Report under The Conservation of Habitats and Species Regulations 2017 (as amended), Regulation 9A

2019-2024

Conservation status assessment for the habitat:

H1150 - Coastal lagoons

Wales

Cyfoeth Naturiol Cymru
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JNCC

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Important note - Please read

- The information in this document represents Wales Report under The Conservation of Habitats and Species Regulations 2017 (as amended), Regulation 9A, for the period 2019-2024.
- It is based on supporting information provided by Natural Resources Wales, which is documented separately.
- The Habitats Regulations reporting 2019-2024 Approach Document provides details on how this supporting information contributed to the UK Report and the fields that were completed for each parameter.
- Maps showing the distribution and range of the habitat are included.
- Explanatory notes (where provided) are included at the end. These provide additional audit trail information to that included within the assessments. Further underpinning explanatory notes are available in the related country reports.
- Some of the reporting fields have been left blank because either: (i) there was insufficient information to complete the field; (ii) completion of the field was not obligatory; and/or (iii) the field was not relevant to this habitat (section 11 National Site Network coverage for Annex I habitats).

Further details on the approach to the Habitats Regulations Reporting 2019-2024 are available on the JNCC website.

Assessment Summary: Coastal lagoons

Distribution Map

Range Map

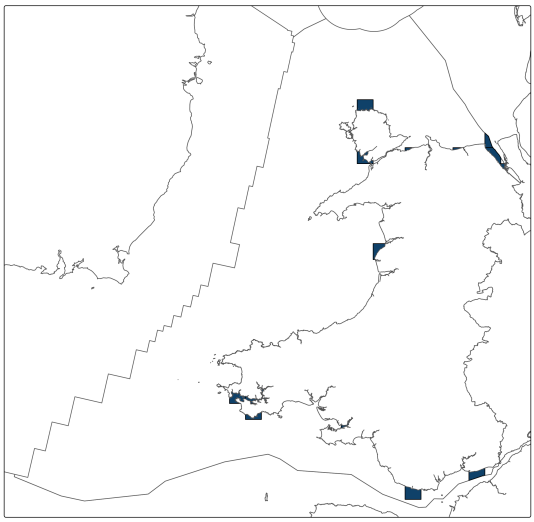

Figure 1: Wales distribution and range map for H1150 - Coastal lagoons. Coastline boundary derived from the Oil and Gas Authority's OGA and Lloyd's Register SNS Regional Geological Maps (Open Source). Open Government Licence v3 (OGL). Contains data © 2017 Oil and Gas Authority. The 10km grid square distribution map is based on available habitat records which are considered to be representative of the distribution within the current reporting period.

The mapped range was considered equivalent to the surface area (distribution) of the habitat. Coastal lagoons are physiographic features and so their range is determined primarily by geomorphological and hydrographic processes occurring over long time-scales and is not related to biological communities or processes supported by communities.

Table 1: Table summarising the conservation status for H1150 - Coastal lagoons. Overall conservation status for habitat is based on assessments of range, area covered by habitat, structure and functions, and future prospects.

Overall Conservation Status (see section 10)

Unfavourable-bad (U2)

Breakdown of Overall Conservation Status

Range (see section 4)	**Favourable (FV)**
Area covered by habitat (see section 5)	**Unfavourable-inadequate (U1)**
Structure and functions (see section 6)	**Unfavourable-bad (U2)**
Future prospects (see section 9)	**Unfavourable-bad (U2)**

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National Level

1. General information

1.1 Country	Wales
1.2 Habitat code	H1150 - Coastal lagoons

2. Maps

2.1 Year or period	1998-2024
2.2 Distribution map	Yes
2.3 Distribution map; Method used	Complete survey or a statistically robust estimate

2.4 Additional information

No additional information

Biogeographical Level

3. Biogeographical and marine regions

3.1 Biogeographical or marine region where the habitat occurs	ATL

3.2 Sources of information

See section 13 References

4. Range

4.1 Surface area (km²)	0.84
4.2 Short-term trend; Period	2013-2024
4.3 Short-term trend; Direction	Stable
4.4 Short-term trend; Magnitude	

a) Estimated minimum

b) Estimated maximum	
c) Pre-defined range	
d) Unknown	
e) Type of estimate	
f) Rate of decrease	
4.5 Short-term trend; Method used	Based mainly on expert opinion with very limited data
4.6 Long-term trend; Period	
4.7 Long-term trend; Direction	
4.8 Long-term trend; Magnitude	
a) Minimum	
b) Maximum	
c) Rate of decrease	
4.9 Long-term trend; Method used	

4.10 Favourable Reference Range (FRR)

a) Area (km²)	
b) Pre-defined increment	Current range is less than 2% smaller than the FRR
c) Unknown	No
d) Method used	Reference-based approach
e) Quality of information	low

4.11 Change and reason for change in surface area of range

a) Change	No
b) Genuine change	
c) Improved knowledge or more accurate data	

d) Different method	
e) No information	
f) Other reason	
g) Main reason	

4.12 Additional information

No additional information

5. Area covered by habitat

5.1 Year or period	2013-2024
5.2 Surface area (km²)	
a) Minimum	
b) Maximum	
c) Best single value	0.834
5.3 Type of estimate	Best estimate
5.4 Surface area; Method used	Based mainly on extrapolation from a limited amount of data
5.5 Short-term trend; Period	2013-2024
5.6 Short-term trend; Direction	Decreasing
5.7 Short-term trend; Magnitude	
a) Estimated minimum	
b) Estimated maximum	
c) Pre-defined range	Decreasing 0 - 12%
d) Unknown	No
e) Type of estimate	Multi-year mean
f) Rate of decrease	Decreasing <=1% (one percent or less) per year on average
5.8 Short-term trend; Method used	Based mainly on extrapolation from a limited amount of data

5.9 Long-term trend; Period	2000-2024
5.10 Long-term trend; Direction	Decreasing
5.11 Long-term trend; Magnitude	
a) Minimum	
b) Maximum	
c) Confidence interval	
d) Rate of decrease	Decreasing <=1% (one percent or less) per year on average
5.12 Long-term trend; Method used	Based mainly on extrapolation from a limited amount of data
5.13 Favourable Reference Area (FRA)	
a) Area (km²)	
b) Pre-defined increment	Current area is less than 2% smaller than the FRA
c) Unknown	No
d) Method used	Reference-based approach
e) Quality of information	low

5.14 Change and reason for change in surface area of range

a) Change	Yes
b) Genuine change	No
c) Improved knowledge or more accurate data	No
d) Different method	Yes
e) No information	No
f) Other reason	No
g) Main reason	Use of different method

5.15 Additional information

No additional information

6. Structure and functions

6.1 Condition of habitat (km²)	
Area in good condition	
ai) Minimum	0
aii) Maximum	0
Area not in good condition	
bi) Minimum	0.657
bii) Maximum	0.657
Area where condition is unknown	
ci) Minimum	0.179
cii) Maximum	0.179
6.2 Condition of habitat; Method used	Based mainly on extrapolation from a limited amount of data
6.3 Short-term trend of habitat area in good condition; Period	2013-2024
6.4 Short-term trend of habitat area in good condition; Direction	Decreasing
6.5 Short-term trend of habitat area in good condition; Method used	Complete survey or a statistically robust estimate
6.6 Typical species	
Has the list of typical species changed in comparison to the previous reporting period?	No
6.7 Typical species; Method used	

6.8 Additional information

Typical species were not used directly in the assessment of conservation status for habitat structure and function as a comprehensive list of typical species for each habitat

was not available. However, the status of typical species was considered when the condition of individual sites was assessed using Common Standards Monitoring Guidance. Common Standards Monitoring (CSM) data was used to assess the area of habitat in 'good' and 'not good' condition (field 6.1). Species were a component of the attributes assessed under CSM. Therefore, an assessment of species is considered to have formed part of the reporting under field 6.1 which supported the Habitats Structure and Function assessment (field 10.3).

7. Main pressures

7.1 Characterisation of pressures

Table 2: Pressures affecting the habitat, including timing and importance/impact ranking. Pressures are defined as factors acting currently and/or during the reporting period (2019–2024). Rankings are: High (direct/immediate influence and/or large spatial extent) and Medium (moderate direct/immediate influence, mainly indirect and/or regional extent).

Pressure	Timing	Ranking
PA17: Agricultural activities generating pollution to surface or ground waters (including marine)	Ongoing and likely to be in the future	High (H)
PF10: Residential, commercial and industrial activities and structures generating marine pollution	Ongoing and likely to be in the future	High (H)
PF15: Modification of coastline, estuary and coastal conditions for built-up areas	Ongoing and likely to be in the future	Medium (M)
PI02: Other invasive alien species (other than species of Union concern)	Ongoing and likely to be in the future	Medium (M)
PJ04: Sea-level rise due to climate change	Ongoing and likely to be in the future	High (H)
PJ10: Change of habitat location, size, and / or quality due to climate change	Only in future	Medium (M)
PJ01: Temperature changes and extremes due to climate change	Only in future	Medium (M)
PJ11: Desynchronisation of biological / ecological processes due to climate change	Only in future	Medium (M)
PJ12: Decline or extinction of related species (e.g. food source / prey, predator / parasite, symbiote, etc.) due to climate change	Only in future	Medium (M)

PJ13: Change of species distribution (natural newcomers) due to climate change	Only in future	Medium (M)
PL05: Modification of hydrological flow (mixed or unknown drivers)	Ongoing and likely to be in the future	Medium (M)
PD05: Development and operation of energy production plants (including infrastructure)	Only in future	Medium (M)
PC13: Mining and extraction activities not referred to above	Ongoing and likely to be in the future	Medium (M)
PA11: Soil management practices in agriculture (e.g. ploughing)	Ongoing and likely to be in the future	Medium (M)
PJ03: Changes in precipitation regimes due to climate change	Only in future	Medium (M)

7.2 Sources of information

See section 13 References

7.3 Additional information

No additional information

8. Conservation measures

8.1: Status of measures

a) Are measures needed?	Yes
b) Indicate the status of measures	Measures identified and taken
8.2 Main purpose of the measures taken	Maintain the current range, surface area or structure and functions of the habitat type
8.3 Location of the measures taken	Both inside and outside National Site Network
8.4 Response to measures	Long-term results (after 2036)

8.5 List of main conservation measures

Table 3: Key conservation measures addressing current pressures and/or anticipated threats during the next two reporting periods (2025–2036). Measures are ranked by importance/impact: High (direct/

immediate influence and/or large spatial extent) and Medium (moderate direct/immediate influence, mainly indirect and/or regional extent).

Conservation measure	Ranking
MC05: Adapt/manage fossil energy installation, facilities and operation	High (H)
MF03: Reduce impact of outdoor sports, leisure and recreational activities (incl. restoration of habitats)	Medium (M)
MF06: Reduce/eliminate marine pollution from industrial, commercial, residential and recreational areas and activities (incl. contamination with litter)	High (H)
MI03: Management, control or eradication of other invasive alien species	Medium (M)
MA10: Reduce/eliminate point or diffuse source pollution to surface or ground waters (including marine) from agricultural activities	Medium (M)
MK01: Reduce impact of mixed source pollution	High (H)

8.6 Additional information

Only part of the measures identified have been taken.

