Cyfoeth Naturiol Cymru
Natural Resources Wales

Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd Special Area of Conservation

Indicative site level feature condition assessments 2018

NRW Evidence Report No: 227

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Contents

Summary

This document presents NRW's indicative assessment of the condition of marine features in Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd Special Area of Conservation (SAC).

Table 1 contains a summary of the indicative condition assessments.

This report is divided into sections as follows:

Section 1: a brief introduction to the importance and need for site level feature condition assessments,

Section 2: a brief description of Carmarthen Bay and Estuaries SAC,

Section 3: NRW's indicative condition assessments for the features of Carmarthen Bay and Estuaries SAC, including a comparison with previous assessments for the site,

Section 4: NRW's plans for the future development of site level condition assessments,

Annexes explain in detail the process of producing indicative condition assessments.

Table 1: Summary of indicative condition assessments for Carmarthen Bay and Estuaries SAC.

Designated Features	Indicative condition assessment	Confidence in assessment
• Estuaries	Unfavourable	Medium
• Mudflats and sandflats not covered by seawater at low tide	Unfavourable	Medium
• Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Unfavourable	High
• *Salicornia* and other annuals colonising mud and sand	Favourable	Medium
• Large shallow inlets and bays	Unfavourable	Medium
• Sandbanks which are slightly covered by seawater all the time	Unfavourable	Low
• Allis shad (*Alosa alosa*)	Unfavourable	Low
• Twaite shad (*Alosa fallax*)	Unfavourable	Low
• River lamprey (*Lampetra fluviatilis*)	Unfavourable	High
• Sea lamprey (*Petromyzon marinus*)	Unfavourable	High
• Otter (*Lutra lutra*)	Favourable	Medium

More detailed explanations of the rationale behind these conclusions can be found in the full indicative condition assessment reports in section 3.

Crynodeb

Mae'r ddogfen hon yn cyflwyno asesiad dangosol CNC o gyflwr nodweddion Ardal Gadwraeth Arbennig Bae Caerfyrddin ac Aberoedd (AGA).

Mae Tabl 1 yn cynnwys crynodeb o'r asesiadau dangosol o gyflwr nodweddion.

Rhennir yr adroddiad hwn yn adrannau fel a ganlyn:

Adran 1: cyflwyniad byr i'r pwysigrwydd a'r angen am asesiadau cyflwr ar lefel safle,

Adran 2: disgrifiad byr o AGA Bae Caerfyrddin ac Aberoedd,

Adran 3: Asesiadau cyflwr dangosol CNC ar gyfer nodweddion AGA Bae Caerfyrddin ac Aberoedd, gan gynnwys cymhariaeth gydag asesiadau blaenorol ar gyfer y safle,

Adran 4: Cynlluniau CNC ar gyfer datblygu asesiadau cyflwr ar lefel safle yn y dyfodol,

Mae **atodiadau'n** egluro'n fanwl y broses o gynhyrchu asesiadau dangosol o gyflwr nodweddion.

Tabl 1: Crynodeb o asesiadau dangosol o gyflwr nodweddion ar gyfer AGA Bae Caerfyrddin ac Aberoedd.

Nodweddion Dynodedig	Asesiad dangosol o gyflwr y nodwedd	Hyder yn yr asesiad
• Aberoedd	Anffafriol	Canolig
• Gwastadeddau llaid neu dywod nas gorchuddir gan y môr ar lanw isel	Anffafriol	Canolig
• Dolydd ar forfeydd arfordir y gorllewin (*Glauco-Puccinellietalia maritimae*)	Anffafriol	Uchel
• *Salicornia* a phlanhigion unflwydd eraill sy'n cytrefu llaid a thywod	Ffafriol	Canolig
• Cilfachau a baeau mawr bas	Anffafriol	Canolig
• Ponciau tywod sydd fymryn dan ddŵr y môr drwy'r amser	Anffafriol	Isel
• Herlyn (*Alosa alosa*)	Anffafriol	Isel
• Gwangen (*Alosa fallax*)	Anffafriol	Isel
• Lamprai'r afon (*Lampetra fluviatilis*)	Anffafriol	Uchel
• Lamprai'r môr (*Petromyzon marinus*)	Anffafriol	Uchel
• Dyfrgi (*Lutra lutra*)	Ffafriol	Canolig

Mae esboniadau manylach o'r rhesymeg y tu ôl i'r casgliadau hyn i'w gweld yn yr adroddiad llawn ar asesu dangosol cyflwr nodweddion.

1. Site level feature condition assessments

Site level feature condition assessments are important for site management. In particular they:

- inform the development of management measures to improve the condition of features
- assist with the prioritisation of resources, and
- help with the assessments of plans and projects.

Marine special areas of conservation (SACs) in Wales cover extensive areas of sea and coast, much of which is challenging and resource intensive to monitor. As a result, assessment of condition can be difficult. It is therefore necessary to use a number of different sources of information and data to inform conclusions. These can vary from, for example, long-term monitoring/surveillance datasets, sampling programs and bathymetric data, to specific data-sets collected primarily for other purposes including Environmental Impact Assessments. For some features, there are very little or no data from which to draw conclusions.

NRW previously undertook preliminary work on full, detailed assessments using all available evidence and assessing all possible attributes. However, this process proved complex and resource intensive. We have therefore concluded that we will not be able to undertake this type of extensive assessment now or in the future, but instead we will develop a new serviceable and streamlined approach that can be embedded in our internal assessment and reporting tools and processes.

As the first stage in developing ongoing streamlined and sustainable site condition assessment and reporting, NRW has undertaken indicative assessments of condition of all marine SAC and Special Protection Area (SPA) sites and features in Wales. During an intensive workshop NRW specialists assessed each feature by using readily available data and information and applying their expert judgement. Further details on the approach taken can be found in Annexes A and B, summary definition in Box 1.

Box 1: Indicative condition assessments - definition and use

The term ‘indicative condition assessment’ describes the use of readily available evidence and expert judgement in an intensive, collective workshop process to provide an indication of feature condition at the site level.

The confidence rating associated with the assessments is an **integral** part of the indicative assessment. Confidence levels for feature assessments should therefore **always** be quoted alongside the indicative condition result, together with NRW’s definition of ‘indicative condition assessment’.

2. Site Description

The Carmarthen Bay and Estuaries SAC is a large site encompassing the estuaries of the Rivers Loughor, Tâf and Tywi (coastal plain estuaries) and the Gwendraeth (a bar-built estuary). There are extensive areas of intertidal mudflats and sandflats with large areas of these flats dominated by bivalves.

Carmarthen Bay is an extensive shallow bay with a wide variety of seabed types, including mud, sand and rock, although the majority of the seabed is sandy. The SAC includes Helwick Bank, a linear shallow subtidal sandbank that is unusual in being highly exposed to wave and tidal action. The Burry Inlet and Three Rivers system provides a migratory route for salmonids, lampreys and shad.

The Carmarthen Bay and Estuaries SAC is a multiple interest site which has been selected for the presence of ten marine features. For the qualifying habitats and species the SAC is considered to be one of the best areas in the UK for:

- Estuaries
- Mudflats and sandflats not covered by seawater at low tide
- Atlantic saltmeadows (*Glauco-Puccinellietalia maritimae*)
- *Salicornia* and other annuals colonising mud and sand
- Large shallow inlets and bays
- Sandbanks which are slightly covered by sea water all the time
- Allis shad *(Alosa alosa)*
- Twaite shad *(Alosa fallax*)

and to support a significant presence of:

- River lamprey *(Lampetra fluviatilis)*
- Sea lamprey *(Petromyzon marinus)*
- Otter *(Lutra lutra)*

The features are distributed throughout the SAC with no single feature occupying the entire SAC and with features overlapping in some locations. The SAC boundary and the general location of the Annex I habitat features are shown in the feature map[1] on the NRW website. These are indicative maps as the extent of most features is not known precisely and some, such as sandbanks, are dynamic and can be highly mobile.

More information on the site and its features can be found in NRW's conservation advice for the site on our website[2].

[1] The feature map can be found on the NRW website and information on the map features, data sources and any changes can be found in Annex I of the conservation advice on EMS (Reg 35).
[2] http://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/find-protected-areas-of-land-and-seas/conservation-advice-for-european-marine-sites/?lang=en

3. Feature level indicative condition assessments

3.1 Estuaries indicative condition assessment

The indicative condition of the feature at this site at the time of assessment

Date	May 2017
Site name	Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC
Site feature assessed	Estuaries

Component of habitat feature assessed	**Indicative Assessment** (*Favourable, unfavourable, unknown*)	**Key evidence type used** (*Monitoring data, reports or expert judgement*)	**Level of agreement**	**Confidence in evidence**	**Component confidence level**
Distribution & Extent (within site)	Favourable	Expert judgement	High	Medium	Medium
Structure & function	Unfavourable	WFD data, reports & expert judgement	High	Medium	Medium
Typical species	Unfavourable	WFD data, reports & expert judgement	High	Medium	Medium
Relevant activities (*activities directly impacting condition of the feature on this site*)	Diffuse water pollution				

Overall Indicative Assessment	**Overall Confidence Level**
Unfavourable	Medium

Notes section: *The rationale for the assessment conclusion and confidence.*

The mudflats and sandflats feature and the Atlantic saltmarsh feature are very important sub-features of the Estuary feature for this site. Therefore, the assessments for these features should be read in conjunction with this assessment. The state of these sub-features has a direct effect on the condition of this feature. Other features e.g. Sea Lamprey can be considered as typical species of the estuary and the assessment of these features should also be read in conjunction with these assessments.

