Angus Council

Angus Shoreline Management Plan SMP2

Appendix J –Water Framework Directive (WFD) Assessment Report

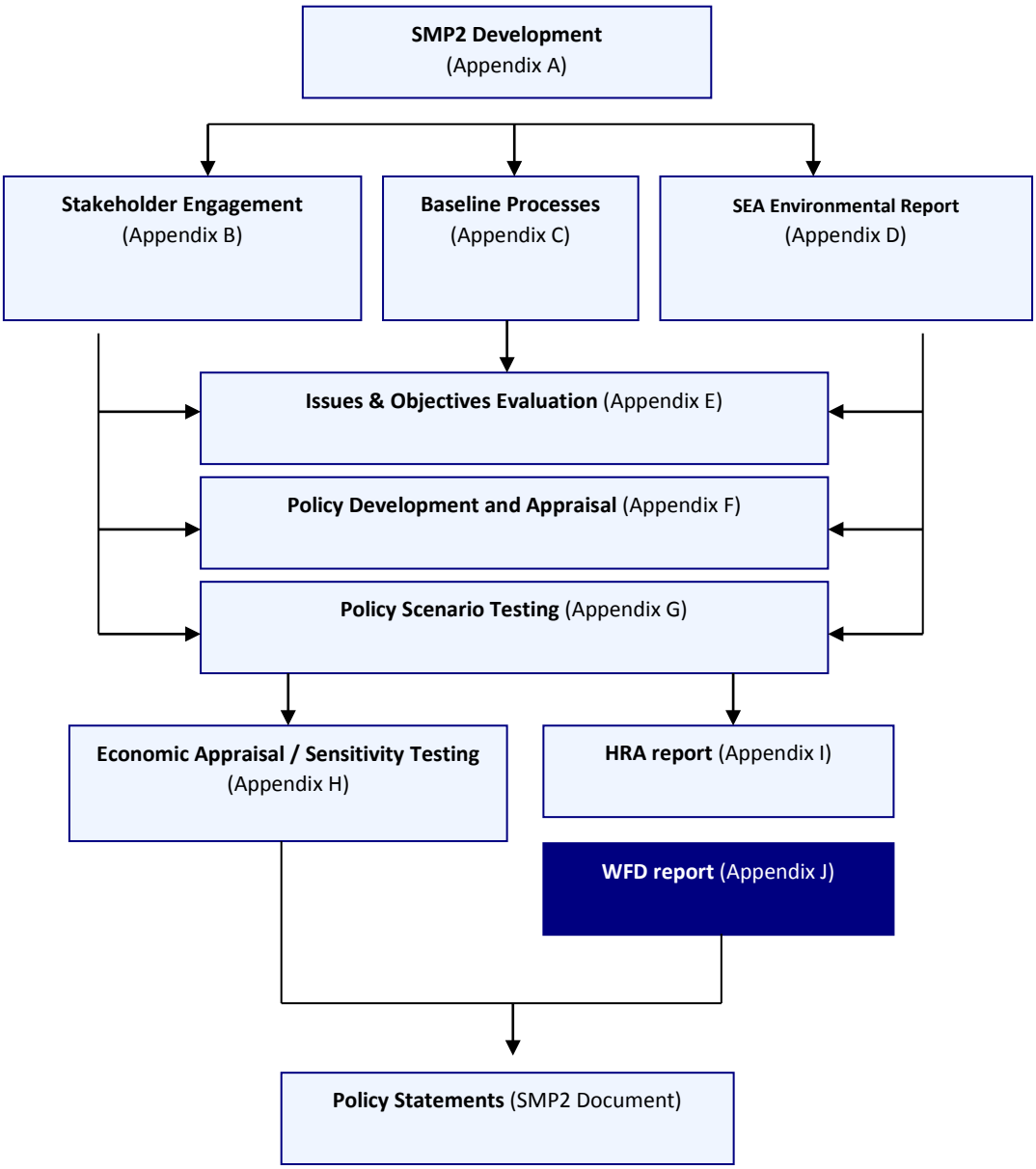

Arbroath, 2012

The Supporting Appendices

This appendix and the accompanying documents provide all of the information required to support the Shoreline Management Plan. This is to ensure that there is clarity in the decision-making process and that the rationale behind the policies being promoted is both transparent and auditable. The appendices are:

A: SMP2 Development	This reports the history of development of the SMP2, describing more fully the plan and policy decision-making process.
B: Consultation	All communications from the stakeholder process are provided here, together with information arising from the consultation process.
C: Baseline Process Understanding	Includes baseline process report, defence assessment, NAI and WPM assessments and summarises data used in assessments.
D: Strategic Environmental Assessment (SEA) Environmental Report	This report identifies and evaluates the baseline environmental features (human, natural, historical and landscape) and presents an overview of the environmental assessment process, showing how the requirements of the EU Council Directive 2001/42/EC (the Strategic Environmental Assessment Directive) are met.
E: Issues & Objective Evaluation	Provides information on the issues and objectives identified as part of the Plan development, including appraisal of their importance.
F: Policy Scenario Identification	Presents the consideration of generic policy options for each frontage, identifying possible acceptable policies, and their combination into 'scenarios' for testing.
G: Policy Scenario Testing	Presents the policy assessment and appraisal of objective achievement towards definition of the Preferred Plan (as presented in the Shoreline Management Plan document).
H: Economic Appraisal and Sensitivity Testing	Presents the economic analysis undertaken in support of the Preferred Plan.
I: Habitats Regulations Assessment	Presents the results of a Habitats Regulations Assessment under the requirements of the EC Habitats Directive (92/43/EEC) and European Union Birds Directive (79/409/EEC).
J: Water Framework Directive (WFD) Assessment	Presents the results of the WFD Assessment.
K: Meta-database and Bibliographic	a database of supporting information used to develop the SMP2, referenced for future examination and retrieval

Within each appendix cross-referencing highlights the documents where related appraisals are presented. The broad relationships between the appendices are as below.



Contents Amendment Record

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Glossary

Glossary

Term	Description
Angiosperms	The flowering plants. In transitional and coastal waters they include sea grasses and the flowering plants found in salt marshes
Biological element	A collective term for a particular characteristic group of animals or plants present in an aquatic ecosystem (for example phytoplankton; benthic invertebrates; phytobenthos; macrophytes; macroalgae; phytobenthos; angiosperms; fish).
Biological quality element	A characteristic or property of a biological element that is specifically listed in Annex V of the Water Framework Directive for the definition of the ecological status of a water body (for example composition of invertebrates; abundance of angiosperms; age structure of fish). Biological and chemical statuses, along with hydromorphological status, together define the overall ecological status of a water body.
Characterisation (of water bodies)	A two-stage assessment of water bodies under the Water Framework Directive. Stage 1 identifies water bodies and describes their natural characteristics. Stage 2 assesses the pressures and impacts from human activities on the water environment. The assessment identifies those water bodies that are at risk of not achieving the environmental objectives set out in the Water Framework Directive. The results are used to prioritise both environmental monitoring and further investigations to identify those water bodies where improvement action is required.
Competent Authority	An authority or authorities identified under Article 3(2) or 3(3) of the Water Framework Directive. The Competent Authority will be responsible for the application of the rules of the Directive within each river basin district lying within its territory.
Ecological potential	The status of a heavily modified or artificial water body measured against the maximum ecological quality it could achieve given the constraints imposed upon it by those heavily modified or artificial characteristics necessary for its use. There are five ecological potential classes for Heavily Modified Water Bodies/Artificial Water Bodies (maximum, good, moderate, poor and bad).
Ecological status	Ecological status applies to surface water bodies and is based on the following quality elements: biological quality, general chemical and physico-chemical quality, water quality with respect to specific pollutants (synthetic and non synthetic), and hydromorphological quality. There are five classes of ecological status (high, good, moderate, poor or bad). Ecological status and chemical status together define the overall surface water status of a water
Good ecological potential	Those surface waters which are identified as Heavily Modified Water Bodies and Artificial Water Bodies must achieve 'good ecological potential' (good potential is a recognition that changes to morphology may make good ecological status very difficult to meet). In the first cycle of river basin planning good potential

Term	Description
	may be defined in relation to the mitigation measures required to achieve it.
Good ecological status	The objective for a surface water body to have biological, structural and chemical characteristics similar to those expected under nearly undisturbed conditions.
Good status	Is a term meaning the status achieved by a surface water body when both the ecological status and its chemical status are at least good or, for groundwater, when both its quantitative status and chemical status are at least good and show no signs of deterioration.
Groundwater	All water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.
Heavily Modified Water Body	A surface water body that does not achieve good ecological status because of substantial changes to its physical character resulting from physical alterations caused by human use, and which has been designated, in accordance with criteria specified in the Water Framework Directive, as 'heavily modified'.
High ecological status	Is a state, in a surface water body, where the values of the hydromorphological, physico-chemical, and biological quality elements correspond to conditions undisturbed by anthropogenic activities.
Hydromorphology	Describes the hydrological and geomorphological processes and attributes of surface water bodies. For example for transitional and coastal waters, hydromorphology describes the physical characteristics of the shape, boundaries and content of the water body. The Water Framework Directive requires surface waters to be managed in such a way as to safeguard their hydrology and geomorphology so that ecology is protected.
Hydromorphological element	Hydromorphological element includes water flow, sediment composition and movement, continuity and the structure of physical habitat.
Hydromorphological quality element	A characteristic or property of a hydromorphological element that is specifically listed in Annex V of the Water Framework Directive for the definition of the ecological status of a water body (for example continuity, hydrology and morphology). Biological and chemical statuses, along with hydromorphological status, together define the overall ecological status of a water body.
Macroalgae	Multicellular algae such as seaweed.
Macrophyte	Larger plants, typically including flowering plants, mosses and larger algae but not including single-celled phytoplankton or diatoms.
Measure	This term is used in the Water Framework Directive and domestic legislation. It means an action which will be taken on the ground to help achieve Water Framework Directive objectives.

Term	Description
Morphology	Describes the physical form, shape, structure and condition of a water body, for example the width, depth, perimeter, structure and condition of an estuary.
No deterioration (in water body status)	None of the quality elements used in the classification of water body status deteriorates to the extent that the overall status is reduced.
Physico-chemical element	Physico-chemical assessment includes elements such as temperature and the level of nutrients, which support the biology.
Physico-chemical quality element	A characteristic or property of a physico-chemical element that is specifically listed in Annex V of the Water Framework Directive for the definition of the ecological status of a water body (for example salinity, thermal conditions and oxygenation). Biological and chemical statuses, along with hydromorphological status, together define the overall ecological status of a water body.
Phytobenthos	Bottom-dwelling multi-cellular and unicellular aquatic plants such as some species of diatom.
Phytoplankton	Unicellular algae and cyanobacteria, both solitary and colonial that live, at least for part of their lifecycle, in the water column.
River basin	A river basin is the area of land from which all surface run-off and spring water flows through a sequence of streams, lakes and rivers into the sea at a single river mouth, estuary or delta. It comprises one or more individual catchments.
River Basin District	A river basin or several river basins, together with associated coastal waters.
River Basin Management Plan	For each River Basin District, the Water Framework Directive requires a River Basin Management Plan to be published. These are plans that set out the environmental objectives for all the water bodies within the River Basin District and how they will be achieved. The plans will be based upon a detailed analysis of the pressures on the water bodies and an assessment of their impacts. The plans must be reviewed and updated every six years.
Transitional water	A Water Framework Directive term for waters that are intermediate between fresh and marine water. Transitional waters include estuaries and saline lagoons.
Water body	A manageable unit of surface water, being the whole (or part) of a stream, river or canal, lake or reservoir, transitional water (estuary) or stretch of coastal water. A ‘body of groundwater’ is a distinct volume of underground water within an aquifer.
Water Framework Directive	European Union legislation – Water Framework Directive (2000/60/EC) – establishing a framework for European Community action in the field of water policy.

