medium-term

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6b1	6b1.2	Largs to Hunterston Ore Terminal	Implement shoreline management at Largs.	Undertake shoreline management as per feasibility study to protect assets at Largs from coastal flooding, erosion and wave overtopping.	North Ayrshire Council	H	Short to Medium-term

### 6.3 SUB-CELL 6B2 ACTION PLAN: HUNTERSTON ORE TERMINAL – FARLAND HEAD

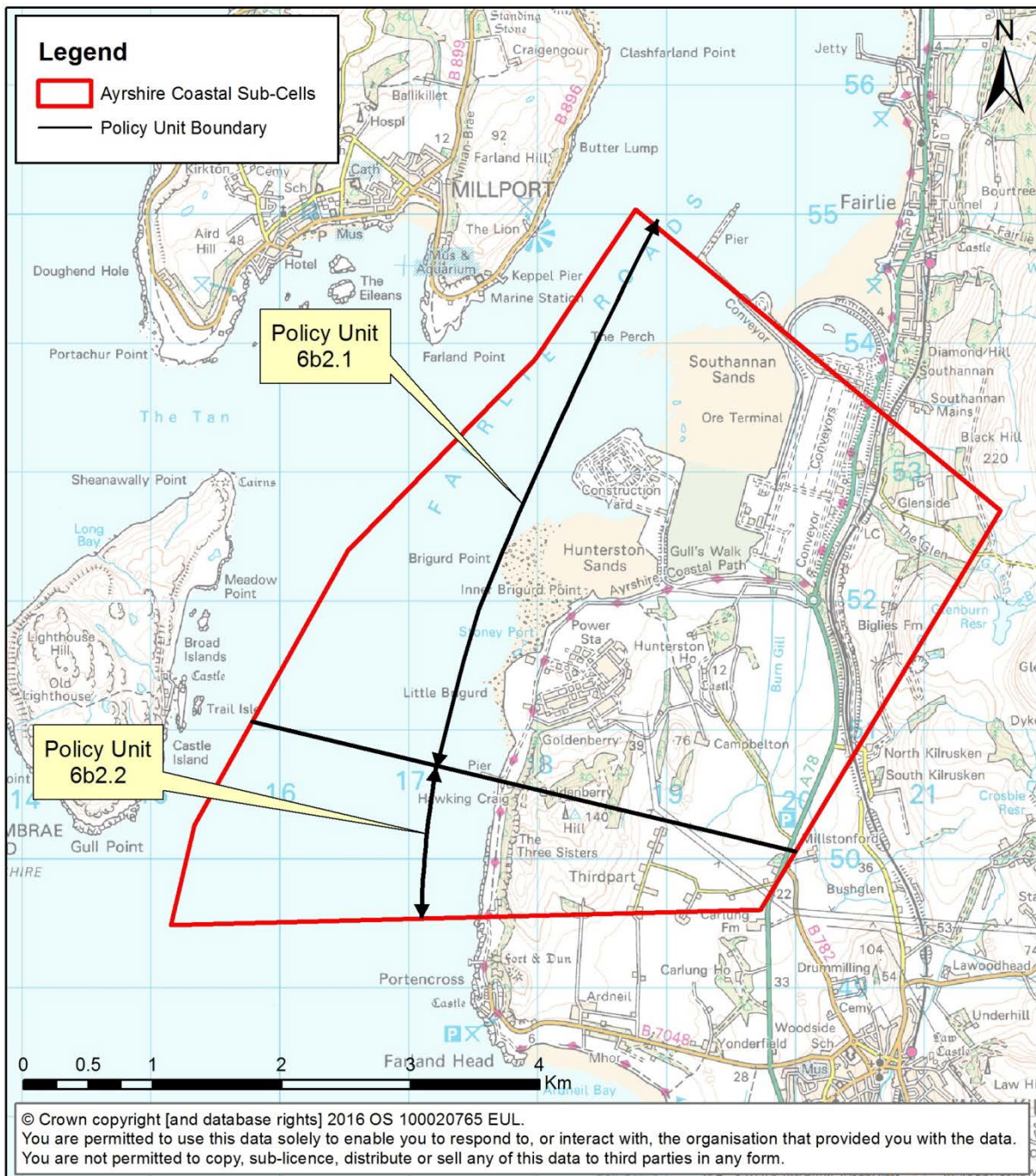


Figure 6.2 Sub-cell 6b2 and associated policy units

**Table 6.2 Sub-cell 6b2 Action Plan: Hunterston Ore Terminal – Farland Head**

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6b2	All	Hunterston to Farland Head	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this sub-cell. Regular condition monitoring should be undertaken and repairs carried out where necessary.	North Ayrshire Council	H	Ongoing
6b2	All	Hunterston to Farland Head	Flood and erosion feasibility study if required.	Carry out detailed assessment of the risk due to coastal flooding and erosion of any proposed development within sub-cell 6b2 and determine appropriate mitigation options for any proposed development.	Asset owner/ developer	L	As required
6b2	6b2.1	Hunterston	Geomorphological Study	Undertake initial hydro-geomorphological study of the effect of potential land reclamation to quantify potential impact on Southannan Sands.	Asset owner/ developer	H	Prior to development

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6b2	6b2.1	Hunterston	Implement shoreline management.	Undertake shoreline management as per feasibility study to protect new development if required.	Asset owner/ developer	L	As required

### 6.4 SUB-CELL 6C1 ACTION PLAN: FARLAND HEAD – ARDROSSAN

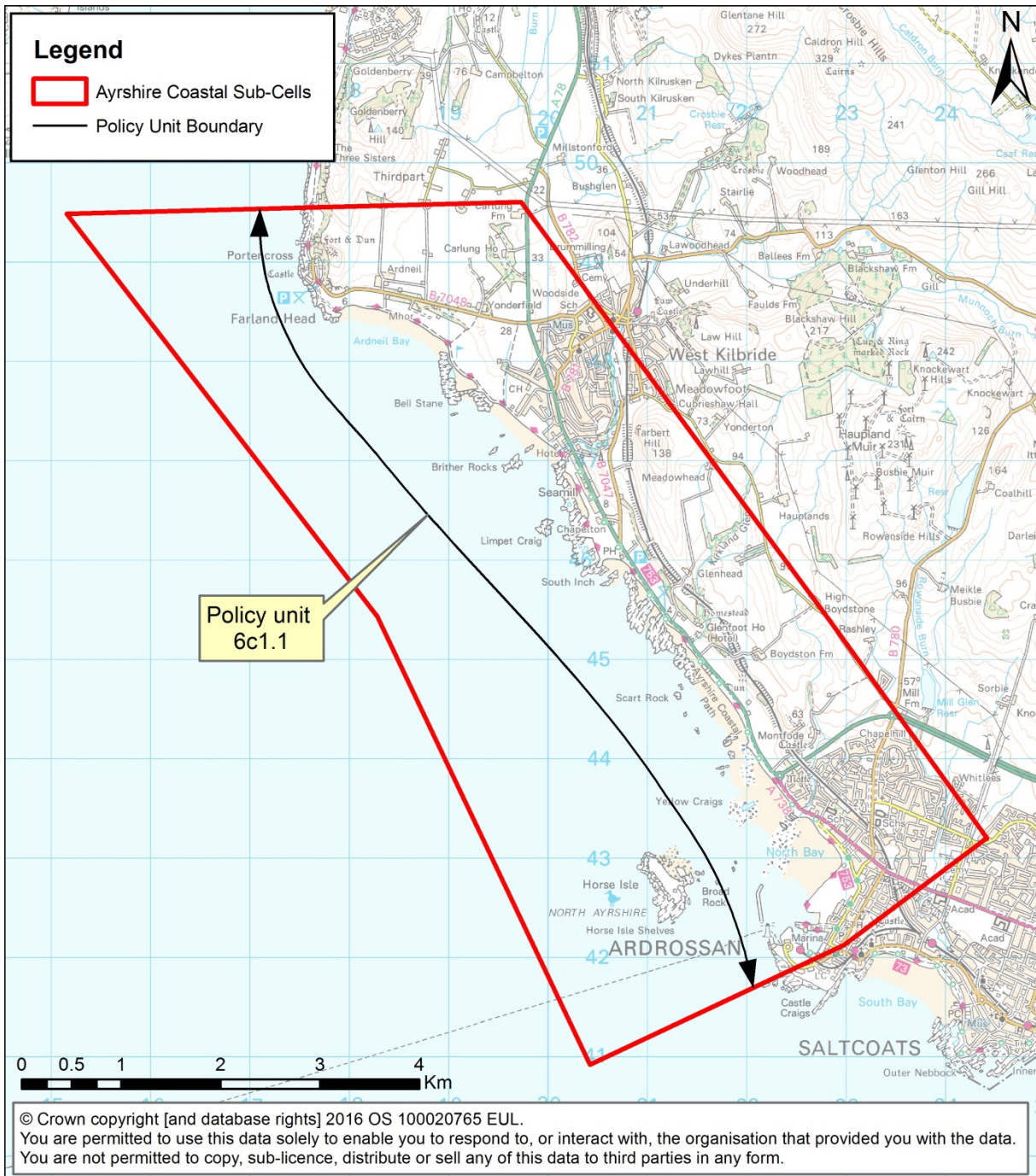


Figure 6.3 Sub-cell 6c1 and associated policy units

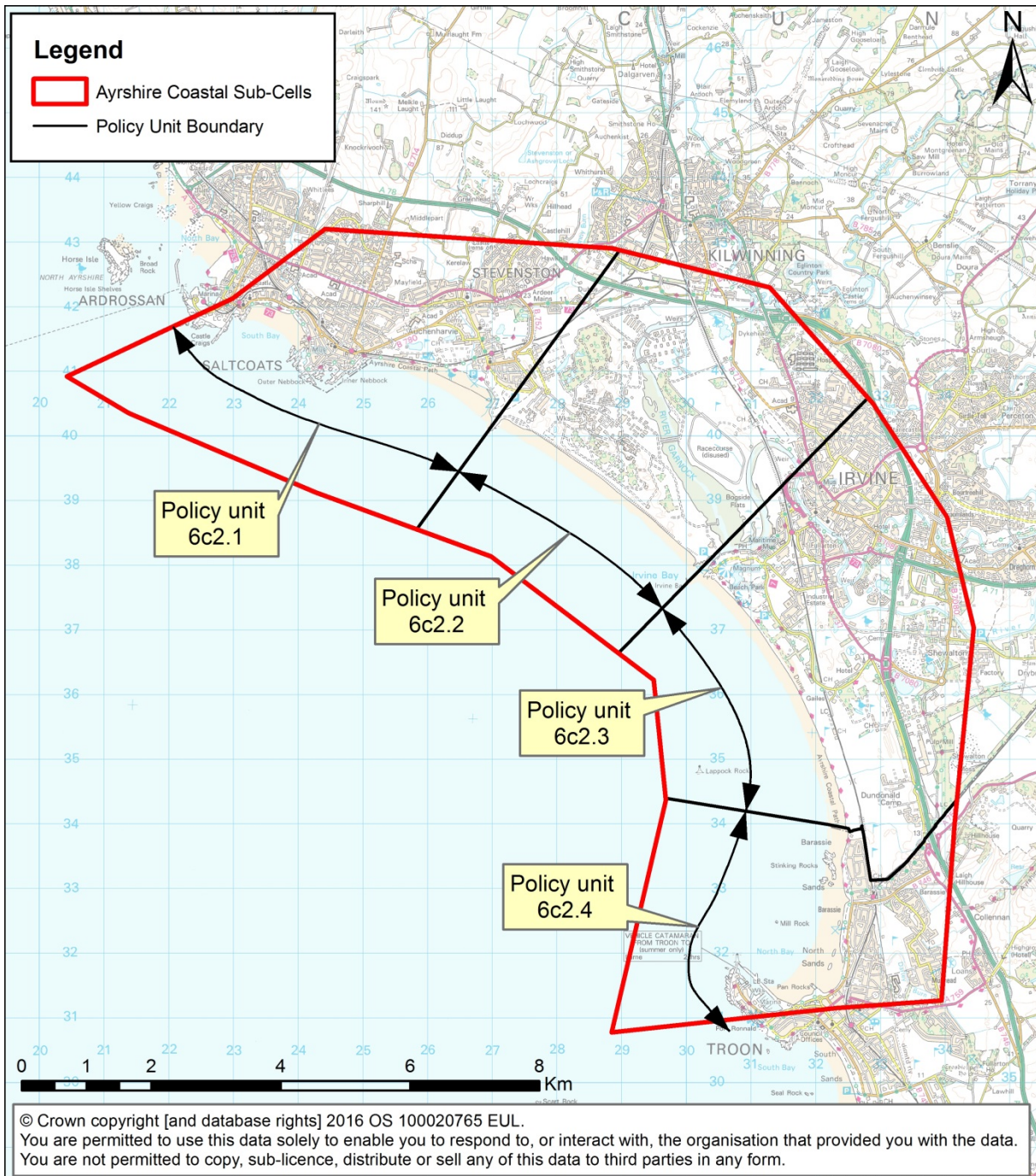
**Table 6.3 Sub-cell 6c1 Action Plan: Farland Head – Ardrossan**

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6c1	All	Farland Head to Ardrossan	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this sub-cell. Regular condition monitoring should be undertaken and repairs carried out where necessary.	North Ayrshire Council, West Kilbride Golf Club, Seamill Hydro Hotel, Scottish Water, Scotland Transerv	H	Ongoing
6c1	All	Farland Head to Ardrossan	Detailed flood, erosion and wave overtopping feasibility study.	Evaluate the risk to properties and Scottish Water assets within sub-cell 6c1 due to coastal flooding, erosion and wave overtopping. Determine and assess potential shoreline management options.	North Ayrshire Council, Scottish Water	H	Short-term
6c1	All	Farland Head to Ardrossan	Implement shoreline management.	Undertake shoreline management as per feasibility study to protect assets at risk due to coastal flooding, erosion and wave overtopping.	North Ayrshire Council	H	Short to Medium-term



Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6c1	All	Farland Head to Ardrossan	Manage risk to Scottish Water asset.	Undertake shoreline management as per feasibility study to protect Scottish Water assets.	Scottish Water	M	Short to Medium-term

### 6.5 SUB-CELL 6C2 ACTION PLAN: ARDROSSAN – TROON



**Figure 6.4 Sub-cell 6c2 and associated policy units**

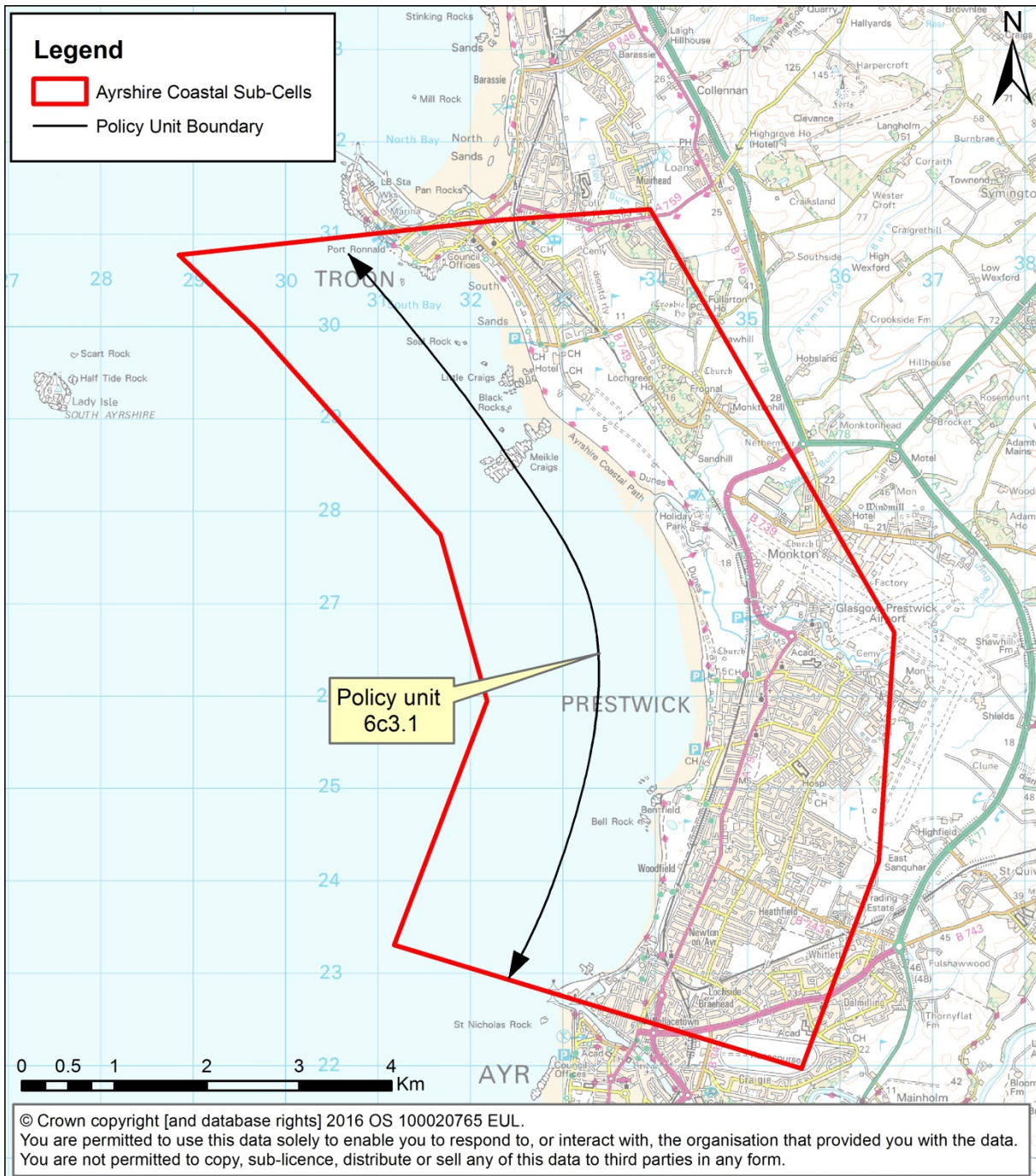
**Table 6.4 Sub-cell 6c2 Action Plan: Ardrossan – Troon**

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6c2	All	Ardrossan to Troon	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this sub-cell. Regular condition monitoring should be undertaken and repairs carried out where necessary.	North Ayrshire Council, South Ayrshire Council, Scotland Transerv, Network Rail, ICI	H	Ongoing
6c2	6c2.4	Gailes Burn to Troon	Dune restoration.	Continue dune restoration works in this policy unit.	South Ayrshire Council	H	Ongoing
6c2	All	Ardrossan to Troon	Detailed coastal flooding and erosion feasibility study.	Evaluate the risk to properties, Network Rail assets and private land within sub-cell 6c2 due to coastal flooding and erosion. Determine and assess potential shoreline management options.	North Ayrshire Council, South Ayrshire Council, Network Rail, ICI	H	Short-term

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6c2/ 6c3	6c2.4/ 6c3.1	Gailes Burn to Ayr	Detailed wave overtopping study.	Detailed study to evaluate the risk due to wave overtopping. Determine and assess options to manage flood risk due to wave overtopping at Troon.	South Ayrshire Council	H	Short-term
6c2	6c2.1	Ardrossan to Stevenston	Flood and erosion management at Saltcoats and Stevenston.	Undertake shoreline management to mitigate flood risk and control erosion at Saltcoats and Stevenston based on feasibility study.	North Ayrshire Council	M	Short to Medium-term
6c2	6c2.2	Stevenston to Irvine Bay	Erosion management.	Undertake shoreline management to control erosion and prevent potential contamination based on feasibility study.	Asset owner – ICI	M	Medium-term
6c2	6c2.3	Irvine Bay to Gailes Burn	Flood and erosion management along River Irvine and at Barassie.	Undertake shoreline management to mitigate flood risk adjacent to the River Irvine and to control erosion at Barassie/Irvine beach park based on feasibility study.	North Ayrshire Council	H	Short to Medium-term

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6c2	6c2.4	Gailes Burn to Troon	Flood management at Troon.	Undertake shoreline management to mitigate flood risk due to coastal inundation and wave overtopping to properties and other assets at Troon based on feasibility and wave overtopping studies.	South Ayrshire Council	H	Short to Medium-term

### 6.6 SUB-CELL 6C3 ACTION PLAN: TROON – AYR



**Figure 6.5 Sub-cell 6c3 and associated policy units**

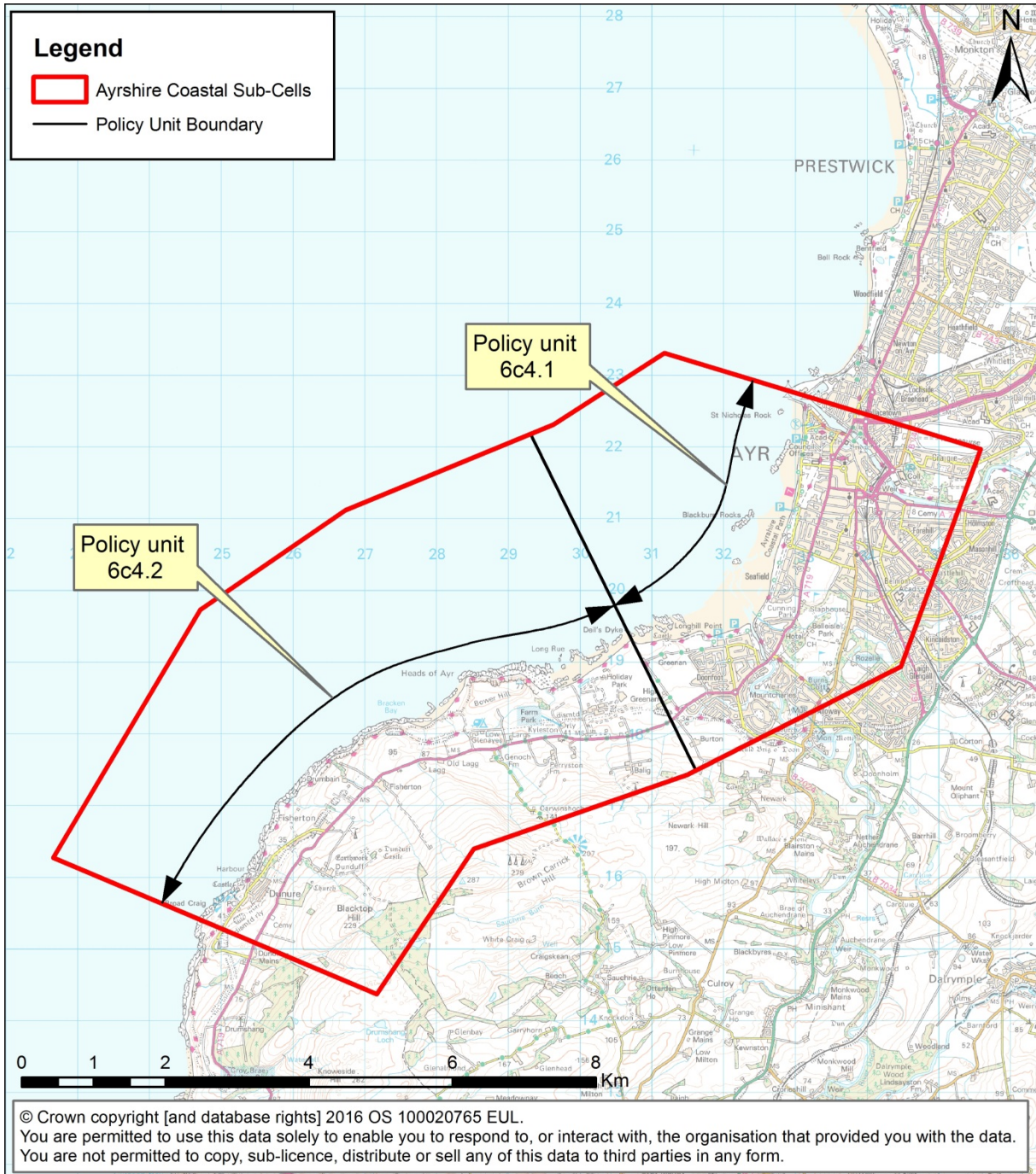
**Table 6.5 Sub-cell 6c3 Action Plan: Troon – Ayr**

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6c3	All	Troon to Ayr	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this sub-cell. Regular condition monitoring should be undertaken and repairs carried out where necessary.	South Ayrshire Council, Scottish Water, Scotland Transerv, Royal Troon Golf Club, Prestwick Golf Club	H	Ongoing
6c3	All	Troon to Ayr	Detailed flood, erosion and wave overtopping feasibility study.	Evaluate the risk to properties and Scottish Water assets within sub-cell 6c3 due to coastal flooding, erosion and wave overtopping. Determine and assess potential shoreline management options.	South Ayrshire Council, Scottish Water	H	Short-term
6c3	All	Troon to Ayr	Erosion protection at Newton shore.	Undertake detailed design and implement erosion protection at Newton shore.	South Ayrshire Council	M	Short-term

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6c3	All	Troon to Ayr	Flood and erosion management at Troon, Prestwick beach and Ayr.	Undertake shoreline management to mitigate flood risk, control erosion and manage wave overtopping at Troon, Prestwick beach and Ayr based on feasibility study.	South Ayrshire Council	M	Short to Medium-term
6c3	All	Troon to Ayr	Manage risk to Scottish Water asset.	Undertake shoreline management as per feasibility study to protect Scottish Water assets.	Scottish Water	M	Short to Medium-term



### 6.7 SUB-CELL 6C4 ACTION PLAN: AYR – DUNURE



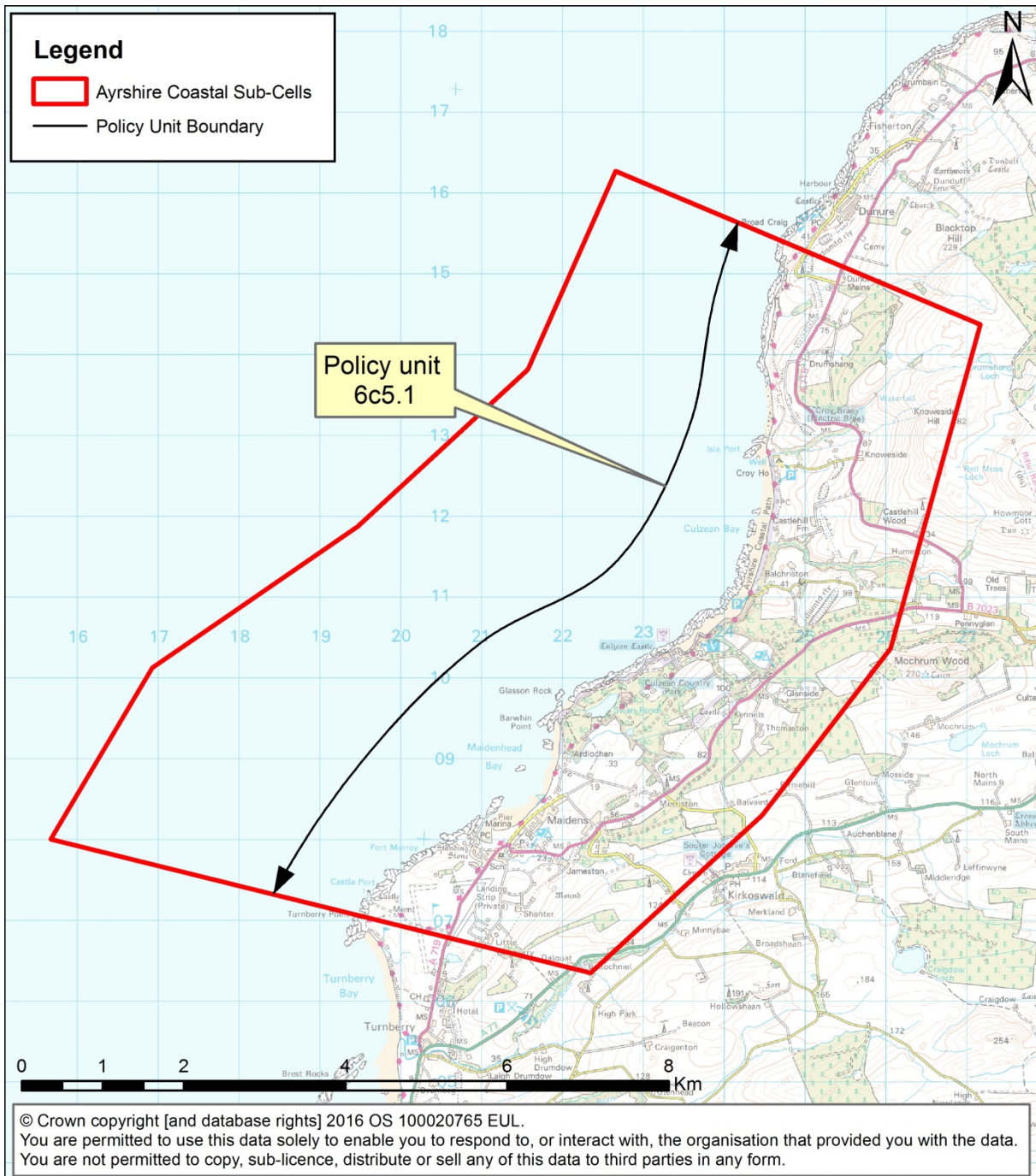
**Figure 6.6 Sub-cell 6c4 and associated policy units**

**Table 6.6 Sub-cell 6c4 Action Plan: Ayr – Dunure**

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6c4	6c4.1	Ayr to Grenan Castle	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this policy unit. Regular condition monitoring should be undertaken and repairs carried out where necessary.	South Ayrshire Council, Scotland Transerv	H	Ongoing
6c4	6c4.1	Ayr to Grenan Castle	Maintain South pier.	Continue maintenance of South Pier due to its importance for the port of Ayr and as a terminal groyne for the retention of sand on the south beach.	South Ayrshire Council	M	Ongoing
6c4	6c4.1	Ayr to Grenan Castle	Detailed coastal flooding and wave overtopping feasibility study.	Detailed feasibility study to evaluate the risk due to coastal flooding at Ayr, Seafield and Doonfoot, and to assess the risk due to wave overtopping along the promenade at south Ayr. Determine and assess potential shoreline management options.	South Ayrshire Council	H	Short-term

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6c4	6c4.2	Grenan Castle to Dunure	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in this policy unit. The shoreline will be allowed to revert to a natural state.	South Ayrshire Council	L	Short to Long-term
6c4	6c4.1	Ayr to Grenan Castle	Flood and wave overtopping management at Ayr.	Undertake shoreline management to mitigate flood risk and manage wave overtopping at Ayr, Seafield and Doonfoot based on feasibility study.	South Ayrshire Council	M	Short to Medium-term

### 6.8 SUB-CELL 6C5 ACTION PLAN: DUNURE – TURNBERRY



**Figure 6.7 Sub-cell 6c5 and associated policy units**

**Table 6.7 Sub-cell 6c5 Action Plan: Dunure – Turnberry**

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6c5	All	Dunure to Turnberry	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in this policy unit. The shoreline will be allowed to revert to a natural state.	South Ayrshire Council, Turnberry Golf Course	L	Short to Long-term

### 6.9 SUB-CELL 6C6 ACTION PLAN: TURNBERRY – BENNANE HEAD

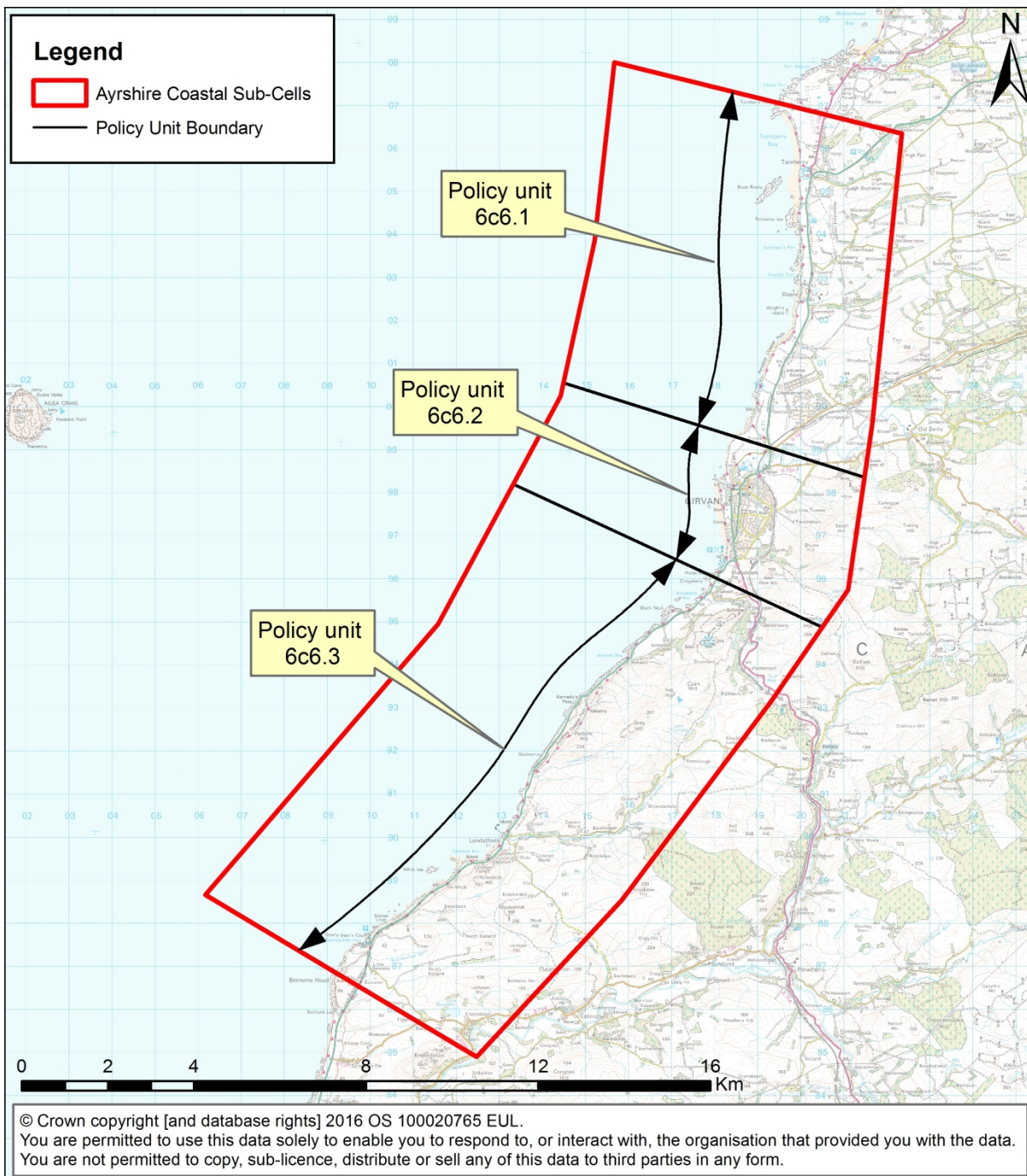


Figure 6.8 Sub-cell 6c6 and associated policy units

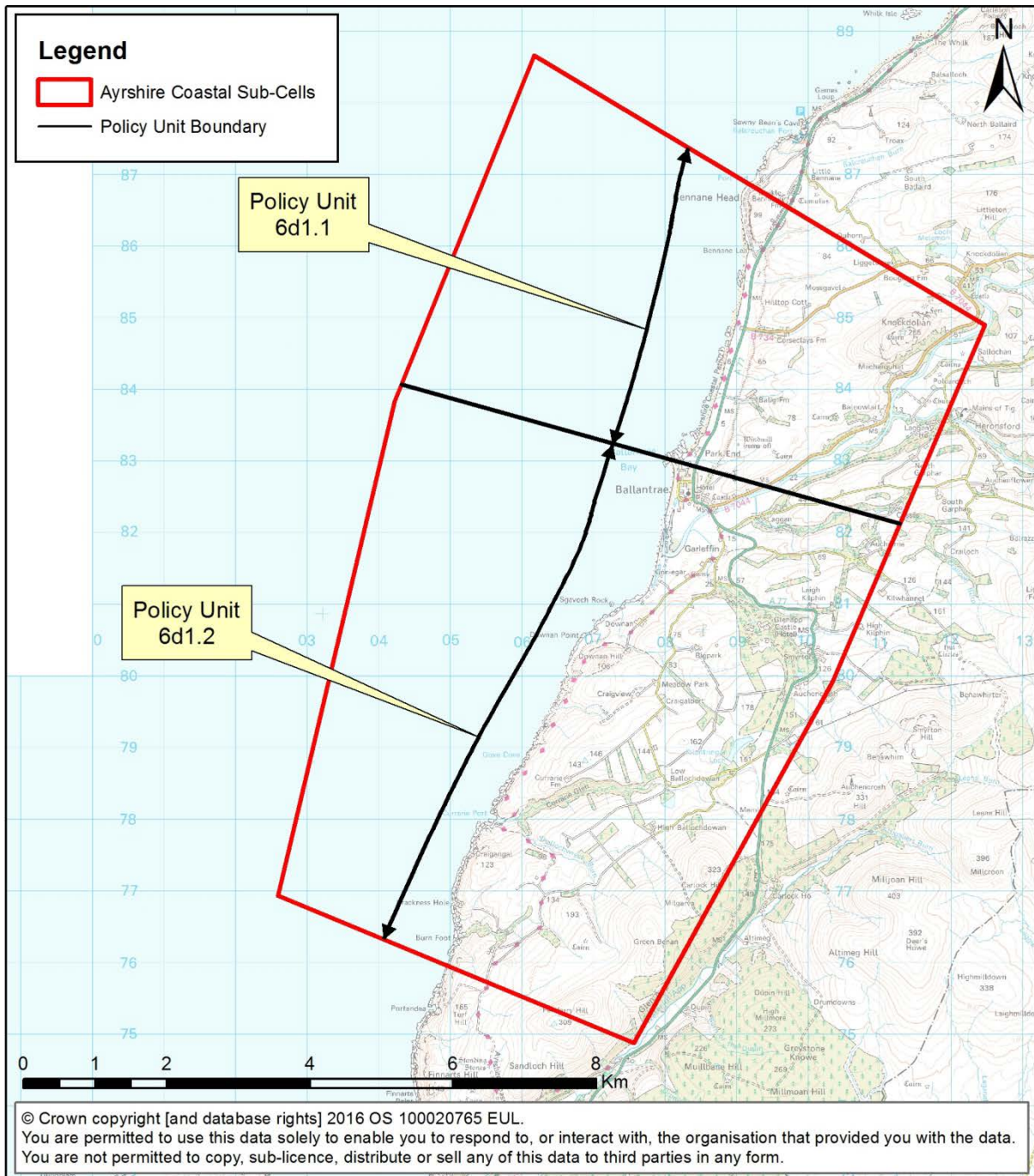
**Table 6.8 Sub-cell 6c6 Action Plan: Turnberry – Bennane Head**

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6c6	6c6.1	Turnberry to North Girvan	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in this policy unit. The shoreline will be allowed to revert to a natural state.	South Ayrshire Council	L	Short to Long-term
6c6	6c6.2/ 6c6.3	Girvan to Bennane Head	Maintenance of existing defences.	Maintenance of coastal defences currently in place within these policy units. Regular condition monitoring should be undertaken and repairs carried out where necessary.	South Ayrshire Council, Scotland Transerv, Turnberry Golf Course, Girvan Golf Club	H	Ongoing
6c6	6c6.2/ 6c6.3	Girvan to Bennane Head	Detailed coastal/ fluvial flooding and coastal erosion feasibility study.	Evaluate coastal/ fluvial flood risk from the Water of Girvan and Mill Burn and the coastal flood risk to the A77. Evaluate coastal erosion risk to Girvan Golf Course and the A77. Determine and assess potential shoreline management options.	South Ayrshire Council, Transport Scotland, Girvan Golf Club	H	Short-term

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6c6	6c6.2	Girvan	Undertake erosion protection at Girvan Golf Course.	Undertake shoreline management to mitigate erosion risk at Girvan Golf Course based on feasibility study.	Girvan Golf Club	L	Short to Medium-term
6c6	6c6.2	Girvan	Undertake flood protection at Girvan.	Implement flood protection scheme at Girvan to protect against fluvial and coastal flooding based on feasibility study.	South Ayrshire Council	H	Short to Medium-term
6c6	6c6.3	South Girvan to Bennane Head	Undertake flood and erosion protection for the A77.	Undertake shoreline management to mitigate flood and erosion risk to the A77 based on feasibility study.	Transport Scotland	M	Short to Medium-term



### 6.10 SUB-CELL 6D1 ACTION PLAN: BENNANE HEAD – CURRARIE PORT

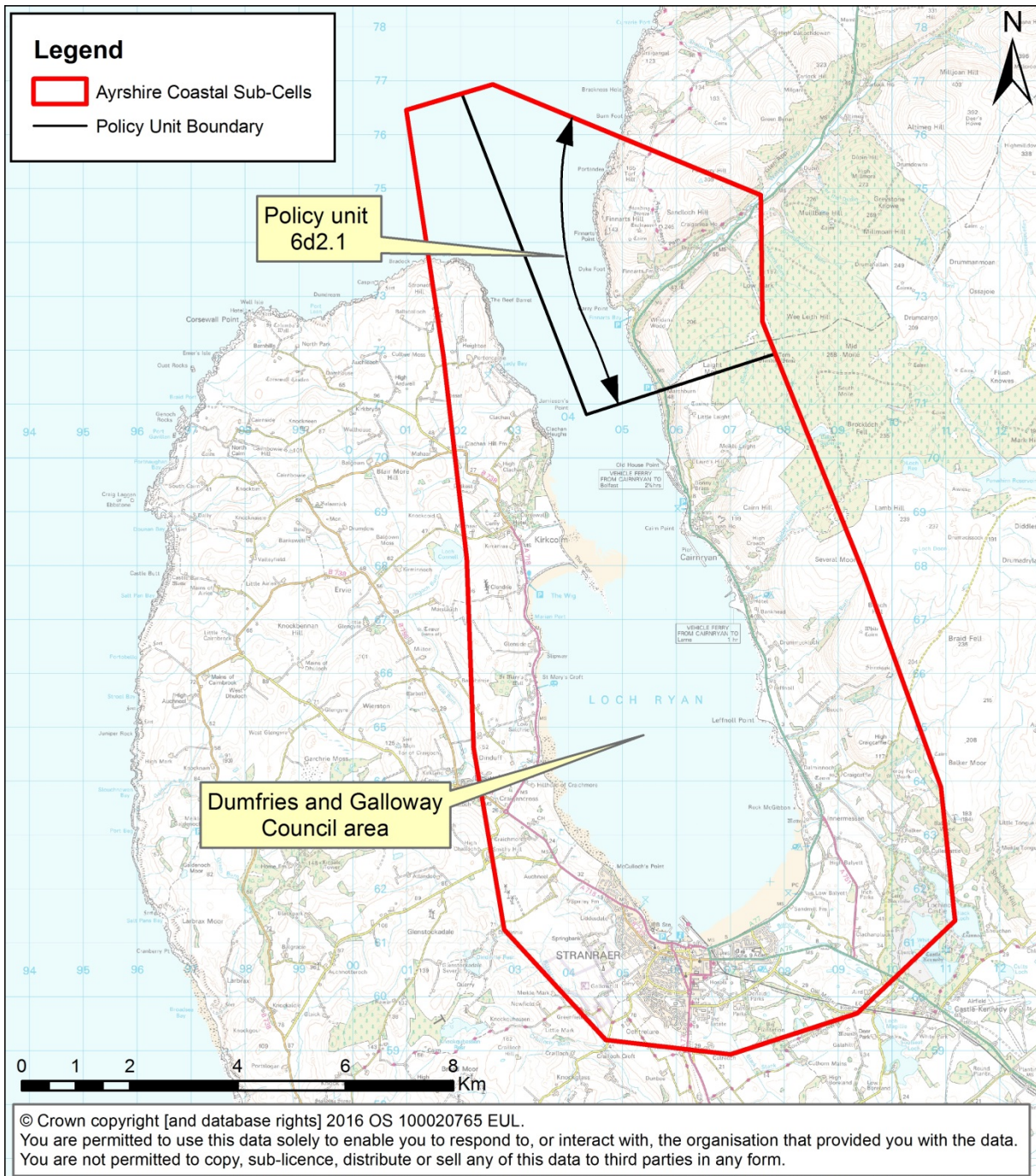


**Figure 6.9 Sub-cell 6d1 and associated policy units**

**Table 6.9 Sub-cell 6d1 Action Plan: Bennane Head – Currarie Port**

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6d1	6d1.1	Bennane Head to Ballantrae	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this policy unit. Regular condition monitoring should be undertaken and repairs carried out where necessary.	South Ayrshire Council, Scotland Transerv	H	Ongoing
6d1	6d1.1	Bennane Head to Ballantrae	Coastal flood and erosion feasibility study.	Detailed assessment of the flood and erosion risk to the A77. Assessment of management options.	Transport Scotland	H	Short-term
6d1	6d1.1	Bennane Head to Ballantrae	Coastal flood and erosion protection.	Undertake shoreline management to protect the A77 from coastal flooding and erosion based on feasibility study.	Transport Scotland	M	Short-term
6d1	6d1.2	South Ballantrae to Currarie Port	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in this policy unit. The shoreline will be allowed to revert to a natural state.	South Ayrshire Council	L	Short to Long-term

### 6.11 SUB-CELL 6D2 ACTION PLAN: CURRARIE PORT – MILLEUR POINT

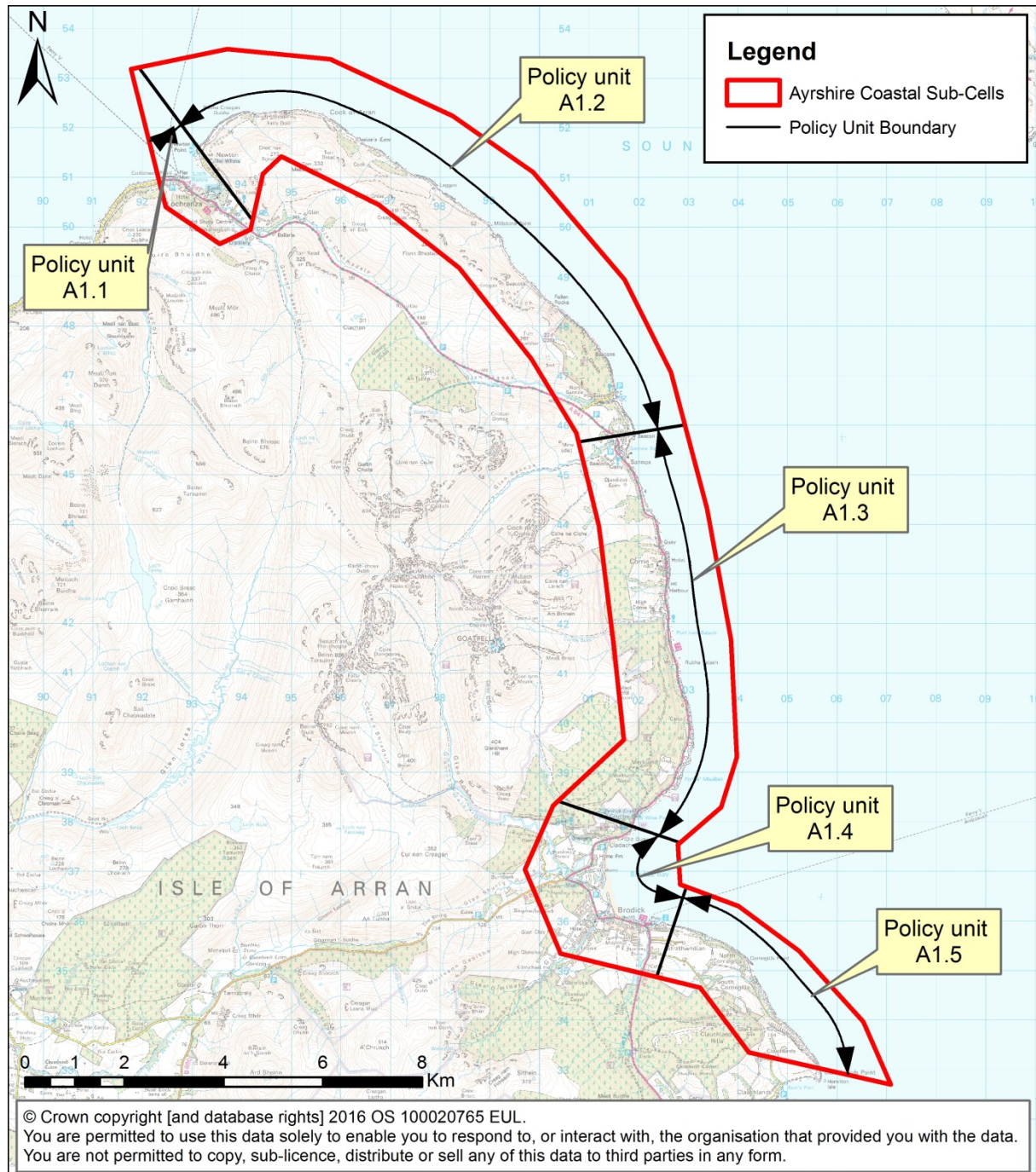


**Figure 6.10 Sub-cell 6d2 and associated policy units**

**Table 6.10 Sub-cell 6d2 Action Plan: Currarie Port – Milleur Point**

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
6d2	6d2.1	Currarie Port to Galloway Burn	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in this policy unit. The shoreline will be allowed to revert to a natural state.	South Ayrshire Council	L	Short to Long-term

### 6.12 SUB-CELL A1 ACTION PLAN: LOCHRANZA – CLAUCHLANDS POINT



**Figure 6.11 Sub-cell A1 and associated policy units**

**Table 6.11 Sub-cell A1 Action Plan: Lochranza – Clauchlands Point**

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
A1	A1.1, A1.3, A1.4	Lochranza and Sannox to Brodick	Maintenance of existing defences.	Maintenance of coastal defences currently in place within these policy units. Regular condition monitoring should be undertaken and repairs carried out where necessary.	North Ayrshire Council, Caledonian MacBrayne	H	Ongoing
A1	A1.2, A1.5	Lochranza to Sannox and Brodick to Clauchlands Point	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in these policy units. The shoreline will be allowed to revert to a natural state.	North Ayrshire Council	L	Short to Long-term
A1	A1.1, A1.3, A1.4	Lochranza and Sannox to Brodick	Integrated flood, erosion and wave overtopping feasibility study.	Undertake a detailed feasibility study to assess the risk due to flooding from all sources including coastal, fluvial, pluvial and groundwater at Lochranza. Assess coastal flood and erosion risk to the A841 and Brodick. Determine shoreline management options.	North Ayrshire Council	H	Short-term

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
A1	A1.1	Lochranza	Flood protection at Lochranza.	Implement works to protect assets from coastal, fluvial, pluvial and groundwater flooding at Lochranza based on feasibility study.	North Ayrshire Council	H	Short to Medium-term
A1	A1.3	Sannox to Brodick	Flood and erosion protection for the A841.	Undertake shoreline management to protect the A841 from coastal flooding and erosion based on feasibility study.	North Ayrshire Council	L	Short to Medium-term
A1	A1.4	Brodick	Protect former landfill site at Brodick.	Undertake shoreline management to defend assets at Brodick based on feasibility study. Progress option to protect landfill site.	North Ayrshire Council	H	Short to Medium-term