9. Future prospects

9.1a Future trends of parameters

ai) Range	Overall stable
bi) Area	Negative - decreasing <=1% (one percent or less) per year on average
ci) Structure and functions	Negative - slight/moderate deterioration

9.1b Future prospects of parameters

aii) Range	Good
bii) Area	Poor
cii) Structure and functions	Bad

9.2 Additional information

No additional information

10. Conclusions

10.1 Range	Favourable (FV)
10.2 Area	Unfavourable-inadequate (U1)
10.3 Specific structure and functions (incl. typical species)	Unfavourable-bad (U2)
10.4 Future prospects	Unfavourable-bad (U2)
10.5 Overall assessment of Conservation Status	Unfavourable-bad (U2)
10.6 Overall trend in Conservation Status	Deteriorating

10.7 Change and reason for change in conservation status

This field is not reported as the period 2019-2024 marks the first instance in which conservation status has been assessed at the national level, meaning no comparisons to previous reports can be drawn.

10.7 Change and reason for change in conservation status trend

This field is not reported as the period 2019-2024 marks the first instance in which conservation status has been assessed at the national level, meaning no comparisons to previous reports can be drawn.

10.8 Additional information

No additional information

11. UK National Site Network (pSCIs, SCIs, SACs) coverage for Annex I habitat types

11.1 Surface area of the habitat type inside the pSCIs, SCIs and SACs network (km^2)

a) Minimum	0.425
b) Maximum	0.425
c) Best single value	0.425

11.2 Type of estimate	Best estimate
11.3 Habitat area inside the network; Method used	Complete survey or a statistically robust estimate
11.4 Short-term trend of habitat area within the network; Direction	Uncertain
11.5 Short-term trend of habitat area within the network; Method used	Complete survey or a statistically robust estimate
11.6 Short-term trend of habitat area in good condition within the network; Direction	Decreasing
11.7 Short-term trend of habitat area in good condition within the network; Method used	Complete survey or a statistically robust estimate

11.8 Additional information

No additional information

12. Complementary information

12.1 Justification of percentage thresholds for trends

No justification information

12.2 Other relevant information

No other relevant information

13. References

Biogeographical and marine regions

3.2 Sources of information

Anderson, M. & Thompson, A. 2004. Multivariate control charts for ecological and environmental monitoring. Ecological Applications, 14(6), 1921–1935.

Bamber, R.N. 2004. Temporal variation and monitoring of important lagoonal communities and species in Wales. Bangor, CCW Marine Monitoring Report No: 12. 42pp

Bamber, R.N., Evans, N. J. & Whittall, A. 2000. Survey of potential coastal saline lagoons and pools in Wales, December 1998. CCW Contract Science Report No: 377

Bamber, R.N., Evans, N. J., Sanderson, W.G. & Whittall, A. 2001. Coastal saline lagoons and pools in Wales: review and proposals. CCW Contract Science Report No: 464

Bergmann, M., Gutow L., & Klages M. 2015. Marine Anthropogenic Litter. https://link.springer.com/content/pdf/10.1007%2F978-3-319-16510-3.pdf

Caprez, S. 2020. Source Apportionment of Nutrient Loadings in the Milford Haven Catchment: A Review of the Percentage Contribution from Sewage Treatment Works for Potential Designation under the Urban Wastewater Treatment Directive. NRW Tech Memo: TMSW20_03.

CCW. 2008. Core Management Plan Including Conservation Objectives. FOR Ynys Feurig, Cemlyn Bay and The Skerries SPA, Cemlyn Bay SAC, Ynys Feurig SSSI, The Skerries SSSI and Cemlyn Bay SSSI.

Cuthbertson, S., Jackson-Bué, M., Wynter, E., Green, M., Lindenbaum, C., Jones, S. and Hatton-Ellis, M. 2025. Condition Assessments for Coastal Lagoons in Welsh Special Areas of Conservation. NRW Evidence Report No: 894, 89pp, NRW, Cardiff.

Edwards, P. 2005. An assessment of the eutrophication risks and impacts in the Milford Haven Waterway. Environment Agency Wales. (used to inform Indicative condition assessment)

Edwards, P. 2014. Nutrient concentrations in the Milford Haven catchment area. Tech. memo: TMW14-09 Natural Resources Wales. NRW.

European Commission descriptor 10 webpage, accessed 2017 http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/index_en.htm

European Commission. 1992. The Habitats Directive (1992) http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm

European Commission. 2000. The EU Water Framework Directive http://ec.europa.eu/environment/water/water-framework/index_en.html

European Commission. 2008. The Marine Strategy Framework Directive https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056

Green, M. and Camplin, M. in prep. Saline lagoons: An Across Wales Macrofaunal Community Monitoring Report. NRW Evidence Report

Haines, L. and Edwards, P. 2016. Evidence Review of the Trophic Status of the Milford Haven Waterway. NRW Report A&R/SW/16/1.

Hargrave. 2018. Pen Llŷn a'r Sarnau SAC Progress Report April 2016 – March 2018

HM Government. 1981. Wildlife and Countryside Act 1981 https://www.legislation.gov.uk/ukpga/1981/69/section/14

HM Government. 1989. Electricity Act 1989 (Section 36) https://www.legislation.gov.uk/ukpga/1989/29/section/36

HM Government. 2008. Planning Act 2008 https://www.legislation.gov.uk/ukpga/2008/29/part/3/crossheading/energy

HM Government. 2010. The Single Use Carrier Bags Charge (Wales) Regulations 2010 http://www.legislation.gov.uk/wsi/2010/2880/contents/made

HM Government. 2017. The Conservation of Habitats and Species Regulations 2017 http://www.legislation.gov.uk/uksi/2017/1012/contents/made

HM government. 2017. Wales Act 2017 http://www.legislation.gov.uk/ukpga/2017/4/section/39/enacted

Holland, M.M., Louchart, A., Artigas, L.F., Ostle, C., Atkinson, A., Rombouts, I., Graves, C.A., Devlin, M., Heyden, B., Machairopoulou, M., Bresnan, E., Schilder, J., Jakobsen, H.H., Lloyd-Hartley, H., Tett, P., Best, M., Goberville, E., McQuatters-Gollop, A., 2023. Major declines in NE Atlantic plankton contrast with more stable populations in the rapidly warming North Sea. Sci. Total Environ. 898, 165505

Hoppit, G., Schmidt, D., 2022. A Regional View of the Response to Climate Change: A Meta-Analysis of European Benthic Organisms' Responses. Frontiers in Marine Science. 9:896157.

Horizon Nuclear Power. 2018. Wylfa Newydd Project, 5.2 Shadow Habitats Regulations Assessment Report

Horizon Nuclear Power. 2018. Wylfa Newydd Project, 6.2.12 ES Volume B - Introduction to the environmental assessments B12 - Coastal processes and coastal geomorphology.

Horizon Nuclear Power. 2018. Wylfa Newydd Project, 6.4.12 ES Volume D - WNDA Development D12 - Coastal processes and coastal geomorphology

Horizon Nuclear Power. 2018. Wylfa Newydd Project, 6.4.80 ES Volume D - WNDA Development App D12-1 - Coastal Geomorphology Baseline for the Wylfa Newydd Project - 2014

Horizon Nuclear Power. 2018. Wylfa Newydd Project, 6.4.81 ES Volume D - WNDA Development App D12-2 - Sediment Regime

Horizon Nuclear Power. 2018. Wylfa Newydd Project, 6.4.82 ES Volume D - WNDA Development App D12-3 - Wylfa Newydd Main Site Wave Modelling Report

Horizon Nuclear Power. 2018. Wylfa Newydd Project, 6.4.90 ES Volume D - WNDA Development App D13-8 - Marine Hydrodynamic Modelling Report - Wylfa Newydd Development Area

Horizon Nuclear Power. 2018. Wylfa Newydd Project, 6.4.96 ES Volume D - WNDA Development App D13-14 - Marine modelling of the construction discharge

Horsburgh K. & Lowe J. 2013. Impacts of climate change on sea level. MCCIP Science Review 2013: 27-33

Hughes, S.L., Tinker, J., and Dyec, S. 2017. Temperature. MCCIP Science Review 2017

IMO. 2014. International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships%27-Ballast-Water-and-Sediments-(BWM).aspx

IUCN Global Invasive Species Database, accessed 2018 (Ficopomatus enigmaticus) http://www.iucngisd.org/gisd/species.php?sc=1382

JNCC. 2004. Common Standards Monitoring Guidance for Lagoons. https://data.jncc.gov.uk/data/9b4bff32-b2b1-4059-aa00-bb57d747db23/CSM-Lagoons-2004.pdf

Jones, D., Bain, V., Dawson, S. & Watt, T. 2011. Assessing the Vulnerability of Marine Habitats in Wales to the Impacts of Climate Change. CCW Contract Science Report No. 969

Jopson L and Lindenbaum C. 2024. WFD Investigation Report: Pickleridge Lagoon Expert Judgement. Internal NRW report.

Lewis, A. 2025. Marine Opportunity Catchment End of Project Report 2022-2025. NRW Internal report.

Lindeque, P., Dimond, A., Harmer, R., Parry, H., Pemberton, K., & Fileman, E. (2015). Feeding selectivity of bivalve larvae on natural plankton assemblages in the Western English Channel. Marine Biology. 162. 10.1007/s00227-014-2580-x.

Lock K. 2021a. WFD TraC Nutrient Failures Investigation Report: Milford Haven Outer Coastal Waterbody. NRW Internal Report.

Lock K. (2021b) WFD TraC Nutrient Failures Investigation Report: Milford Haven Inner Transitional Waterbody. NRW internal report. NRW Internal Report.

Marine Invasive Non-native Species Priority Monitoring and Surveillance List for Wales. 2017. Https:

Moore, P., Smale, D., 2020. Impacts of climate change on shallow and shelf subtidal habitats relevant to the coastal and marine environment around the UK. MCCIP Science Review 2020, 272–292

National Trust. 2017. Our vision for the future Consultation document prepared in consultation with North Wales Wildlife Trust by John Pearson, Andy Godber, Bryn Jones, Gethin Evans, Kathy Laws, Helen Buckingham, Rachel Dolan and Richard Neale

NNSS. 2017. Rapid Risk Assessment Summary Sheet; GB Non-native Species Secretariat. Gracilaria vermiculophylla. https://www.nonnativespecies.org/assets/Uploads/RSS_RA_Gracilaria_vermiculophylla-1.pdf

NRW lagoon net sweeps monitoring data. 2014

NRW lagoon salinity, temperature and depth log data (06-2017) internal NRW data source

NRW meeting minutes. 2018. Article 17 lagoon interview minutes with conservation officers 22.03.2018; present: Anne Bunker, Lilly Pauls and James Moon.

NRW. 2014. Environmental Pressures on the Milford Haven Waterway. Report – A&R/SW/13/1

NRW. 2015. Climate Change Vulnerability of Marine Natura 2000 Features. LIFE Natura 2000 Programme for Wales

NRW. 2017. NRW Actions Database. Internal data source

NRW. 2018a. Indicative feature condition assessments for European marine sites (EMS). [Online]. Available from: https://naturalresources.wales/guidance-and-advice/environmental-topics/wildlife-and-biodiversity/find-protected-areas-of-land-and-seas/indicative-feature-condition-assessments-for-european-marine-sites-ems/?lang=en

NRW. 2018b. Y Fenai a Bae Conwy / Menai Strait and Conwy Bay Special Area of Conservation: Indicative site level feature condition assessments 2018. NRW Evidence Report Series, Report No: 232, 33pp, NRW, Bangor.