Abbreviations	
BQE	Biological Quality Element
Defra	Department of Food Environment and Rural Affairs
HTL	Hold the Line
MR	Managed Realignment
NAI	No Active Intervention
RBD	River Basin District
RBMP	River Basin Management Plan
SEPA	Scottish Environment Protection Agency
TraC	Transitional and Coastal Water Bodies
WFD	Water Framework Directive

J.1 Introduction

J.1.1 Purpose of the report

The Water Framework Directive (WFD) came into force in 2000 and is the most substantial piece of EC water legislation to date. As such the Directive needs to be taken into account in the planning of all new activities in the water environment. The WFD was transposed into law in Scotland by the Water Environment and Water Services (Scotland) Act 2003. The purpose is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwaters. Of specific relevance to this assessment is that the Directive (and thus the Act) includes a duty on the competent authorities to deliver "sustainable flood management".

Under the Water Environment and Water Services (Scotland) Act 2003, SEPA is the competent authority empowered with operational implementation of the Directive, whilst local authorities and other bodies share some duties and responsibilities. However, Shoreline management Plans (SMPs) are delivered in Scotland under guidance prepared by Defra, and guidance on the appropriate consideration of compliance with the WFD for SMPs has been prepared by the Environment Agency (2009a, b). That guidance describes the methodology for assessing the potential hydromorphological changes and consequent ecological impact of SMP2 policies.

This report uses the guidance and highlights compliance with the Directive's environmental objectives by the **Angus Shoreline Management Plan 2** (SMP2). The assessment was conducted in parallel with the development of preferred SMP2 policy options, in order to appropriately inform option choices. As stated in the guidance:

"*By taking into account the environmental objectives of the Directive in policy making, future decisions will already have had consideration of requirements of the Directive and potential for failure to meet the objectives will have been highlighted*".

J.1.2 Background

The framework for delivering the WFD in Scotland is presented in a River Basin Management Plan (RBMP) produced for each River Basin District (RBD). The water bodies relevant to the Angus SMP2 fall entirely within the Scotland RBD (Natural Scotland, 2009). For all water bodies, the Directive requires the setting of environmental objectives. These are based on the default objectives as summarised in Table 1. In order to achieve these environmental objectives where not already met in a water body, appropriate mitigation measures are identified in the RBMP, aimed at returning the water body to at least good status (or at least good potential if the water body has been identified as an artificial or heavily modified water body (AWB, HMWB)).

Table 1 Environmental Objectives of the WFD

Objectives (taken from Article 4 of the Directive)	Reference Article
Implement the necessary measures to prevent deterioration of the status of all bodies of surface water.	4.1(a)(i)
Protect, enhance and restore all bodies of surface water, subject to the application of subparagraph (iii) for artificial and heavily modified bodies of water, with the aim of achieving good surface water status by 2015.	4.1(a)(ii)
Protect and enhance all artificial and heavily modified bodies of water, with the aim of achieving good ecological potential and good surface water chemical status by 2015.	4.1(a)(iii)
Progressively reduce pollution from priority substances and cease or phase out emissions, discharges and losses of priority hazardous substances.	4.1(a)(iv)
Prevent 'deterioration in status' and prevent or limit input of pollutants to groundwater.	4.1(b)(i)

J.1.2.1 Achieving objectives for EU protected areas

Where there are water-dependent sites protected under other EU legislation, such as the Birds, Habitats or Bathing Water Directives, the WFD terms these "protected areas" and requires compliance with any relevant standards or objectives from those Directives. Therefore, if a designation requires more stringent quality standards than are required to achieve good ecological status/potential under the WFD, those more stringent standards must also be met.

J.2 Assessment Methodology

The methodology used in this assessment follows national guidance which identifies a series of clearly defined steps, to provide a transparent and auditable account of the assessment of SMP2 policies. These steps are summarised below (section J.2.1 to J.2.4).

J.2.1 Step 1: Scope the SMP2- Data collation

To make the assessment as comprehensive as possible, a data collation exercise was undertaken to identify the transitional and coastal (TraC) water bodies overlapping and thus relevant to the Angus SMP2 frontage, as well as river water bodies discharging into it and any lake water bodies within the coastal zone and groundwater bodies underlying the coastal zone. Non-TraC water bodies are relevant if preferred policies might impact on their hydromorphological features or ecological features, e.g. new shoreline defences may alter the interactions between a coastal water body and the lower part of a river water body that discharges into it.

The relevant surface water bodies are shown in Figure 1. For each water body the following information was sourced:

- Water body ID number;
- Classification details, including biological quality element[1] (BQE) information and any designation as AWB or HMWB;
- Environmental objective;
- Relevant measures needed to achieve good status/potential.

For groundwater bodies, information was collated on any risk of failing the objectives of the WFD as a result of saline intrusion associated with abstraction. Groundwaters throughout the entire study area constitute drinking water protected areas. Following public consultation, the WFD assessment has been updated using the River Basin Management Plan for the Scotland River Basin District: 2015-2017 and the associated online SEPA Water Environment Hub to update the status of the water bodies.

J.2.2 Step 2: Define WFD features and issues

For each of the water body types identified as relevant in Step 1, a high level assessment was made of the potential impact of generic SMP polices (Advance The Line ATL, Hold the Line HTL, No Active Intervention NAI, Managed Realignment MR) on physical and hydromorphological characteristics and, thus, on biological elements, Table 2. The issues identified were then considered for their relevance to each individual surface water body, as reported in Table 3 which also presents (i) the water body's classification, (ii) any relevant actions proposed in the RBMP programme of measures and (iii) the relevant WFD environmental objectives from Article 4.1 of the Directive, identified from the following list:

- WFD1 - no changes affecting "high" status sites;
- WFD2 - no changes that will cause failure to meet surface water "good" ecological status or potential (where potential relates to HMWB or AWB) or result in a deterioration of surface water ecological status/potential;

[1] The assessment of ecological status or potential of water bodies is carried out with the use of biological indicators from several groups of organisms – referred to in the WFD as "biological quality elements". For example: for rivers the assessment might include consideration of factors relevant to phytoplankton, macrophytes, benthic and macro invertebrates and fish.

- WFD3 - no changes which will permanently prevent or compromise the environmental objectives being met in other water bodies;
- WFD4 - no changes that will cause failure to meet "good" groundwater status or result in a deterioration of groundwater status.

The potential actions from the programme of measures include all those related to achieving good physical status or potential in a specific AWB or HMWB (excluding those related to fisheries, navigation and, for freshwater bodies, abstraction). It is probable that some or many of these may not be directly relevant to implementation of SMP2 policies, especially for river water bodies. However, all actions from the RBMPs are included since these could inform future schemes arising from the SMP2, including those that could affect the physical interface between coastal/transitional water bodies and river water bodies.

J.2.3 Step 3: Assess preferred SMP2 Policies against WFD environmental objectives

In this stage of the assessment the potential changes in physical and hydromorphological processes that could result from the preferred SMP2 policies are assessed against the four WFD environmental objectives (WFD1 to WFD4). For each SMP2 policy unit, the potential changes in relevant physical and hydromorphological processes were identified and recorded in Table 4, which also summarises the proposed policies along each frontage.

The assessment did not only consider coastal and transitional water bodies, but also the potential impact on associated river water bodies. For example, a preferred policy of managed realignment could potentially result in increased saline incursion, benthic habitat modification and other changes in any river water bodies within the realigned frontage. Consideration is also made of the potential effects on groundwater bodies, specifically related to the potential for SMP2 policies to exacerbate any risk of saline intrusion into the water body.

Step 3 also includes assessment of the cumulative effects of all the SMP2 policies for each water body, and the outcome recorded in Table 5.

J.2.4 Step 4: Complete WFD summary statement

Where it is concluded under Step 3 that any preferred SMP2 policy presents a significant risk of failure to meet any of the four WFD environmental objectives, a WFD Summary Statement should be completed, summarising the considerations made in SMP development that are pertinent to Article 4.7 of the WFD, specifically:

- Assess whether all appropriate mitigation measures for potential new modifications have been included in the preferred SMP policy;
- Present evidence that the preferred SMP policy is being promoted for reasons of over-riding public interest;
- Present evidence that no other SMP policy option would present an environmentally better, affordable, option for that policy unit;
- Demonstrate that the effect on water bodies outside the SMP study area have been considered and that the associated WFD objective 3 would not be compromised;
- Highlight any other overriding issues that should be considered.

Where environmental objectives are not met in or within close proximity to a Special Area of Conservation (SAC) or Special Protection Area (SPA), reference should be made to the potential impact of the policy, recommended preventative measures and implications for the integrity of the site as recorded in the Habitats Regulations Appraisal (HRA).

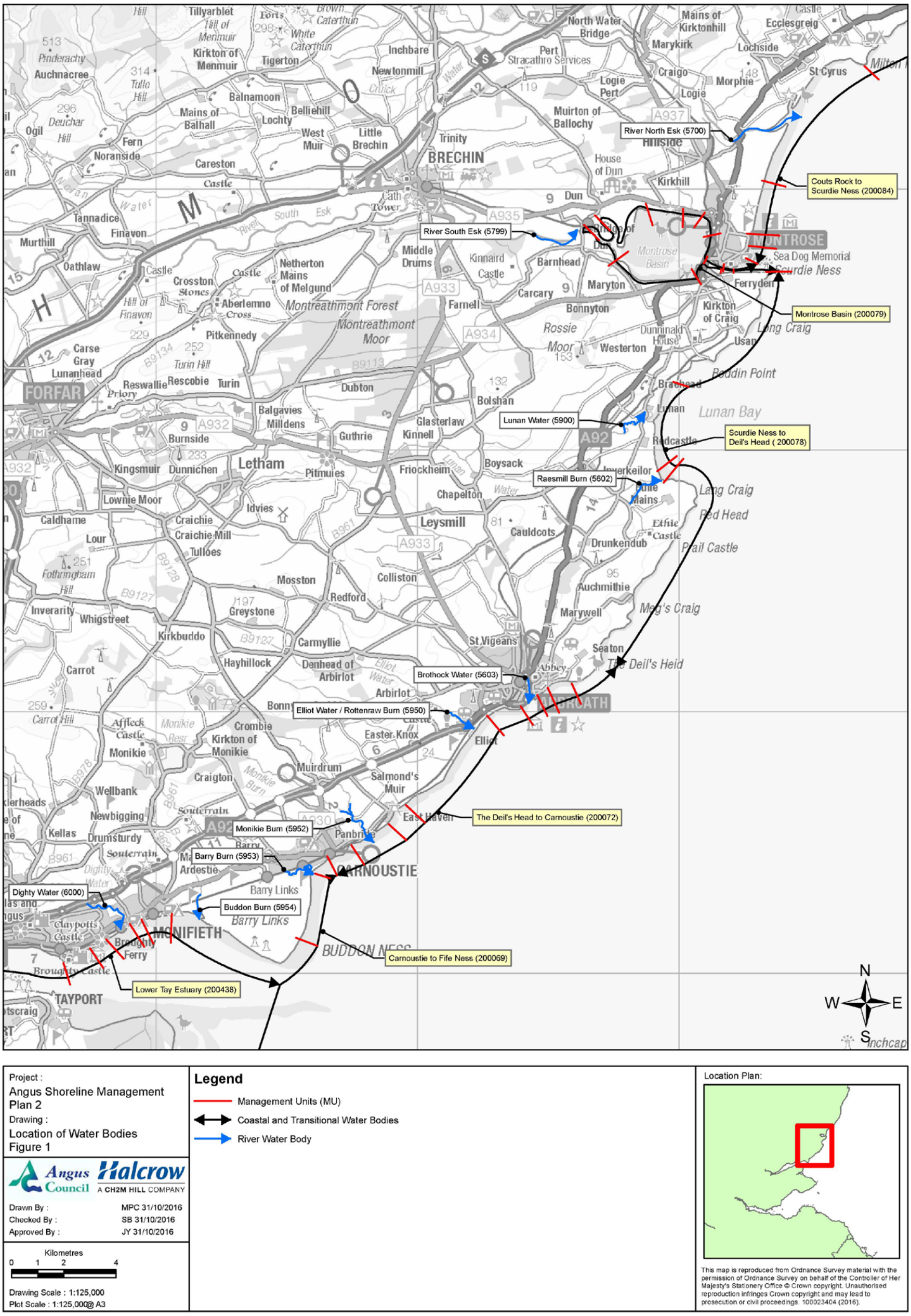


Figure 1 Location of Surface Water Bodies and Policy Units

J.3 Results

J.3.1 Step 1: Scoping the SMP2- Data Collation

J.3.1.1 Transitional and Coastal Water Bodies

The Angus SMP2 study area overlaps with four coastal water bodies and three transitional water bodies, all of which are considered to be in scope. These are, from north to south (see also Figure 1):