Carmarthen Bay & Estuaries Indicative Mudflats and sandflats feature assessment 2017: Unfavourable
Carmarthen Bay & Estuaries Indicative Atlantic Saltmeadows feature assessment 2017: Unfavourable
Carmarthen Bay & Estuaries Indicative Sea Lamprey feature assessment 2017: Unfavourable
Carmarthen Bay & Estuaries Indicative River Lamprey feature assessment 2017: Unfavourable
Carmarthen Bay & Estuaries Indicative Allis & Twaite Shad feature assessment 2017: Unfavourable

Distribution & Extent: No known change since designation, assessment of distribution and extent for mudflats and sandflats and Atlantic saltmeadows were favourable.
This component has been assessed as **favourable**.

Structure & Function: Carmarthen Bay and Estuaries SAC overlaps with five WFD waterbodies however, only three are relevant and overlap with this feature (Burry Inlet Inner, Burry Inlet Outer, and Tywi & Taf & Gwendraeth - Three Rivers Estuary waterbodies). All three of these waterbodies fail their assessments, two with a poor result and one with a moderate result, the reasons for failure are driven by ecological status. All three water bodies have a good chemical status. All three waterbodies receive only a moderate for DIN (dissolved inorganic nitrogen) and both waterbodies assessed for IQI (infaunal quality Index) received a moderate assessment. Although all three waterbodies have a high for macroalgae all three failed for phytoplankton (2 poor and 1 moderate). Structure and function for both Atlantic saltmeadows and mudflats and sandflats were unfavourable.
This component has been assessed as **unfavourable**.

Typical species: Typical species for both Atlantic saltmeadows and mudflats and sandflats were unfavourable. Estuarine fish were not assessed under WFD for any of the associated waterbodies. Indicative condition assessments for River Lamprey, Sea Lamprey and Shad for this site were all unfavourable.
This component has been assessed as **unfavourable**.

Evidence used: *The evidence used to support the assessment conclusion.*

- Brazier, D.P., & Bunker F.StP.D. (2010). *Intertidal SAC monitoring, Carmarthen Bay and Estuaries SAC, September 2008.* CCW Marine Monitoring Report No: 72, 80pp + vi, Countryside Council for Wales, Bangor.
- Edwards, M, Bunker, F, Maggs, C.A. & M.P. Johnson, (2003). *Biodiversity within eelgrass (Zostera marina) beds on the Welsh coast: analysis of epiflora and recommendations for conservation*. CCW Species Challenge Fund; CCW Grant No: SC7472; CCW SCF Report 03/01/01.
- Halcrow (2012). *Lavernock Point to St Ann's Head Shoreline Management Plan (SMP2). Appendix H: Statement to Inform a Habitats Regulations Assessment.*
- Howson, C.M. (2012). *Intertidal SAC monitoring, Carmarthen Bay SAC, September 2009.* CCW Marine Monitoring Report No. 79, 147pp + x, Countryside Council for Wales, Bangor.
- Mazik, K. & Boyes, S. (2009a). *Intertidal monitoring of eelgrass Zostera noltii in the Burry Inlet, Carmarthen Bay and Estuaries SAC*. CCW Marine Monitoring Report No 53.
- Moore, J.J. (2009b). *Surveys of cockle and mussel stocks in the Burry Inlet, 2004 to 2008.* CCW Marine Monitoring Report No: 34, 51pp + iv.
- Moore, J.J. (2009c). *Surveys of cockle and mussel stocks in the Burry Inlet, 2009*. A report to the Countryside Council for Wales from Coastal Assessment, Liaison & Monitoring., Cosheston, Pembrokeshire. 19 pp + iv
- Moore, J.J. (2012). *Surveys of cockle and mussel stocks in the Burry Inlet, 2011*. CCW Marine Monitoring Report No: 93, 25pp + iv.
- Burry Inlet Cockle Mortalities Investigation 2009-2011, (2012). Institute of Estuarine and Coastal Studies University of Hull.
- Burry Inlet Cockle Fishery Order (1965). Management Plan.
- Burry Inlet Cockle Fishery Order (1965).
- South Wales Sea Fisheries Committee Byelaws.
- Survey of cockle stocks in the Burry inlet. May 2015. Eco-Fish Consultants Ltd.
- NRW's analysis of IQI across Carmarthen Bay and Estuaries estuary feature.
- WFD waterbody classifications (2015). 2009-2015 Classification Data: http://waterwatchwales.naturalresourceswales.gov.uk/en/

3.2 Mudflats and sandflats not covered by seawater at low tide indicative condition assessment

The indicative condition of the feature at this site at the time of assessment

Date	May 2017
Site name	Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC
Site feature assessed	Mudflats & sandflats not covered by seawater at low tide

Component of habitat feature assessed	**Indicative Assessment** (*Favourable, unfavourable, unknown*)	**Key evidence type used** (*monitoring data, reports or expert judgement*)	**Level of agreement**	**Confidence in evidence**	**Component confidence level**
Distribution & Extent (within site)	Favourable	Report & expert judgement	High	Medium	Medium
Structure & function	Unfavourable	Reports, WFD data & expert judgement	High	Medium	Medium
Typical species	Unfavourable	Reports, WFD data, SAC monitoring data & expert judgement	High	Medium	Medium
Relevant activities (*activities directly impacting condition of the feature on this site*)	Water quality issues				

Overall Indicative Assessment	**Overall Confidence Level**
Unfavourable	Medium

Notes section: *The rationale for the assessment conclusion and confidence.*

Distribution & Extent: The Swansea Bay & Carmarthen Bay Shoreline Management Plan (SMP) HRA (Halcrow, 2012) predicted a 49 ha loss of intertidal habitat (saltmarsh (ASM, *Salicornia*, and intertidal mudflat and sandflat combined) due to coastal squeeze for the first epoch (2005 - 2025 years) for Carmarthen Bay & Estuaries SAC, incorporating the Burry Inlet SPA/Ramsar. This assumes that no estuary infilling/morphological response would occur to offset the predicted coastal squeeze, and in that context, is seen as a worst-case scenario. Sensitivity testing was also carried out using a range of sea-level rise scenarios, and this predicted a range of 28-70 ha of loss, with 49 ha being based on the UKCP09 central estimate.

The National Habitat Creation Programme is referenced as the mechanism to deliver compensatory habitat within the SMP2 IROPI (issues of overriding public interest) case. Some habitat creation work has been progressed at Cwm Ivy. This site breached in early 2014 and is establishing saltmarsh vegetation along with mudflat habitat within creeks. In the long term, is it anticipated that this site could develop around 39 ha of habitat, although it will be much less than this in the first epoch.

There are no data specifically on shape, but we know that granulometry shows large changes, and that a lot of sediment was moved by the big winter storm of 2013/14. This will have caused change to shape but through natural changes in sediment budget, rather than anthropogenic modification.
This component has been assessed as **favourable**.

Structure & Function: Carmarthen Bay and Estuaries SAC overlaps with five WFD waterbodies however, only three are relevant and overlap with this feature (Burry Inlet Inner, Burry Inlet Outer, and Tywi & Taf & Gwendraeth - Three Rivers Estuary). All three of these waterbodies fail their assessments, two with a poor result and one with a moderate result, the reasons for failure are driven by ecological status. All three water bodies have a good chemical status. All three waterbodies receive only a moderate for DIN (dissolved inorganic nitrogen) and both waterbodies assessed for IQI (infaunal quality Index) received a moderate assessment. Although all three waterbodies have a high for macroalgae all three waterbodies failed for phytoplankton (2 poor and 1 moderate).
This component has been assessed as **unfavourable**.

Typical species: Both waterbodies assessed for IQI received a moderate grade (Burry Inlet Outer and the three rivers estuary). The two waterbodies assessed for seagrass and saltmarsh, Burry Inlet Inner and Outer returned high and good results respectively. Cockles are a typical species of this feature and cockle mortality continues to be a relevant issue.
This component has been assessed as **unfavourable**.

