Sanitary Survey - Review

Car Y Mor – 2024

Document No. – *J0591/24/05/23*

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Cover image: Coastal hike in St Davids, UK. Available at: https://unsplash.com/photos/a-large-body-of-water-surrounded-by-mountains-cW7tjZUhYJU

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Document QA and Approval

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Initial Consultation

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Pembroke County Council	May 2024
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Dŵr Cymru / Welsh Water (DCWW)	August 2024
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Harvester	August 2024
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This is the first full sanitary survey of the Car Y Mor bivalve mollusc production area. The current Classification Zones were classified following the recommendations of a Classification Zone Assessment in 2021. This was undertaken in accordance with Regulation (EC) 854/2004 (which was replaced by retained EU Law Regulation (EU) 2017/625, with sanitary survey requirements now specified in retained EU Law Regulation (EU) 2019/627). These provided appropriate hygiene classification zoning and monitoring plan based on the

best available information with detailed supporting evidence. In line with regulatory and EU guidance the Food Standards Agency undertake targeted sanitary survey reviews to ensure public health protection measures continue to be appropriate. This report provides a review of information and recommendations for a revised sampling plan if required. Carcinus Ltd. (Carcinus) undertook this work on behalf of the FSA. Carcinus Ltd accepts no liability for any costs, losses or liabilities arising from the reliance upon or use of the contents of this report other than by its client.

Dissemination

Food Standards Agency, Pembroke County Council. The report is publicly available via the Carcinus Ltd. website.

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Carcinus Ltd., 2024. Review of the 2021 Classification Zone assessment relevant to the bivalve mollusc Classification Zones in Car Y Mor. Carcinus report on behalf of the Food Standards Agency, to demonstrate compliance with the requirements for classification of bivalve mollusc production areas in England and Wales under retained EU Law Regulation (EU) 2019/627.

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1 Introduction

1.1 Background

The Food Standards Agency (FSA) is responsible for carrying out sanitary surveys in classified production and relay areas in accordance with Article 58 of retained (EU) Regulation 2019/627 and the EU Good Practice Guide (European Commission, 2021). In line with these requirements, sanitary surveys must be reviewed to ensure public health protection measures continue to be appropriate. Carcinus is contracted to undertake reviews on behalf of the FSA.

The report considers changes to bacterial contamination sources (primarily from faecal origin) and the associated loads of the faecal indicator organism *Escherichia coli* (*E. coli*) that may have taken place since the original sanitary survey was undertaken. It does not assess chemical contamination, or the risks associated with biotoxins. The assessment also determines the necessity and extent of a shoreline survey based on the outcome of the desktop report and identified risks. The desktop assessment is completed through analysis and interpretation of publicly available information, in addition to consultation with stakeholders.

1.2 Car Y Mor Review

This report reviews information and makes recommendations for a revised sampling plan for existing mussel (*Mytilus* spp.) classification zones in Car Y Mor (Figure 1.1). The current Classification Zones (CZs) were classified following a CZ Assessment in 2021 (Carcinus Ltd., 2021). This review explores any changes to the main microbiological contamination sources that have taken place since the original sanitary survey was conducted. Data for this review was gathered through a desk-based study and consultation with stakeholders.

An **initial consultation** with Local Authorities (LAs), Natural Resources Wales (NRW), and the Food Business Operator (FBO) responsible for the production area was undertaken in May 2024. This supporting local intelligence is valuable to assist with the review and was incorporated in the assessment process.

Following production of a draft report, a wider **external second round of consultation** with responsible Local Enforcement Authorities (LEAs), Industry and other Local Action Group (LAG) members was undertaken in July and August 2024. It is recognised that dissemination and inclusion of a wider stakeholder group, including local industry, is essential to sense-check findings and strengthen available evidence. The draft report is reviewed taking into account the feedback received.

The review updates the assessment originally conducted in 2021 and sampling plan as necessary and the report should read in conjunction with the previous survey provided in Appendix I.

Specifically, this review considers:
(a) Changes to the shellfishery (if any);
(b) Changes in microbiological monitoring results;

(c) Changes in sources of pollution impacting the production area or new evidence relating to the actual or potential impact of sources;

(d) Changes in land use of the area; and

(e) Change in environmental conditions.

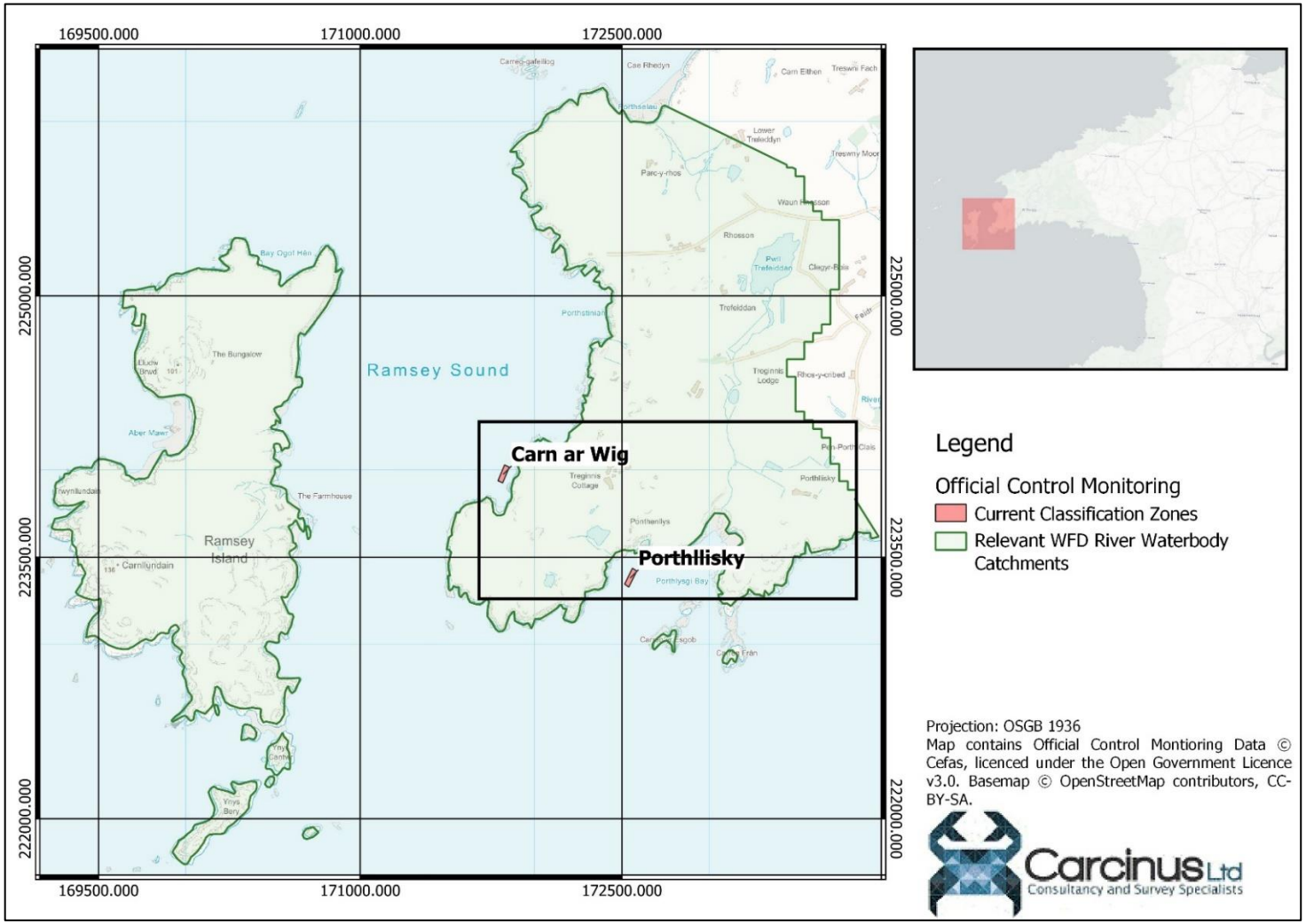

Figure 1.1. Location of Car Y Mor BMPA in Wales. Highlighted green area represents relevant Water Framework Directive (WFD) catchment used.

Sections 2 - 6 detail the changes that have occurred to the shellfishery, environmental conditions and pollution sources within the catchment since the publication of the original sanitary survey. A summary of the changes is presented in section 7 and recommendations for an updated sampling plan are described in section 8.

1.3 Assumptions and limitations

This desktop assessment is subject to certain limitations and has been made based on several assumptions, namely:

- Accuracy of local intelligence provided by the Local Authorities and Natural Resources Wales;
- The findings of this report are based on information and data sources up to and including April 2024;
- Only information that may impact on the microbial contamination was considered for this review; and
- Official Control monitoring data have been taken directly from the Cefas data hub[1], with no additional verification of the data undertaken. Results up to and including April 2024 have been used within this study. Any subsequent samples have not been included.

2 Shellfisheries

2.1 Description of Shellfishery

The Car Y Mor BMPA is situated near St Davids, Pembrokeshire (Figure 1.1). The closest BMPA is that of Milford Haven (Cefas Reference M039) which is classified for Pacific oysters (*Crassostrea gigas*).

The Local Enforcement Authority in terms of food hygiene Official Control purposes (including sampling) is Pembroke County Council. The fishery is a private fishery[2] that leases the area from the Crown Estate with a marine license from the Marine Management Organisation. The adjacent Pembrokeshire Coastline is also a National Park.

In the 2021 Sanitary Survey Classification Zone assessment for the Car Y Mor BMPA, two small CZs (Carn ar Wig and Porthllisky) (Figure 1.1) were recommended for classification for three species (Mussels *M. edulis*, Native Oysters *Ostrea edulis*, and King Scallops *Pecten maximus*). Currently, only mussels are harvested from the *Carn ar Wig* CZ. A summary of the fishery for each species is provided in the following paragraphs.

2.1.1 Mussels

The 2021 CZ assessment specifies harvesting of farmed mussels which are grown on rope and harvested August – May each year. The mussels are cultured, and currently only harvested from the *Carn ar Wig* CZ. At initial consultation, the Food Business Operator (FBO)

[1] Cefas shellfish bacteriological monitoring data hub. Available at: https://www.cefas.co.uk/data-and-publications/shellfish-classification-and-microbiological-monitoring/england-and-wales/.
[2] https://www.carymor.wales/

indicated approximately 2 tonnes of mussels are harvested each year. The *Porthllisky* CZ is currently temporarily declassified for mussel harvesting (as of November 2023) and is not commercially active at the time of writing this report. At initial consultation, the FBO and LEA indicated declassification was a commercial decision due to lack of production from this bed.

