Sanitary Survey - Review

Conwy – 2024

Document No. – *J0591/24/02/05*

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Document QA and Approval

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Initial Consultation

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Welsh Government	December 2023
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Consultation on draft report

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A sanitary survey relevant to the bivalve mollusc beds in Conwy was undertaken in 2014 in accordance with Regulation (EC) 854/2004 (which was replaced by assimilated EU Law Regulation (EU) 2017/625, with sanitary survey requirements now specified in assimilated EU Law Regulation (EU) 2019/627). This 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, Conwy County Borough Council. The report is publicly available via the Carcinus Ltd. website.

Recommended Bibliographic Citation:

Carcinus Ltd., 2024. Review of the Conwy 2014 Sanitary Survey. 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 assimilated 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 assimilated (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 Conwy Review

This report reviews information and makes recommendations for a revised sampling plan for existing mussel (*Mytilus* sp.) classification zones in Conwy (Figure 1.1). 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), Welsh Government (WG) and Natural Resources Wales (NRW) officers responsible for the production area was undertaken in January 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 May 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 2014 (Cefas, 2014)and sampling plan as necessary and the report should read in conjunction with the previous survey.

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.

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, Natural Resources Wales and Welsh Government;
- The findings of this report are based on information and data sources up to and including February 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 January 2024 have been used within this study. Any subsequent samples have not been included.

[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/.

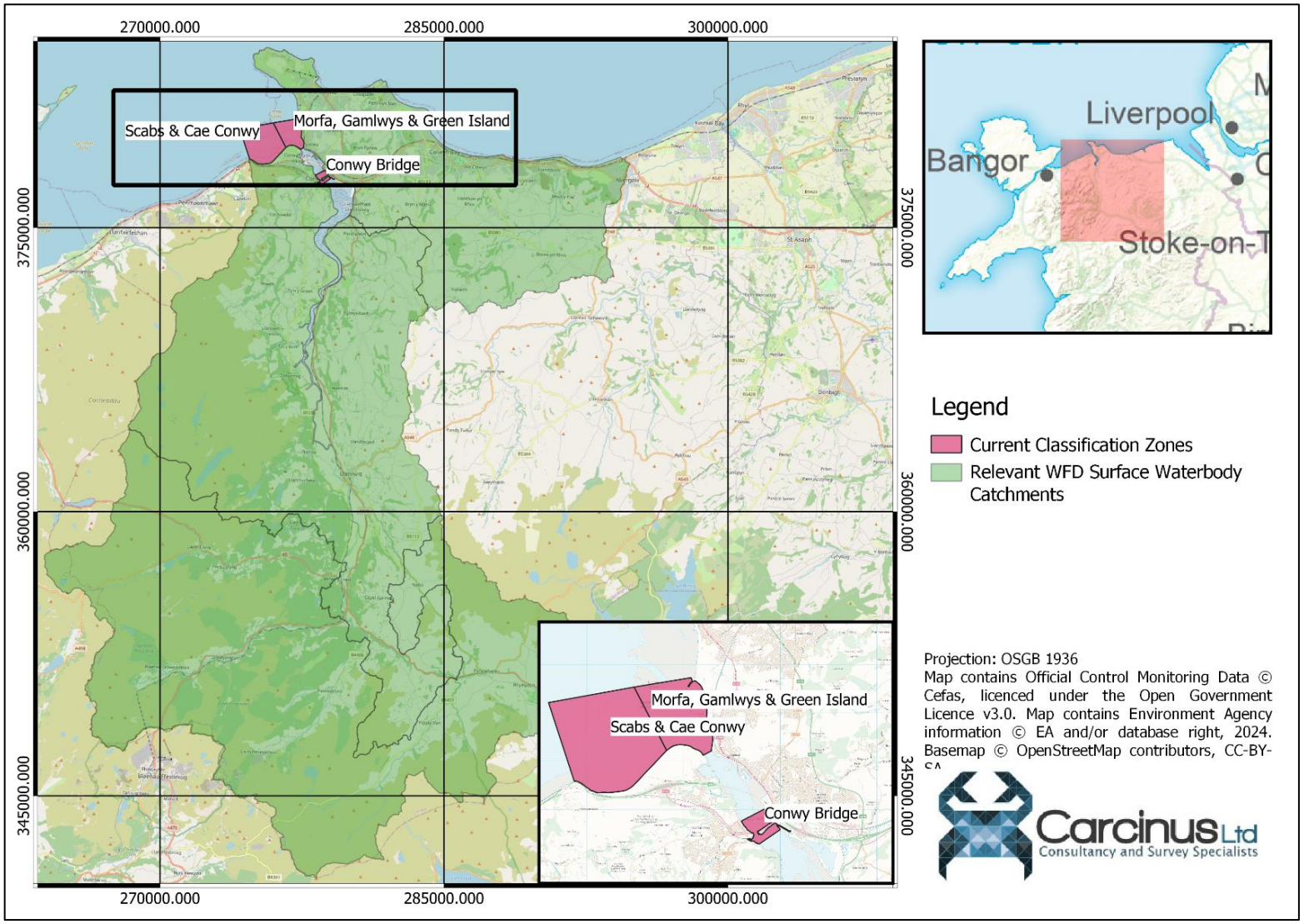

Figure 1.1 Location of Conwy BMPA in north Wales. Inset map shows the locations of the Classification Zones within the BMPA.

2 Shellfisheries

2.1 Description of Shellfishery

The Conwy BMPA is situated within Conwy Bay and Conwy estuary, which in turn are situated along the coast of north Wales (Figure 1.1). The closest BMPA is that of the Menai Strait East (Cefas Reference M055) which is classified for both Mussels and Cockles. There is also a Mussel RMP situated further offshore toward Penmon (Anglesey Mussels - B104A), however the Classification Zone this RMP was used to represent has been declassified since June 2023.

The Local Enforcement Authority in terms of food hygiene Official Control purposes (including sampling) is Conwy County Borough Council. The fishery is a public fishery, but under Byelaw 5 of the Former North Western and North Wales Sea Fisheries Committee (now superseded by Welsh Government)[2], a permit to fish for cockles or mussels is required. At the time of writing this report (February 2024), no formal consultation response has been received from Natural Resources Wales however they were in attendance at an initial consultation meeting.

In the original 2014 Sanitary Survey, 4 Classification Zones (CZs) were proposed for mussels. One of these (Outer North) was unclassified and only proposed to support seed stocks. A summary of the fishery for each species is provided in the following paragraphs.

2.1.1 Mussels

The 2014 Sanitary Survey indicates that the mussel fishery within the BMPA is naturally occurring. In 2014, there were two main mussel beds at *Morfa, Gamlyws & Green Island* and *Outer Conwy Sands*, but wild mussels are widespread throughout the whole BMPA. The Outer Conwy Sands supported seed stocks and mussel distribution generally varies throughout the year.

Currently, the mussels continue to be subject to wild harvest from three CZs *(Conwy Bridge; Scabs & Cae Conwy; Morfa, Gamlwys & Green Island*) with an estimated annual catch of approximately 4.5 – 5 tonnes (1.5 tonnes each per bed). The minimum landing size of *Mytilus* sp. is 50 mm.

As per the 2014 Sanitary Survey, this fishery was previously managed by a regulating order which expired in 2008. Since then, it has been managed by Welsh Government via former North West and North Wales Sea Fisheries Committee Byelaws. Under Byelaw 13A of these Byelaws[2], Welsh Government are empowered to close any mussel fishery for the purposes of fishery management or for controlling the rate of exploitation. The minimum landing size for this species is 45 mm. In 2014, 22 Harvesters were given permits for the defined area, and at initial consultation Welsh Government commented the numbers of fishermen for this species have been declining over recent years. For the 2024 harvest season, 5 fishermen are

[2] Welsh Assembly Government, 2011. Inshore Fishery Legislation (Text of the saved Byelaws of the former North Western and North Wales Sea Fisheries Committee). Available at: https://www.gov.wales/sites/default/files/publications/2018-05/inshore-fishery-legislation-definitions-of-north-and-north-west-inshore-district-byelaws.pdf

permitted to fish within the BMPA. The fishery is closed from 01 May to 31 August inclusive to protect the spawning periods of the shellfish. However, under Byelaw 13A the shellfishery was closed from 01 September 2023 through to 30 April 2024. During the 2022/2023 season, landings were ca. 6,000 kg.