Evidence used: *The evidence used to support the assessment conclusion.*

- Brazier, D.P., & Bunker F.StP.D. (2010). *Intertidal SAC monitoring, Carmarthen Bay and Estuaries SAC, September 2008.* CCW Marine Monitoring Report No: 72, 80pp + vi, Countryside Council for Wales, Bangor.
- Edwards, M., Bunker, F., Maggs, C.A. & Johnson M.P. (2003). *Biodiversity within eelgrass (Zostera marina) beds on the Welsh coast: analysis of epiflora and recommendations for conservation*. CCW Species Challenge Fund; CCW Grant No: SC7472; CCW SCF Report 03/01/01.
- Halcrow (2012). *Lavernock Point to St Ann's Head Shoreline Management Plan (SMP2). Appendix H: Statement to Inform a Habitats Regulations Assessment*.
- Howson, C.M. (2012). *Intertidal SAC monitoring, Carmarthen Bay SAC, September 2009.* CCW Marine Monitoring Report No. 79, 147pp + x, Countryside Council for Wales, Bangor.
- Mazik, K. & Boyes, S. (2009). *Intertidal monitoring of eelgrass Zostera noltii in the Burry Inlet, Carmarthen Bay and Estuaries SAC*. CCW Marine Monitoring Report No 53.
- Moore, J.J. (2009b). *Surveys of cockle and mussel stocks in the Burry Inlet, 2004 to 2008.* CCW Marine Monitoring Report No: 34, 51pp + iv.
- Moore, J.J. (2009c). *Surveys of cockle and mussel stocks in the Burry Inlet, 2009*. A report to the Countryside Council for Wales from Coastal Assessment, Liaison & Monitoring., Cosheston, Pembrokeshire. 19 pp + iv
- Moore, J.J. (2012). *Surveys of cockle and mussel stocks in the Burry Inlet, 2011*. CCW Marine Monitoring Report No: 93, 25pp + iv.
- Burry Inlet Cockle Mortalities Investigation 2009-2011, 2012. Institute of Estuarine and Coastal Studies University of Hull.
- Burry Inlet Cockle Fishery Order 1965 Management Plan
- Burry Inlet Cockle Fishery Order 1965
- South Wales Sea Fisheries Committee Byelaws.
- Survey of cockle stocks in the Burry inlet. May 2015. Eco-Fish Consultants Ltd.
- NRW's analysis of IQI across Carmarthen Bay & Estuaries estuary feature.
- WFD waterbody classifications (2015). 2009-2015 Classification Data: http://waterwatchwales.naturalresourceswales.gov.uk/en/

3.3 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) indicative condition assessment

The indicative condition of the feature at this site at the time of assessment

Date	May 2017
Site name	Carmarthen Bay & Estuaries SAC
Site feature assessed	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

Component of habitat feature assessed	**Indicative Assessment** (*Favourable, unfavourable, unknown*)	**Key evidence type used** (*monitoring data, reports or expert judgement*)	**Level of agreement**	**Confidence in evidence**	**Component confidence level**
Distribution & Extent (within site)	Favourable	Shoreline management plan & expert judgement.	High	Low	Low
Structure & function	Unfavourable	WFD waterbody assessments, monitoring reports & expert judgement.	High	Medium	Medium
Typical species	Unfavourable	WFD waterbody assessments, monitoring reports & expert judgement.	High	Low	Low
Relevant activities (*activities directly impacting condition of the feature on this site*)	Grazing Water quality issues				

Overall Indicative Assessment	**Overall Confidence Level**
Unfavourable	Medium

Notes section: *The rationale for the assessment conclusion and confidence.*

Distribution & extent: The Swansea Bay & Carmarthen Bay Shoreline Management Plan HRA predicted a 49 Ha loss of intertidal habitat (saltmarsh (ASM, *Salicornia*, and intertidal mudflat and sandflat combined) due to coastal squeeze for the first epoch (2005 - 2025) for Carmarthen Bay & Estuaries SAC, incorporating the Burry Inlet SPA/Ramsar (Halcrow, 2012). This assumes that no estuary infilling/morphological response would occur to offset the predicted coastal squeeze, and in that context this is seen as a worst case scenario. Sensitivity testing was also carried out using a range of sea-level rise scenarios, and this predicted a range of 28-70 Ha of loss, with 49 Ha being based on the UKCP09 central estimate. There is no current evidence of loss.

The National Habitat Creation Programme is referenced as the mechanism to deliver compensatory habitat within the SMP2 IROPI case. Some habitat creation work has been progressed at Cwm Ivy. This site breached in early 2014 and is establishing saltmarsh vegetation along with mudflat habitat within creeks. In the long term is it anticipated that this site could develop around 39 Ha of habitat, although it will be much less than this in the first epoch. There is no evidence of change since designation so this component was assessed as **favourable**.

Structure & function: Carmarthen Bay and Estuaries SAC overlaps with five WFD waterbodies however, only three are relevant and overlap with this feature (Burry Inlet Inner, Burry Inlet Outer, and Tywi & Taf & Gwendraeth - Three Rivers Estuary). All three of these waterbodies fail their assessments, two with a poor result and one with a moderate result, the reasons for failure are driven by ecological status. All three water bodies have a good chemical status. All three waterbodies receive only a moderate for DIN (dissolved inorganic nitrogen). Although all three waterbodies have a high for macroalgae all three waterbodies failed for phytoplankton (2 poor and 1 moderate).
This component has been assessed as **unfavourable**.

Typical species: Two of the three relevant waterbodies were assessed for saltmarsh (Bury Inlet Inner and Outer) one was high and the other was good. However, published literature based on common standards monitoring show changes in species composition and abundance because of grazing. Light grazing can have positive impact upon species composition and abundance so it is the localised heavy overgrazing that is causing this component to be assessed as unfavourable. Bynea saltmarsh was overgrazed in 2012 but since ponies were removed sward height has increased. Llangennech is known to be overgrazed by too many horses, however there has been no new information since 2012. North Gower (west) is very highly grazed (Pauls, in draft). It is unknown to what extent the grazing has affected species composition and abundance (no baseline and no specific data except for Loughor), therefore this component has received an **unfavourable** assessment with low confidence. Note that there are some species present in grazed areas that are not present in ungrazed areas.

Noted activities:

- Coastal flood defence and erosion control
- Infrastructure maintenance
- Dumping waste/spoil
- Nitrogen Deposition

Managed Realignment is occurring at this site (Cwm Ivy) and is regarded as a positive activity for the site https://naturalresources.wales/about-us/our-projects/cwm-ivy-marsh-habitat-creation-project/?lang=en

Evidence used: *The evidence used to support the assessment conclusion.*

- Boyes, S. and Brazier, D.P. (2006). *Intertidal monitoring of the saltmarsh boundaries in the Burry Inlet, Carmarthen Bay and Estuaries SAC in 2004*. CCW Marine Monitoring Report No: 51.
- Environment Agency. (2011). *The Extent of Saltmarsh in England and Wales 2006 – 2009*. Environment Agency report.
- Halcrow (2012). *Lavernock Point to St Ann's Head Shoreline Management Plan (SMP2). Appendix H: Statement to Inform a Habitats Regulations Assessment.*
- Howson, C.M. (2012). *Intertidal SAC monitoring, Carmarthen Bay SAC, September 2009.* CCW Marine Monitoring Report No. 79, 147pp + x, Countryside Council for Wales, Bangor.
- Pauls L. (in draft). *Carmarthen Bay and Estuaries Saltmarsh monitoring report*, NRW.
- Prosser, M.V., Wallace, H.L. (1998). *Taf, Tywi and Gwendraeth saltmarsh survey (Burry Inlet cSAC), 1997*. CCW Contract Science Report No. 293.
- Prosser, M.V., Wallace, H.L. (1999a). *Burry Inlet and Loughor Estuary SSSI, NVC Survey 1998*. CCW Contract Science Report No. 376.
- WFD waterbody classifications (2015). 2009-2015 Classification Data: http://waterwatchwales.naturalresourceswales.gov.uk/en/

3.4 *Salicornia* and other annuals colonising mud and sand indicative condition assessment

The indicative condition of the feature at this site at the time of assessment

Date	May 2017
Site name	Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC
Site feature assessed	*Salicornia* and other annuals colonizing mud and sand

Component of habitat feature assessed	**Indicative Assessment** (*Favourable, unfavourable, unknown*)	**Key evidence type used** (*monitoring data, reports or expert judgement*)	**Level of agreement**	**Confidence in evidence**	**Component confidence level**
Distribution & Extent (within site)	Favourable	WFD assessments, Saltmarsh Monitoring Report, NVC survey & expert judgement	High	Medium	Medium
Structure & function	Favourable	WFD assessments & expert judgement	High	Low	Low
Typical species	Favourable	WFD, Condition Monitoring Report & expert judgement	High	Medium	Medium
Relevant activities (*activities directly impacting condition of the feature on this site*)	No activities identified as having a direct impact on feature condition.				

Overall Indicative Assessment	**Overall Confidence level**
Favourable	Medium

Notes section: *The rationale for the assessment conclusion and confidence.*

Distribution & extent: The Swansea Bay & Carmarthen Bay Shoreline Management Plan HRA predicted a 49 ha loss of intertidal habitat (saltmarsh (ASM, *Salicornia*, and intertidal mudflat and sandflat combined) due to coastal squeeze for the first epoch (0-20 years) for Carmarthen Bay & Estuaries SAC, incorporating the Burry Inlet SPA/Ramsar. This assumes that no estuary infilling/morphological response would occur to offset the predicted coastal squeeze, and in that context, is seen as a worst-case scenario. Sensitivity testing was also carried out using a range of sea-level rise scenarios, and this predicted a range of 28-70 Ha of loss, with 49 ha being based on the UKCP09 central estimate.