- *Couts Rock to Scurdie Ness* (coastal, ID 200084) which extends beyond the northern limit of the SMP2 study area;
- *Montrose Basin* (transitional, ID 200079);
- *Scurdie Ness to Deils Head* (coastal, ID 200078));
- *The Deil's Head to Carnoustie* (coastal, ID 200072);
- *Carnoustie to Fife Ness* (coastal, ID 200069) the large majority of which is beyond the southern limit of the SMP2 study area;
- *Lower Tay Estuary* (transitional, ID 200438) which extends to the west of the SMP2's southern limit at Broughty Ferry.

J.3.1.2 River and lake water bodies

River water bodies which discharge into the coast or the Tay estuary within the SMP2 area all have some potential for modification as a result of proposed SMP2 policies and are, therefore, considered to be in scope. These are, from north to south (see Figure 1):

- *River North Esk (Confluence with Cruick Water to Estuary* (ID 5700);
- *River South Esk (White Burn Confluence to Estuary)* (which discharges into Montrose Basin*)* (ID 5799);
- *Lunan Water (Friockheim to Estuary)* (ID 5900)*;*
- *Raesmill Burn* (ID 5602)(known locally as Keilor Burn);
- *Brothock Water* (ID 5603);
- *Elliot Water / Rottenraw Burn* (ID 5950);
- *Monikie Burn* (ID 5952);
- *Barry Burn* (ID 5953);
- *Buddon Burn* (ID 5954);
- *Dighty Water* (ID 6000).

There are also a number of small water courses identified as small water bodies or not identified as water bodies at all. These, however, have not been considered here (except, in theory, where they are associated with a river water body which could be affected by the proposed policies, and none such were identified).

There are no lake water bodies in the coastal zone of the Angus SMP2.

J.3.1.3 Groundwater Bodies

WFD consideration of risks of saline intrusion of groundwater bodies relates in particular to the impact of water abstractions. If a coastal system changes due, for example, to managed realignment this is considered a return to more natural conditions. Under such circumstances, any consequent natural saline intrusion of the underlying groundwater would not result in a poor status classification (Environment Agency WFD implementation team for hydromorphology, pers. comm.). The assessment of SMP2 consequences for groundwater bodies is therefore only required for those which have an existing pressure of saline intrusion resulting from abstraction, which could be exacerbated by the SMP2 policy.

Groundwater bodies from north to south are:

- *Montrose bedrock and localised sand and gravel aquifers* (ID 150267) which extends from the northern limit of the SMP2 area southwards to Lunan Bay – Good status for saline intrusion and not considered further;
- *Arbroath bedrock and localised sand and gravel aquifers* (ID 150265) which extends from Lunan Bay southwards to the northern limit of Arbroath and also outcrops at the coast at a point south of Arbroath – Good status for saline intrusion and not considered further;
- *Brothock Valley sand and gravel* (ID 150272) which underlies Arbroath – Good status for saline intrusion and not considered further;
- *Carnoustie bedrock and localised sand and gravel aquifers* (ID 150257) which extends from Eliot south of Arbroath to Monifieth– Good status for saline intrusion and not considered further;
- *Dundee bedrock and localised sand and gravel aquifers* (ID 150256) which extends from Monifieth westwards beyond the limit of the SMP2 study area – Good status for saline intrusion and not considered further.

J.3.1.4 International nature conservation sites

In the WFD guidance (Environment Agency, 2009b) the following reference is made to the protection of the internationally designated sites for nature conservation:

'Where there are sites protected under other EU legislation (such as the Birds or Habitats Directives, Shellfish Water Directive and others), the Directive aims for compliance with any relevant standards or objectives for these sites.

Therefore, where a site which is water-dependent in some way is protected via designation under another EU Directive, and the GES or GEP targets set under the Directive would be insufficient to meet the objectives of the other relevant environmental Directive, the more stringent targets would apply'

Compliance with the EU legislation has been considered in Appendix I of this SMP2, and the conclusions are noted under "Protected Areas" in Table 4 of this assessment.

J.3.2 Step 2: Define WFD features and issues

BQEs that are affected by hydromorphological and physical features of the TraC water bodies of Angus SMP2 area that in-turn could influence SMP2 policies are listed in **Table 2**. Features and issues are further explored in **Table 3** which also presents water body classifications and relevant WFD environmental objectives. Coastal water bodies' features and issues are consistent along the Angus SMP2 area. Transitional water bodies attract a wider range of differing impacts on the BQEs due to the variety of transitional water body types (tidal basin, saline lagoon, open estuary).

J.3.2.1 Coastal and Transitional Water Bodies

The SMP2 shoreline is extremely diverse, incorporating substantial reaches of open coast, a complex estuary, undeveloped and urban/defended shorelines, and widely different geomorphological habitats including cliffs (with and without pocket beaches), saltmarsh, sand dune complexes and extensive sandy beaches and sand dune complexes. Key issues related to each water body's biological quality elements, as identified in the SMP2 baseline review, are summarised below (from north to south).

J.3.2.2 Couts Rock to Scurdie Ness (coastal)

The current (2014) hydromorphological status of the Couts Rock to Scurdie Ness coastal water body is 'Good'.

MU1/1: The water body extends far to the north, with slightly under half its shoreline length overlapping the SMP2. Within the SMP2 area the water body shoreline is characterised by sandy beaches with wide inter-tidal zones and backed by dune systems, and with a short extent of rocky foreshore and cliffs of andesitic lavas at the northern limit. St Cyrus and Kinnaber Links is one of the richest coastal habitats in the North East of Scotland, and the northern extent of Montrose Bay and Kinnaber Links supports a lichen rich dune heathland, foreshore and saltmarsh.

The dune network in the northern part of MU1/1 is sandwiched between the beach and landward cliffs, but widens progressively moving southwards where there is significant marram grass vegetation. The shoreline is unconstrained by coastal defences.

Beach in MU1/1

Dunes in MU1/1

The River North Esk flows into the sea near Kinnaber, through a wide dune system. The estuary mouth is dynamic, and includes areas of saltmarsh. The river has migratory salmon and sea trout, and attracts a fishery designation. The current (2014) hydromorphological status of the River North Esk water body is 'Moderate' as the water flows and levels are impacted by water abstraction.

MU1/2, MU1/3a and MU1/3b: The beach and dune systems extend southwards throughout MU1/2. At MU1/3 the beach is narrowed and disconnected from the dune system by a high sea wall/revetment at MU1/3a, which almost eliminates the beach at high tide, and by rock armour at MU1/3b.

Beach and dunes in MU1/2

Erosion protection in MU1/3b

Erosion protection in MU1/3b

J.3.2.3 Montrose Basin (transitional)

The Montrose Basin water body encompasses the entirety of the tidal basin as well as the tidal inlet to the coast, extending as far as a line drawn from Montrose south-eastwards to Scurdie Ness. These two parts of the water body are notably different from one-another in water body character. The current (2014) hydromorphological status of the Montrose Basin transitional water body is 'Moderate' due to water quality issues from diffuse sources.

MU1/4: The beach around the Glaxo site is on the open coast although within the Montrose Basin water body. As at the immediate north, the beach has previously been narrowed and disconnected from the dune system by rock armour, and there are also a few rock groynes. However, in this reach the majority of the shoreline is accreting and dunes have formed seaward of defences, and in some areas have buried them. Further westwards, where MU1/4 extends into the tidal inlet to Montrose Basin (along the north bank of the River South Esk channel), the shoreline is still defended and the beach is narrower, as a result of lower rates of dune accretion combined with tidal and wave action through the inlet.

Dunes accreting in front of rock armour in MU1/4

Rock armour covered by accreting dunes in MU1/4

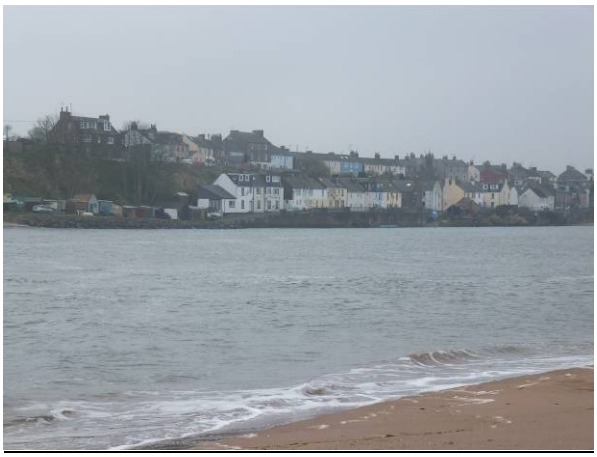
Narrowed beach in western part of MU1/4

MU2/1a, MU2/1b, MU2/7, MU2/8: MU2/1a on the northern shore of the tidal inlet to Montrose Basin and MU2/1b opposite are entirely artificial shorelines providing the Montrose harbour frontage, whilst MU2/7 also on the southern shore has hard defences protecting the community of Ferryden, with only narrow fronting intertidal areas.

Eastwards from here (MU2/8) the natural intertidal rocky shoreline continues as far as Scurdie Ness, with a transition eastwards to open coast. The tidal inlet is an important migratory route for fish into and out of Montrose Basin and the River South Esk.

Defended shoreline of Montrose harbour in MU2/1a (viewed from south shore)

Defended shoreline of Montrose harbour in MU2/1b (viewed from north shore)



Coastal defences at Ferryden MU2/7 (viewed from north shore)

Coastal defences at Ferryden MU2/7

MU2/2a to MU2/6: The tidal Montrose Basin is characterised by a mixture of mudflats, sands, occasional shingle beaches and tidal channels. It is bordered to the east by Montrose, with a continuous defended urban frontage. Elsewhere the basin is bordered by a mixture of agricultural land (the majority of the shoreline), a wildlife reserve and small communities and local infrastructure, notably on the north-eastern and shout-eastern shores. Defences here tend to be small scale, including low walls, gabion baskets and other reinforcement.

The basin is designated for the environmental importance of its habitats, including inter-tidal mudflats, saltmarsh, marsh, saline lagoons and reed swamp. All biological quality element types associated with transitional water bodies are present and potentially sensitive to changes. Due to the low-lying nature of the area, fields close to the shore have a tendency to flood during wet periods, and also constitute part of the water body.