2.2 Classification History

There are currently three Classification Zones (CZs) within the Conwy BMPA, all of which are classified for mussels. The 2014 Sanitary Survey recommend three CZs (the current: *Conwy Bridge; Scabs & Cae Conwy; Morfa, Gamlwys & Green Island)* and notes an additional zone (*Outer North*) that was a significant seed mussel bed but did not require classification unless requested by harvesters or Welsh Government, neither of which have happened between the original sanitary survey in 2014 and now (2024).

Conwy Bridge has recently been downgraded from long-term B to Seasonal B/C (Class B between 1 October and 30 April reverting to Class C at all other times).

The location and classification status of all active CZs, along with all RMPs sampled in the BMPA since 2014, are presented in Table 2.1 and Figure 2.1.

Table 2.1 Summary of all currently active Classification Zones in the Conwy BMPA.

Classification Zone	Species	Current Classification (as of January 2024)	RMP Used
Conwy Bridge	Mussels	B 1 October - 30 April (reverting to Class C at all other times)	Conwy Bridge B044T
Morfa, Gamlwys & Green Island	Mussels	Long-term B	Conwy East B044U
Scabs & Cae Conwy	Mussels	Long-term B	Conwy West B044V

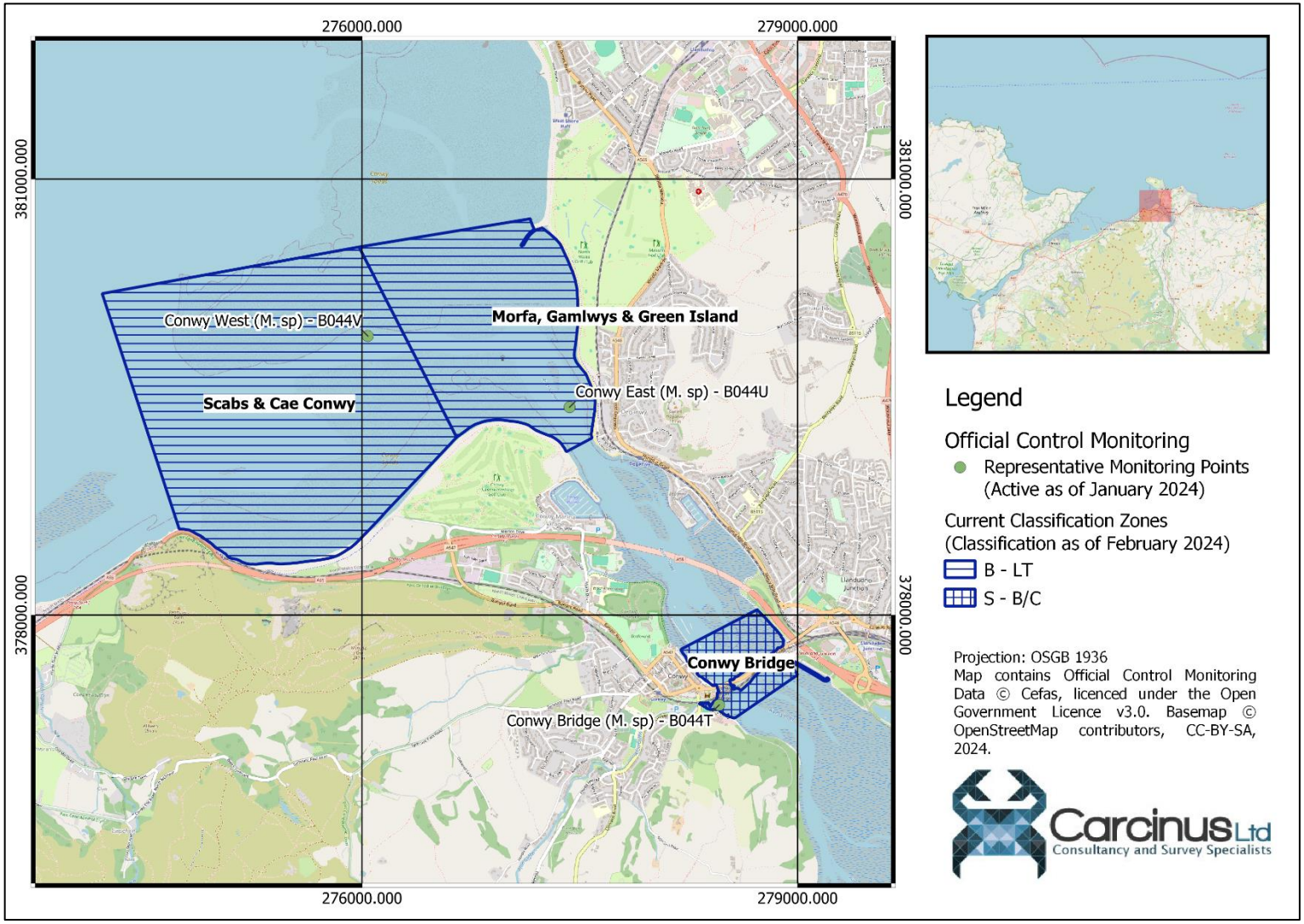

Figure 2.1 Current Classification Zones and Associated Representative Monitoring Points in the Conwy BMPA. Conwy Bridge Class B 1 October – 30 April (Class C outside of these dates).

3 Pollution sources

3.1 Human Population

The 2014 Sanitary Survey provides population data based on the 2011 Census. The largest settlements were Llandudno, Conwy Junction and Colwyn Bay. The population was concentrated to coastal areas adjacent to the shellfisheries. A subsequent Census was conducted in March 2021 and so the results of those two surveys have been compared to give an indication of the changes in the distribution of human population across the catchment between 2011 and 2021. Human population density at the 2011 and 2021 Censuses within Census Output Areas wholly or partially contained within the Conwy BMPA catchment are presented in Figure 3.1.

The maps presented in Figure 3.1 show that the majority of the land surrounding Conwy is rural with population densities fewer than 500 people per square kilometre. There continues to be areas with higher population densities on the coastline adjacent to the shellfisheries, as mentioned in the previous 2014 Sanitary Survey. For the catchment presented in Figure 3.1, the population at the 2011 Census was 95,292 and by the 2021 Census the population had increased to 96,040, showing a minimal increase of < 1,000 for the whole catchment area. During the initial consultation stage, the LA stated there had been no significant changes in the catchment area in terms of urban development or housing. As the largest population densities remain coastal, these are likely to have the most significant effect on the shellfish beds with regards to urban runoff and potential contamination.

The 2014 Sanitary Survey does also cite an increase in population during the summer months. The coastal and seaside towns closest to the BMPA do see an increase in tourism during the main summer holiday period, with 9.47 million people visiting in 2022 and staying for at least 1 day. This is a 20% increase from 2021[3]. The peak population in the catchment is likely to occur between June – September, which ultimately results in increased loading to the wastewater treatment network. During initial consultations, the LEA had no concerns over the adequacy of the existing water treatment network to handle seasonal increases. Full details of changes to the wastewater treatment network are discussed in the next section.

Analysis of the Census data suggests that's the population has seen a minimal (< 1,000 persons) increase in population size, but that the majority of the catchment is rural with population densities < 500 people per square kilometre. The main urban centres are unchanged from the original 2014 sanitary survey, and the area remains a popular tourist destination with tourism statistics increasing since 2021. Overall, the recommendations made in the 2014 sanitary survey to account for the impacts from human populations remain valid.