NRW. 2018c. Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau Special Area of Conservation: Indicative site level feature condition assessments 2018. NRW Evidence Report Series, Report No: 234, 58pp, NRW, Bangor.

NRW. 2018d. Pembrokeshire Marine / Sir Benfro Forol Special Area of Conservation: Indicative site level feature condition assessments 2018. NRW Evidence Report Series, Report No: 233, 67pp, NRW, Bangor.

NRW. 2018e. Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd Special Area of Conservation: Indicative site level feature condition assessments 2018. NRW Evidence Report Series, Report No: 227, 49pp, NRW, Bangor.

NRW. 2018f. Bae Cemlyn / Cemlyn Bay Special Area of Conservation. Indicative site level feature condition assessments 2018. NRW Evidence Report No: 228, 22pp, NRW Bangor.

NRW. 2019. Supporting documentation for the conservation status assessment for the habitat: H1150 - Coastal lagoons. Fourth Report by the United Kingdom under Article 17. https://jncc.gov.uk/jncc-assets/Art17/H1150-WA-Habitats-Directive-Art17-2019.pdf

OSPAR, 2023. Benthic Habitats Thematic Assessment. In: OSPAR, 2023: Quality Status Report 2023. OSPAR Commission, London. Available at: https://oap.ospar.org/en/ospar-assessments/quality-status-reports/qsr-2023/thematic-assessments/benthic-habitats/

Pye, K. & Blott, S. 2010. Cemlyn Bay and Adjoining Areas, Anglesey: Geomorphological Assessment. External Investigation Report No. EX1208

Pye, K. & Blott, S. 2016. Cemlyn, Anglesey: Further Geomorphological Assessment. KPAL External Investigation Report No. EX20671

Pye, K. 2018. Personal Communication. Email received: 11 July 2018 14:58 correspondence with Charles Lindenbaum

Pye K and Blott, SJ. 2021 Carew Lagoon Environmental Assessment and Management Options. KPAL Report No. EX040321.

Pye K and Blott, SJ. 2023. Pickleridge and Neyland Lagoons: Geomorphological Assessment. KPAL Report No. Ex 050323.

Schmidt, K., Birchill, A.J., Atkinson, A., Brewin, R.J., Clark, J.R., Hickman, A.E., Johns, D.G., Lohan, M.C., Milne, A., Pardo, S., 2020. Increasing picocyanobacteria success in shelf waters contributes to long-term food web degradation. Glob. Chang. Biol. 26, 5574–5587.

Smith, K. 2006. A Multidisciplinary Study of the Morfa Gwyllt Spit Lagoon. MSc Thesis. CCW Marine Monitoring Report No: 044

Stebbing, P., Tidbury, H. and Hill, T. 2015. Development of priority species lists for monitoring and surveillance of marine non-natives in the UK. Cefas contract report C6484. Issue date 30/10/2015.

Stringell, T., Burton, M., Bamber, R., Lindenbaum, C., Skates, L., & Sanderson, W. (2013) A tool for protected area management: multivariate control charts 'cope" with rare variable communities. Ecology and Evolution, 3(6)

Teferle, F. N., Bingley, R. M., Orliac, E. J., Williams, S. D. P., Woodworth, P. L., McLaughlin, D., Baker, T. F., Shennan I., Milne, G. A., Bradley, S. L. & Hansen D. N. 2009. Crustal motions in Great Britain: evidence from continuous GPS, absolute gravity and Holocene sea level data. Geophysical Journal International. (doi:10.1111/j.1365-246X.2009.04185.x).

Tillin, H.M., Hull, S.C. & Tyler-Walters, H.T.W. 2010. Accessing and developing the required biophysical datasets and data layers for Marine Protected Areas network planning and wider marine spatial planning purposes. Report No 22 Task 3 Development of a Sensitivity Tool (pressures-MXZ/MPA features).

Viñas, L., Soerensen, A.L. and Fryer, R. 2022. Status and Trends of Polybrominated Diphenyl Ethers (PBDEs) in Biota and Sediment. In: OSPAR, 2023: The 2023 Quality Status Report for the North-East Atlantic. OSPAR Commission, London.

Webster, L. and Fryer, R. 2022. Status and Trends in the Concentrations of Polycyclic Aromatic Hydrocarbons (PAHs) in Shellfish and Sediment. In: OSPAR, 2023: The 2023 Quality Status Report for the North-East Atlantic. OSPAR Commission, London.

Welsh Government. 2009. Climate Change: its impacts for Wales

Welsh Government. 2017. Marine Invasive Non-native Species Priority Monitoring and Surveillance List for Wales. https://beta.gov.wales/sites/default/files/publications/2018-02/invasive-aquatic-species-priority-marine-species.pdf

Welsh Government. 2018. Environmental Protection (Microbeads) (Wales) Regulations 2018 was voted on and passed by the Welsh Assembly in June 2018 http://www.assembly.Wales/laid%20documents/sub-ld11558-em/sub-ld11558-em-e.pdf

WFD waterbody classifications. 2015. 2009-2015 Classification Data: https://waterwatchwales-nrw.hub.arcgis.com/

Woolf D., & Wolf J. 2013. Impacts of climate change on storms and waves. MCCIP Science Review 2013: 20-26. https://www.mccip.org.uk/sites/default/files/2021-08/2013arc_sciencereview_03_st_wav_final.pdf

Wynne, C. 2018. North Wales Wildlife Trust File Note: Cemlyn: Storms of the week of 27/2 – 3/3 2018

Main pressures

7.2 Sources of information

No sources of information

14. Explanatory Notes

Field label	Note
2.3: Distribution map; Method used	Initial survey across Wales of all potential saline lagoons and pools was completed in 1998 by Bamber (2000) under contract to CCW.
4.3: Short-term trend; Direction	The occurrence of this habitat is largely defined by physiographic processes over long timescales. While the physical area of some lagoons may have declined as discussed in section 5, the geographic spread and distribution of features is not thought to have been reduced. Therefore, this is stable over the past 12 years.
4.4: Short-term trend; Magnitude	Not applicable (no decrease in range), i.e. 'stable' see 4.3.
4.5: Short-term trend; Method used	There has not been a repeat survey of Welsh lagoons and their presence is assumed to be unchanged. Recent aerial imagery has been used to confirm the lagoons presence and rough area remain unchanged.
5.6: Short-term trend; Direction	Cemlyn Lagoon (20.2% of Welsh lagoon resource): There has been some landward retreat of a shingle bank which provides a barrier between Cemlyn lagoon and the adjacent sea. Pye and Blott, 2016; 'The suggestion that the upper part of the beach and shingle ridge has retreated slowly is supported by the fact that the remains of concrete fence posts, erected on the ridge crest during the early Hewitt era in the 1930's, are now visible on the upper beach face slope and outer part of the ridge crest today, suggesting an average retreat of 5 - 10 m over the last 70 years (< 0.1 to 0.2 m / year).” Furthermore, in February 2018 a significant storm event (Storm Emma) occurred which overtopped the Cemlyn lagoon barrier pushing lobes of ridge material back into the lagoon by approximately up to 3m at the western end of the ridge (Wynne, 2018).

	The latest coastal lagoon condition assessment (Cuthbertson et al, 2025) has reported that at Cemlyn Lagoon there has been an apparent loss of 727m2 between 2000-2022 (0.43% loss). This is mainly due to the movement back of the shingle barrier as described above. Other lagoons: In addition, at Pickleridge lagoon there is an estimated loss of 880m2 (1.4% loss) between 2000 and 2022. The minor losses are attributed to natural variation in surrounding vegetation and mostly seasonal. It should be noted that the amount loss is very small relative to the entire lagoon resource.
5.7: Short-term trend; Magnitude	There has been as apparent loss of 0.19% of the Welsh coastal lagoon resource between 2013 and 2025. This is based on limited survey and the use of historic aerial imagery at a small number of the Welsh lagoons.
5.9: Long-term trend; Period	There have been known minor losses at two of the fifteen lagoons reported here as described in section 5.6 above.
6.1: Condition of habitat	The area in good/not good/unknown condition for structure and function of Welsh lagoons was assessed using collated available evidence and conclusions from specific data analysis which were spatially and ecologically relevant to Welsh lagoons. The primary evidence used includes: Site level condition assessments for specific lagoons within Welsh SACs (Cuthbertson et al, 2025); the Cycle 3 Interim Water Framework Directive assessments; observations from local conservation officers; casework; and presence of litter High quality annual macrofaunal invertebrate lagoon survey data collected up to 2021 from 5 Welsh lagoons was collected at fixed stations. Some of lagoons have also been sampled using a random net sweep method, but due to resource restrictions this is not done annually. . Lagoons outside SACs were not included in the condition assessment. For these sites a similar method was used as described below.

Condition Assessment 2025:

The condition assessments used data collected by NRW's marine monitoring team to assess the condition of lagoon habitats within SACs around Wales. NRW monitors five lagoons annually (Carew Castle Moat, Neyland Weir Pool, Pickleridge lagoon, Morfa Gwyllt Spit lagoon and Cemlyn lagoon). The most recent SAC condition assessments (Cuthbertson et al, 2025) used a new assessment process, where sampling locations and sub-features were assessed against various indicators and targets. Each indicator was assigned primary, secondary or tertiary weighting to reflect their relative importance to the feature. The overall SAC feature was classified favourable or unfavourable based on the combinations of indicators that failed their targets i.e. the feature failed if one primary indicator failed, or if two secondary indicators or three tertiary indicators failed their targets. The latest Water Framework (WFD) Cycle 3 Interim results (where available) were used to inform the status of some relevant primary and secondary indicators ie DIN, Opportunistic Macroalgae etc.

In this Habs Regs 9a reporting round (2025) this new approach has also been applied to features outside of SACs where information was available. Individual lagoon features represented the unit of assessment, rather than SACs, and these were assessed against multiple indicators and were classified as 'Not Good' where one primary indicator failed, or if two secondary, or three tertiary indicators failed their targets.

There are only 2 WFD designated 'Lagoon' waterbodies in Wales (Pickleridge and Cemlyn Lagoon) (WFD waterbody classification, 2015). The remaining lagoons either fall inside or adjacent to a transitional or coastal waterbody.

Litter:

Artificial material (usually reported as 'plastic', 'metal' or

'glass') from anthropogenic origin were recorded at all lagoons surveyed in 2017 by NRW. All items were identified post sieving (over 0.5mm sieve). Plastic was by far the most commonly recorded litter item (in terms of abundance). The number of particles of plastic ranged from 0 – 64 per sample (sample area varied from 0.025 – 0.0044m2) or an average of 0 – 14.2 items per sample. The mass of the litter is unclear at all lagoons. Further information in Pressures Section 7.1

Lagoon Environmental Variation:

The temperature, salinity and depth in the lagoons have been systematically recorded with data recorders since 2006. This has provided an enormous wealth of data, upon which, contextual information can be drawn should there be changes in the recorded biological data. Some of the lagoons water inputs are managed, such as Cemlyn via its weir. The data loggers enable the physical effects of the management to be observed and adjusted if necessary.