### 6.13 SUB-CELL A2 ACTION PLAN: CLAUCHLANDS POINT – KINGSCROSS POINT

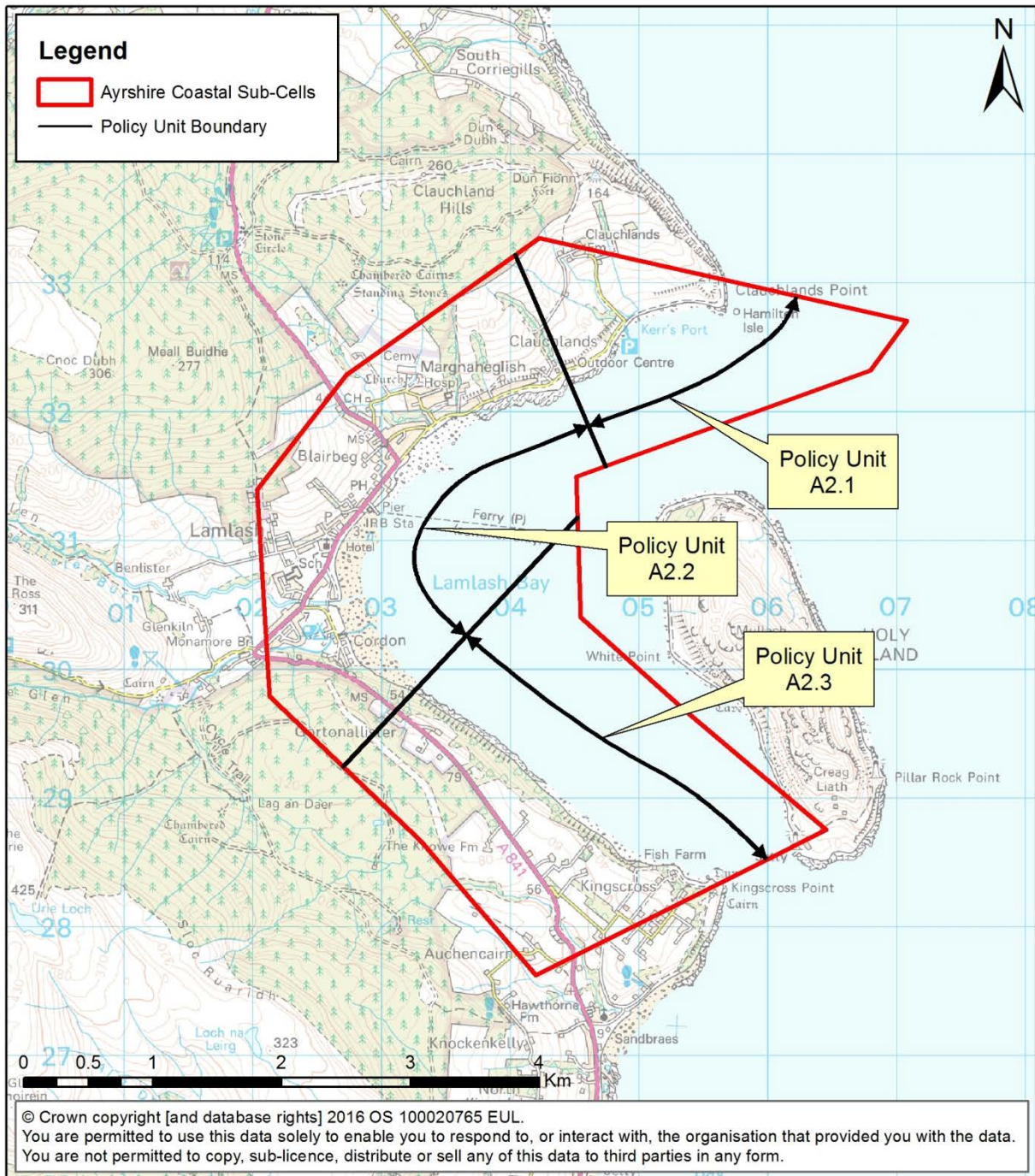


Figure 6.12 Sub-cell A2 and associated policy units

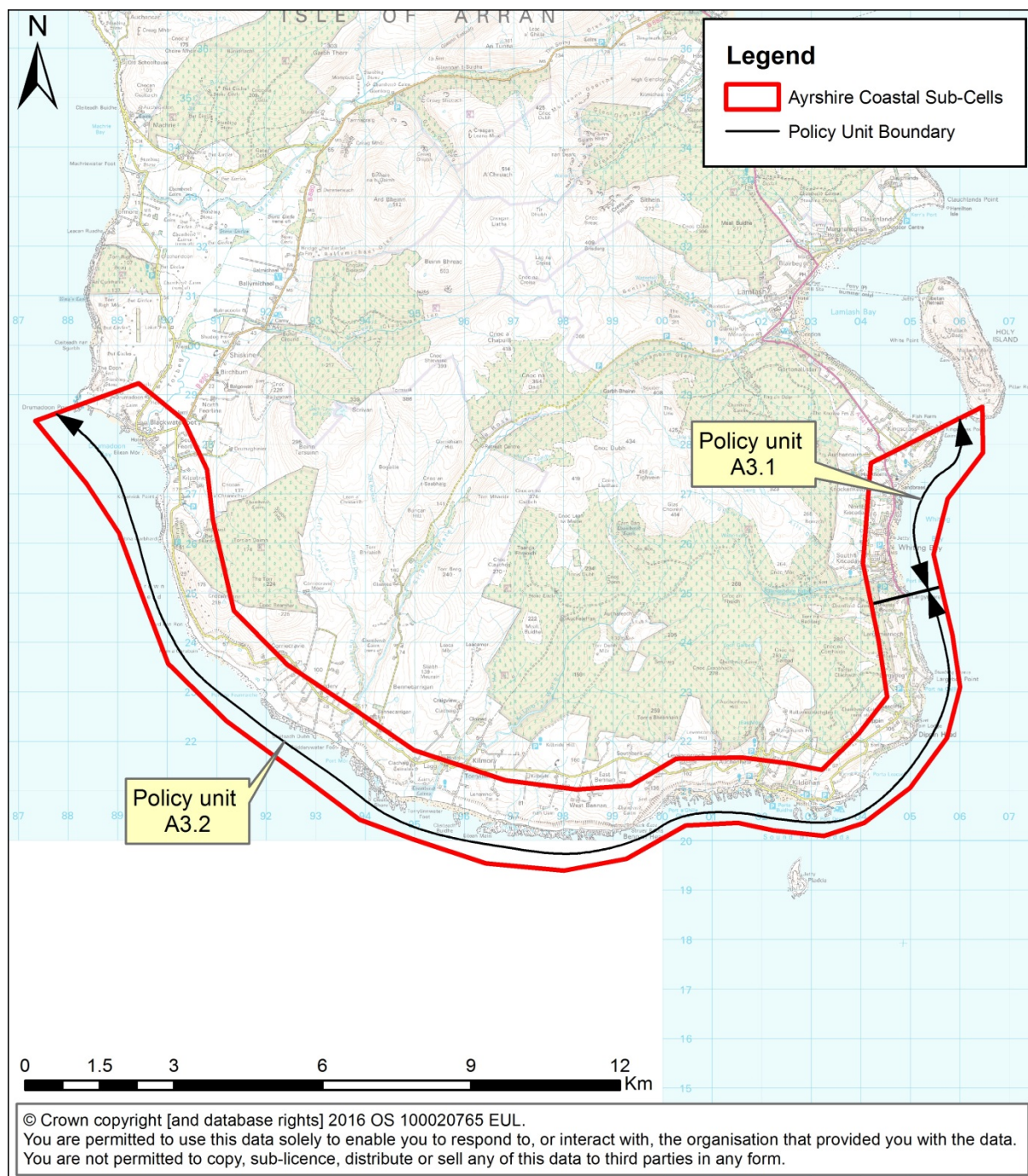


**Table 6.12 Sub-Cell A2 Action Plan: Clauchlands Point – Kingscross Point**

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
A2	A2.1, A2.3	Clauchlands Point to Kingscross Point (excluding Lamlash)	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in these policy units. The shoreline will be allowed to revert to a natural state.	North Ayrshire Council	L	Short to Long-term
A2	A2.2	Lamlash	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this policy unit. Regular condition monitoring should be undertaken and repairs carried out where necessary.	North Ayrshire Council, Scottish Water	H	Ongoing
A2	A2.2	Lamlash	Flood and erosion study.	Detailed assessment of the risks due to coastal flooding and erosion in this policy unit, along with an assessment of potential management options.	North Ayrshire Council, Scottish Water	H	Short-term

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
A2	A2.2	Lamlash	Coastal flood and erosion protection at Lamlash.	Undertake shoreline management to mitigate coastal flood and erosion risk at Lamlash based on feasibility study.	North Ayrshire Council, Scottish Water	H	Short to Medium-term

### 6.14 SUB-CELL A3 ACTION PLAN: KINGSCROSS POINT – DRUMADOON POINT



**Figure 6.13 Sub-cell A3 and associated policy units**

**Table 6.13 Sub-cell A3 Action Plan: Kingscross Point – Drumadoon Point**

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
A3	A3.1	Whiting Bay	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this policy unit. Regular condition monitoring should be undertaken and repairs carried out where necessary.	North Ayrshire Council	H	Ongoing
A3	A3.1	Whiting Bay	Integrated flood and wave overtopping study.	Detailed assessment of the risk to assets in this policy unit due to coastal flooding, wave overtopping and drainage from fluvial and pluvial flooding. Assessment of flood risk management options.	North Ayrshire Council	H	Short-term
A3	A3.1	Whiting Bay	Flood and wave overtopping protection at Whiting Bay.	Undertake shoreline management to protect assets at Whiting Bay from coastal flooding, wave overtopping and drainage from fluvial and pluvial flooding based on feasibility study.	North Ayrshire Council	H	Short to Medium-term

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
A3	A3.2	Largymore to Drumadoon Point	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in this policy unit. The shoreline will be allowed to revert to a natural state.	North Ayrshire Council	L	Short to Long-term

### 6.15 SUB-CELL A4 ACTION PLAN: DRUMADOON POINT – LOCHRANZA

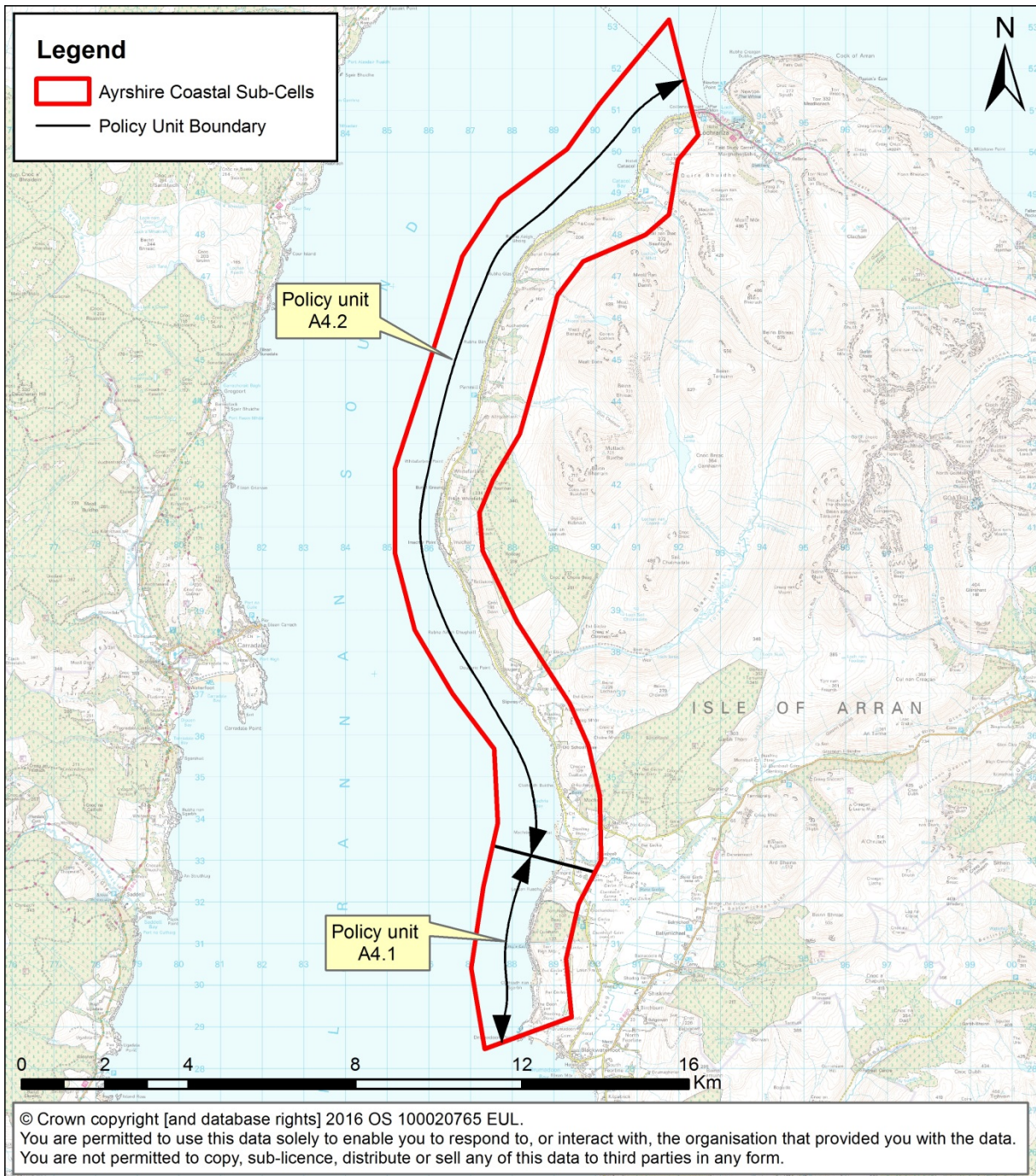
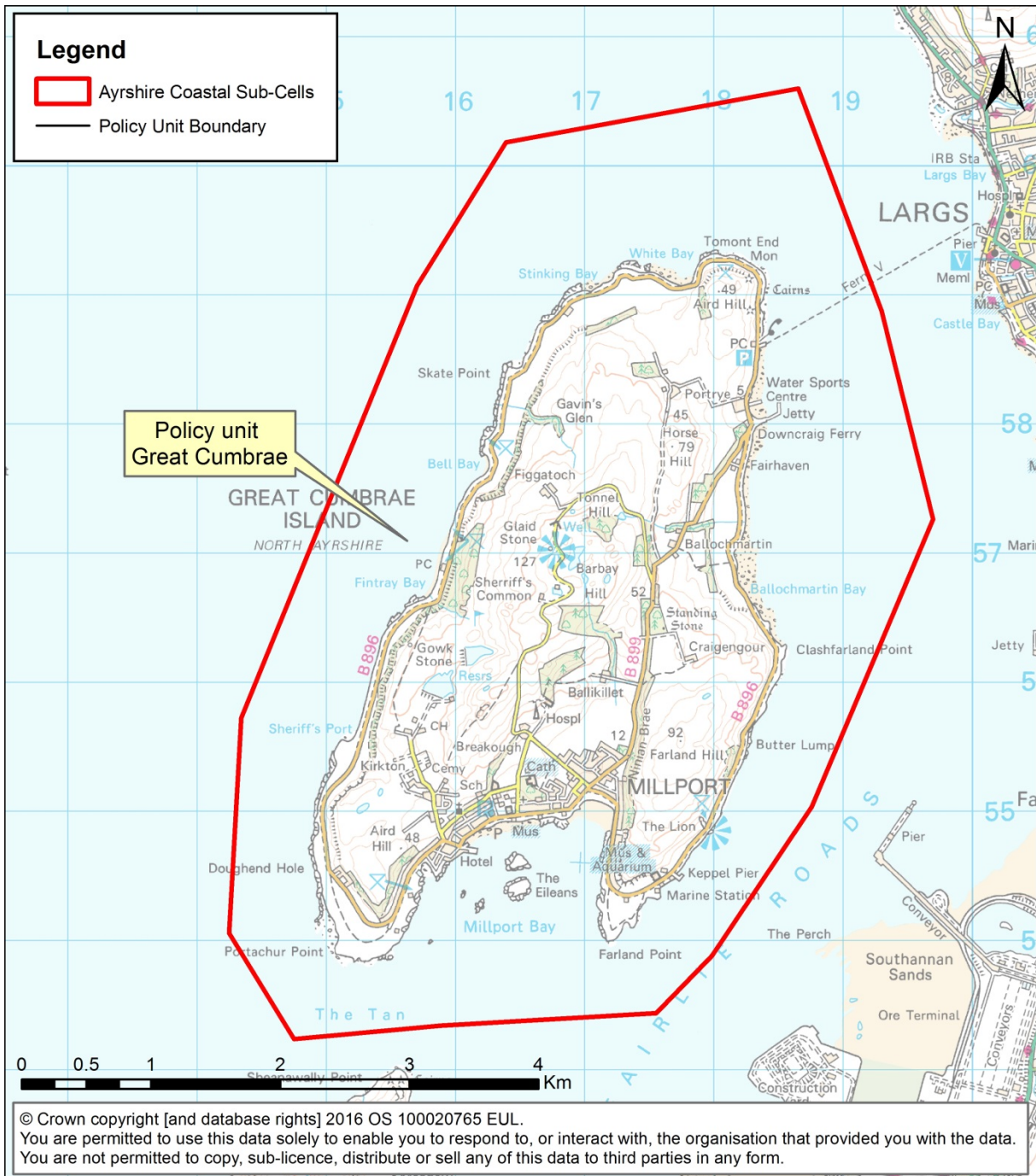


Figure 6.14 Sub-cell A4 and associated policy units

**Table 6.14 Sub-cell A4 Action Plan: Drumadoon Point – Lochranza**

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
A4	A4.1	Drumadoon Point to Tormore	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in this policy unit. The shoreline will be allowed to revert to a natural state.	North Ayrshire Council	L	Short to Long-term
A4	A4.2	Machrie Bay to Lochranza	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this policy unit. Regular condition monitoring should be undertaken and repairs carried out where necessary.	North Ayrshire Council	H	Ongoing
A4	A4.2	Machrie Bay to Lochranza	Coastal flooding and erosion feasibility study.	Detailed assessment of the risk to assets in this policy unit due to coastal flooding and erosion. Assessment of flood risk management options.	North Ayrshire Council	H	Short-term
A4	A4.2	Machrie Bay to Lochranza	Coastal flood and erosion protection.	Undertake shoreline management based on feasibility study to mitigate coastal flood and erosion risk.	North Ayrshire Council	M	Short to Medium-term

### 6.16 SUB-CELL GREAT CUMBRAE ACTION PLAN



**Figure 6.15 Sub-cell Great Cumbrae and associated policy units**



**Table 6.15 Sub-cell Great Cumbrae Action Plan**

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
Great Cumbrae	Great Cumbrae	Great Cumbrae	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this policy unit. Regular condition monitoring should be undertaken and repairs carried out where necessary.	North Ayrshire Council	H	Ongoing
Great Cumbrae	Great Cumbrae	Great Cumbrae	Millport flood scheme.	Construction of the flood scheme at Millport as proposed in the 2015 study. This scheme includes a harbour breakwater, flood walls and shore connected rock breakwaters.	North Ayrshire Council	H	Short-term
Great Cumbrae	Great Cumbrae	Great Cumbrae	Coastal flooding feasibility study.	Detailed assessment of the coastal flood risk to roads to the north of the island. Assessment of flood risk management options.	North Ayrshire Council	L	Short-term

Sub-cell	Policy Unit	Location reference	Action	Description	Responsibility	Priority (H/M/L)	Target Timescale
Great Cumbrae	Great Cumbrae	Great Cumbrae	Coastal flood protection for roads.	Undertake shoreline management to protect roads to the north of the island from coastal flooding based on feasibility study.	North Ayrshire Council	L	Short to Medium-term

## 7 MITIGATION AND MONITORING

### 7.1 MITIGATION

Mitigation measures have been recommended where potential negative impacts are likely to result from a proposed measure for shoreline management. These mitigation measures are detailed in the SEA Environmental Report “IBE1107Rp00003”, and aim to prevent, reduce and as fully as possible offset any significant adverse effects on the environment due to the implementation of the Plan.

#### 7.1.1 General Mitigation

The principal mitigation recommendation is that the predicted negative effects should be considered further during the next stage of policy development, when details of the physical shoreline management measures (e.g. visual appearance and alignment of hard engineering works) can be optimised through detailed feasibility studies and design in order to limit potential identified impacts on sensitive receptors. Implementation of shoreline management measures in the vicinity of sensitive areas may need to be specific consideration at design stage so that the sediment budgets and wave regimes are not adversely affected. Where feasible, natural flood management and soft / green engineering methods should be incorporated into the detailed planning to reduce the negative environmental impacts of any scheme.

Further environmental studies based on the detailed design and construction methodology should be undertaken as appropriate. Further Appropriate Assessment, to meet the requirements of the Habitats Directive, of the detailed design and construction methodology will be required at the project level.

Before any works are carried out, detailed method statements and management plans (construction and environmental) should be prepared, to include timing of works, information on the specific mitigation measures to be employed for each work area, and mechanisms for ensuring compliance with environmental legislation and statutory consents. Construction Environmental Management Plans (CEMPs) prepared by contractors should include related plans to be prepared, as appropriate, for project implementation, such as Erosion and Sediment Control, Invasive Species Management, Emergency Response, Traffic and Safety Management, Dust and Noise Minimisation and Stakeholder Communication Plans.

The timing of construction and maintenance works should be planned to avoid any potential for negative cumulative impacts or inter-relationships with other schemes, plans or projects, yet with a view to optimise any potential positive cumulative impacts or inter-relationships.

Works should only be carried out once the method statements have been agreed with competent authorities such as SNH, Historic Environment Scotland and SEPA. At the project level it will not be sufficient to defer the production of construction method statements until construction commencement. These should be completed at the detailed design stage and may be subject to further Appropriate Assessment where potential impacts have been identified in the SEA Environmental Report - IBE1107Rp00003. Where there may be unavoidable impacts on protected habitats and/or species the necessary derogation licences should be applied for prior to seeking planning permission or approval for a scheme.

Marine construction and in stream works, such as sea wall refurbishment, groynes or dredging have the greatest potential for negative impacts during spawning / breeding and early nursery periods for aquatic and marine protected species. No marine or instream works should occur during restricted periods for relevant species and consultation should be undertaken with the appropriate authorities in this regard.

Monitoring of project level mitigation measures should be undertaken during and after works, to ensure effectiveness.

All works and planning of works should be undertaken with regard to all relevant legislation, licensing and consent requirements, and recommended best practice guidelines. An ecological clerk of works should be appointed for environmental management of each scheme, and where specific sensitive species may be impacted, an appropriate expert should also be appointed.

## **7.2 MONITORING**

The SEA Directive requires that the significant environmental effects of the implementation of an SMP are monitored in order to identify, at an early stage, unforeseen adverse effects and in order to undertake appropriate remedial action. For the environmental monitoring of the SMP the proposed indicators, data and responsible authorities are recommended in section 8.2 of the SEA Environmental Report - IBE1107Rp00003. These are based on the Targets and Indicators established in the SEA Objectives. This monitoring will be undertaken in the course of the SMP adoption.

Detailed monitoring for specific policies proposed should be re-scoped in consultation with the appropriate authorities at the detailed feasibility and design stages. This agreed detailed monitoring should then be undertaken before, during and after construction, where and when appropriate.

## 8 NEXT STEPS

### 8.1 APPLICATION OF THE SMP IN SPATIAL PLANNING

The risk management policies set out in the Ayrshire SMP cannot be implemented through engineering or coastal defence management alone. It is important that the policies of the Ayrshire SMP are appropriately considered and reflected in regional and local spatial planning. This will ensure that long term coastal flooding and erosion risks are considered in the planning process.

Where a policy of **no active intervention** or **managed realignment** has been proposed, it is important that development zones are updated accordingly to ensure no inappropriate future development is carried out in areas which have been identified to be at risk due to coastal flooding or erosion. Even in areas where a policy of **hold the line** is recommended it may be necessary to limit the types of development permitted in order to manage future flood risk or indeed limit the development of presently undeveloped areas.

Table 8.1 contains actions which should be undertaken to ensure the Ayrshire SMP policies are appropriately reflected in regional and local spatial planning.

**Table 8.1 Actions for spatial planning**

Action	Responsibility
Inform Local Authority Planning Officers of the final Ayrshire SMP recommendations and implications.	Local Authority Officers
Include the Ayrshire SMP as reference material, or as an annex to local development plans.	
Ensure that SMP policies are integrated into Development Control activities to control development and flood risk.  Particular attention should be paid to No Active Intervention and Managed Realignment policies.	
Define 'No Development Areas'	

## 8.2 FURTHER ACTIONS TO FACILITATE MEDIUM/LONG TERM POLICIES

In addition to the specific actions outlined in the Action Plan, there is also a need for some activities to be progressed which require consideration over the whole Ayrshire SMP area or even beyond the scale of the Ayrshire SMP.

Table 8.2 summarises these actions.

**Table 8.2 Further actions to facilitate medium/long term policies**

Action	Responsibility
Formal adoption of the Ayrshire SMP by the Coast Protection Authorities, SEPA, SNH and Historic Environment Scotland.	NAC/ SAC
Promote the investigation, and implementation, of mechanisms to facilitate the removal of 'at risk' assets. This will facilitate implementation of long term No Active Intervention and Managed Realignment policies.	
Develop exit strategies/ management plans for the relocation of people and removal of assets when they become at risk from erosion.	
Develop and promote a public communication strategy with regards to potential future coastal issues and SMP recommendations.	
Develop a coastal monitoring strategy for the entire SMP area.	
Ensure alignment of the Clyde Regional Marine Plan with the SMP.	

### **8.3 MANAGEMENT OF SMP UNTIL NEXT REVIEW**

It is important that progress against the actions in the Action Plan is monitored so that any developments which might affect policy, and hence works, are notified. This also enables the need for revision of the SMP to be monitored.

Monitoring progress will be the responsibility of the project steering/technical group. The Action Plan should be published and updated at regular intervals (not less than once every six months) in order to track progress of each action and to communicate progress to stakeholders.

The Ayrshire SMP should be reviewed every six years in order to assess if the policies and actions proposed are still appropriate.

## 9 REFERENCES

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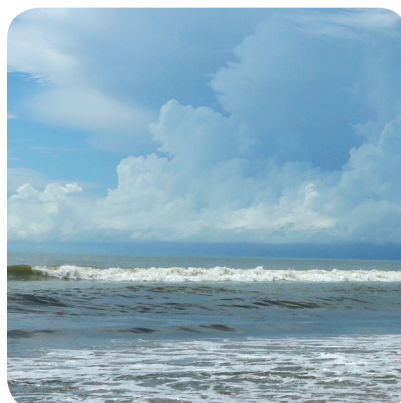
# Ayrshire Shoreline Management Plan

## Appendix A: SMP Development

IBE1107/D03

Final

July 2018





# Ayrshire Shoreline Management Plan

## Appendix A: SMP Development

### DOCUMENT CONTROL SHEET

Client	North / South Ayrshire Council					
Project Title	Ayrshire Shoreline Management Plan					
Document Title	Appendix A - SMP Development					
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## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>A-1</b>
<b>2</b>	<b>PROJECT INFORMATION .....</b>	<b>A-2</b>
	2.1 SMP BACKGROUND.....	A-2
	2.2 PROJECT STEERING GROUP (PSG).....	A-2
	2.3 CONSULTANT .....	A-2
	2.4 SMP STUDY BOUNDARIES .....	A-3
<b>3</b>	<b>SMP PROGRAMME .....</b>	<b>A-5</b>
	3.1 STAGE 1: SCOPE SMP .....	A-7
	3.1.1 Data Collection and Data Gap Analysis .....	A-7
	3.2 STAGE 2: ASSESSMENTS TO SUPPORT POLICY DEVELOPMENT .....	A-9
	3.2.1 Baseline Process Understanding of coastal behaviour and dynamics.....	A-9
	3.2.2 Sediment Sub-cell definition .....	A-9
	3.2.3 Flooding and Erosion Risk Assessment.....	A-11
	3.2.4 SEA Scoping Report.....	A-11
	3.3 STAGE 3: POLICY DEVELOPMENT .....	A-12
	3.3.1 Derivation of policy units and draft policies .....	A-12
	3.3.2 Supporting Assessments .....	A-12
	3.3.3 Develop Action Plan .....	A-13
	3.3.4 Economic Appraisal.....	A-13
	3.3.5 Draft Consultation SMP Document and Appendices .....	A-14
	3.4 STAGE 4: PUBLIC EXAMINATION .....	A-15
	3.4.1 Gain Approval in Principle.....	A-15
	3.4.2 Confirm Consultation Strategy .....	A-15
	3.4.3 Public Consultation .....	A-15
	3.5 STAGE 5: FINALISE PLAN .....	A-16
	3.5.1 Determine revisions to the draft SMP.....	A-16

- 3.5.2 Finalise SMP ..... A-16
- 3.6 STAGE 6: PLAN DISSEMINATION ..... A-17
  - 3.6.1 Dissemination and Implementation of the Final SMP ..... A-17
- 4 REFERENCES ..... A-18**

## **1 INTRODUCTION**

This Appendix provides a summary of the Shoreline Management Plan (SMP) development process adopted, a description of the policy decision-making process and outlines the chronology of the SMP development.

As such it provides a 'route map' for the supporting information used in the SMP development included in the other appendices.

## 2 PROJECT INFORMATION

### 2.1 SMP BACKGROUND

The requirement for a SMP covering the Ayrshire coastline was identified by SEPA through the development of the Ayrshire Local Flood Risk Management Strategy and implementation of the strategy is detailed in the Ayrshire Local FRM Plan.

This SMP was developed and produced in accordance with the latest Procedural Guidance (PG) for the production of SMPs (Defra, 2006). The SMP was initiated in May 2016, with the draft for consultation produced in January 2018.

### 2.2 PROJECT STEERING GROUP (PSG)

The Ayrshire SMP has been developed in partnership between the operating authorities and other organisations with key roles in shoreline management. The project was led by a Project Steering Group (PSG), with North Ayrshire Council acting as lead authority in developing and managing the SMP. Members of this group are listed in Table 2.1.

**Table 2.1 Ayrshire SMP Project Steering Group members**

Organisation	Name
North Ayrshire Council (NAC) (involving their engineering and planning departments)	Patricia Rowley
South Ayrshire Council (SAC) (involving their engineering and planning departments)	Scott Greig
Scottish Environment Protection Agency (SEPA)	David Scott
Scottish Natural Heritage (SNH)	Alistair Rennie
Historic Scotland	John Raven

### 2.3 CONSULTANT

RPS was commissioned to produce the SMP on behalf of North and South Ayrshire Councils. The key team members are listed in Table 2.2.

**Table 2.2 Ayrshire SMP Key Team members**

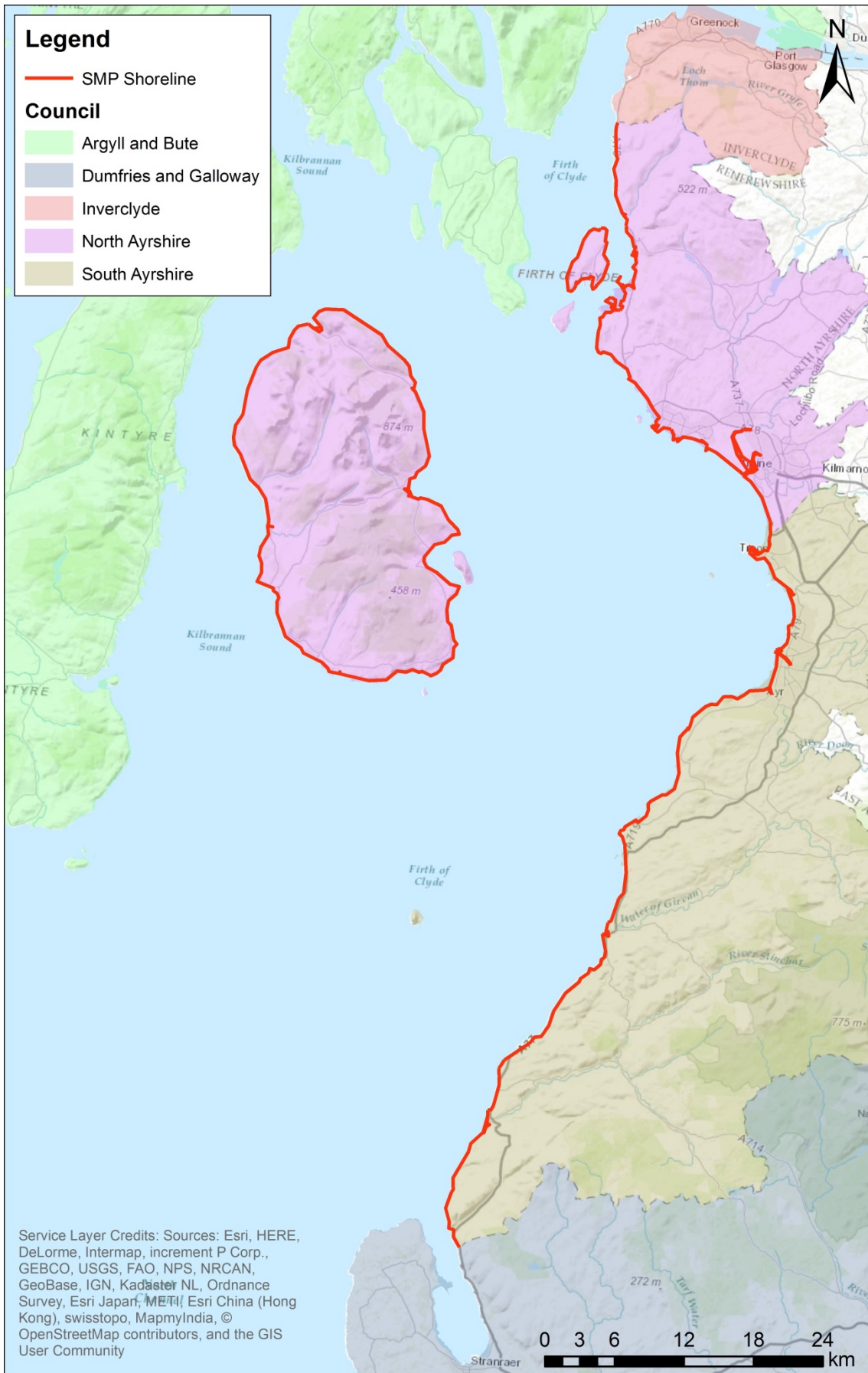
Name	Role
Andrew Jackson	Project Director
Malcolm Brian	Project Manager
Adrian Bell	Coastal Processes Lead
David Irwin	Coastal Processes
Richard Bingham	SEA Lead
Danielle King	SEA and Communications

## 2.4 SMP STUDY BOUNDARIES

The administrative boundaries of the Ayrshire SMP extend from the northern boundary of the North Ayrshire Council area to the southern boundary of the South Ayrshire Council area. This is approximately from the town of Skelmorlie to the outlet of the Galloway Burn on the north-eastern edge of Loch Ryan. The islands of Great Cumbrae and Arran are also included within the scope of the Ayrshire SMP.

Coastal processes are not restricted by the presence of these administrative boundaries, therefore the implications of the suggested management measures have been considered for the adjacent council areas of Inverclyde and Dumfries & Galloway, even though policy for these areas is not set by the Ayrshire SMP.

The area of application of the Ayrshire SMP is illustrated graphically in Figure 2.1.



**Figure 2.1 Ayrshire SMP area**



### 3 SMP PROGRAMME

Table 3.1 illustrates the timetable of activities carried out as part of the SMP development. Activities which involved stakeholder engagement are highlighted in *italics*.

**Table 3.1 Ayrshire SMP Programme**

Stage	Activities
Stage 1: Scope SMP	<ul style="list-style-type: none"> <li>• Undertaken by North and South Ayrshire Councils</li> <li>• Data Collection and Data Gap Analysis</li> </ul>
Stage 2: Assessments to Support Policy	<ul style="list-style-type: none"> <li>• Baseline Process Understanding of coastal behaviour and dynamics developed</li> <li>• Sediment Sub-cell definition</li> <li>• <i>PSG meeting to discuss proposed sediment sub-cells</i></li> <li>• Stakeholder feedback incorporated</li> <li>• Flooding and Erosion Risk Assessment</li> <li>• <i>SEA scoping undertaken</i></li> </ul>
Stage 3: Policy Development	<ul style="list-style-type: none"> <li>• <i>PSG meeting to discuss assets at risk of flooding and/or erosion, and to develop policy ideas by coastal sub-cell</i></li> <li>• Consideration of Stakeholder feedback</li> <li>• Derivation of policy units and draft policies</li> <li>• Strategic Environmental Assessment of draft policy</li> <li>• Appropriate Assessment of draft policy</li> <li>• <i>PSG workshop to discuss potential shoreline management actions</i></li> <li>• Develop Action Plan</li> <li>• Economic Appraisal</li> <li>• Preparation of draft consultation SMP document and appendices</li> </ul>
Stage 4: Public Examination	<ul style="list-style-type: none"> <li>• <i>Public Consultation</i></li> <li>• Analysis of consultation responses</li> <li>• Produce Consultation report</li> </ul>
Stage 5: Finalise SMP	<ul style="list-style-type: none"> <li>• Determine and implement revisions to SMP and SEA</li> </ul>

Stage	Activities
	<ul style="list-style-type: none"><li>• Finalise SMP and SEA</li></ul>
Stage 6: SMP Dissemination	<ul style="list-style-type: none"><li>• Publicise SMP</li><li>• Implement SMP</li></ul>

### 3.1 STAGE 1: SCOPE SMP

Scoping for the Ayrshire SMP was completed by North and South Ayrshire Councils in July 2015. This set out the guiding principles of the Ayrshire SMP, along with the required location and extent. The overall development process was determined along with target timescales.

#### 3.1.1 Data Collection and Data Gap Analysis

An initial review of available information was undertaken by North and South Ayrshire Councils. The information obtained is shown in Table 3.2.

**Table 3.2 Data obtained during initial review**

Source	Data
North Ayrshire Council	<ul style="list-style-type: none"> <li>• Irvine to Ardrossan Coastal Study               <ul style="list-style-type: none"> <li>○ Main Report</li> <li>○ Ardrossan Harbour and Headland</li> <li>○ North Ardrossan Local Study</li> <li>○ Ardeer Peninsula &amp; Garnock &amp; Irvine Estuaries</li> <li>○ Saltcoats Bay &amp; Harbour Feasibility Study</li> </ul> </li> <li>• Ardrossan Northshore Development – Technical Note</li> <li>• Coastal Protection Asset Survey Report               <ul style="list-style-type: none"> <li>○ Mainland</li> <li>○ Arran</li> <li>○ Cumbrae</li> </ul> </li> <li>• North Ayrshire Coastal Study – Farland Pt to Skelmorlie</li> <li>• Sandylands Promenade Engineers Report</li> <li>• Millport Coastal Flood Risk Assessment</li> <li>• Millport FRA Option Appraisal</li> </ul>
South Ayrshire Council	<ul style="list-style-type: none"> <li>• Coastal Protection Study</li> <li>• Defence Inspections 2015</li> <li>• Local Development Plan</li> <li>• FRA North Beach Road Barassie</li> <li>• FRA Doune Mill Burns Girvan</li> <li>• FRA Troon Shore</li> <li>• FRA Cunning Park, Ayr</li> <li>• SNH Report – Beaches of Southwest Scotland</li> </ul>

Source	Data
SEPA	<ul style="list-style-type: none"><li>• Study of the Clyde Sea Tidal Circulation</li></ul>

This information was reviewed by RPS' coastal engineers in order to ascertain if sufficient information was available to fully inform the development of the Ayrshire SMP. It was concluded that there was not enough existing information regarding the baseline coastal processes within the remit of the Ayrshire SMP study area.

An approach to provide the required information and inform the understanding of the coastal processes was agreed. This involved detailed computational modelling as detailed in **Appendix C**.

## **3.2 STAGE 2: ASSESSMENTS TO SUPPORT POLICY DEVELOPMENT**

### **3.2.1 Baseline Process Understanding of coastal behaviour and dynamics**

#### **3.2.1.1 Assessment of coastal processes and evolution**

A high level assessment of coastal behaviour and understanding was undertaken. Computational modelling of the hydrodynamic processes around the Firth of Clyde was undertaken to gain an understanding of the tides, wave climate and sediment transport regime. The impact of climate change was also considered in order to gain an understanding of how these coastal processes may change in the future. This assessment is detailed in **Appendix C**.

#### **3.2.1.2 Assessment of Shoreline Management Assets**

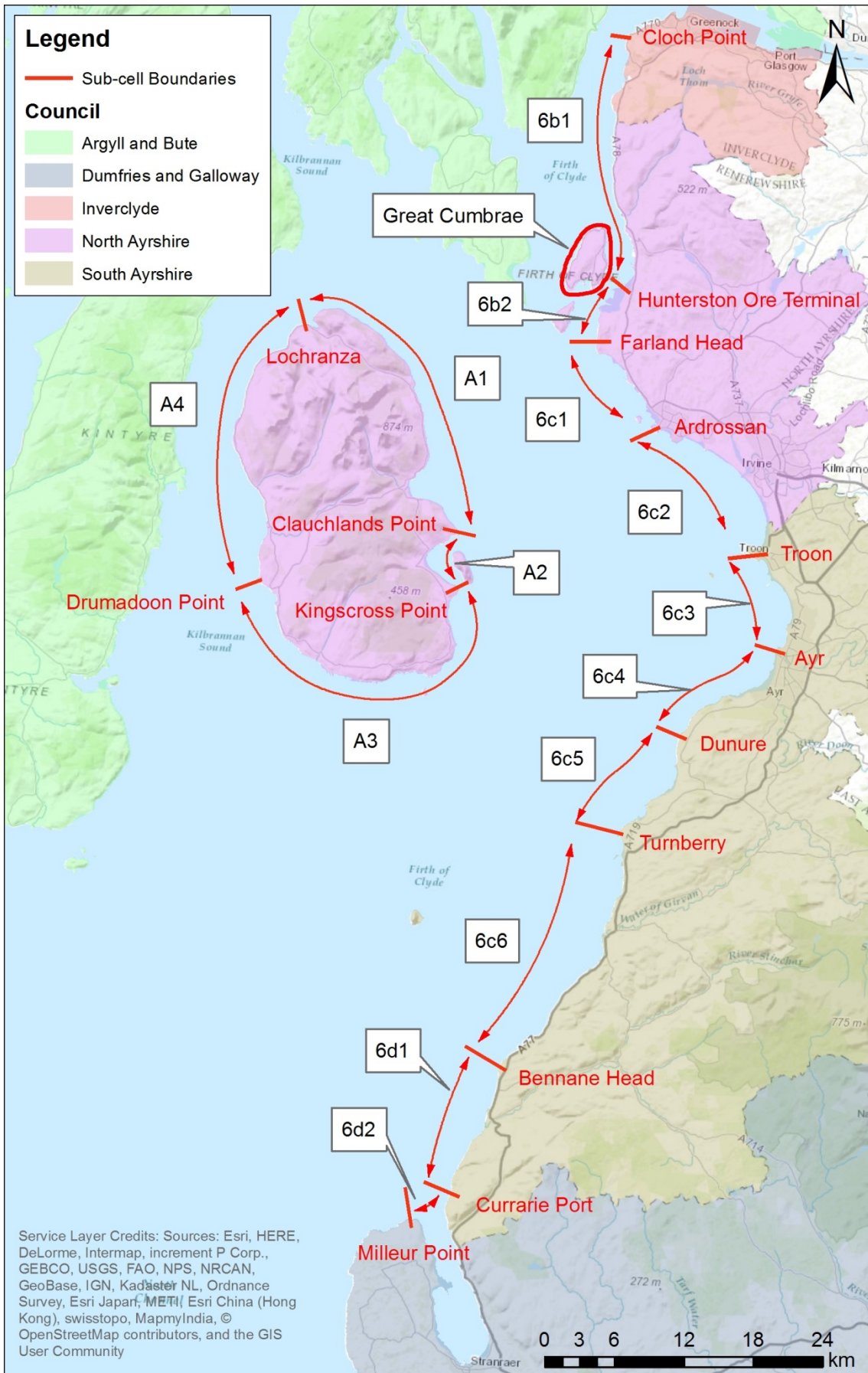
Information from coastal asset inspection and survey reports has been used to identify the shoreline management assets currently in place along the Ayrshire coast, and is included within **Section 3** of the main SMP document.

Inspection Reports from surveys carried out for North Ayrshire by AECOM between October 2013 and February 2014 adopted the methodology described in the Condition Assessment Manual (Environment Agency, 2006) to determine the overall condition of structures, with defences identified as being in Very Good, Good, Fair, Poor or Very Poor condition. A Coastal Protection Study incorporating inspections of the shoreline was carried out for South Ayrshire in 1999 by White Young Green with further coastal inspections were undertaken for South Ayrshire in 2015. Condition classification in these studies was based on BA 63/94 for each element of the structures and the extent and severity of any defects was also noted.

### **3.2.2 Sediment Sub-cell definition**

In order to facilitate the development and presentation of appropriate shoreline management policies for the Ayrshire Coastline it was essential to sub-divide the full extent of the Ayrshire coastline in to a number of smaller geographic sections. A broad scale assessment of sediment transport potential using computational modelling was used to sub-divide the Ayrshire coastline in to coastal 'sub-cells'. The boundaries between adjacent coastal sub-cells were defined as locations across which there is little or no sediment exchange.

A total of 15 sub-cells were thus identified as shown in Figure 3.1.



**Figure 3.1 Coastal sub-cell boundaries for the Ayrshire and Arran coastlines**

### 3.2.3 Flooding and Erosion Risk Assessment

An assessment of the assets at risk of flooding or erosion was undertaken based on previously published studies. Properties, roads and environmentally designated areas were all assessed. Both the erosion and flood risk data was derived from nationally consistent datasets.

Reported information on the susceptibility of the shoreline to coastal erosion was drawn from the outputs of The National Coastal Change Assessment (NCCA). This study is a national study undertaken by SNH to quantify the amount and rate of coastal change around the Scottish Coast. Data for the Ayrshire coast in the form of derived erosion rates and potential coastline set-back lines, was made available in GIS format by the SNH team. This dataset was used to assess the assets predicted to be at risk of damage due to shoreline change.

Similarly reported information on the coastal flood risk was drawn from the information developed by SEPA as part of the process of implementing the EU Floods Directive in Scotland. Data in the form of flood risk extents was made available in GIS format by SEPA for this study. This dataset was used to assess the assets predicted to be at risk of damage due to coastal inundation, however this dataset does not account for flood risk due to wave overtopping.

No comparable datasets were identified from which the risk associated with wave overtopping could be identified, some local studies were found, for example for Millport on Great Cumbrae, however as there was not consistent coverage of the entire Ayrshire coastline this source of flood risk has not be fully considered in this version of the Ayrshire SMP. Instead an approach has been taken of recommending further study in areas where anecdotal evidence suggests that wave over-topping may be a contributor to flood risk.

### 3.2.4 SEA Scoping Report

A SEA Scoping Report (**IBE1107Rp0001**) was prepared to determine the level of detail to be included in the SEA Environmental Report, including the proposed SEA methodology, and to enable the Statutory Consultation Authorities to form a view on the scope of the Plan. The Scoping Report described relevant environmental baseline data, proposed a framework of SEA objectives, presented our initial understanding of key environmental issues within the SMP area at that time, and considered other plans and programmes of relevance. This report also scoped out issues not requiring further assessment.

### **3.3 STAGE 3: POLICY DEVELOPMENT**

#### **3.3.1 Derivation of policy units and draft policies**

Defra SMP guidance (Defra, 2006) was used to outline four potential shoreline management policies, namely:

- Advance the existing defence line
- Hold the existing defence line
- Managed realignment
- No active intervention

The main factors influencing policy decisions along the coast were determined based on the flooding and erosion risk assessment and consultation with the PSG. Stakeholder engagement was sought at this stage in order to gain a wider appreciation of the shoreline features which may influence the chosen policy for a particular section of shoreline.

A screening procedure taking into consideration the assets at risk and stakeholder feedback was undertaken to further sub-divide the study area into 'policy units' and determine draft shoreline management policy for each policy unit. In this context a policy unit is defined by the geographic extent of the applicability of a particular management policy, ownership of assets at risk and the extent of administrative responsibilities. Policy units as defined for the Ayrshire SMP always lie within a single sub-cell, even though there may be locations where the recommended management policy and other defining parameters may be the same in the adjacent sub-cell.

#### **3.3.2 Supporting Assessments**

##### **3.3.2.1 Strategic Environmental Assessment**

An important part of the SMP process is to understand and assess how the Plan will impact on the environment by considering both positive and negative effects of policies on, and relationships between, wildlife and habitats, people and their health, soil, water, air, climate, landscape and cultural heritage.

Under the SEA Directive (2001/42/EC) of the European Parliament and European Council on the assessment of the effects of certain plans and programmes on the environment, a SEA is required for certain statutory plans. As SMPs are not required by legislation, SEA is also not strictly required. However, SMPs do set a framework for future coastal risk management and for planning decisions, and have the potential to result in significant environmental effects, and consequently an SEA has been undertaken as best practice. This is detailed in the SEA Environmental Report (**IBE1107Rp0003**).



### 3.3.2.2 Appropriate Assessment

An Appropriate Assessment for the Ayrshire SMP has been carried out in parallel with the SEA process. The output of this is a Habitats Regulations Appraisal (HRA), which has been prepared in accordance with the requirements of the EC Habitats Directive (92/43/EEC) and European Union Birds Directive (79/409/EEC) to influence the draft Plan and to provide SNH with information on the draft Plan, the process undertaken for the HRA and to establish whether or not the Ayrshire SMP is likely to have a significant effect upon any European sites(s). The findings of the HRA have been integrated into the SEA Environmental Report (**IBE1107Rp0003**) and subsequently into the Plan.

### 3.3.3 Develop Action Plan

A long list of potential shoreline management actions (**Appendix D**) was derived based on 'Shoreline Management Guidelines' (Mangor et al., 2017). This is a non-exhaustive list of potential shoreline management actions, and was used to inform the discussion with stakeholders about potential ways the shoreline management policy for each policy unit could be achieved. Stakeholder engagement was sought through a workshop (**Appendix D**) and the feedback from this was used to inform the development of the Action Plan in **section 6** of the main SMP document.

Proposed shoreline management actions were developed for three epochs: short (0 – 20 years), medium (20 – 50 years), and long-term (50 – 100 years). Responsibility for each action was designated based on the stakeholders influencing/ influenced by the action.

A priority level (high, medium or low) was designated to each action based on the importance of the action. For example actions influencing public safety or property damage due to flooding or erosion were designated as high priority.

### 3.3.4 Economic Appraisal

A high level economic review of the actions proposed in **section 6** of the main SMP document was carried out and the results of this Economic Appraisal are given in **Appendix E**.

The potential economic damages to assets due to coastal flooding (excluding wave overtopping) were assessed. Values of Average Annual Damage (AAD) were calculated based on the SEPA Flood Risk Appraisal Baseline National Coastal Receptor outputs.

Based on the AAD values, Present Value Damages (PVD) were calculated for the receptors at risk. The PVD is the cumulative AAD taken over the lifetime of the project discounted back to the present day. A project lifetime of 100 years was assumed.

The PVD is therefore an appropriate indicator of the potential additional economic benefit which could be gained by implementing shoreline management actions which provide effective flood protection. However it is acknowledged that in certain areas the reported PVD will be an underestimation of the actual benefit available due to the omission of costs associated with damages due to wave over-topping and / or coastal erosion from the economic analysis.

Potential cost estimates of each action were also provided based on experience from previous studies. These are high-level estimates and subject to change.

### **3.3.5 Draft Consultation SMP Document and Appendices**

A draft version of the main SMP document was produced to clearly present the Plan and the associated policies for review and consultation. This included:

- An introduction to the Ayrshire SMP including why this study was being undertaken.
- Details of the objectives and general principles of the Ayrshire SMP.
- An overview of the Plan development process.
- Draft Policy Statements for each policy unit
- Draft Action Plan

## **3.4 STAGE 4: PUBLIC EXAMINATION**

### **3.4.1 Gain Approval in Principle**

The draft Plan was presented to North and South Ayrshire Councils for comment between August and November 2017. Following updates to the Plan document and supporting Appendices based on feedback from North and South Ayrshire Councils, an updated document was submitted to the Councils for approval to go forward to public consultation.

### **3.4.2 Confirm Consultation Strategy**

A strategy for the public consultation exercise was developed. Some of the agreed methods of consultation were:

- Newsletters/ Information leaflets
- Stakeholder workshops/ Public consultation days
- Email service
- Websites
- FAQs
- Feedback forms
- Advertisement/ Press release

### **3.4.3 Public Consultation**

Public consultation events were undertaken between February-March 2018. The public consultation report based on feedback from these events is included in **Appendix B**.

### **3.5 STAGE 5: FINALISE PLAN**

#### **3.5.1 Determine revisions to the draft SMP**

Comments received during the public consultation period have been reviewed and any required revisions to the Draft Plan documents based on these comments determined.

#### **3.5.2 Finalise SMP**

All revisions to the Plan documents determined from the review of feedback received during the public consultation period have been implemented to finalise the SMP.

## **3.6 STAGE 6: PLAN DISSEMINATION**

### **3.6.1 Dissemination and Implementation of the Final SMP**

North and South Ayrshire will be responsible for making the SMP accessible, for publicising its completion and monitoring progress against the Action Plan. The SMP will be published on both the North Ayrshire Council and South Ayrshire Council web pages.

It is considered likely that the next review of the SMP will take place within a 5-10 year period.

## 4 REFERENCES

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# Ayrshire Shoreline Management Plan

## Appendix B: Stakeholder Engagement

IBE1107/D03

Final

July 2018





# Ayrshire Shoreline Management Plan

## Appendix B: Stakeholder Engagement

### DOCUMENT CONTROL SHEET

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## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION.....</b>	<b>B-1</b>
1.1	BACKGROUND .....	B-1
1.2	GUIDING PRINCIPLES.....	B-1
1.3	STAKEHOLDER MAPPING .....	B-1
1.4	PROJECT STEERING GROUP.....	B-3
1.5	CONSULTATION ACTIVITIES .....	B-3
	1.5.1 Initial Consultation .....	B-3
	1.5.2 Elected Member Briefing.....	B-5
	1.5.3 Public Consultation.....	B-5
1.6	CONSULTATION FEEDBACK.....	B-7
	1.6.1 Initial Consultation .....	B-7
	1.6.2 Public Consultation.....	B-9

## LIST OF TABLES

Table 1: Stakeholders consulted in relation to the Stakeholder Consultation Report.....	B-3
Table 2: Draft Plan Public Consultation Days .....	B-5

# **1 INTRODUCTION**

## **1.1 Background**

The Ayrshire Shoreline Management Plan (SMP) aims to provide guidance to operating authorities and regulatory bodies as to future sustainable flood and coastal erosion risk management policy along the Ayrshire coastline. The SMP essentially provides an agreed high level approach, intent and framework for shoreline management. In addition, the SMP also aims to provide guidance to planners, individuals and organisations with interests in the coast; setting out an overview of coastal behaviour, the pressures, constraints and opportunities for sustainable use of the coastal zone to facilitate and guide others in the development of their own plans.