2.1.2 Native Oysters

The shellfishery has not been classified for native oysters, although RMPs were recommended in the 2021 CZ Assessment. At the time of the 2021 CZ assessment, it was indicated that *Mytilus* spp. samples could be used to represent *O. edulis* however it was recommended that samples still be taken from both species.

During initial consultations, the FBO indicated farming techniques are currently being investigated for the potential harvesting of these species in the future. A revised sampling plan will be required if this is the case, but the species is not included in the recommended sampling plan provided in Section 8.

2.1.3 King Scallops

Both CZs were declassified for king scallops in November 2022. The use of indicator species like *Mytilus* spp. for *O. edulis* is not recommended with regards to king scallops.

During initial consultations, the FBO indicated farming techniques are currently being investigated for the potential harvesting of these species in the future. A revised sampling plan will be required if this is the case, but the species is not included in the recommended sampling plan provided in Section 8.

2.2 Classification History

There are currently two Classification Zones (CZs) (Carn ar Wig and Pothlliksy) within the Car Y Mor BMPA. They are both classified for mussel harvesting, however only *Carn ar Wig* is commercially active at the time of writing this report (September 2024). The *Porthllisky* CZ was temporarily declassified for this species in November 2023 as a commercial decision by the FBO. Previously both CZs were also classified for native oysters and king scallops as per the 2021 CZ assessment recommendations. Neither CZ is currently classified for native oysters, and declassification for king scallops occurred in November 2022, again as a commercial decision by the FBO. At initial consultation, it was noted seed stock of both these species, and of mussels at *Porthllisky*, does exist however commercial production for all these is some time away whilst different farming techniques are investigated by the FBO. If native oysters and king scallops are to be harvested in the future, a revised sampling plan will be necessary.

The *Carn ar Wig* CZ has an A classification. *Porthllisky* also holds an A classification but is not currently commercially active and is therefore currently de-classified and subject to quarterly monitoring.

The location and classification status of all CZs along with all RMPs sampled in the BMPA since 2021 are presented in Table 2.1 and Figure 2.1.

Table 2.1 Summary of all currently active Classification Zones in the Car Y Mor BMPA

Classification Zone	Species	Current Classification (as of April 2024)	RMP used
Carn ar Wig	Mussels	A	Carn ar Wig (M. sp – B097A)
Porthllisky	Mussels	A (temporarily declassified as of Nov 2023)	Porthllisky (M. sp – B097D)

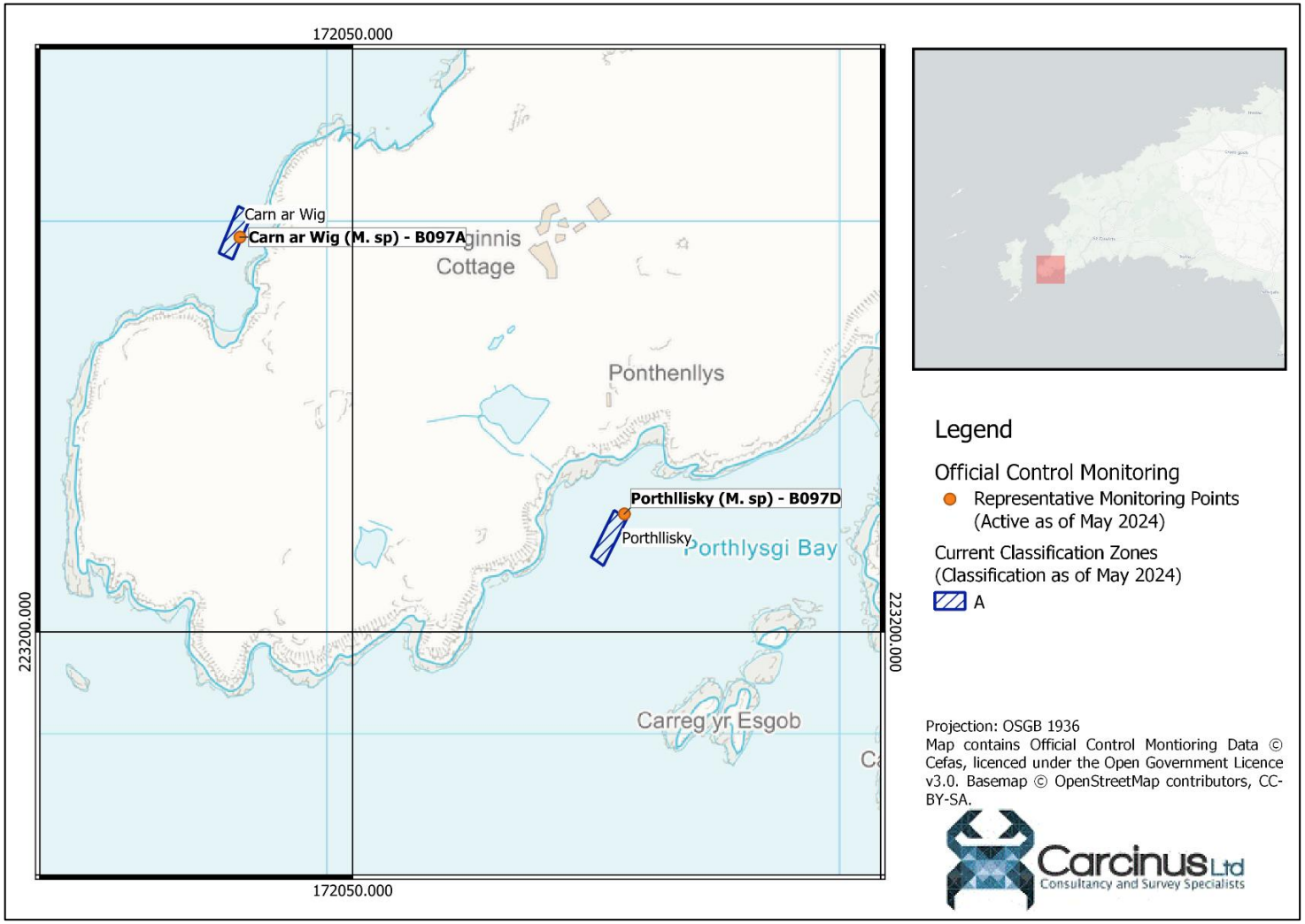

Figure 2.1 Current Classification Zones and Associated Representative Monitoring Points in the Car Y Mor BMPA. Porthllisky CZ temporarily declassified November 2023.

3 Pollution sources

3.1 Human Population

The 2021 CZ assessment does not include population data analysis. Since urban associated runoff can be a potentially significant contamination source of BMPAs, the distribution of urban centres throughout the catchment has been considered within this report. The 2021 and 2021 Censuses of the United Kingdom were used to give an indication of the patterns of human population density across the catchment.

There are only two Census Output Areas within the catchment considered in this report. The Output Area is the smallest Census geographic area, representing approximately 40 – 250 households or 100 – 625 persons. Table 3.1 presents the human population density and total count in the 2011 and 2021 censuses for the Car Y Mor catchment. It shows that the majority of the land within the catchment is rural, with a population density of less than 30 people per square kilometre. The population increased from 273 in 2011 to 285 in 2021 (increase of 4.4%). There are no large areas of residential housing within the catchment itself, and during initial consultations, the LEA stated that there had not been any significant amount of urban development within the catchment. The nearest urban area is the city of St. Davids, approximately 1.5 km from the WFD catchment perimeter and > 3 km from the nearest CZ. St. Davids has a population of 1,751 (37 people per square kilometre) and during initial consultations the LEA stated that some building works have occurred in the city. Whilst it is not inside the catchment given in Figure 1.1, St. Davids presents the highest risk of urban associated run-off to the CZ. Given the distance to the CZ, potential contamination from this urban source is likely to experience dilution and/or die-off before reaching the shellfish waters. Further investigation of local planning portals suggests that no new residential dwellings have been permitted, and all building works in the catchment have been for general property improvements.

Table 3.1 Human population density in Census Output Areas wholly or partially contained within the Car Y Mor catchment at the 2011/2021 Census.

Year	**2011**	**2021**
Population count	273	285
Population density (km^2)	27.57	28.79

The CZs of the Car Y Mor BMPA are adjacent to the Pembrokeshire National Park. The BMPA is also situated to the east of Ramsey Island. Both of these make the area a popular tourist destination. In 2019, the Pembrokeshire tourism industry hosted 7.053 million visits[3]. These are likely to be mainly during summer months, which is also when the population is likely to peak. This will result in increased loading to the wastewater treatment network. During initial consultations, the LEA stated no concerns over the adequacy of the existing water

[3] https://www.pembrokeshire.gov.uk/cscorporatestrategy202328/cspembsincontext

treatment network to handle this seasonal increase. At secondary consultation, DCWW supported this conclusion. Full details of the changes to the wastewater treatment network are discussed in the next section.

No population data for the Car y Mor catchment was presented in the 2021 CZ assessment to facilitate comparison in this report. However, analysis of the available 2011 and 2021 Census data shows that the majority of the catchment is rural, with population densities of fewer than 30 people per square kilometre. The main risk of urban associated runoff lies outside of the catchment in the city of St Davids to the east. Both CZs are more than 3 km from this source of contamination, and therefore contamination levels are unlikely to be significantly impacted at either of them. No concerns were shared during consultation for the impact of seasonal tourism on the BMPA.

3.2 Sewage

Details of all consented discharges in the vicinity of the Car y Mor BMPA were taken from the most recent update (2023 data) to Natural Resources Wales' (NRW's) national permit database (Natural Resources Wales, 2024). The locations of these discharges within the catchment and near the Classification Zones are shown in Figure 3.1. The 2021 CZ assessment identified a single continuous discharge within the catchment draining to the shellfish waters which was the continuous discharge from St Davids WWTW, situated in Porthclais Bay and is approximately 1.7 km from the nearest CZ (*Porthllisky*). This discharge employs secondary treatment (biological filtration) and has an unchanged Dry Weather Flow (DWF) from that reported in the 2021 CZ assessment (987 m^3/day). Based on this, the recommendations made in the 2021 CZ assessment remain valid. This continuous discharge remains as a low risk of contamination to the BMPA given the lack of connectivity, and distance between the discharge and CZs allowing for bacteriological die-off.