The National Habitat Creation Programme is referenced as the mechanism to deliver compensatory habitat within the SMP2 IROPI case. Some habitat creation work has been progressed at Cwm Ivy. This site breached in early 2014 and is establishing saltmarsh vegetation along with mudflat habitat within creeks. In the long term is it anticipated that this site could develop around 39 ha of habitat, although it will be much less than this in the first epoch.

Given the amount of *Salicornia* present (increase in extent since 1999) this small reduction in extent is not significant enough for the assessment to be unfavourable. Only medium confidence in evidence is assigned because there is no data for Three Rivers (West 2015, in prep).

Survey work in the Loughor Estuary suggests a large increase in the feature since 1999 (West, in prep) and there is now some *Salicornia* in in the central coastal section of Llanrhidian Marsh that had diminished since the field survey in 1982 (Charman, 1983). The beds of *Salicornia* between Llanelli and Machynys are likely to be present due to habitat modification for coastal defence purposes. A bed of *Salicornia* was cut in half by vehicle track at Weobley Castle in 2013 and has not recovered as the track is still in use. No other evidence of anthropogenic modification from casework, observation, on ground monitoring or remote sensing.
This component has been assessed as **favourable**.

Structure & function: Carmarthen Bay and Estuaries SAC overlaps with five WFD waterbodies however, only three are relevant and overlap with this feature (Burry Inlet Inner, Burry Inlet Outer, and Tywi & Taf & Gwendraeth - Three Rivers Estuary). All three of these waterbodies fail their assessments, two with a poor result and one with a moderate result, the reasons for failure are driven by ecological status. All three water bodies have a good chemical status. All three waterbodies receive only a moderate for DIN (dissolved inorganic nitrogen). Although all three waterbodies have a high for macroalgae all three waterbodies failed for phytoplankton (2 poor and 1 moderate). However, this feature is relatively tolerant to nitrates and a failure for DIN and phytoplankton was not considered, using expert judgement, to be enough to fail this component of the feature assessment.
This component has been assessed as **favourable**.

Typical species: WFD saltmarsh assessment were carried out in two waterbodies (Burry inlet inner and outer) one was assessed as high and one as good. This habitat is naturally species poor. Species typical of *Salicornia* habitat were recorded in 27 stands which were primarily located in the area east of Whiteford Burrows, with another large bed recorded west of Salthouse in 2013 (West, in prep.).
This component has been assessed as **favourable**.

Noted activities:

- Grazing
- Infrastructure maintenance
- Pollution, diffuse and discharges- point sources

Managed Realignment is occurring at this site (Cwm Ivy) and is regarded as a positive activity for the site https://naturalresources.wales/about-us/our-projects/cwm-ivy-marsh-habitat-creation-project/?lang=en

Evidence used: *The evidence used to support the assessment conclusion.*

- Charman (1983) In: Burd, F. (1987). *Saltmarsh Survey of Great Britain*. County Report: West Glamorgan and Llanelli. Nature Conservancy Council.
- Pauls L. (in draft). *Carmarthen Bay and Estuaries Saltmarsh monitoring report*, NRW.
- Prosser, M.V. and Wallace, H.L. (1999). *Burry Inlet and Loughor Estuary SSSI, NVC Survey 1998*. CCW Contract Science Report No 376.
- Halcrow (2012). *Lavernock Point to St Ann's Head Shoreline Management Plan (SMP2). Appendix H: Statement to Inform a Habitats Regulations Assessment.*
- West, R. (in prep). *Loughor Estuary Salicornia survey 2013.* Natural Resources Wales.
- WFD waterbody classifications (2015). 2009-2015 Classification Data: http://waterwatchwales.naturalresourceswales.gov.uk/en/

3.5 Large shallow inlets and bays indicative condition assessment

The indicative condition of the feature at this site at the time of assessment

Date	May 2017
Site name	Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC
Site feature assessed	Large shallow inlets & bays

Component of habitat feature assessed	**Indicative Assessment** (*Favourable, unfavourable, unknown*)	**Key evidence type used** (*Monitoring data, reports or expert judgement*)	**Level of agreement**	**Confidence in evidence**	**Component confidence level**
Distribution & Extent (within site)	Favourable	Expert judgement	High	Medium	Medium
Structure & function	Unfavourable	WFD assessments, monitoring data and expert judgement	High	Medium	Medium
Typical species	Unfavourable	WFD assessments, monitoring data and expert judgement	High	Low	Low
Relevant activities (*activities directly impacting condition of the feature on this site*)	Diffuse pollution Point source pollution				

Overall Indicative Assessment	**Overall Confidence Level**
Unfavourable	Medium

Notes section: *The rationale for the assessment conclusion and confidence.*

The mudflats and sandflats feature is a sub-feature of the Large shallow inlets & bays feature for this site, at least in part. Therefore, the assessment for this feature should be read in conjunction with this assessment. The state of this sub-features is intrinsically linked to the condition of this feature as it is nested within the feature, at least in part.

Carmarthen Bay & Estuaries Indicative Mudflats and sandflats feature assessment 2017: Unfavourable

Distribution & Extent: There is no casework evidence that indicates a reduction in distribution or extent since designation (expert judgement). Therefore, this component has been assessed as **favourable**.

Structure & Function: The Carmarthen Bay and Estuaries SAC overlaps with a number of WFD waterbodies however, only two overlap with this feature (Burry Inlet Outer & Carmarthen Bay). Burry Inlet Outer has an overall poor status but a good chemical status, Carmarthen Bay waterbody has an overall moderate status but a fail for chemical status driven by a failure for mercury and its compounds. Both waterbodies receive only a moderate for DIN (dissolved inorganic nitrogen) and Bury Inlet outer has a poor assessment for phytoplankton, although both waterbodies had favourable results (high and good) for macroalgae. This component has been assessed as **unfavourable**.

Typical Species: Both waterbodies were assessed for IQI (infaunal quality Index) one (Bury Inlet Outer) received a moderate grade, the other was good. Bury Inlet outer was also assessed as poor for phytoplankton.

Intertidal SAC infaunal data has been gathered recently but has not been fully worked up. Statistical analysis for all of the infaunal sites around Carmarthen Bay do not show any changes up until 2010, other than at Llansteffan where there is a trend over time of increasing *Spio* and *Capitella* (polychaete worms) species, whilst the cockle and other species stay the same. At all but one of the sample sites (2010: LS04b), the changes were not statistically significant.

Subtidal data from 2012 indicates lower species richness compared to 1996, not apparently related to PSA (particle size analysis). Changes due to types of species present as well as abundance (internal NRW analysis), confidence level of medium. Data collected in 1996 and 2012 however survey methods have changed so the data is difficult to interpret. Communities are changing year on year but it is unclear whether the reason for this is anthropogenic or natural. Low number of sampling dates leads to low confidence in the data. More recent surveys may be more conclusive. A good data set exists post 2012 which need analysing.
This component has been assessed as **unfavourable**.

Noted activities:

- Potting for whelks (removal of typical species)

Evidence used: *The evidence used to support the assessment conclusion.*

- Intertidal SAC faunal survey data (not fully analysed)
- Subtidal survey data 1996 & 2012 (not fully analysed)
- WFD waterbody classifications (2015). 2009-2015 Classification Data: http://waterwatchwales.naturalresourceswales.gov.uk/en/

3.6 Sandbanks which are slightly covered by seawater all the time indicative condition assessment

The indicative condition of the feature at this site at the time of assessment

Date	May 2017
Site name	Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC
Site feature assessed	Sandbanks which are slightly covered by seawater all the time

Component of habitat feature assessed	**Indicative Assessment** (*Favourable, unfavourable, unknown*)	**Key evidence type used** (*monitoring data, reports or expert judgement*)	**Level of agreement**	**Confidence in evidence**	**Component confidence level**
Distribution & Extent (within site)	Favourable	NRW monitoring data & expert judgement	High	Low	Low
Structure & function	Unfavourable	NRW monitoring data, WFD assessments & expert judgement	High	Low	Low
Typical species	Unfavourable	NRW monitoring data & expert judgement	High	Low	Low
Relevant activities (*activities directly impacting condition of the feature on this site*)	Water quality issues				

Overall Indicative Assessment	**Overall Confidence level**
Unfavourable	Low

Notes section: *The rationale for the assessment conclusion and confidence.*

Distribution and extent: This component for the feature has been assessed as favourable due to consensus among the assessors that the feature is dynamic and there is no evidence of changes beyond those expected through natural processes. See note on natural loss of extent in relation to 2005 public inquiry below.
This component has been assessed as **favourable**.