To achieve this, meaningful and effective stakeholder communication and engagement was critical as it provided an essential means by which to improve the quality and comprehensiveness of the Plan. This was realised, by providing platforms through which the unique expertise and opinions of interested parties could be assimilated and taken into consideration throughout the decision-making process. This further enabled stakeholders to take ownership of the chosen solution(s).

## **1.2 Guiding principles**

Positive relationships, built upon trust and mutual understanding, are necessary to ensure effective stakeholder participation. Consequently, all communication and consultation activities adhered to the principles of being proactive, accessible, meaningful and accountable so as to provide for overall effectiveness.

Using these principles, stakeholder communication and engagement may take many direct and indirect forms, using both contemporary and traditional mediums, whilst remaining ever fluid and flexible so as to ensure that stakeholder and project needs are tailored to, as and when required.

## **1.3 Stakeholder Mapping**

The tailored nature of communication and engagement activities was dependent upon the identification of individuals and groups interested in, or affected by, the Plan. Consequently, stakeholder mapping was an essential conduit to ensuring that individuals and organisations were identified and targeted with relevant information about the project at the appropriate juncture(s).

Stakeholder mapping activities for the Ayrshire SMP included:

- an initial stakeholder mapping exercise; and
- ongoing stakeholder mapping activities.

The initial stakeholder mapping exercise included compilation of a list of all potential relevant stakeholders including:

- Environmental Authorities;
- Primary Stakeholders;
  - Government Departments;
  - County, city and town councils.
- Secondary Stakeholders:
  - State agencies and bodies;
  - Regional authorities;
  - Development boards;
  - Industry and representative bodies;
  - Non-governmental organisations;
  - Research projects.

Stakeholder details were compiled into a Stakeholder Register. The stakeholders included in the register constituted the Stakeholder Group. Ongoing stakeholder mapping ensured that the Stakeholder Register remained relevant and up-to-date.

Additional interested parties outside of the Stakeholder Group were also identified. These included:

- The general public living within the vicinity of the Ayrshire coast;
- Local groups;

- Councillors; and
- MSPs.

These individuals were invited to attend public consultation activities, and to use the various other mechanisms established to engage with the project team during the Plan development.

## 1.4 Project Steering Group

In addition to the Stakeholder Group and those interested parties identified during stakeholder mapping, a Project Steering Group (PSG) was established at the project outset to provide information and specialist knowledge in relation to the Plan. It was principally composed of statutory consultees, local authorities and other primary interest groups; to provide for the consideration of all interests when reviewing issues. The group meet regularly throughout the life of the project to discuss and provide feedback in relation to the development of the Plan. It provided a forum through which collaborative decision-making could be achieved in order to enhance stakeholder ownership of final decisions.

## 1.5 Consultation Activities

### 1.5.1 Initial Consultation

The Ayrshire Stakeholder Consultation Report was distributed to members of the Stakeholder Group on Monday 22<sup>nd</sup> May 2017. The report provides a brief description of the scope, necessity and intended purpose of the Plan. It was sent as an accompaniment to an email that invited members to provide information which might be pertinent to the successful development of the Plan.

Responses in relation to the report were received from several stakeholders who provided further details regarding past and present coastal processes, environmental concerns and works which had previously been undertaken. Details of responses received can be found in section 1.6.1.

**Table 1:** Stakeholders consulted in relation to the Stakeholder Consultation Report

Organisation	Contacted	Received	Medium
RSPB	22/05/2017	N/A	N/A
Firth of Clyde Forum	22/05/2017	14/06/2017	Email
Scottish Water	22/05/2017	14/06/2017	Tel/Email
Transport Scotland	22/05/2017	12/06/2017	Email
Hunterston/EDF	22/05/2017	N/A	N/A

<b>Largs Golf Club</b>	22/05/2017	N/A	N/A
<b>Routenburn Golf Club</b>	22/05/2017	N/A	N/A
<b>West Kilbride Golf Club</b>	22/05/2017	N/A	N/A
<b>Auchenharvie Golf Club</b>	22/05/2017	N/A	N/A
<b>Irvine Bogside Golf Club</b>	22/05/2017	N/A	N/A
<b>Gailes Link</b>	22/05/2017	N/A	N/A
<b>Western Gailes Golf Club</b>	22/05/2017	13/06/2017	Email
<b>Dundonald Links</b>	22/05/2017	N/A	N/A
<b>Troon Yacht Havens</b>	22/05/2017	N/A	N/A
<b>Darley Golf Course</b>	22/05/2017	N/A	N/A
<b>Fullarton Golf Club</b>	22/05/2017	N/A	N/A
<b>Lochgreen Golf Course</b>	22/05/2017	N/A	N/A
<b>Royal Troon Golf Club</b>	22/05/2017	12/06/2017	Tel/Email
<b>Prestwick St Nicholas Golf Club</b>	22/05/2017	N/A	N/A
<b>Prestwick St Cuthbert</b>	22/05/2017	N/A	N/A
<b>Dalmilling Golf Club</b>	22/05/2017	N/A	N/A
<b>Seafield Golf Course</b>	22/05/2017	N/A	N/A
<b>Belle isle Golf Club</b>	22/05/2017	N/A	N/A
<b>Trump Turnberry Ailsa</b>	22/05/2017	N/A	N/A
<b>Girvan Golf Course</b>	22/05/2017	N/A	N/A
<b>Brodick Golf Club</b>	22/05/2017	N/A	N/A
<b>Futurescape</b>	22/05/2017	N/A	N/A
<b>Ayrshire Rivers Trust</b>	22/05/2017	12/06/2017	Email
<b>Community of Arran Seabed Trust</b>	31/05/2017	N/A	N/A
<b>Whiting Bay and Districts Improvement Association</b>	N/A	15/06/2017	Email
<b>North Ayrshire Council</b>	31/05/2017	15/08/2017	Email

### 1.5.2 Elected Member Briefing

In August 2017, Elected Members within North and South Ayrshire were provided with a short summary of the Ayrshire SMP and its associated environmental assessments. They were also provided with a PowerPoint presentation which detailed the scope, objectives, and policy options available to the Plan; along with a brief summary of the assets which had been identified as being at risk of coastal flooding. The purpose of these documents was to better inform Elected Members of the Plan, as a way of maintaining and enhancing stakeholder relationships, promoting positive dialogues in relation to the Plan, and ensuring ongoing transparency throughout the Plan development.

### 1.5.3 Public Consultation

Upon completion of the draft Plan, it was issued for public consultation. This was achieved by making the Plan and associated documents available in hard copy at North Ayrshire Council and South Ayrshire Council premises, and in electronic format via both Council websites. A number of Public Consultation Days; as detailed in Table 2 were also held to provide a forum for members of the public to view the draft Plan and directly engage with members of the Project Team; to ask questions, express concerns and/or provide feedback.

**Table 2:** Draft Plan Public Consultation Days

Location and Venue	Date and Time	RPS Staff	LA Staff
Irvine Library, 168 High Street, Irvine, KA12 8AN	Monday 19 <sup>th</sup> February 2018, 12pm – 7pm	MB/DK	PR
Millport Library, The Garrison, Millport, Isle of Cumbrae, KA28 0DG	Tuesday 20 <sup>th</sup> February 2018, 12pm - 6:50pm	MB/DK	PR
Ardrossan Civic Centre, 150 Glasgow Street, Ardrossan,	Wednesday 21 <sup>st</sup> February 2018, 12pm – 7pm	MB/DK	PR

KA22 8EU			
Brodick Library, Main Street, Brodick, Isle of Arran, KA27 8DL	Thursday 22 <sup>nd</sup> February 2018, 12pm - 6:50pm	MB/DK	PR
Largs Library, 26 Allanpark Street, Largs, KA30 9AG	Friday 23 <sup>rd</sup> February 2018, 12pm - 5pm	MB/DK	PR
Prestwick Library, 14 Kyle Street, Prestwick, KA9 1PQ.	Monday 5 <sup>th</sup> March 2018, 2pm – 6pm	MB/DK	SG
Carnegie Library, 12 Main Street, Ayr, KA8 8EB.	Tuesday 6 <sup>th</sup> March 2018, 2pm - 6pm	MB/DK	SG
Girvan Library, Montgomerie Street, Girvan, KA26 9HE.	Wednesday 7 <sup>th</sup> March 2018, 12pm - 1pm and 2pm – 5pm	MB/DK	SG
Troon Library, 5 South Beach, Troon, KA10 6EF.	Thursday 8 <sup>th</sup> March 2018, 2pm - 6pm	MB/DK	SG

## 1.6 Consultation Feedback

### 1.6.1 Initial Consultation

Information received in response to the invitation which was sent out to members of the Stakeholder Group to provide details which might be pertinent to the Plan can be summarised as follows:

Ayrshire Rivers Trust:

- Alterations to the mouth of the River Stinchar in 2013.
- Migratory trout common to all Ayrshire Rivers.
- Sedimentation resulting in management means such as dredging may lead to degradation of marine habitats. Reducing this type of sediment loss/deposition should be a priority.

Firth of Clyde Forum:

- Coast should be managed flexibly to allow for the uncertainties in the future impacts of sea-level rise and storminess on the shoreline.
- Reference to GEN 5 climate change on page 18-19 and Gen 8 on page 22 – 23 at: <http://www.gov.scot/Publications/2015/03/6517>

Royal Troon Golf Club:

- All the land within the ownership of Royal Troon Golf Club south of the Gyaws Burn lies within an SSSI (extends 150 hectares).
- The Royal Troon Golf Club enjoys gold level standard certification under the Golf Environment Organisation.
- Coastal protection work undertaken primarily comprised of chespaie sand fencing and the installation of gabions.
- In the late 80's/early 90's various remedial measures were implemented to regenerate and stabilise dunes however repeated severe storms resulted in continued loss of ground. Remedial measures include sand traps, fencing and netting, gabion wire baskets and plastic Georgia mesh.
- Formal monitoring regime currently in place – annual inspection and monitoring survey of coastal dynamics.
- “Coastal erosion at Royal Troon is fairly latent at least through certain sections with little obvious change being noted over the five year term. Certain sections of the coastline however, are not recovering following periods of erosion attributable to high tides and/or increased storm surge events”.



- “Areas of particular concern include the right of the 2<sup>nd</sup> tee through and right of the 3<sup>rd</sup> hole, although here coastal defences in the form of wire gabion baskets are holding up and will provide good short term protection against seawater inundation”.
- Another key issue highlighted in the report is the repositioning of the mouth of the Pow Burn, where the sandpit on the south side of the Burn is accreting which is pushing the Burn northwards with impacts on the dune system to the south of the 6<sup>th</sup> green.
- The Club has commissioned STRI Ecology and Environment to prepare a Coastal Management Plan. Various surveys will be undertaken as part of the study...these include botanical and winter bird surveys in addition to extensive desk top surveys.

#### Whiting Bay and Districts Improvements Association:

- Area between Sandbraes and Glen Ashdale Burn is subject to erosion; as is Sandbraes Park, the area opposite the school and the putting green.
- Erosion also at the standing area for a boat slip was protected by gabions but these are breaking up.
- Further south, gabions protect a parking area and a sea wall extends to the south. While the wall appears to be holding the sea back there have been times when it was breached and holes have appeared in the road. At high tides, the waves often come over the wall and can flood the other side of the road.
- Coastal erosion appears to be getting worse and at a much faster rate than in the past.

#### Western Gailes Golf Club:

- A limited number of large concrete pipes are supporting the dunes. The pipes are filled with sand. A local company looked to fortify some of the dunes with gabions.
- High tides in winter can give rise to sea water encroaching around the area of the burn at the south end of the golf course. Would estimate the depth to be up to around three feet in and around the burn area. This can give rise to sedimentation.
- Proportion of the dunes has been lost over the years as this would apply to the full extent of the course shoreline.
- Part of the golf course lies within an SSSI.
- Awaiting photographs of erosion/coastal landscape.

#### Transport Scotland:

- Suggested consulting SEPA/Local Council.

## **1.6.2 Public Consultation**

Information received via the Public Consultation Days and through the online consultation process is collated in the Consultation Summary Report, IBE1107Rp0005 July 2018. The comments received during public consultation events were generally positive and in agreement with the proposed policies for each policy unit or sub-cell and the Ayrshire coast as a whole. Where disagreement was expressed, it was mostly in relation to particular localised issues as opposed to issues affecting the entire policy unit or sub-cell. However all issues raised were noted, along with any suggestions for amendments or future work in order to ensure that the consultation process was fully inclusive.

One recurring comment related to concern with regard to the timescale for the implementation of the Plan, and any works which may result. Other key issues raised were as follows:

### **1.6.2.1 Clarity**

The need for greater clarity was identified in relation to several aspects of the Plan and Environmental Report (ER). In particular, the notion of maximum wave height required explanation, insofar as it needed to be clarified that the wave heights quoted within the Plan are those at the shoreline, as opposed to deep-sea wave heights, and are thus depth limited. Clarification was further required in relation to the depth of the Plan Area inland. Whilst this was noted in the ER as being a minimum of 1km inland of the coastline, this was not elucidated within the Plan. Clarification was also sought with regard to the extent of implementation of proposed policy within policy units. It was noted that it was unclear as to whether proposed policy would be implemented throughout the relevant policy unit or solely in relation to those areas which would justify the use of the policy. Further detail was added to the final Plan to clarify that the proposed policy provided an indication of the most appropriate approach towards shoreline management within a given unit. That said, the approach outlined is one of generality and thus the most appropriate measures with regard to specific sites will depend on the issue at hand, and upon the technical, environmental, social and economic circumstances which surround it.

### **1.6.2.2 Information**

The approach taken towards the development of the Plan, with regard to the information which was used in relation to its formulation, was both commended and criticised, and a range of suggestions relating to the use of further information was provided. An example of this relates to the use of Natural Environment Research Council's (NERC's) Greening the Grey document to inform the development of coastal defence infrastructure subsequent to the implementation of the Plan. A further example relates to the need to make specific reference to SEPA's indicative flood maps within the ER, with regard to the flood risk context along the shoreline.

The need to acknowledge the limitations of the information which was used to compile the Plan was also identified. For example, the Dynamic Coast: Scotland's National Coastal Change Assessment (NCCA) was used to inform the Plan. One of the limitations of this assessment is that it assumes no increase in erosion rates as a result of relative erosion risk where this has been managed in the past by way of defences. Another example relates to the use of SEPA's coastal flood maps which do not consider the impact of wave over-topping upon flood risk. These comments were noted and the limitations of the data are acknowledged in the final Plan.

#### **1.6.2.3 Detail**

Concern was expressed with regard to the level of detail into which the Plan went. This was particularly the case with regard to the use of coastal process information within the Plan. For example, it was expressed that the Plan did not adequately consider the interconnectedness of the coast and hinterland and the impact which this might have upon coastal processes and thus management approach. Another example related to a comment received which expressed concern for the extent to which modelling was undertaken and the extent to which it informed the management policies proposed. While this was acknowledged, the presumption on which the Plan was developed was that it would be based on existing information and knowledge (including that developed by way of modelling) without extensive recourse to new studies or research. No new modelling was thus undertaken as part of the Plan.

#### **1.6.2.4 Climate Change**

Criticism was received which suggested that a narrow view of climate change, one which does not adequately consider future changes to wave height and sediment movement, was undertaken during the development of the Plan. While this was acknowledged, the presumption on which the Plan was developed was that it would be based on existing information and knowledge without extensive recourse to new studies or research. Hence the effects of climate change could only be assessed to the degree that they had in the informing studies.

#### **1.6.2.5 Policy Development/Approach**

It was alleged that whilst the Plan takes into account the high-level impact of proposed policies upon tangible assets such as people, properties and material assets, it fails to consider intangible assets such as objectives relating to land use, landscape and the built and natural environment. This, it was claimed, results in an approach towards policy which focuses upon what is going to be built as opposed to what is trying to be achieved – i.e. integrated and sustainable shoreline management. This is incorrect as the plan and its associated policies were developed on the basis of what high level measures to manage the flood and erosion risk could be sustained from a geomorphological viewpoint

without incurring unacceptable impact on landuse, and the environment with little reference to what measures might actually be implemented and only passing reference to economic considerations. The setting of policy for each policy unit was heavily influenced by the input of strategic planners from North and South Ayrshire thus ensuring that the intangible aspects were given adequate consideration at this key stage of the process.

#### **1.6.2.6 Localised Issues**

A number of issues, such as the flooding of local road and rail infrastructure and the erosion of cultural heritage features, were highlighted. Furthermore, clarity was sought in relation to many localised issues, such as flooding to individual properties. The information which was received with regard to localised issues was acknowledged however it was not always possible to address these comments within the Plan and ER due to the strategic level of these documents. The policies which were proposed to manage the shoreline were reconsidered in light of new information, though it must be said that none of these changed significantly as a result of such reconsideration.

#### **1.6.2.7 Economic Justification**

The economic justification for the implementation of proposed policies was queried. This was particularly the case with regard to those areas in which extensive defences may be required despite few assets being at risk. Whilst this is an important issue, it was considered to be beyond the scope of the SMP as it requires detailed knowledge of measures to undertake the necessary cost/benefit assessment. It will be addressed where further study is pursued and measures are to be progressed to optioneering, design and construction.

#### **1.6.2.8 SMP Review**

Finally, the Plan concludes by stating that: *“The Ayrshire SMP should be reviewed in six years (2023) in order to assess if policies and actions proposed are still appropriate”*

It was commented that this statement suggests that there is little confidence in the policies proposed, given that it is the intention of the SMP to provide an approach to shoreline management which extends over the next 100 years and beyond, developed from a good and argued understanding of the coastline and coastal processes. This is incorrect; the coastline and human interaction with the coastline is constantly evolving. Hence it is entirely prudent that a strategic document such as the Ayrshire SMP is reviewed frequently in order to account for these changes. The suggested frequency of 6 years is associated with the typical review period for strategic development plans which the SMP is intended to inform, and was selected to ensure that the policies of the SMP are current when these documents are reviewed.



NORTH AYRSHIRE  
COUNCIL



# Ayrshire Shoreline Management Plan

## Appendix C: Data Gap Analysis - Coastal Processes

IBE1107/D03

Final

July 2018



[rpsgroup.com/ireland](http://rpsgroup.com/ireland)





# Ayrshire Shoreline Management Plan

## Appendix C: Data Gap Analysis – Coastal Processes

### DOCUMENT CONTROL SHEET

Client	North / South Ayrshire Council					
Project Title	Ayrshire Shoreline Management Plan					
Document Title	Appendix C - Data Gap Analysis – Coastal Processes					
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This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
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# TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	BACKGROUND.....	1
1.2	STUDY AREA.....	1
<b>2</b>	<b>TIDAL MODELLING.....</b>	<b>2</b>
2.1	TIDAL MODEL.....	2
2.1.1	Bathymetry .....	2
2.1.2	Modelling Procedure.....	5
2.1.3	Model Calibration and Verification .....	6
<b>3</b>	<b>WIND AND WAVE DATA .....</b>	<b>13</b>
3.1	DATA SOURCES .....	13
3.1.1	Wind Data.....	13
3.1.2	Wave Data.....	15
<b>4</b>	<b>MODELLING THE WAVE CLIMATE .....</b>	<b>17</b>
4.1	WAVE TRANSFORMATION MODELLING .....	17
4.1.1	Wave Transformation Model.....	17
4.1.2	Modelling Procedure.....	18
4.1.3	Littoral Current Results .....	24
<b>5</b>	<b>SEDIMENT TRANSPORT MODELLING .....</b>	<b>26</b>
5.1	SEDIMENT TRANSPORT MODEL .....	26
5.1.1	Sediment Transport Modelling Methodology.....	26
5.1.2	Sediment Sampling.....	26
5.1.3	Sediment Transport Modelling Results .....	27
5.1.4	Coastal Cell and Sub-Cell Boundaries .....	27
5.1.5	LiDAR Gap Sensitivity Testing.....	33
<b>6</b>	<b>CLIMATE CHANGE.....</b>	<b>34</b>
6.1	TIDAL MODELLING .....	34

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6.2	WAVE CLIMATE .....	36
6.2.1	Littoral Currents .....	36
6.3	SEDIMENT TRANSPORT .....	39
<b>7</b>	<b>REFERENCES .....</b>	<b>40</b>



# 1 INTRODUCTION

## 1.1 BACKGROUND

The requirement for a Shoreline Management Plan covering the Ayrshire coastline including the Isle of Arran was identified by SEPA through the development of the Ayrshire Regional Flood Risk Management Strategy. The SMP is required to provide guidance to operating authorities and regulatory bodies as to future sustainable flood and coastal erosion risk management, essentially providing an agreed high level approach, intent and framework for management.

In order to develop a sustainable approach to management of the shoreline, an understanding of the present and future behaviour of the coast was required.

## 1.2 STUDY AREA

The boundaries of the Ayrshire SMP are the northern boundary of North Ayrshire which includes the town of Skelmorlie but excludes Wemyss Bay, while the southern limit of the SMP is the Galloway Burn on the north-eastern edge of Loch Ryan. The islands of Great Cumbrae and Arran are also included within the scope of the SMP.

While the spatial extent of the final SMP policy recommendations is limited to the mainland and associated island coastlines within the North and South Ayrshire Council areas it is likely that the coastal processes will not reflect these administrative boundaries. The implications of the SMP recommendations therefore must had to be considered for an area wider than the defined Ayrshire SMP boundaries, even though policy would not be set for these areas by the Ayrshire SMP. These implications and impacts had to be considered in developing the plan and policies for the Ayrshire and associated island shorelines if they were to be truly sustainable.

## **2 TIDAL MODELLING**

### **2.1 TIDAL MODEL**

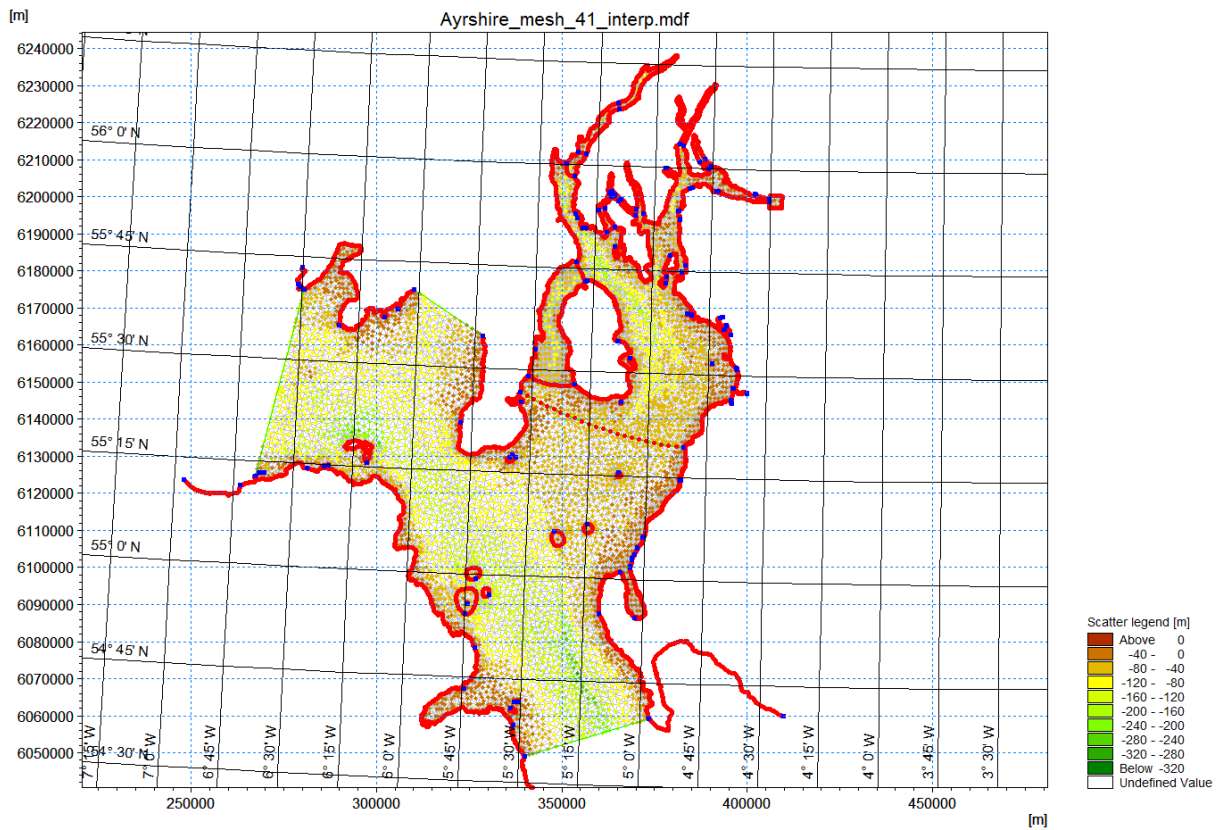
The modelling of the hydrodynamic processes around the Firth of Clyde was undertaken using the MIKE 21 FM HD model which is the basic computational component of the MIKE modelling system and provides the hydrodynamic basis for all other modules.

The application areas for MIKE 21 FM HD are generally situations where flow and transport phenomena are important with particular emphasis on coastal and marine applications, where the flexibility inherited in the unstructured meshes can be utilized.

The modelling system is based on the numerical solution of the two-dimensional shallow water equations - the depth-integrated incompressible Reynolds averaged Navier-Stokes equations. Thus, the model consists of continuity, momentum, temperature, salinity and density equations. In the horizontal domain both Cartesian and spherical coordinates can be used.

#### **2.1.1 Bathymetry**

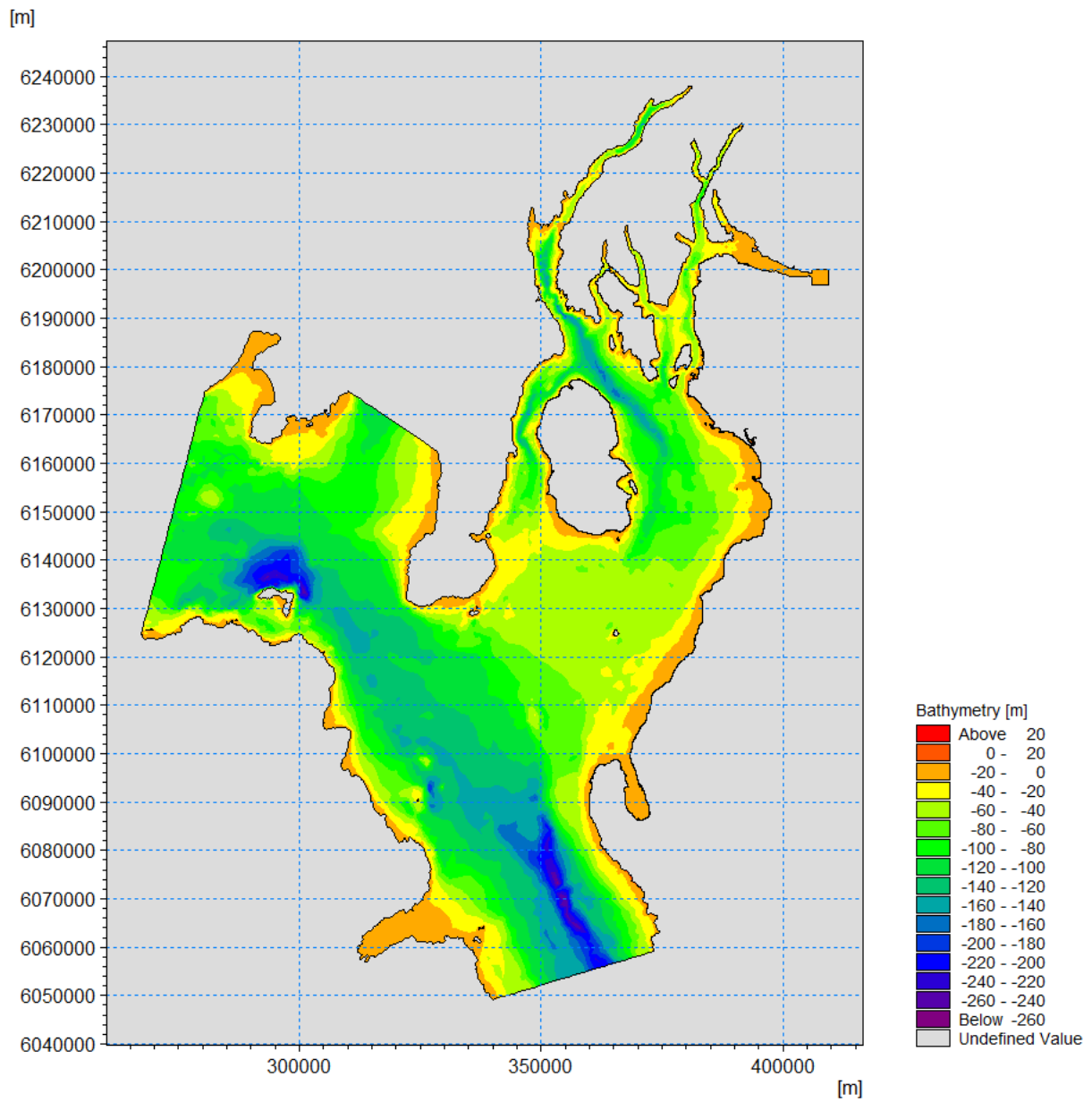
The analysis required the bathymetry around the north Irish Sea, the North Channel, the Firth of Clyde and the Sound of Jura to be included in the model. This was undertaken using a single flexible mesh grid system. The bathymetry data was derived from various sources including the INFOMAR, JIBS and MEDIN survey data as well as other surveys and digital chart data which RPS has collated for previous studies. Nearshore data was extracted from Lidar coverage of the shore line supplied by Ayrshire Council specifically for this project. The extent of the data used in the generation of the hydrodynamic model for this study is shown in Figure 2.1.



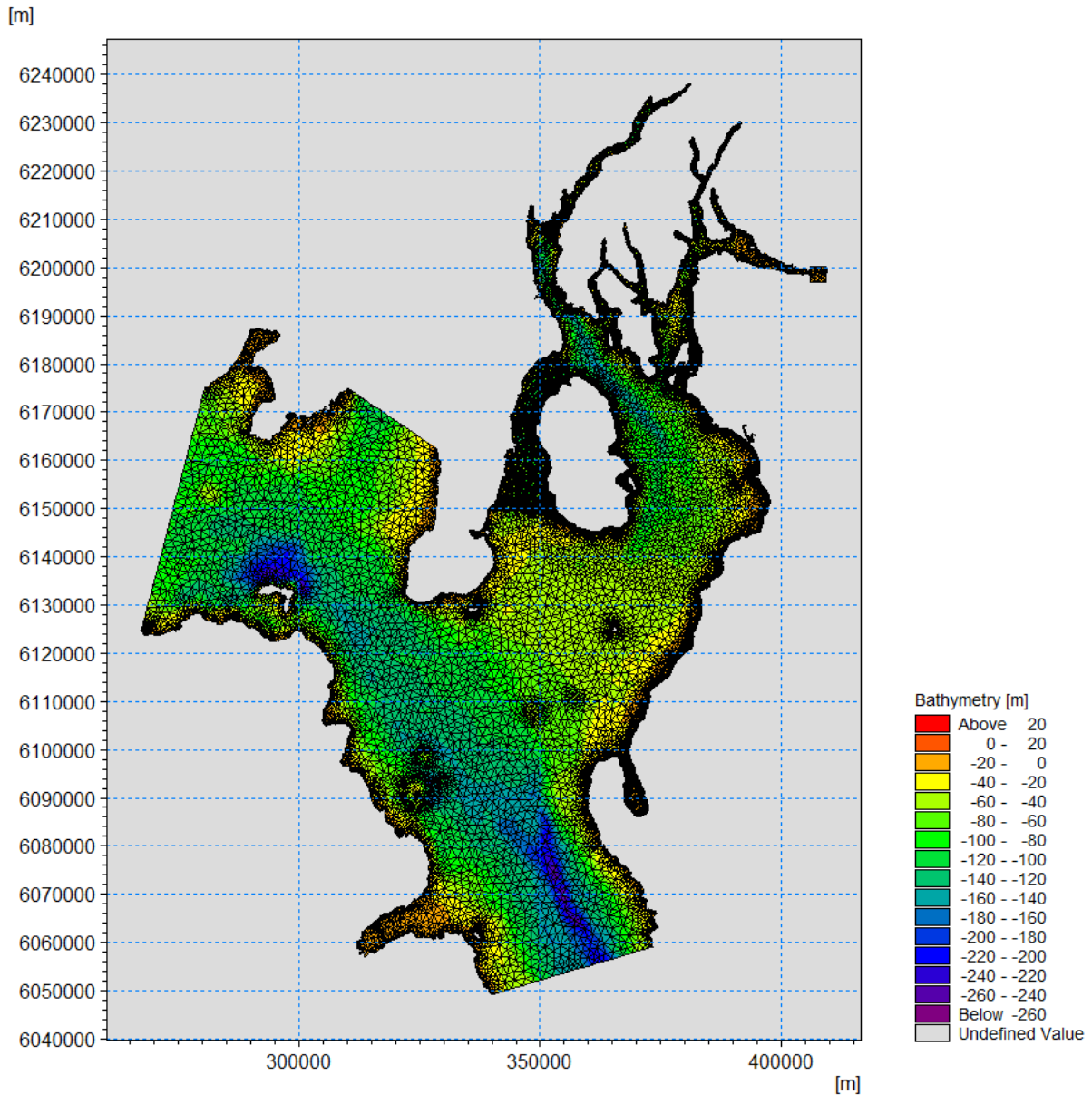
**Figure 2.1** Extent of bathymetry data used for the wave transformation model

The bathymetry of the flexible mesh model is shown in Figure 2.2 and the model mesh in Figure 2.3. The model had open boundaries along its southern and north western sides, as well as across the entrance to the Sound of Jura. The southern boundary stretched from Ballywalter in Northern Ireland to the southern tip of the Mull of Galloway. The north west boundary ran from Port Wemyss, Islay to Portrush in Northern Ireland. The boundary across the Sound of Jura ran from Glenbarr on the Kintyre Peninsula to Ardmore, Islay.

The mesh resolution employed in this model varied from about 1.4km away from the area of interest down to about 20m at the approaches to the Ayrshire shoreline.



**Figure 2.2 Model bathymetry – HD tidal model for Ayrshire SMP**



**Figure 2.3 Model mesh – HD tidal model for Ayrshire SMP**

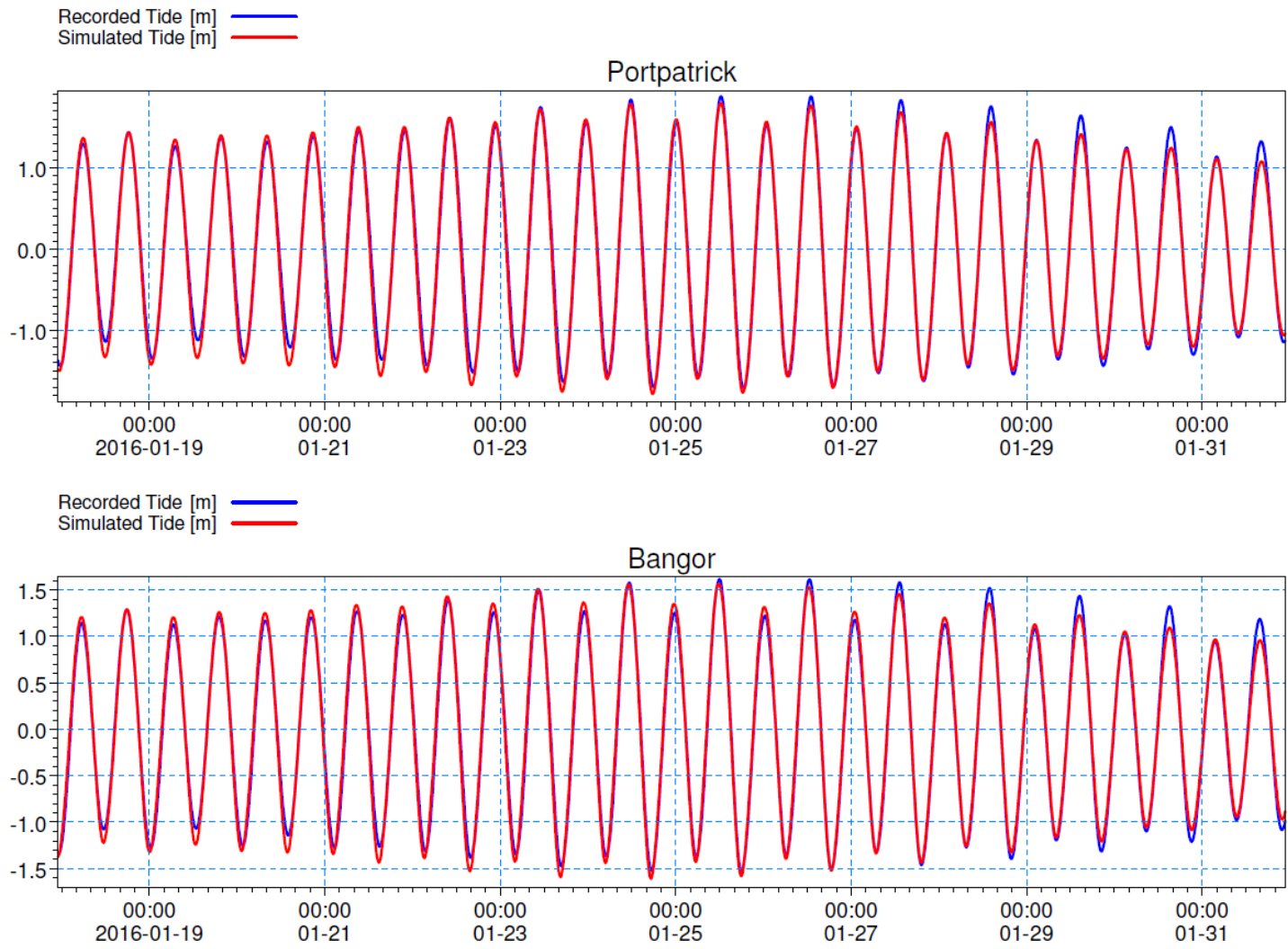
**2.1.2 Modelling Procedure**

Boundary conditions were applied to the open boundaries at the southern and north western extents of the model domain, as well as the Sound of Jura boundary. These boundary conditions were extracted from the Irish Coast Waters Storm Surge forecast model operated by RPS. Model boundary conditions were extracted for a period of approximately 2 weeks allowing model simulations to be run for a typical spring/neap tidal cycle.

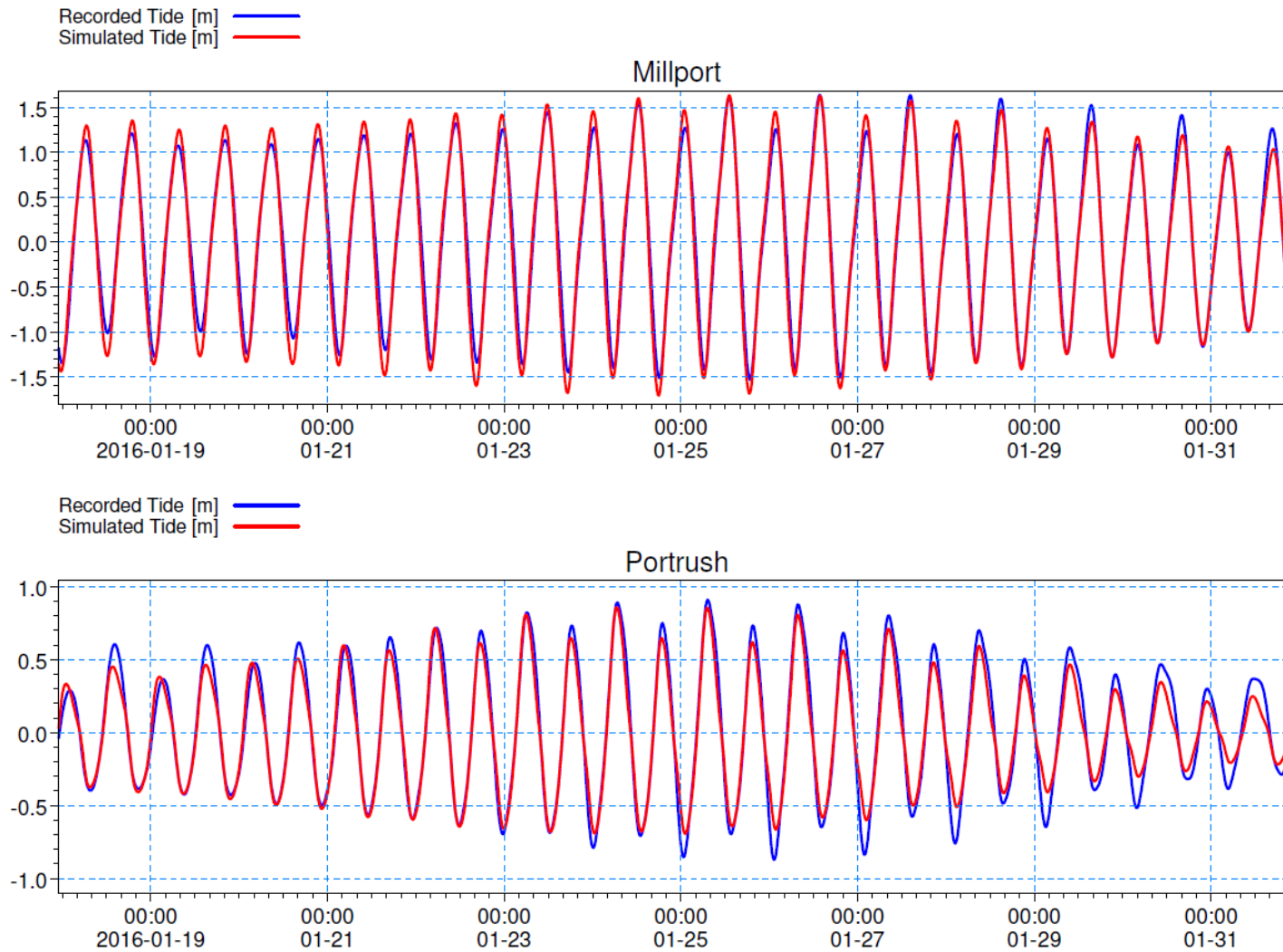
### 2.1.3 Model Calibration and Verification

Model calibration and verification was carried out to ensure that the model results were representative of actual conditions within the Firth of Clyde. This was achieved by comparing modelled water surface elevations with gauge records at Portpatrick, Bangor, Millport and Portrush. Modelled current speeds and directions were also compared with tidal stream data published by the United Kingdom Hydrographic Office (UKHO) on available Admiralty Charts.

Plots of tidal gauge records compared with modelled surface elevations at Portpatrick, Bangor, Millport and Portrush are shown in Figure 2.4 and Figure 2.5. Good model calibration has generally been achieved with good temporal correlation between the modelled and measured data. The tidal ranges at the Portpatrick and Bangor gauges are generally predicted to within 10%, however a maximum range difference of approximately 12% is observed at both locations towards the end of the simulation, with the modelled high water level being lower than the recorded level. The maximum range difference at Millport was found to be approximately 18%. This occurred during the neap cycle towards the start of the simulation and was due to the modelled range being larger than the recorded range. The maximum range difference at Portrush was found to be approximately 25%. Portrush is known to be a complex tidal gauge due to its proximity to the amphidromic point near Machrihanish.



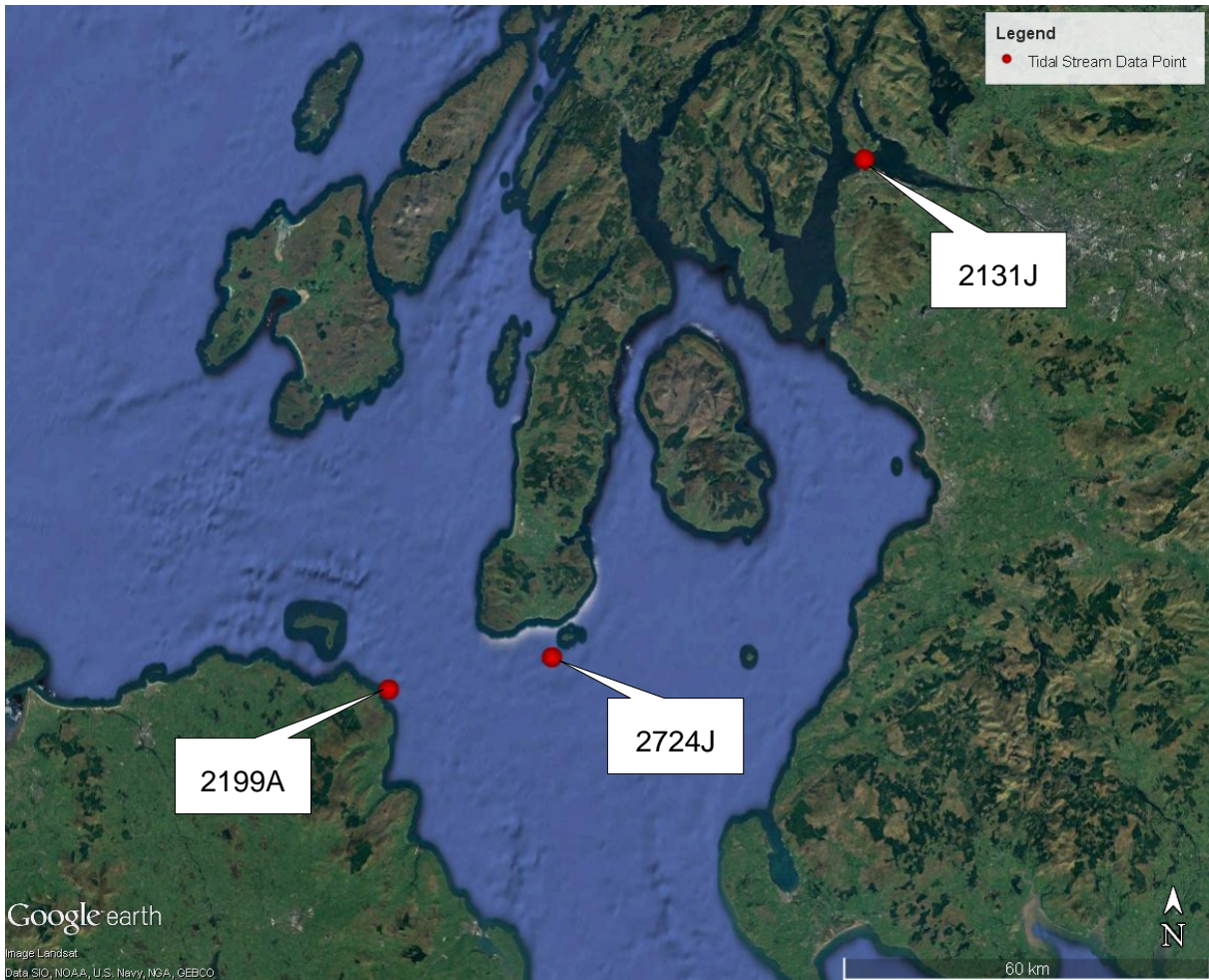
**Figure 2.4 Gauge record versus model simulated levels at Portpatrick and Bangor**



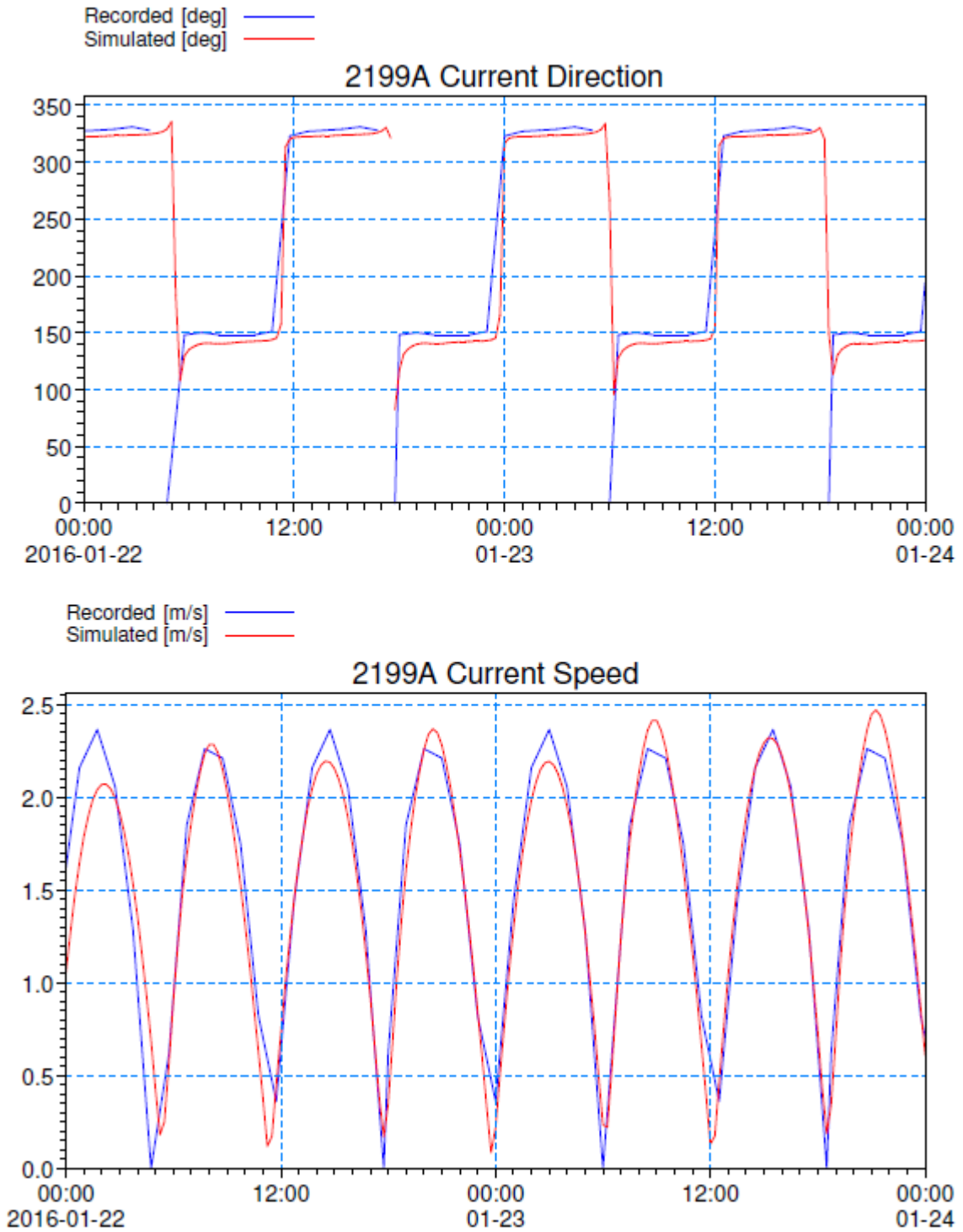
**Figure 2.5 Gauge record versus model simulated levels at Millport and Portrush**



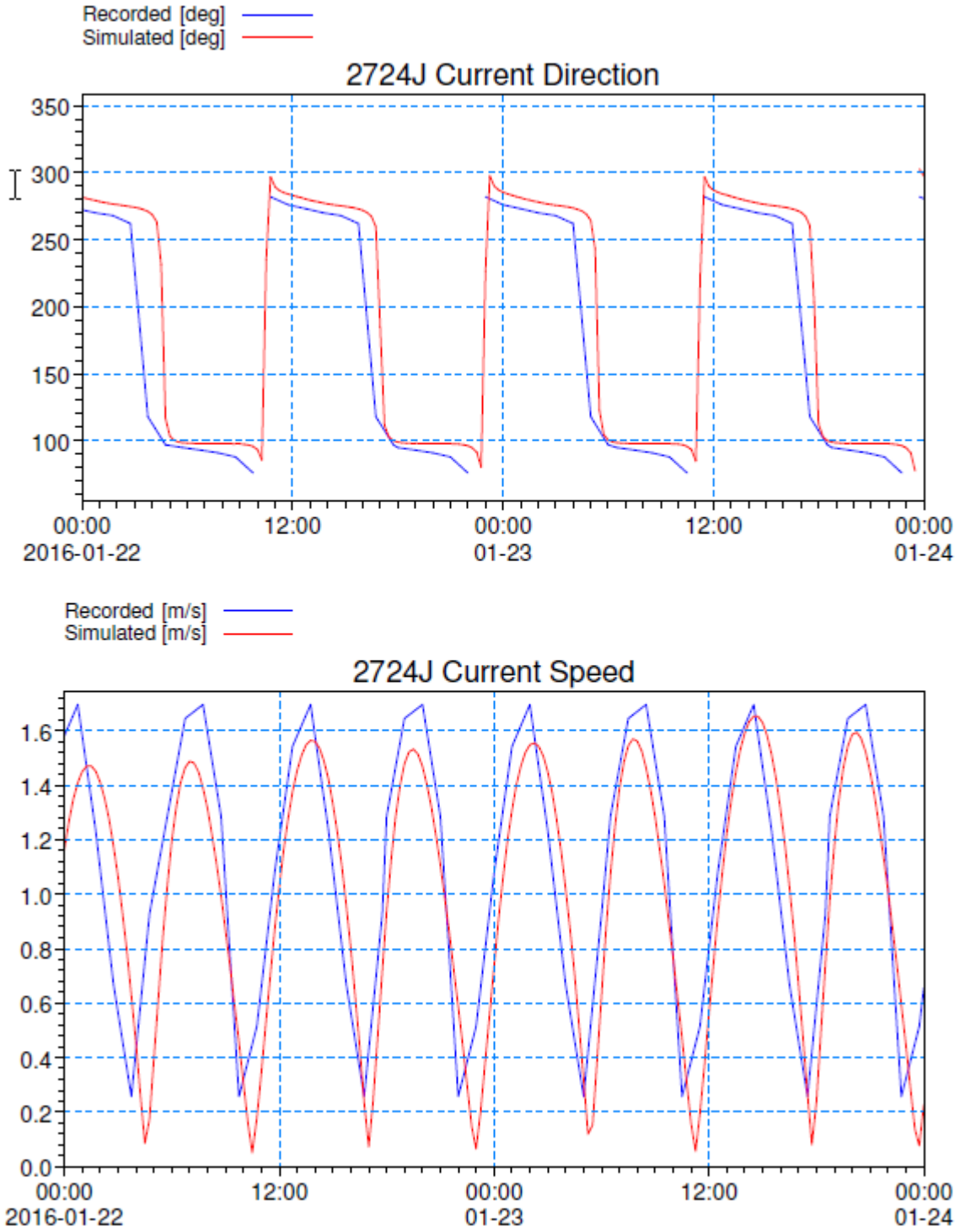
A total of 18 tidal stream data points were also analysed in order to verify the model outputs. Tidal stream data provides a reasonable estimation of the current direction and speed at hourly intervals between six hours before and after high water (HW). Three of the points used are presented in this report as an example of the correlation achieved. The locations of these points are shown in Figure 2.6. It can be seen from Figure 2.7 to Figure 2.9 that good model verification has been achieved at these data points in terms of both current direction and speed.



