

Appendix H

Estuary Assessment

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H1 Introduction

This appendix provides an assessment in accordance with Defra guidance on the need (or otherwise) to include the six main estuaries of the study area within the SMP2 process. An assessment has been undertaken and conclusions provided for the following estuaries, as defined by Defra's *Futurecoast* study:

- River Tweed estuary;
- River Aln estuary;
- River Coquet estuary;
- River Wansbeck estuary;
- River Blyth estuary; and
- River Tyne estuary.

Also within the SMP study area are a number of other outfalls, such as that of the River Lyne in Lynemouth Bay, Meggie's Burn along Blyth South Beach and Briardene Burn in Whitley Bay. However, each of these has only very localised effects on the foreshore and therefore it is not necessary to incorporate these smaller outfalls other than through local interactions. This is addressed, where relevant, in each Policy Development Zone statement.

For each of the six main estuaries, consideration is given to:

- Should the estuary be included in the SMP process?
- If so, how should the estuary be included?
- How far upstream should the estuary be included?

H2 Guidance on the Integration of Estuaries within SMPs

H2.1 Background

This estuary assessment has been produced in accordance with Defra's Guidance for the Production of SMPs. The guide overall is aimed at those responsible for the definition, management and production of SMPs, providing procedural guidance on SMP production complying with specific requirements. Volume 3 of the guidance consists of technical appendices outlining a number of tools and techniques to be used in support of SMP production.

Of Volume 3 it is its Appendix F that gives guidance regarding the incorporation of estuarine shores into the SMP process. The guidance enables the scale of water and sediment exchanges between an estuary and an adjacent open coast to be considered, along with the scale of management issues, to feed into the decision as to whether or not an estuary should be included in the SMP process in terms of estuarine shore policy development. It should be noted that the process interactions will always need to be considered; the question is whether policy for the estuary needs to be developed within the SMP and, if so, to what geographical extent this should be done. It should also be borne in mind that conventionally an estuarine shore will generally be incorporated within the relevant Catchment Flood Management Plan in terms of policy development.

The following sections give a brief overview of the guidance to provide background context for the assessments made here.

H2.2 Open Coast – Estuary Interactions

The inclusion of estuaries assessment within the SMP process has arisen in recognition of the importance of understanding physical processes in providing effective flood and coastal management. The interaction of, and exchanges between, the open coast and estuaries means management policies in one environment have the potential to affect the other.

The interactions between the open coast and estuaries may take a number of forms:

- Sediment supply – the open coast may provide a significant supply of sediments to the estuary and the estuary may supply sediment to the coast. Therefore any management policy that acts to alter this supply may have an impact on the estuary.
- Alteration to longshore drift – water flows from the estuary can act to block longshore sediment transport across the mouth of an estuary (i.e. effectively a 'hydraulic groyne'). In addition, high river flows can drive sediment from the longshore transport system offshore.
- Flood and ebb tide deltas – Sediment within the longshore transport system can be transported into the estuary mouth and stored on flood tide deltas before being transferred to the downdrift shore. Similarly, ebb tide deltas may store sediments and also serve a natural coastal defence function to the estuary mouth and adjacent stretches of the open coast.
- Tidal prism changes – a change in tidal prism of the estuary may alter processes to the extent that changes also occur to erosion/deposition patterns and/or changes in the dominance of the flood or ebb tide and hence the import or export of sediment. This will have implications for the sediment budget of adjacent coasts.

H2.3 Should the Estuary be Included in the SMP Process?

This is the first stage of the assessment process. The guidance states that this question is to be addressed by considering:

- The type and scale of physical interactions and their significance; and
- Management issues and their significance.

H2.4 How Should the Estuary be Included in the SMP Process?

If a decision is made to incorporate the estuary in the SMP, then there are two options:

- The estuary should be included in the open coast SMP; or
- The estuary should have its own estuary SMP (e.g. the Humber Estuary SMP).