Note: During the 2005 Public Inquiry into aggregate extraction at Helwick Bank, the Countryside Council for Wales (CCW) presented evidence that we considered the bank to be declining in extent over the long term. This was based on a mixture of historical maps and charts with high associated inaccuracies and more recent bathymetry data collected by the marine aggregates industry. The apparent trend indicated that the bank was losing volume inexcess of that which was being extracted and therefore CCW's case was that the additional effect of extraction would further affect condition of the feature. Despite a licence being granted to allow limited further extraction to take place, no further extraction has actually occurred since 2005, and the licence has now been relinquished. Unfortunately, we are not aware of any new bathymetry data to identify whether the apparent long term trend has continued and whether the bank has continued to reduce in extent.

Structure and function: Carmarthen Bay and Estuaries SAC overlaps with five WFD waterbodies (Burry Inlet Inner, Burry Inlet Outer, Carmarthen Bay, Tywi & Taf & Gwendraeth - Three Rivers Estuary and Bristol Channel Outer North). However, the sandbank feature on this site (Helwick bank) overlaps partially with only one water body - Bristol Channel Outer North – the rest of the sandbank is outside the WFD assessment area. This waterbody has an overall moderate status with a good chemical status. The only failure in this waterbody is a moderate for DIN (dissolved inorganic nitrogen) but it was assessed as good for phytoplankton, it was not assessed for any of the other relevant WFD elements such as infaunal quality index, angiosperms or macroalgae. NRW SAC monitoring has found a decline in species richness, abundance and diversity on this sandbank but the data is quite old so there is low confidence in the evidence.
This component has been assessed as **unfavourable**.

Typical species: NRW SAC monitoring data shows that there has been a decline in species richness, abundance and diversity (Shannon Diversity Index) of infauna on all Welsh sandbanks for which there are data. For this site there are data for two sampling locations adjacent to Helwick Bank in 1998 and samples from a transect across the bank in 2001 & 2013. The evidence for decline is strong but the reason(s) are not clear so this attribute has been assessed as unfavourable with a low confidence due to the age of the data from the actual bank and uncertainty over the cause of the decline. More grab data was collected in 2015 and 2016 but has yet to be analysed.
This component has been assessed as **unfavourable**.

Evidence used: *The evidence used to support the assessment conclusion.*
• Bergmann, M.J., Hinz, H., Galanidid, M., Shucksmith, R., Rees, E.I.S, Darbyshire, T. & Ramsay, K. (2004) Demersal fish and spifauna associated with sandbank habitats. Estuarine, Coastal and Shelf Science, 60:445-456. • NRW SAC monitoring data • WFD waterbody classifications (2015). 2009-2015 Classification Data: http://waterwatchwales.naturalresourceswales.gov.uk/en/

3.7 Allis shad *Alosa alosa* & Twaite shad *Alosa fallax* indicative condition assessment

The indicative condition of the feature at this site at the time of assessment

Date	May 2017
Site name	Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC
Site feature assessed	Allis & Twaite Shad (*Alosa alosa & Alosa fallax)*

Component of species feature assessed	**Indicative Assessment** (*Favourable, unfavourable, unknown*)	**Key evidence type used** (*Monitoring data, reports or expert judgement*)	**Level of agreement**	**Confidence in evidence**	**Component confidence level**
Freshwater population variables	Favourable	Monitoring Report (Garrett, 2015)	High	High	High
Marine habitat	Unfavourable	WFD 2015 assessments & expert judgement	High	Low	Low
Relevant activities (*activities directly impacting condition of the feature on this site*)	Water quality issues				

Overall Indicative Assessment	**Overall Confidence level**
Unfavourable	Low

Notes section: *The rationale for the assessment conclusion and confidence.*

Note: Allis and twaite shad are closely related and are known to hybridise. Allis shad are much rarer and although their presence is suspected in the Wye and Usk, there are no recent confirmed records. Genetic studies show that populations in the Wye, Usk, Tywi and Severn all show evidence of significant levels of past or current hybridisation (Hardouin *et al*., 2013). Hybrids are particularly prevalent on the Tywi, where about 75% of twaite shad contain allis shad genes, though this is more likely to reflect past hybridisation.

The Welsh side of the Bristol Channel contains almost all the known UK populations of shad. This assessment uses data from the Afon Tywi SAC. It is also likely that juvenile and adult fish from Severn Estuary SAC use Carmarthen Bay & Estuaries SAC, but as no specific fish monitoring data are available no separate assessment has been carried out.

Freshwater population variables: Population assessment data are spatial and based on egg surveys with DNA quality assurance (Hardouin *et al.,* 2013, Stone, 2015). These indicate that spawning occurs mainly in the lower river below Nantgaredig, but are unable to reflect the likely impact of the Nantgaredig abstraction. Temperature studies have shown that the Tywi is too cold to support a viable shad population above Llandeilo (Knights 2014). A fish counter is present at Nantgaredig but shad have proved technically difficult and relatively labour-intensive to monitor in this way: consequently, only limited count data are available. This component has been assessed as **favourable** and high confidence based on the high-quality data from egg survey in the Afon Tywi SAC.

Marine habitat: The **unfavourable** assessment of this component is habitat is due to WFD assessment for the relevant waterbodies, indicating poor habitat quality in relation to dissolved inorganic nitrogen (DIN), phytoplankton and invertebrates – but note that lack of fish tool data for this area is a significant gap.

Noted Activities: Assessment of relevant activities in the marine environment has not been possible in advance of the workshop. Shad feed pelagically on crustaceans and small fish in estuaries as juveniles and subsequently at sea, so are sensitive to impacts affecting the abundance of prey items, noise disturbance and impacts on migration routes. They may also be entrained in industrial intakes.

Evidence used: *The evidence used to support the assessment conclusion.*

- Garrett, HM, (2015). *Afon Tywi SAC shad spawning assessment 2015 (Alosa alosa & Alosa fallax), incorporating classification of 2013 and 2014 survey data*. NRW Evidence report no 87. 29pp, Natural Resources Wales, Bangor.
- Hardouin, E.A., Stuart, S., Andreou, D. (2013). *Monitoring Allis and Twaite Shad: quality assurance and species identification using molecular techniques*. NRW Evidence Report No: 1, 41pp, Natural Resources Wales, Bangor.
- Knights AM. (2014). *Modelling the response of the twaite shad (Alosa fallax) population in the Afon Tywi SAC to a modified temperature regime*. 48pp. NRW Evidence Report No. 6. Bangor, Natural Resources Wales.
- JNCC (2005). *Common Standards Monitoring Guidance for Freshwater Fauna*, Version - August 2015, ISSN 1743-8160 (Online)
- JNCC (2015). *Common Standards Monitoring Guidance for Freshwater Fauna*, Version - October 2015, ISSN 1743-8160 (Online)
- Stone, D.M. (2015). *Monitoring Allis and Twaite Shad: quality assurance and species identification using molecular techniques*. NRW Evidence Report 53. Bangor, Natural Resources Wales.
- Thomas, R. & Garrett, H. (2013). *2nd Reporting Cycle Condition Assessments (2007-2012): Afon Tywi SAC*.
- Thomas, Rh., Hatton-Ellis, T.W., Garrett, H. (2013). *Water Quality Assessments for River Special Areas of Conservation: Second Habitats Directive Reporting Round (2007-2012).* 12/8/2. Bangor, Countryside Council for Wales. CCW Staff Science Reports.
- WFD waterbody classifications (2015). 2009-2015 Classification Data: http://waterwatchwales.naturalresourceswales.gov.uk/en/

3.8 River lamprey *Lampetra fluviatilis* indicative condition assessment

The indicative condition of the feature at this site at the time of assessment

Date	May 2017
Site name	Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC
Site feature assessed	River Lamprey (*Lampetra fluviatilis*)

Component of species feature assessed	**Indicative Assessment** (*Favourable, unfavourable, unknown*)	**Key evidence type used** (*Monitoring data, reports or expert judgement*)	**Level of agreement**	**Confidence in evidence**	**Component confidence level**
Freshwater population variables	Favourable	Monitoring Report (Thomas & Garrett, 2012).	High	High	High
Marine habitat	Unfavourable	WFD 2015 assessments & expert judgement.	High	High	High
Relevant activities (*activities directly impacting condition of the feature on this site*)	Water quality issues				

Overall Indicative Assessment	**Overall Confidence level**
Unfavourable	High

Notes section: *The rationale for the assessment conclusion and confidence.*

Freshwater population variables: The supporting datasets are based on a specific NRW monitoring programme following relevant JNCC CSM Guidance (2005; 2015). As with all migratory fish, the assessment is based on data from the inflowing river (Afon Tywi), as relevant marine data have not been collected. *Lampetra* spp. cannot be reliably identified to species at the larval stage, so there is inherent uncertainty in the population assessment. The specific variables measured were: Age Structure: Pass, Distribution within catchment: Pass. Ammocoete density: Pass, Overall: Pass/favourable.
This component has been assessed as **favourable**.