A number of watercourses discharge into the basin, of which only one, the River South Esk, is designated as a river water body. It has migratory salmon and sea trout and attracts a fishery designation. The Basin has traditionally been important for salmon and sea trout fishing, both having been fished commercially since 1836 but in recent years the numbers caught have declined. The current (2014) hydromorphological status of the River South Esk water body is 'Moderate' due to invasive species (North American signal crayfish) and water quality issues.

View towards higher ground behind southern shoreline, MU2/5

Raised shoreline with toe defences, MU2/6

J.3.2.4 Scurdie Ness to Deil's Head (coastal)

The current (2014) hydromorphological status of the Scurdie Ness to Deil's Head coastal water body is 'Moderate' due to the ecological condition impacted by unknown pressure on animals and plants.

MU3/1, MU4/1 and MU4/2: The shoreline within MU3/1 is represented by undefended rocks and low cliffs of basaltic lava (with an outcrop of red sandstone at Boddin Point), with a number of pocket shingle or sand beaches in the northern and southern extents. The height of the cliffs reduces to the south, and in MU4/1 they give way to a wide, inter-tidal sandy beach backed by vegetated dunes in Lunan Bay. The dunes are highest in the north.

The bay is very popular for salmon fishing with netting stations placed to the north and south of Lunan Water, which bisects the beach midway in the bay. This river water body has little intertidal habitat but some small extents of reedbed. The river has migratory salmon and sea trout. The current (2014) hydromorphological status of the Lunan Water river water body is 'Poor' due to the impact of water abstraction on water flows and levels.

Neither the beach nor Lunan Water is defended. At the southern end of Lunan Bay, in MU4/2, a short extent of loose rock and rock gabions provides protection for a few non-residential properties where the dunes transition into cliffs at Corbie Knowe. A small watercourse known locally as Keilor Burn but identified as the Raesmill Burn WFD water body crosses the beach here. The current (2014) hydromorphological status of the Reesmill Burn river water body is 'Moderate' due to issues with water quality from diffuse sources and impacts of water abstraction on water flows and levels.

Cliffs in MU3/1

Beach and dunes in Lunan Bay MU4/1

Lunan Water in MU4/1

Corbie Knowe in MU4/2

MU5/1: South from Corbie Knowe as far as Deil's Head (the southern limit of the coastal water body) and beyond to Whiting Ness, the shoreline returns to cliffs, primarily of basaltic lava but with outcrops of sandstones and conglomerates, partly fronted by a rock platform, and with a number of pocket shingle beaches. The shoreline is undefended even at the settlements of Ethie Haven and Auchmithie, apart from a former harbour structure at the latter. Two water courses (neither identified as WFD water bodies) penetrate the cliffs and cross the beach, one at Auchmithie and the other at Carlingheughe Bay.

Ethie Haven in MU5/1

Cliffs at Auchmithie in MU5/1

Cliffs at Seaton in MU5/1

J.3.2.5 The Deil's Head to Carnoustie (coastal)

The current (2014) hydromorphological status of the Deil's Head to Carnoustie coastal water body is 'Moderate' due to the ecological condition impacted by unknown pressure on animals and plants.

MU6/1 to MU6/3: A short reach of the water body's shoreline is within MU5/1 as described above. South of this natural reach, a sea wall at Arbroath separates the rocky and shingle/sandy shore from the land behind (MU6/1a and part of MU6/1b). South from here the upper shoreline is defined by residential properties then the harbour (in part of MU6/1b and MU6/2). Brothock Water (which is a designated fishery) enters the sea just to the north of the harbour (in MU6/2). The current (2014) hydromorphological status of the Brothock Water river water body is 'Moderate' due to ecological condition, impacted by unknown pressure on animals and plants; water abstraction impacting on water flows and levels and physical condition impacted by modification to the bed, banks and shores. South from the harbour (MU6/3) the natural low, rocky shore is backed by a low sea wall much as in north Arbroath, on top of which sits public open space and a seafront roadway. Towards West Links the rocky shore gives way to a sandy shore, but the low sea wall remains throughout MU6/3.

MU6/4 and MU7/1: In Mu6/4a from West Links southwards the shoreline is sand mixed with cobbles and shingle in the northern extent, largely undefended but with some areas of rock armour, giving way to a rock platform fronting a much narrowed beach in the southern extent. The extent of MU6/4a is backed by dunes. Elliot Links SSSI is a stable sand dune system with abandoned river meanders, which support important open dune and fen plant communities and invertebrates.

The entire rocky shore is important for shellfish and supports commercial fishing for prawns, crab, and lobster.

A number of watercourses fall into this reach of coast including Elliot Water, Craigmill Burn (Monikie Burn water body) and a series of small watercourses and land drains not identified as WFD water bodies. The current (2014) hydromorphological status of the Elliot Water river water body is 'Bad' due to ecological condition impacted by pressure on animals and plants and water abstraction impacting water flows and levels. Elliot Water has defences comprising of gabions and rock armour to train the river and prevent breaches through the beach, in order to maintain the estuary's position and reduce flooding risk to Elliot. The river is a designated fishery, as is Monickie Burn. The current (2014) hydromorphological status of the Monickie Burn river water body is 'Poor' due to ecological condition, impacted by pressure on animals and plants; water abstraction impacting on water flows and levels and water quality issues from diffuse sources. One of the smaller watercourse outfalls near Hatton is also fixed, with a revetment wall which also protects the railway embankment where it is particularly close to the coast.

The rock platform fronting the beach continues through MU6/4b (though broken at East Haven), MU6/4c and MU7/1. Craigmill Burn and a small local watercourse discharge in MU6/4c.

Sea wall in north Arbroath MU6/1a

Beach and rock armour in MU6/4a

Revetment adjacent to railway MU6/4a

East Haven MU6/4b

J.3.2.6 Carnoustie to Fife Ness (coastal)

The current (2014) hydromorphological status of the Carnoustie to Fife Ness coastal water body is 'Moderate' due to impacts on the ecological condition from unknown pressure on animals and plants.

MU7/2 and MU8/1: The large majority of this water body is outside of the SMP2 area, overlapping only within the relatively short reach from Carnoustie to Buddon Ness. This is a sandy coastline, backed by the very large dune systems of Barry Links. The full extent of MU7/2 and MU8/1 is defended by rock armour including the mouth of Barry Burn water body (which is a designated fishery), whilst that part of MU8/2 within the water body is undefended. The current (2014) hydromorphological status of the Barry Burn river water body is 'Poor' due to impacts on the ecological condition from unknown pressure on animals and plants, water abstraction impacting on water flows and levels and physical condition resulting from modifications to the bed, banks and shores. On areas without coastal protection the sand naturally undergoes cycles of erosion and accretion. During summer embryonic dunes accrete on the upper beaches, but during the winters erosion occurs, the beach level drops and sand is lost to the sea or blown inland.

The area forms part of Firth of Tay and Eden Estuary Special Area of Conservation (SAC), designated for its coastal dune heathland, shifting dunes, dune grassland, humid dune slacks and shifting dunes with marram grass.

Start of rock armour at transition from MU7/1 to MU/72

Rock armour along Barry Sands west (MU8/1)

Barry Burn MU7/2

J.3.2.7 Lower Tay Estuary (transitional)

The current (2014) hydromorphological status of the Lower Tay Estuary transitional water body is 'Good'.

The Lower Tay Estuary extends from Buddon Ness to the southern/western limit of the SMP2 at Broughty Ferry. This is a naturally sandy shore in an active estuary. Monifieth Bay intertidal area stretches along the coast for almost 6km. It is fronted by a relatively narrow (200m) intertidal sand flat at Buddon Ness, but this widens towards Monifieth reaching a greatest width of 1km. Monifieth Bay SSSI is an area of inter-tidal habitat used as a feeding area by internationally important numbers of wintering waders and ducks. The Firth of Tay and Eden Estuary Special Area of Conservation (SAC), designated for its coastal dune heathland, shifting dunes, dune grassland, humid dune slacks and shifting dunes with marram grass.

MU8/2: The sandy coastline backed by Barry Links dunes from Buddon Ness westwards is undefended, apart from short reaches of rock armour stabilising the dunes in the western part. Located in the western extent of the management unit, the current (2014) hydromorphological status of the Buddon Burn river water body is 'Poor' due to impacts on the ecological condition from unknown pressure on animals and plants and water abstraction impacting on water flows and levels.

MU9/1 to MU9/5: At Monifieth and Barnhill a combination of rock armour revetment (MU9/1, MU9/3) and timber walls and groynes (MU9/2, MU9/3) is used to retain the beach and dunes. The frontage in Broughty Ferry combines a mixture of undefended beach frontage with reaches of rock armour (especially MU9/4), some reaches with a low wall backing the beach, and some timber groynes. The outfall of Dighty Water (which is a designated fishery) is heavily engineered as is passes under the coastal highway and railway. The current (2014) hydromorphological status of the Dighty Water river water body is 'Moderate' due to water quality issues as a result of diffuse sources and point source discharges of waste water and sewage.

View west to Barry sands east MU8/2

Rock armour, eastern Monifieth MU9/1

Timber wall and groynes MU9/2

Revetment at Dighty Water outfall, Barnhill MU9/3

Revetment at Broughty Ferry MU9/4

Undefended frontage, with timber groynes in background, MU9/5

Beach with low wall at Broughty Castle MU9/5

Table 2 Biological quality elements within water bodies that could theoretically be affected by changes to hydromorphology as a result of any SMP policy

Biological Quality Element (BQE)	Potential for change in hydromorphological or physical parameters	Coastal Water Bodies				Transitional Water Bodies		River Water Bodies									
		Couts Rock to Scurdie Ness	Scurdie Ness to Deil's Head	The Deil's Head to Carnoustie	Carnoustie to Fife Ness	Montrose Basin	Lower |Tay Estuary	River North Esk	River South Esk	Lunan Water	Raesmill Burn	Brothock Water	Elliot Water / Rottenraw Burn	Monikie Burn	Barry Burn	Buddon Burn	Dighty Water
Phytoplankton	Residence time	-	-	-	-	✓	✓	-	-	-	-	-	-	-	-	-	-
	Water depth	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Thermal regime	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Turbidity	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Macrophytes	Slope	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Longitudinal position	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Shoreline complexity or heterogeneity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Light quality and quantity (for macroalgae and bryophytes)	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Episodicity of flows and inundation	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Turbidity	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Riparian shade and structure	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Substrate conditions	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Macroalgae	Episodicity (at low end of velocity spectrum)	-	-	-	-	✓	✓	-	-	-	-	-	-	-	-	-	-
	Salinity	-	-	-	-	✓	✓	-	-	-	-	-	-	-	-	-	-
	Abrasion (associated with velocity)	-	-	-	-	✓	✓	-	-	-	-	-	-	-	-	-	-
Angiosperms	Inundations (tidal regime)	-	-	-	-	✓	✓	-	-	-	-	-	-	-	-	-	-
	Sediment loading	-	-	-	-	✓	✓	-	-	-	-	-	-	-	-	-	-
	Land elevation salinity	-	-	-	-	✓	✓	-	-	-	-	-	-	-	-	-	-
	Abrasion (associated with velocity)	-	-	-	-	✓	✓	-	-	-	-	-	-	-	-	-	-
Benthic/macro invertebrates	Beach water table (TraC)	✓	✓	✓	✓	✓	✓	-	-	-	-	-	-	-	-	-	-
	Light	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Groundwater connectivity	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Availability of leaf litter/organic debris	-	-	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Connectivity with riparian zone	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fish	Heterogeneity of habitat (substrate, provision of shelter)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Continuity for migration routes	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Substrate conditions	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Presence of macrophytes	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Accessibility to nursery areas (elevation of saltmarshes, connectivity with shoreline/riparian zone)	✓	✓	✓	✓	✓	✓	-	-	-	-	-	-	-	-	-	-