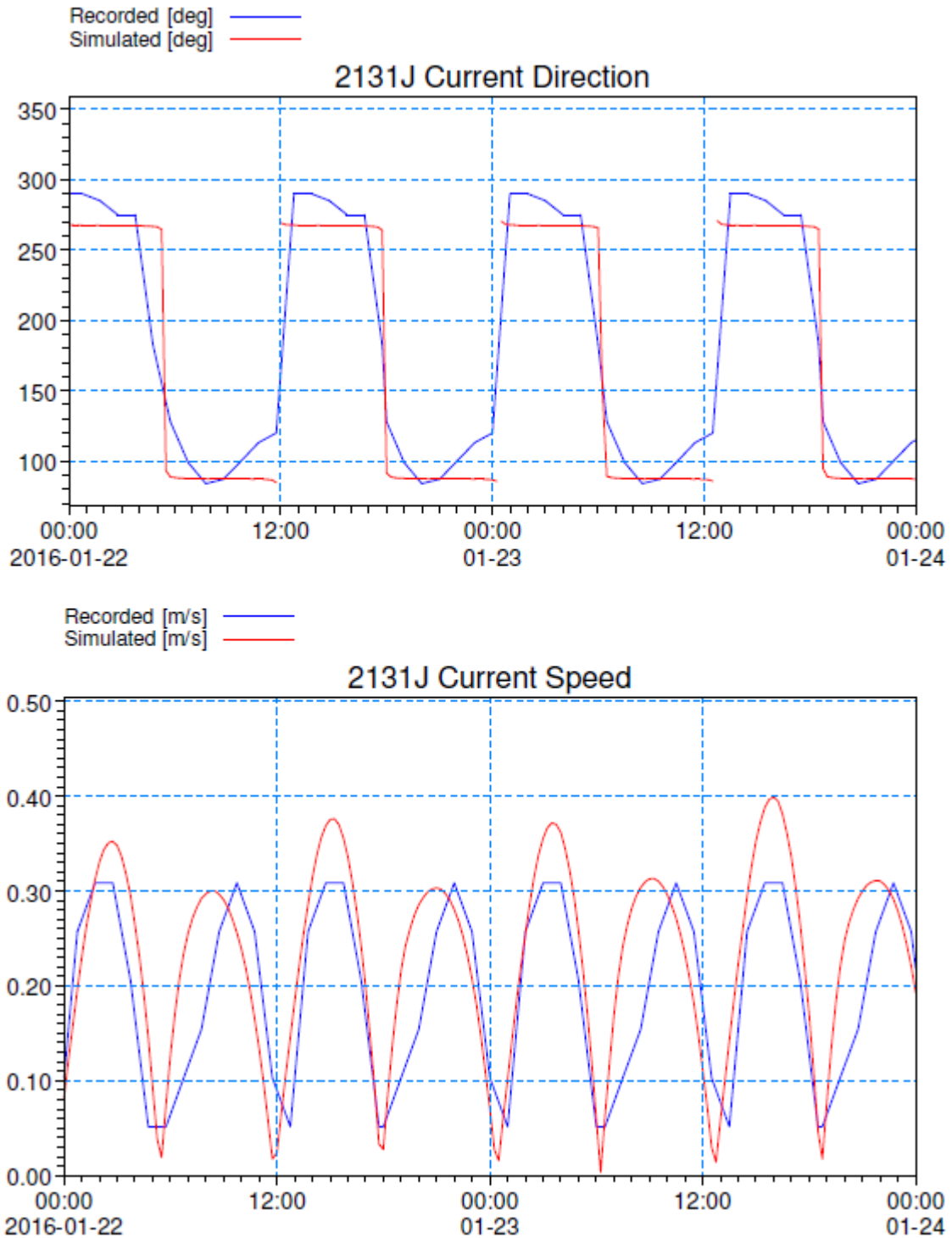
**Figure 2.6** Location of three of the tidal stream data points used for model verification



**Figure 2.7** Recorded and simulated current direction and speed at tidal stream data point 2199A



**Figure 2.8** Recorded and simulated current direction and speed at tidal stream data point 2724J



**Figure 2.9 Recorded and simulated current direction and speed at tidal stream data point 2131J**

The results presented here demonstrate acceptable model accuracy in terms of both water levels and tidal current speed and direction.

### **3 WIND AND WAVE DATA**

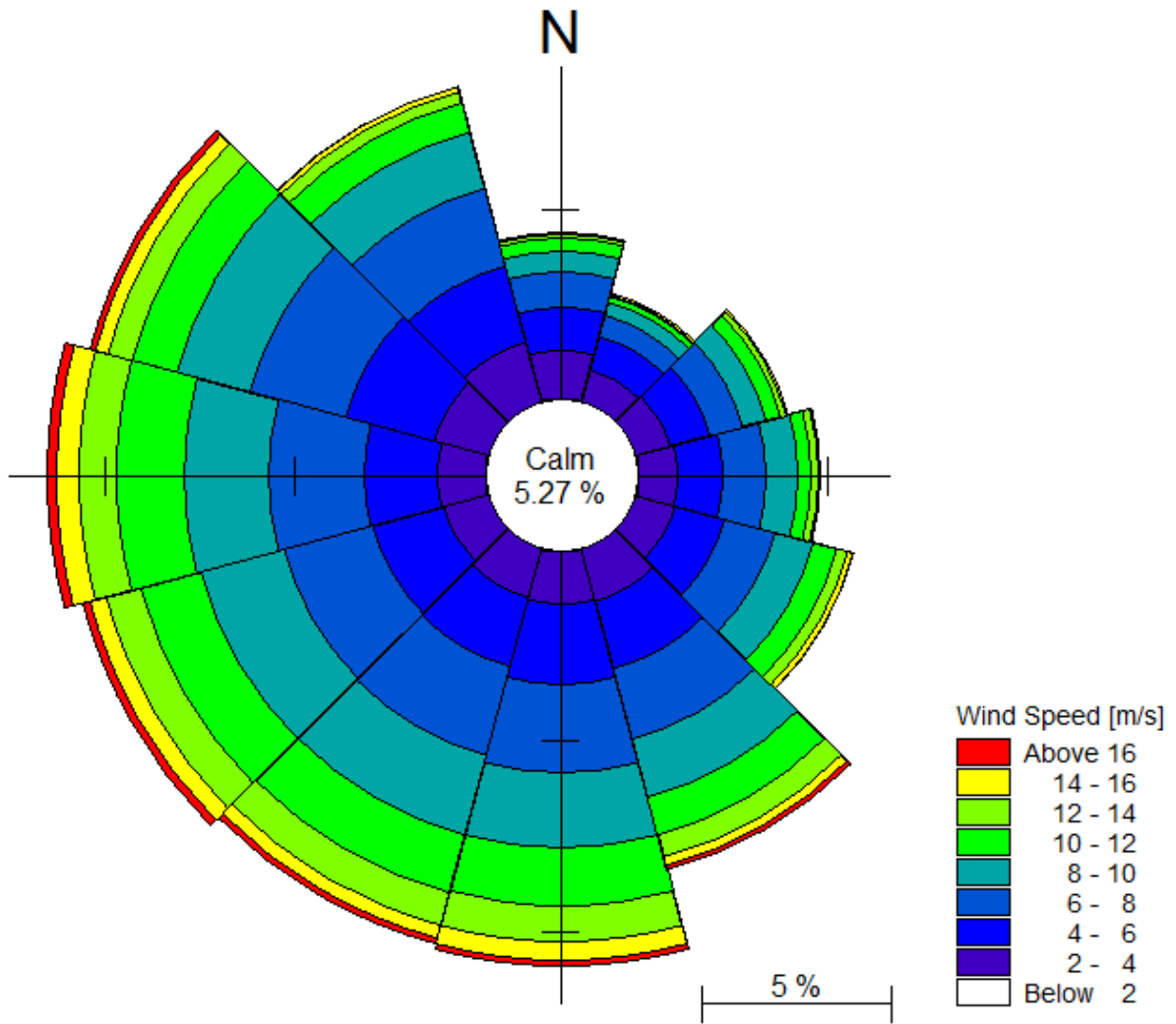
#### **3.1 DATA SOURCES**

Wind and Wave data for the study was obtained from the European Centre for Medium range Weather Forecasts (ECMWF). The data from the ECMWF consisted of 3 hourly wind data derived for a point at 5.25°W, 55.25°N for the period 1983 to 2016. Wave data was also derived for a point at 6.5°W, 55.5°N for the period 1957 to 2002.

The ECMWF data point 5.25°W, 55.25°N is within the Firth of Clyde and representative of wind and wave conditions over this area, while the point at 6.5°W, 55.5°N is close to the western boundary of the wave transformation model and is exposed to long period swell waves from the Atlantic Ocean.

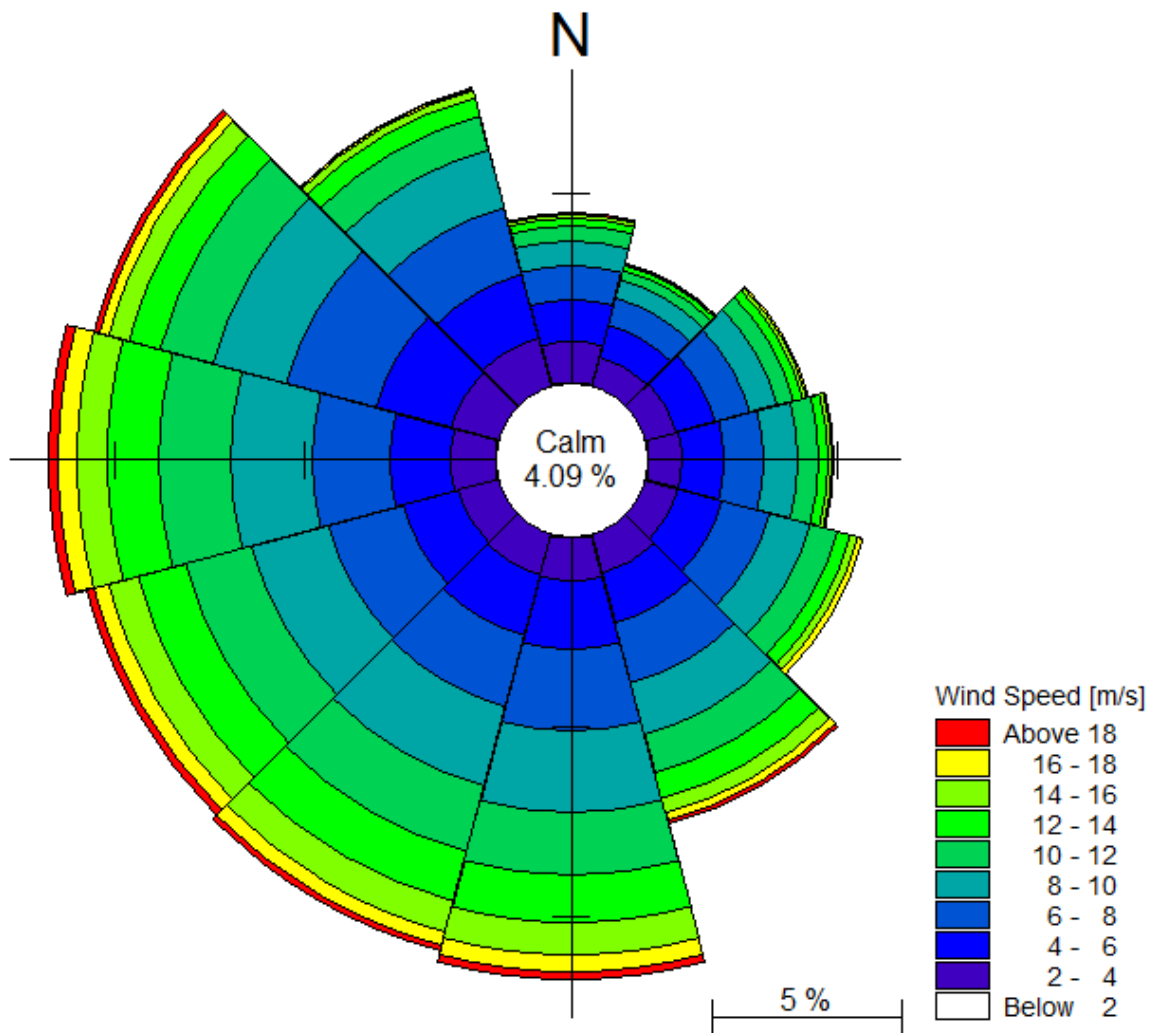
##### **3.1.1 Wind Data**

Figure 3.1 shows the wind rose for the dataset at 5.25°W, 55.25°N.



**Figure 3.1 3 hourly wind rose for point 5.25°W, 55.25°N for period 1983-2016**

It is known that the ECMWF UK waters wave model tends to under predict the extreme wind speeds in the Irish Sea by circa 15%, thus the wind speeds for wave generation in this study were increased by 15%. The wind rose for the data set at 5.25°W, 55.25°N after this 15% increase has been applied is shown in Figure 3.2.



**Figure 3.2 3 hourly wind rose for point 5.25°W, 55.25°N for period 1983-2016 with data increased by 15%**

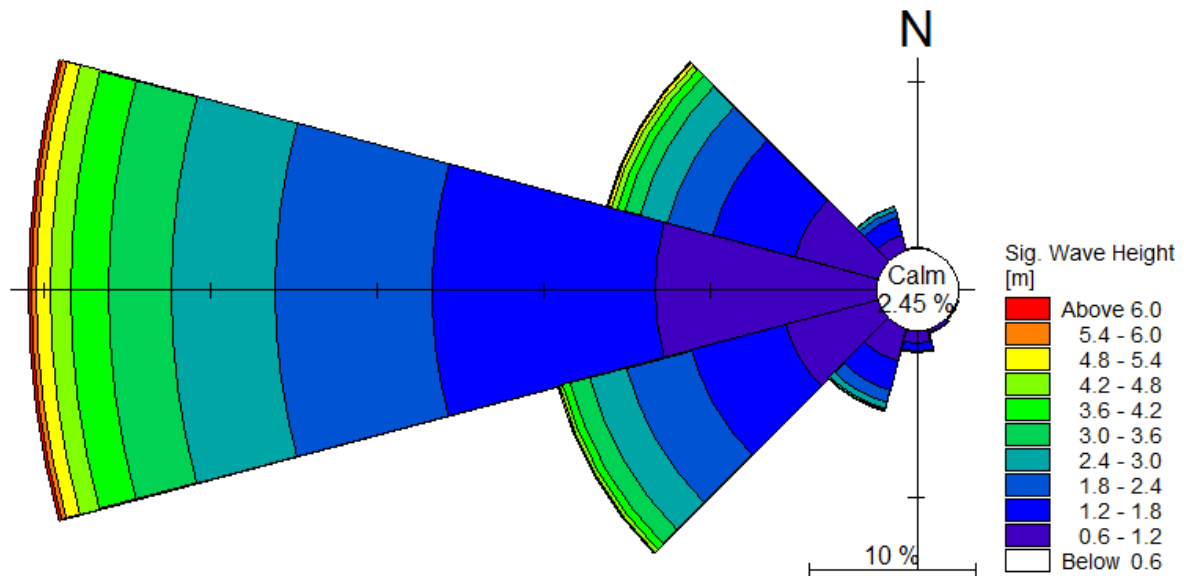
It can be seen from Figure 3.2 that the predominant wind directions are from 180-300°N. These directions were therefore selected for further analysis, resulting in 5 directional scenarios at 30° sectors.

Three wind speed scenarios were selected for analysis from each direction. The scenarios selected were 8, 12 and 19m/s, which correspond to a force 4, force 6 and force 8 winds respectively.

### 3.1.2 Wave Data

The waves which approach the Ayrshire shoreline are mostly generated across the fetches within the north Irish Sea and the Firth of Clyde. However, North Atlantic storm waves can propagate toward the southern extent of the Ayrshire shoreline through the North Channel. Thus, the wave data from the ECMWF model at a point 6.5°W, 55.5°N was used to define

the western boundary condition. Figure 3.3 shows the wave rose for significant wave heights at 6.5°W, 55.5°N.



**Figure 3.3** 3 hourly wave rose for point 6.5°W, 55.5°N for period 1957-2002

It can be seen from Figure 3.3 that swell waves predominantly originate from the west at 6.5°W, 55.5°N. Swell waves originating from the North Atlantic at a direction of 270°N may refract around the Mull of Kintyre and enter the Firth of Clyde. A storm scenario considering long period swell waves from a direction of 270°N at the north western model boundary along with wind from 270°N was therefore considered in addition to the wind-only storm scenarios.

**Table 3.1** Wave climate at western model boundary

Scenario	Direction	Hm0 [m]	Tp [s]
1	270	1.8	10.62
2	270	3.0	12.4
3	270	6.0	15.6



## 4 MODELLING THE WAVE CLIMATE

### 4.1 WAVE TRANSFORMATION MODELLING

#### 4.1.1 Wave Transformation Model

The modelling of the wave transformation from the offshore boundary of the overall model to the Ayrshire shoreline was undertaken using the MIKE 21 SW model which is a new generation spectral wind-wave model based on unstructured meshes. The model simulates the growth, decay and transformation of wind-generated waves and swells in offshore and coastal areas.

MIKE 21 SW includes the following physical phenomena:

- Wave growth by action of wind
- Non-linear wave-wave interaction
- Dissipation due to white-capping
- Dissipation due to bottom friction
- Dissipation due to depth-induced wave breaking
- Refraction and shoaling due to depth variations
- Diffraction
- Wave-current interaction
- Effect of time-varying water depth and flooding and drying

The discretization of the governing equation in geographical and spectral space is performed using a cell-centred finite volume method. In the geographical domain, an unstructured mesh technique is used. The time integration is performed using a fractional step approach where a multi-sequence explicit method is applied for the propagation of wave action.

MIKE 21 SW includes two different formulations:

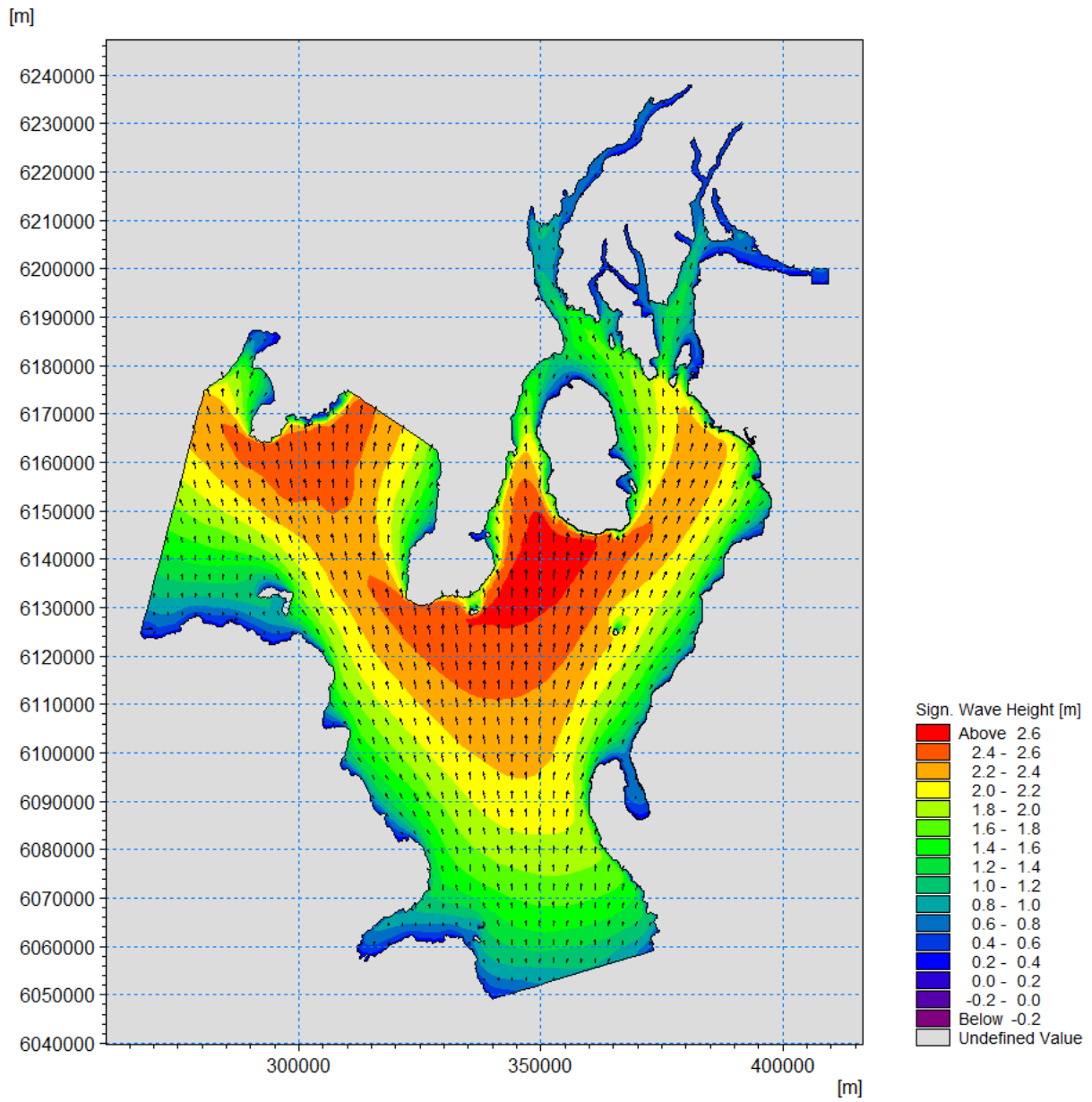
- Directional decoupled parametric formulation
- Fully spectral formulation

Both formulations were used in the simulations. The fully spectral formulation is based on the wave action conservation equation, as described in e.g. Komen et al. (1994) and Young (1999), where the directional-frequency wave action spectrum is the dependent variable.

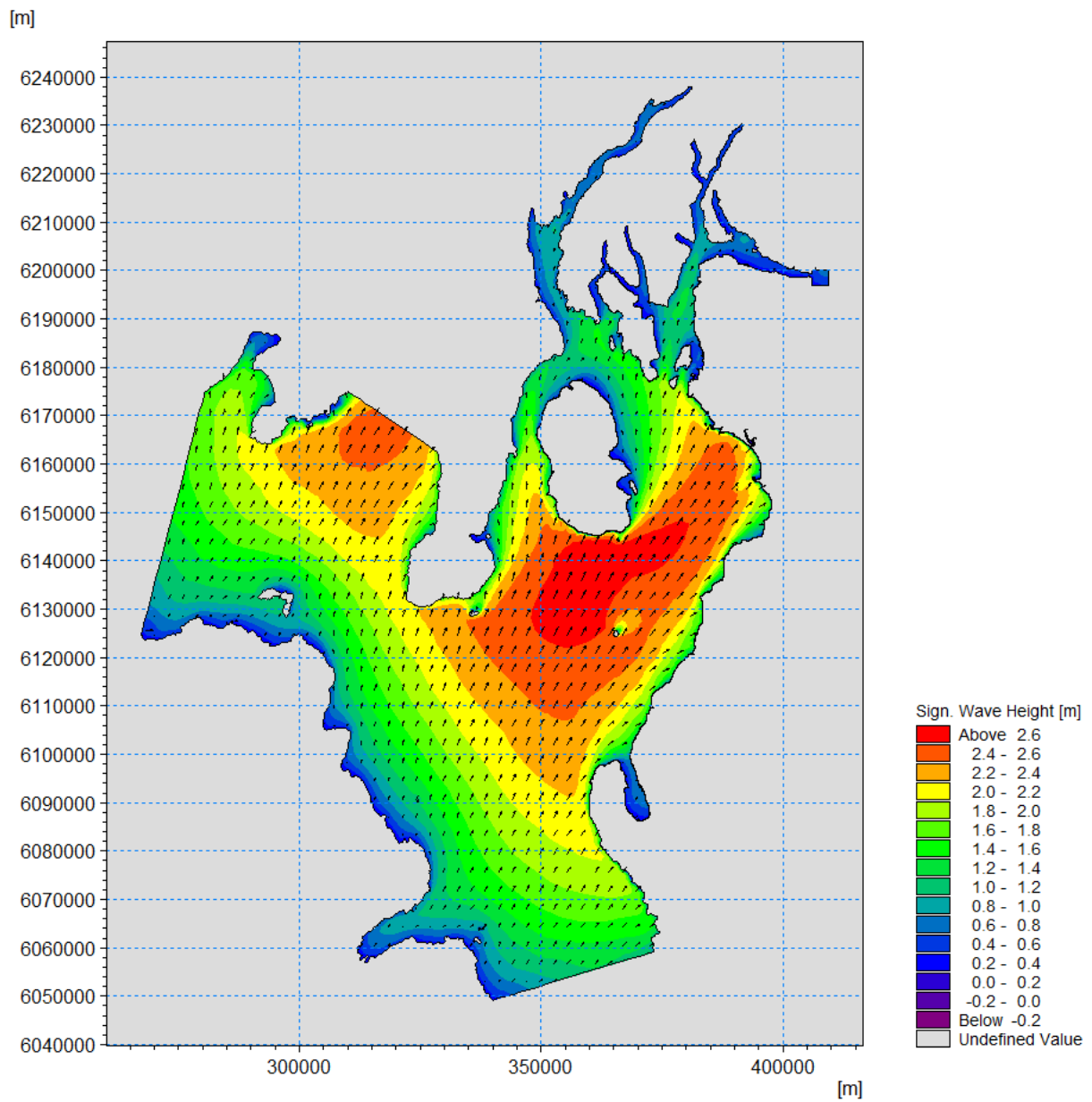
### 4.1.2 Modelling Procedure

The storm wave climate around the Ayrshire coastline was established by modelling the transformation of waves entering and generated within the Firth of Clyde from the south to the north west sectors. The wave transformation simulations were run for force 4, force 6 and force 8 winds for storm directions in intervals of 30° between 180°N to 300°N. The wave transformation simulations were run for each relevant 30° sector over two tidal cycles during spring tides.

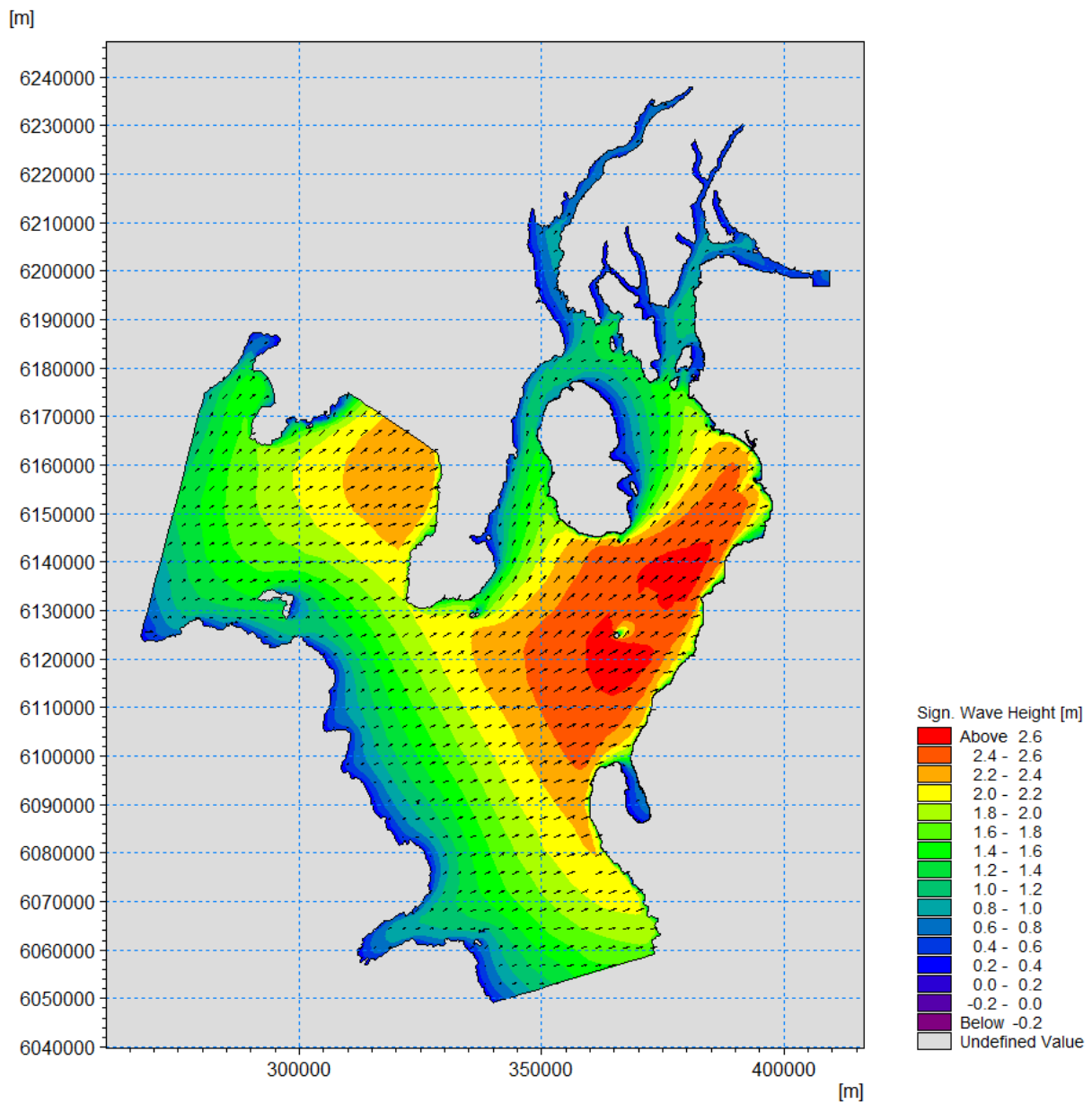
Figure 4.1 to Figure 4.5 show the distribution of significant wave heights and mean wave directions in the north Irish Sea and Firth of Clyde during force 8 gales from 180°N through to 300°N. Figure 4.6 shows the distribution of significant wave heights and mean wave directions when long period waves from the North Atlantic are refracted into the Firth of Clyde during extreme storms, in combination with a force 8 gale from 270°N.



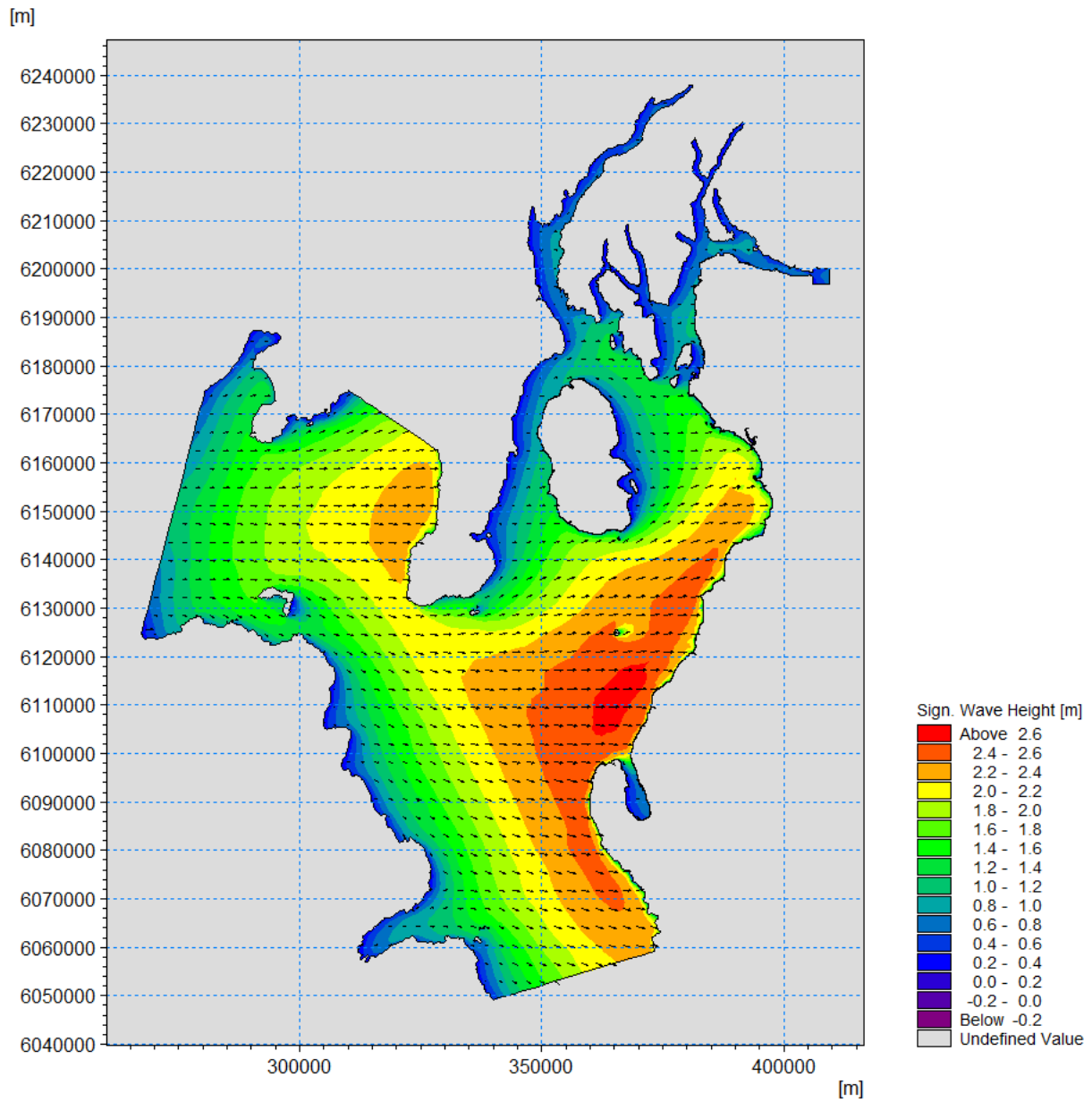
**Figure 4.1 Significant wave height and mean wave direction during force 8 gale from 180°N**



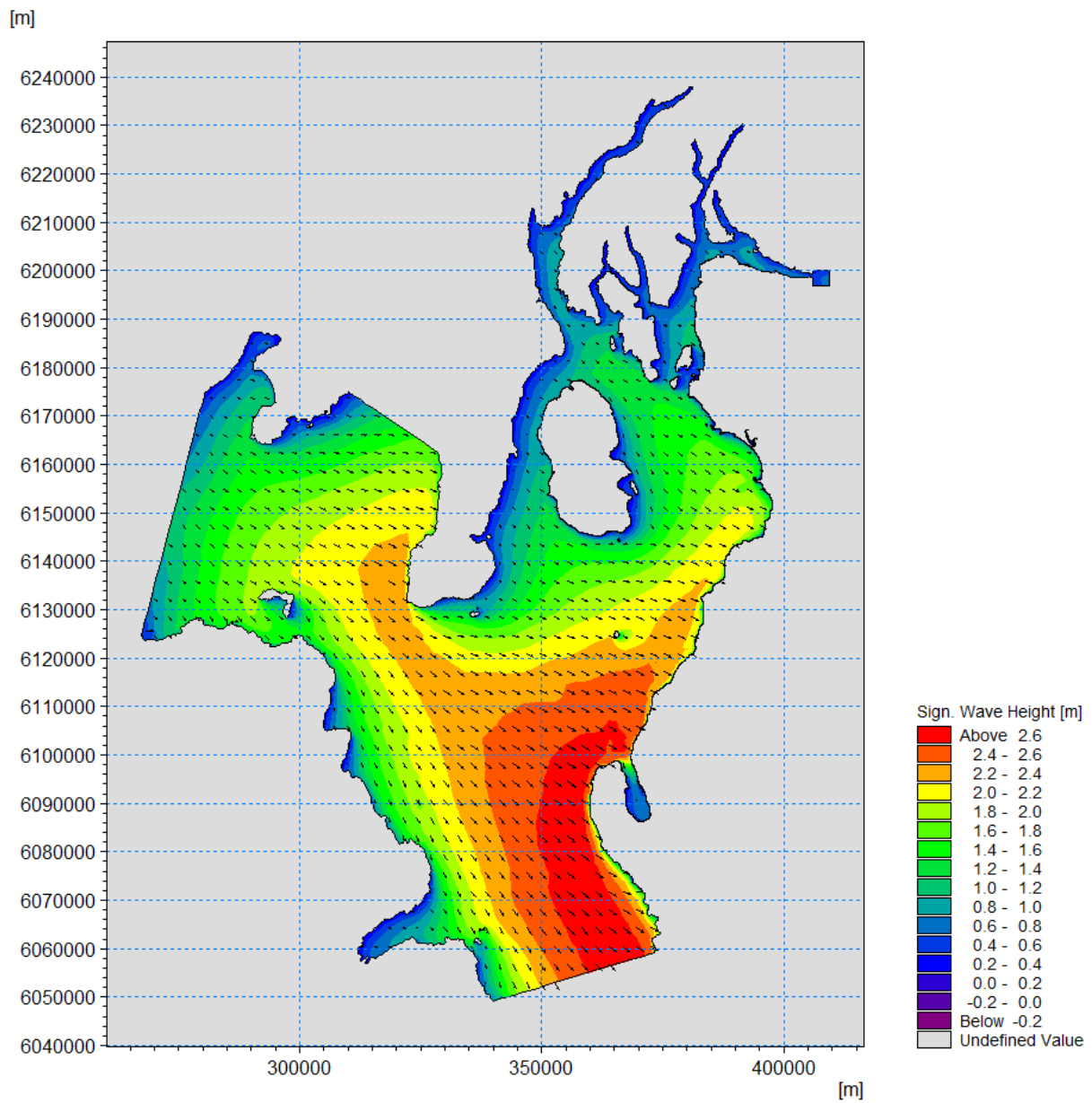
**Figure 4.2 Significant wave height and mean wave direction during force 8 gale from 210°N**



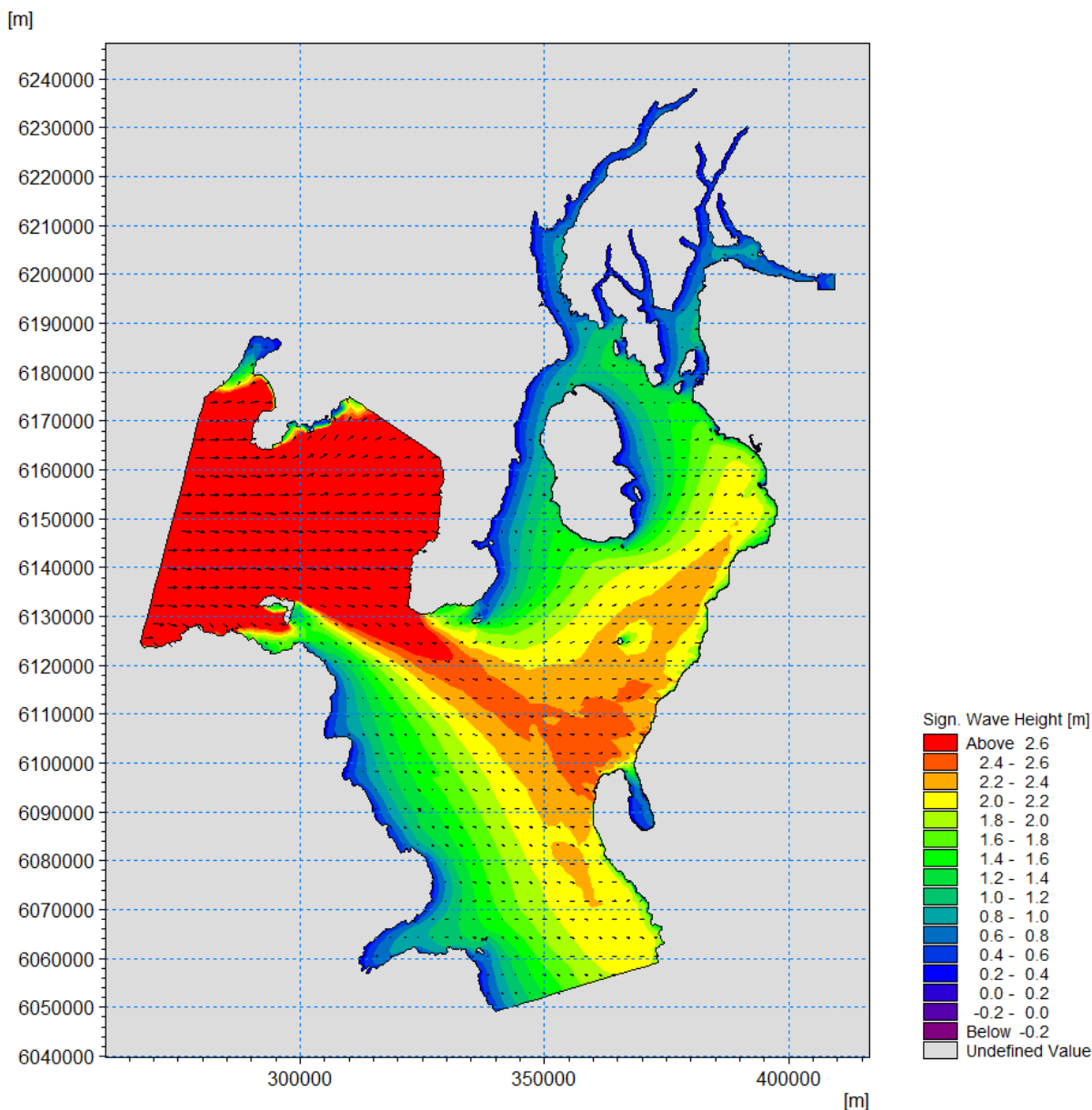
**Figure 4.3 Significant wave height and mean wave direction during force 8 gale from 240°N**



**Figure 4.4 Significant wave height and mean wave direction during force 8 gale from 270°N**



**Figure 4.5 Significant wave height and mean wave direction during force 8 gale from 300°N**

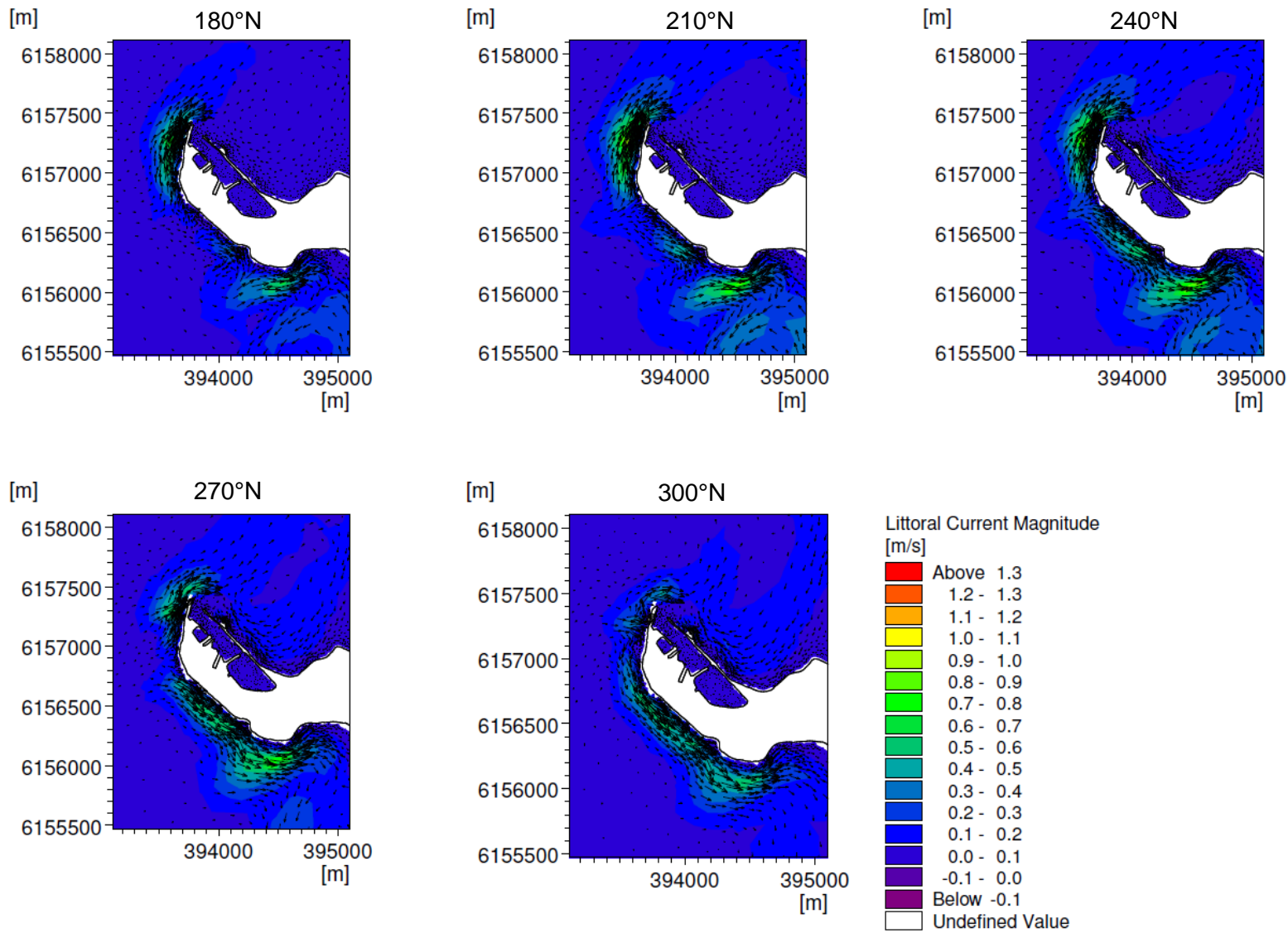


**Figure 4.6 Significant wave height and mean wave direction with long period waves entering from the North Atlantic during force 8 gale from 270°N**

**4.1.3 Littoral Current Results**

Littoral currents along the Ayrshire coastline were established directly from the results of the MIKE 21 SW simulations as these simulations consider the combined effect of tides and waves. An example of the littoral currents established from the model results is shown in Figure 4.7. This figure shows the magnitude and direction of the littoral currents in the vicinity of Troon for force 8 gales through directions from 180°N to 300°N.





**Figure 4.7 Littoral current magnitude and directions at Tron for force 8 gales between directions 180°N to 300°N**

## **5 SEDIMENT TRANSPORT MODELLING**

### **5.1 SEDIMENT TRANSPORT MODEL**

The modelling of the sediment transport potential around the Ayrshire coastline was undertaken using the MIKE 21 ST model which is the module of the MIKE 21 modelling system that calculates the rates of non-cohesive sediment (sand) transport for both pure current and combined wave and current situations.

MIKE 21 ST can be applied to a wide range of sediment-transport related phenomena, including modelling of sediment transport fields in the littoral zone, in the vicinity of coastal structures, in tidal inlets, and under the sole or combined effects of tidal-, wind- and wave-driven currents in estuaries or coastal areas.

#### **5.1.1 Sediment Transport Modelling Methodology**

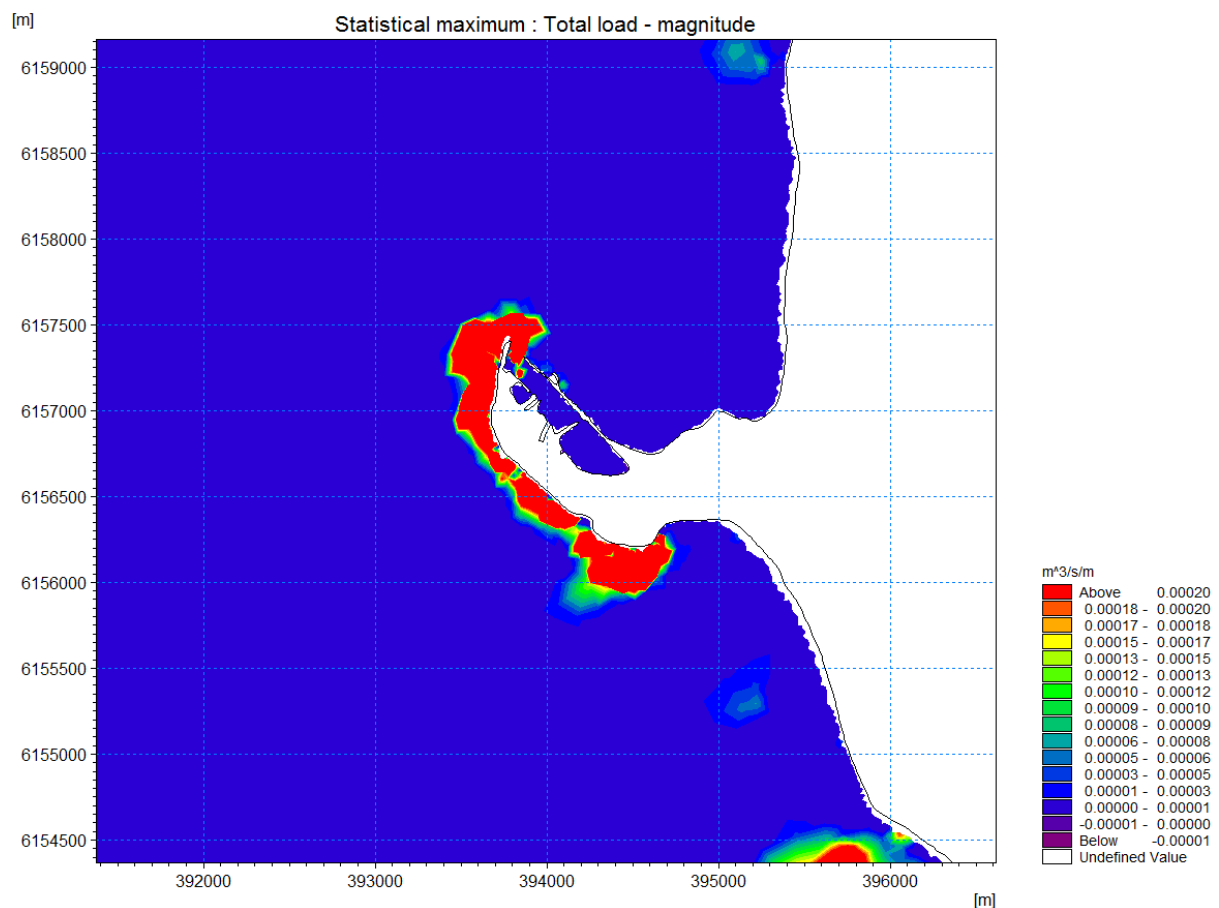
Results from the previously completed hydrodynamic (HD) and wave transformation (SW) model simulations were used as boundary data within the sediment transport (ST) model. The sediment transport model simulations were run for the same scenarios as the wave transformation model i.e. force 4, force 6 and force 8 winds for storm directions in intervals of 30° between 180°N to 300°N. The simulations were again run for each relevant 30° sector over two tidal cycles during spring tides.