H2.5 How Far Upstream Should the Estuary be Included in the SMP Process?

To completely cover any potential interactions, the estuary should theoretically be incorporated up to its tidal limit. This may not be practical in all situations, however. The practical alternative is to determine an upstream limit beyond which no change in policy is assumed.

H2.6 Estuary Guidance Tables

The SMP guidance does not (and can not) provide a prescriptive method for assessing estuaries and their inclusion in an SMP. Instead, a series of Estuary Guidance Tables (EGT) have been produced that provide consistency in the approach, but still enable end-user judgment to be applied.

The guidance tables assess the 'significance' of water and sediment exchanges between the estuary and the open coast and of the management issues within the estuary. In undertaking the assessment, the term "insignificant" has been used as one category. This is read to mean no, or low, significance to the larger-scale evolution of the coast, acknowledging that there could remain significant local-scale interactions that will need to be addressed. At one scale estuaries such as the Humber, Thames, Morecambe Bay, The Wash and the Severn clearly have significant interactions on large-scale coastal systems. In contrast the River Lyne in Northumberland only has a very small-scale and local impact. The estuaries assessment attempts to identify if and how each estuary in the study area should be incorporated in the SMP process.

The following sections present results from the assessments for the estuaries of the rivers Tweed, Aln, Coquet, Wansbeck, Blyth and Tyne.

H3 Assessment of the River Tweed Estuary

Estuary Name	River Tweed estuary
Classification	Origin: Drowned river valley Type: Ria Sub-type: No spits
Main Characteristics	Macro-tidal medium-sized estuary. Relatively long, narrow with steep natural valley.
Data Availability	<ul style="list-style-type: none"> • Shoreline Management Plan 1. • Ongoing monitoring and inspection findings. • Futurecoast. • An Inventory of UK Estuaries (JNCC, 1997).
Stage 1; Step 1 Significance of water exchange (EGT2)	Total Area: Low Intertidal Area: Low Channel Length: Moderate Mouth Width: Moderate Tidal Range: Moderate Mean Freshwater Flows: High % Area: Low
	Verdict on Significance: The estuary is of medium size. River spates can have an effect on the mouth and adjacent beaches and can cause changes in channel alignment. Influence is predominantly of the river on the coast.
	In accordance with EGT2, in terms of water exchange the estuary is assessed as “insignificant”.
Stage 1; Step 2 Significance of sediment exchange (EGT3)	Morphological Features: Some flats and marsh. Source/Sink Relationship: Source during river spates. Potential for plume generation: High.
	Verdict on Significance: “Marginal”.
Stage 1; Step 3 Significance of process	Verdict on relevance of Process Issues: Step 1: Insignificant water exchange

Estuary Name	River Tweed estuary
issues	<p>Step 2: Marginal sediment exchange</p> <p>Step 3, therefore, from EGT5 process issues are assessed as Grade C.</p>
Stage 1; Step 4 Significance of management issues	<p>Historic reclamation: Some, but valley dictated by natural slopes.</p> <p>Presence or absence of jetties: Breakwater present at mouth on north side.</p> <p>Maintenance dredging: Some.</p> <p>Future intervention potential: Limited due to steep slopes of valley sides.</p> <p>Verdict on Significance: Insignificant</p>
Stage 1; Step 5 Recommendation on whether the estuary should be included in the SMP process	<p>Step 3 Process Issues are assessed as Grade C.</p> <p>Step 4 Management Issues are assessed as "Insignificant".</p> <p>Therefore, from Step 5 of EGT5, the Tweed scores "3".</p> <p>Verdict: The estuary need not be included in the SMP process.</p> <p>A suitable limit in the estuary would be the Royal Tweed Bridge, which would allow the process interactions at the mouth, especially around Sandstell Point, to be incorporated.</p>