Intermittent discharges, comprising Combined Storm Overflows (CSOs), storm tank overflows and pumping station (PS) emergency overflows, have the potential to significantly affect local water quality and subsequently the management of shellfish hygiene within BMPAs. Spill events either occur during periods of wet weather when the sewers are inundated with surface water and infiltration of groundwater, or in the event of an emergency failure of a plant/equipment. There are four intermittent discharges in the vicinity of the BMPA. Given the close proximity of the city of St David's, discharges located in or around this area that are outside of the primary catchment have been included (Figure 3.1). Of these, three discharges drain to the Afon Alun which ultimately drains out into Porthclais Bay. The fourth discharge drains directly to Porthclais Bay. All four employ screening as a treatment methodology. Details of the intermittent discharges and available Event Duration Monitoring (EDM) data are shown in Table 3.2.

Table 3.2 Details of intermittent discharges in the vicinity of the Car y Mor BMPA.

Site Name	Permit Number	Receiving Environment	Outlet NGR	Total Duration (hrs) of spills in 2023	Number of spills in 2023	Distance from centre of nearest CZ (km)
ST DAVID'S WWTW ST DAVID'S PEMBS	BP0062702	Coastal Waters (Porth Clais)	SM 74303 23849	2,631.25	135	1.77
PIT ST ST. DAVIDS SWO	BP0208101	River Alun	SM 74930 25350	35.25	33	3.05
PEBBLES ST. DAVIDS SWO	BP0208201	River Alun	SM 75060 25420	13.5	8	3.16
VIC'GE RD ST.DAVIDS.SWO	BP0208301	River Alun	SM 75080 25460	2	3	3.22

The intermittent discharge closest to any CZ in the Car y Mor BMPA is at St David's WWTW which in 2023 spilled for 2,631.25 hours, with a spill count of 135. This discharge does not need to be factored into the placement of RMPs as there is very limited hydrodynamic connectivity between where it discharges to, and the shellfish waters. This discharge releases into Porthclais Bay, which is 1.7 km from the BMPA, and any potential contamination would also need to be carried around the headland and island of Carreg Fran to reach the shellfish waters. There is limited hydrodynamic connectivity between where this discharge is draining to in Porthclais Bay, and the BMPA itself therefore it does not need to be considered in the placement of RMPs. There is also limited hydrodynamic connectivity between the remaining three discharges and the water surrounding the BMPA. In addition, these discharges spilled less frequently and for less time. They are also a greater distance from the CZs and so would experience significant bacterial die-off/dilution before potential contamination reached the shellfish waters.

In addition to continuous and intermittent discharges in the catchment, there are other privately owned discharges throughout the catchment (Figure 3.1). During the desk-based study of satellite imagery of the catchment, multiple caravan and camping holiday parks were identified with one reported as a private discharge in NRW's Water Quality permit database. Limited details of these can be provided due to data protection requirements. However, during further consultation NRW advised caravan sites are likely to discharge to soakaway. Given the nature of these sites, there may be increased faecal loading during the

summer months when tourism to the area increases from these sources. Results in section 6.1.3 show a seasonal increase in Autumn months, potentially due to an accumulation of contamination over the busy summer period. However this was shown to not be a statistically significant increase compared to other seasons. During initial consultations, Natural Resources Wales provided additional information for caravan/holiday parks in the catchment. They stated they are not aware of any discharges direct into the sea, and that these would be to soakaway. Additional information on the routing of wastewater from these caravan parks was sought from the LEA at secondary consultation which confirmed the conclusions of NRW. During secondary consultation, DCWW stated that they had no concerns over the wastewater treatment network (particularly in summer months) in the catchment.

Overall, the continuous discharge network of the catchment is relatively sparse, reflecting the rural nature of the area and small permanent population. The main continuous and intermittent discharges in the area are situated in Porthclais Bay (1.5 km from the *Porthllisky* CZ). Satellite imagery suggests that there are numerous caravan and camping holiday parks in the area. Information provided during consultation suggests that these sites discharge via soakway and do not directly discharge to the coastal waters of the Car y Mor, and that stakeholders do not have concerns over the capacity of the treatment network to accommodate summer increases in loading to the network. Their presence should however be taken into consideration in any updated sampling plan.

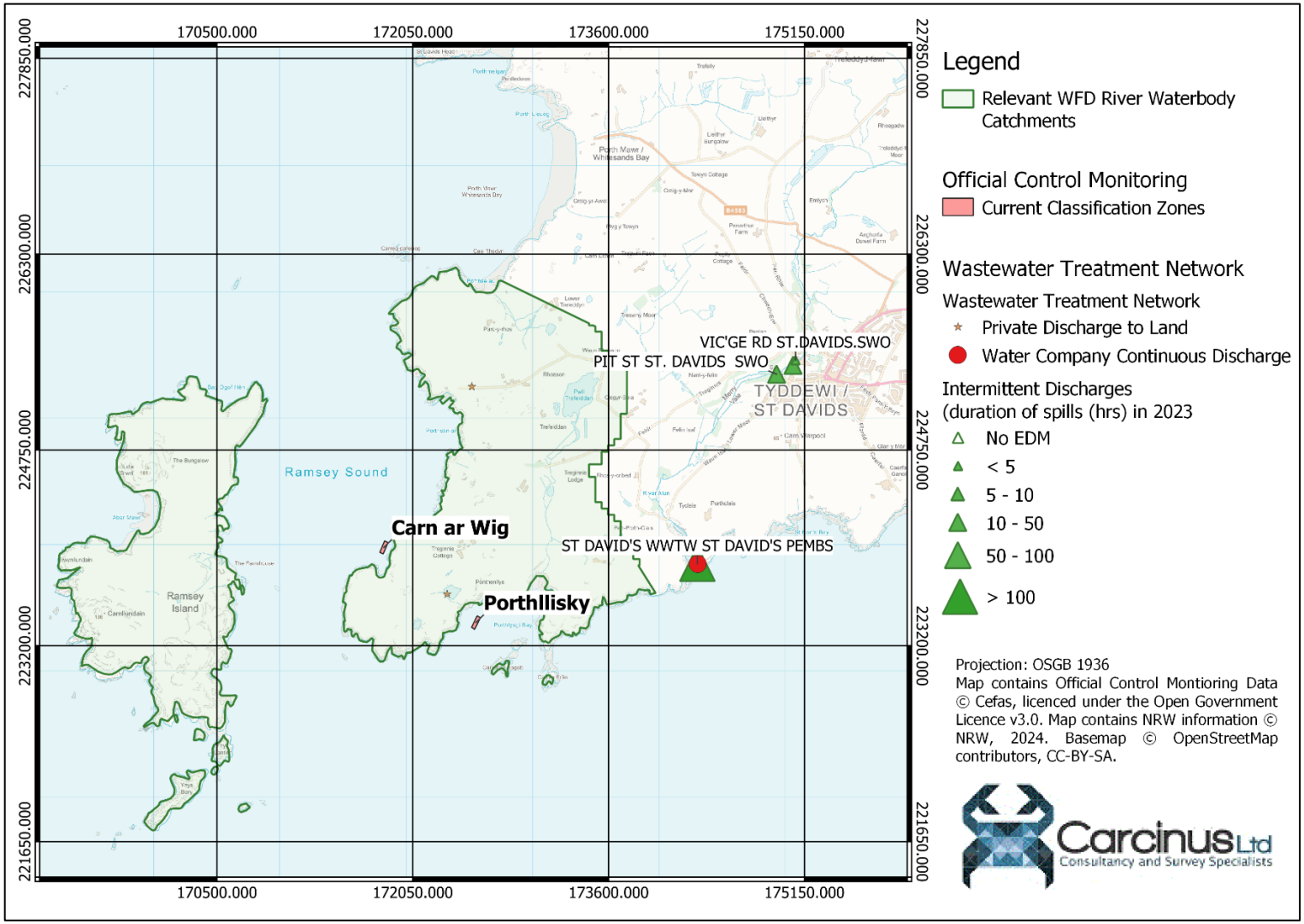

Figure 3.1 Locations of all consented discharges in the Car y Mor catchment.

3.3 Agricultural Sources

The 2021 CZ assessment identified that a significant proportion of the Car y Mor catchment is pasture, including the land immediately adjacent to the shorelines where each CZ is situated. No livestock data was assessed in the 2021 CZ assessment. To provide an indication of changes to the livestock population in the catchment, a data request was made,. however, at the time of writing (August 2024), no livestock data has been provided and therefore no comparison of livestock populations is possible.

The principal route of contamination of coastal waters by livestock is surface runoff carrying faecal matter. The land cover of the Car y Mor BMPA in 2018 is shown in Figure 3.2. The maps show that the majority of the catchment is rural and continues to be dominated by pastures. The pasture areas noted adjacent to the shorelines present the greatest contamination risk to the classification zones. This is due to run-off from the land travelling less distance before reaching the CZs, resulting in less dilution and *E. coli* die off. Livestock numbers will be greatest in Spring, and lowest in Autumn when animals are sent to market. At secondary consultation, the LEA stated that populations of livestock near the coast were *"low level"*, and generally consisting of sheep. A small livestock population means that whilst there is some risk of direct runoff, the overall *E. coli* loading is low. Areas of pasture should still be taken into consideration in any updated sampling plan.

A small area within the catchment is also shown as arable farmland. This can represent a risk to the bacteriological health of the BMPA through the application of slurry used as fertiliser. The closed periods for the spreading of slurry in Wales are 1 September – 31 December for sandy/shallow soils, and 15 October – 15 January for other soil types[4,5]. The Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021[6] specifies that silage cannot be stored within 10 m of a coastal or inland water. This regulation was introduced in 2021 when the original CZ assessment with authored, therefore no comparison can be made for how this change has affected this source of contamination.

Run-off from rivers further up the catchment (River Arun, and other small creeks) discharging close to the BMPA will have a lower risk of contamination to the CZs, because the increased distance will result in further dilution and *E. coli* die off. These may however contribute to background levels of contamination in the CZs, particularly following significant rainfall events.

At consultation, NRW were able to provide additional details on new dedicated agricultural teams being implemented across the catchment. These teams will work to ensure farms are

[4] https://ahdb.org.uk/knowledge-library/water-resources-control-of-agricultural-pollution-regulation-wales-faqs#:~:text=For%20grassland%20the%20closed%20periods,(2670%20gall%2Fac.)