The data loggers have also provided a greater understanding of the lagoons and the conditions they experience, which influences the fauna and flora which inhabit them. No lagoon is the same but may be broadly similar depending on the lagoon type (i.e. percolation).

Cemlyn and Morfa Gwyllt lagoons have similar average monthly temperatures. Cemlyn's temperature ranges between 3.3°C in the winter and 20.4°C in the summer. Morfa Gwyllt is similar and ranges between 4.2°C in the winter and 21.2°C in the summer. Pickleridge lagoon is slightly warmer ranging from between an average of 6.0°C in the winter and 21.8°C in the summer.

Extreme temperatures events are also recorded and defined as those less than 2°C or greater than 25°C. This has been based on observations of the natural variability in the data.

Morfa Gwyllt has the most consistently variable temperatures, experiencing the most frequent (370) extreme temperature events, probably due to low flushing rates and relatively small size. Conversely, Cemlyn tends to experience colder extremes at a less frequent rate (221 extreme events). Pickleridge experienced only 22 extreme temperature events and is by far the most stable lagoon with respect to temperature.

Extreme low salinity events are recorded as days when salinity falls below 8ppt. Again, Pickleridge has the fewest low salinity events with just 24 events recorded since 2007. Cemlyn has 218 events and Morfa Gwyllt has 441 events. Extreme high salinity events are days when the salinity average exceeds 28ppt. Cemlyn and Pickleridge have a similar number of events, occurring 1461 and 1388 times respectively over the survey period. In contrast to this Morfa Gwyllt has not had any events and only occasionally exceeds 25ppt.

The conditions found in each lagoon are unique. There are no apparent trends, in the conditions recorded although there are yearly fluctuations which are dependent upon the weather experienced.

Summary of lagoon condition (where recently assessed):

Cemlyn Bay SAC

Cemlyn Lagoon (20.2% of Welsh resource; 0.1689km2 Not Good):

The condition assessment for Cemlyn Bay SAC lagoon found there to be failures for four primary indicators and two secondary indicators. This resulted in coastal lagoon feature being assessed to be in unfavourable condition. The indicators that failed to meet their targets and reasons why (if known), are stated below:

Species composition of communities (P)

This feature failed to meet the requirements for the primary indicator due to a significant shift in community composition in recent years (2016-2021). The shift has been driven by declines in the once abundant lagoon specialist Ecrobia ventrosa and shifts in community composition.

Abundance of lagoon specialist species (P)

This feature failed to meet the requirements for the primary indicator due to significant declines in some of the lagoon's specialist species. Of the nine lagoon specialist species seven have seen declines. Some of these such as Gammarus chevreuxi, G. insensibilis, Chaetomorpha linum and Conopeum seurati may be due to not being easy to pick up with current sampling methods and locations, or the boom-and-bust nature of some populations. More targeted investigations to find these species should be carried out. In the case of Ecrobia ventrosa and Cerastoderma glaucum we are confident that these species have seen real and significant declines. E. ventrosa, a once abundant gastropod in the lagoon has declined significantly since 2016. The lagoon cockle C. glaucum seems to have disappeared from Cemlyn. Targeted surveys searching for the cockle in recent years have failed to find any.

Species richness and diversity (P)

This waterbody failed to meet the requirements for the primary indicator due to a significant decline in species richness and abundance in the years 2016-2021 compared to years 2006-2015. Declines in species richness can indicate a change in environmental conditions. While taxonomic spread was deemed to meet its target, the data suggested there has been a decline in recent years. If this trend continues it would be further evidence for disturbance and loss of biodiversity within the lagoon.

Water quality: nutrients (DIN only) (P)

This waterbody failed to meet the requirements for the primary indicator as the WFD and was classified with a Bad status for the DIN element in the 2024 cycle 3 interim classification. In addition, monitoring within the lagoon shows that the average DIN levels in the three stations within the lagoon were significantly worse than the WFD Poor status classification threshold in all months but one.

Water quality: opportunistic macroalgae (S)

This waterbody failed to meet the requirements for the secondary indicator due to a large accumulation of green algae has been observed in the lagoon since 2020. This led to a water quality investigation. The algae is growing because of high levels of nutrients in the lagoon (see above).

Integrity of lagoon banks (S)

This waterbody failed to meet the requirements for the secondary indicator due to bank integrity being significantly impacted by cattle from neighbouring farmland. Trampling and poaching of vegetation have led to bank erosion and instability in many areas. Management measures have since been put in place to deal with this issue.

Dee SAC

Point of Ayr Colliery (1.5% of Welsh resource; 0.0122km2 Not Good)

And Connah's Quay (2.7% of Welsh resource; 0.0229 km2 Not Good):

These two lagoons are within the Dee Estuary SAC but are not a qualifying feature but are listed as a grade D features. The WFD Cycle 3 Interim assessment of the surrounding Dee (N.Wales) transitional waterbody failed the primary indicator for DIN (Moderate - uncertain). The waterbody also failed the secondary indicator Water quality – chemical contaminants with elevated levels of Brominated diphenylether (BDPE) (WFD waterbody classification Cycle 3 Interim, 2024). These lagoons are not specifically monitored by NRW. Low confidence is associated with this assessment as the specific location of the sampling points contributing to the assessment have not been reviewed due to lack of time.

Pembrokeshire Marine SAC

The coastal lagoon feature in Pembrokeshire Marine SAC is comprised of three separate lagoons within the SAC: Pickleridge lagoon; Carew Castle Millpond; and Neyland Weir pool. Each lagoon has been assessed separately against the performance indicators and been assigned its own condition.

Pickleridge lagoon, (7.5% of the national resource; 0.063km2 Not Good)

Pickleridge Lagoon is located on the Gann Estuary which forms part of the Milford Haven Waterway. The lagoon formed behind the shingle storm beach when gravel extraction ceased. Pickleridge lagoon has been monitored annually between 2006-2021 with both net sweep and grab sampling surveys

Water quality: nutrients (DIN) (P)

This lagoon failed to meet the requirements for this primary indicator. The Pickleridge Lagoon waterbody was not classified for DIN the 2024 cycle 3 interim classification. However, evidence from a planned investigation in 2023

shows that the status of the Pickleridge Lagoon waterbody is less than Good status due to elevated nutrients, and would classify as Bad status (Jopson and Lindenbaum, 2023). The adjacent WFD waterbody that feeds into Pickleridge Lagoon was classified as Poor status for DIN in the 2024 cycle 3 interim classification (Lock, 2021a).

Water quality: opportunistic macroalgae (S)

This lagoon failed to meet the requirements for this secondary indicator. The Pickleridge Lagoon was not classified for the opportunistic macroalgae element in the 2024 cycle 3 interim classification. However, there have been ongoing observations of opportunistic macroalgae in areas surrounding the lagoon.

Evidence from a planned investigation of Pickleridge Lagoon suggest there is an ongoing issue with elevated nutrients which is causing and adverse biological response evident by the presence of opportunistic macroalgae in the 2013 algal blooms, and the ongoing observation of opportunistic macroalgae in surrounding areas.

The adjacent waterbody that feeds into Pickleridge Lagoon was classified with a Good status for opportunistic macroalgae in the 2024 cycle 3 interim classification (Lock, 2021a). However, there has been localised growth of opportunistic macroalgae recorded in some of the inlets of this waterbody, including around the Dale Gann area.

Confidence is low as the Pickleridge Lagoon has not been classified for this element.

Carew Castle Moat (9.5% of Welsh resource; 0.0795km2 Not Good):

Carew Castle Millpond (Carew) lagoon in Pembrokeshire Marine SAC was created during the establishment of the tidal corn mill around 1800. The lagoon is separated from

the estuary by a brick dam and sluice gates. Carew Mill Pond has been monitored annually between 2006-2021 with both net sweep and grab sampling surveys. This data together with data loggers, WFD monitoring, casework and site knowledge have been used to assess the lagoon against the performance indicators. The assessment of Carew lagoon found five indicators with primary targets and two indicators with secondary targets failed. These failures resulted in Carew lagoon being assessed as having unfavourable condition. The failing indicators and reasons for failure, if known, are stated below.

Isolating barrier integrity (P)

This indicator failed to meet its primary target as the dam wall isolating the lagoon from the estuary is leaking, despite repair. This is causing water to drain out constantly. The sluice gates, which are opened during heavy rainfall to reduce flood risk are often left open after the flood risk has ended. This resulting in the isolating barrier not operating as it should for the lagoon to function.

Abundance of lagoon specialist species (P)

This indicator failed to meet its primary target as the tentacled lagoon worm Alkmaria romijni, once present in large densities across all three sampling stations, has seen significant declines at two of these in recent years. These two stations are those that dry out when the sluice gates are left open after the risk of flooding has passed. More investigation is needed but it is likely the abundance of this species has declined due to water levels dropping. Low water levels would likely lead to increased water temperature and semi-regular periods of sediment exposure and drying.

Water depth (P)

This indicator failed to meet its primary target as the

frequency of extreme low water depths at Carew has increased significantly. This is due to the leaking dam wall and sluice gates being kept open for long periods during flood risk events. Sediment accretion due to sediment laden water entering the lagoon has led to reductions in the water planar area and volume. These issues have led to the water depth being much lower than expected for the lagoon.

Water quality: nutrients (DIN only) (P)

This indicator failed to meet its primary target as the Milford Haven Inner waterbody was classified with a Poor status for DIN in the 2024 cycle 3 interim classification. The WFD investigation report confirmed elevated nutrients in this waterbody, where it was concluded that major input of nutrients is likely to be derived from diffuse sources associated with farm infrastructure and probable losses from agricultural land (Haines and Edwards, 2016; Lock, 2021b). Further investigation is required to determine the breakdown of nutrient sources into the catchments. Point source continuous sewage discharge from the water industry was confirmed as minor source of nutrients linked to the DIN failures (Haines and Edwards, 2016; Caprez, 2020; Lock, 2021b). Intermittent and domestic sewage are also suspected in the catchments. Further investigation locally is required to confirm these.

Water quality: physicochemical properties (P)

This indicator failed to meet its primary target as the salinity in the lagoon is very low and highly variable. This is highly likely to be caused by the leaking dam wall and the sluice gates failing to close after flood risk events and during spring tides. The incoming tide fills the lagoon with saline water, but this is emptied again during the low tide in periods where the sluice gates are locked open, reducing the salinity.

Water quality: opportunistic macroalgae (S)

This indicator failed to meet its secondary target as the Milford Haven Inner WFD waterbody was classified as Moderate status for the opportunistic macroalgae element in the 2024 cycle 3 interim classification. The WFD investigation report confirmed the opportunistic macroalgae failure in this waterbody. Major input of nutrients was found to be from diffuse sources associated with farm infrastructure and probable losses from agricultural land (Haines and Edwards, 2016; Lock, 2021b). In addition, point source continuous sewage discharge from the water industry were confirmed as a major source of nutrients linked to the opportunistic macroalgae failure, but only a minor source for the DIN failure (Haines and Edwards, 2016; Caprez, 2020; Lock, 2021b). Intermittent and domestic sewage are also suspected in the catchment. Further investigation locally is required to confirm these.