H4 Assessment of the River Aln Estuary

Estuary Name	River Aln estuary
Classification	Origin: Drowned river valley Type: Spit-enclosed Sub-type: Double spit
Main Characteristics	Macro-tidal, small-sized estuary.
Data Availability	<ul style="list-style-type: none"> • Shoreline Management Plan 1. • Ongoing monitoring and inspection findings. • Futurecoast. • An Inventory of UK Estuaries (JNCC, 1997).
Stage 1; Step 1 Significance of water exchange (EGT2)	Total Area: Low Intertidal Area: Low Channel Length: Low Mouth Width: Low Tidal Range: Low Mean Freshwater Flows: Low % Area: Low Verdict on Significance: Insignificant
Stage 1; Step 2 Significance of sediment exchange (EGT3)	Morphological Features: Flats and marshes. Source/Sink Relationship: Sink Potential for plume generation: Moderate. Verdict on Significance: Insignificant
Stage 1; Step 3 Significance of process issues	Verdict on relevance of Process Issues: Step 1: Insignificant Step 2: Insignificant Step 3, therefore, from EGT5 process issues are assessed as Grade C.
Stage 1; Step 4 Significance of	Historic reclamation: Some through flood embankments. Presence or absence of jetties: None.

Estuary Name	River Aln estuary
management issues	<p>Maintenance dredging: None.</p> <p>Future intervention potential: Limited, but some managed realignment.</p> <p>Verdict on Significance: Insignificant.</p>
Stage 1; Step 5 Recommendation on whether the estuary should be included in the SMP process	<p>Step 3 Process Issues are assessed as Grade C.</p> <p>Step 4 Management Issues are assessed as "Insignificant".</p> <p>Therefore, from Step 5 of EGT5, the Aln scores "3".</p> <p>Verdict: The Aln need not be included in the SMP process.</p> <p>A suitable limit in the estuary would be the road bridge in order to incorporate the effects of the recent managed realignment scheme.</p>

H5 Assessment of the River Coquet Estuary

Estuary Name	River Coquet estuary
Classification	Origin: Drowned river valley. Type: Spit-enclosed. Sub-type: Single spit.
Main Characteristics	Main channel constrained by harbour breakwaters. Relict channel has flat and marsh.
Data Availability	<ul style="list-style-type: none"> • Shoreline Management Plan 1. • Ongoing monitoring and inspection findings. • Futurecoast. • An Inventory of UK Estuaries (JNCC, 1997).
Stage 1; Step 1 Significance of water exchange (EGT2)	Total Area: Low Intertidal Area: Low Channel Length: Low Mouth Width: Low Tidal Range: Low Mean Freshwater Flows: Low % Area: Low
	Verdict on Significance: Insignificant
Stage 1; Step 2 Significance of sediment exchange (EGT3)	Morphological Features: Flats and marshes. Source/Sink Relationship: Sink. Potential for plume generation: On flooding tide.
	Verdict on Significance: Insignificant.
Stage 1; Step 3 Significance of process issues	Verdict on relevance of Process Issues: Step 1: Insignificant Step 2: Insignificant Step 3, therefore, from EGT5 process issues are assessed as Grade C.
Stage 1; Step 4 Significance of	Historic reclamation: Yes and historic diversion of main channel. Presence or absence of jetties: Breakwaters at mouth.

Estuary Name	River Coquet estuary
management issues	Maintenance dredging: Yes. Siltation is a problem in the harbour and in the marina. Future intervention potential: Low.
	Verdict on Significance: Insignificant
Stage 1; Step 5 Recommendation on whether the estuary should be included in the SMP process	Step 3 Process Issues are assessed as Grade C. Step 4 Management Issues are assessed as "Insignificant". Therefore, from Step 5 of EGT5, the Coquet scores "3".
	Verdict: The Coquet need not be included in the SMP process. A suitable limit in the estuary would be the inner most length of the harbour arms.