Table 3 Surface water body features and issues for assessment

Feature		Issue	Water body classification and environmental objectives	Opportunity to deliver mitigation measures and/or recommendations on preferred policy
Water body (and designation)	**Biological Quality Element**	**Potential for change in hydro-morphological or physical parameters**		
Couts Rock to Scurdie Ness **ID: 200084** **Coastal** Area: 91.59 km^2	Phytoplankton	There are no significant links between phytoplankton community status and hydromorphological affects related to SMP2 policies. Any potential changes in physical or hydromorphological parameters as a result of SMP2 policies are considered trivial at the water body scale.	**Current classification: Good status (2014)** Benthic invertebrates Good status; phytoplankton and macroalgae High status. Future classification: 2021 Good 2027 Good **HMWB/AWB: No** **Associated protected areas:** Montrose EC bathing water; Montrose Bay Water contact activity – recreational water; Strathmore / Fife nitrate vulnerable zone **Relevant WFD objectives**: **WFD1**: No changes affecting high status sites; **WFD2**: No changes causing failure to meet Good status or potential or result in a deterioration; **WFD3**: No changes which will compromise the environmental objectives in other water bodies	No hydromorphological mitigation measures required for water body.
	Macroalgae	There are no significant links between macroalgae community status and hydromorphological affects related to SMP2 policies. Any potential changes in physical or hydromorphological parameters as a result of SMP2 policies are considered trivial at the water body scale.		
	Benthic/macro invertebrate	May be impacted through a change in beach / shoreline water table (e.g. inundation of former intertidal areas) resulting from modifications in shoreline management.		
	Fish	Although not used to determine coastal water body status, fish may be impacted by hydromorphological effects related to SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); modify substrate conditions; and change accessibility to nursery areas (elevation of saltmarshes, connectivity with shoreline).		
Scurdie Ness to Deil's Head **ID: 200078** **Coastal** Area: 119.65 km^2	Phytoplankton	There are no significant links between phytoplankton community status and hydromorphological affects related to SMP2 policies. Any potential changes in physical or hydromorphological parameters as a result of SMP2 policies are considered trivial at the water body scale.	**Current classification: Moderate status (2014)** Benthic invertebrates Good status, phytoplankton and macroalgae High status. Future classification: 2021 Good 2027 Good **HMWB/AWB: No** **Associated protected areas:** Lunan Bay EC bathing water; Strathmore / Fife nitrate vulnerable zone **Relevant WFD objectives: WFD1:** No changes affecting high status sites; **WFD2:** No changes causing failure to meet Good status or potential or result in a deterioration; **WFD3:** No changes which will compromise the environmental objectives in other water bodies	No hydromorphological mitigation measures required for water body.
	Macroalgae	There are no significant links between macroalgae community status and hydromorphological affects related to SMP2 policies. Any potential changes in physical or hydromorphological parameters as a result of SMP2 policies are considered trivial at the water body scale.		
	Benthic/macro invertebrate	May be impacted through a change in beach / shoreline water table (e.g. inundation of former intertidal areas) resulting from modifications in shoreline management.		
	Fish	Although not used to determine coastal water body status, fish may be impacted by hydromorphological effects related to SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); modify substrate conditions; and change accessibility to nursery areas (elevation of saltmarshes, connectivity with shoreline).		
The Deil's Head to Carnoustie **ID: 200072** **Coastal** Area: 72.9 km^2	Phytoplankton	There are no significant links between phytoplankton community status and hydromorphological affects related to SMP2 policies. Any potential changes in physical or hydromorphological parameters as a result of SMP2 policies are considered trivial at the water body scale.	**Current classification: Moderate status (2014)** Benthic invertebrates Good status; phytoplankton and macroalgae High status. Future classification: 2021 Good 2027 Good **HMWB/AWB: No** **Associated protected areas:** i. Arbroath (West Links) and ii. Carnoustie EC bathing water; Strathmore / Fife nitrate vulnerable zone **Relevant WFD objectives: WFD2:** No changes causing failure to meet Good status or potential or result in a deterioration; **WFD3:** No changes which will compromise the environmental objectives in other water bodies	No hydromorphological mitigation measures required for water body.
	Macroalgae	There are no significant links between macroalgae community status and hydromorphological affects related to SMP2 policies. Any potential changes in physical or hydromorphological parameters as a result of SMP2 policies are considered trivial at the water body scale.		
	Benthic/macro invertebrate	May be impacted through a change in beach / shoreline water table (e.g. inundation of former intertidal areas) resulting from modifications in shoreline management.		
	Fish	Although not used to determine coastal water body status, fish may be impacted by hydromorphological effects related to SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); modify substrate conditions; and change accessibility to nursery areas (elevation of saltmarshes, connectivity with shoreline).		
Carnoustie to Fife Ness	Phytoplankton	There are no significant links between phytoplankton community status and hydromorphological affects related to SMP2 policies. Any potential changes in physical	**Current classification: Moderate status (2014)** Benthic invertebrates Good status; phytoplankton and macroalgae	No hydromorphological mitigation measures required for water body.

Feature		Issue	Water body classification and environmental objectives	Opportunity to deliver mitigation measures and/or recommendations on preferred policy
Water body (and designation)	**Biological Quality Element**	**Potential for change in hydro-morphological or physical parameters**		
ID: 200069 **Coastal** Area: 235.27 km^2		or hydromorphological parameters as a result of SMP2 policies are considered trivial at the water body scale.	High status. Future classification: 2021 Good 2027 Good **HMWB/AWB: No** **Associated protected areas:** Carnoustie EC bathing water; Strathmore / Fife nitrate vulnerable zone; Barry Links SAC; Firth Of Tay And Eden Estuary SAC & SPA (and others outside of the SMP2's area of influence) **Relevant WFD objectives: WFD2:** No changes causing failure to meet Good status or potential or result in a deterioration; **WFD3:** No changes which will compromise the environmental objectives in other water bodies	
	Macroalgae	Macroalgae not anticipated within SMP2 study area – active sandy frontage.		
	Benthic/macro invertebrate	May be impacted through a change in beach / shoreline water table (e.g. inundation of former intertidal areas) resulting from modifications in shoreline management.		
	Fish	Although not used to determine coastal water body status, fish may be impacted by hydromorphological effects related to SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); modify substrate conditions; and change accessibility to nursery areas (elevation of saltmarshes, connectivity with shoreline).		
Montrose Basin **ID: 200079** **Transitional** Area: 8.52 km^2	Phytoplankton	Potential changes to phytoplankton through SMP2 policies resulting in changes in: residence time; water depth; thermal regime; turbidity.	**Current classification: Moderate status (2014)** Benthic invertebrates High status; fish Good status, macroalgae Moderate status. Future classification: 2021 Moderate 2027 Good **HMWB/AWB: No** **Associated protected areas:** Strathmore / Fife nitrate vulnerable zone; River South Esk SAC; Montrose Basin SPA **Relevant WFD objectives: WFD2:** No changes causing failure to meet Good status or potential or result in a deterioration; **WFD3:** No changes which will compromise the environmental objectives in other water bodies	No hydromorphological mitigation measures required for water body. Pressure on water body is diffuse source pollution, with mitigation being non-urban land management measures.
	Macroalgae	Potential changes to macroalgae through SMP2 policies resulting in changes in: abrasion (associated with velocity), salinity.		
	Angiosperms	Potential changes to angiosperm distribution through SMP2 policies resulting in changes in: land elevation; inundations (tidal regime); abrasion (associated with increased velocities); sediment loading; salinity.		
	Benthic/macro invertebrate	Potential changes to benthic / macro invertebrates through SMP2 policies which result in changes in: the beach water table (potentially constraining vertical distribution up the beach); light (turbidity); connectivity with groundwater; and connectivity with riparian zone.		
	Fish	Potential changes to fish populations through SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); affect continuity for migration routes; modify substrate conditions; change presence of macrophytes; and change accessibility to nursery areas (elevation of saltmarshes, connectivity with shoreline).		
Lower Tay Estuary **ID: 200438** **Transitional** Area: 43.48 km^2	Phytoplankton	Potential changes to phytoplankton through SMP2 policies resulting in changes in: residence time; water depth; thermal regime; turbidity.	**Current classification: Good status (2014)** Benthic invertebrates, macroalgae High status; fish Good status Future classification: 2021 Good 2027 Good **HMWB/AWB: No** **Associated protected areas:** Broughty Ferry and Monifieth EC bathing water; Strathmore / Fife nitrate vulnerable zone; Barry Links SAC; Firth Of Tay And Eden Estuary SAC & SPA **Relevant WFD objectives: WFD2:** No changes causing failure to meet Good status or potential or result in a deterioration; **WFD3:** No changes which will compromise the environmental objectives in other water bodies	No hydromorphological mitigation measures required for water body. Pressure on water body is point source pollution, with mitigation being nitrogen reduction both at source and through improved sewage treatment.
	Macroalgae	Macroalgae not anticipated within SMP2 study area – active sandy frontage.		
	Angiosperms	Potential changes to angiosperm distribution through SMP2 policies resulting in changes in: land elevation; inundations (tidal regime); abrasion (associated with increased velocities); sediment loading; salinity.		
	Benthic/macro invertebrate	Potential changes to benthic / macro invertebrates through SMP2 policies which result in changes in: the beach water table (potentially constraining vertical distribution up the beach); light (turbidity); connectivity with groundwater; and connectivity with riparian zone.		
	Fish	Potential changes to fish populations through SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); affect continuity for migration routes; modify substrate conditions; change presence of macrophytes; and change accessibility to nursery areas (elevation of saltmarshes, connectivity with shoreline).		
River North Esk	Phytoplankton	Potential changes to phytoplankton through SMP2 policies resulting in changes in: water depth; thermal regime; turbidity.	**Current classification: Moderate status (2014)**	No hydromorphological mitigation measures required for water body.