[5] Farm pollution | Sub-topic | GOV.WALES

[6] Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021. Available at: https://www.gov.wales/water-resources-control-agricultural-pollution-wales-regulations-2021-summarymeasures-and-timeline

complying with regulations to reduce agricultural pollution in Wales [7]. Given the small scale of the Car y Mor catchment, it is unlikely these teams will focus on smaller farms located here during the first years of their engagement. However, it is likely to reduce farming impacts on coastal water, and ultimately shellfish beds, in the near future, though no precise dates are available.

Agricultural use of land in the catchment is likely to have an impact on bacteriological contamination in the BMPA, particularly given that land adjacent to the CZs is used as both pasture and arable farmland. Presence of both pastural and arable farmland should be taken into consideration in any updated sampling plan.

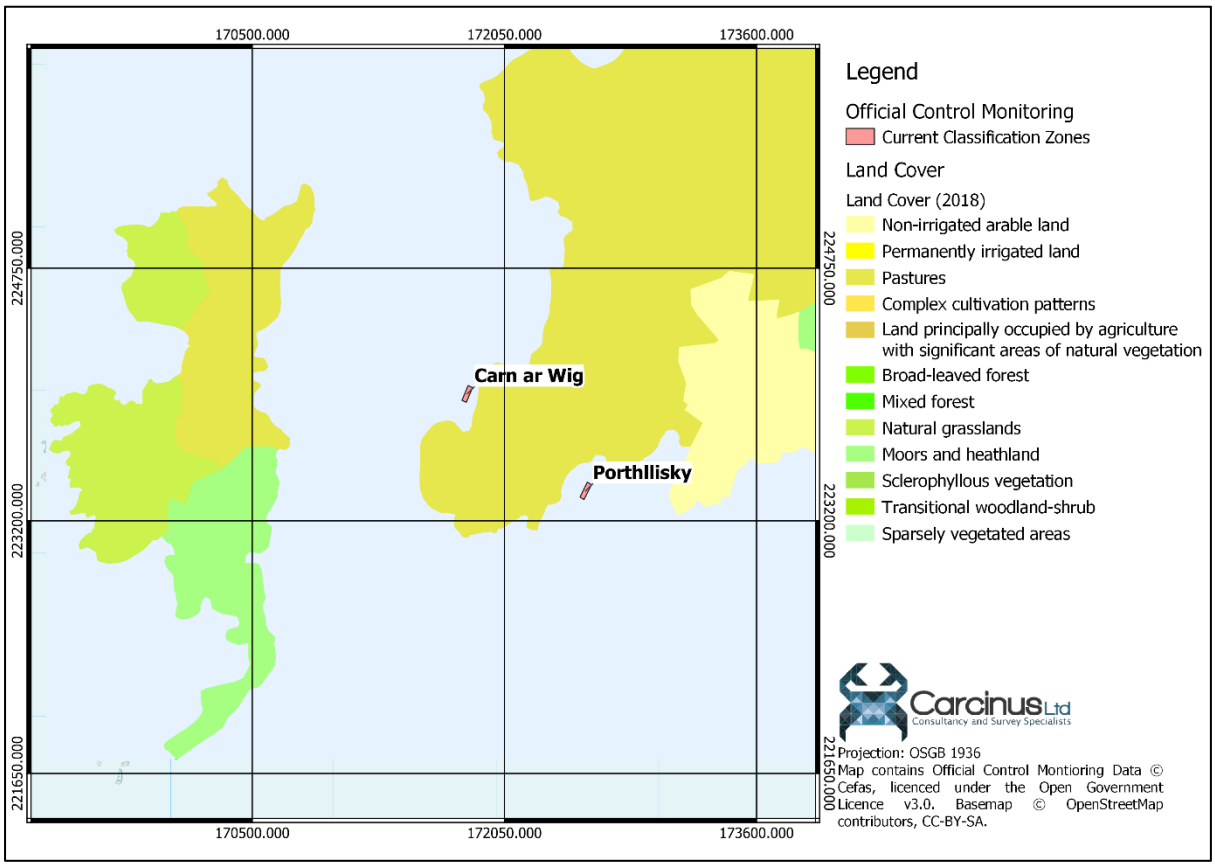

Figure 3.2 Land cover in the Car y Mor catchment in 2018.

3.4 Wildlife

The survey area of the Car y Mor BMPA encompasses a range of estuarine habitats which in turn attracts aggregations of wildlife, some of which may be an influential to shellfish hygiene through defecation in or nearby to the waters. The most significant of these is likely to be the waterbirds (wildfowl and waders) populations which overwinter in the area. The waters and coastline around the BMPA contain a variety of habitats that support many

[7] Natural Resources Wales / A new team will soon be in place to help farms reduce agricultural pollution in Wales

important wildlife species. As such, the area is conferred protection under a variety of national and international designations, including as a Special Area of Conservation (SAC), Site of Special Scientific Interest (SSSI) and National Nature Reserve. The Wetland Bird Survey (WeBS) provides waterbird counts for St Davids Airfield SSSI, which sits between the two CZs of the Car y Mor BMPA.

Figure 3.3 shows the temporal trend in overwintering waterbird counts from the winter of 2000/2001 – 2022/2023 (the most recent for which data are available). It shows that the most dominant group in terms of population size is generally Waders, although on one occasion in 2012 their population is exceeded by Wildfowl. The 2021 CZ Assessment did not provide analysis of WeBS data, and so no comparison can be made in this instance. The current five year average total count (2018/19 – 2022/23) is 87 overwintering birds. St David's Airfield SSSI does not support any nationally or internationally significant populations of birds.

The 2021 CZ Assessment describes Ramsey Island, 1 km to the west of the BMPA, as supporting several important waterbird species (Guillemots, Razorbills, Fulmars and Kittiwakes). When foraging for food, these species may defecate directly on shellfish waters given their close proximity, which therefore represents a potentially significant source of pollution. The precise distribution of all waterbird species in this area is driven by their prey, and so it is difficult to define an RMP that accurately captures this source of pollution, given the spatial and temporal variability of the avian population.

Ramsey Island is also a particularly popular location with seals. It hosts 500 – 700 seal pups each year making it the largest grey seal pupping site in southern Britain (Pembrokeshirecoast, 2024). A minimum of 2,688 individuals were documented between 1992 and 2016 (Langley *et al.*, 2020). Highest numbers around the BMPA tend to be in the winter months (Westcott and Stringell, 2004). As with avian species, the foraging behaviour and associated faecal pollution of seals around the BMPA is spatially and temporally unpredictable, and so it is difficult to define an RMP that will effectively capture the influence.

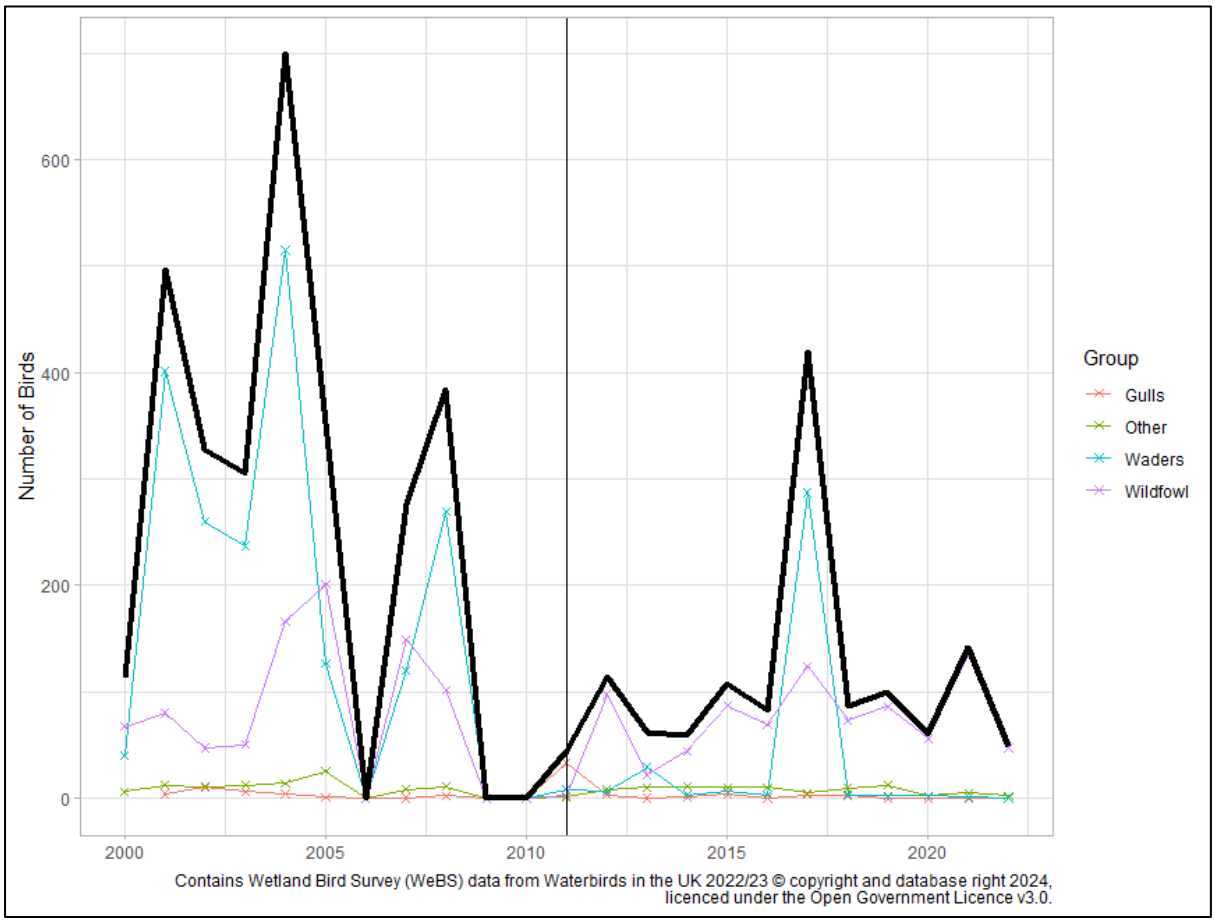

Figure 3.3 Temporal trend in waterbird counts from St David's Airfield Heath SSSI. Data from the Wetland Bird Survey (Austin et al.*, 2024). Black line represents total number of birds.*

3.5 Boats and Marinas

The discharge of sewage from boats is unlikely to be a significant source of contamination to the shellfish beds of the Car y Mor BMPA. In the 2021 CZ assessment it was noted that the coastal waters off Pembrokeshire are popular with recreational boaters, however most of this activity is focussed around the Milford Haven waterway (approximately 25 km as the crow flies to the South). Boating activities in the area have been derived through analysis of satellite imagery and various internet sources (Figure 3.4). Analysis of this indicated that there is a single small harbour at the head of Porthclais Bay, although this has no facilities for visiting vessels. No fishing vessels list Porthclais Harbour as their home port (gov.uk, 2024), and it is mainly used for launching canoes or by activity centres[8].