[3] https://www.visitconwy.org.uk/dbimgs/CON%20Basic%20ES%2022.pdf

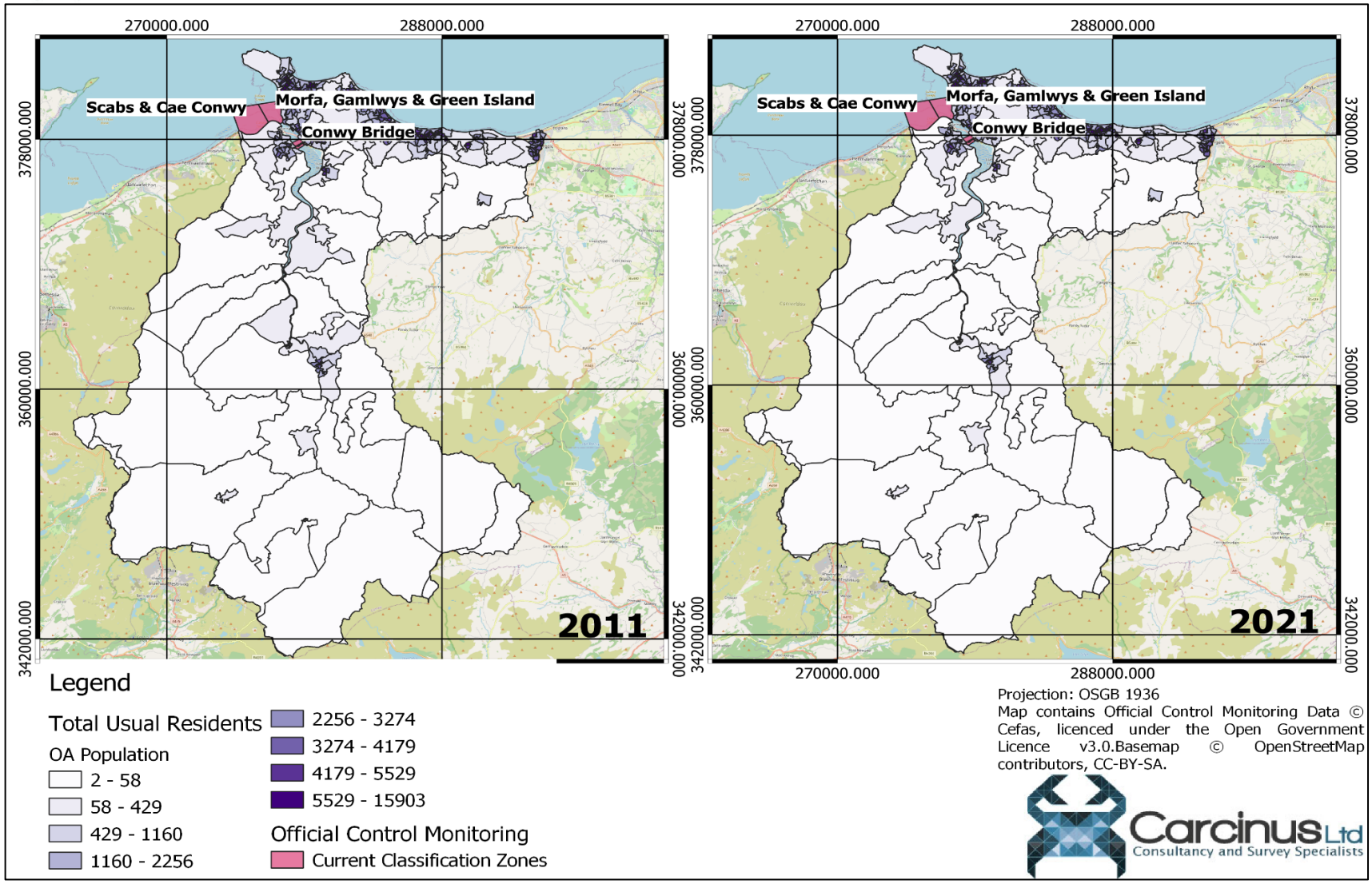

Figure 3.1 Human population density in Census Output Areas wholly or partially contained within the Conwy Catchment at the 2011 and 2021 Censuses.

3.2 Sewage

Details of all consented discharges in the vicinity of the Conwy BMPA were taken from the most recent update to Natural Resources Wales (NRW) national permit database at the time of writing (December 2023 update). The locations of these discharges within the catchment and near the Classification Zones are shown in Figure 3.2.

There are 35 continuous discharges in the Conwy BMPA catchment, and the 10 nearest to the CZs have been highlighted in Table 3.1. The original 2014 Sanitary Survey identified Penmaenmawr STW (Sewage Treatment Works) as the largest sewage works potentially affecting the shellfishery, which discharges to the shallow subtidal to the west of the main Conwy estuary approach. The consented dry weather flow (DWF) of 2,329.7 m^3/day is unchanged from the original sanitary survey and undergoes secondary treatment. It is 2.5 km away from the nearest CZ, and so any potential contamination is likely to experience significant dilution before reaching the fishery. This discharge is outside of the catchment considered in this report, but it has been included in Figure 3.2 given its consideration in the previous 2014 report. The continuous discharges listed in Table 3.1 as closest to the BMPA within the catchment are all beyond 3 km from the fishery, and have relatively low DWF therefore contamination will experience dilution and die-off and potential effects on the shellfishery are limited.

In addition to the continuous discharges, the 2014 Sanitary Survey identified a number of intermittent discharges with the potential to impact the bacteriological health of the BMPA. Intermittent discharges comprise Combined Storm Overflows (CSOs), Storm Tank Overflows (STOs), Pumping Station Emergency Overflows (PSs), and Sewer Pumping Stations (SPSs). A summary of the EDM return for discharges within 2 km of the BMPA are listed in Table 3.2. According to Event Duration Monitoring (EDM) data for 2022, the discharges closest (< 1 km) to the BMPA have low (< 20) spills counts and spill durations (< 20 hours). EDM data is an indication of how often (and for how long) an intermittent discharge is active (it does not measure the actual volume of flow) and is only provided on an annual summary basis.

The 2014 Sanitary Survey does not present any EDM data, however it does note a concentrated cluster of 24 intermittent discharges around the mouth of the estuary at Conwy, Llandudno Junction and Deganway (see inset map: Figure 3.2). Whilst individual discharges within this cluster did not spill very frequently in 2022 (see previous paragraph), their aggregated contamination should be taken into consideration in any updated sampling plan. Only two discharges in the catchment spilled more than 100 times in 2022. The CSO at Rowen STW is 6.44 km away from the nearest CZ and spilled 108 times for a total of 311.25 hours. This discharge does not undergo any treatment, however given its distance from the BMPA any bacterial loading discharged into the water will experience significant dilution and die-off before reaching any CZ. The CSO and EO at Deganwy Pumping Station (discharge number 11: Figure 3.2, Table 3.2) is 1.34 km from the nearest CZ, and spilled 115 times for 88.75 hours in 2022. The position of this discharge should be considered in the placement of RMPs given its spill frequency and proximity to CZs in this BMPA.