#### **5.1.2 Sediment Sampling**

Random sediment samples were collected along the South Ayrshire coastline in order to determine a representative grain diameter to be used within the ST modelling. Samples and photographs were taken in June 2016 at 8 locations between Ballantrae and Dunure. The samples were mainly observed to be a medium sand, however the photographs recorded that coarser material including cobble is present along much of the coastline. However it was determined from the site visits that the movement of the medium sand was likely to be of most interest for the ST modelling, consequently a mean grain diameter of 0.4mm representing a medium sand was selected for use in determining the sediment transport potential.

### 5.1.3 Sediment Transport Modelling Results

The maximum potential sediment transport (suspended load and bed load) during each model simulation was analysed in order to establish the potential longshore drift along the Ayrshire coastline. This enabled sediment cells and sub-cells along the coastline to be identified. An example of the maximum potential sediment transport in the vicinity of Troon due to a force 8 gale from 240°N after a storm duration of 24 hours is shown in Figure 5.1. Potential sediment transport is observed from the southern tip to the northern tip of Troon Head; however as this headland is rocky and potential for sediment movement does not connect to the softer shorelines north and south of the headland this is considered an effective sub-cell boundary with little sediment transport across this point.

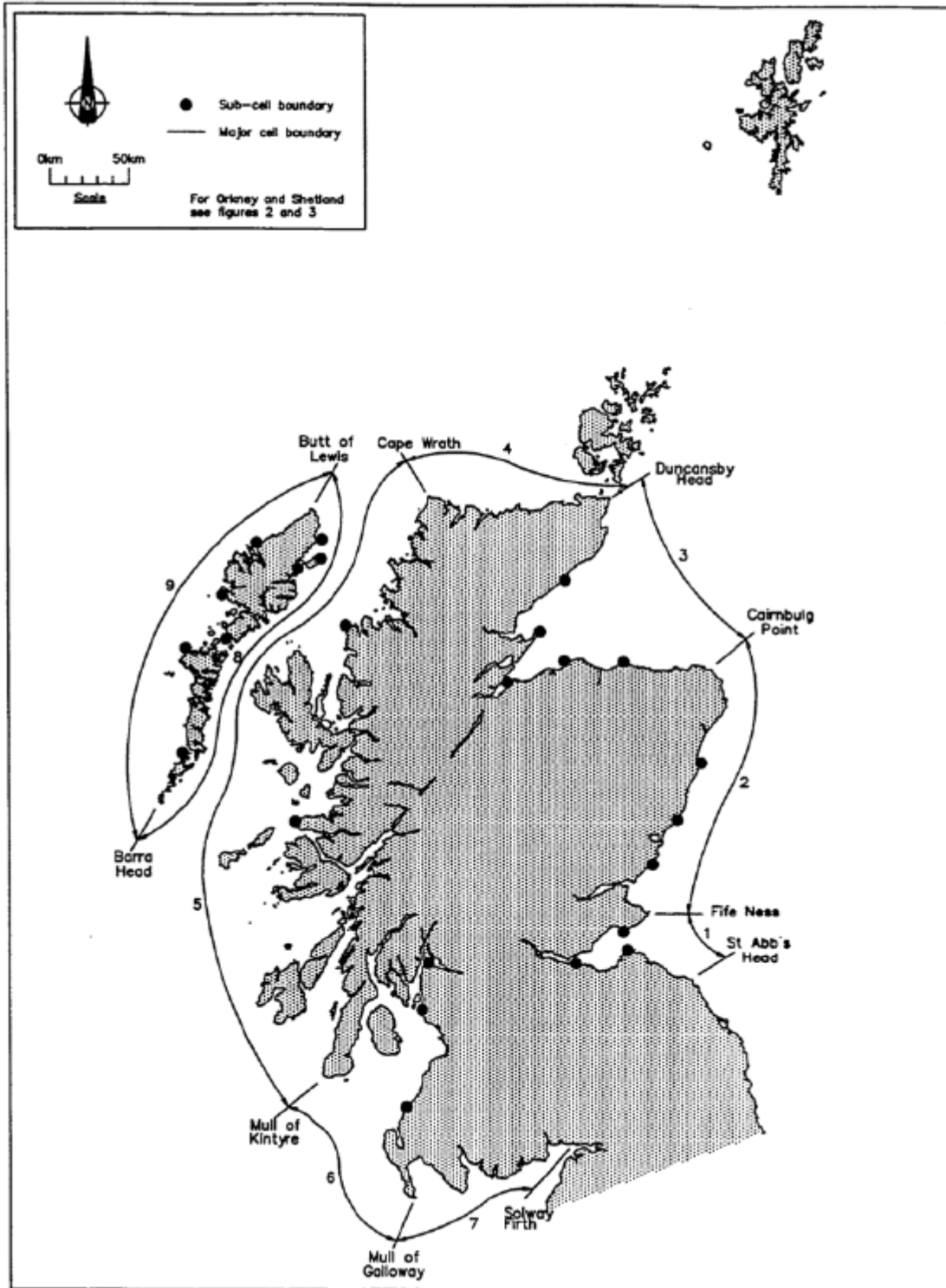


**Figure 5.1 Maximum potential sediment transport due to force 8 gale from 240°N, gale duration 24 hours**

### 5.1.4 Coastal Cell and Sub-Cell Boundaries

Eleven coastal cells for the Scottish coastline were categorised by H R Wallingford in 1997, between which the movement of sediment was considered to be relatively limited. These 11

coastal cells are shown in Figure 5.2. The Firth of Clyde is located within cell 6, between the Mull of Kintyre and the Mull of Galloway. The Firth of Clyde was further divided into 4 sub-cells (6a-6d) as shown in Figure 5.3.



**Figure 5.2 Coastal cells in Scotland**

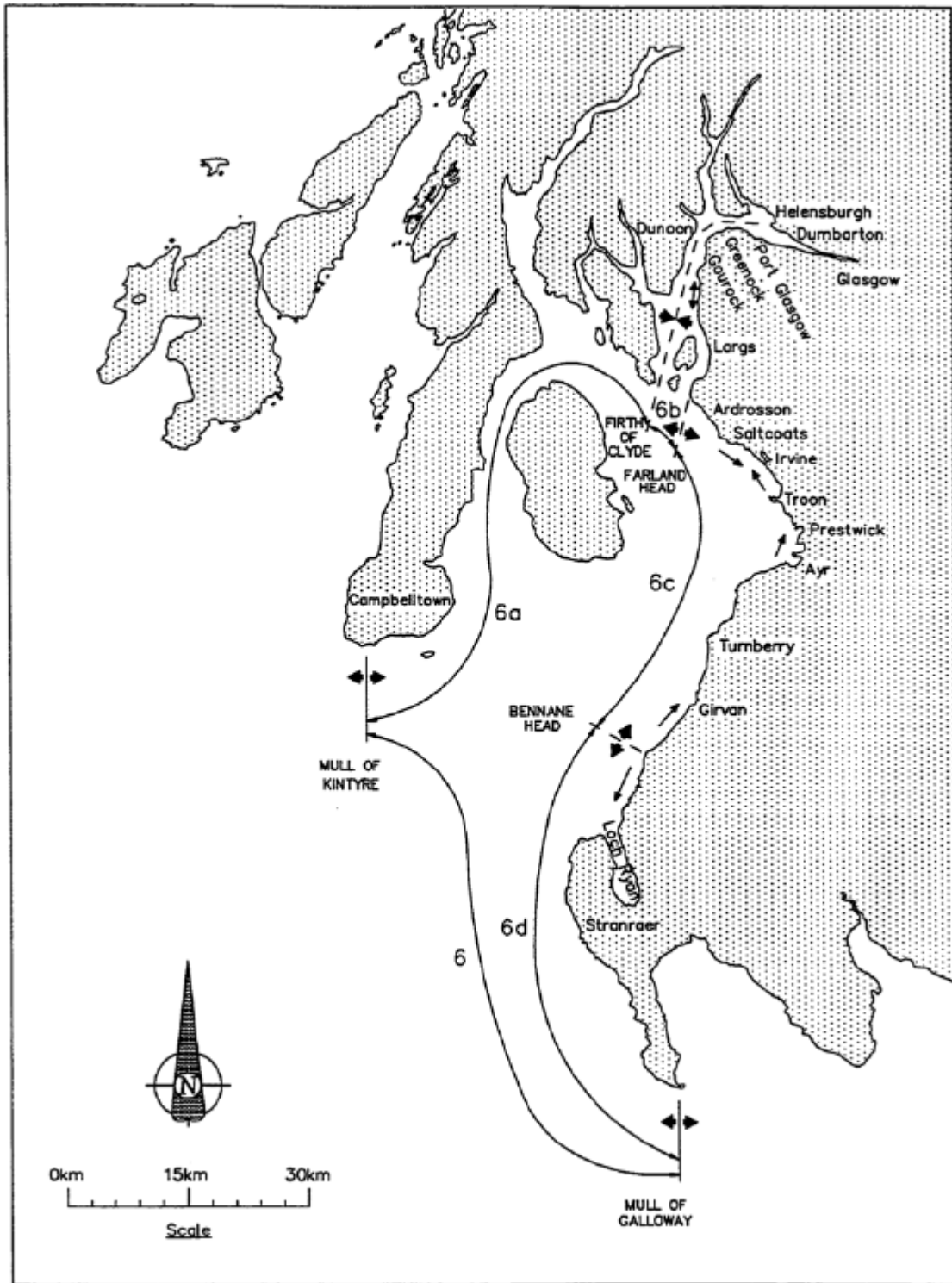
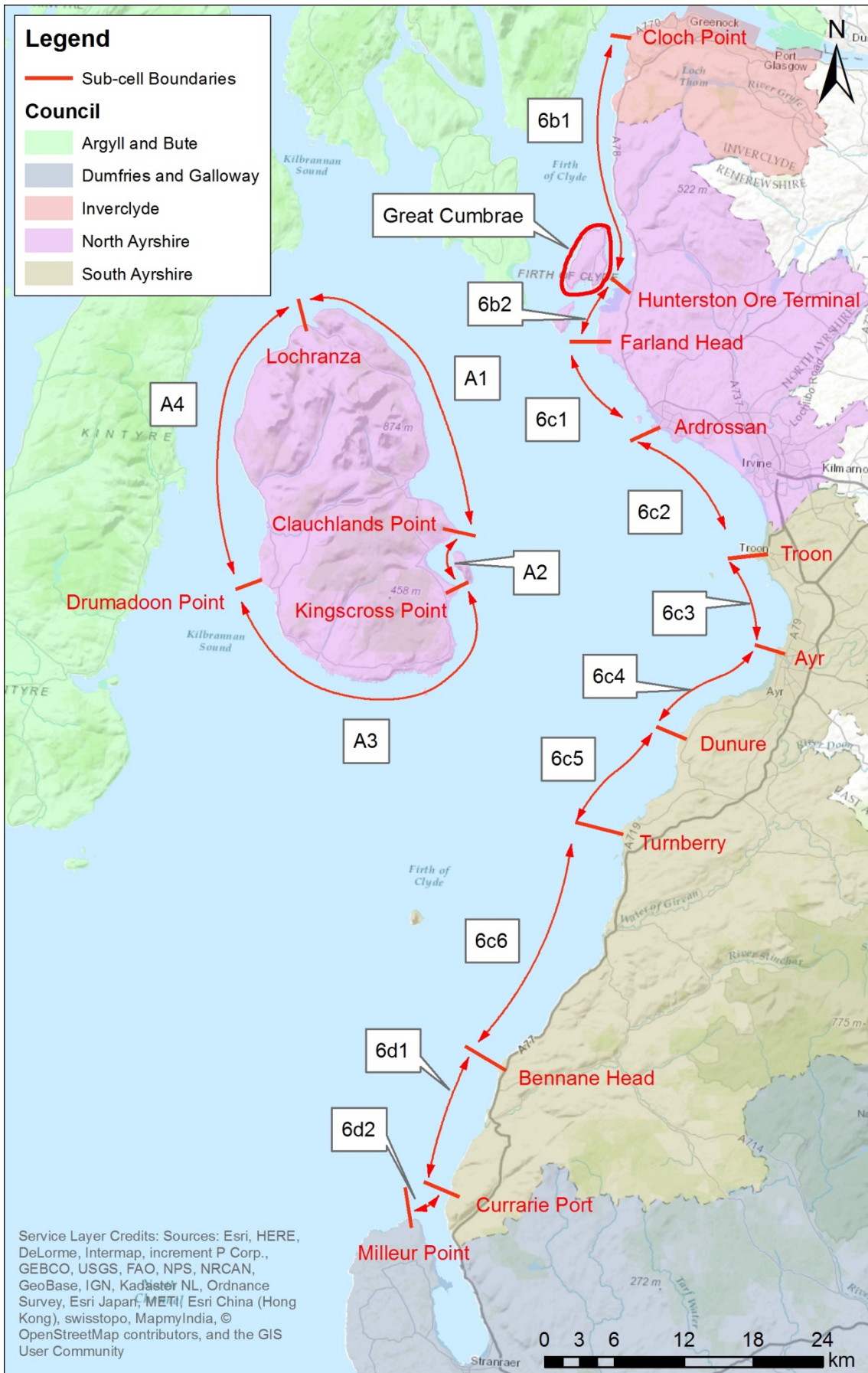


Figure 5.3 Coastal sub-cells from Mull of Kintyre to Mull of Galloway

The ST model results were used to further sub-divide the coastal sub-cells for the main Ayrshire and associated island coastlines. The sub-cell boundaries were defined by points across which there was limited sediment movement potential even during storm conditions. The boundary locations of the 15 sub-cells identified for the Ayrshire coast are shown in Figure 5.4 and defined in Table 5.1. The original naming convention adopted by Wallingford (1997) was maintained, with further divisions within an existing sub-cell defined by appending a number to the existing cell name e.g. 6b1, 6b2 etc.

The definition of these coastal sub-cells is critical in terms of the development of a sustainable Shoreline Management Plan for the Ayrshire coast as this defines the areas within which various measures can be applied without affecting adjoining sections of the coast, for example a policy of hold the line applied in a sub-cell will not affect coastal processes in an adjoining cell. Thus the sub-cells define the geographic boundaries for future studies associated with the detailed design of a wide range of coastal management measures with potential to impact on coastal sediment dynamics.



**Figure 5.4 Coastal sub-cell boundaries for the Ayrshire and Arran coastlines**

**Table 5.1 Coastal sub-cell boundary locations**

Sub-cell	Boundary locations
<b>6b1</b>	Cloch Point – Hunterston Ore Terminal
<b>6b2</b>	Hunterston Ore Terminal – Farland Head
<b>6c1</b>	Farland Head – Ardrossan
<b>6c2</b>	Ardrossan – Troon
<b>6c3</b>	Troon – Ayr
<b>6c4</b>	Ayr – Dunure
<b>6c5</b>	Dunure – Turnberry
<b>6c6</b>	Turnberry – Bennane Head
<b>6d1</b>	Bennane Head – Currarie Port
<b>6d2</b>	Currarie Port – Milleur Point
<b>A1</b>	Lochranza – Clauchlands Point
<b>A2</b>	Clauchlands Point – Kingscross Point
<b>A3</b>	Kingscross Point – Drumadoon Point
<b>A4</b>	Drumadoon Point – Lochranza
<b>Great Cumbrae</b>	Great Cumbrae

None of the sub-cells identified as part of the data gap analysis for the Ayrshire SMP interact with shoreline within Argyll and Bute Council.

Sub-cell 6b1, located between Cloch Point and Hunterston Ore Terminal, extends north of the North Ayrshire Council area to include part of the Inverclyde Council area. Objectives for



shoreline management of this sub-cell will therefore need to be prepared in coordination with Inverclyde Council.

The shoreline of sub-cell 6d2, is composed of mainly of rock south of Currarie Port as far as Cairnryan, with no significant sediment movement. Softer sediments are present within Loch Ryan South of Cairnryan, however this is within the Dumfries and Galloway Council area and therefore outside the scope of the Ayrshire SMP.

### **5.1.5 LiDAR Gap Sensitivity Testing**

Additional survey data of the Ayrshire Coastline between Ayr and Girvan not covered by the main LiDAR survey was made available to RPS in November 2016. Prior to this the present day modelling of the Ayrshire shoreline was completed using MEDIN and digital chart data to represent the shoreline in this area. Following receipt of the additional data the model mesh was re-generated with the new beach survey data included and the model was re-run using the updated mesh to test if including this high resolution data significantly altered the model results.

With the new survey data applied the bed levels in the model mesh adjacent to the shoreline at Turnberry point and along the cliffs at Dunure was found to increase. As a result the current speeds in the littoral zone were found to be lower. However these changes were not found to significantly affect sediment transport potential, and did not alter the location of sediment sub-cell boundaries.

## 6 CLIMATE CHANGE

The effect of climate change on coastal processes along the Ayrshire shoreline was simulated by reference to the UK Climate Projections UKCP09 guidance.

Predictions of future sea level rise, changes in storm surges and climate driven changes in waves are available from the report 'UK Climate Projections science report: Marine & coastal projections' by Lowe et al. (2009). However further research carried out since UKCP09 was published has resulted in recommendations to adopt higher values of projected sea level rise (IPCC, 2013). SEPA took cognisance of this research by IPCC when producing the coastal flood risk maps for Scotland and used the 2080 high emissions scenario 95<sup>th</sup> percentile relative sea level rise values from UKCP09 (SEPA, Flood Modelling Guidance for Responsible Authorities). The same sea level rise scenario has therefore been used in this study to assess the impact of climate change on the coastal processes around the Ayrshire shoreline. Predictions of relative sea level rise were extracted from the UKCP09 user interface and these predictions were used to update the model boundaries.

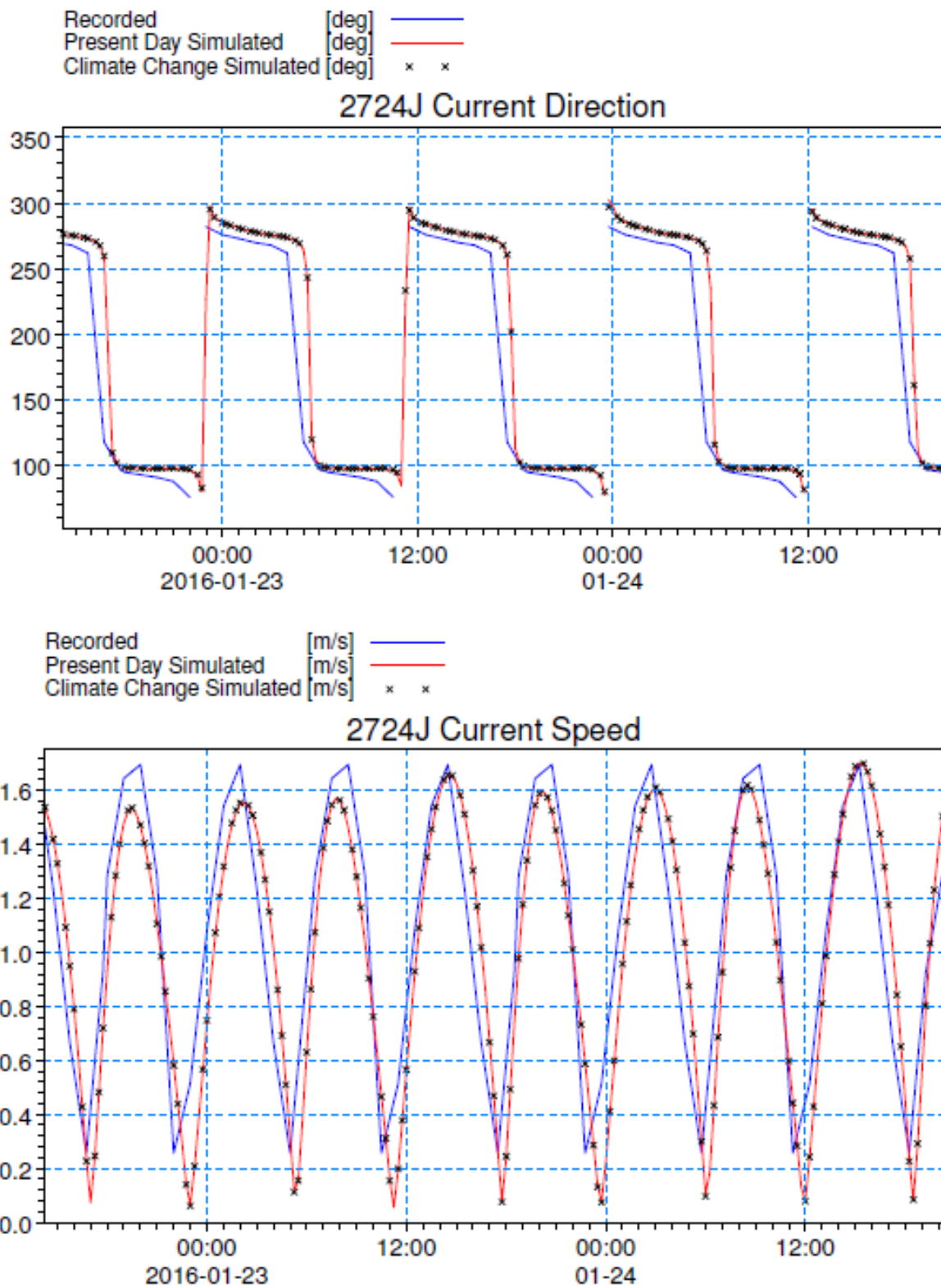
The projected rate of change in storm surge levels is relatively small at less than 0.5mm/year (Lowe et al., 2009). The effect of climate change on storm surges (50mm over 100 years) is therefore considered insignificant when assessing the coastal processes around the Ayrshire shoreline.

In terms of potential future changes to wave climate, a reduction in wave height to the north of the UK is projected (Lowe et al., 2009). Changes in wave period and direction are considered to be small, however it is noted that these are difficult to interpret. Since there is high uncertainty in the projected changes to wave climate, it was considered inappropriate to reduce the modelled wave height. The current scenario wave conditions were therefore retained for assessing the impact of climate change on coastal processes around the Ayrshire shoreline.

### 6.1 TIDAL MODELLING

The effect of sea level rise on tides within the Firth of Clyde was modelled. The tidal modelling as discussed in Section 2 was repeated using boundary conditions representative of a climate change scenario. Using predictions from UKCP09 as previously discussed, a sea level rise of 0.55m was applied to each model boundary.

This increased sea level was found to have little effect on tidal currents within the Firth of Clyde. Overall current speeds and directions were found to be very similar to those predicted from present day scenario modelling, as shown in Figure 6.1.



**Figure 6.1** Recorded, simulated present day and simulated climate change current direction and speed at tidal stream data point 2724J

## 6.2 WAVE CLIMATE

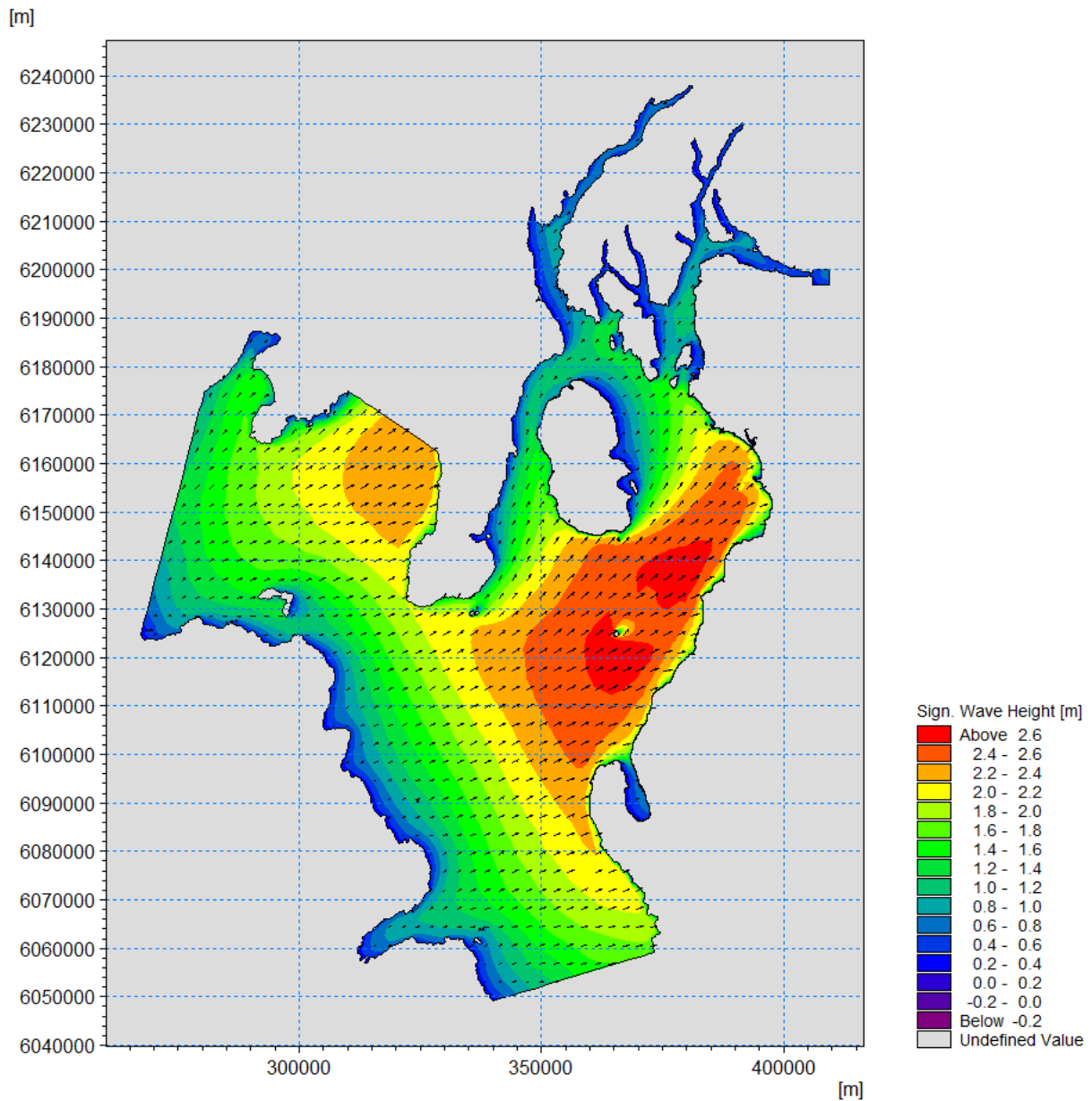
The potential effect of sea level rise on the transformation of waves within the Firth of Clyde was simulated by re-running the previous model simulations with increased water levels. Revised wave transformation simulations were run for force 4, force 6 and force 8 winds for storm directions in intervals of 30° between 180°N to 300°N. The wave transformation simulations were run over two tidal cycles during spring tides. As previously discussed, potential changes in wave period and direction are considered to be small (Lowe et al., 2009) hence it was considered appropriate to use the present day wind conditions for these model simulations.

Increased sea level was found to have negligible effect on modelled wave heights, periods and directions for each model scenario. Figure 6.2 shows the distribution of significant wave heights and mean wave directions in the North Channel and Firth of Clyde during a force 8 gale from 240°N when a sea level rise of 0.55m is applied. There is negligible difference between these results and the equivalent present day scenario as shown in Figure 4.3.

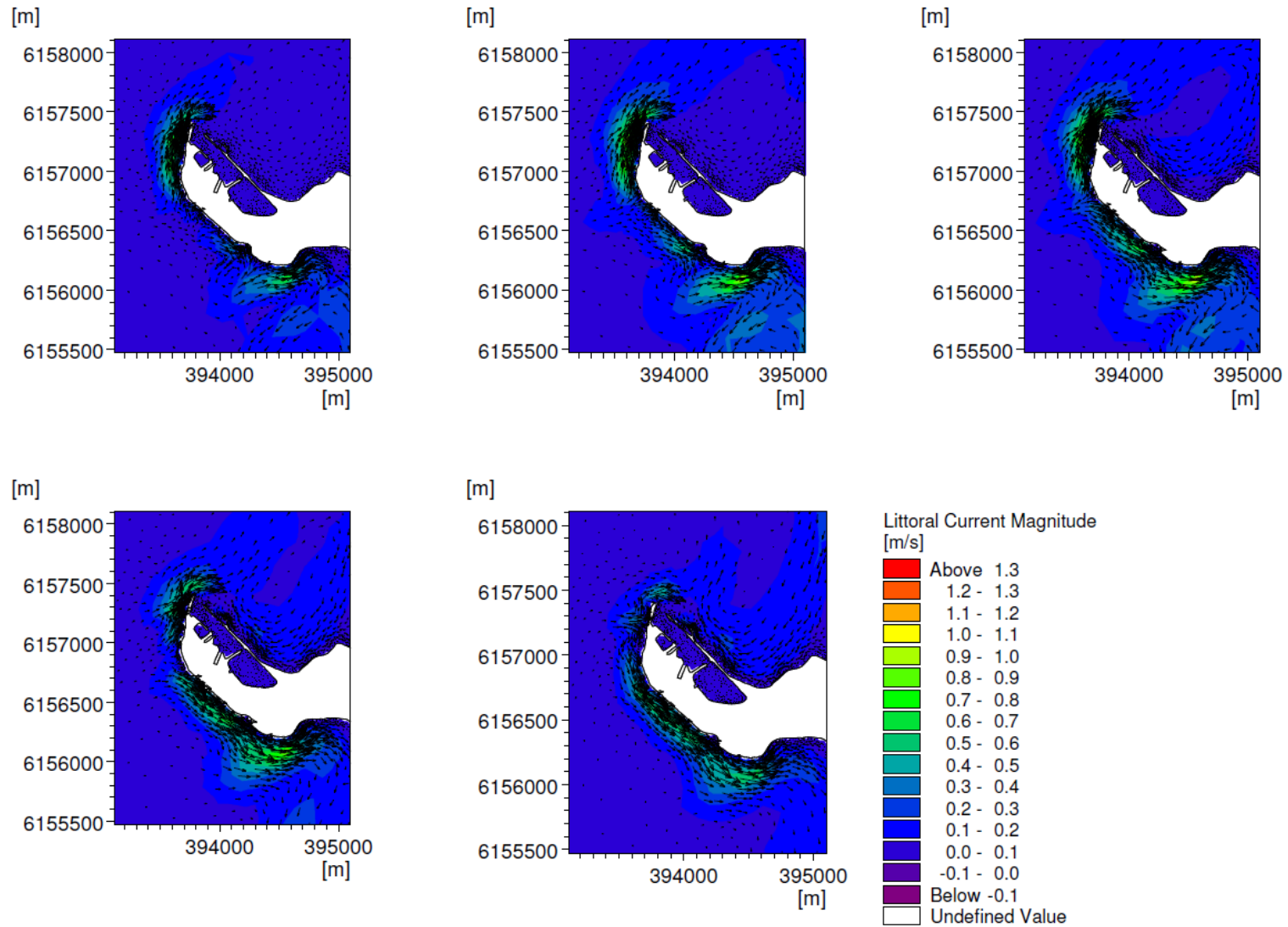
### 6.2.1 Littoral Currents

The effect of 0.55m sea level rise on littoral currents along the Ayrshire coastline was established directly from the results of the MIKE 21 SW simulations. Figure 6.3 shows the magnitude and direction of the littoral currents in the vicinity of Troon for force 8 gales through directions from 180°N to 300°N with 0.55m of sea level rise applied.

Comparing the littoral currents shown in Figure 6.3 to the equivalent present day scenario shown in Figure 4.7, reveals subtle differences in both magnitude and direction. The littoral current adjacent to the shoreline is generally greater in the climate change scenario due to the increased water depth. Slight reductions in magnitude are generally observed at the offshore boundary of the littoral zone during the climate change runs.



**Figure 6.2 Significant wave height and mean wave direction during force 8 gale from 240°N with sea level rise**

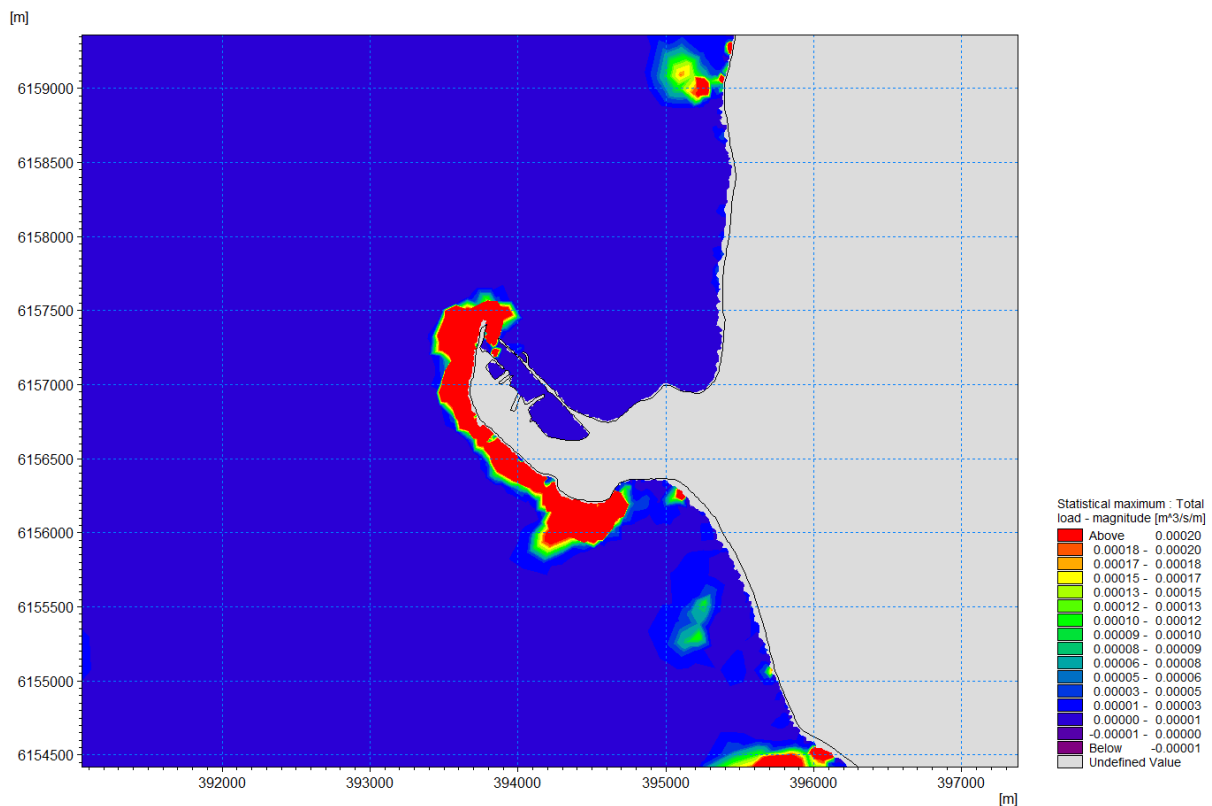


**Figure 6.3 Littoral current magnitude and directions at Troon for force 8 gales between directions 180°N to 300°N with sea level rise applied**

### 6.3 SEDIMENT TRANSPORT

The potential effect of sea level rise on sediment transport along the Ayrshire coastline was also modelled. Simulations were carried out as per the methodology described in Section 5, with a sea level rise of 0.55m applied to the model boundaries.

The maximum potential sediment transport (suspended load and bed load) during each model simulation was analysed and compared to the equivalent present day simulation in order to establish the potential impact of sea level rise on longshore drift along the Ayrshire coastline. An example of the maximum potential sediment transport in the vicinity of Troon due to a force 8 gale from 240°N with sea level rise is shown in Figure 6.4 and is similar to that determined during the present day modelling (Figure 5.1). The maximum potential sediment transport was found to be greater in the climate change scenarios however the increases observed are relatively minor and would not significantly affect the sediment budget along the Ayrshire coastline. The modelling results did not indicate that any sub-cell boundary locations would be changed by a sea level rise of 0.55m.



**Figure 6.4 Maximum potential sediment transport due to force 8 gale from 240°N with sea level rise, storm duration 24 hours**

## 7 REFERENCES

1. H R Wallingford Ltd. (1997). Coastal cells in Scotland. Scottish Natural Heritage Research, Survey & Monitoring Report. No 56.
2. IPCC. (2013). Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Stocker, T.F. et al. (eds). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
3. Lowe, J. A. et al. (2009). UK Climate Projections science report: Marine and coastal projections. Met Office Hadley Centre, Exeter, UK.
4. SEPA. Flood Modelling Guidance for Responsible Authorities, Version 1.0.





# Ayrshire Shoreline Management Plan

## Appendix D: Policy & Actions Assessment

IBE1107/D03

Final

July 2018





# Ayrshire Shoreline Management Plan

## Appendix D: Policy & Actions Assessment

### DOCUMENT CONTROL SHEET

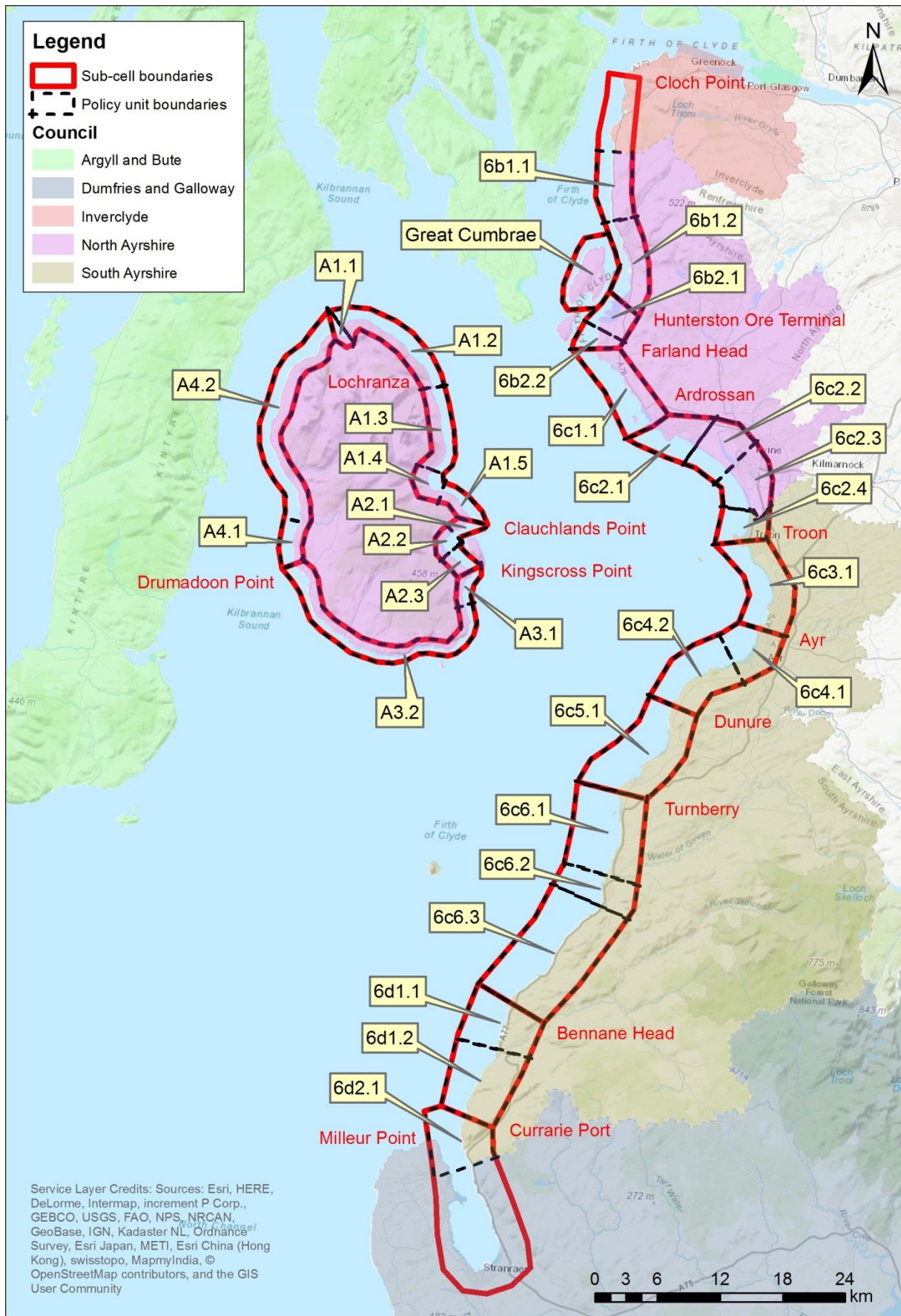
Client	North / South Ayrshire Council					
Project Title	Ayrshire Shoreline Management Plan					
Document Title	Appendix D – Policy & Actions Assessment					
Document No.	IBE1107/D03 – Appendix D					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
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Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
D01	Draft	DI	MB	MB	Belfast	23/01/2018
F01	Final	DI	MB	MB	Belfast	27/07/2018

## **INTRODUCTION**

This Appendix presents an overview of the coastal flood and erosion risk within the various Policy Units identified within the Ayrshire SMP study area, and the outcomes of a series of policy workshops undertaken with Planners and Engineers for both North and South Ayrshire Council. In essence this Appendix documents the process by which the recommended policies were decided and records key issues and considerations that influenced the selection of the relevant policy prior to the finalisation of the draft SMP.

# AYRSHIRE SMP STUDY AREA EXTENTS



**Long List of Potential Actions to achieve Shoreline Management Policies**

Potential Actions	Policies action is applicable for				Risks action is applicable for			Construction Type
	Hold the line	Advance the line	Managed realignment	No active intervention	Tidal Flooding	Wave Overtopping	Erosion	
Seawalls	✓	✓	▲		✓	✓	✓	Hard
Revetments	✓	✓	▲			▲	✓	Hard
Embankments	✓	✓	▲		✓	▲		Hard
Maintenance	✓				▲	▲	▲	Mixed
Groynes	✓						✓	Mixed
Detached breakwaters	✓					▲	✓	Mixed
Headlands	✓					▲	✓	Mixed
Perched beaches	✓						✓	Mixed
Cove	✓						✓	Mixed
Dune stabilisation	✓		▲		✓	▲	✓	Soft
Managed realignment			✓		✓	✓	✓	Soft
Nourishment	✓	▲	✓		▲	▲	✓	Soft
Beach drain	✓						✓	Soft

Key	
Applicable	✓
Applicable in some cases	▲
Not applicable	

## Definitions of Long List of Potential Actions

Potential Actions	Definition
<b>Seawalls</b>	These are typically of concrete, masonry or gabion construction. They are typically sloped but can also be near-vertical. The face can be smooth, stepped or curved. Seawalls protect against both erosion and flooding.
<b>Revetments</b>	A sloping structure with a facing of typically stone, concrete units or cobble. Revetments protect against erosion; however they do not normally protect against flooding.
<b>Embankments</b>	A sloping sea defence structure of typically earthen/sand construction. These structures protect the coast from flooding; however they do not normally provide erosion protection.
<b>Maintenance</b>	In areas where coastal defences are currently in place, a maintenance regime can ensure that these structures continue to provide the required standard of protection.
<b>Groynes</b>	These are normally straight structures perpendicular to the shoreline. They block part of the littoral drift and trap sand on their upstream side.
<b>Detached breakwaters</b>	These are straight shore-parallel structures which partly provide direct coastal protection as the shoreline in the lee of the structure is sheltered. Littoral transport in the lee of the structure is also reduced, trapping sand.
<b>Headlands</b>	These are smooth structures which extend out on the shoreface from the coastline. They block part of the littoral transport and have similar effects on the shoreline as groynes and detached breakwaters; however some of the disadvantages of groynes and detached breakwaters are minimised such as leeside erosion.
<b>Perched beaches</b>	These are natural or nourished beaches at locations with a steep shoreface where a submerged structure supports the lower part of the beach.
<b>Cove</b>	This is a semi-protected sandy bay. Two curved breakwaters which connect to the shore are used to form a cove.
<b>Dune stabilisation</b>	Dunes are a natural coastal feature formed by sand which blows inland from the beach and is deposited behind the coastline. Dunes act as a flexible buffer zone, moving backwards with an eroding coastline as long as there is space for this to occur. This process protects the hinterland from erosion and flooding. The ability of dunes to recover after a storm event can be affected if the dune vegetation is damaged. Planting marram grass and setting up spruce fascines or similar to trap sand can stabilise the dune encouraging accretion and build up. This needs to be carried out in a sensitive manner, as over-use of this technique may completely stabilise the dune, interrupting the natural cycle of dune initiation and sediment redistribution.
<b>Managed realignment</b>	In areas where significant coastal defence works have been undertaken, relaxing the requirements for fixing the coastline position to allow managed realignment may be feasible. If housing or infrastructure facilities are very close to the coastline this option will only be feasible if these can be abandoned or moved landward. Where managed realignment is implemented, the coast is given back to natural processes, thereby enhancing the environmental and recreational quality of the area. The rate of realignment can be managed by combining this measure with nourishment if required. If implemented successfully, managed realignment can be effective against both erosion and flooding.
<b>Nourishment</b>	This is a very natural way of combating erosion as sediment is added to artificially replace a deficit in the sediment budget. This measure does not remove the cause of erosion, so erosion will continue to occur along the nourished section. Continual maintenance is required as the nourished sand is gradually sacrificed. This measure generally does not prevent flooding, except in the case of dune nourishment which can offer additional flood protection.
<b>Beach drain</b>	In this system a drain is installed running parallel to the beach in the wave up-rush zone. The drain lowers the groundwater table in this localised area. This decreases the strength of the down-rush of the wave and increases the strength of the beach sand, thereby reducing erosion. This measure does not protect against flooding.

**Sub-Cell 6b1: Cloch Point - Hunterston Ore Terminal****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave Max. Significant Wave Height (Hm0)
	200yr	200yr CC	2050				2100				
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	249	402		0	0	0		0	0	1	<1.0m
RP <sub>s</sub> AAD (£)	£98,724										
NRPs (no.)	78	138		0	0	2		0	0	2	
NRPs AAD (£)	£201,105										
A Roads (km)	0.837	2.462		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.350	0.468		0.000	0.000	0.025		0.000	0.000	0.062	
Minor Roads (km)	0.129	0.252		0.000	0.046	0.101		0.040	0.020	0.287	
Roads AAD (£)	£14,485										
SSSIs (km <sup>2</sup> )	0.275	0.279	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

\*Note this sub-cell contains assets located within Inverclyde Council, therefore the sum of the policy units may not total the sub-cell value.

**Policy Unit 6b1.1: Skelmorlie to Largs****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave Max. Significant Wave Height (Hm0)
	200yr	200yr CC	2050				2100				
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	0	0		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£0										
NRPs (no.)	0	0		0	0	0		0	0	0	
NRPs AAD (£)	£0										
A Roads (km)	0.298	0.725		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.010		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£6,313										
SSSIs (km <sup>2</sup> )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

**Policy Unit 6b1.2: Largs to Hunterston Ore Terminal****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave Max. Significant Wave Height (Hm0)
	200yr	200yr CC	2050				2100				
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	249	402		0	0	0		0	0	1	<1.0m
RP <sub>s</sub> AAD (£)	£98,724										
NRPs (no.)	75	132		0	0	2		0	0	2	
NRPs AAD (£)	£32,858										
A Roads (km)	0.530	1.723		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.350	0.468		0.000	0.000	0.025		0.000	0.000	0.062	
Minor Roads (km)	0.123	0.236		0.000	0.046	0.101		0.040	0.020	0.287	
Roads AAD (£)	£8,154										
SSSIs (km <sup>2</sup> )	0.275	0.279	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Subcell		Policy unit	
6b1		6b1.1	
Cloch Point - Hunterston Ore Terminal		Skelmorlie to Largs	
<b>Policy</b>			
Hold the line			
<b>Issue</b>			
<p>The A78 road is at risk of coastal flooding. No assets have been identified to be at risk due to coastal erosion in this policy unit, although this may be because the A78 is currently defended and therefore an erosion risk to this asset was not highlighted. The A78 is managed by Transport Scotland. The maximum wave height during a force 8 storm was found to be less than 1.0m.</p>			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✓ Will protect against both flooding and erosion	Perched beaches	▲ Will not protect against flooding but may provide erosion protection
Revetments	▲ Will not protect against flooding but may provide erosion protection	Cove	▲ Will not protect against flooding but may provide erosion protection
Embankments	✓ Will protect against flooding	Dune stabilisation	✗ No space for dunes
Maintenance	✓ There are existing defences including seawalls, revetments rock armour and groynes.	Managed realignment	✗ Will not hold the existing line
Groynes	▲ Will not protect against flooding but may provide erosion protection	Nourishment	✓ Potentially feasible
Detached breakwaters	▲ Will not protect against flooding but may provide erosion protection	Beach drain	▲ Will not protect against flooding but may provide erosion protection
Headlands	▲ Will not protect against flooding but may provide erosion protection	Additional Actions	✗
<b>Workshop Conclusions</b>			
<p>Significant defences are currently in place so maintenance is a potential action. Lack of erosion detected through NCCA likely to be due to coastline being mostly protected already. Realignment of road may not be practical due to the topography. Transport Scotland to manage risk to their assets. Overtopping study may be required by Transport Scotland.</p>			
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Subcell		Policy unit	
6b1		6b1.2	
Cloch Point - Hunterston Ore Terminal		Largs to Hunterston Ore Terminal	
<b>Policy</b>			
Hold the line			
<b>Issue</b>			
Significant coastal flood risk around the ferry terminal at Largs, the mouth of the Noddsdale Water and Allanton Park Terrace. There are other small pockets of coastal flood risk throughout the policy unit. A number of properties are also at risk due to erosion in the vicinity of Mackerston Place. The maximum wave height during a force 8 storm was found to be less than 1.0m.			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✓ Will protect against both flooding and erosion	Perched beaches	▲ Will not protect against flooding but may provide erosion protection
Revetments	▲ Will not protect against flooding but may provide erosion protection	Cove	▲ Will not protect against flooding but may provide erosion protection
Embankments	✓ Will protect against flooding	Dune stabilisation	✗ No space for dunes
Maintenance	✓ There are existing defences including seawalls, revetments and rock armour.	Managed realignment	✗ Will not hold the existing line
Groynes	▲ Will not protect against flooding but may provide erosion protection	Nourishment	✓ Potentially feasible in isolated areas
Detached breakwaters	▲ Will not protect against flooding but may provide erosion protection	Beach drain	▲ Will not protect against flooding but may provide erosion protection
Headlands	▲ Will not protect against flooding but may provide erosion protection	Additional Actions	✓ Wave overtopping study recommended
<b>Workshop Conclusions</b>			
Many properties potentially affected from flooding but damages relatively low. Wave overtopping study recommended to consider full risk and determine best action. Overtopping risk particularly evident in Largs based on Local Authority feedback. It was noted that groynes, cove and headlands may not be suitable at Largs due to recreational use of area.			