Feature		Issue	Water body classification and environmental objectives	Opportunity to deliver mitigation measures and/or recommendations on preferred policy
Water body (and designation)	**Biological Quality Element**	**Potential for change in hydro-morphological or physical parameters**		
ID: 5700 **River** Length: 12.65 km	Macrophytes	Potential changes at estuarine / coastal extents of water bodies through SMP2 policies resulting in changes in: light &/or turbidity; riparian structure; substrate conditions; episodicity of inundation.	Benthic invertebrates and fish High status. Phytobenthos and macrophytes Good status Future classification: 2021Moderate 2027 Good **HMWB/AWB: No** **Associated protected areas:** Strathmore / Fife nitrate vulnerable zone; River North Esk urban wastewater treatment. **Relevant WFD objectives: WFD2:** No changes causing failure to meet Good status or potential or result in a deterioration	Pressure on water body is point source pollution, with mitigation being improved sewage treatment.
	Benthic/macro invertebrate	Potential changes to benthic / macro invertebrates through SMP2 policies which result in changes in: light (turbidity); connectivity with groundwater; availability of organic matter/debris; and connectivity with riparian zone.		
	Fish	Potential changes to fish populations through SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); affect continuity for migration routes; modify substrate conditions; or change presence of macrophytes.		
River South Esk **ID: 5799** **River** Length: 32.67 km	Phytoplankton	Potential changes to phytoplankton through SMP2 policies resulting in changes in: water depth; thermal regime; turbidity.	**Current classification: Moderate status (2014)** Benthic invertebrates, fish, phytobenthos and macrophytes all High status Future classification: 2021 Moderate 2027 Moderate **HMWB/AWB: No** **Associated protected areas:** Strathmore / Fife nitrate vulnerable zone; River South Esk urban wastewater treatment; River South Esk SAC; Montrose Basin SPA **Relevant WFD objectives: WFD2:** No changes causing failure to meet Good status or potential or result in a deterioration	No hydromorphological mitigation measures required for water body. Pressures on water body (and associated measures) are: point source pollution (improved sewage treatment); arable farming (control abstraction); and alien species (control American crayfish).
	Macrophytes	Potential changes at estuarine / coastal extents of water bodies through SMP2 policies resulting in changes in: light &/or turbidity; riparian structure; substrate conditions; episodicity of inundation.		
	Benthic/macro invertebrate	Potential changes to benthic / macro invertebrates through SMP2 policies which result in changes in: light (turbidity); connectivity with groundwater; availability of organic matter/debris; and connectivity with riparian zone.		
	Fish	Potential changes to fish populations through SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); affect continuity for migration routes; modify substrate conditions; or change presence of macrophytes.		
Lunan Water **ID: 5900** **River** Length: 11.19 km	Phytoplankton	Potential changes to phytoplankton through SMP2 policies resulting in changes in: water depth; thermal regime; turbidity.	**Current classification: Poor status (2014)** Benthic invertebrates, fish Good status,; phytobenthos and macrophytes Moderate status Future classification: 2021 Good 2027 Good **HMWB/AWB: No** **Associated protected areas:** Strathmore / Fife nitrate vulnerable zone; Lunan Water urban wastewater treatment **Relevant WFD objectives: WFD2:** No changes causing failure to meet Good status or potential or result in a deterioration	Identified hydromorphological mitigation measure is to "improve modified habitats". No further details available.. There are multiple other pressures on water body including: point source pollution; diffuse source pollution, and abstraction.
	Macrophytes	Potential changes at estuarine / coastal extents of water bodies through SMP2 policies resulting in changes in: light &/or turbidity; riparian structure; substrate conditions; episodicity of inundation.		
	Benthic/macro invertebrate	Potential changes to benthic / macro invertebrates through SMP2 policies which result in changes in: light (turbidity); connectivity with groundwater; availability of organic matter/debris; and connectivity with riparian zone.		
	Fish	Potential changes to fish populations through SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); affect continuity for migration routes; modify substrate conditions; or change presence of macrophytes.		
Raesmill Burn **ID: 5602** **River** Length: 3.59 km	Phytoplankton	Potential changes to phytoplankton through SMP2 policies resulting in changes in: water depth; thermal regime; turbidity.	**Current classification: Moderate status (2014)** Benthic invertebrates Moderate status, fish, phytobenthos and macrophytes High status Future classification: 2021 Good 2027 Good **HMWB/AWB: Yes, HMWB** **Associated protected areas:** Strathmore / Fife nitrate vulnerable zone **Relevant WFD objectives: WFD2:** No changes causing failure to meet Good status or potential or result in a deterioration	Identified hydromorphological mitigation measure is to" improve modified habitats". No further details available. Current morphology supports Good status (Bad status is due to hydrology impaired by abstraction.) There are multiple other pressures on water body including: point source pollution; diffuse source pollution, and abstraction.
	Macrophytes	Potential changes at estuarine / coastal extents of water bodies through SMP2 policies resulting in changes in: light &/or turbidity; riparian structure; substrate conditions; episodicity of inundation.		
	Benthic/macro invertebrate	Potential changes to benthic / macro invertebrates through SMP2 policies which result in changes in: light (turbidity); connectivity with groundwater; availability of organic matter/debris; and connectivity with riparian zone.		
	Fish	Potential changes to fish populations through SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); affect continuity for migration routes; modify substrate conditions; or change presence of macrophytes.		
Brothock Water	Phytoplankton	Potential changes to phytoplankton through SMP2 policies resulting in changes in:	**Current classification: Moderate status (2014)**	Identified hydromorphological mitigation

Feature		Issue	Water body classification and environmental objectives	Opportunity to deliver mitigation measures and/or recommendations on preferred policy
Water body (and designation)	**Biological Quality Element**	**Potential for change in hydro-morphological or physical parameters**		
ID: 5603 **River** Length: 11.66 km		water depth; thermal regime; turbidity.	Benthic invertebrates, phytobenthos and fish Moderate status, macrophytes Good status Future classification: 2021 Moderate 2027 Good **HMWB/AWB: No** **Associated protected areas:** Strathmore / Fife nitrate vulnerable zone **Relevant WFD objectives: WFD2:** No changes causing failure to meet Good status or potential or result in a deterioration	measure is to "improve modified habitats". No further details available. There are multiple other pressures on water body including: point source pollution; diffuse source pollution, and abstraction.
	Macrophytes	Potential changes at estuarine / coastal extents of water bodies through SMP2 policies resulting in changes in: light &/or turbidity; riparian structure; substrate conditions; episodicity of inundation.		
	Benthic/macro invertebrate	Potential changes to benthic / macro invertebrates through SMP2 policies which result in changes in: light (turbidity); connectivity with groundwater; availability of organic matter/debris; and connectivity with riparian zone.		
	Fish	Potential changes to fish populations through SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); affect continuity for migration routes; modify substrate conditions; or change presence of macrophytes.		
Elliot Water / Rottenraw Burn **ID: 5950** **River** Length: 19.54 km	Phytoplankton	Potential changes to phytoplankton through SMP2 policies resulting in changes in: water depth; thermal regime; turbidity.	**Current classification: Bad status (2014)** Phytobenthos, Benthic invertebrates and macrophytes Good status, fish Moderate status Future classification: 2021 Good 2027 Good **HMWB/AWB: No** **Associated protected areas:** Strathmore / Fife nitrate vulnerable zone **Relevant WFD objectives: WFD2:** No changes causing failure to meet Good status or potential or result in a deterioration	No morphological mitigation measures required for water body. There are multiple other pressures on water body including: point source pollution; diffuse source pollution, and abstraction.
	Macrophytes	Potential changes at estuarine / coastal extents of water bodies through SMP2 policies resulting in changes in: light &/or turbidity; riparian structure; substrate conditions; episodicity of inundation.		
	Benthic/macro invertebrate	Potential changes to benthic / macro invertebrates through SMP2 policies which result in changes in: light (turbidity); connectivity with groundwater; availability of organic matter/debris; and connectivity with riparian zone.		
	Fish	Potential changes to fish populations through SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); affect continuity for migration routes; modify substrate conditions; or change presence of macrophytes.		
Monikie Burn **ID: 5952** **River** Length: 28.13 km	Phytoplankton	Potential changes to phytoplankton through SMP2 policies resulting in changes in: water depth; thermal regime; turbidity.	**Current classification: Poor status (2014)** Phytobenthos, macrophytes and fish Good status; benthic invertebrates Moderate status. Future classification: 2021 Good 2027 Good **HMWB/AWB: No** **Associated protected areas:** Strathmore / Fife nitrate vulnerable zone; Monikie Burn urban wastewater treatment **Relevant WFD objectives: WFD2:** No changes causing failure to meet Good status or potential or result in a deterioration	No morphological mitigation measures required for water body. There are multiple other pressures on water body including: point source pollution; diffuse source pollution; abstraction and flow regulation.
	Macrophytes	Potential changes at estuarine / coastal extents of water bodies through SMP2 policies resulting in changes in: light &/or turbidity; riparian structure; substrate conditions; episodicity of inundation.		
	Benthic/macro invertebrate	Potential changes to benthic / macro invertebrates through SMP2 policies which result in changes in: light (turbidity); connectivity with groundwater; availability of organic matter/debris; and connectivity with riparian zone.		
	Fish	Potential changes to fish populations through SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); affect continuity for migration routes; modify substrate conditions; or change presence of macrophytes.		
Barry Burn **ID: 5953** **River** Length: 14.40 km	Phytoplankton	Potential changes to phytoplankton through SMP2 policies resulting in changes in: water depth; thermal regime; turbidity.	**Current classification: Poor status (2014)** Phytobenthos and benthic invertebrates macrophytes Good status, and fish Poor status Future classification: 2021 Poor 2027 Good **HMWB/AWB: No** **Associated protected areas:** Strathmore / Fife nitrate vulnerable zone **Relevant WFD objectives: WFD2:** No changes causing failure to meet Good status or potential or result in a deterioration	Identified hydromorphological mitigation measure is to "improve modified habitats". No further details available. There are multiple other pressures on water body including: point source pollution; diffuse source pollution; abstraction and flow regulation.
	Macrophytes	Potential changes at estuarine / coastal extents of water bodies through SMP2 policies resulting in changes in: light &/or turbidity; riparian structure; substrate conditions; episodicity of inundation.		
	Benthic/macro invertebrate	Potential changes to benthic / macro invertebrates through SMP2 policies which result in changes in: light (turbidity); connectivity with groundwater; availability of organic matter/debris; and connectivity with riparian zone.		
	Fish	Potential changes to fish populations through SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); affect continuity for migration routes; modify substrate conditions; or change presence of macrophytes.		
Buddon Burn	Phytoplankton	Potential changes to phytoplankton through SMP2 policies resulting in changes in:	**Current classification: Poor status (2014)**	Identified hydromorphological mitigation

Feature		Issue	Water body classification and environmental objectives	Opportunity to deliver mitigation measures and/or recommendations on preferred policy
Water body (and designation)	**Biological Quality Element**	**Potential for change in hydro-morphological or physical parameters**		
ID: 5954 **River** Length: 12.11 km		water depth; thermal regime; turbidity.	Phytobenthos and fish Poor status; macrophytes Good status and benthic invertebrates Moderate status, Future classification: 2021 Poor 2027 Poor **HMWB/AWB: No** **Associated protected areas:** Strathmore / Fife nitrate vulnerable zone; Buddon Burn urban wastewater treatment; Barry Links SAC; Firth Of Tay And Eden Estuary SAC & SPA **Relevant WFD objectives: WFD2:** No changes causing failure to meet Good status or potential or result in a deterioration	measure is to "improve modified habitats". No further details available. There are multiple other pressures on water body including: point source pollution; diffuse source pollution; and abstraction.
	Macrophytes	Potential changes at estuarine / coastal extents of water bodies through SMP2 policies resulting in changes in: light &/or turbidity; riparian structure; substrate conditions; episodicity of inundation.		
	Benthic/macro invertebrate	Potential changes to benthic / macro invertebrates through SMP2 policies which result in changes in: light (turbidity); connectivity with groundwater; availability of organic matter/debris; and connectivity with riparian zone.		
	Fish	Potential changes to fish populations through SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); affect continuity for migration routes; modify substrate conditions; or change presence of macrophytes.		
Dighty Water **ID: 6000** **River** Length: 4.81 km	Phytoplankton	Potential changes to phytoplankton through SMP2 policies resulting in changes in: water depth; thermal regime; turbidity.	**Current classification: Moderate status (2014)** Phytobenthos. Macrophytes, benthic invertebrates and fish all Moderate status Future classification: 2021 Moderate 2027 Good **HMWB/AWB: Yes, HMWB** **Associated protected areas:** Strathmore / Fife nitrate vulnerable zone; Dighty Water urban wastewater treatment; Firth Of Tay And Eden Estuary SAC & SPA **Relevant WFD objectives: WFD2:** No changes causing failure to meet Good status or potential or result in a deterioration	Identified morphological mitigation measure is to "improve modified habitats where the channel is constructed of laid brick/stone". Other pressures on water body include: point source pollution; diffuse source pollution (mitigation to reduce inputs in both cases)
	Macrophytes	Potential changes at estuarine / coastal extents of water bodies through SMP2 policies resulting in changes in: light &/or turbidity; riparian structure; substrate conditions; episodicity of inundation.		
	Benthic/macro invertebrate	Potential changes to benthic / macro invertebrates through SMP2 policies which result in changes in: light (turbidity); connectivity with groundwater; availability of organic matter/debris; and connectivity with riparian zone.		
	Fish	Potential changes to fish populations through SMP2 policies which: affect the heterogeneity of habitat (changes in substrate, provision of shelter); affect continuity for migration routes; modify substrate conditions; or change presence of macrophytes.		