Recreational vessels of sufficient size to contain on-board toilets are liable to make overboard discharges from time to time, particularly when moored overnight or when navigating through an area. Contamination from recreational vessels can represent a

[8] https://www.visitpembrokeshire.com/explore-pembrokeshire/beaches/porthclais-harbour

significant source of contamination at certain times of the year (May to September). Merchant shipping vessels are prohibited from making overboard discharges within three nautical miles of land[9], meaning that no impact on the BMPA is expected from vessels transiting past the area. Discharges from recreational vessels may contribute to the overall faecal loading around the CZs, however, this contribution is considered to be minimal and also cannot be reliably captured by an RMP.

[9] The Merchant Shipping (Prevention of Pollution by Sewage and Garbage from Ships) Regulations 2008

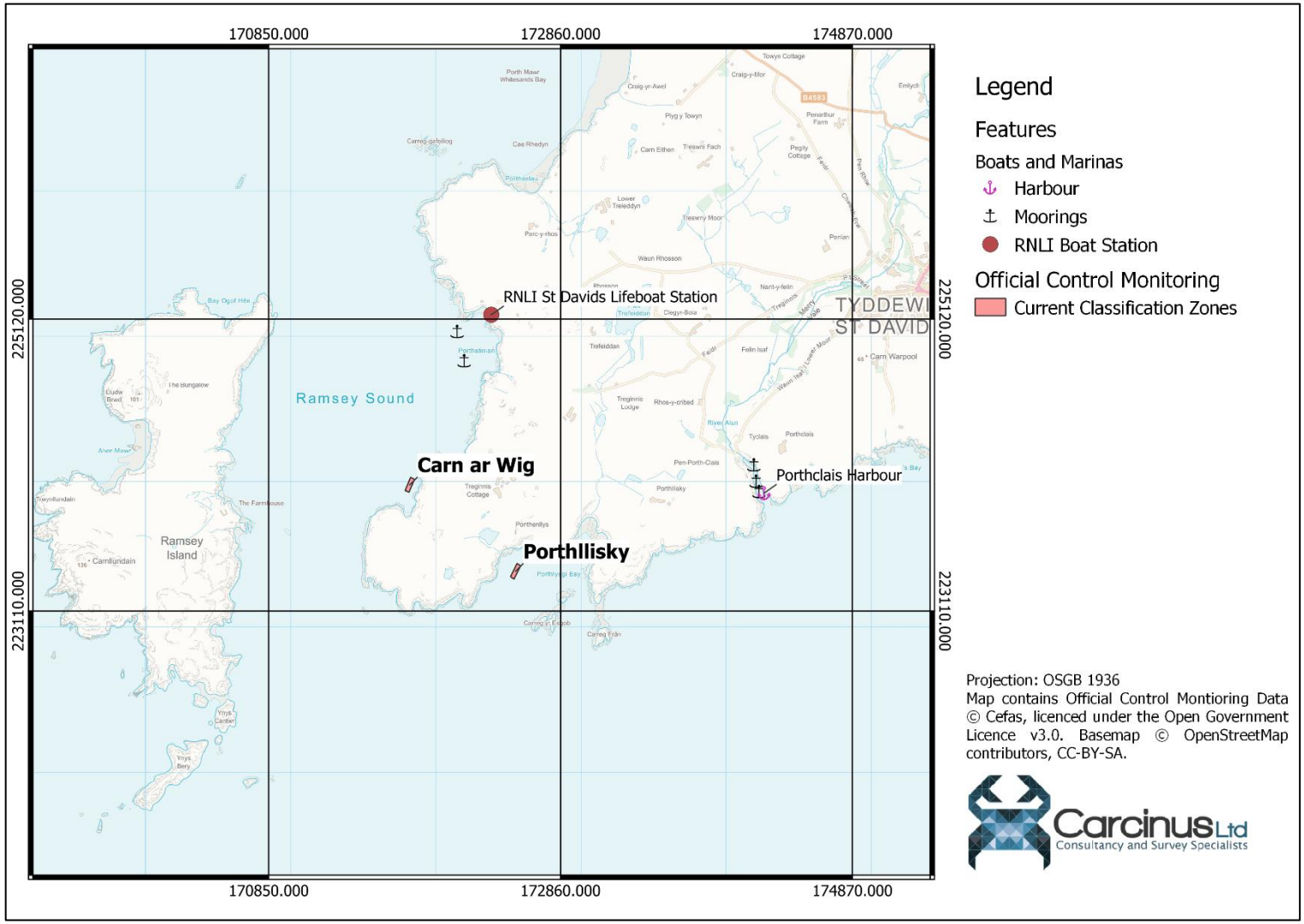

Figure 3.4 Locations of boats, marinas, and other boating activities in the vicinity of the Car y Mor BMPA.

3.6 Other Sources of Contamination

The 2021 CZ assessments notes urban fabric within the catchment is limited, but the city of St Davids (approximately 1 km to the east) is the most built-up area within the vicinity. Runoff from St Davids, through utility misconnections and dog fouling, will be carried into coastal waters via the Afon Alun, and is unlikely to pose a significant risk to the application area due to a lack of hydraulic connectivity. The Pembrokeshire Coastal path runs past both CZs and is likely to be popular with dog walkers[10]. Some contamination of nearshore coastal waters by dog fouling may therefore occur, although the effect from this source of contamination is likely to be minimal. One of the most popular tourist beaches, Whitesands Bay to the north, is closed May – September inclusive for dog walkers, further limiting the potential of contamination from this source seasonally.

4 Hydrodynamics/Water Circulation

The BMPA is located on the western coast of Wales, near Ramsey Island (approximately 1 km west of the CZs). The 2021 CZ assessment reported tidal streams to be the likely dominating force of water circulation under most conditions. This remains the case today. The most relevant tidal prediction for the BMPA is located at Ramsey Sound which reports a tidal range of ~5.5 m. Ramsey Sound is a north-south tidal sea passage which separates the mainland, of which the BMPA is on the coast, and the island itself. There is a central deep channel and strong tidal currents (<6 knots) (pembrokeshirecoast.wales, 2013).

Tidal currents by the *Carn ar Wig* site run on an approximate north-south axis, contrasting those at the *Portllisky* CZ which run on a more east-west axis. It is possible given the hydrodynamics in the area that contamination could be transported a significant distance during spring tides. No recent hydrodynamic modelling data for the Car y Mor BMPA area was available at consultation. It is considered unlikely that patterns of tidal circulation will have changed significantly since the 2021 CZ assessment was undertaken, and so no update to the sampling plan is necessary on this basis.

5 Rainfall

A complete record of the rainfall data for the Mathry raingauge (ID: 061R0263W) rainfall station at NGR SM 88246 31577 was downloaded from the rivers, rainfall and sea database NRW[11]. This station was chosen as it is the closest monitoring station to the BMPA (approximately 17 km from the nearest CZ). The data from 2018 to 2024 (3 years pre- CZ assessment) were processed in R (R Core Team, 2021). The rainfall levels per year are shown in Figure 5.1, and per month in Figure 5.2.

[10] https://www.pembrokeshirecoast.wales/things-to-do/outdoor-activities/beaches/dogs-on-beaches/
[11] https://rivers-and-seas.naturalresources.wales/

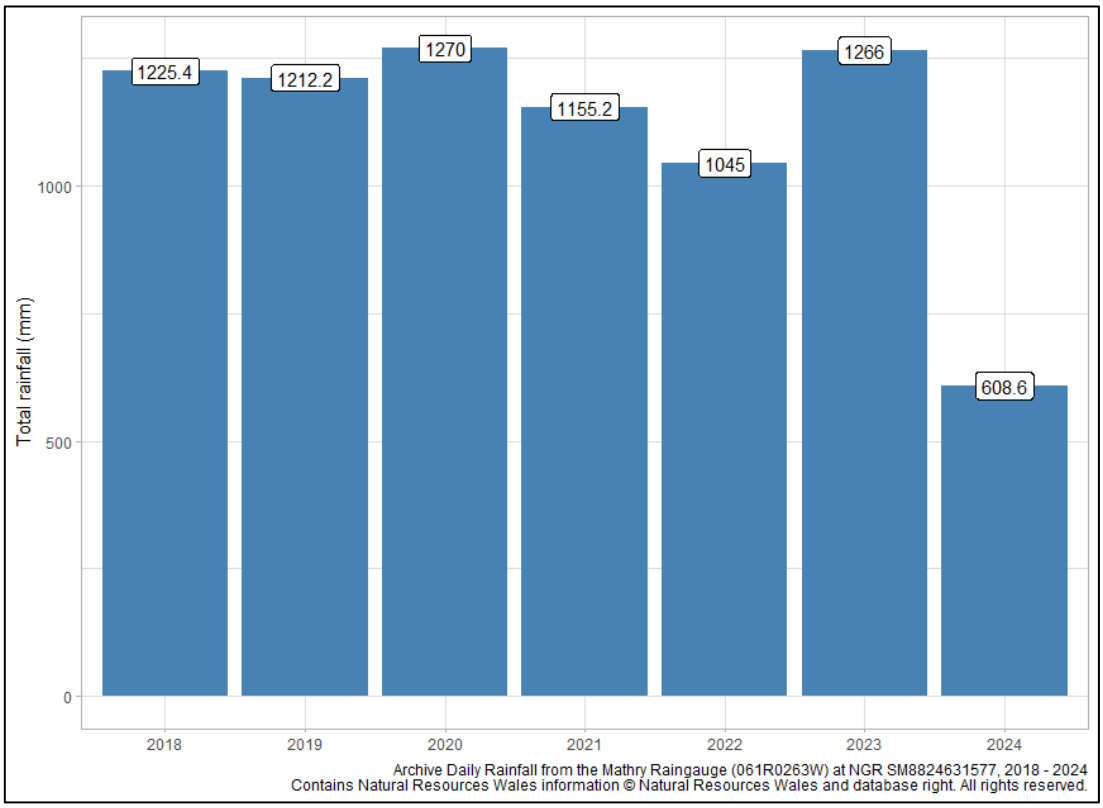

Figure 5.1 Mean daily rainfall per month 2018 – 2024 at the Mathry raingauge (ID: 061R0263W) rainfall station at NGR SM 88246 31577.