Marine habitat: WFD data was used from the relevant waterbodies (Burry Inlet Inner, Burry Inlet Outer, Carmarthen Bay, Tywi & Taf & Gwendraeth - Three Rivers Estuary and Bristol Channel Outer North), all five of these waterbodies fail their assessments, two with a poor result and three with a moderate result. Four of five water bodies have a good chemical status although one – Carmarthen Bay waterbody – fails for mercury and its compounds. All five waterbodies receive only a moderate for DIN (dissolved inorganic nitrogen) and two of the three waterbodies assessed for IQI (infaunal quality index) received a moderate grade, the other was good. All five waterbodies were assessed for phytoplankton with the following results: 2 poor, 1 moderate and 2 good. Lack of fish tool data is a significant gap here.
This component has been assessed as **unfavourable**.

Evidence used: *The evidence used to support the assessment conclusion.*

- Carpenter, G. (2013). *River Tywi EA assessment of recent actual flows 2006 - 2011 FINAL version 2013*. NRW-14-008823
- JNCC (2005). *Common Standards Monitoring Guidance for Freshwater Fauna, Version - August 2015*, ISSN 1743-8160 (Online)
- JNCC (2015). *Common Standards Monitoring Guidance for Freshwater Fauna, Version - October 2015*, ISSN 1743-8160 (Online)
- JNCC (2016). *Common Standards Monitoring Guidance for Rivers. Version September 2016* (Updated from January 2014), Peterborough: Joint Nature Conservation Committee.
- Thomas, Rh. & Garrett, H. (2012). *Afon Tywi Population Attribute Condition Assessment for Brook, River and Sea Lamprey 2011.* CCW Staff Science Report No. 11/8/5.
- Thomas R, Garrett H. (2013). *2nd Reporting Cycle Condition Assessments (2007-2012)*: Afon Tywi SAC.
- Thomas Rh, Hatton-Ellis TW, Garrett H. (2013). *Water Quality Assessments for River Special Areas of Conservation: Second Habitats Directive Reporting Round (2007-2012).* 12/8/2. Bangor, Countryside Council for Wales. CCW Staff Science Reports.
- WFD waterbody classifications (2015). 2009-2015 Classification Data: http://waterwatchwales.naturalresourceswales.gov.uk/en/

3.9 Sea lamprey *Petromyzon marinus* indicative condition assessment

The indicative condition of the feature at this site at the time of assessment

Date	May 2017
Site name	Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC
Site feature assessed	Sea lamprey (*Petromyzon marinus*)

Component of species feature assessed	**Indicative Assessment** (*Favourable, unfavourable, unknown*)	**Key evidence type used** (*monitoring data, reports or expert judgement*)	**Level of agreement**	**Confidence in evidence**	**Component confidence level**
Freshwater population variables	Unfavourable	Monitoring reports (Thomas & Garrett 2012; Davies 2016).	High	High	High
Marine habitat	Unfavourable	WFD Assessment 2015 & expert judgement	High	Medium	Medium
Relevant activities (*activities directly impacting condition of the feature on this site*)	Water quality issues				

Overall Indicative Assessment	**Overall Confidence level**
Unfavourable	High

Notes section: *The rationale for the assessment conclusion and confidence.*

Freshwater population variables: The supporting datasets are based on a specific NRW monitoring programme following relevant JNCC CSM Guidance (2005; 2015). As with all migratory fish, the assessment is based on data from the inflowing river (Afon Tywi), as relevant marine data have not been collected.

Although sea lamprey ammocoetes are distinct from *Lampetra* ammocoetes, they are typically much less frequent in samples and so can be difficult to detect. Therefore, sea lamprey ammocoete data are always poor. At this site, valuable hydroacoustic data have been collected demonstrating a strong but highly variable annual run estimated at between 1200 and 12,000 individuals (Davies 2016). Since the monitoring location at Nantgaredig is approximately 9km above the tidal limit, it is probable that this underestimates the number of spawners, as some spawning may occur downstream with these individuals not being detected.

The specific variables measured were: Ammocoetes: Fail (Low confidence) and Adult Run: Favourable.
This component was assessed as **unfavourable**.

Marine habitat: WFD data was used from the relevant waterbodies (Burry Inlet Inner, Burry Inlet Outer, Carmarthen Bay, Tywi & Taf & Gwendraeth - Three Rivers Estuary and Bristol Channel Outer North), all five of these waterbodies fail their assessments, two with a poor result and three with a moderate result. Four of the five waterbodies have a good chemical status although one – Carmarthen Bay waterbody – fails for mercury and its compounds. All five waterbodies receive only a moderate for DIN (dissolved inorganic nitrogen) and two of the three waterbodies assessed for IQI (infaunal quality Index) received a moderate grade, the other was good. All five waterbodies were assessed for phytoplankton with the following results: 2 poor, 1 moderate and 2 good. The lack of fish tool data is a significant gap here however.
This component was assessed as **unfavourable**.

Evidence used: *The evidence used to support the assessment conclusion.*

- Carpenter, G. (2013). *River Tywi EA assessment of recent actual flows 2006 - 2011 FINAL version 2013*. NRW-14-008823
- Davies R. (2016). *Sea Lamprey Monitoring on the River Tywi 2011-2014*. NRW Report NFAT/16/02.
- JNCC, (2005). *Common Standards Monitoring Guidance for Freshwater Fauna, Version - August 2015*, ISSN 1743-8160 (Online)
- JNCC, (2015). *Common Standards Monitoring Guidance for Freshwater Fauna, Version - October 2015*, ISSN 1743-8160 (Online)
- Thomas, Rh. & Garrett, H. (2012). *Afon Tywi Population Attribute Condition Assessment for Brook, River and Sea Lamprey 2011.* CCW Staff Science Report No. 11/8/5.

- Thomas R, Garrett H. (2013) *2nd Reporting Cycle Condition Assessments* (2007-2012): Afon Tywi SAC.
- Thomas Rh, Hatton-Ellis TW, Garrett H. (2013). *Water Quality Assessments for River Special Areas of Conservation: Second Habitats Directive Reporting Round (2007-2012). 12/8/2*. Bangor, Countryside Council for Wales. CCW Staff Science Reports.
- WFD waterbody classifications (2015). 2009-2015 Classification Data: http://waterwatchwales.naturalresourceswales.gov.uk/en/

3.10 Otter *Lutra lutra* indicative condition assessment

The indicative condition of the feature at this site at the time of assessment

Date	May 2017
Site name	Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC
Site feature assessed	Otter (*Lutra lutra*)

Component of species feature assessed	**Indicative Assessment** (*Favourable, unfavourable, unknown*)	**Key evidence type used** (*Monitoring data, reports or expert judgement*)	**Level of agreement**	**Confidence in evidence**	**Component confidence level**
Population (e.g. size, structure, production, condition of species within site, contaminant burdens)	Favourable	Monitoring data, reports & expert judgement	High	Medium	Medium
Range (within site)	Unknown	Reports & expert judgement	High	Not applicable	Not applicable
Supporting habitats					
Distribution & extent	Unfavourable	Monitoring data & reports.	High	Medium	Medium
Structure & function	Unfavourable	Monitoring data & reports.	High	Medium	Medium
Prey availability and quality	Unknown	Not applicable	High	Not applicable	Not applicable
Relevant activities (*activities directly impacting condition of the feature on this site*)	No activities identified as having a direct impact on feature condition.				

Overall Indicative Assessment	**Overall Confidence Level**
Favourable	Medium

Notes section: *The rationale for the assessment conclusion and confidence.*

Note: For the otter feature the population and range attributes were felt to be the most important elements with supporting habitats, although also important, as less important in these indicative condition assessments. It was agreed that they should not fail the feature if the population and/or range were favourable. This is because less is known about these supporting habitats as they relate to otter in European marine sites.

Population: The two hydrometric sites of relevance to this site are the Tywi and Loughor hydrometric area. The Tywi hydrometric area showed a continued improvement in the total number and proportion of positive sites[3] from 2002 to 2009-10, having an additional 17 positive sites, an increase from 76% to 94% while the Loughor area showed an increase from 78% to 100% positive sites between 2002 and 2009/10 (Strachan, 2015).

No data available on cub production or population available, although breeding sites were identified and were mapped in 2010. Kean, Lyons and Chadwick (2013) show that despite the population increase, there are indications which suggests that otters may not be in optimal reproductive health.
This component has been assessed as **favourable**.

Trend (population only): Increasing
Confidence in trend: Medium

Range (within site): Liles (2010) identified 4 places where there are physical barriers that prevent or deter otter travel at this site. Wilkinson and Chadwick (2012) identified 2 areas of high concern and 2 areas of medium concern in Carmarthenshire. More needs to be known about these barriers to assess their effects on otter range within this area and how it relates to the condition of otters of the Carmarthen Bay & Estuaries SAC.
This component has been assessed as **unknown**.

Supporting Habitats:

Distribution & extent: Results from Liles 2010 indicate that, although the estuaries of the Taf, Tywi and Loughor are well used by otters, habitat availability (both resting and breeding sites) on coastal & estuarine fresh water streams is generally poor. Lack of resting sites was particularly highlighted for Pendine Marsh. Only one potential breeding site was found close to the coast on the

[3] Positive sites are survey sites which show sign of the presence of otters, this is calculated against a baseline survey in 1977-78.

three coastal stretches, at West House on the Pendine Marshes. In contrast, 10 potential breeding sites were found in the 4 estuaries. Breeding sites are notoriously difficult to find/determine. Local record centre records of breeding otter do exist for this site. Opportunities to create otter habitat, mostly for resting sites, were identified at 14 sites, in both the coastal stretches and estuaries (Liles, 2010). This attribute has been assessed as **unfavourable** with a high confidence because of the evidence documented in Liles' report.