Water quality: contaminants (P)

This indicator failed to meet its primary target as the Milford Haven Inner waterbody has a fail for chemicals due to PBDE and PAH. Historically, the main source of PBDE is as flame retardants in a variety of materials (Viñas et al., 2022). PAHs can be produced through natural processes, but also arise from anthropogenic sources, for example during combustion of fossil fuels and organic material (Webster and Fryer, 2022).

The contaminants in the water column may be derived from diffuse sources from contaminated waterbody bed sediments, or point sources from continuous sewage discharge from waste water treatment. However, a WFD investigation of the failure in Milford Haven Inner waterbody is yet to be undertaken. PBDE is being managed and it is hoped that levels will reduce in time. There is currently no management in place for PAH. While the PAH EQS is based on the most sensitive taxa and may not be

applicable to all of the mudflats and sandflats biota, it cannot be ruled out as having a negative impact.

Neyland Weir Pool (13.1% of national resource; 0.1097km2 Not Good):

Neyland Weir Pool (Neyland) lagoon in Pembrokeshire Marine SAC was established as a saline lagoon in the 1980's being separated from the Cleddau estuary by a concreate bund. Neyland lagoon has been monitored annually between 2011-2021 with both net sweep and grab sampling surveys. The Neyland Weir Pool (Neyland) lagoon in Pembrokeshire Marine SAC has been assessed as being in unfavourable condition (medium confidence) as the assessment found three indicators with primary targets and one indicator with secondary targets failed.

Species composition of communities (P)

This indicator failed to meet its primary target as the variation in the species that make up the communities found in Neyland has been declining since 2017. Communities are increasingly composed of similar species that are opportunistic, with smaller body sizes and shorter life spans. This indicates the lagoon has undergone continued disturbance since 2017. There is no obvious cause of disturbance that would lead to a decline in species variation therefore the reason for the failure of this indicator is not clear. There could be links to the high nutrient levels in the surrounding water bodies. However, an investigation would be needed to see what the nutrient levels are within the lagoon itself before any link could be made.

Water quality: nutrients (DIN only) (P)

This indicator failed to meet its secondary target for the same reasons outlined above for Carew Mill Pond.

Water quality: opportunistic macroalgae (S)

This indicator failed to meet its secondary target for the same reasons outlined above for Carew Mill Pond.

Water quality: contaminants (S)

This indicator failed to meet its secondary target for the same reasons outlined above for Carew Mill Pond.

Pembroke Castle Pond (4.3% of national resource; 0.0359km2 Not Good):

This coastal saline lagoon is not within Pembrokeshire Marine SAC. However, the same assessment protocol was applied to this lagoon and found it failed the primary indicator for DIN (Poor – very certain). It also failed to meet the target for the secondary indicator for opportunistic macroalgae and Water quality contaminants. For further details see Carew Mill Pond above.

Pen Llŷn a'r Sarnau SAC

Morfa Gwyllt Spit lagoon (0.4% of national resource; 0.0037km2 Not Good)

This lagoon is a primary feature of the Pen Llŷn a'r Sarnau SAC. The lagoon is a small percolation lagoon that consists of a depression in a shingle bar across the mouth of the Afon Dysynni in mid Wales. Monitoring data collected between 2006-2021, together with other relevant evidence has been used to assess the performance indicators. The assessment of Morfa Gwyllt lagoon found four indicators with primary targets failed. This resulted in Morfa Gwyllt lagoon being assessed as having unfavourable condition. The failing indicators and reasons for failure, if known, are stated below.

Abundance of lagoon specialist species (P)

This indicator failed to meet its primary target as two of the three lagoon specialists have been absent from monitoring in recent years (Conopeum seurati and Chaetomorpha linum). The absence of Conopeum seurati may be due to the standard sampling methods not picking it up. However, a targeted survey in 2013 failed to find it. Reasons for the absence of these species is not clear. It could be a natural loss due to the shallow nature of the lagoon limiting the availability of the habitat. However, further investigation is needed and links between the declines in water depths and increase in salinity observed should be considered.

Species richness and diversity (P)

This indicator failed to meet its primary target due to a decline in species richness and diversity over time. Declines in these indices can indicate disturbance to the habitat resulting in biodiversity loss. The reductions to species richness and diversity in Morfa Gwyllt could be due low water depth and concerns around salinity.

Water depth (P)

This indicator failed to meet its primary target due to decreasing depth of water at Morfa Gwyllt in recent years, with an increase in instances of extreme low water events seen. This was especially the case in 2020. Excavation on the of the channel entrance of the Dysynni river/ Broadwater Lagoon to Tywyn might have affected the depth of the lagoon by lowering the water table, reducing freshwater percolation. The river channel was last dredged in 2018 and extreme low water events within the lagoon have become more evident since 2019. A missing data logger in 2018 lowers the confidence to medium. An investigation of the links between dredging and water depth in the lagoon is needed. This is especially important before the dredging work is carried out again. There would be a need to consider air temperature and rainfall data in as part of the investigation.

Water quality: physicochemical properties (P)

This indicator failed to meet its primary target due to increasing salinity in the Morfa Gwyllt lagoon in the two most recent sample years (2019 and 2020), with more instances of high salinity events seen. Excavating work of the channel entrance to manage flood risk from the Dysynni River/ Broadwater Lagoon to Tywyn might affect the salinity of the lagoon by lowering the water table reducing the water depth in the lagoon.

Penclawydd North Pool(2.7% of Welsh resource; 0.02km2 Not Good)

Aberthaw Lagoon (2.1% of Welsh resource; 0.018km2 Not Good)

Rhyl Marine Lake (14.8% of Welsh resource; 0.124km2 Not Good)

These three lagoons do not fall within an SAC and are not monitored. However the condition assessment process was applied to these lagoons using the WFD Cycle 3 Interim data and found that all three lagoons fail to meet the target for the primary indicator DIN (Moderate). Some of which also failed secondary indicators for water quality – chemical contaminants and phytoplankton.

Malltraeth Cob Pool (6.2% of Welsh resource; 0.051km2 - Unknown

Gwent Levels (13.4% of Welsh resource; 0.112km2 – Unknown

Morfa Madryn pools(1.6% of Welsh resource; 0.014km2 – Unknown

Morfa Aber pools (0.2% of Welsh resource; 0.002km2 –

	Unknown At the remaining 4 sites (Malltraeth Cob Pool, Gwent Levels, Morfa Madryn pools, and Morfa Aber pools) the condition was assessed as 'unknown' (The majority of the non-SAC lagoons have not been visited since they were originally assessed by Bamber et al [Bamber et al., 2000 & Bamber et al., 2001]). It is assumed that the sites assessed as unknown do not receive lagoon relevant management and are therefore likely to be in worse condition to those managed (i.e. not good). Although these sites did not fail the primary indicator for DIN, it is likely that these sites would not have Achieved a good status had they been directly assessed rather that the coastal/transitional waterbody they are each associated with. The sources of DIN are derived from land/freshwater inputs. As such the condition in lagoons are likely to be worse than that of the adjacent marine waterbody.
6.2: Condition of habitat; Method used	See 6.1 for additional information.
6.4: Short-term trend of habitat area in good condition; Direction	Cemlyn Bay lagoon has been assessed as failing during this reporting round where as previously this was reported as being in Good condition.
7.1: Characterisation of pressures	Pressures and threats were identified from indicative condition assessments, scientific literature, the 2019 article 17 report, interviews with casework officers and monitoring data. Pressures and threats ranked based on expert opinion with reference to EU definitions and consideration of internal guidance. Outputs from the Actions Database were not considered relevant for this assessment. The top ten threats were selected based on expert judgement with reference to the likely impacts as detailed below. Pressures: PA17 Agricultural activities generating pollution to surface or ground waters (including marine) (High - ongoing and likely to be in the future):

Raised levels of nutrients; either measured directly or inferred from high algae growth were key reasons for 5 of 7 monitored/observed lagoons to be in unfavourable condition. The dominant sources of DIN were assessed to be from agricultural losses in the Milford Haven Waterway where many Welsh lagoons are situated. Agricultural land is considered to be the primary source of diffuse pollutants impacting on water quality within waterbodies the related Milford Haven Waterway catchment area (Lock, 2021a, Lock, 2021b). The impact on other lagoons is not known, variable confidence is associated with this assessment as the quality of evidence varies with lagoon.

Raised levels of nutrients; either measured directly or inferred from high levels of algae growth were key reasons for 5 of 7 monitored/observed lagoons to be in unfavourable condition. The dominant sources of DIN were assessed to be from agricultural losses in the Milford Haven Waterway where many Welsh lagoons are situated. Agricultural land is considered to be the primary source of diffuse pollutants impacting on water quality within waterbodies the related to the Milford Haven Waterway catchment area (Lock, 2021a; Lock, 2021b). Nutrient rich run–off from agricultural land adjacent to Cemlyn Lagoon has been identified as potential threat (National Trust, 2017). A project between NRW and the National Trust was carried out in 2022. The aim was to re-establish fences around field boundaries, completely excluding the cattle from the lagoon. Feeding stations and water troughs were moved to the centre of the field to limit cattle proximity to the lagoon and reduce trampling of the banks. The field near the western end of the lagoon that often gets wet has been fenced off to stop grazing (Lewis, 2025). The impact of agricultural run off on other lagoons is not known but likely to an influence. It is likely that some improvements will be seen over the next two reporting cycles due to planned measures however it is difficult to predict the time scales and success of measures at this point, measures

are currently not planned to tackle specific local issues relating to many lagoons (Cuthbertson 2025; WFD Cycle 3 Interim classification 2024).

PF10 Residential, commercial and industrial activities and structures generating marine pollution (High - ongoing and likely to be in the future)

In general, the key physical impact of litter on species associated with lagoons is likely to be linked to ingestion of plastic. Several invertebrate species in relevant taxonomic groups to the species associated lagoons have been shown to ingest plastic in field and laboratory experiments. Negative (and some negligible) impacts of ingestion of plastic have been observed on marine species but the research on the impacts of litter in the marine environment is in its infancy and impacts are currently poorly understood (Bergmann et al., 2015).

Further assessment of the impacts is required to aid understanding of the extent and the likely impact of litter on the function of communities associated with lagoons (and other protected marine habitats) to recommend any appropriate management action. Further assessment of thresholds in relation to condition of marine habitats will be considered in the future. Monitoring, reporting and method development under MSFD and OSPAR will help increase knowledge and confidence over the coming years.

Due to the high proportion of samples where litter has been recorded as present, evidence of ingestion of many related taxa and demonstrated impact on some studied marine taxa, there is cause for concern. Therefore, where a high proportion of samples contained litter (recorded present) this was considered at the associated lagoon. Due to the lack of understanding of the extent of litter, the potential for sample contamination and the uncertainty of ecological impact of the litter at lagoons low confidence was associated with this assessment and this was not used

alone for the calculation of condition area.