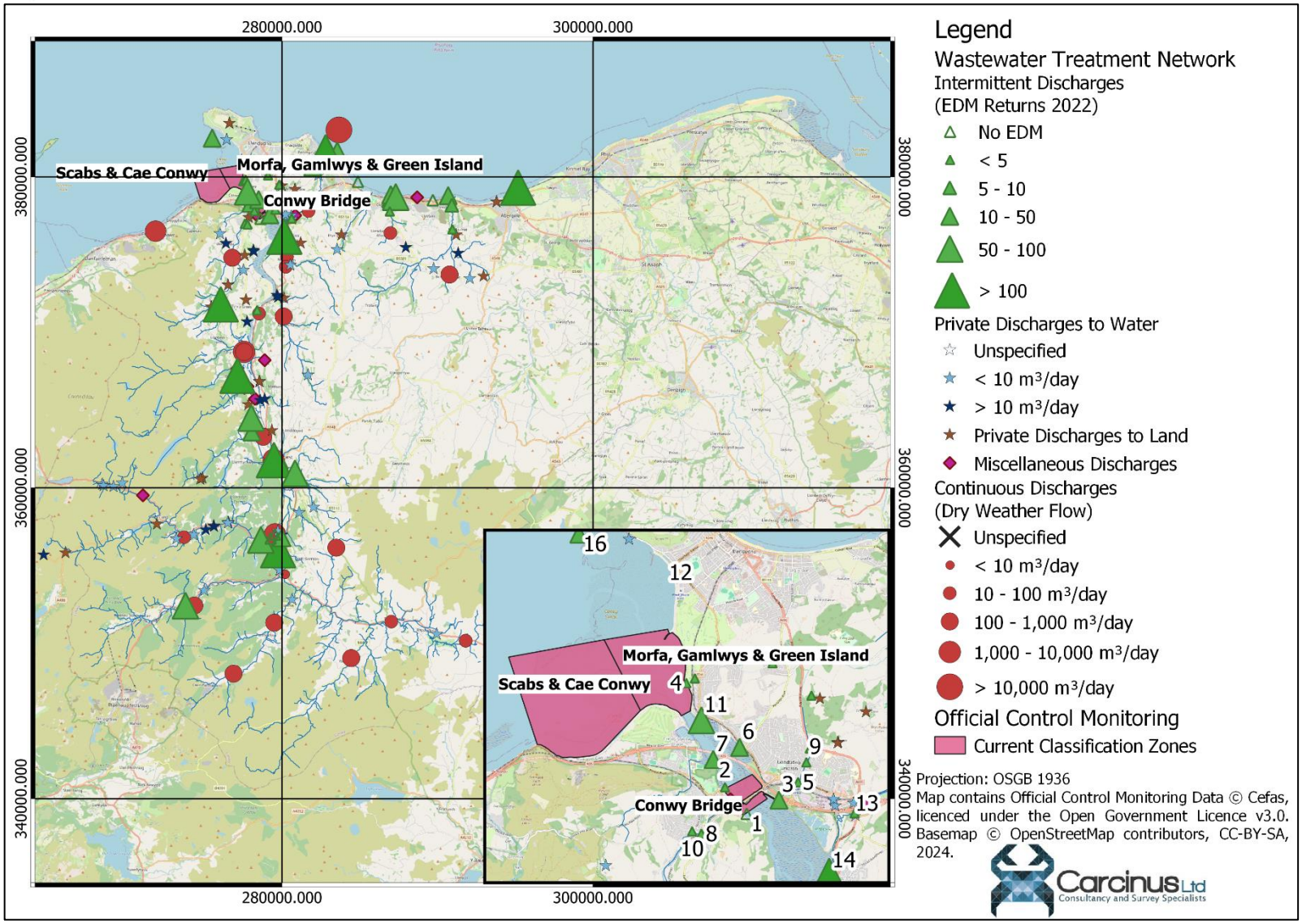

Figure 3.2 Locations of all consented discharges in the Conwy BMPA catchment. Details continuous discharges are shown in Table 3.1.

Table 3.1 Details of the 10 closest consented continuous discharges in the Conwy catchment.

Discharge name	Permit number	Receiving water	Outlet NGR	Treatment	DWF (m3/day)	Nearest CZ	Distance to nearest CZ (km)
DOLWYD STW	CG0156201	Groundwater via infiltration system	SH 81706 77804	SEPTIC TANK	12.5	Conwy Bridge	3.00
PENTREFELIN STW	CG0035201	NANT-Y-GARREG DDU	SH 80320 74860	BIOLOGICAL FILTRATION	16.2	Conwy Bridge	3.24
PENTREFELIN STW	CG0035201	NANT-Y-GARREG DDU	SH 80320 74860	BIOLOGICAL FILTRATION	24.3	Conwy Bridge	3.24
HENRHYD STW	CG0081001	HENRHYD	SH 76800 74800	BIOLOGICAL FILTRATION	46	Conwy Bridge	3.44
HENRHYD STW	CG0081001	HENRHYD	SH 76800 74800	BIOLOGICAL FILTRATION	138	Conwy Bridge	3.44
GRAIG SEWAGE TREATMENT WORKS	CG0108901	TRIB OF NANT GARREG DDU	SH 80240 74220	PACKAGE TREATMENT PLANT	10.08	Conwy Bridge	3.77
GRAIG SEWAGE TREATMENT WORKS	CG0108901	TRIB OF NANT GARREG DDU	SH 80240 74220	PACKAGE TREATMENT PLANT	64.8	Conwy Bridge	3.77
TYN Y GROES STW	CG0015401	CONWY ESTUARY	SH 78520 71210	BIOLOGICAL FILTRATION	62.1	Conwy Bridge	6.46
ROWEN STW	CG0089401	ROE	SH 76080 71700	BIOLOGICAL FILTRATION	95.5	Conwy Bridge	6.52
ROWEN STW	CG0089401	ROE	SH 76080 71700	BIOLOGICAL FILTRATION	286.5	Conwy Bridge	6.52

Table 3.2 Details of intermittent discharges within 2 km of the Conwy BMPA catchment. Those likely to have an impact on contamination in the BMPA are highlighted in yellow.

Discharge number (Figure 3.2)	Discharge Name	Permit Number	Spill Duration (hours)	Spill Count	Distance to centre of nearest CZ (km)	Closest CZ
1	Gyffin PS Morfa Bach Conwy	CG0094401	0	0	0.364	Conwy Bridge
2	CSO and EO at Conwy Quay PS	CG0315801	2	1	0.506	Conwy Bridge
3	Llandudno Junction SPS Storm Discharge and EO	CG0379201	13	17	0.523	Conwy Bridge
4	Deganwy Road CSO	CG0127101	6	2.5	0.741	Morfa, Gamlwys & Green Island
5	CSO and EO at Llandudno Junction Conwy Road SPS	CG0379301	1	0.5	0.898	Conwy Bridge
6	TYWYN PS	CG0379401	16	12	0.903	Conwy Bridge
7	CSO and EO at Conwy Morfa Drive SPS	CG0141901	11	11	0.961	Conwy Bridge
8	ST. AGNES ROAD CSO	CG0162501	1	0.75	1.174	Conwy Bridge
9	Llandudno Junction Marl Drive CSO	CG0190901	2	2.75	1.183	Conwy Bridge
10	HENDRE ROAD SSO	CG0094301	1	0.75	1.289	Conwy Bridge
11	CSO and EO at Deganwy Pumping Station	CG0379501	115	88.75	1.337	Morfa, Gamlwys & Green Island
12	DALE ROAD STORM SPS LLANDUDNO	CG0152501	NA	NA	1.582	Morfa, Gamlwys & Green Island
13	GANOL WWTW (STW) GLAN CONWY CORNER	CG0377701	1	0.25	1.923	Conwy Bridge

During initial consultations, no improvement works to the Wastewater Treatment Network for the catchment were noted.

In addition to the water company owned infrastructure, there continues to be privately owned discharges throughout the catchment. A number of these have consented discharge volumes of more than 10 m^3 /day. Limited details of these can be provided due to data protection requirements. In the 2014 Sanitary survey, the majority of private discharges were recorded as soakaway with little impact on coastal water. Those that discharge to water drain to the upper estuary. Two larger discharges from caravan parks were identified in the mid reaches of the estuary which remain today. The DWF is < 100 m^3 /day and treatment remains unspecified. Given the nature of the sites, there may also be increased faecal loading during the summer months when tourism to the area increases. The assessment of the impact from private discharges is considered to be small in comparison to the other sources of contamination discussed elsewhere in this report, including from the caravan parks, and therefore does not require consideration in the placement of RMPs for the Conwy BMPA.