**Sub-Cell 6b2: Hunterston Ore Terminal - Farland Head****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	0	0		0	0	0		0	0	0	1.0-1.5m
RP <sub>s</sub> AAD (£)	£0										
NRPs (no.)	1	1		0	0	0		0	0	0	
NRPs AAD (£)	£1,045										
A Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.042	0.056	0.220		0.151	0.047	0.130	
Roads AAD (£)	£0										
SSSIs (km <sup>2</sup> )	0.348	0.400	0.000	0.002	0.001	0.003	0.000	0.002	0.001	0.002	

**Policy Unit 6b2.1: Hunterston****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	0	0		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£0										
NRPs (no.)	1	1		0	0	0		0	0	0	
NRPs AAD (£)	£1,045										
A Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.042	0.056	0.220		0.151	0.047	0.130	
Roads AAD (£)	£0										
SSSIs (km <sup>2</sup> )	0.264	0.296	0.000	0.002	0.001	0.003	0.000	0.002	0.001	0.002	

**Policy Unit 6b2.2: Hunterston to Farland Head****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	0	0		0	0	0		0	0	0	1.0-1.5m
RP <sub>s</sub> AAD (£)	£0										
NRPs (no.)	0	0		0	0	0		0	0	0	
NRPs AAD (£)	£0										
A Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£0										
SSSIs (km <sup>2</sup> )	0.084	0.104	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Subcell		Policy unit	
6b2		6b2.1	
Hunterston Ore Terminal - Farland Head		Hunterston	
Policy			
Advance the line			
Issue			
One Non-residential property (NRP) at risk of coastal flooding at Hunterston construction yard. A localised area of minor road is at risk due to coastal erosion close to the power station. The maximum wave height during a force 8 storm was found to be less than 1.0m.			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✓ Will protect against both flooding and erosion	Perched beaches	▲ Will not protect against flooding but may provide erosion protection
Revetments	✓ Will not protect against flooding but may provide erosion protection	Cove	▲ Will not protect against flooding but may provide erosion protection
Embankments	✓ Will not protect against erosion but may provide flood protection	Dune stabilisation	▲ Will not protect against flooding but may provide erosion protection
Maintenance	▲ There are existing defences including rock armour revetments. Maintaining the existing defences will not advance the line	Managed realignment	✗ Will not advance the line
Groynes	▲ Will not protect against flooding but may provide erosion protection	Nourishment	▲ May be required in conjunction with hard shoreline reinforcement such as seawalls
Detached breakwaters	▲ Will not protect against flooding but may provide erosion protection	Beach drain	▲ Will not protect against flooding but may provide erosion protection
Headlands	▲ Will not protect against flooding but may provide erosion protection	Additional Actions	✗

**Workshop Conclusions**

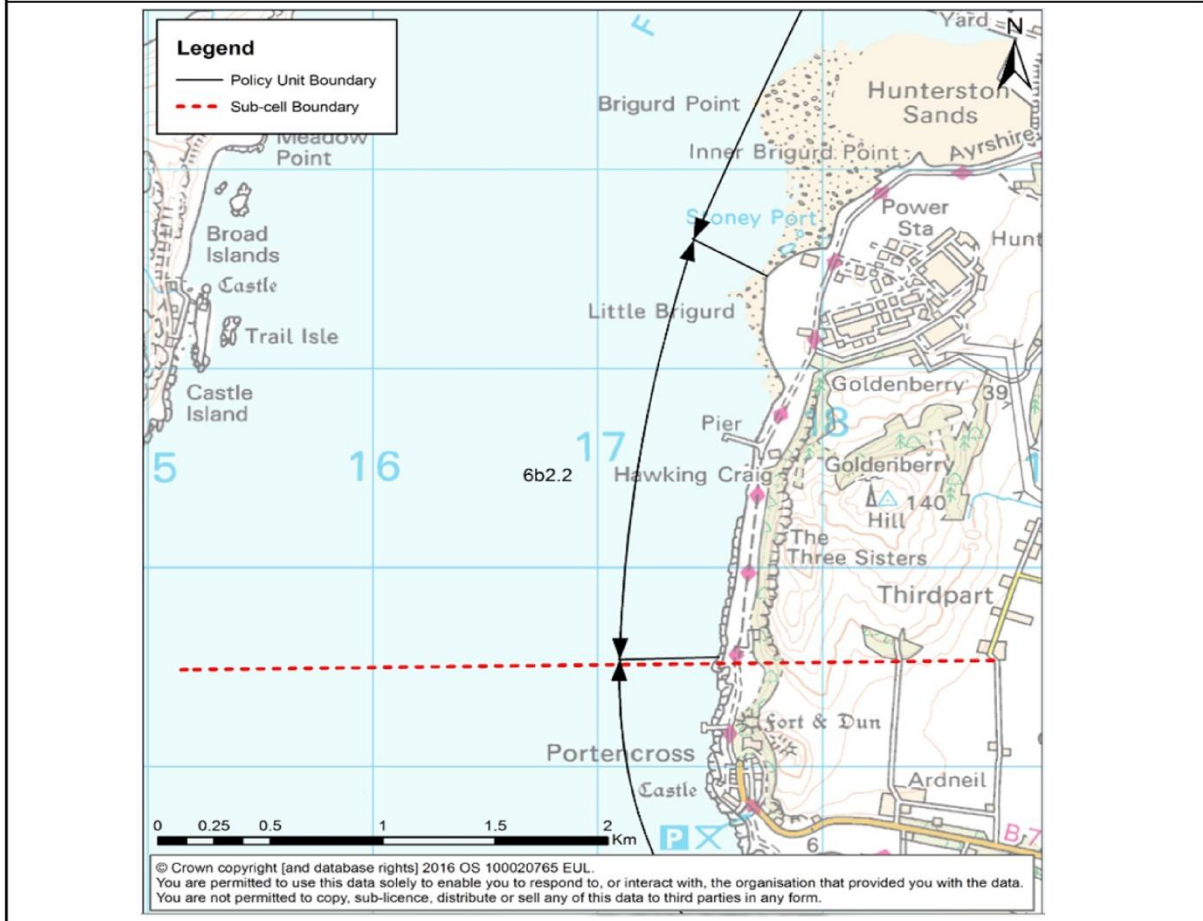
Hunterston is a Strategic Site under the National Planning Framework. Policy under the National Policy Framework is to not constrain development in this area. Actions will be the responsibility of the asset owners.



Subcell		Policy unit	
6b2		6b2.2	
Hunterston Ore Terminal - Farland Head		Hunterston to Farland Head	
Policy			
Hold the line			
Issue			
No assets have been identified to be at risk due to coastal flooding or erosion in this policy unit. The maximum wave height during a force 8 storm was found to be between 1.0-1.5m.			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✗ No flood or erosion risk identified	Perched beaches	✗ No erosion risk identified
Revetments	✗ No erosion risk identified	Cove	✗ No erosion risk identified
Embankments	✗ No flood risk identified	Dune stabilisation	✗ No flood or erosion risk identified
Maintenance	✓ There are existing defences including rock armour revetments.	Managed realignment	✗ Will not hold the existing line
Groynes	✗ No erosion risk identified	Nourishment	✗ No flood or erosion risk identified
Detached breakwaters	✗ No erosion risk identified	Beach drain	✗ No erosion risk identified
Headlands	✗ No erosion risk identified	Additional Actions	✗

**Workshop Conclusions**

Maintenance of the shoreline will be the responsibility of the asset owners.



**Sub-Cell 6c1: Farland Head - Ardrossan****RISKS**

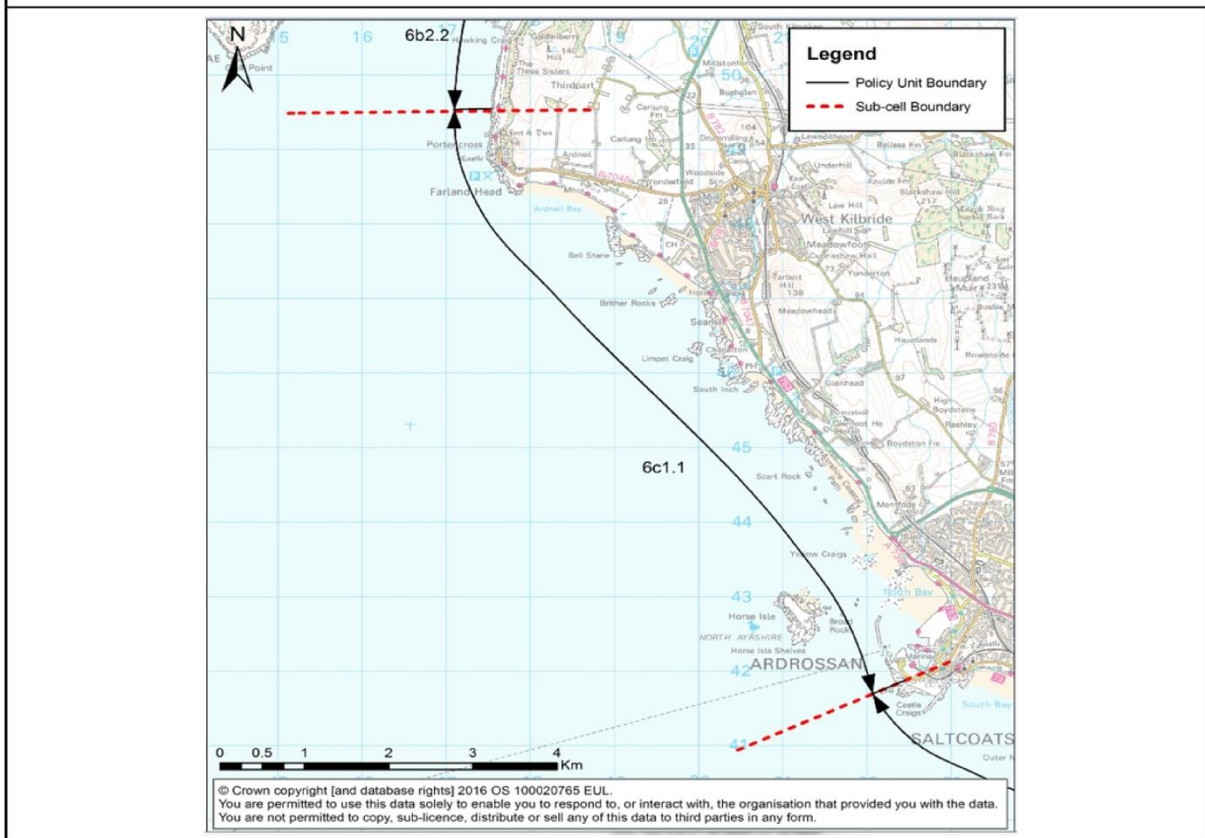
Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
<b>RPs (no.)</b>	1	326		0	0	0		0	0	0	1.5-2.0m
<b>RPs AAD (£)</b>	£3,780										
<b>NRPs (no.)</b>	5	75		0	0	0		0	0	0	
<b>NRPs AAD (£)</b>	£4,369										
<b>A Roads (km)</b>	0.000	0.190		0.000	0.000	0.000		0.000	0.000	0.000	
<b>B Roads (km)</b>	0.021	0.414		0.000	0.000	0.000		0.000	0.000	0.000	
<b>Minor Roads (km)</b>	0.080	1.370		0.000	0.000	0.000		0.000	0.000	0.000	
<b>Roads AAD (£)</b>	£572										
<b>SSSIs (km<sup>2</sup>)</b>	0.000	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Policy Unit 6c1.1 (Farland Head to Ardrossan) is the only policy unit within this sub-cell, therefore the policy unit risk values are equal to the sub-cell risk values.

Subcell		Policy unit			
6c1		6c1.1			
Farland Head - Ardrossan		Farland Head to Ardrossan			
Policy					
Hold the line					
Issue					
A number of properties are at risk of coastal flooding in the vicinity of Portencross Castle, along Eglinton Road and at Ardrossan Marina. No assets were found to be at risk due to coastal erosion. Risk to Scottish Water assets. The maximum wave height during a force 8 storm was found to be between 1.5-2.0m. Wave overtopping risk to Ardrossan.					
Potential Actions	Technically feasible?		Potential Actions	Technically feasible?	
Seawalls	✓	Will protect against flooding	Perched beaches	✗	Will not protect against flooding
Revetments	✗	Will not protect against flooding	Cove	✗	Will not protect against flooding
Embankments	✓	Will protect against flooding	Dune stabilisation	✓	Potentially feasible at Eglinton Road
Maintenance	✓	There are existing defences including seawalls, revetments, rock armour and dunes	Managed realignment	✗	Will not hold the existing line
Groynes	✗	Will not protect against flooding	Nourishment	✓	Potentially feasible at Eglinton Road
Detached breakwaters	✓	May provide protection to the marina	Beach drain	✗	Will not protect against flooding
Headlands	✗	Will not protect against flooding	Additional Actions	✓	Wave overtopping study recommended

**Workshop Conclusions**

Planning application currently in for North Bay which could provide 200yr plus climate change standard of protection against coastal flooding. Scottish Water to manage risk to their assets.



**Sub-Cell 6c2: Ardrossan - Troon****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	134	707		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£71,206										
NRPs (no.)	118	308		0	0	1		0	0	1	
NRPs AAD (£)	£224,240										
A Roads (km)	0.511	0.246		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.746	2.323		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.249	0.881		0.000	0.000	0.000		0.000	0.000	0.273	
Roads Damage (£)	£14,267										
SSSIs (km <sup>2</sup> )	1.101	1.253	0.011	0.000	0.000	0.000	0.011	0.000	0.000	0.000	

**Policy Unit 6c2.1: Ardrossan to Stevenston****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	13	382		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£26,167										
NRPs (no.)	1	161		0	0	1		0	0	1	
NRPs AAD (£)	£10,592										
A Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.744		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.515		0.000	0.000	0.000		0.000	0.000	0.273	
Roads Damage (£)	£397										
SSSIs (km <sup>2</sup> )	0.062	0.063	0.005	0.000	0.000	0.000	0.005	0.000	0.000	0.000	

**Policy Unit 6c2.2: Stevenston to Irvine Bay****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	0	0		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£0										
NRPs (no.)	3	3		0	0	0		0	0	0	
NRPs AAD (£)	£2,822										
A Roads (km)	0.019	0.477		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.257	0.382		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£1,706										
SSSIs (km <sup>2</sup> )	0.829	0.961	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Policy Unit 6c2.3: Irvine Bay to Gales Burn**RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	10	84		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£6,859										
NRPs (no.)	11	18		0	0	0		0	0	0	
NRPs AAD (£)	£192,426										
A Roads (km)	0.253	0.276		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.005	0.031		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£7,307										
SSSIs (km <sup>2</sup> )	0.211	0.229	0.006	0.000	0.000	0.000	0.006	0.000	0.000	0.000	

Policy Unit 6c2.4: Gales Burn to Troon**RISKS**

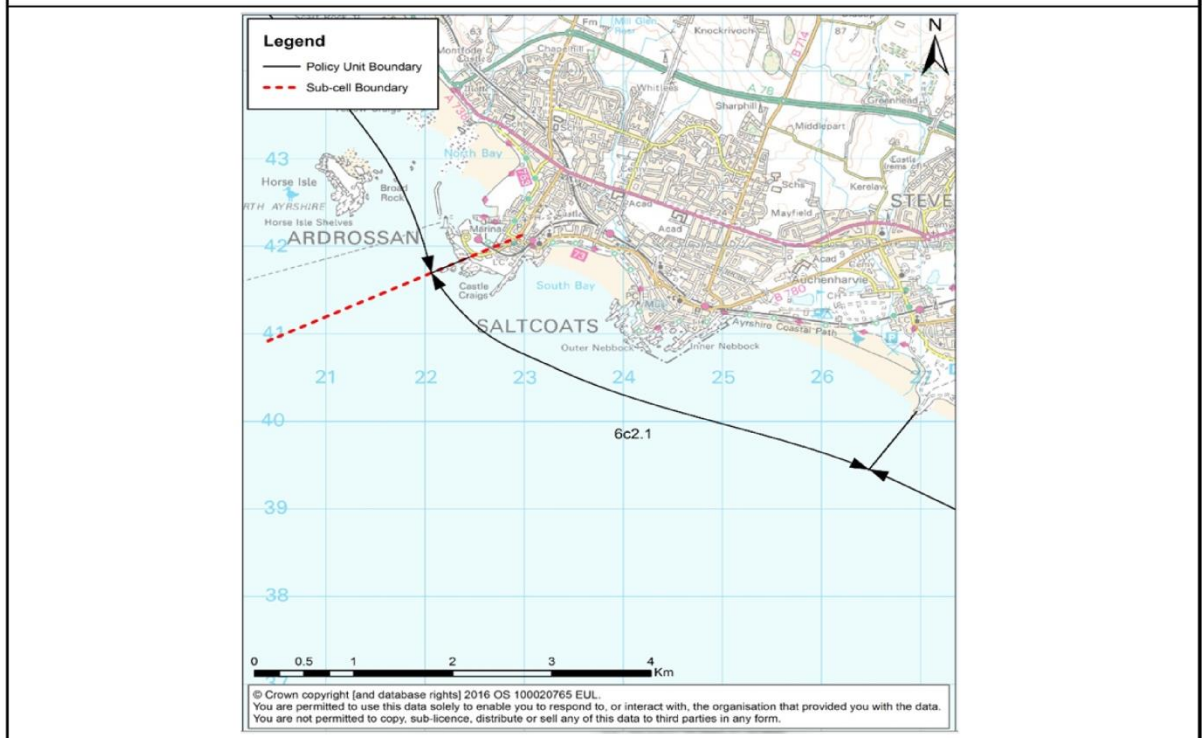
Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	111	241		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£38,181										
NRPs (no.)	103	126		0	0	0		0	0	0	
NRPs AAD (£)	£18,401										
A Roads (km)	0.238	0.246		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.484	1.579		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.249	0.366		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£4,857										
SSSIs (km <sup>2</sup> )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

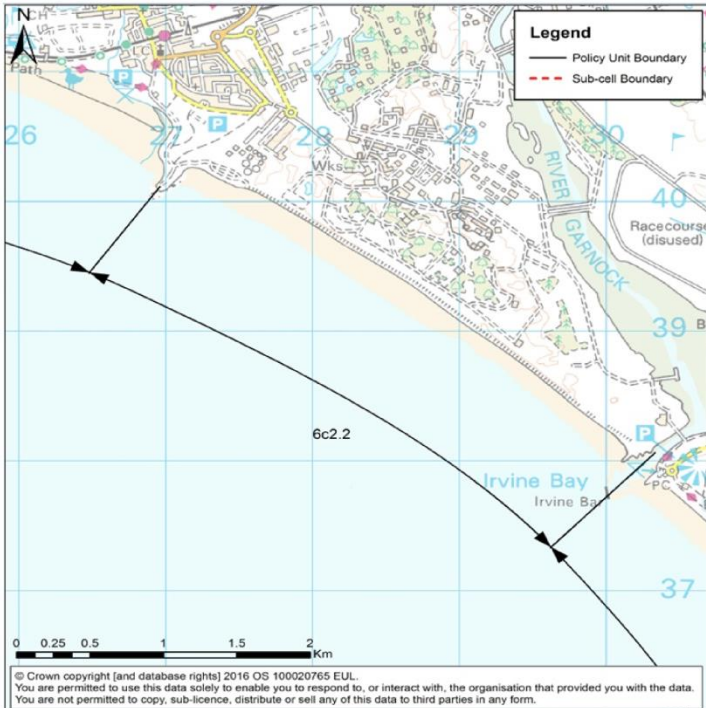


Subcell		Policy unit			
6c2		6c2.1			
Ardrossan - Troon		Ardrossan to Stevenston			
Policy					
Hold the line					
Issue					
Significant coastal flood risk adjacent at Canal Crescent (Stevenston). Potential flood risk to rail line at Saltcoats. Significant additional coastal flood risk at Saltcoats and Stevenston during climate change scenario. One NRP is at risk due to coastal erosion at Stevenston beach. The maximum wave height during a force 8 storm was found to be less than 1.0m.					
Potential Actions	Technically feasible?		Potential Actions	Technically feasible?	
Seawalls	✓	Will protect against both flooding and erosion	Perched beaches	▲	Will not protect against flooding but may provide erosion protection
Revetments	▲	Will not protect against flooding but may provide erosion protection	Cove	▲	Will not protect against flooding but may provide erosion protection
Embankments	▲	Will not protect against erosion but may provide flooding protection	Dune stabilisation	✓	Potentially feasible, especially at Stevenston beach
Maintenance	✓	There are existing defences including seawalls, revetments, rock armour and dunes	Managed realignment	✗	Will not hold the existing line
Groynes	▲	Will not protect against flooding but may provide erosion protection	Nourishment	✓	Potentially feasible in isolated areas
Detached breakwaters	▲	Will not protect against flooding but may provide erosion protection	Beach drain	▲	Will not protect against flooding but may provide erosion protection
Headlands	▲	Will not protect against flooding but may provide erosion protection	Additional Actions	✗	

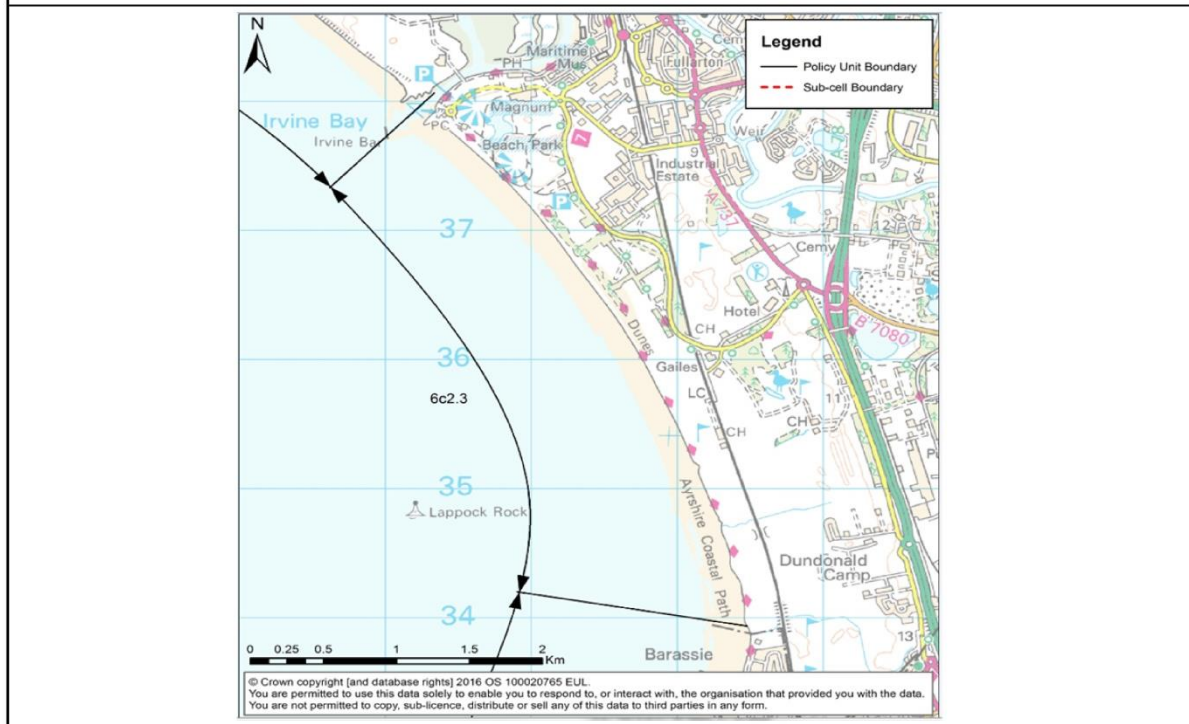
**Workshop Conclusions**

Soft engineering action preferred to manage erosion at Stevenston. Actions will be the responsibility of the asset owner. Network Rail to manage risk to their assets.



Subcell		Policy unit	
6c2		6c2.2	
Ardrossan - Troon		Stevenston to Irvine Bay	
<b>Policy</b>			
Hold the line			
<b>Issue</b>			
Isolated areas of coastal flood risk adjacent to the River Irvine affecting three NRPs. No assets have been identified to be at risk due to coastal erosion, however unknown materials are present along the shoreline and there is potential for contamination if future erosion was to occur. The maximum wave height during a force 8 storm was found to be less than 1.0m.			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✓ Will protect against both flooding and erosion	Perched beaches	▲ Will not protect against flooding but may provide erosion protection
Revetments	▲ Will not protect against flooding but may provide erosion protection	Cove	▲ Will not protect against flooding but may provide erosion protection
Embankments	▲ Will not protect against erosion but may provide flooding protection	Dune stabilisation	✓ Potentially feasible
Maintenance	✓ There are existing defences including seawalls, revetments, rock armour and dunes	Managed realignment	✗ Will not hold the existing line
Groynes	▲ Will not protect against flooding but may provide erosion protection	Nourishment	✓ Potentially feasible in isolated areas
Detached breakwaters	▲ Will not protect against flooding but may provide erosion protection	Beach drain	▲ Will not protect against flooding but may provide erosion protection
Headlands	▲ Will not protect against flooding but may provide erosion protection	Additional Actions	✗
<b>Workshop Conclusions</b>			
Unknown materials are present at the site along this section of shoreline. Potential for contamination, so erosion protection is required.			
			

Subcell		Policy unit			
6c2		6c2.3			
Ardrossan - Troon		Irvine Bay to Gailles Burn			
Policy					
Hold the line					
Issue					
Significant coastal flood risk adjacent to the River Irvine. No assets were identified as being at risk due to coastal erosion, however Local Authorities indicate there is significant loss of sand dune at Barassie. The maximum wave height during a force 8 storm was found to be less than 1.0m.					
Potential Actions	Technically feasible?		Potential Actions	Technically feasible?	
Seawalls	✓	Will protect against both flooding and erosion	Perched beaches	▲	Will not protect against flooding but may provide erosion protection
Revetments	▲	Will not protect against flooding but may provide erosion protection	Cove	▲	Will not protect against flooding but may provide erosion protection
Embankments	▲	Will not protect against erosion but may provide flooding protection	Dune stabilisation	✓	Potentially feasible
Maintenance	✓	There are existing defences including seawalls, revetments, rock armour and dunes	Managed realignment	✗	Will not hold the existing line
Groynes	▲	Will not protect against flooding but may provide erosion protection	Nourishment	✓	Potentially feasible in isolated areas
Detached breakwaters	▲	Will not protect against flooding but may provide erosion protection	Beach drain	▲	Will not protect against flooding but may provide erosion protection
Headlands	▲	Will not protect against flooding but may provide erosion protection	Additional Actions	✗	
Workshop Conclusions					
Dune management recommended at Barassie/Irvine beach park to manage erosion. Hard engineering actions may be required along the river Irvine to manage flooding.					

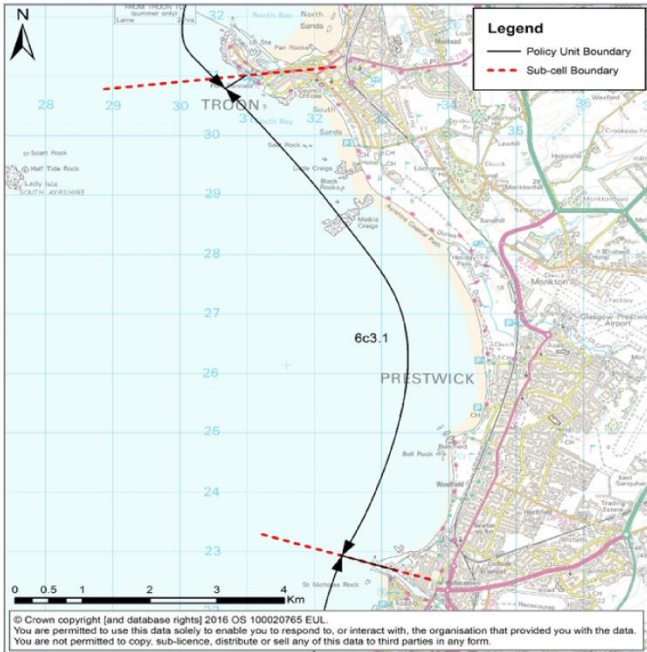


Subcell		Policy unit	
6c2		6c2.4	
Ardrossan - Troon		Gailes Burn to Troon	
<b>Policy</b>			
Hold the line			
<b>Issue</b>			
Significant coastal flood risk in the vicinity of Portland St (Troon). No assets have been identified to be at risk due to coastal erosion in this policy unit. The maximum wave height during a force 8 storm was found to be less than 1.0m.			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✓ Will protect against flooding	Perched beaches	✗ Will not protect against flooding
Revetments	✗ Will not protect against flooding	Cove	✗ Will not protect against flooding
Embankments	✓ Will protect against flooding	Dune stabilisation	✓ Potentially feasible
Maintenance	✓ There are existing defences including seawalls, rock armour and dunes	Managed realignment	✗ Will not hold the existing line
Groynes	✗ Will not protect against flooding	Nourishment	✓ Potentially feasible
Detached breakwaters	✗ Will not protect against flooding	Beach drain	✗ Will not protect against flooding
Headlands	✗ Will not protect against flooding	Additional Actions	✓ Wave overtopping study recommended
<b>Workshop Conclusions</b>			
Seawalls, embankments and maintenance at Troon. Dune stabilisation or maintenance at North Sands, Barassie and Troon North Beach. South Ayrshire Council currently do dune restoration work in the area. Groynes, detached breakwaters or headlands are not socially acceptable at Troon North Beach as these measures would impact upon the recreational use of the beach. Wave overtopping study recommended to assess risk to Portland St.			
<p><b>Legend</b>                  — Policy Unit Boundary                  - - - Sub-cell Boundary</p> <p>© Crown copyright [and database rights] 2016 OS 100020765 EUL.                  You are permitted to use this data solely to enable you to respond to, or interact with, the organisation that provided you with the data.                  You are not permitted to copy, sub-licence, distribute or sell any of this data to third parties in any form.</p>			

**Sub-Cell 6c3: Troon - Ayr****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
<b>RPs (no.)</b>	317	669		0	0	0		0	0	0	<1.0m
<b>RPs AAD (£)</b>	£114,471										
<b>NRPs (no.)</b>	264	375		0	0	0		0	0	0	
<b>NRPs AAD (£)</b>	£60,772										
<b>A Roads (km)</b>	0.298	0.299		0.000	0.000	0.000		0.000	0.000	0.000	
<b>B Roads (km)</b>	0.230	0.989		0.000	0.000	0.000		0.000	0.000	0.000	
<b>Minor Roads (km)</b>	0.240	0.340		0.000	0.000	0.000		0.000	0.000	0.000	
<b>Roads AAD (£)</b>	£2,345										
<b>SSSIs (km<sup>2</sup>)</b>	0.041	0.067	0.008	0.000	0.000	0.000	0.008	0.000	0.000	0.000	

Policy Unit 6c3.1 (Troon to Ayr) is the only policy unit within this sub-cell, therefore the policy unit risk values are equal to the sub-cell risk values.

Subcell		Policy unit			
6c3		6c3.1			
Troon - Ayr		Troon to Ayr			
<b>Policy</b>					
Hold the line					
<b>Issue</b>					
Significant coastal flood risk around West Portland St (Troon), Prestwick beach and York St (Ayr). Erosion at Newton shore, area of fill material needs protected. Scottish Water rising main runs along the shore and needs protected or moved. Local Authorities have indicated Titchfield Road and adjacent property gardens have flooded in the past due to wave overtopping. The maximum wave height during a force 8 storm was found to be less than 1.0m.					
Potential Actions	Technically feasible?		Potential Actions	Technically feasible?	
Seawalls	✓	Will protect against flooding and erosion	Perched beaches	▲	Will not protect against flooding but may provide erosion protection
Revetments	✓	Will protect against erosion	Cove	▲	Will not protect against flooding but may provide erosion protection
Embankments	✓	Will protect against flooding	Dune stabilisation	✗	Properties at risk either have no space for dunes or have existing seawall defences in front of them
Maintenance	✓	There are existing defences including seawalls, revetments, rock armour and dunes	Managed realignment	✗	Will not hold the existing line
Groynes	▲	Will not protect against flooding but may provide erosion protection	Nourishment	✓	Potentially feasible to protect the SW asset
Detached breakwaters	▲	Will not protect against flooding but may provide erosion protection	Beach drain	▲	Will not protect against flooding but may provide erosion protection
Headlands	▲	Will not protect against flooding but may provide erosion protection	Additional Actions	✓	Wave overtopping study recommended
<b>Workshop Conclusions</b>					
Revetments a potential option to protect against erosion at Newton shore. Scottish Water to manage risk to their asset and could consider nourishment as a potential option. Wave overtopping study including Titchfield Road recommended.					
					

**Sub-Cell 6c4: Ayr - Dunure****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave Max. Significant Wave Height (Hm0)
	200yr	200yr CC	2050				2100				
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	173	575		0	0	0		0	0	0	1.5-2.0m
RP <sub>s</sub> AAD (£)	£143,844										
NRP <sub>s</sub> (no.)	26	59		0	0	0		0	0	0	
NRP <sub>s</sub> AAD (£)	£27,936										
A Roads (km)	0.397	0.496		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.101		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.203	1.010		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£8,209										
SSSIs (km <sup>2</sup> )	0.062	0.070	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	

**Policy Unit 6c4.1: Ayr to Greenan Castle****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave Max. Significant Wave Height (Hm0)
	200yr	200yr CC	2050				2100				
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	173	575		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£143,844										
NRP <sub>s</sub> (no.)	24	57		0	0	0		0	0	0	
NRP <sub>s</sub> AAD (£)	£14,353										
A Roads (km)	0.397	0.496		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.101		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.203	1.010		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£8,209										
SSSIs (km <sup>2</sup> )	0.013	0.014	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	

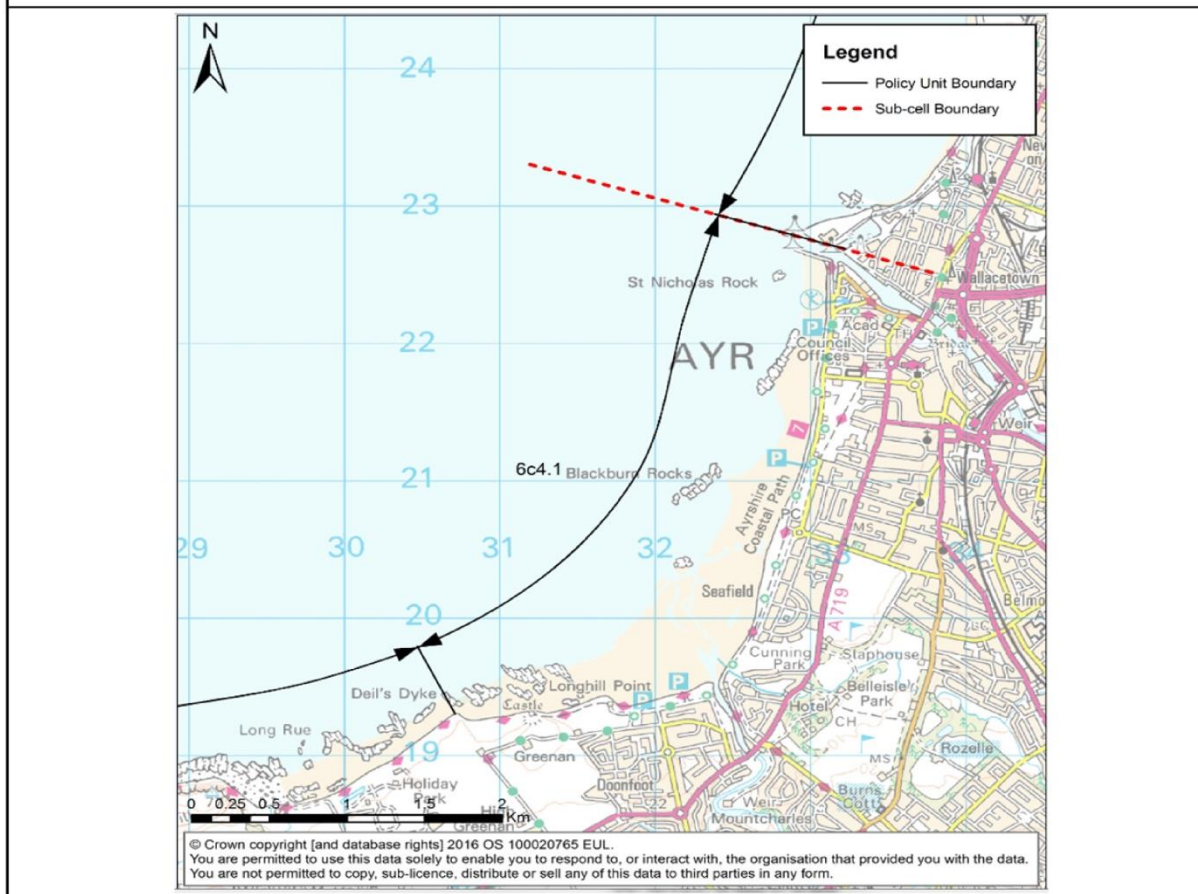
**Policy Unit 6c4.2: Greenan Castle to Dunure****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave Max. Significant Wave Height (Hm0)
	200yr	200yr CC	2050				2100				
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	0	0		0	0	0		0	0	0	1.5-2.0m
RP <sub>s</sub> AAD (£)	£0										
NRP <sub>s</sub> (no.)	2	2		0	0	0		0	0	0	
NRP <sub>s</sub> AAD (£)	£13,583										
A Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£0										
SSSIs (km <sup>2</sup> )	0.049	0.056	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Subcell		Policy unit	
6c4		6c4.1	
Ayr - Dunure		Ayr to Greenan Castle	
Policy			
Hold the line			
Issue			
Significant coastal flood risk at River St (Ayr), Westfield Rd/Clarke Avenue/Arrol Dr (Seafield) and Gearholm Rd/Goukscroft Park (Doonfoot). No assets have been identified to be at risk due to erosion. The maximum wave height during a force 8 storm was found to be less than 1.0m.			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✓ Will protect against flooding	Perched beaches	✗ Will not protect against flooding
Revetments	✗ Will not protect against flooding	Cove	✗ Will not protect against flooding
Embankments	✓ Will protect against flooding	Dune stabilisation	✓ Potentially feasible at Seafield
Maintenance	✓ There are existing defences including seawalls, revetments, rock armour, dunes and the south pier.	Managed realignment	✗ Will not hold the existing line
Groynes	✗ Will not protect against flooding	Nourishment	✓ Potentially feasible at Seafield
Detached breakwaters	✗ Will not protect against flooding	Beach drain	✗ Will not protect against flooding
Headlands	✗ Will not protect against flooding	Additional Actions	✓ Wave overtopping study recommended

**Workshop Conclusions**

Maintenance of the South Pier was suggested due to its importance in maintaining the port at Ayr. A wave overtopping study along the promenade at south Ayr town was recommended. The policy unit boundary was adjusted to include Greenan Castle within the hold the line policy.

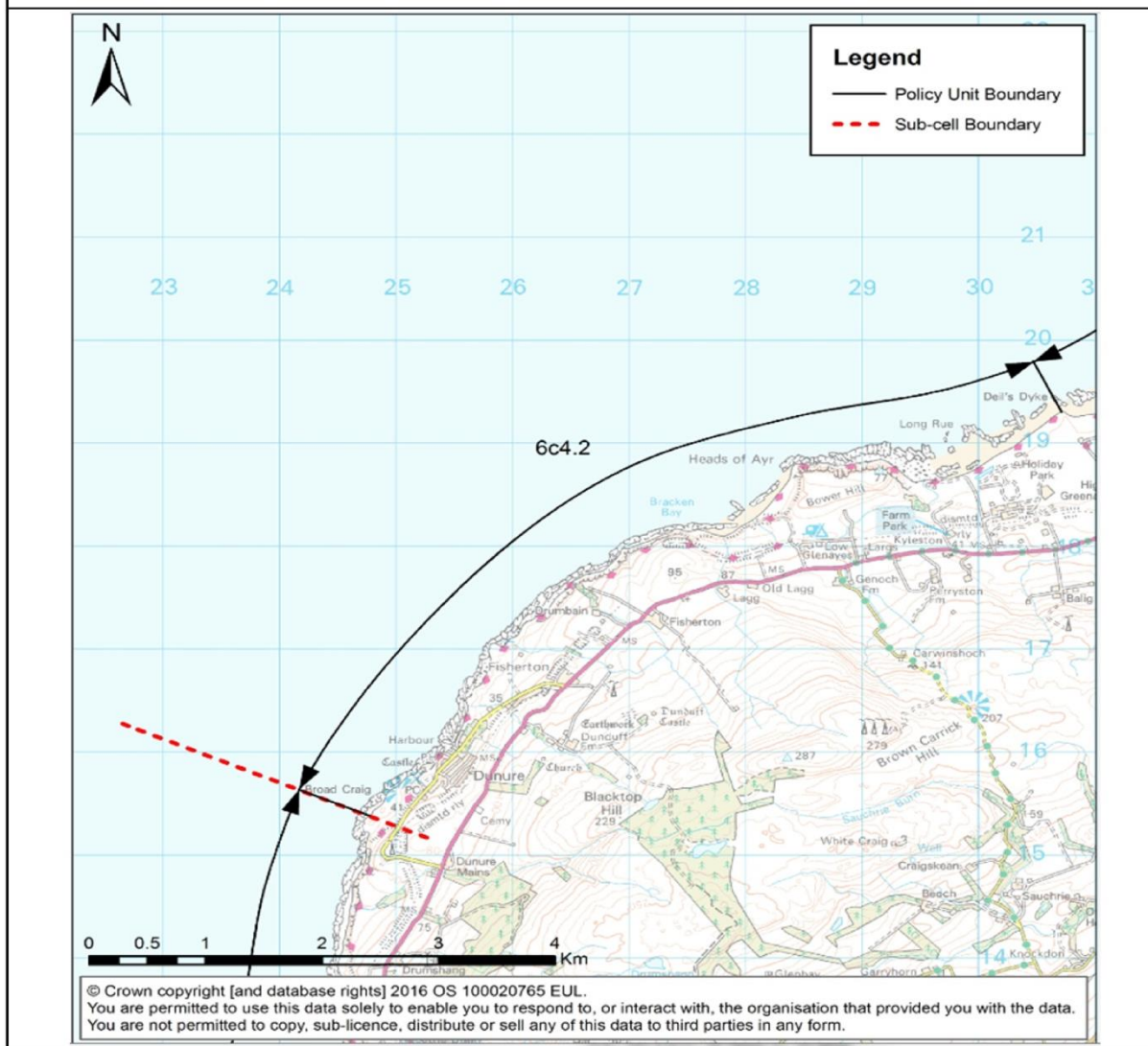




Subcell		Policy unit			
6c4		6c4.2			
Ayr - Dunure		Greenan Castle to Dunure			
Policy					
No active intervention					
Issue					
Two NRPs at coastal flood risk at Dunure. No assets have been identified to be at risk due to erosion. The maximum wave height during a force 8 storm was found to be between 1.5-2.0m.					
Potential Actions	Technically feasible?		Potential Actions	Technically feasible?	
Seawalls	x	N/A	Perched beaches	x	N/A
Revetments	x	N/A	Cove	x	N/A
Embankments	x	N/A	Dune stabilisation	x	N/A
Maintenance	x	N/A	Managed realignment	x	N/A
Groynes	x	N/A	Nourishment	x	N/A
Detached breakwaters	x	N/A	Beach drain	x	N/A
Headlands	x	N/A	Additional Actions	x	

**Workshop Conclusions**

The policy was agreed with no amendments. No active intervention



**Sub-Cell 6c5: Dunure - Turnberry****RISKS**

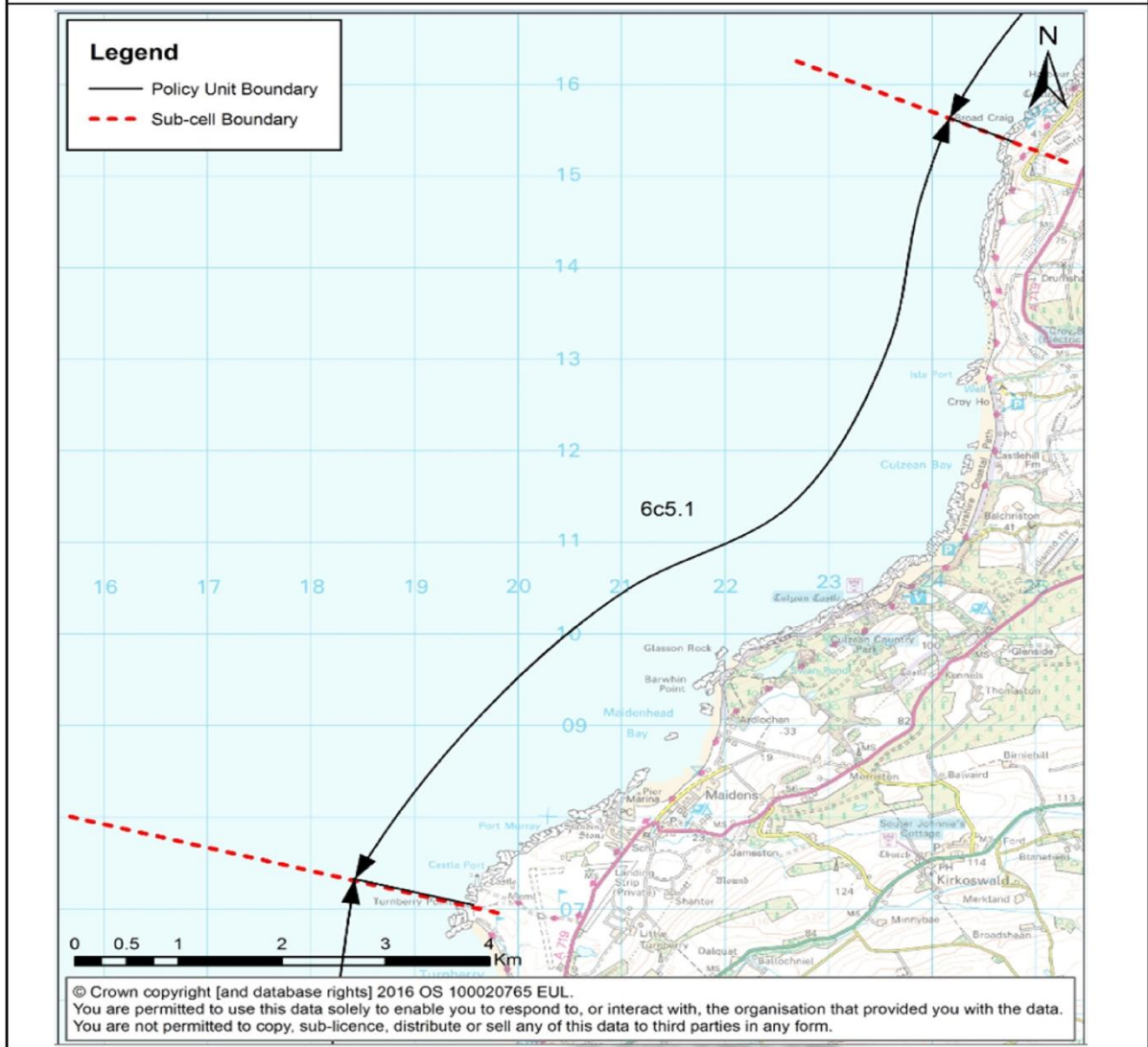
Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
<b>RPs (no.)</b>	1	1		0	0	0		0	0	0	1.5-2.0m
<b>RPs AAD (£)</b>	£7,785										
<b>NRPs (no.)</b>	2	5		0	0	0		0	0	0	
<b>NRPs AAD (£)</b>	£1,143										
<b>A Roads (km)</b>	0.000	0.015		0.000	0.000	0.000		0.000	0.000	0.000	
<b>B Roads (km)</b>	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
<b>Minor Roads (km)</b>	0.014	0.093		0.000	0.000	0.000		0.000	0.000	0.000	
<b>Roads AAD (£)</b>	£225										
<b>SSSIs (km<sup>2</sup>)</b>	0.056	0.065	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Policy Unit 6c5.1 (Dunure to Turnberry) is the only policy unit within this sub-cell, therefore the policy unit risk values are equal to the sub-cell risk values.

Subcell		Policy unit			
6c5		6c5.1			
Dunure - Turnberry		Dunure to Turnberry			
Policy					
No active intervention					
Issue					
Isolated areas of coastal flood risk have been identified at Maidenhead Bay and Turnberry lighthouse. The maximum wave height during a force 8 storm was found to be between 1.5-2.0m.					
Potential Actions	Technically feasible?		Potential Actions	Technically feasible?	
Seawalls	x	N/A	Perched beaches	x	N/A
Revetments	x	N/A	Cove	x	N/A
Embankments	x	N/A	Dune stabilisation	x	N/A
Maintenance	x	N/A	Managed realignment	x	N/A
Groynes	x	N/A	Nourishment	x	N/A
Detached breakwaters	x	N/A	Beach drain	x	N/A
Headlands	x	N/A	Additional Actions	x	

**Workshop Conclusions**

The policy was agreed with no amendments. This section of coastline is potentially important as a sediment source.



**Sub-Cell 6c6: Turnberry - Bennane Head****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave Max. Significant Wave Height (Hm0)
	200yr	200yr CC	2050				2100				
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	8	15		0	0	0		0	0	0	1.5-2.0m
RP <sub>s</sub> AAD (£)	£9,190										
NRPs (no.)	13	22		0	0	0		0	0	0	
NRPs AAD (£)	£4,153										
A Roads (km)	0.240	0.473		0.000	0.051	0.115		0.048	0.021	0.101	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.088	0.192		0.000	0.000	0.107		0.030	0.011	0.073	
Roads AAD (£)	£6,257										
SSSIs (km <sup>2</sup> )	0.268	0.292	0.002	0.001	0.001	0.003	0.002	0.001	0.001	0.003	

**Policy Unit 6c6.1: Turnberry to North Girvan****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave Max. Significant Wave Height (Hm0)
	200yr	200yr CC	2050				2100				
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	1	2		0	0	0		0	0	0	1.5-2.0m
RP <sub>s</sub> AAD (£)	£692										
NRPs (no.)	0	0		0	0	0		0	0	0	
NRPs AAD (£)	£0										
A Roads (km)	0.020	0.020		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£705										
SSSIs (km <sup>2</sup> )	0.059	0.067	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

**Policy Unit 6c6.2: Girvan****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave Max. Significant Wave Height (Hm0)
	200yr	200yr CC	2050				2100				
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	7	13		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£8,498										
NRPs (no.)	13	21		0	0	0		0	0	0	
NRPs AAD (£)	£4,153										
A Roads (km)	0.034	0.119		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.088	0.191		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£1,184										
SSSIs (km <sup>2</sup> )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

## Policy Unit 6c6.3: South Girvan to Bennane Head

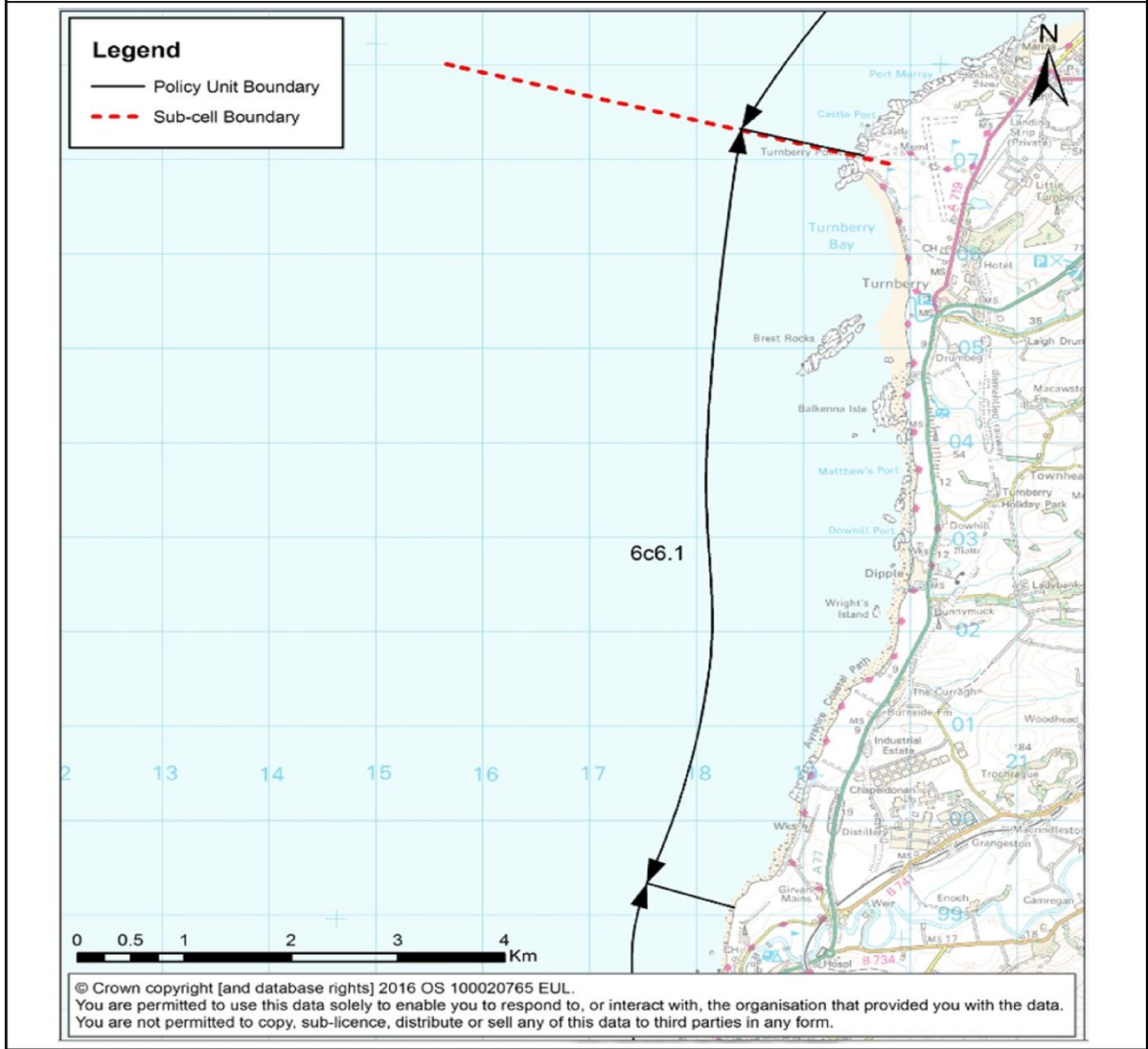
**RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
<b>RPs (no.)</b>	0	0		0	0	0		0	0	0	<1.0m
<b>RPs AAD (£)</b>	£0										
<b>NRPs (no.)</b>	0	1		0	0	0		0	0	0	
<b>NRPs AAD (£)</b>	£0										
<b>A Roads (km)</b>	0.186	0.334		0.000	0.051	0.115		0.048	0.021	0.101	
<b>B Roads (km)</b>	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
<b>Minor Roads (km)</b>	0.000	0.001		0.000	0.000	0.107		0.030	0.011	0.073	
<b>Roads AAD (£)</b>	£4,368										
<b>SSSIs (km<sup>2</sup>)</b>	0.209	0.225	0.002	0.001	0.001	0.003	0.002	0.001	0.001	0.003	

Subcell		Policy unit	
6c6		6c6.1	
Turnberry - Bennane Head		Turnberry to North Girvan	
Policy			
No active intervention			
Issue			
Isolated coastal flood risk identified to a single residential property (RP) at Dipple. There is potential for erosion of agricultural land but risk is low. The maximum wave height during a force 8 storm was found to be between 1.5-2.0m.			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✗ N/A	Perched beaches	✗ N/A
Revetments	✗ N/A	Cove	✗ N/A
Embankments	✗ N/A	Dune stabilisation	✗ N/A
Maintenance	✗ N/A	Managed realignment	✗ N/A
Groynes	✗ N/A	Nourishment	✗ N/A
Detached breakwaters	✗ N/A	Beach drain	✗ N/A
Headlands	✗ N/A	Additional Actions	✗

**Workshop Conclusions**

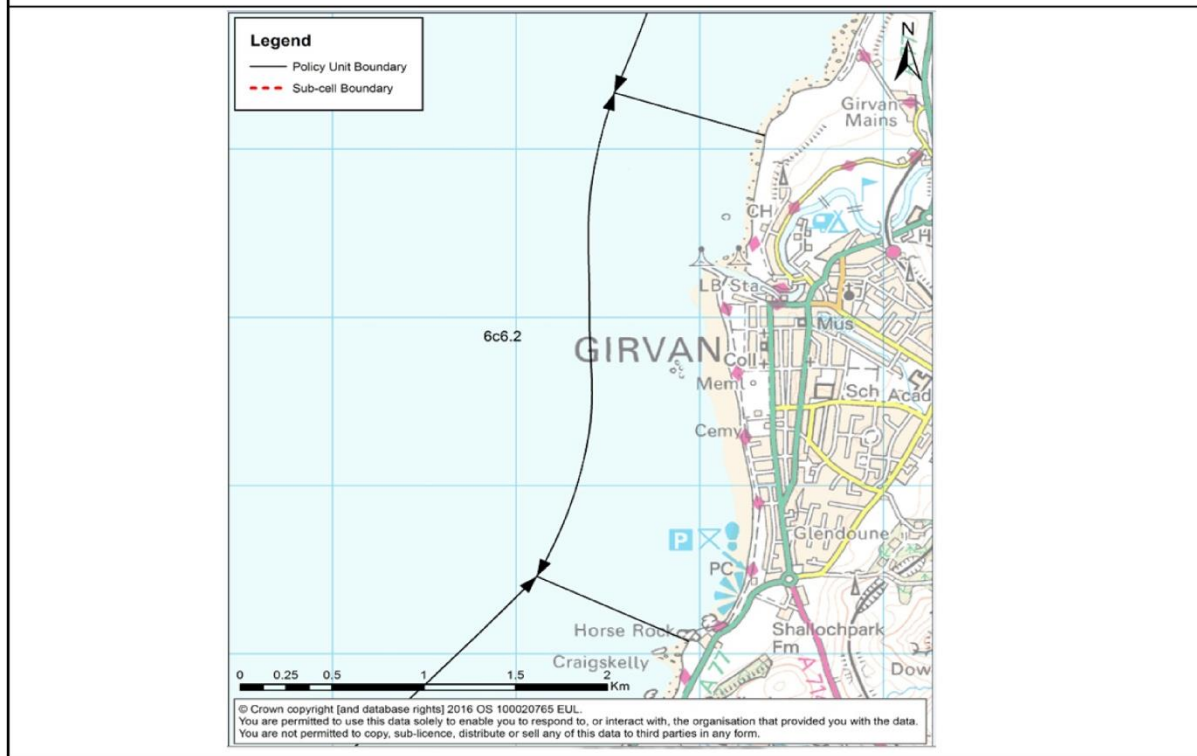
The policy was agreed with no amendments. This section of coastline is potentially important as a sediment source.