Structure & function: *Habitat quality:* Liles, 2010 specifically looked at this attribute: Access for otters between coastal streams and the coast was recorded as "difficult" at three sites. At Tenby otters must cross the railway line; at Saundersfoot, tidal doors prevent access into the upper harbour and a long culvert pipe runs under part of the town and the main road; and at Amroth Castle the stream culvert pipe under the road is situated 2m above the beach, so that otters must cross the road. This attribute has therefore been recorded as unfavourabl**e** and with a high confidence because there are several examples of this target not being met. Consideration was given to the fact that these modifications were made some time ago (some certainly before the site was designated). However, there is scope to improve the foreshore access for otters in line with the restoration objectives of the Habitats Directive so the unfavourable assessment seems appropriate.

Kean *et al*. (2013) shows that despite the population increase, there are indicators which suggest that otters may not be in optimal reproductive health. The Article 17 reporting (reporting to Europe) ranked the threat of "Use of biocides, hormones and chemicals" as of high importance for otters. Since no target has been developed it is difficult to assess this attribute but the general trend of bioaccumulating contaminants decreasing in otters suggests that a favourable assessment is appropriate, but with a low confidence because of limited data on effect and source (Kean *et al*., 2013, Walker et al., 2011).

The assessment for this attribute is **unfavourable** due to habitat quality although it is recognised that bioaccumulating contaminants are decreasing and if this was a separate attribute it would be assessed as favourable.

Prey availability & quantity: There is no evidence regarding the diet of otters in this site and whether prey is changing. Therefore, this component has been assessed as **unknown**.

Evidence used: *The evidence used to support the assessment conclusion.*

- Evidence of breeding otter at this site from Local Records Centre records
- Hobbs, G.I., Chadwick, E.A., Bruford, M.W. and Slater, F.M. (2011). *Bayesian clustering techniques and progressive partitioning to identify population structuring within a recovering otter population in the UK*. Journal of Applied Ecology 48: 1206–1217.
- Kean, E.F., Lyons G, & Chadwick EA. (2013). *Persistent organic pollutants and indicators of otter healt*h. A CHEM Trust report.
- Liles, G. (2004). *Otter Road Mortality Site. Mitigation measures*. Proposals for Commissioners Bridge, Kidwelly.
- Liles, G. (2010). *Otter (Lutra lutra) activity within the Carmarthen Bay & Estuaries Special Area of Conservation*. A report for the Carmarthen Bay & Estuaries European Marine Site Relevant Authorities Group.
- Strachan, R. (2015). *Otter Survey of Wales*. Natural Resources Wales. Published by Natural Resources Wales. https://naturalresources.wales/evidence-and-data/research-and-reports/wales-otter-report-2009-10/?lang=en
- Walker, L.A, Lawlor, A.J., Chadwick, E.A., Potter, E., Pereira, M.G. & Shore, R.F. (2011). *Inorganic elements in the livers of Eurasian otters, Lutra lutra, from England and Wales in 2009 - a Predatory Bird Monitoring Scheme (PBMS) report***.** Centre for Ecology & Hydrology, Lancaster, UK.
- Wilkinson, C. and Chadwick, EA (2012) *Otter casualties in South Wales: Recommendations for Mitigation*. *Cardiff University Otter Project.*

3.11 Comparison with previous assessments

The indicative condition assessments were compared to previous assessments for these features at the site level carried out between 2005 – 2007. The earlier assessments were carried out in more detail and different data and evidence sources were sometimes used; as a result, current and previous assessments are not directly comparable, although they do both give an indication of the condition of the feature at the time of assessment.

Feature	2005 - 07 assessments	2017 indicative assessments
• Estuaries	Unfavourable	Unfavourable
• Mudflats and sandflats not covered by seawater at low tide	Unfavourable	Unfavourable
• Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	Unfavourable	Unfavourable
• *Salicornia* and other annuals colonising mud and sand	Favourable	Favourable
• Large shallow inlets and bays	Unfavourable	Unfavourable
• Sandbanks which are slightly covered by seawater all the time	Unfavourable	Unfavourable
• Allis shad (*Alosa alosa*)	Unfavourable	Unfavourable
• Twaite shad (*Alosa fallax*)	Unfavourable	Unfavourable
• River lamprey (*Lampetra fluviatilis*)	Unfavourable	Unfavourable
• Sea lamprey (*Petromyzon marinus*)	Unfavourable	Unfavourable
• Otter (*Lutra lutra*)	Favourable	Favourable

4. Future development of site level assessments

Following this full round of indicative site condition assessments, we are now developing a permanent, sustainable, site level feature condition reporting process that can be delivered on a regular basis. We are planning a series of projects to work towards this goal. It is unlikely that resources and suitable evidence sources will all be available at any given time to monitor and report on all features, or to report to the same level of confidence. Our aim, however, is to develop, over the coming few years, an assessment and reporting process that is of practical use in informing effective site management for the maintenance or improvement of feature and site condition.

Annex A: Process used to produce indicative condition assessments

The process to produce indicative feature condition assessments at the site level centred around a workshop approach that applied readily available evidence and expert judgement to provide an *indication* of features condition. Figure A1 summarises the process of producing indicative condition assessments, and Figure A2 provides a summary definition of NRW's meaning of indicative site level feature condition assessments and advice on how they should be used.

Figure A1: Summary of the procedure undertaken

Stages undertaken to produce indicative site level condition assessment reports for Welsh European marine sites (EMS)

1. Indicative condition assessment workshop
2. Standardisation of indicative feature assessments across different sites
3. Standardised feature assessments sent out internally for comment
4. Issues with individual assessments resolved
5. Features assessments re-issued to internal staff for final comments.
6. Final draft indicative feature-level condition assessments produced
7. Internal sign-off * - draft indicative feature-level condition assessments
8. External quality assurance of draft indicative feature-level condition assessments
9. Changes made to assessments arising from quality assurance stage
10. Production of site-level reports containing indicative assessments and guidance for interpretation and use of indicative assessments
11. Final Internal sign-off ** - final site-level reports

* 1st internal sign-off by a dedicated task & finish group for the work
** Final internal sign-off by the task & finish group and then the Marine Programme Board

Figure A2: Summary definition of indicative site condition assessment.

Indicative condition assessments: Definition and use

The term 'indicative condition assessment' describes the use of readily available evidence and expert judgement in an intensive, collective workshop process to provide an indication of feature condition at the site level.

The confidence rating associated with the assessments is an **integral** part of the indicative assessment. Confidence levels for feature assessments should therefore **always** be quoted alongside the indicative condition result, together with NRW's definition of 'indicative condition assessment'.

A.1 Indicative condition assessment workshop

Existing readily available data and information was collated and an organisation-wide workshop held with NRW's specialists. By using the evidence available at the workshop and applying expert judgement, staff examined each feature for each site and drew indicative conclusions on condition. A total of 69 assessments were carried out; 66 within the workshop and a further three, for otter, following the workshop, to accommodate staff availability.

A.1.1 Assessment templates

Assessment templates were produced in advance of the workshop. These templates differed slightly depending on the feature type. In all cases the assessments were broken down into different components that were assessed separately. To assist with the workshop assessment process, staff populated the templates with relevant information before the workshop.

The templates included a notes section for providing more information on the component assessments, and an evidence section for listing the information used to inform the assessments – this was not, however, a full reference list.

A.1.2 Confidence levels

Guidance on the confidence levels to use for the assessments was produced before the workshop (Annex B).

A.1.3 Guidelines agreed at the workshop

At the beginning of the workshop the assessment approach was discussed and the following guidelines were agreed:

- 'Baseline' is considered to be the state at the time of designation – unless there is a recovery target in the conservation objectives. This means that significant modifications at the site before designation should not be taken into consideration unless there was a recovery target in the conservation objective for that feature at that site.
- The indicative condition is based on current knowledge and is based on the present i.e. the date of the assessment - but significant future concerns should be noted.
- If one attribute of the condition assessment is unfavourable, then the whole assessment is judged to be unfavourable ('one out, all out') unless there is a good reason to diverge from this. This is standard practice for NRW's Water Framework Directive (WFD) assessment processes as well as for terrestrial sites.
- Small-scale local known impacts should not necessarily result in a conclusion of unfavourable condition, but impacts should be noted.
- Assessments where there are 'unknowns' do not necessarily lead to a conclusion of unfavourable condition.
- There can be an overall 'unknown' conclusion where there is no information available to make the assessment.
- Nested features should be related to each other in the assessments. For example, an estuary feature in a site might encompass other named features. For example, in Pembrokeshire Marine SAC, the estuary feature also encompasses the mudflats and sandflats feature and the Atlantic saltmeadows feature.