The main risk from sewage discharges in the Conwy BMPA comes from intermittent discharges near the mouth of the River Conwy, as there are no significant continuous discharges nearby. This should be taken into consideration in any updated sampling plan.

3.3 Agricultural Sources

The 2014 Sanitary Survey identified that the majority of the land in the hydrological catchment of the Conwy BMPA is used for agriculture, with almost all of this being pasture. In 2014, the upper areas of the catchment supported extensive sheep grazing, whilst the lower reaches supported a mixture of dairy and livestock farming. To provide an indication of changes to the livestock population in the catchment, a data request was made to the Agriculture and Rural Affairs department at Welsh Government. At the time of writing (April 2024), no livestock data has been provided and therefore no comparison of livestock populations is possible.

Sheep farming was said to be ubiquitous in the 2014 Sanitary Survey, with almost 350,000 animals identified in the 2012 livestock census. There were also significant numbers of cattle and poultry farmed in the catchment.

The principal route of contamination of coastal waters by livestock is surface runoff carrying faecal matter. The land cover of the Conwy BMPA between 2012 and 2018 is shown in Figure 3.3. The maps show that the majority of the catchment is rural and dominated by pastures although the area surrounding the three CZs in the BMPA is more urban. 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. Run-off from rivers further up the catchment 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.

Some small areas within the catchment are 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]. The Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021[5] specifies that silage cannot be stored within 10 m of a coastal or inland water. Given this regulation was introduced in 2021, we are unlikely to have seen large reductions, if any, in the overall bacteriological contamination caused by silage stored < 10 m from coastal or inland water before 2021.

Agricultural use of land in the catchment is likely to have an impact on bacteriological contamination in the BMPA, and therefore should be considered when deciding the locations of the RMPs for classification zones.

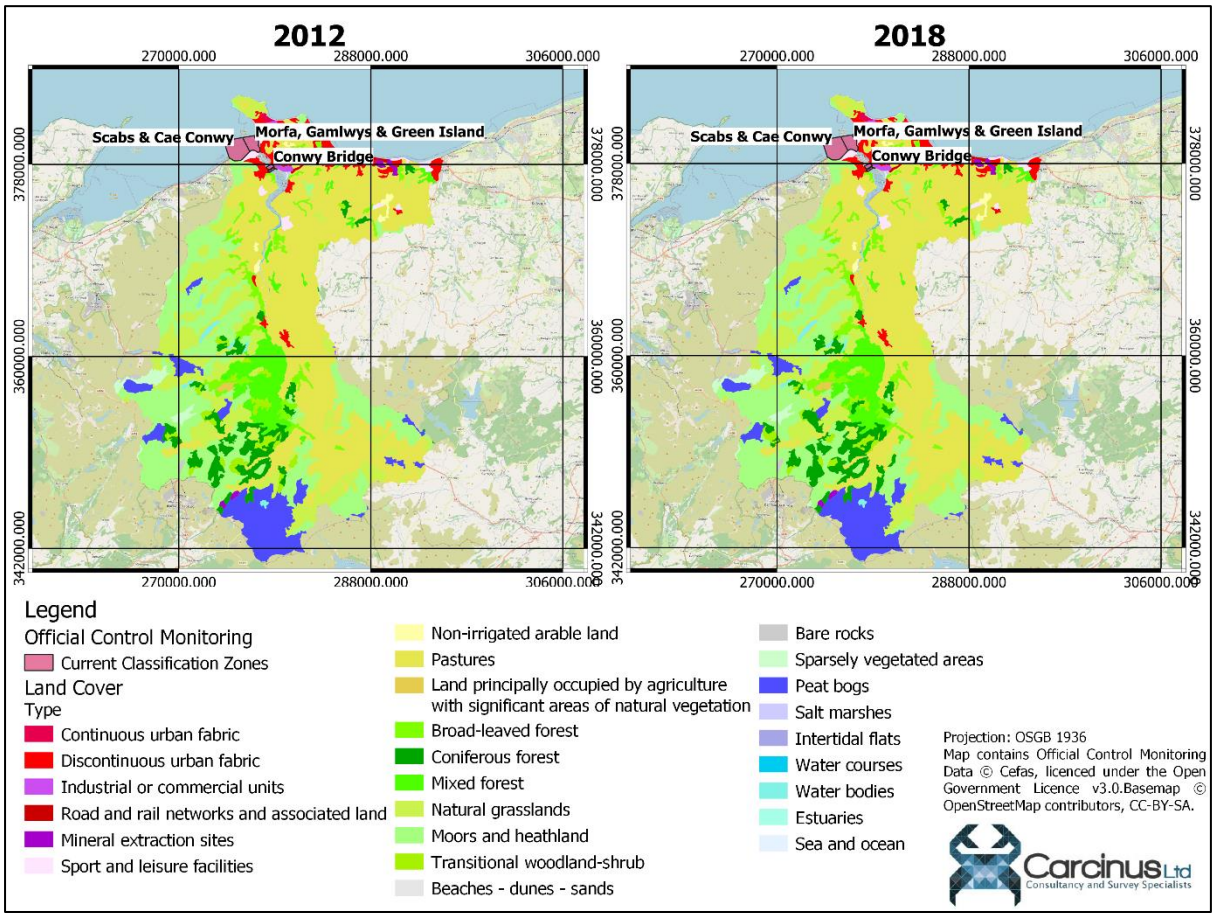

Figure 3.3 Land cover in the Conwy catchment in 2012 and 2018.

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

3.4 Wildlife

The survey area of the Conwy BMPA encompasses a range of estuarine habitats and these attract aggregations of wildlife, some of which may be an influence on shellfish hygiene through defecation in or nearby to the waters. Areas of the catchment are protected by UK legislation including Conwy Special Area of Conservation (SAC), Sites of Special Scientific Interest (SSSI)[6], and several Local Nature Reserves. Snowdonia National Park forms over half of Conwy's hydrological catchment. Waterbirds (particularly wildfowl and waders) are likely to represent a significant pollution source to the BMPA, particularly populations which overwinter in the area. The Wetland Bird Survey (WeBS) provides waterbird counts for Conwy estuary.

Figure 3.4 shows the temporal trend in total overwintering counts from the winter of 1966/1967 – 2021/2022 (the most recent for which data are available). It shows that the dominant group in terms of population size is waders. Conwy estuary also supports a nationally significant population of Redshank. The current five year average total count (2017/18 – 2021/22) is 3,029. Whilst bird numbers have been gradually increasing from 2000 – 2020, they did experience a sharp decline pre-2000 as shown in Figure 3.4.