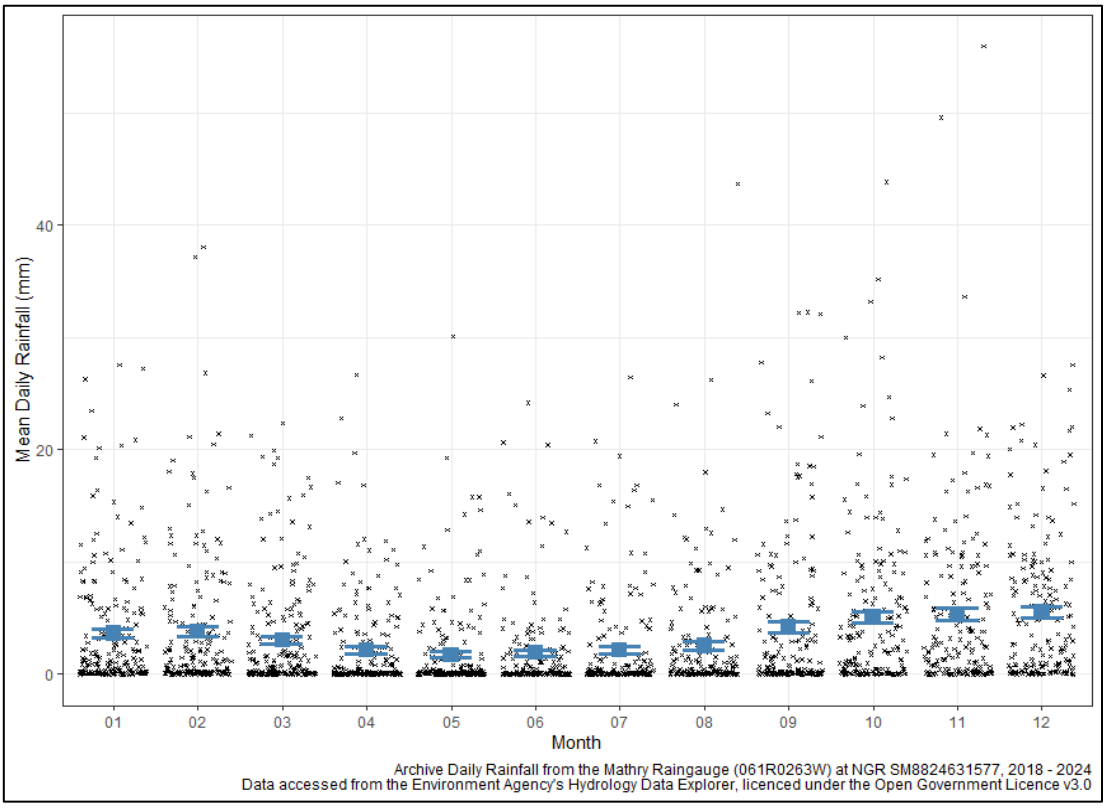

Figure 5.2 Rainfall levels per month at the Mathry raingauge (ID: 061R0263W) rainfall station at NGR SM 88246 31577.

The data show that the highest total annual rainfall recorded was in 2020 with 1,270 mm rainfall falling. So far this year, 608.6 mm of rainfall has fallen at this station. Winter months tended to have the highest levels of rainfall (Figure 5.2).

At initial consultation, anecdotal evidence was provided that suggested that overall rainfall was increasing in Wales. At secondary consultation it was confirmed that this was a general observation and was not specific to Car Y Mor. Rainfall data from the Mathry raingauge suggests rainfall for the first four months (January – April) of 2024 is broadly similar to previous years. It should be noted that the beds at Car y Mor are coastal offshore and therefore less likely to be affected by the impacts of rainfall.

Rainfall leads to increased faecal loading through two factors: elevated levels of surface runoff and increased spill events from intermittent discharges, particularly during periods of heavy rain. Rainfall levels during all years considered were greatest in winter months (November – February), and so levels of runoff etc. would be expected to be greatest during this time. Rainfall patterns have remained similar across the time period and no changes to the sampling plan are needed on this basis.

6 Microbial Monitoring Results

6.1 Official Control Monitoring

6.1.1 Summary Statistics and geographical variation

Mean Official Control Monitoring results for *E. coli* concentrations at RMPs sampled in the Car y Mor BMPA since 2021 are presented spatially in Figure 6.1 and summary statistics are presented in Table 6.1. This data was obtained from the Cefas datahub[12].

[12] https://www.cefas.co.uk/data-and-publications/shellfish-classification-and-microbiological-monitoring/england-and-wales/shellfish-monitoring-results/

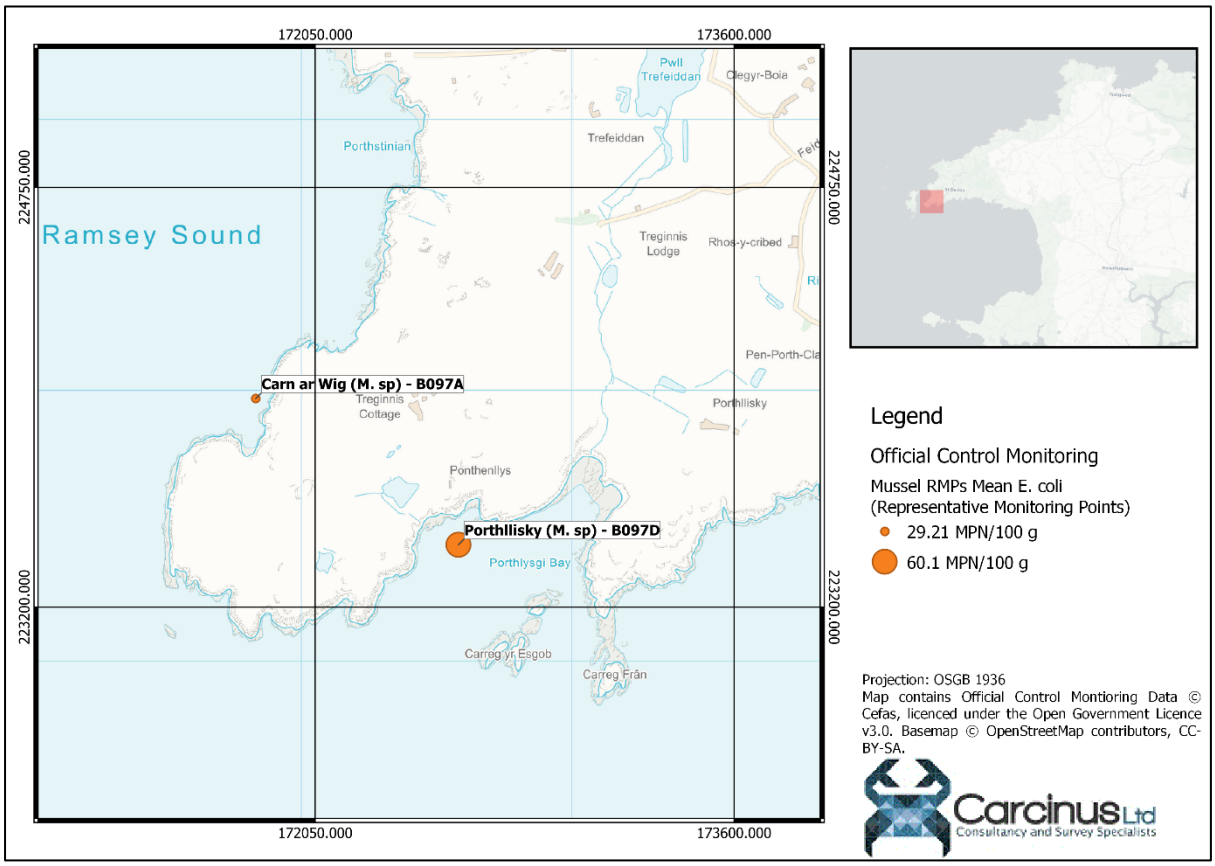

Figure 6.1 Mean E. coli results from Official Control Monitoring at bivalve RMPs in the Car y Mor BMPA.

Table 6.1 Summary statistics from official control monitoring at bivalve RMPs in the Car y Mor BMPA.

RMP (Species)	NGR	Species	No. Samples	First Sample	Last Sample	Mean	Min Value	Max Value	% > 230	% > 4,600	% > 46,000
Carn ar Wig (M. sp) - B097A	SM71832397	Mussels	33	27/05/2021	01/04/2024	29.21	18	130	0	0	0
Porthllisky (M. sp) - B097D	SM72582343	Mussels	30	27/05/2021	01/04/2024	60.1	18	330	6.67	0	0

Two RMPs are currently sampled in the Car y Mor BMPA. Quarterly samples are taken from both CZs despite *Porthllisky*'s current declassified status. Only 6.67 % of results at the Porthllisky (B097D) RMP have been greater than 230 *E. coli* MPN/100 g. No results from the Carn ar Wig (B097A) RMP have been greater than 130 *E. coli* MPN/100 g. The Porthllisky (B097D) RMP is fractionally closer to the main urban fabric area of St David's, and to Porthclais Bay where the four intermittent and one continuous discharge drains to. This may be the cause of the elevated mean in comparison to the Carn ar Wig (B097A) RMP.

Figure 6.2 presents box and violin plots of *E. coli* monitoring at RMPs within the Car y Mor BMPA. One-way analyses of variance (ANOVA) tests were performed on the data to investigate the statistical significance of any differences between the monitoring results from the two RMPs. Significance was taken at the 0.05 level[13]. All statistical analysis described in this section was undertaken in R (R Core Team, 2021). Within the mussel data, no significant differences in the monitoring results were found (p = 0.073).