The source of litter at Welsh lagoons is generally unknown. Artificial material (mainly plastic) from anthropogenic origin were recorded at all lagoons surveyed in 2017 by NRW at most monitoring stations, if this is extrapolated out to the whole lagoon the numbers of particles are very large. Furthermore, at Morfa Gwyllt observations of large amounts of marine litter (plastic bags, bottles and containers) were made by NRW staff. This is windblown marine litter (residential and commercial) that collects in the slack (in which the lagoon is situated) behind the cobble sea barrier. It was uncertain whether artificial litter originated from residential or industrial sources. Lagoons were assessed to be sinks for litter and therefore may be more vulnerable to litter than other features. Poor knowledge of the material present and little knowledge of its impact on species gives little scope to infer persistence of materials and impact (Bergmann et al., 2015). However, due to the high proportion of samples where litter has been recorded as present at Welsh lagoons, the long-term prevalence of some anthropogenic materials, evidence of ingestion of many related taxa and demonstrated impact on some studied marine taxa, there is cause for concern. Due to the lack of understanding of the extent of litter, the potential for sample contamination and the uncertainty of ecological impact of the litter at lagoons low confidence was associated with this assessment.

PF15 Modification of coastline, estuary and coastal conditions for built-up areas

(Medium - ongoing and likely to be in the future):

Cemlyn Lagoon's seawater input is managed via a weir. During the spring and summer, the input to the lagoon is limited so that the protected Sandwich Tern nest colony on the islands do not get flooded. Also, at Cemlyn a foot bridge has been built across the creek which is also thought to

reduce the flow of seawater to the lagoon. This is also thought to contribute to a reduction in salinity in the lagoon and could be linked to the loss of the lagoon cockle Cerastaderma glaucum which has a preference for higher salinity. Bamber (2004), states that C. glaucum occurs commonly at salinities between 10 and 40‰, preferring levels around 35‰, but will briefly tolerate a range from 2 to 60‰; however, individuals observed in the field at 4‰ for over a week were found to be gaping and torpid.

This loss could impact the future conservation status of this lagoon. Ranked medium as it is important pressure but impacting a moderate sized area and monitoring data has shown consistent records of lagoon specialists which is an important component of this feature. There is also a complex interplay between the conservation of lagoon specialists and sandwich terns which are both managed at this site. It is appreciated that there may be no perfect solution. The sluice gate at Carew Lagoon was broken, presumably impacting abiotic conditions for lagoon specialists. This has since been repaired. Repairs are required on the wall which have not been undertaken. The impact of this is unknown.

Collapsed retaining wall at Penclawydd North Pool, the impact of this is uncertain. No current management plan to improve this (NRW meeting minutes 22.03.2018).

PC13 Mining and extraction activities not referred to above

(Medium - ongoing and likely to be in the future):

A quarry upstream of Carew discharges into the lagoon causing hydrological discontinuity. When the quarry gets down to a level there may be an effect on the water level in the lagoon (NRW meeting minutes 22.03.2018). Carew Mill Pond receives a direct dewatering discharge from a quarry that represents > 12% of the average freshwater input but could represent > 81% during low natural flow. There is

concern that this level of input would reduce the salinity of the water in the lagoon. The impact is potentially over a moderate sized area (in relation to Welsh lagoon resource) and the area is of high conservation value due to the presence of lagoon tentacle worm, Alkmaria romijni which is nationally scarce. The last broad scale detailed assessment of the populations of this species at Carew was undertaken in 2006. The current status of this species is not well understood. The recorded abundance of the species at Carew monitoring stations are very variable (2011-2016), preliminary assessment does not indicate a concerning trend or that the latest numbers are below that expected. However, variability in abundance over time was high and there has also been a change in methods at 2 of 3 stations over the time series so confidence in this assessment is low.

PA11 Soil management practices in agriculture (e.g. ploughing)

(Medium - ongoing and likely to be in the future):

Carew lagoon appears to be silting up, it was assessed that this is likely to be as a result from agricultural practice (NRW meeting minutes 22.03.2018). Ranked medium as impacts are potentially over a moderate area (in relation to Welsh resource) and changes to mud assessed as a threat to Tentacled lagoon-worm, Alkmaria romijni (nationally scarce marine animal). The presence of this species is a key reason this lagoon is of conservation interest (Bamber, 2000). The last broad scale detailed assessment of the populations of this species at Carew was undertaken in 2006. The current status of this species is not well understood. The recorded abundance of A. romijni at Carew monitoring stations are very variable (2011-2016), preliminary assessment does not indicate a concerning trend or that the latest numbers are below that expected. However, variability in abundance over time was high and there has also been a change in methods at 2 of 3 stations

over the time series so confidence in this assessment is low.

PI02 Other invasive alien species (other than species of Union concern) (Medium):

(Medium - ongoing and likely to be in the future):

1 of 2 species considered non-native were recorded at 2 of 5 monitored Welsh lagoons between 2006-2016. These are the polychaete tube worm, Ficopomatus enigmaticus (recorded only Pickleridge lagoon in relatively high numbers) and mud snail, Potamopyrgus antipodarum (one individual recorded at Carew in 1 of 6 annual surveys). P. antipodarum was assessed to be low or unknown risk whereas F. enigmaticus was assessed medium risk (Welsh Government, 2017).

It is noted that the impact of F. enigmaticus on native species is more likely to be beneficial than problematic, however, this may not be considering lagoon habitats (Welsh Government, 2017) and it has also been noted that since it faces little competition in relatively confined waters with variable salinity, it is able to flourish in characteristically highly productive habitats. In the presence of native competitors, abundant populations F. enigmaticus are known to deplete resources from and even replace them (IUCN Global Invasive Species Database, accessed 2018). This species, has been recorded at Pickleridge lagoon and Pembroke castle pond. Assessment of quantitative data collected at Pickleridge show that numbers of this species are very variable, and in some cases relatively high. The impact of non-native taxa on lagoons is currently unknown, preliminary assessment of this species abundance data don't indicate an increasing trend over ten years of monitoring at Pickleridge. Furthermore, this taxon was defined in CSM guidance as a lagoon specialist ('UK population would be unsustainable without the presence of saline lagoons”). This was based on a criteria of UK

population would be unsustainable without the presence of saline lagoons, i.e. >30% of current sites are lagoons at the time of CSM Guidance compilation in 2004. It is uncertain whether this is still the case. In the CSM guidance, the presence of lagoon specialists was generally seen as desirable and presence of non-native species as undesirable (JNCC, 2004). It is uncertain whether the presence of this taxa is desirable or not (presumably not).

Now F. enigmaticus have colonised lagoons it is likely that they will persist and presumably in some way impact lagoon communities. Further analysis is required to understand the impact of this species at Pickleridge lagoon.

Recently Gracilaria vermiculophylla (a highly invasive non-native species) has been recorded in inlets in Dwyryd and Malltraeth waterways. This species has a high tolerance to variable salinity, if this species colonises lagoons there is a potential for high impact on communities present (through displacement, habitat alteration, food availability and abiotic factors such as reducing light, sediment accretion and oxygen availability) (NNSS, 2017).

At Cemlyn lagoon proposed development activities (increased shipping, artificial structures and water temperature increases) associated with the Wylfa Newydd may increase the likelihood of introduction and colonisation of non-native species.

Continuation of this pressure and introduction of species likely to colonise lagoons is a good indication that invasive non-native species are likely to affect the lagoon feature to some degree in the next two reporting rounds.

Ranked medium as ecological/physical impacts not understood but potentially impacting a lagoon of high conservation value covering a moderate area.

PF05 Sports, tourism and leisure activities (Low – ongoing and in the future):

Morfa Gwyllt has experienced the reckless use off-road vehicle being driven through the lagoon presumably causing physical disturbance to the habitat and species. This practice has been stopped with conservation measures. This was not included as a threat due to perceived successful conservation measure in place (see Hargrave, 2018). Many of the lagoons, including Morfa Gwyllt are also popular with dog walkers and visitors who use the lagoon to paddle and play in. This causes disturbance to the lagoon bed sediments and the infauna living in it. Morfa Gwyllt is particularly small potentially increasing its vulnerability to this pressure. Ranked low due to impact on a small area relative to Welsh resource (0.4%) but are ongoing and because of the difficulty in management it is expected this wil continue in the future.

PL05 Modification of hydrological flow (Medium – ongoing and in the future):

The Pembroke Castle lagoon has been observed to be emptied for days at a time, suggesting that management is not appropriate to keep conditions required for lagoon specialists. Although only a small area is affected the severity of impact assumed high (NRW meeting minutes 22.03.2018). This probably does represent a relatively extreme event, but this lagoon is probably not of high conservation merit (no lagoon specialists noted [Bamber et al., 2000; 2001]). The dam wall at Carew Mill pond has had problems leaking and as a result, the sluice gates keep being kept open for long periods during flood risk events.

PJ04 Sea-level rise due to climate change

PJ10 Change of habitat location, size, and / or quality due

to climate change:

(Medium - ongoing and likely to be in the future):

PJ11: Desynchronisation of biological / ecological processes due to climate change

PJ12: Decline or extinction of related species (e.g. food source / prey, predator / parasite, symbiote, etc.) due to climate change

PJ13: Change of species distribution (natural newcomers) due to climate change

(Medium - only in the future)

International and local studies have identified Lagoons as being vulnerable to climate change (e.g. Anthony et al., 2009; NRW, 2015 and Jones et al., 2011). Their setting within the coastal landscape leaves them especially vulnerable to profound physical and ecological disturbance from global climate change. Expected shifts in physical and ecological characteristics range from changes in flushing regime, freshwater inputs, and water chemistry to complete inundation and loss and the loss of natural communities (Anthony et al., 2009). Threats were ranked as medium as impacts are most likely to occur in the long term (beyond the next 12 years) but are likely to impact all lagoons in Wales to some degree.

The likely impact of various factors modelled to be caused by climate change will vary with lagoon physical and ecological community characteristics. Lagoons are rare in Wales. A vulnerability assessment of Welsh lagoons assessed that lagoons would be very sensitive with high urgency to climate change for the following reasons (Jones et al., 2011):

All lagoons are likely to be adversely affected by sea level

rise and may cease to be lagoons depending on the rise of water and height of the retaining barrier (N04) (Jones et al., 2011). Mean sea-level rise measured at tide gauges around the UK (1901-present) is estimated at 1.4 ± 0.5 mm per year, which is consistent with the globally averaged figure from tide gauge records (of 1.8 ± 0.5 mm per year). The rate of sea-level increase was greater in the 20th century than the 19th century (MCCIP: Horsburgh & Lowe, 2013). Tillin et al., 2010 assessed lagoons to be highly sensitive to sea-level rise (Pressure benchmark: Increased ASL of 21 cm by 2050 in London). Sea-level increase over the next 12 years is likely to be lower than benchmark levels assessed but probably still of notable concern over the long term, the extent of sea level rise relative to land will depend latitude with more effect seen in south Wales (Teferle et al., 2009). Much of the lagoon resource is in the south of Wales. Specific studies at Cemlyn lagoon (situated on Anglesey, North Wales), which is of high conservation merit (Pye and Blott, 2010; 2016), present sea level change as a threat and predict future issues. At Cemlyn lagoon, the shingle barrier currently appears to be in no immediate danger of a major breach and over-washing is relatively infrequent. However, the frequency of over-washing appears to have increased since 2000, and a severe event could occur at any time. The rate of retreat indicated by historical maps is low (< 0.2 m / year since the late 19th century).