[6] https://datamap.gov.wales/layers/inspire-nrw:NRW_SSSI

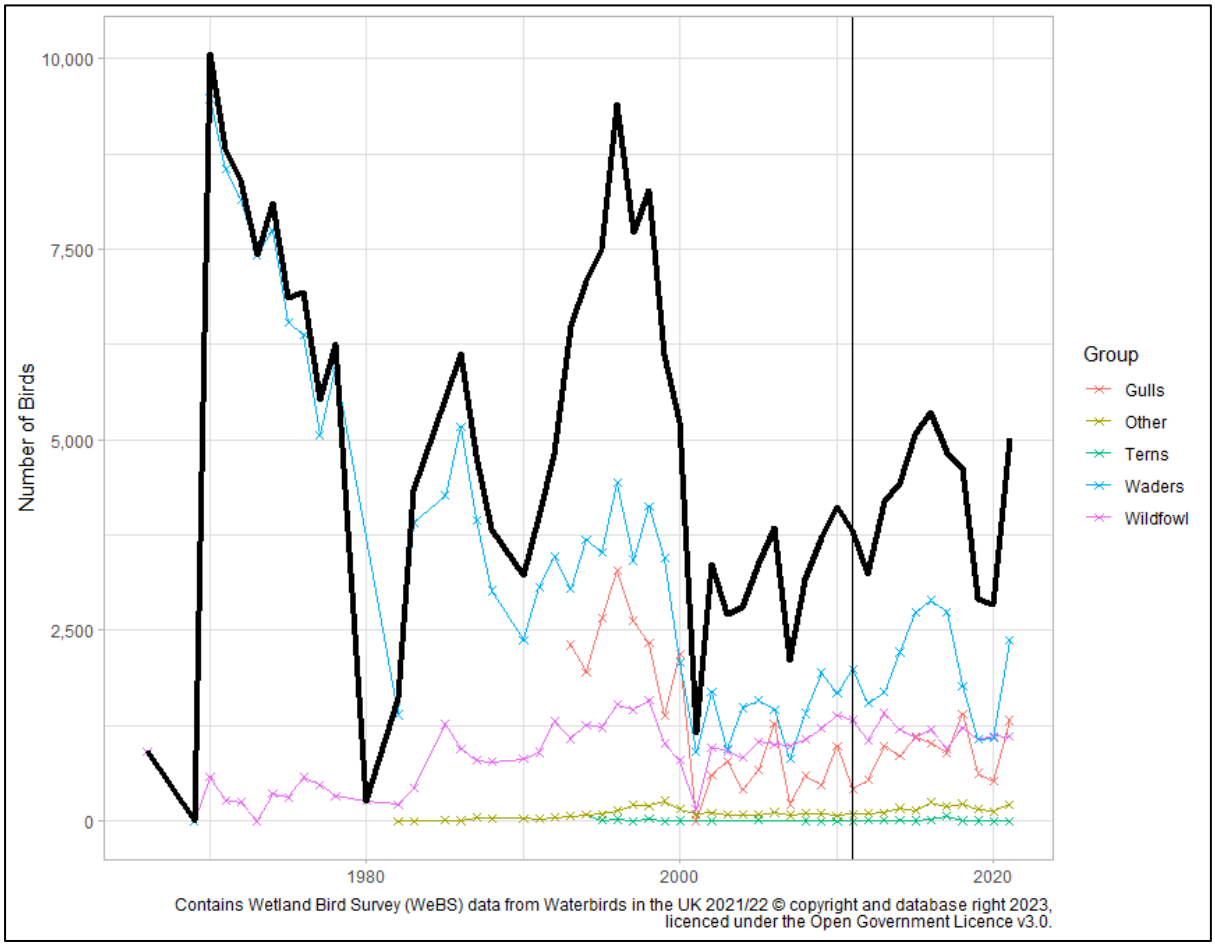

Figure 3.4 Temporal trend in waterbird counts from Conwy estuary. Data from the Wetland Bird survey (Austin et al.*, 2023). Black line represents total number of birds.*

The largest aggregations of waterbirds, and therefore the highest risk of contamination due to defecation, will occur in winter months. The distribution of waterbirds within the estuary will be driven by the aggregations of their foraging resource, which will shift from year to year. The precise timing and locations of the contamination will however be variable, and it is challenging to define RMPs which reliably capture this source of pollution.

The 2014 sanitary survey reported estimated there to be around 365 grey seals in North Wales (Westcott and Stringell, 2004). No formal counts have been undertaken in Conwy estuary or Bay, however the closest recorded haul out site is 10 km west on Puffin Island[7]. The group is quite small, although numbers increase in winter. If seals are within the CZs and defecate, this has the potential to create localised hotspots of contamination. Given their small numbers and the large area they are known to forage over, their impacts are likely to be minimal and unpredictable spatially.

7 https://www.puffinislandboattrips.wales/#:~:text=A%20large%20Pod%20of%20Seals,are%20spotted%20at%20Puffin%20Island.

Both seals and birds are likely to cause minor impacts to bacteriological contamination in the estuary, and therefore do not need consideration in the placement of RMPs.

3.5 Boats and Marinas

The discharge of sewage from boats is a potentially significant source of contamination to the shellfish beds of the Conwy BMPA. Boating activities in the area have been derived through analysis of satellite imagery and various internet sources, and compared to that described in the 2014 Sanitary Survey. Their geographical positions are presented in Figure 3.5.

There are 10 small vessels (< 10 m) and 4 large vessels (> 10 m) which currently list Conwy as their home port (gov.uk, 2024). In the 2014 Sanitary survey, 9 fishing vessels were listed to be under 10 m, and one vessel over 10 m so there has been a small increase in fishing vessels activity. There are two marinas in the survey area; the Deganwy marina which holds 500 pontoon berths, and the Conwy marina which holds 165 berths for recreational vessels. Both marinas have sewage pump out facilities (*The Green Blue*, 2022), which in turn should limit any overboard discharges in the marina. Downstream of the *Conwy Bridge* CZ there are some swinging and pontoon moorings. There are sailing and yacht clubs near the CZs however small pleasure craft are unlikely to have onboard toilet facilities. For those that do, any contamination will occur when the vessels are moving through the main navigational channels rather than when moored overnight. Legislation states commercial vessels are prohibited from making overboard discharges within 3 nautical miles of land[8]. There are no commercial ports within Conwy Bay or the estuary. Boating activity, and water sports like kayaking and windsurfing which are popular in the Bay, are likely to increase seasonally in the summer months. However, given the small vessel numbers listed to Conwy, and nature of boating activities, this is likely to have little impact on contamination in the CZs and does not need consideration in the placement of RMPs. The situation is unchanged from the 2014 Sanitary Survey.