Subcell		Policy unit	
6c6		6c6.2	
Turnberry - Bennane Head		Girvan	
Policy			
Hold the line			
Issue			
Significant coastal flood risk adjacent to the Water of Girvan and A77. Significant joint fluvial and coastal flood risk with the Water of Girvan and Mill Burn. Erosion risk at Girvan golf course. The maximum wave height during a force 8 storm was found to be less than 1.0m.			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✓ Will protect against flooding	Perched beaches	▲ Will not protect against flooding but may provide erosion protection
Revetments	✓ Will protect against erosion	Cove	▲ Will not protect against flooding but may provide erosion protection
Embankments	✓ Will protect against flooding	Dune stabilisation	✓ Potentially feasible at Girvan golf club
Maintenance	✓ There are existing defences including harbour walls, seawalls, revetments and rock armour	Managed realignment	✗ Will not hold the existing line
Groynes	▲ Will not protect against flooding but may provide erosion protection	Nourishment	✓ Potentially feasible at Girvan golf club
Detached breakwaters	▲ Will not protect against flooding but may provide erosion protection	Beach drain	▲ Will not protect against flooding but may provide erosion protection
Headlands	▲ Will not protect against flooding but may provide erosion protection	Additional Actions	✓ Flood study at Girvan golf course

**Workshop Conclusions**

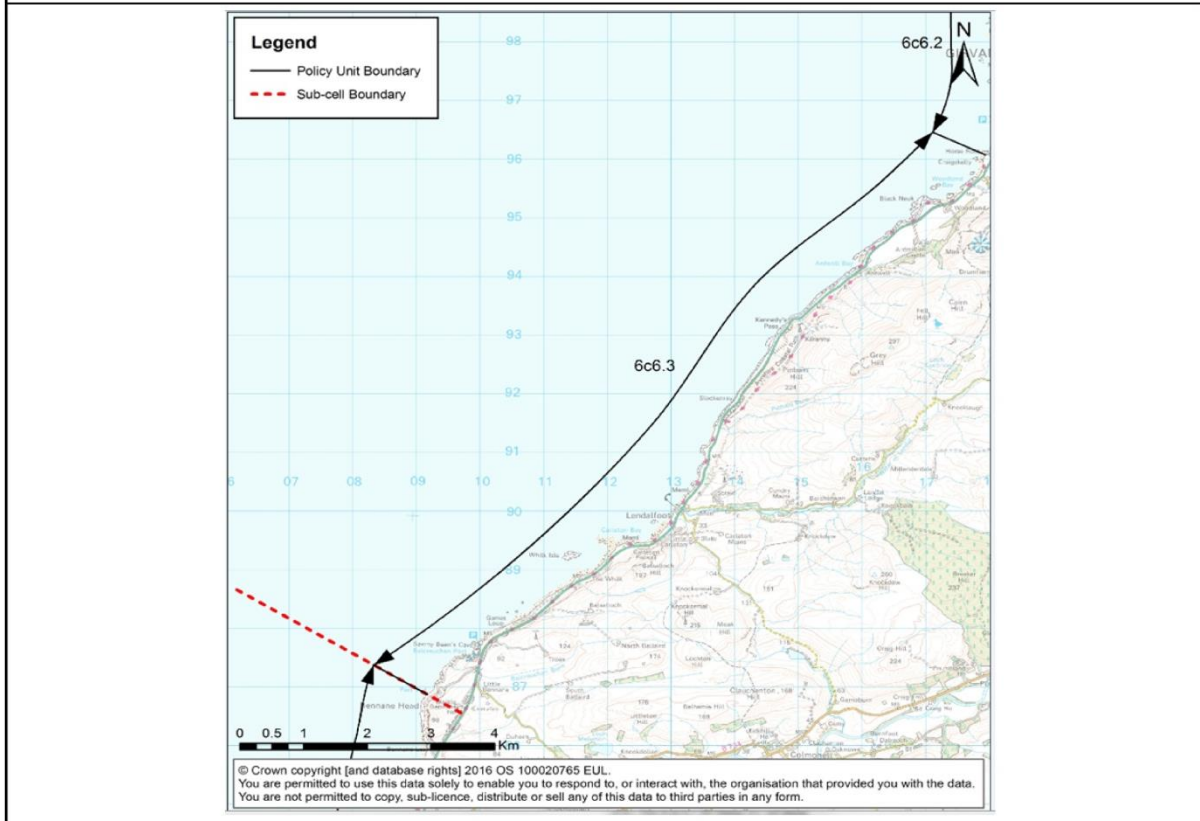
Girvan golf course erosion may be partially protected by golf club intervention but may require more formal protection to hold the line. Water of Girvan harbour regularly needs dredged due to sedimentation. Potential to use dredged material for nourishment.



Subcell		Policy unit	
6c6		6c6.3	
Turnberry - Bennane Head		South Girvan to Bennane Head	
Policy			
Hold the line			
Issue			
Isolated areas of the A77 were found to be at risk of coastal flooding. The A77 at Woodland Bay Hotel was also found to be at risk due to erosion. The A77 is managed by Transport Scotland. The maximum wave height during a force 8 storm was found to be less than 1.0m.			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✓ Will protect against flooding and erosion	Perched beaches	▲ Will not protect against flooding but may provide erosion protection
Revetments	▲ Will not protect against flooding but may provide erosion protection	Cove	▲ Will not protect against flooding but may provide erosion protection
Embankments	✓ Will protect against flooding	Dune stabilisation	✗ Not suitable for this policy unit.
Maintenance	✓ The A77 is mostly defended currently	Managed realignment	▲ Potentially feasible if the road can be diverted
Groynes	▲ Will not protect against flooding but may provide erosion protection	Nourishment	▲ Potentially feasible
Detached breakwaters	▲ Will not protect against flooding but may provide erosion protection	Beach drain	▲ Will not protect against flooding but may provide erosion protection
Headlands	▲ Will not protect against flooding but may provide erosion protection	Additional Actions	✗

**Workshop Conclusions**

Significant defences are currently in place so maintenance is a potential action. Managed realignment is also a potential option if the road can be diverted. Transport Scotland to manage risk to their asset.





**Sub-Cell 6d1: Bennane Head - Currarie Port****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	0	0		0	0	0		0	0	1	1.5-2.0m
RP <sub>s</sub> AAD (£)	£0										
NRPs (no.)	1	1		0	0	0		0	0	0	
NRPs AAD (£)	£1,045										
A Roads (km)	0.035	0.047		0.000	0.000	0.477		0.000	0.035	0.531	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.026		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£1,133										
SSSIs (km <sup>2</sup> )	0.202	0.216	0.002	0.000	0.000	0.000	0.002	0.000	0.000	0.000	

**Policy Unit 6d1.1: Bennane Head to Ballantrae****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	0	0		0	0	0		0	0	1	1.0-1.5m
RP <sub>s</sub> AAD (£)	£0										
NRPs (no.)	1	1		0	0	0		0	0	0	
NRPs AAD (£)	£1,045										
A Roads (km)	0.035	0.047		0.000	0.000	0.477		0.000	0.035	0.531	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£1,133										
SSSIs (km <sup>2</sup> )	0.038	0.044	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

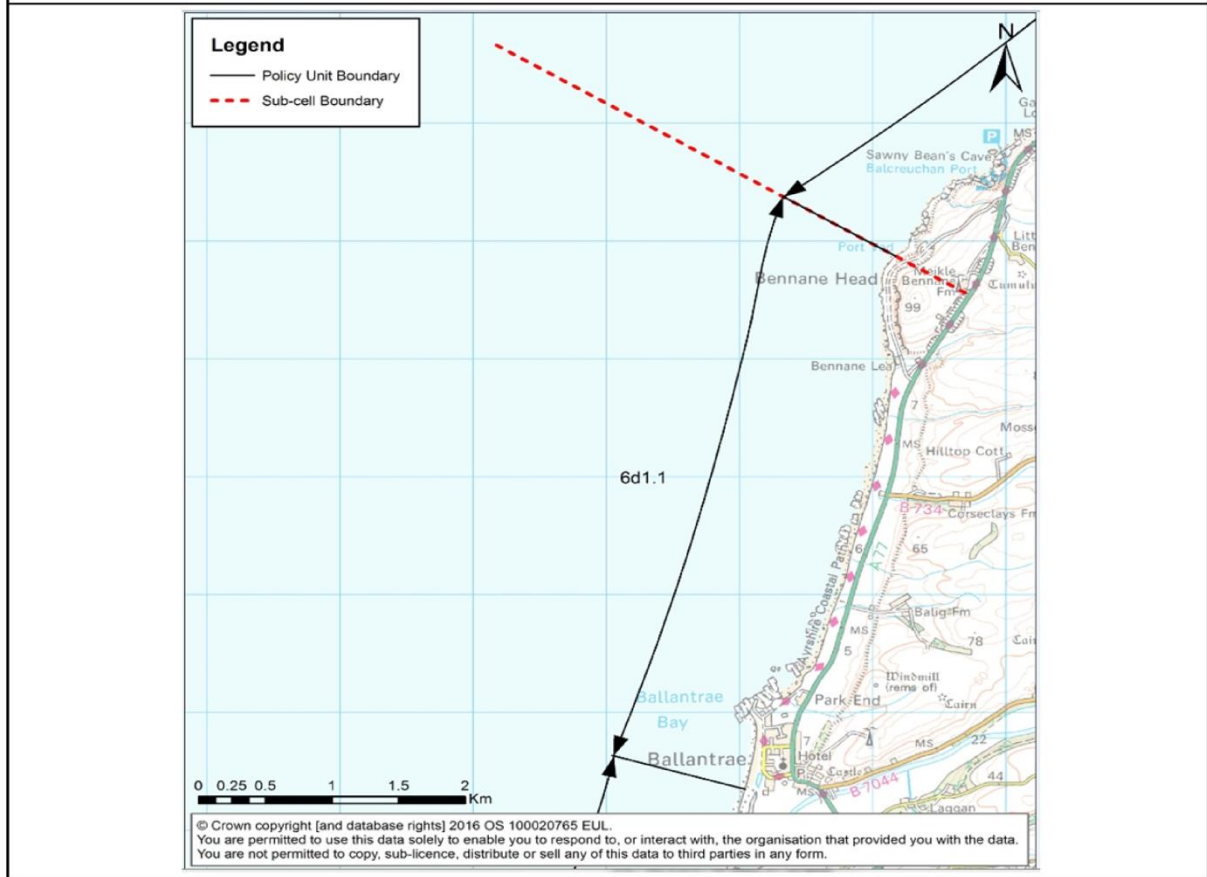
**Policy Unit 6d1.2: South Ballantrae to Currarie Port****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	0	0		0	0	0		0	0	0	1.5-2.0m
RP <sub>s</sub> AAD (£)	£0										
NRPs (no.)	0	0		0	0	0		0	0	0	
NRPs AAD (£)	£0										
A Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.026		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£0										
SSSIs (km <sup>2</sup> )	0.164	0.173	0.002	0.000	0.000	0.000	0.002	0.000	0.000	0.000	

Subcell		Policy unit	
6d1		6d1.1	
Bennane Head - Currarie Port		Bennane Head to Ballantrae	
Policy			
Hold the line			
Issue			
Isolated area of coastal flood risk affecting one NRP and the A77 to the southern extent of Ballantrae. A significant section of the A77 was found to be at risk due to coastal erosion north of Ballantrae. The A77 is managed by Transport Scotland. The maximum wave height during a force 8 storm was found to be between 1.0-1.5m.			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✓ Potentially feasible for the isolated area of flooding or to protect the A77 against erosion	Perched beaches	✓ Potentially feasible to protect the A77 against erosion
Revetments	✓ Potentially feasible to protect the A77 against erosion	Cove	✓ Potentially feasible to protect the A77 against erosion
Embankments	✓ Potentially feasible for the isolated area of flooding	Dune stabilisation	✓ Potentially feasible to protect the A77 against erosion
Maintenance	✓ There are existing defences including seawalls and rock armour	Managed realignment	▲ Potentially feasible if the road can be diverted
Groynes	✓ Potentially feasible to protect the A77 against erosion	Nourishment	✓ Potentially feasible to protect the A77 against erosion
Detached breakwaters	✓ Potentially feasible to protect the A77 against erosion	Beach drain	✓ Potentially feasible to protect the A77 against erosion
Headlands	✓ Potentially feasible to protect the A77 against erosion	Additional Actions	✗

**Workshop Conclusions**

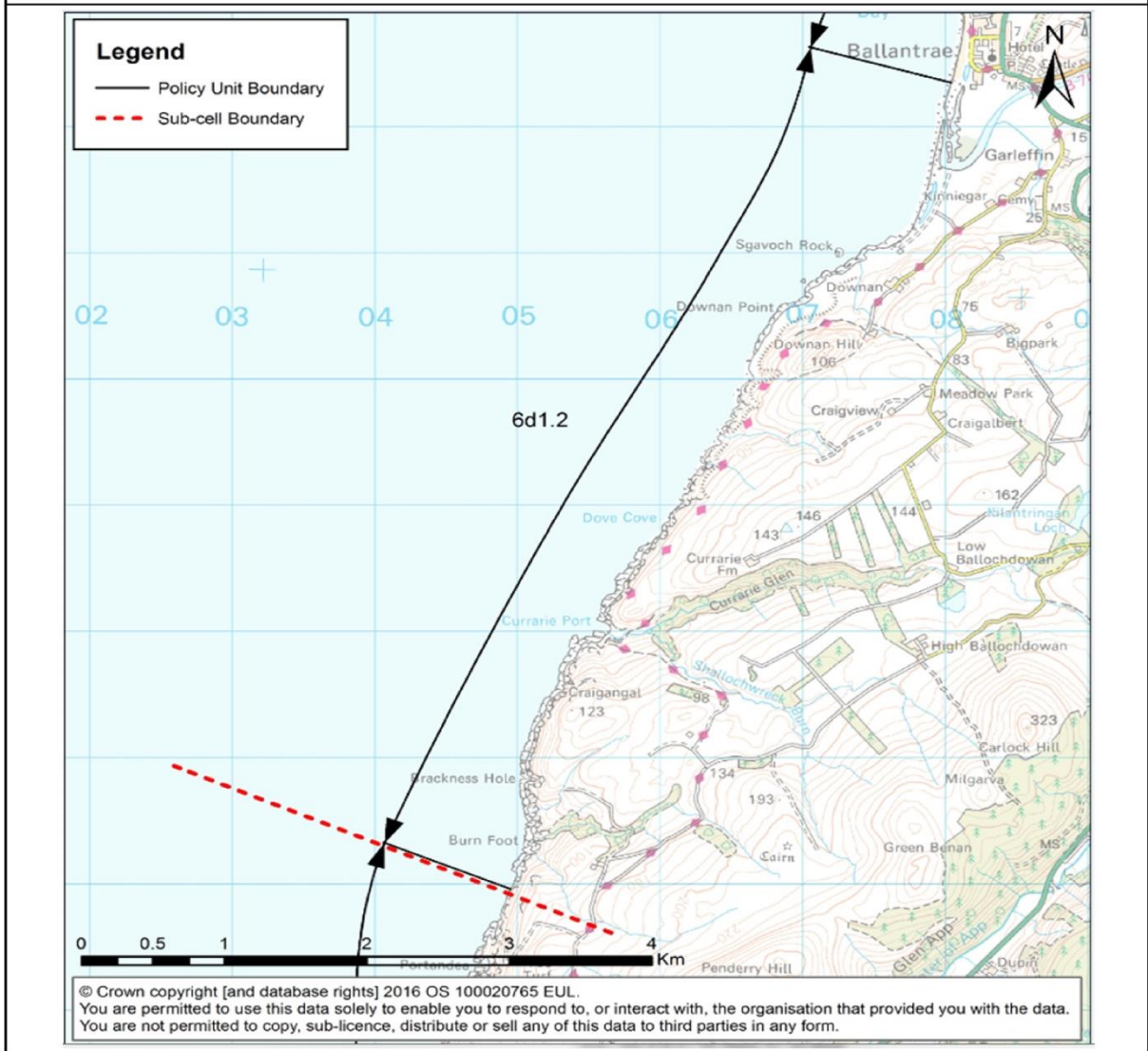
Significant defences are currently in place so maintenance is a potential action. Managed realignment is also a potential option if the road can be diverted. Transport Scotland to manage risk to their asset.



Subcell		Policy unit	
6d1		6d1.2	
Bennane Head - Currarie Port		South Ballantrae to Currarie Port	
Policy			
No active intervention			
Issue			
No assets have been identified to be at risk due to coastal flooding or erosion in this policy unit. The maximum wave height during a force 8 storm was found to be between 1.5-2.0m.			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✗ N/A	Perched beaches	✗ N/A
Revetments	✗ N/A	Cove	✗ N/A
Embankments	✗ N/A	Dune stabilisation	✗ N/A
Maintenance	✗ N/A	Managed realignment	✗ N/A
Groynes	✗ N/A	Nourishment	✗ N/A
Detached breakwaters	✗ N/A	Beach drain	✗ N/A
Headlands	✗ N/A	Additional Actions	✗

**Workshop Conclusions**

The policy was agreed with no amendments. No active intervention.



**Sub-Cell 6d2: Currarie Port - Milleur Point****RISKS**

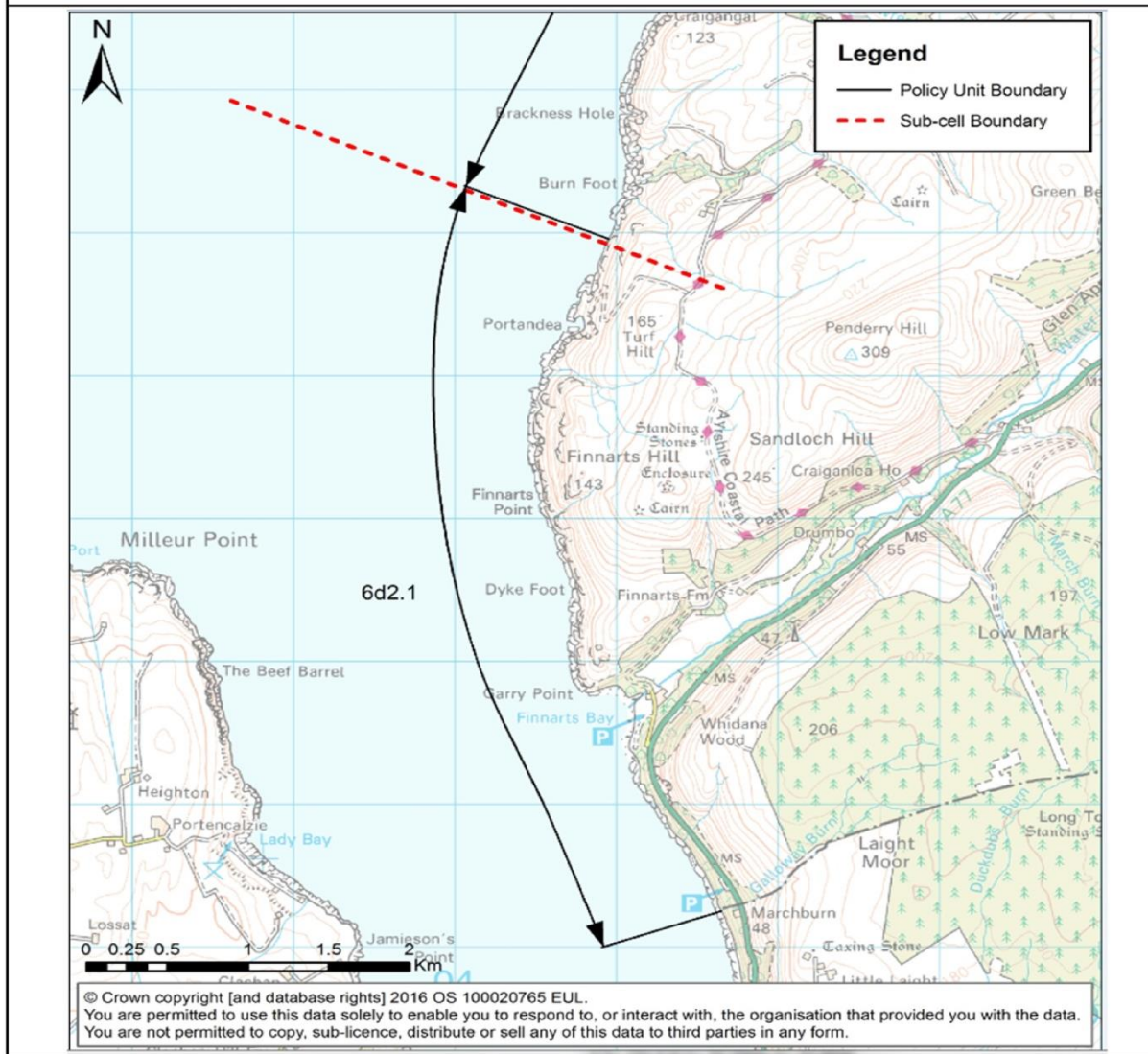
Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	137	257		0	0	0		0	0	0	1.5-2.0m
RP <sub>s</sub> AAD (£)	£137,081										
NRPs (no.)	30	41		0	0	0		0	0	0	
NRPs AAD (£)	£39,911										
A Roads (km)	5.726	7.372		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.112	0.239		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£145,400										
SSSIs (km <sup>2</sup> )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

\*Note this sub-cell contains assets located within Dumfries & Galloway Council, therefore the sum of the policy units may not total the sub-cell value.

**Policy Unit 6d2.1: Currarie Port to Galloway Burn****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	0	0		0	0	0		0	0	0	1.5-2.0m
RP <sub>s</sub> AAD (£)	£0										
NRPs (no.)	1	1		0	0	0		0	0	0	
NRPs AAD (£)	£1,045										
A Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£5										
SSSIs (km <sup>2</sup> )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Subcell		Policy unit			
6d2		6d2.1			
Currarie Port - Milleur Point		Currarie Port to Galloway Burn			
Policy					
No active intervention					
Issue					
Isolated area of coastal flood risk at Finnarts Bay. No assets have been identified to be at risk due to erosion. The maximum wave height during a force 8 storm was found to be between 1.5-2.0m.					
Potential Actions	Technically feasible?		Potential Actions	Technically feasible?	
Seawalls	x	N/A	Perched beaches	x	N/A
Revetments	x	N/A	Cove	x	N/A
Embankments	x	N/A	Dune stabilisation	x	N/A
Maintenance	x	N/A	Managed realignment	x	N/A
Groynes	x	N/A	Nourishment	x	N/A
Detached breakwaters	x	N/A	Beach drain	x	N/A
Headlands	x	N/A	Additional Actions	x	
Workshop Conclusions					
The policy was agreed with no amendments. No active intervention. NRP at Finnarts Bay is abandoned.					



**Sub-Cell A1: Lochranza - Clauchlands Point****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	17	48		0	0	0		0	0	1	<1.0m
RP <sub>s</sub> AAD (£)	£16,628										
NRPs (no.)	22	30		0	1	2		0	1	4	
NRPs AAD (£)	£24,444										
A Roads (km)	1.918	4.011		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£39,471										
SSSIs (km <sup>2</sup> )	0.096	0.111	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

**Policy Unit A1.1: Lochranza****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	6	8		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£1,569										
NRPs (no.)	3	4		0	0	0		0	0	0	
NRPs AAD (£)	£4,415										
A Roads (km)	0.404	0.952		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£7,924										
SSSIs (km <sup>2</sup> )	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

**Policy Unit A1.2: Lochranza to Sannox****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	0	0		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£0										
NRPs (no.)	0	0		0	0	0		0	0	0	
NRPs AAD (£)	£0										
A Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£0										
SSSIs (km <sup>2</sup> )	0.015	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Policy Unit A1.3: Sannox to Brodick**RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP (no.)	2	3		0	0	0		0	0	0	<1.0m
RP AAD (£)	£7,805										
NRP (no.)	0	0		0	0	0		0	0	0	
NRP AAD (£)	£0										
A Roads (km)	0.578	1.572		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£10,354										
SSSIs (km <sup>2</sup> )	0.027	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

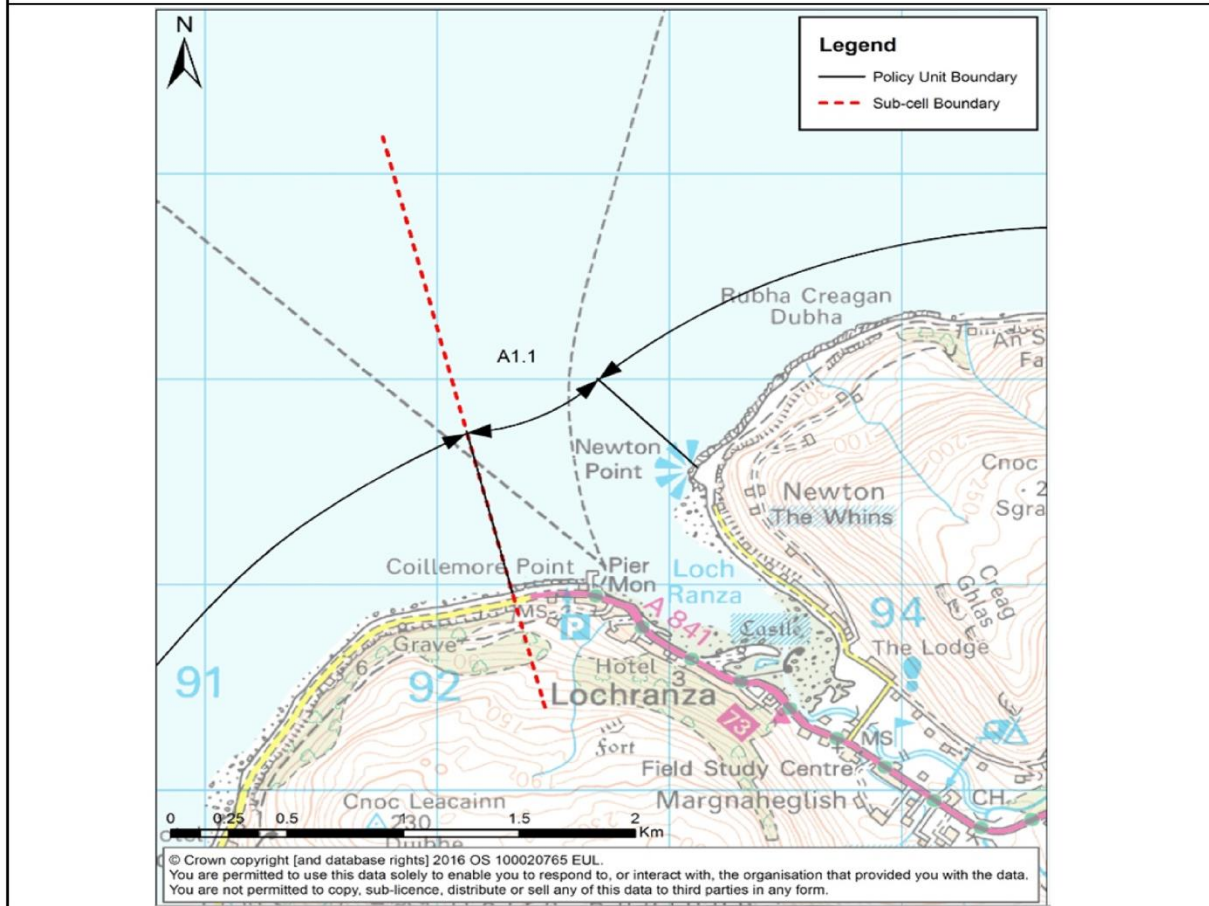
Policy Unit A1.4: Brodick**RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP (no.)	9	37		0	0	0		0	0	1	<1.0m
RP AAD (£)	£7,254										
NRP (no.)	19	26		0	1	2		0	1	4	
NRP AAD (£)	£20,029										
A Roads (km)	0.936	1.487		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£21,193										
SSSIs (km <sup>2</sup> )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Policy Unit A1.5: Brodick to Clauchlands Point**RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP (no.)	0	0		0	0	0		0	0	0	<1.0m
RP AAD (£)	£0										
NRP (no.)	0	0		0	0	0		0	0	0	
NRP AAD (£)	£0										
A Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£0										
SSSIs (km <sup>2</sup> )	0.053	0.059	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Subcell		Policy unit	
A1		A1.1	
Lochranza - Clauchlands Point		Lochranza	
<b>Policy</b>			
Hold the line			
<b>Issue</b>			
<p>Significant area of flood risk around Newton Road affecting residential and non-residential properties. A significant section of the A841 is at risk of coastal flooding. Fluvial, pluvial and groundwater flooding risk present also. No assets were found to be at risk due to coastal erosion. The maximum wave height during a force 8 storm was found to be less than 1.0m.</p>			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✓ Will protect against flooding	Perched beaches	✗ Will not protect against flooding
Revetments	✗ Will not protect against flooding	Cove	✗ Will not protect against flooding
Embankments	✓ Will protect against flooding	Dune stabilisation	✗ No naturally occurring dunes
Maintenance	✓ There are existing defences including seawalls, revetments and rock armour	Managed realignment	✗ Will not hold the existing line
Groynes	✗ Will not protect against flooding	Nourishment	✓ Potentially feasible
Detached breakwaters	✗ Will not protect against flooding	Beach drain	✗ Will not protect against flooding
Headlands	✗ Will not protect against flooding	Additional Actions	✓ Integrated flood study recommended
<b>Workshop Conclusions</b>			
<p>Significant flood risk from multiple sources. Recommended to carry out further local study considering all sources of flooding to establish suitable flood risk management actions.</p>			

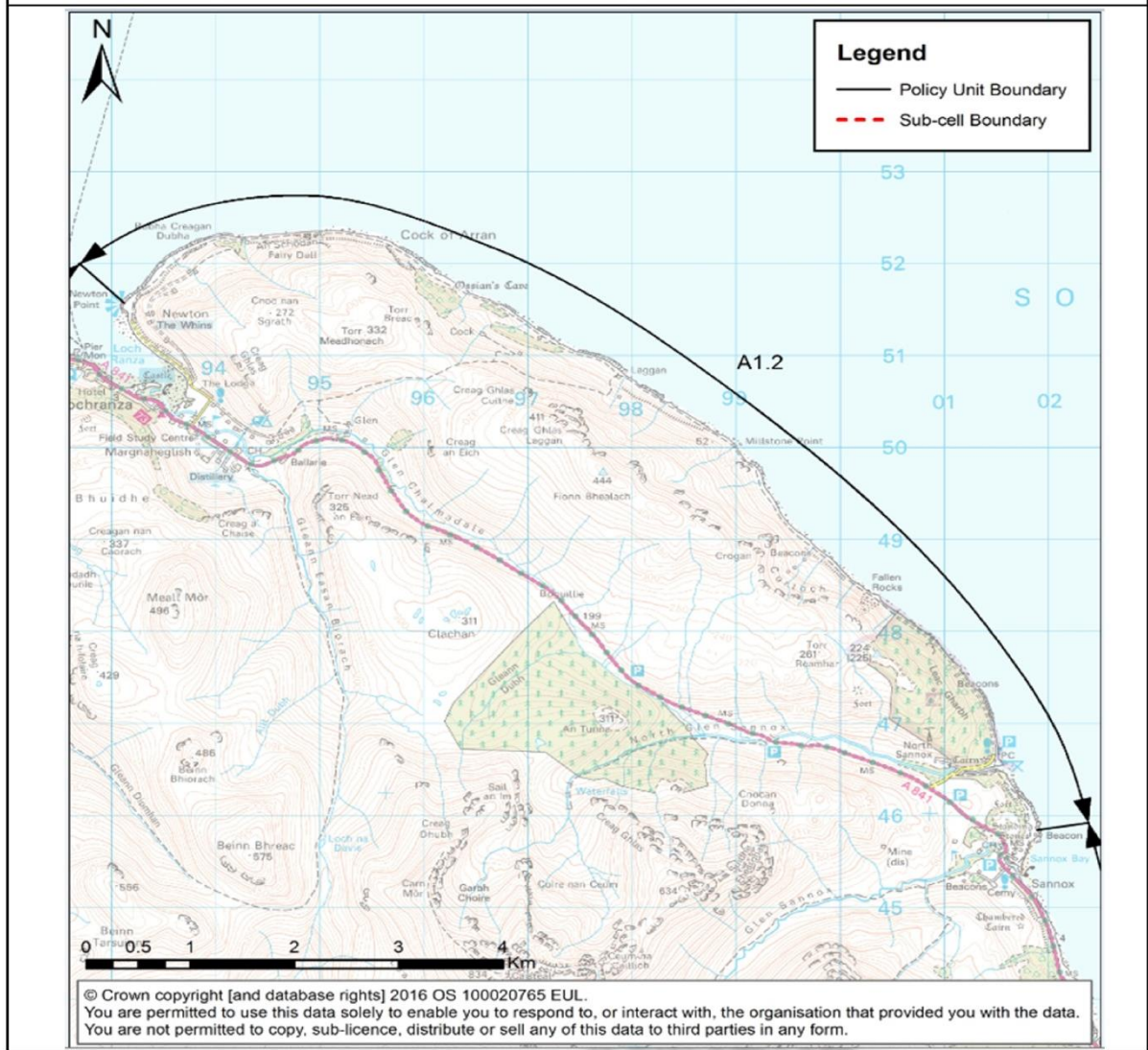




Subcell		Policy unit			
A1		A1.2			
Lochranza - Clauchlands Point		Lochranza to Sannox			
Policy					
No active intervention					
Issue					
No assets were found to be at risk due to coastal flooding or erosion. The maximum wave height during a force 8 storm was found to be less than 1.0m.					
Potential Actions	Technically feasible?		Potential Actions	Technically feasible?	
Seawalls	×	N/A	Perched beaches	×	N/A
Revetments	×	N/A	Cove	×	N/A
Embankments	×	N/A	Dune stabilisation	×	N/A
Maintenance	×	N/A	Managed realignment	×	N/A
Groynes	×	N/A	Nourishment	×	N/A
Detached breakwaters	×	N/A	Beach drain	×	N/A
Headlands	×	N/A	Additional Actions	×	

**Workshop Conclusions**

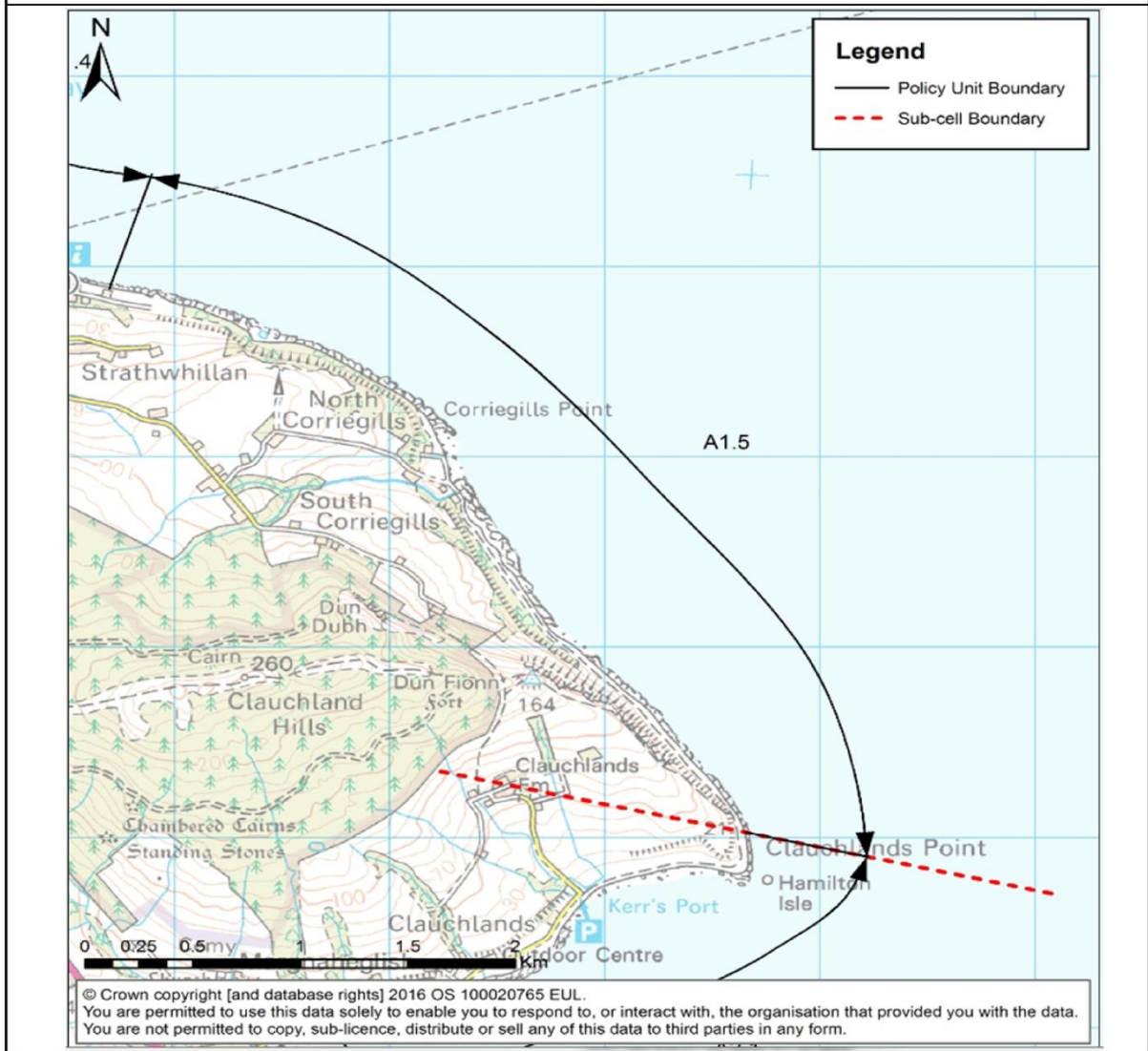
The policy was agreed with no amendments. No active intervention.



Subcell		Policy unit	
A1		A1.3	
Lochranza - Clauchlands Point		Sannox to Brodick	
<b>Policy</b>			
Hold the line			
<b>Issue</b>			
Isolated coastal flood risk affecting two residential properties at Sannox Bay. Isolated sections of the A841 were also found to be at risk of coastal flooding. The A841 is maintained by NAC. No assets were found to be at risk due to coastal erosion. The maximum wave height during a force 8 storm was found to be less than 1.0m.			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✓ Will protect against flooding	Perched beaches	✗ Will not protect against flooding
Revetments	✗ Will not protect against flooding	Cove	✗ Will not protect against flooding
Embankments	✓ Will protect against flooding	Dune stabilisation	✓ Potentially feasible
Maintenance	✓ There are existing defences including seawalls, revetments and rock armour	Managed realignment	▲ May consider diverting road
Groynes	✗ Will not protect against flooding	Nourishment	✓ Potentially feasible
Detached breakwaters	✗ Will not protect against flooding	Beach drain	✗ Will not protect against flooding
Headlands	✗ Will not protect against flooding	Additional Actions	✗
<b>Workshop Conclusions</b>			
Flood and erosion risk to the road. Existing defences in place so maintenance is preferred. Actions will be the responsibility of NAC.			

Subcell		Policy unit			
A1		A1.4			
Lochranza - Clauchlands Point		Brodict			
Policy					
Hold the line					
Issue					
Significant coastal flood risk is the vicinity of the bowling green, with other isolated areas of flood risk along the A841. The A841 road is at significant coastal flood risk. The A841 is maintained by NAC. A significant number of properties are at risk due to coastal erosion also. A landfill site to the south of the policy unit is at risk of erosion and requires protection. The maximum wave height during a force 8 storm was found to be less than 1.0m.					
Potential Actions	Technically feasible?		Potential Actions	Technically feasible?	
Seawalls	✓	Will protect against both flooding and erosion	Perched beaches	▲	Will not advance the line but may be used in conjunction with other measures
Revetments	▲	Will not protect against flooding but may provide erosion protection	Cove	▲	Will not advance the line but may be used in conjunction with other measures
Embankments	▲	Will not protect against erosion but may provide flood protection	Dune stabilisation	▲	Potentially feasible
Maintenance	▲	There are existing defences including seawalls, rock armour revetments, a rock groyne and sand bags. Maintaining the existing defences will not advance the line	Managed realignment	✗	Will not advance the line
Groynes	▲	Will not advance the line but may be used in conjunction with other measures	Nourishment	▲	May be required in conjunction with hard shoreline reinforcement such as seawalls
Detached breakwaters	▲	Will not advance the line but may be used in conjunction with other measures	Beach drain	✗	Will not advance the line
Headlands	▲	Will not advance the line but may be used in conjunction with other measures	Additional Actions	▲	Remove landfill material. Wave overtopping study recommended.
Workshop Conclusions					
The policy agreed is hold the line. Recommended to protect landfill site at southern extent against erosion. Potential option to remove landfill was also suggested. Wave overtopping study recommended.					
<p>The map shows the coastline of Brodict Bay. A solid pink line represents the Policy Unit Boundary, and a dashed pink line represents the Sub-cell Boundary. Key locations include Brodict Castle and Country Park, Wine Port, Brewery, Old Quay, Cladach, Home Fm, Strabane, Brodict, Mayish, and Strathwillan. The A1.4 road is also shown. A north arrow is present in the top left corner.</p>					

Subcell		Policy unit			
A1		A1.5			
Lochranza - Clauchlands Point		Brodict to Clauchlands Point			
Policy					
No active intervention					
Issue					
No assets have been identified to be at risk due to coastal flooding or erosion in this policy unit. The maximum wave height during a force 8 storm was found to be less than 1.0m.					
Potential Actions	Technically feasible?		Potential Actions	Technically feasible?	
Seawalls	x	N/A	Perched beaches	x	N/A
Revetments	x	N/A	Cove	x	N/A
Embankments	x	N/A	Dune stabilisation	x	N/A
Maintenance	x	N/A	Managed realignment	x	N/A
Groynes	x	N/A	Nourishment	x	N/A
Detached breakwaters	x	N/A	Beach drain	x	N/A
Headlands	x	N/A	Additional Actions	x	
Workshop Conclusions					
The policy was agreed with no amendments. No active intervention.					



**Sub-Cell A2: Clauchlands Point - Kingscross Point****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	21	38		0	0	4		0	1	5	<1.0m
RP <sub>s</sub> AAD (£)	£94,306										
NRPs (no.)	7	14		0	0	0		0	0	0	
NRPs AAD (£)	£8,501										
A Roads (km)	0.278	0.579		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.733	1.218		0.000	0.000	0.128		0.000	0.000	0.210	
Roads AAD (£)	£12,552										
SSSIs (km <sup>2</sup> )	0.012	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

**Policy Unit A2.1: Clauchlands Point to Lamlash****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	0	0		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£0										
NRPs (no.)	0	0		0	0	0		0	0	0	
NRPs AAD (£)	£0										
A Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.121	0.406		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£919										
SSSIs (km <sup>2</sup> )	0.012	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

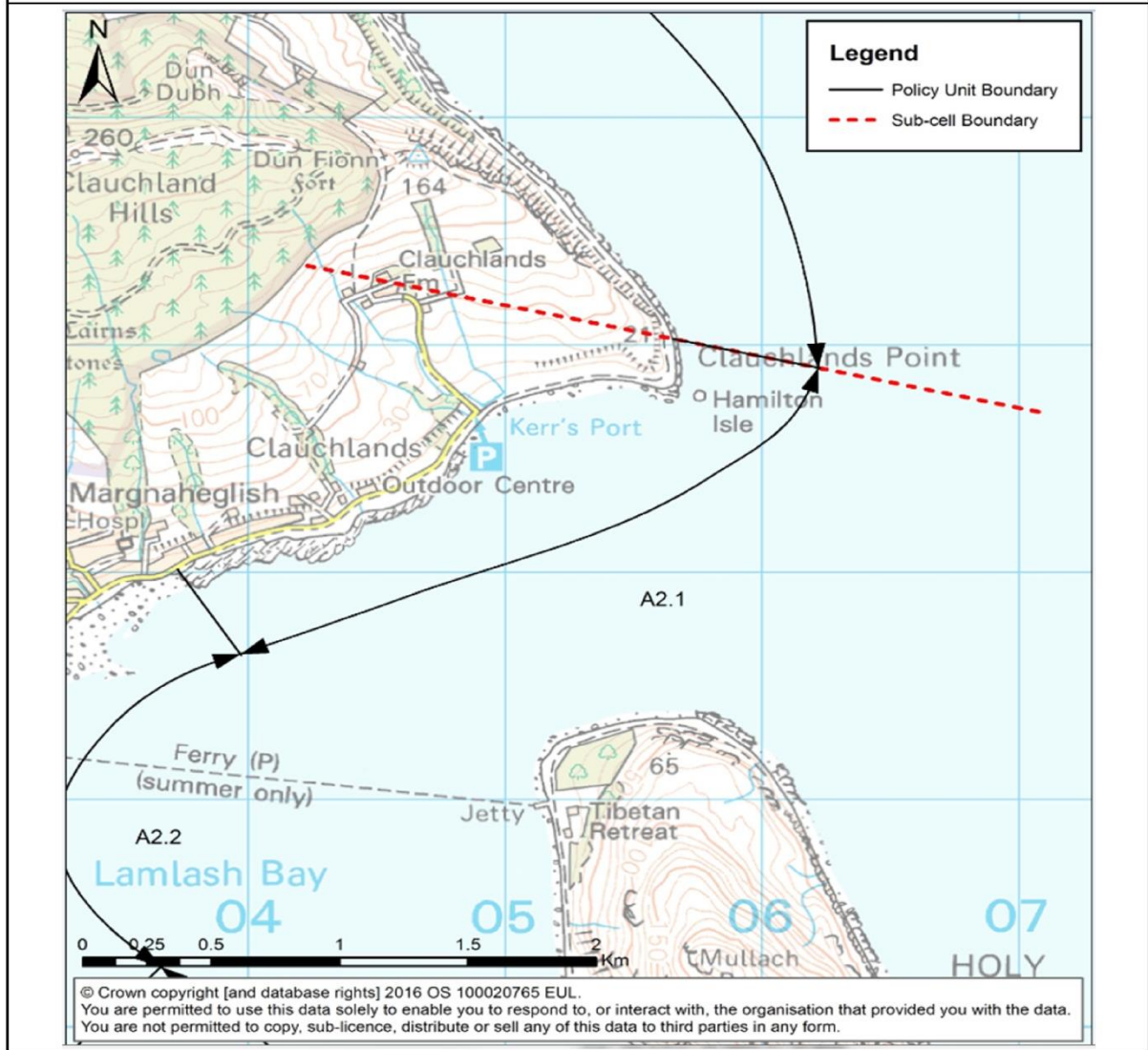
**Policy Unit A2.2: Lamlash****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	21	38		0	0	4		0	1	5	<1.0m
RP <sub>s</sub> AAD (£)	£94,306										
NRPs (no.)	7	14		0	0	0		0	0	0	
NRPs AAD (£)	£8,501										
A Roads (km)	0.278	0.579		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.612	0.812		0.000	0.000	0.128		0.000	0.000	0.210	
Roads AAD (£)	£11,633										
SSSIs (km <sup>2</sup> )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Policy Unit A2.3: Lamblash to Kingscross Point**RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
<b>RPs (no.)</b>	0	0		0	0	0		0	0	0	<1.0m
<b>RPs AAD (£)</b>	£0										
<b>NRPs (no.)</b>	0	0		0	0	0		0	0	0	
<b>NRPs AAD (£)</b>	£0										
<b>A Roads (km)</b>	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
<b>B Roads (km)</b>	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
<b>Minor Roads (km)</b>	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
<b>Roads AAD (£)</b>	£0										
<b>SSSIs (km<sup>2</sup>)</b>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

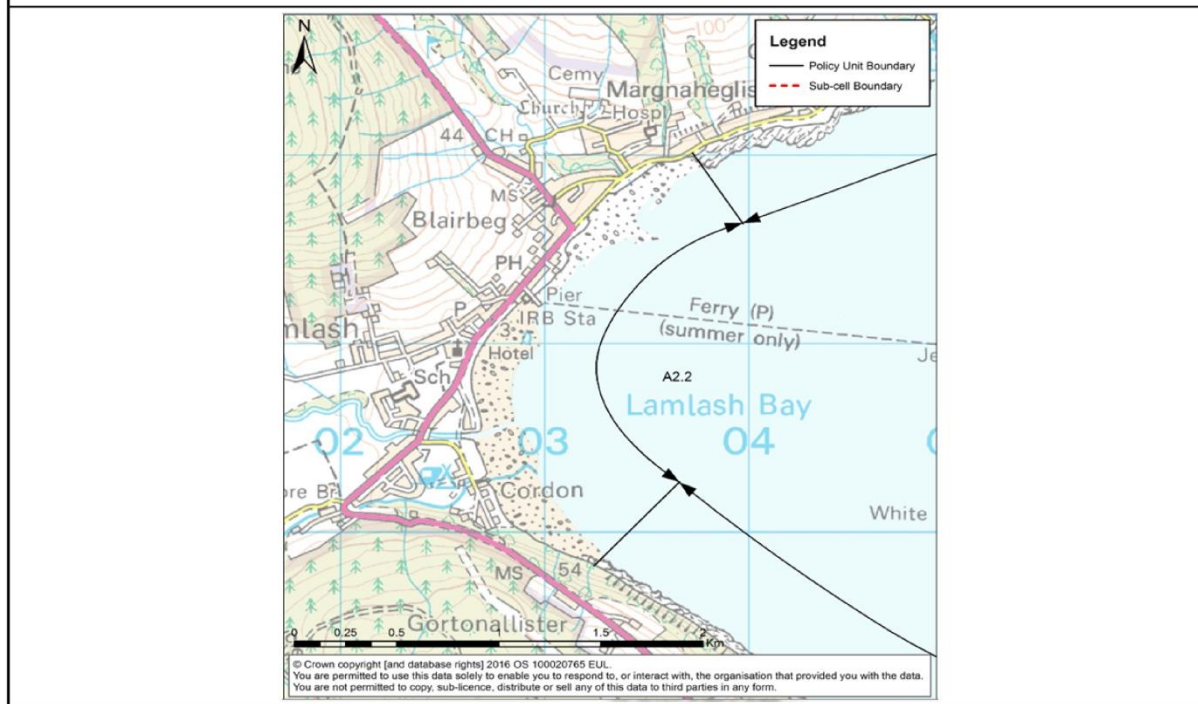
Subcell		Policy unit			
A2		A2.1			
Clauchlands Point - Kingscross Point		Clauchlands Point to Lamlash			
Policy					
No active intervention					
Issue					
A localised section of minor road was found to be at risk of coastal flooding close to the Outdoor Centre. No assets have been identified to be at risk due to coastal erosion in this policy unit. The maximum wave height during a force 8 storm was found to be less than 1.0m.					
Potential Actions	Technically feasible?		Potential Actions	Technically feasible?	
Seawalls	x	N/A	Perched beaches	x	N/A
Revetments	x	N/A	Cove	x	N/A
Embankments	x	N/A	Dune stabilisation	x	N/A
Maintenance	x	N/A	Managed realignment	x	N/A
Groynes	x	N/A	Nourishment	x	N/A
Detached breakwaters	x	N/A	Beach drain	x	N/A
Headlands	x	N/A	Additional Actions	x	
Workshop Conclusions					
The policy was agreed with no amendments.					