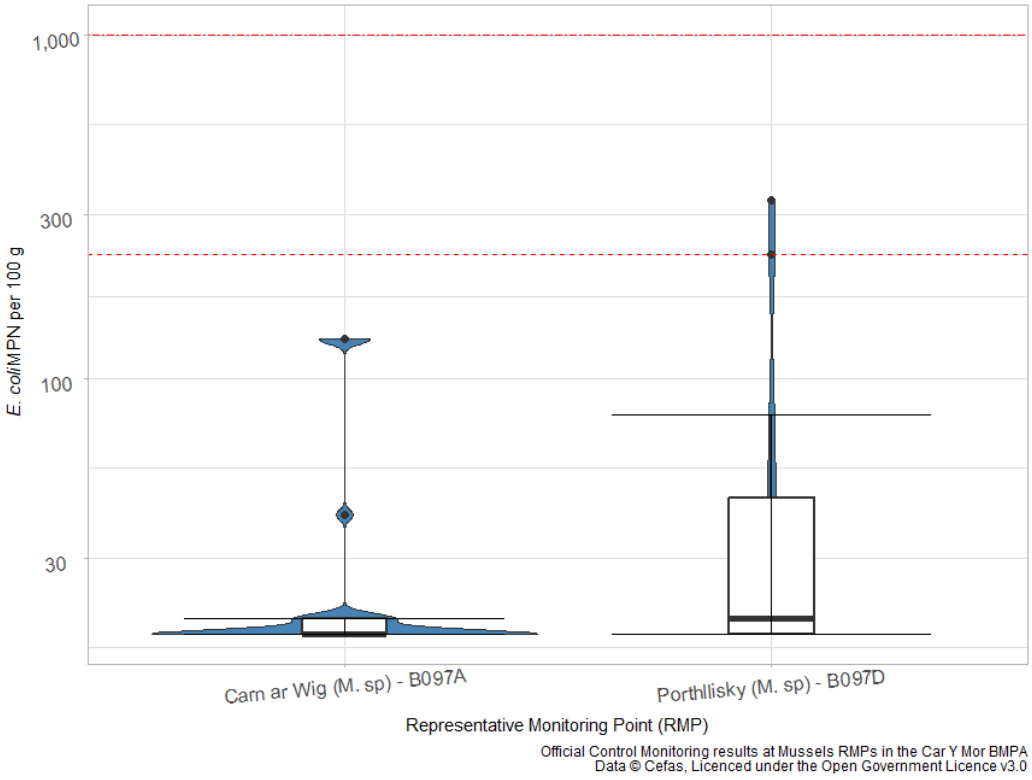

Figure 6.2 Box and violin plots of E. coli monitoring at mussel RMPs in the Car y Mor BMPA. Central line indicates median value, box indicates lower-upper quartile range and whisker indicates minimum/maximum values, excluding outliers. Boxplots are overlaid on the distribution of the monitoring data. Horizontal dashed lines indicate thresholds at 230, and 1,000 E. coli MPN/100 g.

[13] A p-value of < 0.05 means that there is a greater than 95% probability that the observed differences between the groups didn't occur by chance.

6.1.2 Overall temporal pattern in results

The overall temporal pattern in shellfish flesh monitoring results from the Car y Mor BMPA is shown for mussels in Figure 6.3. No clear temporal pattern can be seen in the monitoring data. The loess models for both RMPs show low *E. coli* concentrations (<100 MPN/100 g).

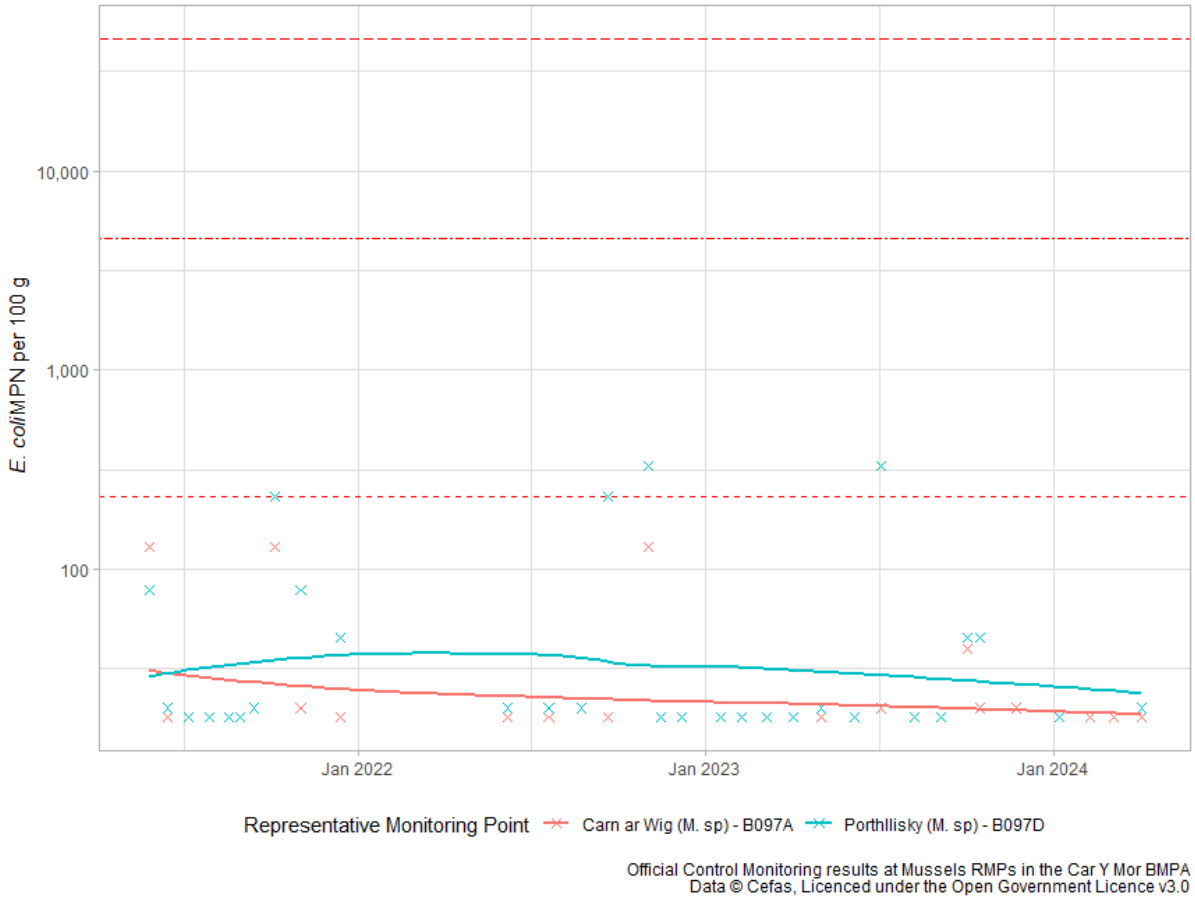

Figure 6.3 Timeseries of E. coli levels at mussel RMPs sampled in the Car y Mor BMPA since 2021. Scatter plots are overlaid with a loess model fitted to the data. Horizontal lines indicate thresholds at 230, and 1,000 E. coli MPN/100 g respectively.

6.1.3 Seasonal patterns of results

Seasonal patterns of *E. coli* concentrations at RMPs in the Car y Mor BMPA were investigated and are shown for mussels in Figure 6.4. The data for each year were averaged into the four seasons, with spring from March – May, summer from June – August, autumn from September – November and winter comprising data from December – February the following year. Two-way ANOVA testing was used to look for significant differences in the data, using both season and RMP (if there is more than one RMP for a given species) as independent factors (i.e., pooling the data across season and RMP respectively), as well as the interaction between them (i.e., exploring seasonal differences within the results for a given RMP). Significance was taken at the 0.05 level.

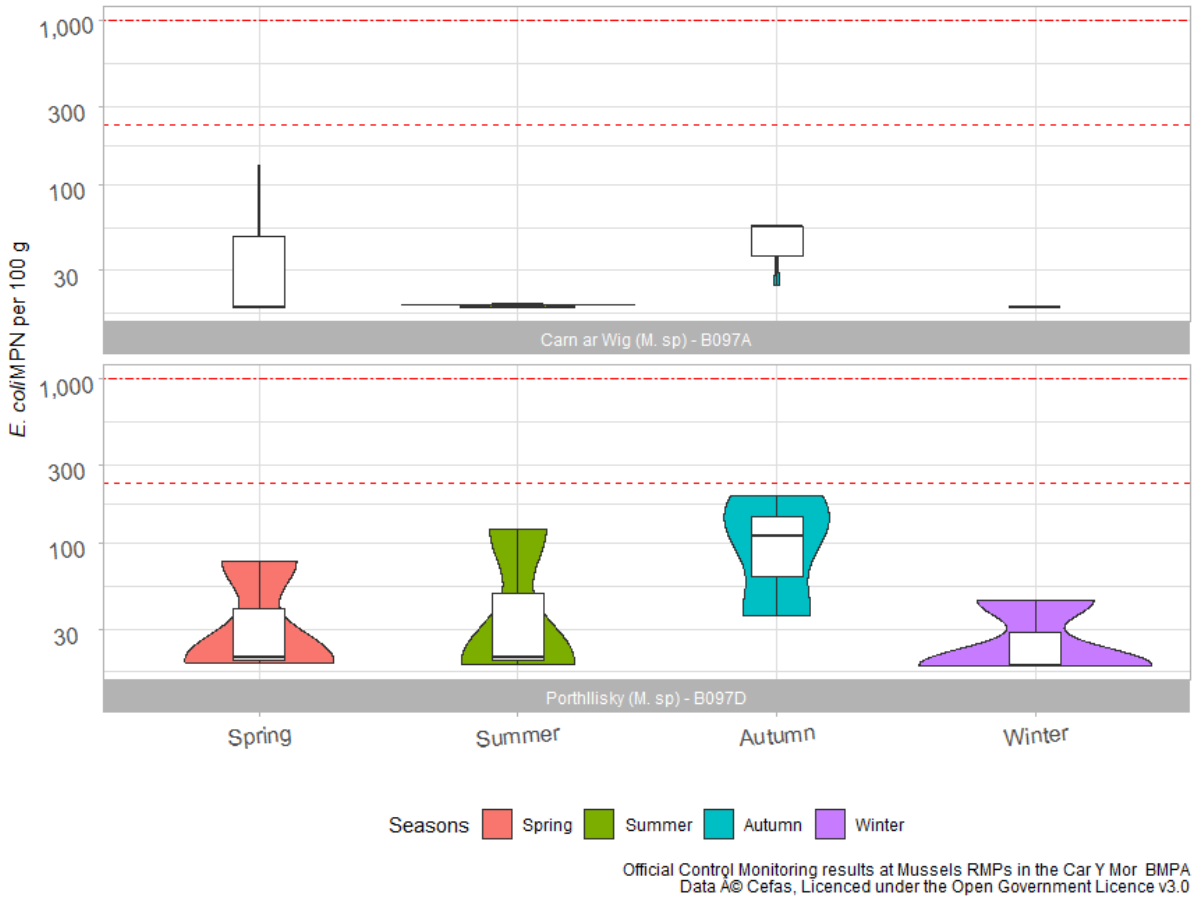

Figure 6.4 Box and violin plots of E. coli levels per season at mussel RMPs sampled within the Car y Mor BMPA since 2021. Horizontal lines indicate thresholds at 230, and 1,000 E. coli MPN/100 g.