[8] https://www.rya.org.uk/knowledge/environment/waste-management

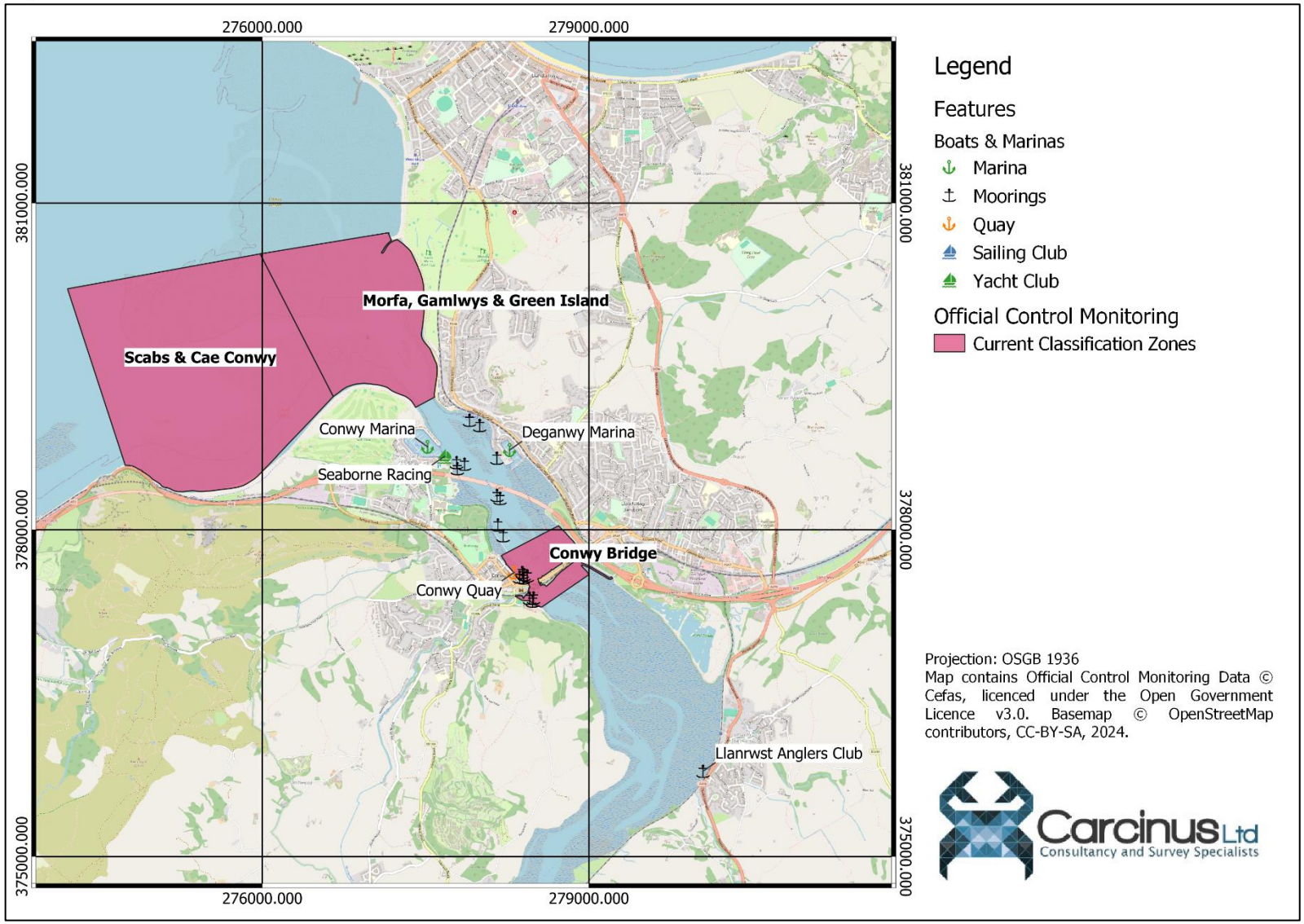

Figure 3.5 Locations of boats, marinas and other boating activities in the vicinity of the Conwy BMPA.

3.6 Other Sources of Contamination

Utility misconnections are when foul water pipes are wrongly connected and enter surface waters without treatment, potentially putting raw sewage directly into watercourses via surface water drains. During initial consultations, the LEA shared that the pollution and housing team at Conwy Council do work on misconnections in the area. There is a working group alongside Welsh Water and NRW, and an issue has been noted with the Craig Y Don 'Washington' area outfall. Historically, other areas such as Llanrwst and Deganwy have had issues. Further investigations are currently being undertaken and bathing water quality is being monitored.

The status of designated bathing waters near to and within the BMPA is of relevance to this assessment. The bathing water quality results closest to the BMPA are excellent[9] at Penmaenmawr and good[10] at Llandudno West Shore (NRW, 2024). Penmaenmawr is approximately 3.3 km from the nearest CZ, and Llandudno West Shore is approximately 1 km from the nearest CZ. Figure 3.6 shows their locations in proximity to the BMPA. 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, and suggest that generally water within Conwy Bay is good, with low *E. coli* concentration. The Bathing Water Quality results from 2021 – 2023 are presented in Table 3.3.

Table 3.3 Bathing Water Quality at Bathing Water Monitoring Points closest to the Conwy BMPA.

Bathing Water	2021	2022	2023
Penmaenmawr	Excellent	Excellent	Excellent
Llandudno West Shore	Excellent	Excellent	Good

[9] Excellent: ("the highest cleanest class"
[10] Good: "pollution effects are small or rare"

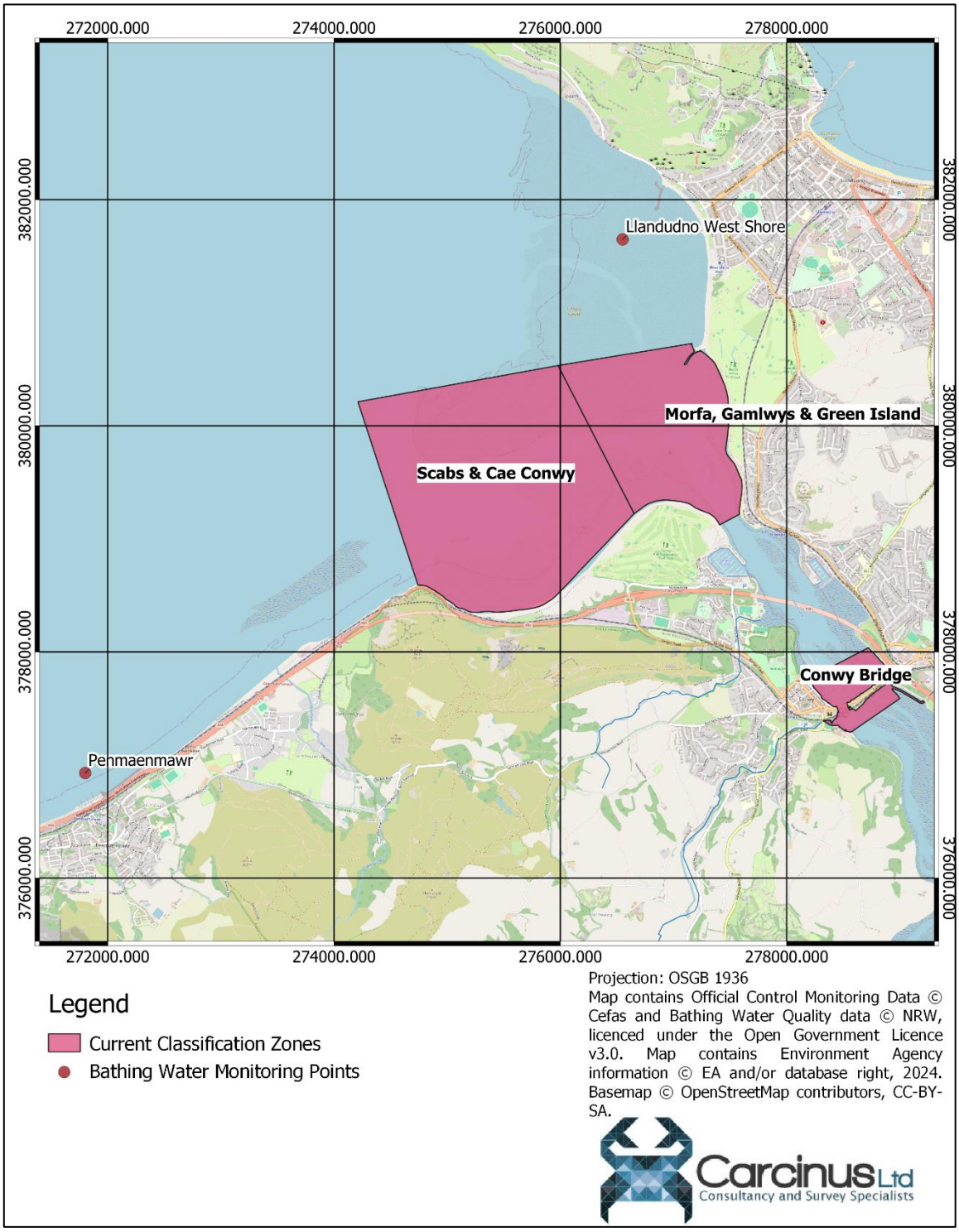

Figure 3.6 Bathing Water Quality Monitoring Points closest to the Conwy BMPA.

Dog fouling was noted in the 2014 Sanitary Survey as a potential source of contamination. This is likely to be higher risk closer to the areas of urban fabric near the coastline and therefore CZs. It is also likely to increase in the summer months with tourism. Overall, dog fouling as a diffuse source of contamination to the shellfish waters will have little influence and does not need consideration in the placement of RMPs.

4 Hydrodynamics/Water Circulation

Conwy estuary is a narrow, steep-sided river valley about 21 km in length, which adjoins the central part of Conwy Bay. The main river Conwy drains an area of 380 km^2 to the tidal limit. A further 200 km^2 of land drains to the estuary itself (UK Centre for Ecology and Hydrology, 2024). The main channel connecting the estuary with the sea has an east-west orientation over a large intertidal area. Depths range from + 0.5 to - 4.5 m relative to chart datum. The tidal range is large which drives extensive water movement. The usual tidal range at the Llandudno Monitoring Station (to the east of the headland) is between -3.66 m and 4.29 m[11]. At the time of the original sanitary survey, no detailed description of tidal streams within Conwy Bay could be found. However, it was indicated that tides flood into Conwy Bay from the north-west and up the main Conwy estuary approach channel. The water spreads over the intertidal and offshore subtidal area as the water level rises. The ebb plume impacts all around the mouth of the estuary with acute impacts on the main approach channel as low water approaches (the reverse). The strength of these currents is unknown although some modelling is underway[12].