The 2006 and 2022 aerial photography was used to calculate the change in shingle area caused by the over wash. The area is approximately 630m2 which equates to a loss of 0.28% of Cemlyn's overall area (Cuthbertson, 2025)

In February 2018 a significant storm event (Storm Emma) occurred which overtopped the Cemlyn lagoon barrier pushing lobes of ridge material back into the lagoon by approximately up to 3m at the western edge of the ridge (Wynne, 2018). Whilst this individual event cannot be specifically linked to climate change, sea-level rise and the potential for increased storminess could increase the

likelihood of overtopping events like this which can have detrimental effects on the extent of the lagoon. The overall impact of Storm Emma on the lagoon is low due to the relatively small area affected.

There are no obvious sources of new sediment supply to the barrier and any future acceleration in sea level rise will make it increasingly difficult for the barrier to maintain its relative crest level and an equilibrium cross-sectional profile. The frequency and severity of over-washing are therefore likely to increase, leading to more rapid landward movement of the barrier and adoption of a flatter profile, reducing the extent of the lagoon. Landward extension of shingle is most likely to occur where the barrier crest is currently lowest, close to the artificial islands. An increase in the frequency of barrier over-washing, and higher rates of percolation through the barrier, are likely to raise salinity in the lagoon. Periodic saltwater intrusion into the site from the north, notably Hen Borth, have occurred during past storm events and are likely to increase in future unless remedial measures are taken (Pye and Blott, 2010; 2016).

Increases in storminess may further impact the barrier creating the lagoons (N04) (Jones et al., 2011) however natural variability in wave climate is strong and the role of anthropogenic forcing is uncertain. There is, as yet, no consensus on the future storm and wave climate, stemming from diverse projections of future storm track behaviour (MCCIP: Woolf and Wolf, 2013). This makes predictions about future threats in relation to climate change driven storminess difficult.

Climate change and ocean acidification cause direct and indirect pressures which can significantly alter the environmental conditions (e.g. decreases in pH, increases in sea surface temperature) necessary for benthic ecosystem processes and functions (OSPAR, 2023). Calcifying organisms are thought to be vulnerable to ocean acidification under climate change, with some models

predicting up to 13% of cold water coral reefs being in low-aragonite areas (Hoppit & Schmidt 2022, Moore & Smale 2020). Climatic models predict there will be changes to area of suitable habitat in the future depending on the climatic scenario (Moore & Smale, 2020). Other studies suggest ecosystem-level responses could remain stable over long periods of time, depending on the species involved (Moore & Smale, 2020). While confidence in evidence has increased from low to medium, there are still knowledge gaps meaning we are unable to fully assess the scale of benthic species and community responses in relation to climate change for broadscale habitats (Moore & Smale, 2020).

As a result of warming seas, there is evidence of major declines in plankton abundances in the NE Atlantic (~50% decline in copepod abundance over the last ~60yrs), shifting to a 'microbial food web" driven by picophytoplankton e.g. Synechococcus (Schmidt et al. 2020; Holland et al. 2023). Synechococcus is a poor primary producer due to its small size and lack of essential fatty acids (Lindeque et al. 2015). Changes such as this are likely to affect entire food-webs and a particular at-risk group would be filter-feeders such as found within reef communities.

PJ01 Temperature changes (e.g. rise of temperature & extremes) due to climate change (Medium – ongoing and in the future):

Lagoons were assessed as having medium sensitivity to seawater temperature changes by Tillin et al., (2010) however Jones et al., (2011) state that angiosperms and invertebrate specialists inhabiting lagoons have a high tolerance for increased temperature. A recent study projected increases in sea surface temperature over the long term (2069-89 relative to 1960-89) of over 3 °C for the Irish and Celtic Seas (Hughes et al., 2017). It is difficult to make predictions on temperature trends over the next two

reporting cycles (12 years). The shallowest percolation lagoons such as Morfa Gwyllt are the most likely to experience problems because they don't tend to have as much daily tidal exchange of water.

PJ03 Changes in precipitation regimes due to climate change (Medium – ongoing and in the future)

Potential change in seasonal precipitation may impact the lagoon by increasing/decreasing freshwater run off and turbidity (Jones et al., 2011). Increased freshwater run off will likely lead to decreased salinity and possibly increase nutrient inputs which may accelerate the eutrophication and sedimentation of lagoons, decreased freshwater run off may lead to elevated salinity which will presumably impact typical species especially at lagoons with low flushing rates. Lagoon specialists typical of lagoons are generally resilient to short term variation in salinity, more long-term changes (i.e. over a season) maybe detrimental. Rainfall is predicted to rise in the winter and fall in the summer which may cause longer term seasonal changes. The projected decreases in the summer average rainfalls in Wales are 7% by the 2020s, 12% by the 2040s and 20% by the 2080s. The projected increases in the winter average rainfalls in Wales are 7% by the 2020s, 11% by the 2040s and 19% by the 2080s for Wales, this will probably be ecologically significant. Greatest decreases and increases are predicted in South West Wales (Welsh Government, 2009) where many Welsh lagoons are situated.

PK02 Mixed source marine water pollution (marine and coastal)

(Low - ongoing and likely to be in the future):

There are raised levels of contaminants in Milford Haven Inner (i.e. Tributyltin Compounds Mercury and Its Compounds, Brominated diphenylether (BDPE)) and in the Dee (i.e. Mercury and Its Compounds, Brominated

diphenylether (BDPE)) adjacent to where many of the lagoons are situated (WFD Cycle 3 Interim classification, 2024).

PE02 Shipping lanes and ferry lanes transport operations

(Low - ongoing and likely to be in the future):

Those lagoons around the oil port of Milford Haven are subjected to raised levels of hydrocarbons from small operational and larger incident spills (e.g. the large Sea Empress spill of 1996).

PD05 Development and operation of energy production plants (including infrastructure) (Medium – only in the future):

Cemlyn lagoon is situated in close proximity to a proposed nuclear power station extension. Associated construction, operation and decommissioning works on land and sea adjacent to the lagoon pose a potential threat.

Perceived threats are from;

• Increased sedimentation (and associated heavy metals) associated with groundworks, in the lagoon from run-off entering a feeder stream. However, planned work to eliminate this occurring has been proposed that would temporarily re-route the flow away during construction period. Increased sedimentation associated with marine works – turbid seawater may be drawn into the lagoon from Cemlyn Bay, increasing sedimentation affecting the fauna and flora present.

• Wave reflection - There will also be some marine structures constructed as part of the Wylfa Newydd development. Modelling predicts that under certain conditions, primarily under north-westerly storm conditions, waves can be reflected off the breakwater back towards the

	Western part of Cemlyn Bay. The Environmental Statement assesses the impacts on Esgair Gemlyn as negligible during construction, and minor during operation. Therefore, there is some potential for the breakwater to influence the morphology of the shingle ridge fronting the lagoon, particularly at the Western end, but this should be considered in the context of the ridge as a naturally dynamic feature which will be modified under storm conditions even without the breakwater associated with the Wylfa Newydd project. • Temperature increases caused by the thermal plume from cooling water discharge – Warmed water may be drawn into Cemlyn Lagoon from the Bay through the weir which may affect the fauna and flora present. • Water quality related to temporary sewage pipe • In combination effects related to this development The impacts of the Wylfa Newydd Project will be assessed through HRA, and as part of this process, measures to avoid adverse effects on Esgair Gemlyn will be considered (Horizon Nuclear Power 2018; various). Esgair Gemlyn and Cemlyn lagoon will still be subject to the influence of climate change threats, and will need to be taken into consideration when determining appropriate mitigation measures in association with the Wylfa Newydd project. The impact severity and likelihood of these threats is currently unclear as the development application is currently suspended.
8.1: Status of measures	Some measures have been taken (e.g. restricted access at Morfa Gwyllt, fixing weir at Carew, work at Cemlyn to restore field boundaries) but the majority of the most important have neither been planned or implemented (I.e. specific mitigation of nutrient pressures, climate change mitigation and resolve specific litter issues). Many other issues remain however. NRW are currently planning to

	reduce general nutrient levels. Site specific measures as well as general measures are required.
8.2: Main purpose of the measures taken	Measures taken are focused on restoring Structure and Function at sites, by maintaining weirs and retaining sluice structure, and through joint projects such as the Marine Opportunity Catchment work which has helped management of the Cemlyn Lagoon's surrounding agricultural land (Lewis, 2025).
8.5: List of main conservation measures	MK01 Reduce impact of mixed source pollution (High): Key measures which are in place to mitigate water quality related pressure and threats identified in this assessment are driven by European legislation and cover the wider sea area: The Water Framework Directive (WFD) aims to maintain the 'high and good status" of waters where it exists, prevent any deterioration in the existing status of waters and to restore at least 'good status" in relation to all waters. The mechanism by which this is to be achieved under the WFD is through the adoption and implementation of River Basin Management Plans and Programmes of Measures for each of the identified River Basin Districts. Many measures planned aim to deal with issues causing WFD coastal and estuarine waterbody failures for ecological and chemical elements. The Programme of measures delivers many of the statutory requirements for other directives and associated legislations e.g. Marine Strategy Framework Directive, Urban Waste Water Directive, Bathing Waters Directive and Eel Regulations. For example, Welsh Government are currently considering putting in place a Nitrate Vulnerable Zone which will facilitate the reduction of diffuse nutrients entering the lagoons originating from the wider area. Other examples of related measures are the Building Resilience in Catchments Project, Blue Green Algae Group, incident response follow-ups targeting specific diffuse runoff issues and the recruitment of an Agricultural Officer at NRW. This measure is relevant to a large area, it may, potentially, have a big impact. The likely impact of this measure and

timescale is currently unclear, there is low confidence on impact for lagoons feature.

MC05 Adapt/manage fossil energy installation, facilities and operation (High):

This conservation measure relates to PD05. Consents are required to develop power stations and associated cable lines. Developers of nuclear power stations are required to gain approval from the UK government (Nationally Significant Infrastructure Projects – Planning Act 2008). For projects such as these a marine licence is also required (Marine and Coastal Access Act, 2009). The licence application is determined by NRW. Each application requires an Environmental Impact Assessment and Habitats Regulation Assessment (where within or adjacent to a Natura 2000 site). Based on evidence produced any mitigation required is agreed and implemented as appropriate. The inclusion of mitigation in a project proposal or consent reduces the environmental impact, or potential environmental impact, to a level acceptable under the relevant regulatory framework. If there are outstanding unresolved issues then they will be subject to monitoring, mitigation or compensatory measures as appropriate.

This measure relates to PD05 and was ranked as high because it relates to a moderate area of lagoon with high conservation merit and mitigates potentially severe impacts.

CF08 Reduce/eliminate marine contamination with litter (High):

This conservation measure relates to pressure and threat PF10. European policies aim to reduce the effect of marine litter, which has recently been well publicised as an issue. The Marine Strategy Framework Directive (MSFD) (descriptor 10) requires EU Member States to ensure that, by 2020, 'properties and quantities of marine litter do not

cause harm to the coastal and marine environment'. Pollution of the seas from plastics and microplastics is one of the three major areas of the Strategy for Plastics, adopted by the European Commission on 16th January 2018; most of the proposed Actions are directly or indirectly related to marine litter, including its international dimension. Initiatives against plastic pollution of the oceans, flowing from the Strategy are (EU descriptor 10 website, accessed 2017):

• consideration of measures against Single Use Plastics and fishing gear

• assessment of the need to restrict microplastics intentionally used in products

• consideration of measures against microplastics generated during the life cycle of products

• The 7th Environment Action Programme calls for the development of an EU-wide 'quantitative reduction headline target for marine litter, supported by source-based measures and taking into account marine strategies established by Member States'. The Circular Economy Package sets a target for reducing by 30% beach litter and list fishing gear.