Monitoring results in winter tend to be higher, however no significant differences were found seasonally in the data. No significant differences were found for any other time of year per RMP, or when all the RMPs are pooled together. Given the high levels of tourism experienced in this area, it is possible that high monitoring results coincide with the after-effects of increased pressure on the wastewater treatment network over the summer months. In addition, rainfall is beginning to increase in the autumn leading to higher levels of surface runoff. This may result in an accumulation of bacterial loading from late summer into Autumn.

6.2 Action States

Since the 2021 CZ assessment, no action states have been triggered within this BMPA.

6.3 Bathing Water Quality Monitoring

The status of bathing waters near to and within the BMPA is also of relevance to this assessment. There are two designated bathing waters in the near vicinity of the Car y Mor BMPA. Whitesands is approximately 3.8 km from the *Carn ar Wig* CZ, and Caerfai is

approximately 3.5 km from *Porthllisky* (both as the crow flies). The 2023 (and previous years) bathing water classification status[14] is shown in Table 6.2.

It should be noted that bathing water sampling only occurs during the bathing water season, which falls within the summer period (May to September inclusive) and therefore may not represent the potential for increased faecal loading during winter months. However, bathing water quality results do provide an indication of water quality in the area during the bathing water season. Results in the vicinity of the Car y Mor BMPA are excellent[15].

Table 6.2 Summary of NRW bathing water quality designations at monitoring locations within Car y Mor BMPA (Pembrokeshire).

Bathing Water Monitoring Point	2020	2021	2022	2023
Whitesands	Excellent	Excellent	Excellent	Excellent
Caerfai	Excellent	Excellent	Excellent	Excellent

7 Conclusion and overall assessment

The Car y Mor BMPA is a small catchment on the West coast of Wales in close proximity to Ramsey Island, Pembrokeshire. There are currently two classification zones; *Carn ar Wig* which is classified for mussels, and *Porthllisky* which is declassified for mussels for commercial purposes. The 2021 CZ assessment detailed plans to harvest mussels, king scallops, and native oysters from this shellfishery. Declassification of both CZs for king scallops occurred in 2022. There are currently no plans within the next year to harvest either of these additional species, however at initial consultation the FBO and LEA indicated this may be a possibility in the future. Native oysters and king scallops are not included in the sampling plan provided at the end of this report as there is no immediate commercial interest.

No population data for the Car y Mor catchment was presented in the 2021 CZ assessment to facilitate comparison in this report. However, analysis of the available 2011 and 2021 Census data shows that the majority of the catchment is rural, with population densities of fewer than 30 people per square kilometre. The main risk of urban associated runoff lies outside of the catchment in the city of St Davids to the east. Both CZs are more than 3 km from this source of contamination, and therefore contamination levels are unlikely to be significantly impacted at either of them. That being said, during periods of heavy rainfall, it is likely the additional surface runoff from urban fabric areas will increase the likelihood of

[14] https://environment.data.gov.uk/wales/bathing-waters/profiles/index.html
[15] Excellent – the highest, cleanest water quality.

contamination reaching the CZ. No concerns were shared during consultations for the impact of seasonal tourism on the BMPA.

There is one continuous and four intermittent discharges in the vicinity of the Car y Mor BMPA. The continuous discharge at St David's WWTW discharges directly into Porthclais Bay. It is approximately 1.7 km from the nearest CZ (*Porthllisky*), employs secondary treatment (biological filtration), and has an unchanged Dry Weather Flow (DWF) from that reported in the 2021 CZ assessment (987 m^3/day). Based on this, the recommendations made in the 2021 CZ assessment remain valid. This continuous discharge remains as a low risk of contamination to the BMPA given the lack of connectivity, and distance between the discharge and CZs allowing for bacteriological die-off. Of the four intermittent discharges, three drain into the upper reaches of the Afon Alun, and one discharges to Porthclais Bay. The intermittent discharge closest to any CZ in the Car y Mor BMPA is at St David's WWTW and in 2023 spilled for 2,631.25 hours, with a spill count of 135. There is limited hydrodynamic connectivity between where this discharge is draining to in Porthclais Bay, and the BMPA itself therefore it does not need to be considered in the placement of RMPs. This is also the case for the remaining three discharges, which spilled less frequently and for less time. They are also a greater distance from the CZs and so would experience significant bacterial die-off/dilution before potential contamination reached the shellfish waters.

Satellite imagery shows multiple caravan parks and holiday sites throughout the catchment. The desk-based study of this report showed only one private discharge accounting for a caravan site. During consultation, both the LEA and NRW confirmed that caravan sites are likely to discharge to soakaway. During secondary consultation, DCWW stated that they had no concerns over the wastewater treatment network (particularly in summer months) in the catchment.

No recent livestock data was available for the Car y Mor catchment. The majority of land cover in the catchment area has been identified as rural and mainly pasture suggesting a potentially high level of surface run off from farm animals. At secondary consultation, the LEA stated that populations of livestock near the coast were *"low level"*, and generally consisting of sheep. A small livestock population means that whilst there is some risk of direct runoff, the overall *E. coli* loading is low. Future changes in areas of pasture should still be taken into consideration in any updated sampling plan.

Waterbird counts suggest that the area does not support either internationally or internationally significant populations of waterbird species. Some minor impacts from either avian species or marine mammals may occur (there is a large seal pupping site off the coast of the BMPA), but these are impossible to reliably predict and are therefore challenging to account for in any updated sampling plan.

No fishing vessels list Porthclais harbour (the only harbour in the vicinity) as their home port. Boating activities are fairly low in the area, with a few small anchorages to the east of the *Porthllisky* BMPA. Some occasional discharges from recreational vessels of a sufficient

size to contain on board toilets may occur from time to time as they pass through the area. The highest risk of this source of pollution will occur during summer months.

There are currently two RMPs sampled in the Car y Mor BMPA. *E. coli* results collected since 2021 show no seasonally or temporally significant differences, although results tend to be higher in autumn months. This coincides with potential accumulation of contamination from increased tourism in the summer months, resulting in additional urban runoff and pressure on the wastewater treatment network.

At secondary consultation, consultees were able to provide additional information to close out some of knowledge gaps of the draft report, namely the fate of wastewater from caravan parks, and the broad numbers of livestock using pastural farmland near the coast.

The FSA has reviewed the official control sampling results for these beds and results were found to be stable and well within the lower parameters for an A classified bed. This combined with the rural location of the beds indicates a lower risk of contamination. As a result of having considered these factors, the desk-based study and information obtained from the consultation process, the FSA is content that a shoreline assessment is not required.

8 Recommendations

Recommendations for the various classification zones within the Car y Mor BMPA are summarised below and a recommended sampling plan is provided in Table 9.1.

8.1 Mussels

Carn ar Wig

The current sampling plan for this CZ states that samples should be taken within 10 m tolerance of NGR SM 7183 2397. The principal contamination source to this CZ is urban associated run off from the city of St David's, potential contamination from private discharges throughout the catchment (particularly in summer with increased tourism), and livestock grazing pastures adjacent to the CZ. Based on the desk-based study, the authors of this review recommend that this RMP be retained moving forward as it continues to be representative of the main sources of contamination.

Porthllisky

The current sampling plan for this CZ states that samples should be taken with 10 m tolerance of NGR SM 7258 2343. The principal sources of contamination to this CZ remain the same as *Carn ar Wig*, with the potential of increased contamination from intermittent discharges draining to the Afon Alun and Porthclais Bay (due to increased proximity compared to *Carn ar Wig*). Based on the desk-based study, the authors of this review recommend review recommend that this RMP be retained moving forward as it continues to be representative of the main sources of contamination.

9 General Information

9.1.1 Location Reference

Production Area	**Car Y Mor**
Cefas Main Site Reference	M097
Ordnance survey 1:25,000	Explorer 3275
Admiralty Chart	5620_11

9.2 Shellfishery

Species	Culture Method	Seasonality of Harvest
Mussels	*Cultured*	*Year round*

9.3 Local Enforcement Authority(s)

Name	**Carwyn Thomas Port Health, Pembrokeshire County Council, Unit 23, Thornton Industrial Estate, Milford Haven, Pembrokeshire. SA73 2RR**
Website	www.pembrokeshire.gov.uk
Telephone number	01437 776390/89/60
E-mail address	porthealth@pembrokeshire.gov.uk

*Table 9.1 Proposed sampling plan for the Car Y Mor BMPA. Suggested changes are given in **bold red** type.*

Classification Zone	RMP	RMP Name	NGR (OSGB 1936)	Lat / Lon (WGS 1984)	Species Represented	Harvesting Technique	Sampling Method	Sampling Species	Tolerance	Frequency
Carn ar Wig	B097A	Carn ar Wig	SM718 32397	51°52’03”N ,005°18’56” W	Mussels	Hand	Hand	Mussels	10 m	Monthly
Porthllisky (declassified)	B097D	Porthllisky	SM725 82343	51°51’47”N ,005°18’16” W	Mussels	Hand	Hand	Mussels	10 m	Quarterly

10 References

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R Core Team (2021) 'R: A language and environment for statistical computing'. Vienna, Austria: R Foundation for Statistical Computing. Available at: https://www.R-project.org/ (Accessed: 8 June 2022).

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Appendices

Sanitary Survey - classification zone

Car y Mor – 2021

Document No. – *J0591/21/02/02*

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Cover image: Porthllisky Bay from the PCP. Image © Row17, CC-BY-SA 2.0.

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About Carcinus Ltd

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Carcinus was established in 2016 by its directors after over 30 years combined experience of working within the marine and freshwater environment sector. From our base in Southampton, we provide environmental consultancy advice and support as well as ecological, topographic and hydrographic survey services to clients throughout the UK and overseas.

Our clients operate in a range of industry sectors including civil engineering and construction, ports and harbours, new and existing nuclear power, renewable energy (including offshore wind, tidal energy and wave energy), public sector, government, NGOs, transport and water.

Our aim is to offer professional, high quality and robust solutions to our clients, using the latest techniques, innovation and recognised best practice.

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"*To be a dependable partner to our clients, providing robust and reliable environmental advice, services and support, enabling them to achieve project aims whilst taking due care of the sensitivity of the environment*"