H6 Assessment of the River Wansbeck Estuary

Estuary Name	River Wansbeck estuary
Classification	Origin: Drowned river valley. Type: Spit-enclosed. Sub-type: Single spit.
Main Characteristics	Short estuary section. Estuary truncated by weir.
Data Availability	<ul style="list-style-type: none"> • Shoreline Management Plan 1. • Ongoing monitoring and inspection findings. • Futurecoast. • An Inventory of UK Estuaries (JNCC, 1997).
Stage 1; Step 1 Significance of water exchange (EGT2)	Total Area: Low Intertidal Area: Low Channel Length: Low Mouth Width: Low Tidal Range: Low Mean Freshwater Flows: Low % Area: Low Verdict on Significance: Insignificant
Stage 1; Step 2 Significance of sediment exchange (EGT3)	Morphological Features: Short section of channel and flat. Source/Sink Relationship: Sink Potential for plume generation: Low Verdict on Significance: Insignificant
Stage 1; Step 3 Significance of process issues	Verdict on relevance of Process Issues: Step 1: Insignificant Step 2: Insignificant Step 3, therefore, from EGT5 process issues are assessed as Grade C.
Stage 1; Step 4 Significance of	Historic reclamation: Yes, including truncation by weir. Presence or absence of jetties: None.

Estuary Name	River Wansbeck estuary
management issues	<p>Maintenance dredging: None.</p> <p>Future intervention potential: Steep-sided valleys within truncated channel section. [Potential for removal of weir].</p> <p>Verdict on Significance: Insignificant.</p>
Stage 1; Step 5 Recommendation on whether the estuary should be included in the SMP process	<p>Step 3 Process Issues are assessed as Grade C.</p> <p>Step 4 Management Issues are assessed as "Insignificant".</p> <p>Therefore, from Step 5 of EGT5, the Tweed scores "3".</p> <p>Verdict: The Wansbeck need not be included in the SMP process.</p> <p>A suitable limit in the estuary would be the weir which truncates the estuary.</p>

H7 Assessment of the River Blyth Estuary

Estuary Name	River Blyth estuary
Classification	Origin: Drowned river valley. Type: Spit-enclosed. Sub-type: Single spit.
Main Characteristics	Industrial harbour.
Data Availability	<ul style="list-style-type: none"> • Shoreline Management Plan 1. • Ongoing monitoring and inspection findings. • Futurecoast. • An Inventory of UK Estuaries (JNCC, 1997).
Stage 1; Step 1 Significance of water exchange (EGT2)	Total Area: Medium Intertidal Area: Medium Channel Length: Large Mouth Width: Large Tidal Range: Medium Mean Freshwater Flows: Medium % Area: Medium
	Verdict on Significance: Medium-sized estuary. Insignificant.
Stage 1; Step 2 Significance of sediment exchange (EGT3)	Morphological Features: Few Source/Sink Relationship: Sink Potential for plume generation: Yes
	Verdict on Significance: Insignificant
Stage 1; Step 3 Significance of process issues	Verdict on relevance of Process Issues: Step 1: Insignificant Step 2: Insignificant Step 3, therefore, from EGT5 process issues are assessed as Grade C.
Stage 1; Step 4 Significance of	Historic reclamation: Yes, extensive. Presence or absence of jetties: Yes, extensive.

Estuary Name	River Blyth estuary
management issues	Maintenance dredging: Yes. Future intervention potential: Yes.
	Verdict on Significance: Marginal.
Stage 1; Step 5 Recommendation on whether the estuary should be included in the SMP process	Step 3 Process Issues are assessed as Grade C. Step 4 Management Issues are assessed as "Marginal". Therefore, from Step 5 of EGT5, the Tweed scores "3".
	Verdict: The Blyth need not be included in the SMP process. A suitable limit in the estuary would be the landward section of the harbour arms.