J.3.3 Step 3: Assess preferred SMP2 Policies against WFD environmental objectives

The potential impacts of preferred SMP2 policies on WFD environmental objectives have been evaluated and are summarised in **Table 4**. The potential to meet or fail each of the relevant WFD environmental objectives has been assessed in terms of the effect of the proposed SMP2 policy on the relevant physical and hydromorphological parameters. The relationship between these parameters and the biological quality elements has already been determined in **Tables 2 and 3**. The impact of climate change (in particular sea level rise) on baseline processes has been taken into account at this stage.

J.3.3.1 Environmental Objective (WFD1)

Two high status water bodies overlap the SMP2 area, Couts Rock to Scurdie Ness and Scurdie Ness to Deil's Head.

Natural coastal hydromorphology will continue in the large majority of Couts Rock to Scurdie Ness. Some frontages within Montrose will have the engineered defences maintained. Some loss of beach frontage is expected, but as this reach has no specific sensitivities, is already modified and is only c. 2-3% of the water body, no decline in the current high status will occur. In the long term, if removal of defences is possible this will allow a more natural shoreline with dunes as a natural line of defence.

In Scurdie Ness to Deil's Head natural coastal hydromorphology will continue throughout the water body as a result of NAI (apart from very localised HTL at Corbie Knowe in the short term).

J.3.3.2 Environmental Objective (WFD2)

The majority of the proposed policies in the SMP2 area do not present a risk of deterioration in ecological potential of the associated transitional or coastal water bodies, nor do they present a risk of failing to reach good potential in these water bodies in the future. This conclusion is expanded on below (see also Table 4).

NAI on undefended coastline. Where the SMP2 policy is NAI on an undefended reach of coastline, natural processes will continue and the biological quality elements are considered to be at no risk of deterioration as a result of the proposed policy. Nor will the policy prevent the water body from achieving good status in the future.

MR on defended coastline. SMP2 proposals for MR on a currently defended shoreline (i.e. Montrose Basin) are considered to be beneficial for biological quality elements, as this will restore a more natural shoreline position and processes. There are no heavily modified water bodies in which MR is proposed, so the SMP2 policies will not make any specific contributions to hydromorphological mitigation measures.

Medium to long term HTL on defended coastline. Several policy units have a proposed HTL policy extending beyond the first epoch. Assessment Table 3 details evaluation of their potential effects on biological quality elements. In summary the following scenarios are considered not to present a risk of failing WFD objective 2:

- At some locations, coastal processes are resulting in sediment accretion which should maintain intertidal habitats even with sea level rise and squeeze of habitats in front of defences. This is particularly notable within the tidal basin and much of the tidal channel of Montrose Basin water body, and also along much of the shoreline within Lower Tay Estuary water body. Here, maintaining the shoreline position through HTL will make no significant difference to the biological quality elements.
- Several HTL frontages are short and either: (a) isolated from wider coastal / estuarine processes; (b) would result in loss of only small extents of fronting habitats and associated biological quality elements (with no opportunity to migrate these habitats landwards as the shoreline is entirely urbanised); and/or

(c) represent only short frontages in a much longer reach of similar habitat. Thus any loss of biological quality elements would remain localised and would not significantly affect the water body, thus not impinging significantly on current or future status. This combination arises in particular in The Deil's Head to Carnoustie coastal water body, and in MU 7/2 in Carnoustie to Fife Ness water body.

The remaining frontage with long term HTL proposed is Barry Sands East (MU8/1). In this case, coastal squeeze of the intertidal beach habitat is anticipated, but at the same time the defence will prevent erosion of the dune habitats that lie shorewards. Thus there are both disbenefits and benefits to biological quality elements from maintaining these defences and modifying natural coastal processes. Significantly, however, only a very small percentage of the water body's shoreline will be affected by this policy, and the consequences for overall status are considered minor and in line with WFD objective 2.

J.3.3.3 Environmental Objective (WFD3)

Other Coastal and Transitional Water Bodies

All of the transitional and coastal water bodies that overlap the SMP2 area have been considered under the objectives WFD1 and/or WFD2 as appropriate. Other TraC water bodies along the eastern Scottish shoreline, including Bell Rock (i.d. 200068) which is approximately 18 km off-shore from the mouth of the Tay estuary, are distant from the area of influence of the SMP2 and do not require consideration under WFD3.

River Water Bodies

NAI on an undefended or a defended coastline is considered here to have no adverse consequences for biological quality elements in associated river water bodies, as any landward movement of the transitional point between saline and fresh water will be a natural process. Similarly MR is considered to be a naturalisation compared to a defended position, and any associated change in biological quality elements in river water bodies is considered not to limit the rivers' ecological status.

HTL on a defended frontage would only be significant for associated river water bodies if the coastal defence infrastructure results in significant modification of the river water body, e.g. by forcing an artificial saline-freshwater regime on the water body. Only four river water bodies that discharge into the SMP2 coastline are within a frontage where HTL is proposed:

- Raesmill Burn enters within MU4/2 and proposed HTL (short term) and NAI (medium and long term) will not affect the water body (the small extent of rock armour does not impinge on the river's hydromorphology).
- Brothock Water discharges through Arbroath harbour within the MU6/2 frontage, and the HTL policy will not change the lower extent of this water body.
- Barry Burn has rock armour and a training wall to fix its position on the beach. The defences occupy only a short reach of the channel, and compared to the water body length of c.14km the effects of the artificial banks are considered not to be significant for the water body. Although the current status is bad, this is not due to morphological pressures.
- Dighty Water is within the HTL frontage of MU9/3, but is a highly urbanised channel here as it passes under the railway and A930 highway, and this channel form would remain irrespective of the SMP2 policy.

Lake Water Bodies

There are no lake water bodies within proximity of the SMP2 coastline.

J.3.3.4 Environmental Objective (WFD4)

All of the groundwater bodies that underlie the SMP2 area are considered to be at Good status for saline intrusion. Therefore they are considered not to be vulnerable to decline in status as a result of any changes in coastal alignment that would result from NAI or MR policies. Thus, SMP2 policy selection will have no effect on any groundwater body's status or on any Drinking Water Protected Area.

J.3.3.5 Other Environmental Directives

As indicated in Appendix I and Table 4, none of the European designated nature conservation sites along the SMP2 shoreline will be significantly affected by the proposed policies. Similarly, there are no risks of failure to comply with the Fishery, Nitrates or Bathing Water Directives as a result of the proposed policies.

J.3.4 Step 4: Complete WFD summary statement

A summary of water bodies achievement (or otherwise) of the WFD environmental objectives is listed in **Table 5**. As all the WFD environmental objective are met, no WFD summary statement is required.

J.4 References

Environment Agency, 2009a, Water Framework Directive: step by step process for assessing Shoreline Management Plans, 82_09.

Environment Agency, 2009b, Water Framework Directive: overview for assessing Shoreline Management Plans 81_09.

Scottish Government/SEPA, 2009, The river basin management plan for the Scotland river basin district, 2009-2015.

Scottish Government/SEPA, 2015, The river basin management plan for the Scotland river basin district, 2015-2017.

Table 4 Assessment of SMP policy against WFD environmental objectives

Policy Unit		Preferred SMP2 Policy			Assessment of impact (including list of water bodies affected)	WFD objectives met?			
		2025	2055	2105		WFD 1	WFD 2	WFD 3	WFD 4
MU1/1	Montrose Bay (Milton Ness to Montrose Links)	NAI	NAI	NAI	**Coastal water body: Couts Rock to Scurdie Ness 200084.** Natural coastal hydromorphology will continue in the larger part (>90%) of the water body within the SMP2 study area as a result of NAI combined with MR to restore beach-dune connectivity. The shorter frontage within MU1/3 will have the sea wall, revetment and rock armour maintained whilst investigating options for long term MR without unacceptable socioeconomic and environmental risk. Sea levels are rising slowly (net rise of the order of 0.02m per decade predicted, based on UKCP09 *UK Climate Projections – Marine and Coastal Projections*) and some loss of beach frontage to coastal squeeze would therefore continue in the medium term. The water body is already at high status, and coastal squeeze along this short reach (of the order of 2-3% of the water body frontage) is not anticipated to impact on this status. In the long term, removal of defences will allow a more natural shoreline alignment to form and reinstate the dunes as a natural line of defence. A release of sediment back into the system will feed intertidal areas. **River water body: River North Esk 5700** flows into the sea within the MU1/1 frontage, and the NAI policy will allow natural hydromorphological functions to continue. **Groundwater body:** Not at risk of saline intrusion. **Protected areas**: No impacts will result on nitrate or bathing water protected areas (coastal water body) or fishery protected area (river water body).	✓	✓	✓	✓
MU1/2	Montrose Golf Links	MR	MR	MR					
MU1/3 a & b	Splash (The Faulds) & South Links Holiday Park	HTL	HTL	MR					
MU1/4	GlaxoSmithKline	HTL	HTL	HTL	**Transitional water body: Montrose Basin 200079.** Littoral processes within Montrose Basin are dominated by tidal and river flows. The Basin acts as a trap to fine sediment from the River South Esk and potentially to sand transported in on strong flood tides from Montrose Bay. Thus the basin's evolution is highly dependent on any changes in sediment supply and in channel position. Assuming present conditions continue, the basin will continue to gradually silt up and intertidal areas will remain relatively stable. Thus maintenance of defences at Montrose (MU1/4 to MU2/2), Tayock (MU2/3, where defences are only localised), West Montorse Basin (MU2/4a, MU2/4c) Rossie Island (MU2/6) and Ferryden (MU2/7 to MU2/8) is unlikely to have a significant impact on changes within the basin or inlet, due to the continued infilling and limited erosion rates. Therefore, the overall patterns of habitat evolution and distribution will continue to be dominated by natural processes, and HTL policy along the inlet, eastern shore and parts of the northern shore will not result in intertidal habitat loss due to coastal squeeze, and will not significantly affect ecological elements in either the inlet of the basin. Much of the western edge of the basin and along the edge of the floodplain of the River South Esk has been reclaimed for agriculture and is protected by embankments. Implementing managed realignment in this area (MU2/4b) will allow new intertidal habitat to develop. Similarly, NAI along much of the southern shore of the basin (MU2/5) will allow natural evolution of the shoreline, although due to the rising ground and geology present here, little change would be expected. Thus the net effect of the policies is likely to be an increase in inter-tidal area. Although changes within the basin will occur, this situation of flux already exists as channels move around in response to natural patterns of sediment deposition. **River water body: River South Esk 5799** flows into the western side of the basin within MU2/4b and MU2/4c, and the MR policy will help to restore natural hydromorphological functions in the lower part of the river, counteracting historic land claim. **Groundwater body:** Not at risk of saline intrusion. **Protected areas**: No impacts will result on nitrate or bathing water protected areas (coastal water body), fishery protected area (river water body) or River South Esk SAC, which is designated for its migratory salmonid fishery (as well as freshwater pearl mussel, also unaffected by the SMP2 policy). The balance of policies should ensure no adverse effect on the Montrose Basin SPA (or Ramsar site), with the Habitats Risk Assessment (Appendix I) concluding no significant effects on qualifying waterfowl or overwintering migratory bird species.	n/a	✓	✓	✓
MU2/1a	Montrose Port (north bank – Glaxo to A92 bridge)	HTL	HTL	HTL					
MU2/1b	Montrose Port (south bank – A92 bridge to Ferryden)	HTL	HTL	HTL					
MU2/2a	Montrose West (A92 Bridge to the end of railway defences)	HTL	HTL	HTL					
MU2/2b	Montrose West (Railway defences to Tayock River)	HTL	HTL	HTL					
MU2/3a	Tayock (Tayock village)	HTL	HTL	HTL					
MU2/3b	Tayock (Tayock Cemetery)	HTL	HTL	HTL					
MU2/4a	West Montrose Basin (West of Tayock)	HTL	HTL	HTL					
MU2/4b	West Montrose Basin (Bridge of Dun)	MR	MR	MR					
MU2/4c	West Montrose Basin (Old Montrose)	HTL	HTL	HTL					
MU2/5	Old Montrose to Railway Bridge	NAI	NAI	NAI					
MU2/6	Rossie Island to A92	HTL	HTL	HTL					
MU2/7	Ferryden	HTL	HTL	HTL					
MU2/8	Ferryden to Scurdie Ness	NAI	NAI	NAI					
MU3/1	Scurdie Ness to Rickle Craig	NAI	NAI	NAI	**Coastal water body: Scurdie Ness to Deils Head 200078.** Natural coastal hydromorphology will continue throughout the water body as a result of NAI. The existing defences at Corbie Knowe (protecting a small number of holiday homes) are ad hoc and very localised. Leaving these in situ through NAI policy will have no anticipated effects on coastal functioning or ecology. The water body is already at high status, and the SMP2 policies will not impact on this status.	✓	✓	✓	✓
MU4/1	Lunan Bay	NAI	NAI	NAI					
MU4/2	Corbie Knowe	NAI	NAI	NAI					