Subcell		Policy unit	
A2		A2.2	
Clauchlands Point - Kingscross Point		Lamlash	
Policy			
Hold the line			
Issue			
Significant coastal flood risk to properties at Cuddy Dook and adjacent to the tennis courts. A significant section of minor road at Cuddy Dook is at risk of coastal flooding, as well as isolated sections of the A841. The A841 is maintained by NAC. Properties and the minor road at Cuddy Dook were also found to be at risk due to coastal erosion. SW assets run along the beach and are at risk of erosion. The maximum wave height during a force 8 storm was found to be less than 1.0m.			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✓ Will protect against both flooding and erosion	Perched beaches	▲ Will not protect against flooding but may provide erosion protection
Revetments	▲ Will not protect against flooding but may provide erosion protection	Cove	▲ Will not protect against flooding but may provide erosion protection
Embankments	▲ Will not protect against erosion but may provide flooding protection	Dune stabilisation	✗ No naturally occurring dunes
Maintenance	✓ There are existing defences including seawalls, revetments and rock armour	Managed realignment	✗ Will not hold the existing line
Groynes	▲ Will not protect against flooding but may provide erosion protection	Nourishment	✓ Potentially feasible in isolated areas
Detached breakwaters	▲ Will not protect against flooding but may provide erosion protection	Beach drain	▲ Will not protect against flooding but may provide erosion protection
Headlands	▲ Will not protect against flooding but may provide erosion protection	Additional Actions	✓ FRA commissioned by NAC. Wave overtopping study recommended.

**Workshop Conclusions**

The policy was agreed with no amendments. SW to manage risk to their assets. NAC has implemented revetment works at Lamlash Green. FRA commissioned by NAC. Wave overtopping study recommended.

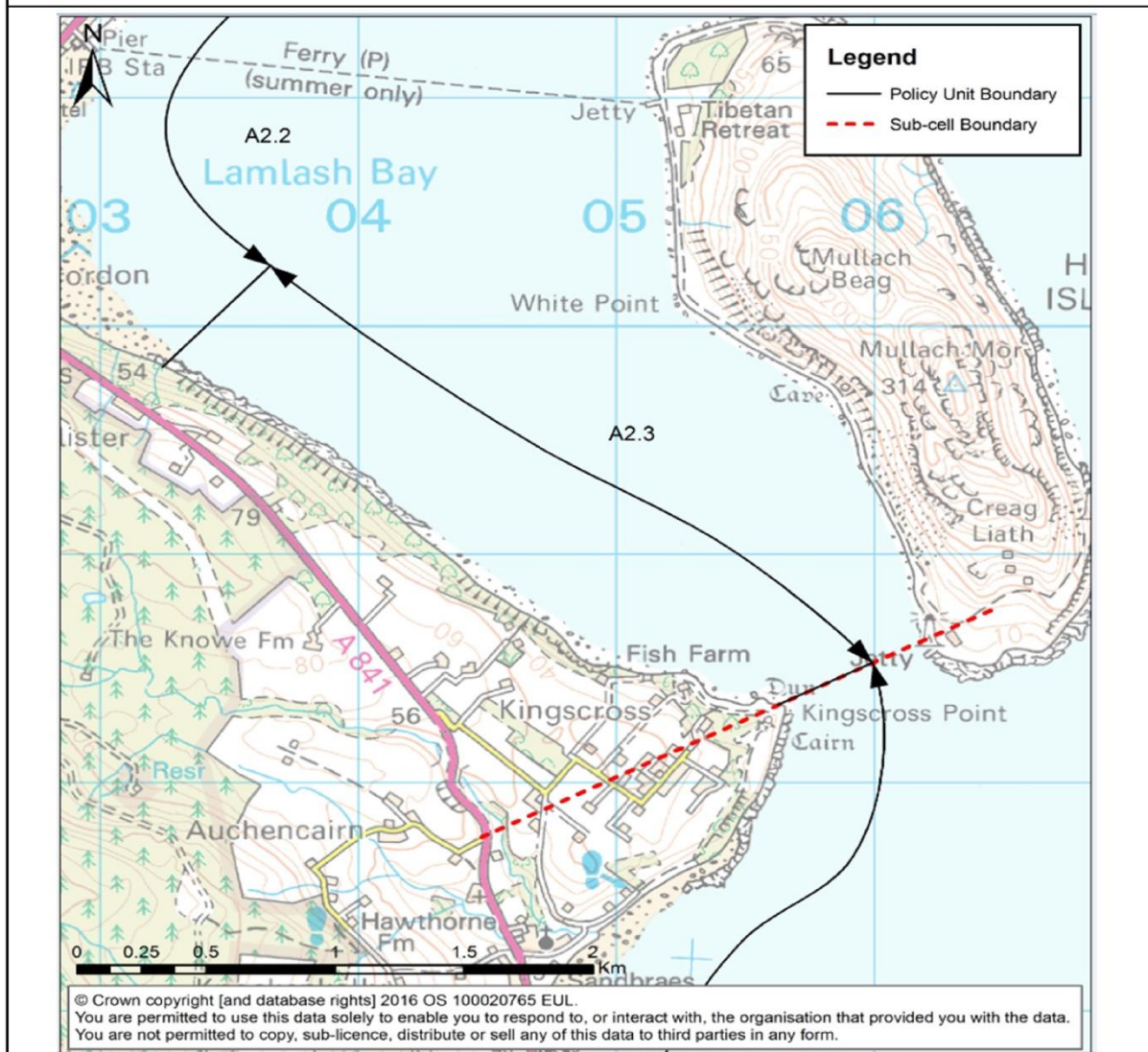




Subcell		Policy unit			
A2		A2.3			
Clauchlands Point - Kingscross Point		Lamlash to Kingscross Point			
Policy					
No active intervention					
Issue					
No assets have been identified to be at risk due to coastal flooding or erosion in this policy unit. The maximum wave height during a force 8 storm was found to be less than 1.0m.					
Potential Actions	Technically feasible?		Potential Actions	Technically feasible?	
Seawalls	x	N/A	Perched beaches	x	N/A
Revetments	x	N/A	Cove	x	N/A
Embankments	x	N/A	Dune stabilisation	x	N/A
Maintenance	x	N/A	Managed realignment	x	N/A
Groynes	x	N/A	Nourishment	x	N/A
Detached breakwaters	x	N/A	Beach drain	x	N/A
Headlands	x	N/A	Additional Actions	x	

**Workshop Conclusions**

The policy was agreed with no amendments. No active intervention.



**Sub-Cell A3: Kingscross Point - Drumadoon Point****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	19	34		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£60,206										
NRPs (no.)	4	7		0	0	0		0	0	0	
NRPs AAD (£)	£2,994										
A Roads (km)	0.960	1.269		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.311	0.470		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£32,014										
SSSIs (km <sup>2</sup> )	0.221	0.254	0.002	0.000	0.000	0.000	0.002	0.000	0.000	0.000	

**Policy Unit A3.1: Whiting Bay****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	18	23		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£59,420										
NRPs (no.)	4	6		0	0	0		0	0	0	
NRPs AAD (£)	£2,994										
A Roads (km)	0.929	1.184		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.021	0.023		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£28,416										
SSSIs (km <sup>2</sup> )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

**Policy Unit A3.2: Largymore to Drumadoon Point****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	1	11		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£786										
NRPs (no.)	0	1		0	0	0		0	0	0	
NRPs AAD (£)	£0										
A Roads (km)	0.031	0.086		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.290	0.447		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£3,598										
SSSIs (km <sup>2</sup> )	0.221	0.254	0.002	0.000	0.000	0.000	0.002	0.000	0.000	0.000	

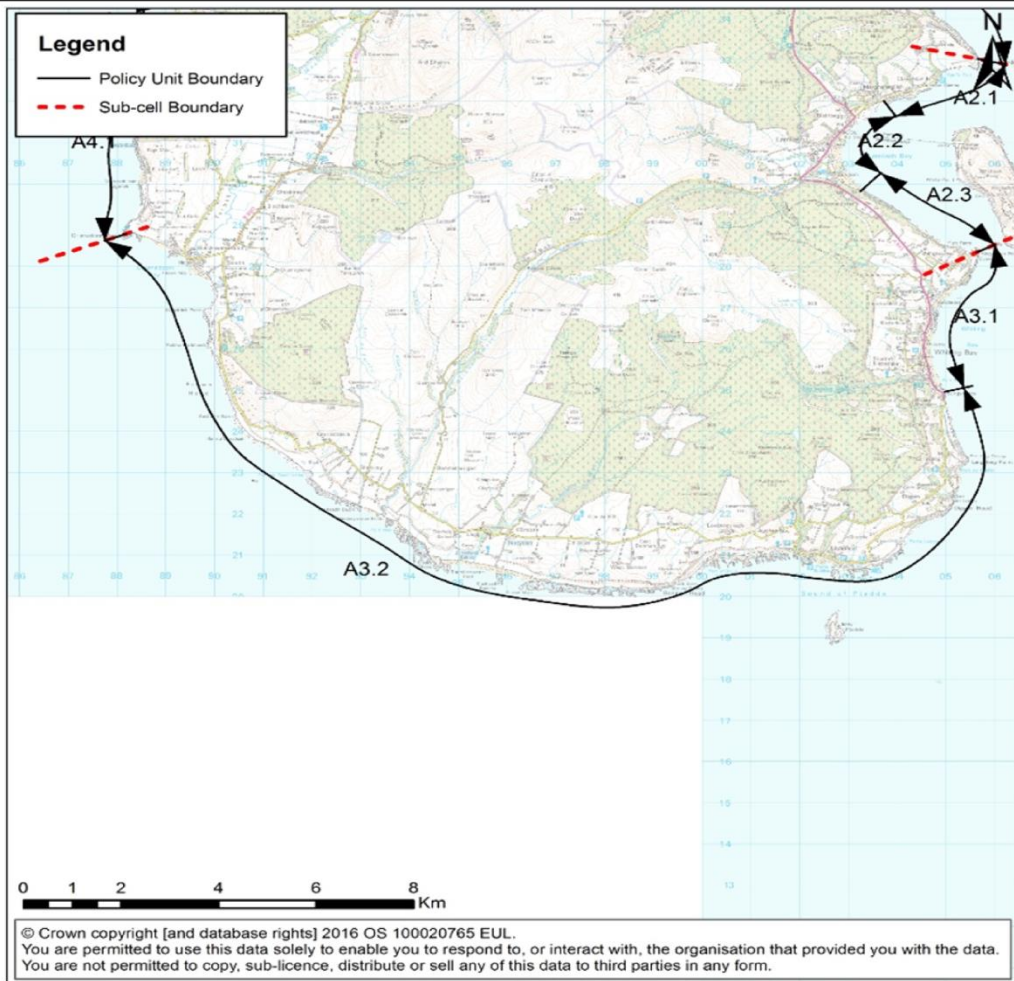
Subcell		Policy unit	
A3		A3.1	
Kingscross Point - Drumadoon Point		Whiting Bay	
Policy			
Hold the line			
Issue			
Significant coastal flood risk to properties at Montrose Terrace. The A841 road is also at significant risk of coastal flooding. The A841 is maintained by NAC. No assets have been identified to be at risk due to coastal erosion in this policy unit. The maximum wave height during a force 8 storm was found to be less than 1.0m.			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✓ Will protect against flooding	Perched beaches	✗ Will not protect against flooding
Revetments	✗ Will not protect against flooding	Cove	✗ Will not protect against flooding
Embankments	✓ Will protect against flooding	Dune stabilisation	✗ No naturally occurring dunes
Maintenance	✓ There are existing defences including seawalls, revetments and rock armour	Managed realignment	✗ Will not hold the existing line
Groynes	✗ Will not protect against flooding	Nourishment	✓ Potentially feasible
Detached breakwaters	✗ Will not protect against flooding	Beach drain	✗ Will not protect against flooding
Headlands	✗ Will not protect against flooding	Additional Actions	✓ Wave overtopping study recommended
Workshop Conclusions			
It was noted that Whiting Bay and Districts Improvements Association have reported breaches in the existing sea wall. There may be drainage issues from fluvial and pluvial flooding which need to be considered when implementing SMP actions. Wave overtopping study recommended.			



Subcell		Policy unit	
A3		A3.2	
Kingscross Point - Drumadoon Point		Largymore to Drumadoon Point	
Policy			
No active intervention			
Issue			
<p>One RP was found to be at risk of coastal flooding at Kildonan. Localised sections of the A841 at Largymore and minor roads at Kildonan and Blackwaterfoot were also found to be at risk due to coastal flooding. No assets have been identified to be at risk due to coastal erosion in this policy unit. The maximum wave height during a force 8 storm was found to be less than 1.0m.</p>			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✗ N/A	Perched beaches	✗ N/A
Revetments	✗ N/A	Cove	✗ N/A
Embankments	✗ N/A	Dune stabilisation	✗ N/A
Maintenance	✗ N/A	Managed realignment	✗ N/A
Groynes	✗ N/A	Nourishment	✗ N/A
Detached breakwaters	✗ N/A	Beach drain	✗ N/A
Headlands	✗ N/A	Additional Actions	✗

**Workshop Conclusions**

The policy was agreed with no amendments. No active intervention. Road is elevated so should not be at risk.



**Sub-Cell A4: Drumadoon Point - Lochranza****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	1	1		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£3,428										
NRPs (no.)	0	0		0	0	1		0	0	1	
NRPs AAD (£)	£0										
A Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	2.329	5.300		0.000	0.000	0.219		0.000	0.000	0.235	
Roads AAD (£)	£20,227										
SSSIs (km <sup>2</sup> )	0.055	0.067	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

**Policy Unit A4.1: Drumadoon Point to Tormore****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	0	0		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£0										
NRPs (no.)	0	0		0	0	0		0	0	0	
NRPs AAD (£)	£0										
A Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Roads AAD (£)	£0										
SSSIs (km <sup>2</sup> )	0.055	0.067	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

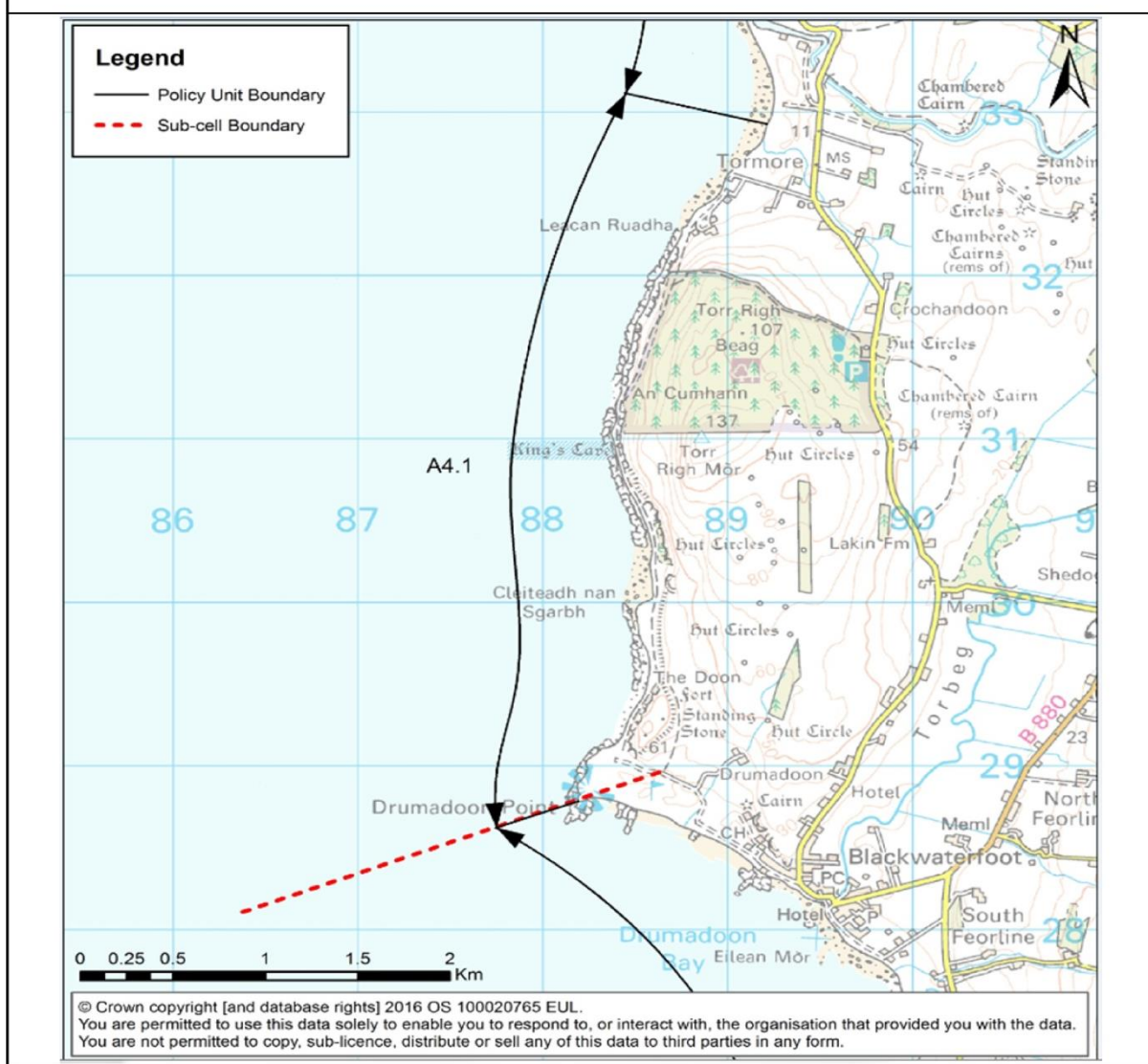
**Policy Unit A4.2: Machrie Bay to Lochranza****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
RP <sub>s</sub> (no.)	1	1		0	0	0		0	0	0	<1.0m
RP <sub>s</sub> AAD (£)	£3,428										
NRPs (no.)	0	0		0	0	1		0	0	1	
NRPs AAD (£)	£0										
A Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
B Roads (km)	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
Minor Roads (km)	2.329	5.300		0.000	0.000	0.219		0.000	0.000	0.235	
Roads AAD (£)	£20,227										
SSSIs (km <sup>2</sup> )	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

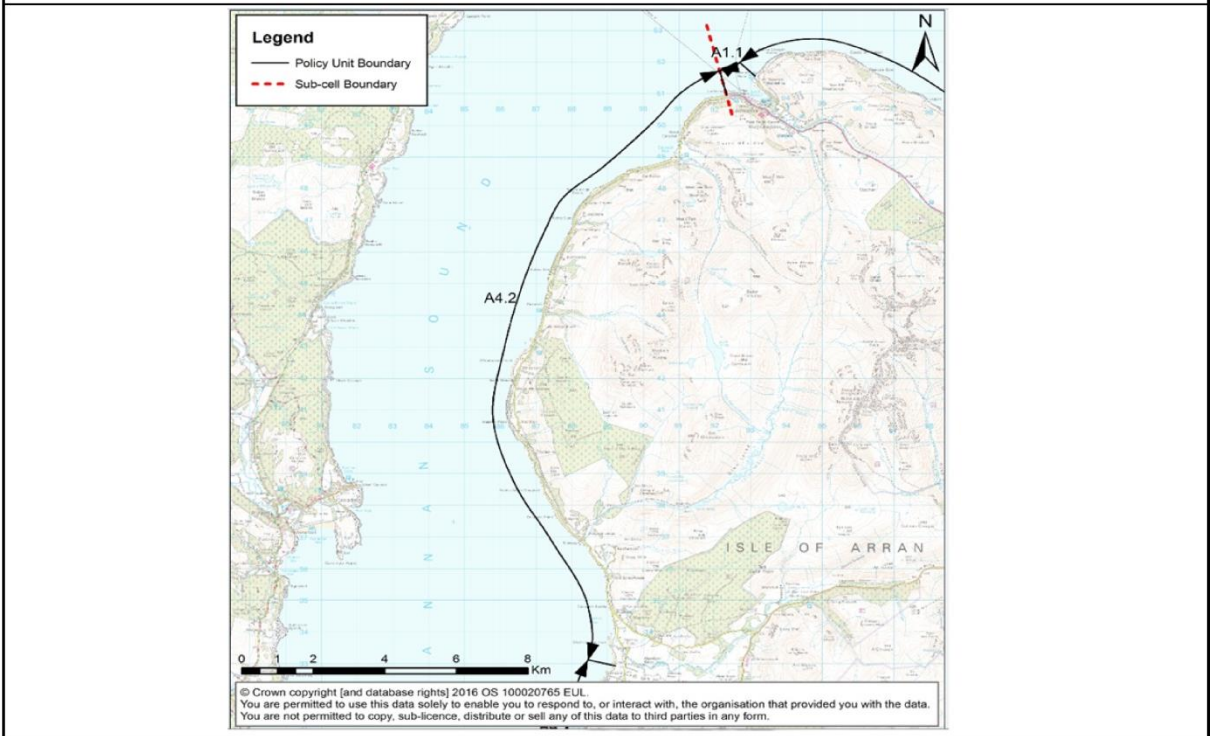
Subcell		Policy unit			
A4		A4.1			
Drumadoon Point - Lochranza		Drumadoon Point to Tormore			
Policy					
No active intervention					
Issue					
No assets have been identified to be at risk due to coastal flooding or erosion in this policy unit. The maximum wave height during a force 8 storm was found to be less than 1.0m.					
Potential Actions	Technically feasible?		Potential Actions	Technically feasible?	
Seawalls	×	N/A	Perched beaches	×	N/A
Revetments	×	N/A	Cove	×	N/A
Embankments	×	N/A	Dune stabilisation	×	N/A
Maintenance	×	N/A	Managed realignment	×	N/A
Groynes	×	N/A	Nourishment	×	N/A
Detached breakwaters	×	N/A	Beach drain	×	N/A
Headlands	×	N/A	Additional Actions	×	

**Workshop Conclusions**

The policy was agreed with no amendments. No active intervention.



Subcell		Policy unit			
A4		A4.2			
Drumadoon Point - Lochranza		Machrie Bay to Lochranza			
Policy					
Hold the line					
Issue					
One RP at Dougarie was found to be at risk of coastal flooding. Significant sections of the A841 were also found to be at risk of coastal flooding at Machrie Bay, Dougarie, Pirnmill, Thundergay and Catacol Bay. One NRP and a section of the A841 were also found to be at risk due to coastal erosion. The A841 is maintained by NAC. The maximum wave height during a force 8 storm was found to be less than 1.0m.					
Potential Actions	Technically feasible?		Potential Actions	Technically feasible?	
Seawalls	✓	Will protect against both flooding and erosion	Perched beaches	▲	Will not protect against flooding but may provide erosion protection
Revetments	▲	Will not protect against flooding but may provide erosion protection	Cove	▲	Will not protect against flooding but may provide erosion protection
Embankments	▲	Will not protect against erosion but may provide flooding protection	Dune stabilisation	✓	Potentially feasible in isolated areas
Maintenance	✓	There are existing defences including seawalls and rock armour revetments	Managed realignment	▲	May consider diverting road
Groynes	▲	Will not protect against flooding but may provide erosion protection	Nourishment	✓	Potentially feasible in isolated areas
Detached breakwaters	▲	Will not protect against flooding but may provide erosion protection	Beach drain	▲	Will not protect against flooding but may provide erosion protection
Headlands	▲	Will not protect against flooding but may provide erosion protection	Additional Actions	✗	
Workshop Conclusions					
Policy unit boundary changed to include northern section of road in hold the line policy. Preferred action would be maintenance of existing defences. Actions will be the responsibility of NAC.					



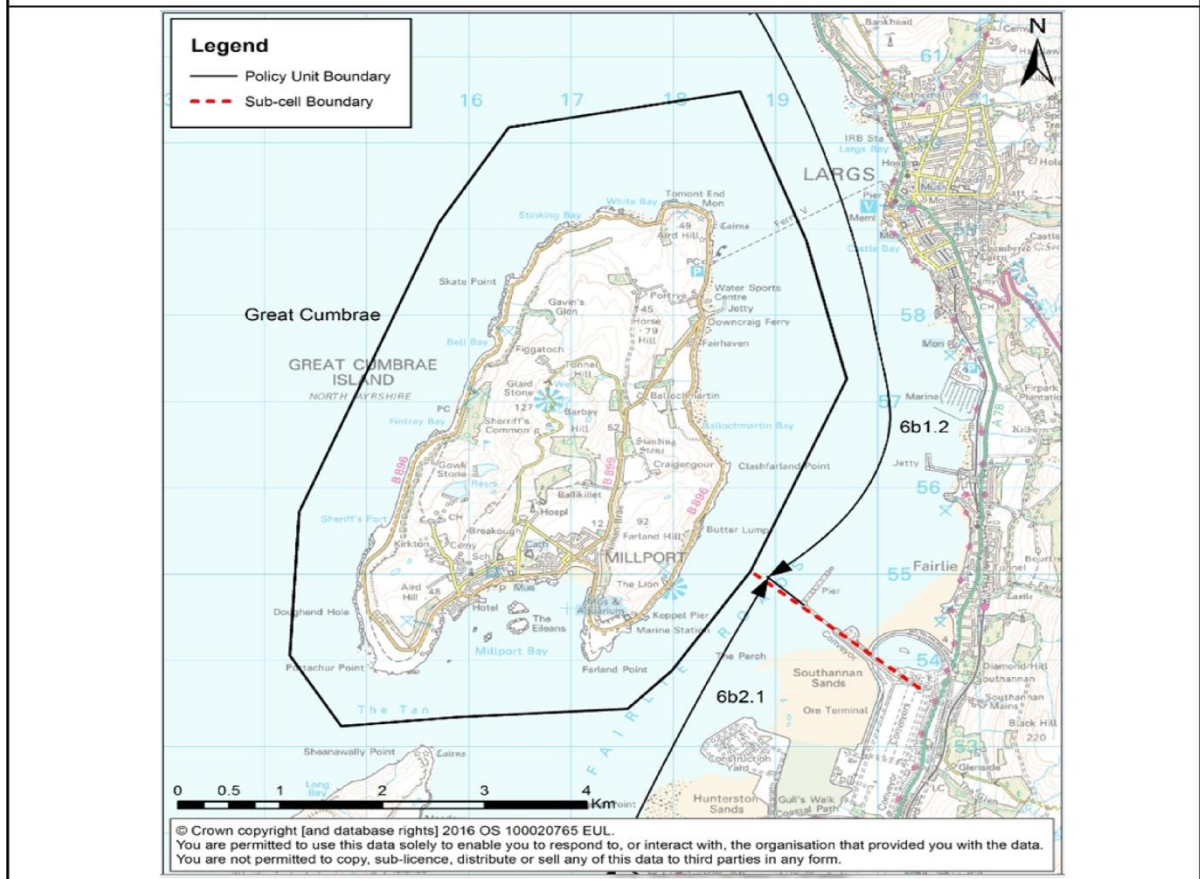
**Sub-Cell Great Cumbrae****RISKS**

Receptor Risk	Coastal Flooding		Accretion / Erosion								Wave
	200yr	200yr CC	2050				2100				Max. Significant Wave Height (Hm0)
			Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	Accretion	Erosion	Erosion Influence (10m)	Erosion Vicinity (60m)	
<b>RPs (no.)</b>	4	75		0	0	0		0	0	0	1.0-1.5m
<b>RPs AAD (£)</b>	£4,121										
<b>NRPs (no.)</b>	5	10		0	0	0		0	0	0	
<b>NRPs AAD (£)</b>	£3,412										
<b>A Roads (km)</b>	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
<b>B Roads (km)</b>	4.560	6.044		0.000	0.000	0.000		0.000	0.000	0.000	
<b>Minor Roads (km)</b>	0.000	0.000		0.000	0.000	0.000		0.000	0.000	0.000	
<b>Roads AAD (£)</b>	£73,143										
<b>SSSIs (km<sup>2</sup>)</b>	0.048	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Policy Unit Great Cumbrae is the only policy unit within this sub-cell, therefore the policy unit risk values are equal to the sub-cell risk values.



Subcell		Policy unit	
Great Cumbrae		Great Cumbrae	
<b>Policy</b>			
Hold the line			
<b>Issue</b>			
Localised coastal flood risk to properties at Quayhead, Millport and at the Water Sports Centre Jetty. Roads to the North of the Island are also at risk due to coastal flooding. No assets have been identified to be at risk due to coastal erosion in this policy unit. The maximum wave height during a force 8 storm was found to be between 1.0-1.5m.			
Potential Actions	Technically feasible?	Potential Actions	Technically feasible?
Seawalls	✓ Will protect against flooding	Perched beaches	✗ Will not protect against flooding
Revetments	✗ Will not protect against flooding	Cove	✗ Will not protect against flooding
Embankments	✓ Will protect against flooding	Dune stabilisation	✗ No naturally occurring dunes
Maintenance	✓ There are existing defences including seawalls, revetments and rock armour	Managed realignment	▲ May consider diverting road
Groynes	✗ Will not protect against flooding	Nourishment	✓ Potentially feasible
Detached breakwaters	✗ Will not protect against flooding	Beach drain	✗ Will not protect against flooding
Headlands	✗ Will not protect against flooding	Additional Actions	✗
<b>Workshop Conclusions</b>			
NAC scheme proposed for Millport. Policy changed to hold the line for the road. Preferred action would be maintenance of existing defences. Actions will be the responsibility of the asset owner.			





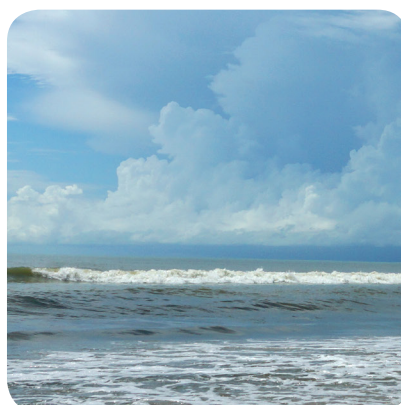
# Ayrshire Shoreline Management Plan

## Appendix E: Economic Appraisal

IBE1107/D03

Final F02

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# Ayrshire Shoreline Management Plan

## Appendix E: Economic Appraisal

### DOCUMENT CONTROL SHEET

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## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>E-1</b>
	1.1 BACKGROUND .....	E-1
<b>2</b>	<b>ECONOMIC APPRAISAL SUMMARY .....</b>	<b>E-3</b>
	2.1 SUB-CELL 6B1 ACTION PLAN: CLOCH POINT – HUNTERSTON ORE TERMINAL ....	E-3
	2.2 SUB-CELL 6B2 ACTION PLAN: HUNTERSTON ORE TERMINAL – FARLAND HEAD .	E-5
	2.3 SUB-CELL 6C1 ACTION PLAN: FARLAND HEAD - ARDROSSAN .....	E-6
	2.4 SUB-CELL 6C2 ACTION PLAN: ARDROSSAN - TROON.....	E-8
	2.5 SUB-CELL 6C3 ACTION PLAN: TROON - AYR.....	E-11
	2.6 SUB-CELL 6C4 ACTION PLAN: AYR - DUNURE .....	E-13
	2.7 SUB-CELL 6C5 ACTION PLAN: DUNURE - TURNBERRY .....	E-15
	2.8 SUB-CELL 6C6 ACTION PLAN: TURNBERRY – BENNANE HEAD .....	E-16
	2.9 SUB-CELL 6D1 ACTION PLAN: BENNANE HEAD – CURRARIE PORT .....	E-19
	2.10 SUB-CELL 6D2 ACTION PLAN: CURRARIE PORT – MILLEUR POINT .....	E-21
	2.11 SUB-CELL A1 ACTION PLAN: LOCHRANZA – CLAUCHLANDS POINT .....	E-22
	2.12 SUB-CELL A2 ACTION PLAN: CLAUCHLANDS POINT – KINGSCROSS POINT .....	E-25
	2.13 SUB-CELL A3 ACTION PLAN: KINGSCROSS POINT – DRUMADOON POINT .....	E-26
	2.14 SUB-CELL A4 ACTION PLAN: DRUMADOON POINT - LOCHRANZA.....	E-28
	2.15 SUB-CELL GREAT CUMBRAE ACTION PLAN .....	E-30

# 1 INTRODUCTION

## 1.1 BACKGROUND

A high level economic review of the actions proposed under the Ayrshire SMP has been carried out. This review included an assessment of potential economic damages to assets due to flooding and estimated potential economic benefits which may be avoided by implementing shoreline management.

Information developed by SEPA as part of the process of implementing the EU Floods Directive in Scotland was used to quantify the coastal flood risk along the Ayrshire shoreline.

Values of Average Annual Damage (AAD) were calculated based on the SEPA Flood Risk Appraisal Baseline National Coastal Receptor outputs. Direct and indirect damages to residential and non-residential properties were calculated following the Multi-Coloured Manual (MCM) methodology. Direct economic damages to roads associated with repair to carriageways as a result of flood water on road surface were also calculated. Impacted road section length combined with vehicle volume was considered as a proxy for indirect damages and disruption due to flooding.

The calculation of AADs was carried out in GIS. This calculation took the total direct and indirect damages for the receptors and calculated the predicted financial damages that would occur in any given year having due regard to the probability of any scale of flood event occurring in that year. The equation below was used to calculate annual average damages:

$$AAD = ([DMG10]+[DMG25])/2*((1/10)-(1/25)) + ([DMG25]+[DMG50])/2*((1/25)-(1/50)) + ([DMG50]+[DMG100])/2*((1/50)-(1/100)) + ([DMG100]+[DMG200])/2*((1/100)-(1/200)) + ([DMG200]+[DMG1000])/2*((1/200)-(1/1000)) + ([DMG1000]+[DMGInfin])/2*((1/1000)-0)$$

$$Infin = [DMG1000] + (([DMG1000] - [DMG200]) * (1/1000-0)/(1/200-1/1000))$$

### Notes

- *DMG* is the total financial damages for a given return period, e.g. *DMG10* is the total direct and indirect damages for a 10 year flood event.
- *Infin* is the infinity value.

The economic factors that were included within the AAD calculations were as follows:

- **Coastal Flooding AADs**
  - For the coastal flood modelling the following receptor damages were used in the AAD calculation:
    - Residential Properties (Direct Damages, Indirect Damages and Emergency Services)
    - Non Residential Properties (Direct Damages and Emergency Services)
- All **Road Damages** used in the AAD calculations were based on the flooded length of road (m) multiplied by the damage cost per length (£/km).

In order to calculate the potential additional economic benefit an action may have, Present Value Damages (PVD) were calculated for the receptors at risk. The PVD is the cumulative AAD taken over the lifetime of the project (assumed to be 100 years) discounted back to the present day. The discount rates are set by HM treasury and were 3.5% in years 1 to 30, 3% from years 31 to 75 and 2.5% from years 76 to 100. The potential additional economic benefit is equal to the PVD as this is the value of damage which may be prevented by implementing shoreline management actions.

It should be noted that the potential additional benefit quoted was the maximum available if all receptors were protected from flooding to a standard of protection of 1 in 200 years. It is also noted that the potential additional benefit calculated was based on the assets at risk due to coastal inundation only and did not include potential additional benefit due to coastal erosion risk and flood risk from wave overtopping, river or surface waters.

## 2 ECONOMIC APPRAISAL SUMMARY

### 2.1 SUB-CELL 6B1 ACTION PLAN: CLOCH POINT – HUNTERSTON ORE TERMINAL

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
6b1	£146,050	All	Skelmorlie to Hunterston Ore Terminal	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this sub-cell. Regular condition monitoring should be undertaken and repairs carried out where necessary.	Ongoing	Existing Expenditure	N/A
				Detailed flood, erosion and wave overtopping feasibility study.	Evaluate the risk to the A78 and properties in Largs and Skelmorlie due to coastal flooding, erosion and wave overtopping. Determine and assess potential shoreline management options.	Short-term	Circa £150k	Circa £4,350,000 calculated based on tidal inundation

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
		6b1.1	Skelmorlie to Largs	Implement shoreline management to protect A78	Undertake shoreline management based on feasibility study to protect the A78 from coastal flooding and erosion.	Short to Medium-term	TBC based on feasibility study	
		6b1.2	Largs to Hunterston Ore Terminal	Implement shoreline management at Largs	Undertake shoreline management as per feasibility study to protect assets at Largs from coastal flooding, erosion and wave overtopping.	Short to Medium-term	TBC based on feasibility study	



## 2.2 SUB-CELL 6B2 ACTION PLAN: HUNTERSTON ORE TERMINAL – FARLAND HEAD

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
6b2	£1,045	All	Hunterston to Farland Head	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this sub-cell. Regular condition monitoring should be undertaken and repairs carried out where necessary.	Ongoing	Existing Expenditure	N/A
				Flood and erosion feasibility study if required.	Carry out detailed assessment of the risk due to coastal flooding and erosion of any proposed development within sub-cell 6b2 and determine appropriate mitigation options for any proposed development.	As required	Circa £100k	Circa £31,000 calculated based on tidal inundation
		6b2.1	Hunterston	Implement shoreline management.	Undertake shoreline management as per feasibility study to protect new development if required.	As required	TBC based on feasibility study	

## 2.3 SUB-CELL 6C1 ACTION PLAN: FARLAND HEAD - ARDROSSAN

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
6c1	£8,721	All	Farland Head to Ardrossan	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this sub-cell. Regular condition monitoring should be undertaken and repairs carried out where necessary.	Ongoing	Existing Expenditure	N/A
				Detailed flood, erosion and wave overtopping feasibility study.	Evaluate the risk to properties and Scottish Water assets within sub-cell 6c1 due to coastal flooding, erosion and wave overtopping. Determine and assess potential shoreline management options.	Short-term	Circa £150k	Circa £260,000 calculated based on tidal inundation

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
				Implement shoreline management.	Undertake shoreline management as per feasibility study to protect assets at risk due to coastal flooding, erosion and wave overtopping.	Short to Medium-term	TBC based on feasibility study	
				Manage risk to Scottish Water asset.	Undertake shoreline management as per feasibility study to protect Scottish Water assets.	Short to Medium-term	TBC based on feasibility study	

## 2.4 SUB-CELL 6C2 ACTION PLAN: ARDROSSAN - TROON

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
6c2	£309,713	6c2.4	Gailes Burn to Troon	Dune restoration.	Continue dune restoration works in this policy unit.	Ongoing	Existing Expenditure	N/A
		All	Ardrossan to Troon	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this sub-cell. Regular condition monitoring should be undertaken and repairs carried out where necessary.	Ongoing	Existing Expenditure	N/A
				Detailed coastal flooding and erosion feasibility study.	Evaluate the risk to properties, Network Rail assets and private land within sub-cell 6c2 due to coastal flooding and erosion. Determine and assess potential shoreline management options.	Short-term	Circa £100K	Circa £9,230,000 calculated based on tidal inundation

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
6c2/ 6c3		6c2.4/ 6c3.1	Gailes Burn to Ayr	Detailed wave overtopping study.	Detailed study to evaluate the risk due to wave overtopping. Determine and assess options to manage flood risk due to wave overtopping at Troon.	Short-term	Circa £50k	
6c2		6c2.1	Ardrossan to Stevenston	Flood and erosion management at Saltcoats and Stevenston.	Undertake shoreline management to mitigate flood risk and control erosion at Saltcoats and Stevenston based on feasibility study.	Short to Medium- term	TBC based on feasibility study	
		6c2.2	Stevenston to Irvine Bay	Erosion management.	Undertake shoreline management to control erosion and prevent potential contamination based on feasibility study	Medium- term	TBC based on feasibility study	

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
		6c2.3	Irvine Bay to Gales Burn	Flood and erosion management along River Irvine and at Barassie.	Undertake shoreline management to mitigate flood risk adjacent to the River Irvine and to control erosion at Barassie/ Irvine beach park based on feasibility study.	Short to Medium-term	TBC based on feasibility study	
		6c2.4	Gales Burn to Troon	Flood management at Troon.	Undertake shoreline management to mitigate flood risk due to coastal inundation and wave overtopping to properties and other assets at Troon based on feasibility and wave overtopping studies.	Short to Medium-term	TBC based on feasibility study	

## 2.5 SUB-CELL 6C3 ACTION PLAN: TROON - AYR

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
6c3	£177,588	All	Troon to Ayr	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this sub-cell. Regular condition monitoring should be undertaken and repairs carried out where necessary.	Ongoing	Existing Expenditure	N/A
				Detailed flood, erosion and wave overtopping feasibility study.	Evaluate the risk to properties and Scottish Water assets within sub-cell 6c3 due to coastal flooding, erosion and wave overtopping. Determine and assess potential shoreline management options.	Short-term	Circa £150k	Circa £5,290,000 calculated based on tidal inundation
				Erosion protection at Newton shore.	Undertake detailed design and implement erosion protection at Newton shore.	Short-term	TBC based on feasibility study	

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
				Flood and erosion management at Troon, Prestwick beach and Ayr	Undertake shoreline management to mitigate flood risk, control erosion and manage wave overtopping at Troon, Prestwick beach and Ayr based on feasibility study.	Short to Medium-term	TBC based on feasibility study	
				Manage risk to Scottish Water asset.	Undertake shoreline management as per feasibility study to protect Scottish Water assets.	Short to Medium-term	TBC based on feasibility study	



## 2.6 SUB-CELL 6C4 ACTION PLAN: AYR - DUNURE

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
6c4	£166,406	6c4.1	Ayr to Grenan Castle	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this policy unit. Regular condition monitoring should be undertaken and repairs carried out where necessary.	Ongoing	Existing Expenditure	N/A
				Maintain South pier.	Continue maintenance of South Pier due to its importance for the port of Ayr.	Ongoing	Existing Expenditure	
				Detailed coastal flooding and wave overtopping feasibility study.	Detailed feasibility study to evaluate the risk due to coastal flooding at Ayr, Seafield and Doonfoot and to assess the risk due to wave overtopping along the promenade at south Ayr. Determine and assess potential shoreline management options.	Short-term	Circa £100k	Circa £4,960,000 calculated based on tidal inundation

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
				Flood and wave overtopping management at Ayr	Undertake shoreline management to mitigate flood risk and manage wave overtopping at Ayr, Seafield and Doonfoot based on feasibility study.	Short to Medium-term	TBC based on feasibility study	
		6c4.2	Grenan Castle to Dunure	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in this policy unit. The shoreline will be allowed to revert to a natural state.	Short to Long-term	N/A	N/A

**2.7 SUB-CELL 6C5 ACTION PLAN: DUNURE - TURNBERRY**

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
6c5	£9,153	All	Dunure to Turnberry	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in this policy unit. The shoreline will be allowed to revert to a natural state.	Short to Long-term	N/A	N/A

## 2.8 SUB-CELL 6C6 ACTION PLAN: TURNBERRY – BENNANE HEAD

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
6c6	£19,600	6c6.1	Turnberry to North Girvan	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in this policy unit. The shoreline will be allowed to revert to a natural state.	Short to Long-term	N/A	N/A
		6c6.2/ 6c6.3	Girvan to Bennane Head	Maintenance of existing defences.	Maintenance of coastal defences currently in place within these policy units. Regular condition monitoring should be undertaken and repairs carried out where necessary.	Ongoing	Existing Expenditure	N/A

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
				Detailed coastal/ fluvial flooding and coastal erosion feasibility study.	Evaluate coastal/ fluvial flood risk from the Water of Girvan and Mill Burn and the coastal flood risk to the A77. Evaluate coastal erosion risk to Girvan Golf Course and the A77. Determine and assess potential shoreline management options.	Short-term	Circa £150k	Circa £540,000 calculated based on tidal inundation
		6c6.2	Girvan	Undertake erosion protection at Girvan Golf Course.	Undertake shoreline management to mitigate erosion risk at Girvan Golf Course based on feasibility study.	Short to Medium-term	TBC based on feasibility study	
				Undertake flood protection at Girvan.	Implement flood protection scheme at Girvan to protect against fluvial and coastal flooding based on feasibility study.	Short to Medium-term	TBC based on feasibility study	

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
		6c6.3	South Girvan to Bennane Head	Undertake flood and erosion protection for the A77.	Undertake shoreline management to mitigate flood and erosion risk to the A77 based on feasibility study.	Short to Medium-term	TBC based on feasibility study	

## 2.9 SUB-CELL 6D1 ACTION PLAN: BENNANE HEAD – CURRARIE PORT

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
6d1	£2,178	6d1.1	Bennane Head to Ballantrae	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this policy unit. Regular condition monitoring should be undertaken and repairs carried out where necessary.	Ongoing	Existing Expenditure	N/A
				Coastal flood and erosion feasibility study.	Detailed assessment of the flood and erosion risk to the A77. Assessment of management options.	Short-term	Circa £100k	Circa £65,000 calculated based on tidal inundation
				Coastal flood and erosion protection.	Undertake shoreline management to protect the A77 from coastal flooding and erosion based on feasibility study.	Short-term	TBC based on feasibility study	

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
		6d1.2	Ballantrae to Currarie Port	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in this policy unit. The shoreline will be allowed to revert to a natural state.	Short to Long-term	N/A	N/A



**2.10 SUB-CELL 6D2 ACTION PLAN: CURRARIE PORT – MILLEUR POINT**

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
6d2	£1,050	6d2.1	Currarie Port to Galloway Burn	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in this policy unit. The shoreline will be allowed to revert to a natural state.	Short to Long-term	N/A	Circa £31,000 calculated based on tidal inundation

**2.11 SUB-CELL A1 ACTION PLAN: LOCHRANZA – CLAUCHLANDS POINT**

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
A1	£80,543	A1.2, A1.5	Lochranza to Sannox and Brodick to Cluchlands Point	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in these policy units. The shoreline will be allowed to revert to a natural state.	Short to Long-term	N/A	N/A
		A1.1, A1.3, A1.4	Lochranza and Sannox to Brodick	Maintenance of existing defences.	Maintenance of coastal defences currently in place within these policy units. Regular condition monitoring should be undertaken and repairs carried out where necessary.	Ongoing	Existing Expenditure	N/A

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
				Integrated flood, erosion and wave overtopping feasibility study.	Undertake a detailed feasibility study to assess the risk due to flooding from all sources including coastal, fluvial, pluvial and groundwater at Lochranza. Assess coastal flood and erosion risk to the A841. Determine shoreline management options.	Short-term	Circa £175k	Circa £2,400,000 calculated based on tidal inundation
		A1.1	Lochranza	Flood protection at Lochranza.	Implement works to protect assets from coastal, fluvial, pluvial and groundwater flooding at Lochranza based on feasibility study.	Short to Medium-term	TBC based on feasibility study	
		A1.3	Sannox to Brodick	Flood and erosion protection for the A841.	Undertake shoreline management to protect the A841 from coastal flooding and erosion based on feasibility study.	Short to Medium-term	TBC based on feasibility study	

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
		A1.4	Brodick	Protect landfill site at Brodick.	Construct preferred option from Coast Protection Optioneering and Design Study for Brodick by AECOM in 2015 to protect landfill site. This consists of constructing two fishtail rock groynes extending from the shore at the southern extent of Brodick beach.	Short to Medium-term	£680,000-£985,000 (2015 costs)	

**2.12 SUB-CELL A2 ACTION PLAN: CLAUCHLANDS POINT – KINGSCROSS POINT**

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
A2	£115,359	A2.1, A2.3	Clauchlands Point to Kingscross Point (excluding Lamlash)	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in these policy units. The shoreline will be allowed to revert to a natural state.	Short to Long-term	N/A	N/A
		A2.2	Lamlash	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this policy unit. Regular condition monitoring should be undertaken and repairs carried out where necessary.	Ongoing	Existing Expenditure	N/A
				Coastal flood and erosion protection at Lamlash.	Undertake shoreline management to mitigate coastal flood and erosion risk at Lamlash based on feasibility study.	Short to Medium-term	TBC based on ongoing feasibility study	Circa £3,410,000 calculated based on tidal inundation

**2.13 SUB-CELL A3 ACTION PLAN: KINGSCROSS POINT – DRUMADOON POINT**

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
A3	£95,214	A3.1	Whiting Bay	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this policy unit. Regular condition monitoring should be undertaken and repairs carried out where necessary.	Ongoing	Existing Expenditure	N/A
				Integrated flood and wave overtopping study.	Detailed assessment of the risk to assets in this policy unit due to coastal flooding, wave overtopping and drainage from fluvial and pluvial flooding. Assessment of flood risk management options.	Short-term	Circa £150k	Circa £2,710,000 calculated based on tidal inundation

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
				Flood and wave overtopping protection at Whiting Bay.	Undertake shoreline management to protect assets at Whiting Bay from coastal flooding, wave overtopping and drainage from fluvial and pluvial flooding based on feasibility study.	Short to Medium-term	TBC based on feasibility study	
		A3.2	Largymore to Drumadoon Point	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in this policy unit. The shoreline will be allowed to revert to a natural state.	Short to Long-term	N/A	N/A

**2.14 SUB-CELL A4 ACTION PLAN: DRUMADOON POINT - LOCHRANZA**

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
A4	£23,655	A4.1	Drumadoon Point to Tormore	Allow shoreline to function naturally.	No coastal defence measures are to be implemented in this policy unit. The shoreline will be allowed to revert to a natural state.	Short to Long-term	N/A	N/A
		A4.2	Machrie Bay to Lochranza	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this policy unit. Regular condition monitoring should be undertaken and repairs carried out where necessary.	Ongoing	Existing Expenditure	N/A
				Coastal flooding and erosion feasibility study.	Detailed assessment of the risk to assets in this policy unit due to coastal flooding and erosion. Assessment of flood risk management options.	Short-term	Circa £100k	Circa £705,000 calculated based on tidal



Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
				Coastal flood and erosion protection.	Undertake shoreline management based on feasibility study to mitigate coastal flood and erosion risk.	Short to Medium-term	TBC based on feasibility study	inundation

## 2.15 SUB-CELL GREAT CUMBRAE ACTION PLAN

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
Great Cumbrae	£80,676	Great Cumbrae	Great Cumbrae	Maintenance of existing defences.	Maintenance of coastal defences currently in place within this policy unit. Regular condition monitoring should be undertaken and repairs carried out where necessary.	Ongoing	Existing Expenditure	N/A
				Millport flood scheme.	Construction of the flood scheme at Millport as proposed in the 2015 study. This scheme includes a harbour breakwater, flood walls and shore connected rock breakwaters.	Short-term	£12,446,000 (2015 costs)	Circa £2,405,000 calculated based on tidal inundation
				Coastal flooding feasibility study.	Detailed assessment of the coastal flood risk to roads to the north of the island. Assessment of flood risk management options.	Short-term	Circa £75k	

Sub-cell	Total AAD	Policy Unit	Location reference	Action	Description	Target Timescale	Potential Estimated Cost	Potential Additional Benefit
				Coastal flood protection for roads.	Undertake shoreline management to protect roads to the north of the island from coastal flooding based on feasibility study.	Short to Medium-term	TBC based on feasibility study	