H8 Assessment of the River Tyne Estuary

Estuary Name	River Tyne estuary
Classification	Origin: Drowned river valley Type: Ria Sub-type: No spits
Main Characteristics	Macro-tidal, medium-sized estuary. Relatively long, narrow estuary with steep banks in places. Large degree of industrial and urban activity along the banks of the estuary, leaving only a narrow intertidal zone. Estuary confined at mouth by piers.
Data Availability	<ul style="list-style-type: none"> • Shoreline Management Plan 1. • Ongoing monitoring and inspection findings. • Futurecoast. • An Inventory of UK Estuaries (JNCC, 1997).
Stage 1; Step 1 Significance of water exchange (EGT2)	<p>Total Area: Medium size in terms of whole range of UK estuaries. Intertidal Area: Small intertidal area relative to total area. Channel Length: High Mouth Width: Moderate Tidal Range: Moderate Mean Freshwater Flows: Relatively high % Area: Low</p>
	<p>Verdict on Significance: The estuary is of medium size. The mouth width is considered low in relation to the channel length, indicating a deep channel at the mouth. The ratio of tidal exchange to freshwater flow is low due to high input of freshwater flows. The system is also highly stratified.</p> <p>In accordance with EGT2, in terms of water exchange the estuary is assessed as “insignificant”.</p>
Stage 1; Step 2 Significance of sediment exchange (EGT3)	<p>Morphological Features: Outer estuary is confined by the piers and mudflats constrained by development and associated quay walls.</p> <p>Source/Sink Relationship: Net sink.</p>

Estuary Name	River Tyne estuary
	Potential for plume generation: Likely.
	Verdict on Significance: Marginal
Stage 1; Step 3 Significance of process issues	Verdict on relevance of Process Issues: Step 1: Insignificant water exchange Step 2: Marginal sediment exchange Step 3, therefore, from EGT5 process issues are assessed as Grade C.
Stage 1; Step 4 Significance of management issues	Historic reclamation: High degree of reclamation. Presence or absence of jetties: Two prominent piers. Maintenance dredging: Yes. Future intervention potential: Limited scope for significant changes in policy.
	Verdict on Significance: Marginal
Stage 1; Step 5 Recommendation on whether the estuary should be included in the SMP process	Step 3 Process Issues are assessed as Grade C. Step 4 Management Issues are assessed as "Marginal". Therefore, from Step 5 of EGT5, the Tweed scores "3" in terms of overall significance and need not be included in the SMP process..
	Verdict: The estuary need not be included in the SMP process.
	It is considered that the Fish Quay provides an appropriate limit for the inclusion of the Tyne on the open coast SMP. This location allows the physical interaction to be represented along with the important influence of the piers. This is also the existing Schedule IV boundary under the Coast Protection Act (1949) and is consistent with the boundary defined in the SMP from the River Tyne to Flamborough Head.

H9 Summary

The assessment of the six estuaries within the study area has revealed that none require inclusion in the SMP in terms of policy development. This is because even the larger estuaries of the Tweed, Blyth and Tyne remain exerting relatively local effects on the shore and there is limited scope for large-scale changes in policy and therefore unlikely to be significant changes in water or sediment exchanges between the estuaries and the open coast.

It does, however, remain important to understand process interactions when developing policy for the open coast and therefore the following limits are suggested for consideration within the SMP:

- River Tweed estuary – include up to the Royal Tweed Bridge.
- River Aln estuary – include up to the road bridge.
- River Coquet estuary – include up to the landward extent of the harbour arms.
- River Wansbeck estuary – include up to the weir which truncates the estuary.
- River Blyth estuary – include up to the landward extent of the harbour arms.
- River Tyne estuary – include up to the Fish Quay (this ensures compatibility with the River Tyne to Flamborough Head SMP2 which starts at a similar position on the south bank of the river).

Other smaller outfalls, such as the River Lyne, Meggie's Burn and Briardene Burn, need to be considered at a local scale when developing policy along relevant stretches of frontage.