Policy Unit		Preferred SMP2 Policy			Assessment of impact (including list of water bodies affected)	WFD objectives met?			
		2025	2055	2105		WFD 1	WFD 2	WFD 3	WFD 4
MU5/1	Lang Craig to Whiting Ness (partial overlap)	NAI	NAI	NAI	**River water body: Lunan Water 5900** flows into the sea in Lunan Bay within the MU4/1 frontage, and the NAI policy will allow natural hydromorphological functions to continue. **Raesmill Burn 5602** enters within MU4/2; NAI has no impacts on the water body (the small extent of rock armour does not in any way affect interaction between the river water body and coastal water body). **Groundwater body:** Not at risk of saline intrusion. **Protected areas**: No impacts will result on nitrate or bathing water protected areas (coastal water body) or fishery protected area (river water body).				
MU5/1	Lang Craig to Whiting Ness (partial overlap)	NAI	NAI	NAI	**Coastal water body: The Deil's Head to Carnoustie 200072.** The existing urban frontage and artificial upper tidal limit through Arbroath (MU6/1, MU6/2 and MU6/3) already curtails the upper intertidal zone of the beach. Maintaining these defences will continue to prevent release of sediment material from the hinterland, but with insignificant longshore processes here the effect will remain localised to this frontage. Additionally, removing the defences would not provide major benefit to the water body, as the urban areas of Arbroath would prevent natural shoreline hydromorphology developing through the majority of the frontage. The same applies to the short MU7/1 frontage in Carnoustie, although here the urban coastal defence is fronted by a wide rock platform. Thus HTL at these locations will not result in any increased impacts on coastal ecology or processes. Natural coastal hydromorphology will continue throughout most of the remaining frontage (MU 6/4a, c) as a result of the NAI policy along the large majority. Within MU6/4a the proposed HTL is only localised, related to short reaches of defences that fix the outfall of Elliot Water and rock armour and revetment alongside the railway at Hatton. A MR policy at East Haven (MU 6/4b) will work with coastal processes to reduce erosion of the dunes. HTL and MR at these locations is not expected to have a significant adverse effect on coastal processes or ecology, due to the short lengths of defences and adaptive management approach at East Haven. Maintaining the position of the Elliot Water outfall does prevent natural movement of the outfall position; however, this stabilisation will not impact significantly on either coastal or river ecology. The water body is already at good status, and the SMP2 policies will not impact on this status. **River water body: Brothock Water 5603** discharges through Arbroath harbour within the MU6/2 frontage, and the HTL policy will not change the lower extent of this water body. **Elliot Water 5950** training defences will remain, but whilst these do prevent natural beach-estuary interaction (i.e. accretion and breach cycles) the consequences for ecology are a reduction in long-term dynamic changes, as opposed to impacts on biological quality. **Monikie Burn's 5952** ecology and hydromorphology will not be impacted by the NAI policy in MU6/4, although the outflow across the beach may be locally affected by changes in patterns of beach movement and accretion. **Groundwater body:** Not at risk of saline intrusion. **Protected areas**: No impacts will result on nitrate or bathing water protected areas (coastal water body) or fishery protected area (river water bodies).	n/a	✓	✓	✓
MU6/1a	Victoria Park	HTL	HTL	HTL					
MU6/1b	Seagate	HTL	HTL	HTL					
MU6/2	Arbroath Harbour	HTL	HTL	HTL					
MU6/3	Inchcape Park to Westway Road	HTL	HTL	HTL					
MU6/4a	West Links to East Haven	HTL	HTL	HTL					
MU6/4b	East Haven	MR	MR	MR					
MU6/4c	East Haven to West Haven	NAI	NAI	NAI					
MU7/1	West Haven to Carnoustie Station	HTL	HTL	HTL					
MU7/2	Carnoustie Station to Barry Burn	HTL	HTL	HTL	**Coastal water body: Carnoustie to Fife Ness 200069.** The short frontage in MU7/2 has been defended for some years, and the former dunes behind it levelled and developed as urban amenity land. Maintaining the defences here will sustain the interruption of natural dune-beach interaction, although the dunes themselves have already been lost to urbanisation. The defences will also be reducing the supply of eroded sediment here, in a location where longshore drift appears to be northwards. As the shore to the north is occupied by urban Carnoustie and natural rock platforms, any impacts of this on the adjacent water body's biological quality elements are considered negligible. HTL of the rock armour along the MoD frontage in MU8/1will continue to prevent natural dune evolution at the beach edge. Natural evolution here is likely to be erosion of the dunes. As the major part of the water body is to the south, and is also represented largely by sandy beaches and dune systems, the constraint in beach-dune interaction here (about 7% of the shoreline) is considered unlikely to significantly affect the water body's ecology or status (currently good). NAI in the southern part of Barry Sands West (MU8/2) will continue to provide sediment for southerly longshore movement towards Gaa sands at the mouth of the Tay. Thus the ecology of the estuary mouth is unlikely to be adversely impacted. As the beach at MU8/1 is particularly wide any effects of coastal squeeze are considered to be minor and local. Rising sea levels (at an estimated rate of about 0.02m per decade, based on UKCP09) will, however, see a progressive loss of the intertidal habitat extent and the ecology that it supports. Conversely, the backing dune systemand the ecology that it supports will be maintained. The water body is already at good status, and the SMP2 policies will not impact on this status. **River water body: Barry Burn 5953** has rock armour on the south bank and a recently constructed training wall on the north bank to fix the burn's position on the beach, in response to historic movement and the associated threat of flooding of southern Carnoustie. The defences occupy only a short reach of the channel, and compared to the water body length of c.14km the effects of the artificial banks is considered not to be significant for	n/a	✓	✓	✓
MU8/1	Barry Sands East	HTL	HTL	HTL					
MU8/2	Barry Buddon & Barry Sands West (partial overlap)	NAI	NAI	NAI					

Policy Unit		Preferred SMP2 Policy			Assessment of impact (including list of water bodies affected)	WFD objectives met?			
		2025	2055	2105		WFD 1	WFD 2	WFD 3	WFD 4
					the water body's ecology. Although the current status is bad, this is not due to morphological pressures. **Groundwater body:** Not at risk of saline intrusion. **Protected areas**: No impacts will result on nitrate or bathing water protected areas, or fishery protected area (river water body). Habitat Regulations Assessment has concluded no significant effects on dune systems in the Barry Links SAC, on intertidal or subtidal features or common seal in the Firth of Tay and Eden Estuary SAC, or on breeding or overwintering birds in the Firth of Tay and Eden Estuary SPA (or Ramsar site) (Appendix I).				
MU8/2	Barry Buddon & Barry Sands West (partial overlap)	NAI	NAI	NAI	**Transitional water body: Lower Tay Estuary 200438**. NAI along Barry Sands East (MU8/2) (c.50% of the water body's shoreline within the SMP2 area) will ensure that natural processes continue and water body ecology remains natural. Further to the west, HTL is proposed from the MoD boundary through to Broughty Castle. In the eastern part (MU9/1 and MU9/2) HTL may only involve limited intervention due to continued accretion. To the west the urban hinterland is anticipated to require greater intervention to maintain the shoreline position. However, the shoreline defences retain beach material (for amenity purposes as well as coastal defence) and thus sustain the area of intertidal habitat. To the east of Monifieth, and to the west at Broughty Ferry, the frontages are currently accreting. If defences were removed, the shoreline would lose intertidal areas, and the connection to the urban hinterland would not benefit water body ecology. There would also be a potential contamination issue at the former disposal site at Monifieth playing fields. The water body is already at good status, and the SMP2 policies will not impact on this status. **River water body: Buddon Burn 5954**, is within the NAI frontage (MU8/2) and will be unaffected by the SMP2 policy. **Dighty Water** 6000 is within the HTL frontage of MU9/3, but is a highly urbanised channel here as it passes under the railway and A930 highway, and this channel form would remain irrespective of the SMP2 policy. **Groundwater body:** Not at risk of saline intrusion. **Protected areas**: No impacts will result on nitrate or bathing water protected areas, or fishery protected area (river water body). Habitat Regulations Assessment has concluded no significant effects on dune systems in the Barry Links SAC, on intertidal or subtidal features or common seal in the Firth of Tay and Eden Estuary SAC, or on breeding or overwintering birds in the Firth of Tay and Eden Estuary SPA (or Ramsar site) (Appendix I).	n/a	✓	✓	✓
MU9/1	MoD Boundary to west Tayview Caravan Park	HTL	HTL	HTL					
MU9/2	Monifieth West	HTL	HTL	HTL					
MU9/3	Barnhill to the Esplanade	HTL	HTL	HTL					
MU9/4	Broughty Ferry East	HTL	HTL	HTL					
MU9/5	Broughty Ferry	HTL	HTL	HTL					

Table 5 Summary of achievement (or otherwise) of environmental objectives for each water body in the SMPs area

Water Body (and related SMP2 policy units)	Environmental objectives met?				WFD Summary Statement required?
	WFD1	WFD2	WFD3	WFD4	
Coastal water body: Couts Rock to Scurdie Ness 200084 (Policy units: MU1/1, MU1/2, MU1/3)	✓	✓	✓	✓	**No**
Transitional water body: Montrose Basin 200079 (Policy units: MU1/4, MU2/1, MU2/2, MU2/3, MU2/4, MU2/5, MU2/6, MU2/7, MU2/8)	n/a	✓	✓	✓	**No**
Coastal water body: Scurdie Ness to Deils Head 200078 (Policy units: MU3/1, MU4/1, MU4/2, MU5/1 part)	✓	✓	✓	✓	**No**
Coastal water body: The Deil's Head to Carnoustie 200072 (Policy units: MU5/1 part, MU6/1, MU6/2, MU6/3, MU6/4, MU7/1 part)	n/a	✓	✓	✓	**No**
Coastal water body: Carnoustie to Fife Ness 200069 (Policy units: MU7/1 part, MU8/1, MU8/2 part)	n/a	✓	✓	✓	**No**
Transitional water body: Lower Tay Estuary 200438 (Policy units: MU8/2 part, MU9/1, MU9/2, MU9/3, MU9/4, MU9/5)	n/a	✓	✓	✓	**No**