- Where there is limited data an assessment should be made but the lack of data should be reflected in the confidence score.
- Any activities, developments or management measures that are having either positive or negative impacts should be noted in the assessments.
- Context on the indicative assessments and confidence ratings should always accompany the release of the conclusions on site level feature condition.

A.1.4 Post workshop processing of indicative assessments.

All 69 assessments were then taken through a process of developing them from the draft assessments agreed at the workshop to finalised indicative assessments contained within site level reports (Figure A1).

A.2 Use of best, readily available evidence

During the collation exercise and the workshop the best readily available evidence was used. Confidence ratings were applied to the evidence used for each component of the assessment (the guidance on these confidence levels can be found in Annex B). Three main sources of evidence were available before and during the workshop:

- Site-level monitoring data
- WFD Waterbody Assessments
- Activities information

In addition, expert judgement was a key part of the assessment process, drawing on the knowledge, expertise and experience that staff have amassed over many years collectively, from: training and research; visiting the sites; monitoring and survey work; and the provision of advice on development planning and activities regulation at the site level.

A.2.1 Site level monitoring data and reports

Monitoring is carried out on features or sub-features of our European marine sites following the UK common standards monitoring guidance. The amount of monitoring NRW carries out is, however, limited to the resources available, and hence the resultant prioritised monitoring programme does not provide monitoring data for all features.

Limitations:
Although the relevant specialists were present, the intensive workshop format did not always allow for full, detailed scrutiny of individual SAC monitoring reports for some features. Some monitoring information was therefore checked or added to after the workshop. A lack of resources to produce analysed reports on all existing monitoring data was highlighted as an issue during the workshop.

A.2.2 Water Framework Directive (WFD) Waterbody Assessments

The latest relevant WFD waterbody assessments (2015[4]) were used during the workshop. Both Transitional and Coastal Water bodies overlap with the SAC boundaries but, in most cases, the boundaries do not match with SAC boundaries. Maps showing the water bodies can be found at the Water Watch Wales web site[5].

[4] Environment Agency. 2015. Classification of Surface Water Bodies for the Water Framework Directive – Method Statement. Version 3.0 updated August 2014.
[5] http://waterwatchwales.naturalresourceswales.gov.uk/en/

Limitations:
Although good use was made of the summary data for the waterbody assessments, and tables had been created linking the relevant waterbodies to the relevant European marine sites, complete datasets were not available for the workshop. In addition, although some mapping data was available, the data points for each monitoring element and how they related to the feature being assessed were not available for all assessments. This was due to time constraints and the number of assessments being carried out. WFD specialists were, however, available to provide expert advice during and after the workshop.

There was some discussion among assessors on the use of some WFD elements and their relevance to individual features. The mercury and brominated diphenylether (BDPE) standard used in the 2015 WFD assessments are new more stringent standards which did not need to be implemented until 2018 but nonetheless were used in the knowledge that new standards will be coming in and to be consistent between England and Wales. These new standards have not been used in the Marine Strategy Framework Directive (MSFD) habitat assessments, which instead used the OSPAR[6] (Oslo and Paris conventions) standards for these elements.

Since the WFD assessments had been used extensively in the NRW indicative condition assessments, the decision was made, for reasons of consistency, to use the new WFD standard. It should be noted that if NRW had used the OSPAR standard some of the component elements of the indicative condition assessments would have been favourable. As part of the next stage of further developing NRW's approach to MPA site level feature condition assessment, further work is planned to assess which standards are the most relevant to apply to the Welsh MPA network.

A.2.3 Activities information

The NRW LIFE Natura 2000 (N2K) Programme[7] focussed on producing Prioritised Improvement Plans (PIPs) for each European site in Wales. These provided information on the pressure and threats for each feature of each site for assessors at the workshop. Staff were also available to discuss any ongoing casework[8] at the site level that may have impacted site condition.

Limitations:
The summary data provided was useful but, due to the number of features, information on the pressures and threats was only provided in a summary form so that detailed site level information for each issue against each feature could not be explored.

However, staff with expert local knowledge were also available to discuss pressures and threats at the site, and hence available activity information and knowledge was sufficient to support the indicative assessment process.

Two types of activity information were reported by assessors in the indicative condition assessments:

[6] Oslo and Paris conventions managed by the OSPAR Commission: https://www.ospar.org/
[7] https://naturalresources.wales/about-us/our-projects/life-n2k-wales/?lang=en
[8] Casework is a term used to encompass the assessments of plans and projects on protected sites

Relevant activities: These were activities agreed during the indicative assessment process as having an impact on the condition of the feature, underpinned by evidence. There was no confidence rating associated with these activities or their associated impacts.

Noted activities: These were activities agreed during the indicative assessment process as occurring in the site, but where there is no evidence that the activity is having a direct impact on condition of the feature at that site. Noted activities may be having, or have the potential to have, an impact on feature condition, and were listed to be kept under review.

Not all activities for a site from the LIFE N2K Programme were listed in the assessments as relevant or noted activities by the assessors. The activities listed are not meant to replace the pressures and threats in the Prioritised Improvement Plans.

Annex B: Confidence level guidance used in the site level indicative condition assessments.

B.1 Assigning confidence to component parts of the feature assessments

An indicative assessment was made for each component part of the assessment (e.g. structure and function, or typical species). These components varied depending on which feature was being assessed.

There were three potential outcomes for the assessment for each component of condition:

- favourable,
- unfavourable or
- unknown

Each outcome was assigned a confidence level.

Use of 'Unknown': The *unknown* category was only used for the condition assessment where the evidence base was extremely low or absent, and as a result it was not possible to reach any conclusion on condition. In this case the confidence level for the evidence part of that assessment was recorded as not applicable (N/A).

Even where a value was given for 'level of agreement', if the overall assessment of the component was unknown, the overall component confidence level was also recorded as not applicable (N/A).

Use of 'Unfavourable': Where any one component was unfavourable, the overall conclusion was unfavourable, (the 'one out, all out' rule), unless there was a good reason to deviate from this. See, for example, the otter assessments.

There were two types of confidence considered during the indicative condition assessment process.

1. The level of consensus between assessors and
2. The confidence in the evidence that the assessment was based on.

A matrix approach was used for this first stage of assigning confidence levels for each component of the indicative assessment.

Figure B1: Matrix used to assign the confidence level for each component of the indicative condition assessment.

Level of agreement ↑				
	High	***Low***	***Medium***	***High***
	Medium	***Low***	***Medium***	***Medium***
	Low	***Low***	***Low***	***Low***
		Low	Medium	High
		Confidence in evidence →		

B.1.1 Level of agreement between assessors

Assessors were required to draw conclusions based on the available evidence in the context of their knowledge of the relevant feature at that site. Where available evidence was contradictory or of only partial benefit in arriving at a condition assessment, this was resolved as far as possible, taking into account the amount, quality and relevance of the data. The resultant conclusion was given a confidence rating for the degree of consensus amongst the assessors, as follows:

- **High:** All assessors agreed with the assessment of the feature condition component;
- **Medium:** The majority of the assessors agreed with the assessment of the feature condition component;
- **Low:** There was no clear consensus on the assessment of the feature condition component.

B.1.2 Level of confidence in the evidence used to make the assessment

The degree of confidence in the assessments of each component was based on the quantity, quality, relevance or consistency of the evidence used. The categories are high, medium and low confidence as described below:

High confidence

- Clear evidence from complete monitoring surveys (high quality data collected to relevant standards with robust analysis of results and appropriate positional data) to support assessment relevant to condition components.

Medium confidence

- Partial survey or one of lower quality (i.e. lacking detail or appropriate positional data);
- Indirectly relevant to condition components but evidence may be from a complete survey, scientifically accurate study, peer-reviewed research or other surveys;
- Site-based, expert knowledge directly relevant to targets, supported by evidence (i.e. records, casework history, photos, positional data).

Low confidence

- Incomplete, old or lower quality survey;
- High quality data but from only a small portion of the component (e.g. data only available for one small area of a habitat on a site where that habitat is extensive and varied);
- Modelled information;
- Site-based, expert knowledge information either indirectly relevant to component condition or lacking sufficient supporting information.

B.2 Assigning confidence levels to the overall indicative condition assessment

The process for assigning the overall confidence level for the indicative assessment of the feature from the component confidence levels used the following rules:

- Where the overall indicative condition assessment was Unknown the confidence level was stated as not applicable.
- Where only one of the assessment components was unfavourable (leading to the overall assessment of unfavourable), the confidence level associated with the unfavourable component was used.
- Where two or more of the assessment components were unfavourable (leading to the overall assessment of unfavourable), the highest confidence level assigned to one of the unfavourable components was used for the overall confidence level.
- In all other circumstances the highest confidence level[9] attained for one of the individual components was used.

B.3 Use of confidence ratings

In all instances, whenever the indicative features and site condition assessments are reproduced or quoted this should be done together with the confidence rating and the definition of indicative assessment provided in this report.

[9] The use of the highest confidence level is one used in WFD assessments – reflecting that the assessment confidence is based on the best evidence available.

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