Actions Identified by the actions database (site level) include:

• Direct management is the most frequently identified mechanism for addressing marine litter impacts. This mechanism predominantly refers to action required by Local Authorities (LA) to support and help implement measures to remove litter from beaches (e.g. third-party collections and LA beach cleaning), ensuring that approaches are sensitive to features.

• Investigation actions principally relate to improving the

evidence base to underpin better management and reduce both sources of marine litter and impacts on features. This includes investigations to develop better understanding of local sources of marine litter and its disposal, and identification or high-risk areas for marine litter.

• Targeted education, awareness raising, and liaison actions include, for example, developing opportunities to reduce litter at source (locally), including site level awareness.

Example legislation include:

• Plastic bags: The Single Use Carrier Bags Charge (Wales) Regulations 2010 (http://www.legislation.gov.uk/wsi/2010/2880/contents/made) came into force on the 1 October 2011 and brought into effect a charge of 5p for all plastic bags formerly given out for free by retailers.

• Environmental Protection (Microbeads) (Wales) Regulations 2018 was voted on and passed by the Welsh Assembly in June 2018 The Environmental Protection (Microbeads) (Wales) Regulations 2018

MA10 Reduce/eliminate point or diffuse source pollution to surface or ground waters (including marine) from agricultural activities (Medium)

A project between NRW and the National Trust was carried out in 2022. The aim was to re-establish fences around field boundaries, completely excluding the cattle from the lagoon. Feeding stations and water troughs were moved to the centre of the field to limit cattle proximity to the lagoon and reduce trampling of the banks. The field near the western end of the lagoon that often gets wet has been fenced off to stop grazing (Lewis, 2025).

MF03 Reduce impact of outdoor sports, leisure and recreational activities (incl. restoration of habitats)

(Medium):

Since issues (relating to access to Morfa Gwyllt lagoon) were identified in the NRW actions database and the Pen Llŷn a'r Sarnau management scheme, Gwynedd Council have installed a robust metal fence and gate preventing easy access to Morfa Gwyllt Lagoon. The gate is locked. This essentially prevents easy access to the site. The only way to access the site is by wading through the river under the bridge or by walking a fair distance along a stony beach (approx. half an hour walk). There have been issues in the past with unidentified members of the public breaking the lock on the gate and breaking the gate itself to gain access to the site. However, this has not occurred in the last 18 months. The lock remains secure. Therefore, there was no need to install any fences or gates at the site (Hargrave, 2018). Identified as medium as it is effective but effects a very small area.

MI03 Management, control or eradication of other invasive alien species (Medium):

Legislative agreements seek to protect biodiversity, species and habitats, and include provisions requiring measures to prevent the introduction, spread and control of, invasive non-native species, especially those that threaten native or protected species and habitats.

The UK is a signatory to the Ballast Water Convention which aims to prevent the spread of harmful aquatic organisms by establishing standards and procedures for the management and control of ships' ballast water and sediments. These include specific ballast water management standards (e.g. concerning the efficacy of water exchange), the requirement for international vessel traffic to manage ballast water and sediments in accordance with vessel-specific ballast water management plans, and for all such vessel to carry a ballast water record book and an international ballast water management

certificate.

Through its implementation of the Marine Strategy Framework Directive (MSFD), the UK aims to ensure that INNS introduced by human activities are at levels that do not adversely alter the ecosystems'. The UK's Marine Strategy includes targets to reduce the risk of introduction and spread of non-native species through improved management of high risk pathways and vectors, and for action plans to be developed for key high-risk marine non-indigenous species by 2020. The strategy also sets out indicators for Good Ecological Status (GES) in respect of these INNS targets, and monitoring programmes for measuring progress towards achieving or maintaining GES. In Wales, various statutory and ad-hoc monitoring programmes contribute towards the MSFD INNS evidence baseline. Examples include marine rapid assessment surveys of Welsh marinas carried out in 2011 and 2014. Contingency plans are currently being developed for priority marine INNS species not yet established in Wales.

The impacts associated with INNS are also recognised as potentially significant anthropogenic pressures through the UK's approach to implementing the Water Framework Directive. Impacts from invasive non-native species are considered as part of the assessment of the ecological status of water bodies and, in general terms, measures are adopted to improve status and address impacts, on a water body by water body basis, where INNS are implicated in a water body failing to achieve its objectives.

At a national level, specific legislation restricts the spread or release of INNS in the wild. Section 14 of the Wildlife and Countryside Act 1981, for example, contains specific provisions relating to the introduction of new species and provides that it is an offence to release or allow to escape into the wild, any animal which is not ordinarily resident in Great Britain, or those listed in Schedule 9. In Wales, anthropogenic activities with the potential to introduce or

	spread INNS are managed through the implementation of biosecurity risk assessment and management planning under existing regulatory and consenting frameworks. Examples include the marine licensing provisions of the Marine and Coastal Access Act, Habitats Regulations Assessments under the Conservation of Habitats and Species Regulations 2017 and Sites of the Special Scientific Interest (SSSI) consenting procedures under the Wildlife and Countryside Act 1981. Natural Resources Wales and the Welsh Government are standing members of the UK Marine Pathways Group, a coordinated approach to preventing new INNS introductions, early detection and rapid action to prevent the establishment of INNS, and containment and long-term control measures across the UK and Ireland. The Marine Pathways Group, in its earlier project form, produced specific INNS guidance and voluntary best practice for marina operators, boat owners and the aquaculture sector, and led on the identification of locations at high risk of introduction where biosecurity efforts should be focused. Specific Welsh control and eradication projects taken forward under the Marine Pathways banner include The Dee Chinese Mitten Crab Project and determining the extent of Grateloupia turuturu in Wales and feasibility of eradication.
9.1:Future trends and prospects of parameters	Range: The occurrence of this habitat is largely defined by physiographic processes over long timescales. While the physical area of some lagoons may change (see 9.1b), the geographic spread and distribution of features is not expected to change within the next 12 years. Area: Lagoons are considerably vulnerable to climate change; if unmanaged this is likely to result in a significant loss over

the long-term. It is difficult to assess the scale and period of likely loss as it could range from overtopping and barrier realignment to a catastrophic breach of a lagoon barrier. Some loss has already been observed at Cemlyn lagoon this is currently modelled to be less than 1% per year. Over the next 12 years loss is expected to continue. It is difficult to predict the rate of loss; however landward movement of the lagoon barrier at Cemlyn has been observed to be increasing. Climate change related impacts are predicted to be likely to affect the area of other lagoons. It is likely that Pickleridge lagoon will experience similar pressures.

Structure & function:

Application of expert judgement indicates that the future trend of structure and function is assessed as negative as various pressures have been identified which are likely to remain in the near future.

Lagoons have been highlighted as very vulnerable to climate change; it is likely that various physical alterations predicted to be caused by climate change will impact lagoons cumulatively. There is little in the way of current planned local mitigation. However, the effects are likely to be seen over long-time periods which mean that it is possible to adapt and act in the coming years as has been recommended in cited publications (Jones et al., 2011 [section 4.4.5]; National Trust, 2017; Pye & Blott, 2016).

High nutrient levels; although there are plans to improve general water quality around Wales through a program of measures, the issues highlighted at lagoons are likely to be mainly related to adjacent locations in addition to background levels. The opportunity catchment work carried out at Cemlyn (Lewis, 2025) could be extended and implemented at other lagoons.

Litter; plastic is present at almost all stations recently monitored by NRW within 5 lagoons across Wales. The

	extent of litter (mainly plastic) and effects of this on functioning of the lagoon communities are not understood but impacts are presumably undesirable and often plastics will remain present for long periods. It is also likely that planned regulation will take some years to become effective. It is possible that maintaining infrastructure at some lagoons may improve functioning which will help achieve FCS. This has been undertaken at some locations but not all. Resolving this may be positive step to improve resilience and functioning of lagoons into the future. Overall, due to the vulnerability of lagoons to climate change, ongoing nutrient issues and presence of litter in lagoons without current measures to mitigate impacts the future prospects of structure and function were assessed as negative.
10.1: Range	Conclusion on Range reached because: (i) the short-term trend direction in Range surface area is stable; and (ii) the current Range surface area is approximately equal to the Favourable Reference Range.
10.2: Area	Conclusion on Area reached because:(i) the short-term trend direction in Area is decreasing by 1% per year or less; (ii) the current Area is approximately equal to the Favourable Reference Area; and iii) there has been no significant change in distribution pattern within range.
10.3: Specific structure and functions	Conclusion on Structure and function reached because: i) habitat condition data indicates that more than 25% of the habitat is in unfavourable (not good) condition; ii) short-term trend in area of habitat in good condition is decreasing; and iii) expert opinion determines that there are significant issues for this habitat.
10.4: Future prospects	Conclusion on Future prospects reached because: (i) the Future prospects for Range are good; (ii) the Future prospects for Area covered by habitat are poor; and (iii) the Future prospects for Structure and function are bad.

10.5: Overall assessment of Conservation Status	Overall assessment of Conservation Status is Unfavourable-bad because two of the conclusions are Unfavourable-bad.
11.1: Surface area of the habitat type inside the pSCIs, SCIs and SACs network	Cemlyn Lagoon (Cemlyn Bay SAC)16.885ha Morfa Gwyllt Spit lagoon (PLAS SAC) 0.366ha Pickleridge lagoon (Pembs Marine SAC) 6.304ha Neyland Weir Pool (Pembs Marine SAC) 10.973Ha Carew Castle Moat (Pembs Marine SAC) 7.952Ha Total: 42.481Ha = 0.425km2
11.3: Surface area of the habitat type inside the network; Method used	Data sources include combination of Field surveys, OS mastermap and aerial photos
11.4: Short-term trend of habitat area within the network; Direction	We are currently uncertain of the short-term trend in the area of good condition for this feature within SACs. Whilst evidence may be available we are unable to assess this field given the unpredictability of the effects of climate change, sea level rise, coastal squeeze and the increasing threat of a catastrophic breach of a retaining barrier.
11.6: Short-term trend of habitat area in good condition within the network; Direction	Cemlyn lagoon (within Cemlyn Bay SAC) has deteriorated from good to not good structure and function. See Section 6.1.
5.13: Favourable Reference Area (FRA)	The UK-level FRV for surface area was developed by JNCC using an audit trail based on the year the FRV was first established and any changes made in subsequent reporting rounds. The audit may draw from any combination of the 2007, 2013, or 2019 Habitats Directive reports and reflects the full rationale used for the 2019 Article 17 reporting. This FRV was reviewed by Welsh experts and considered appropriate for use in Wales based on current habitat extent and trends.

4.10: Favourable Reference Range (FRR)	The UK-level FRV for range was developed by JNCC using an audit trail based on the year the FRV was first established and any changes made in subsequent reporting rounds. The audit may draw from any combination of the 2007, 2013, or 2019 Habitats Directive reports and reflects the full rationale used for the 2019 Article 17 reporting. This FRV was reviewed by Welsh experts and considered appropriate for use in Wales based on current distribution and trends.