There is no evidence that the patterns of water movement within the Conwy BMPA will have changed significantly since the 2014 Sanitary Survey was published. No update to the sampling plan is necessary, as the recommendations made in the 2014 Sanitary Survey to account for the impact of water circulation within the estuary continue to be valid.

5 Rainfall

A complete record of the rainfall data for the Llanrwst raingauge (ID: 535895) rainfall station at NGR SH 79555 61824 was received following a data request to Natural Resources Wales. This station is the closest to the BMPA (approx. 15 km as the crow flies). The data were subdivided into 2009 – 2014 (pre-sanitary survey) and 2014 – 2024 (post-sanitary survey) and processed in R (R Core Team, 2021). These data were used to determine whether any changes in rainfall patterns had occurred since the original sanitary survey was published. The rainfall data are summarised in Table 5.1 and the rainfall levels per month are shown in Figure 5.1.

[11] https://riverlevels.uk/llandudno-clwyd-tidal-level
[12] https://cams.bangor.ac.uk/Divisions/project_details.php?project=25

Table 5.1 Summary statistics for the period preceding and following the 2014 Sanitary survey.

Period	Mean Annual Rainfall	Percentage Dry Days	Percentage Days Exceeding 10 mm	Percentage Days Exceeding 20 mm
2009 - 2014	1242.60	38.80	36.09	23.42
2014 - 2024	1315.73	36.12	38.53	25.13

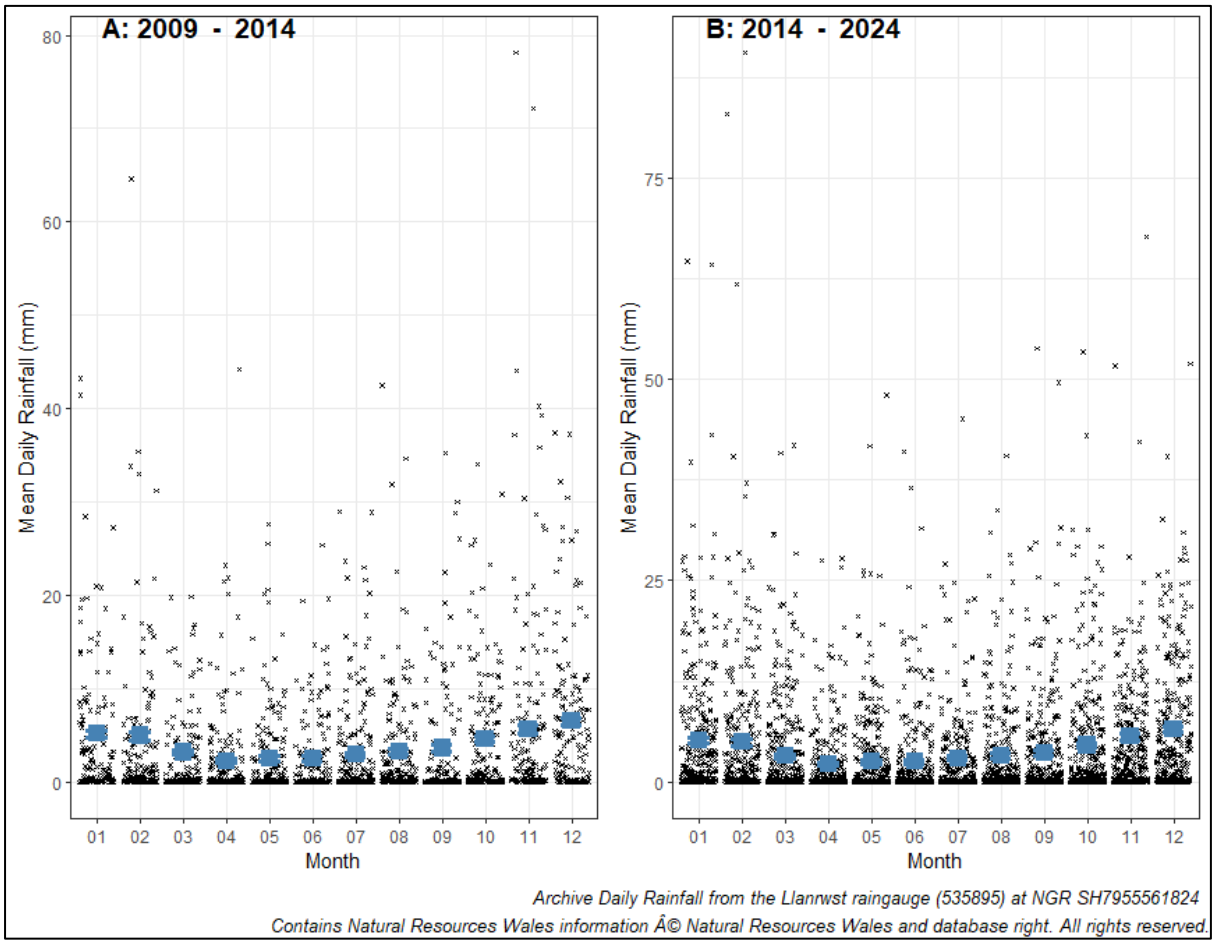

Figure 5.1 Mean daily rainfall per month at the Llanrwst raingauge (NGR: SH 79555 61824) for the period (A) 2009-2014 and (B) 2014-2024.

The data shows that the rainfall levels in the area have increased slightly with 73.13 mm more rainfall annually in period B (2014 – 2024). The number of dry days has decreased by 2.68 days and the percentage of days with rainfall exceeding 10 mm has increased by 6.76%. The percentage of days with heavy rainfall (> 20 mm) has also increased by 7.3%. Two sample t-tests indicated that there was no significant difference ($p > 0.05$) in the mean daily rainfall per month for the 2009 – 2014 and 2014 – 2023 periods (the mean daily rainfall between the two data sets is statistically similar).

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 both periods were greatest in winter months (November – February), and so levels of runoff etc. would be expected to be greatest during this time.

The Conwy area has a strong climatic gradient with annual precipitation varying from the north-east to west where Snowdonia lies. The higher land area supports limited livestock grazing and so despite higher rainfall levels, the level of potential contamination carried to the Conwy estuary from here remains low (UK Centre for Ecology and Hydrology, 2024).

As the rainfall patterns have remained statistically similar across the two time periods A and B, significantly altered bacterial loading due to these factors is unlikely and as such sampling plan recommendations made in the original sanitary survey to capture the influence of runoff and spill events remain valid.

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 Conwy BMPA since 2010 are presented spatially in Figure 6.1 and summary statistics are presented in Table 6.1. This data was obtained from the Cefas datahub[13].

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

Table 6.1 Summary statistics from official control monitoring at bivalve RMPs in the Conwy BMPA. All RMPs are currently in use. Please note the NGRs reported on the datahub differ to the current sampling plan. A recommended sampling plan moving forward is provided in Table 9.1.

RMP (Species)	NGR	Species	No. Samples	First Sample	Last Sample	Mean	Min Value	Max Value	% > 230	% > 4,600	% > 46,000
Conwy Bridge (M. sp) - B044T	SH78467738	Mussels	91	28/01/2016	15/01/2024	2391.692	68	35,000	85.71	7.69	0
Conwy East (M. sp) - B044U	SH77437943	Mussels	91	28/01/2016	15/01/2024	1199.385	18	13,000	78.02	2.20	0
Conwy West (M. sp) - B044V	SH7604079920	Mussels	91	28/01/2016	15/01/2024	1037.484	20	11,000	76.92	3.30	0

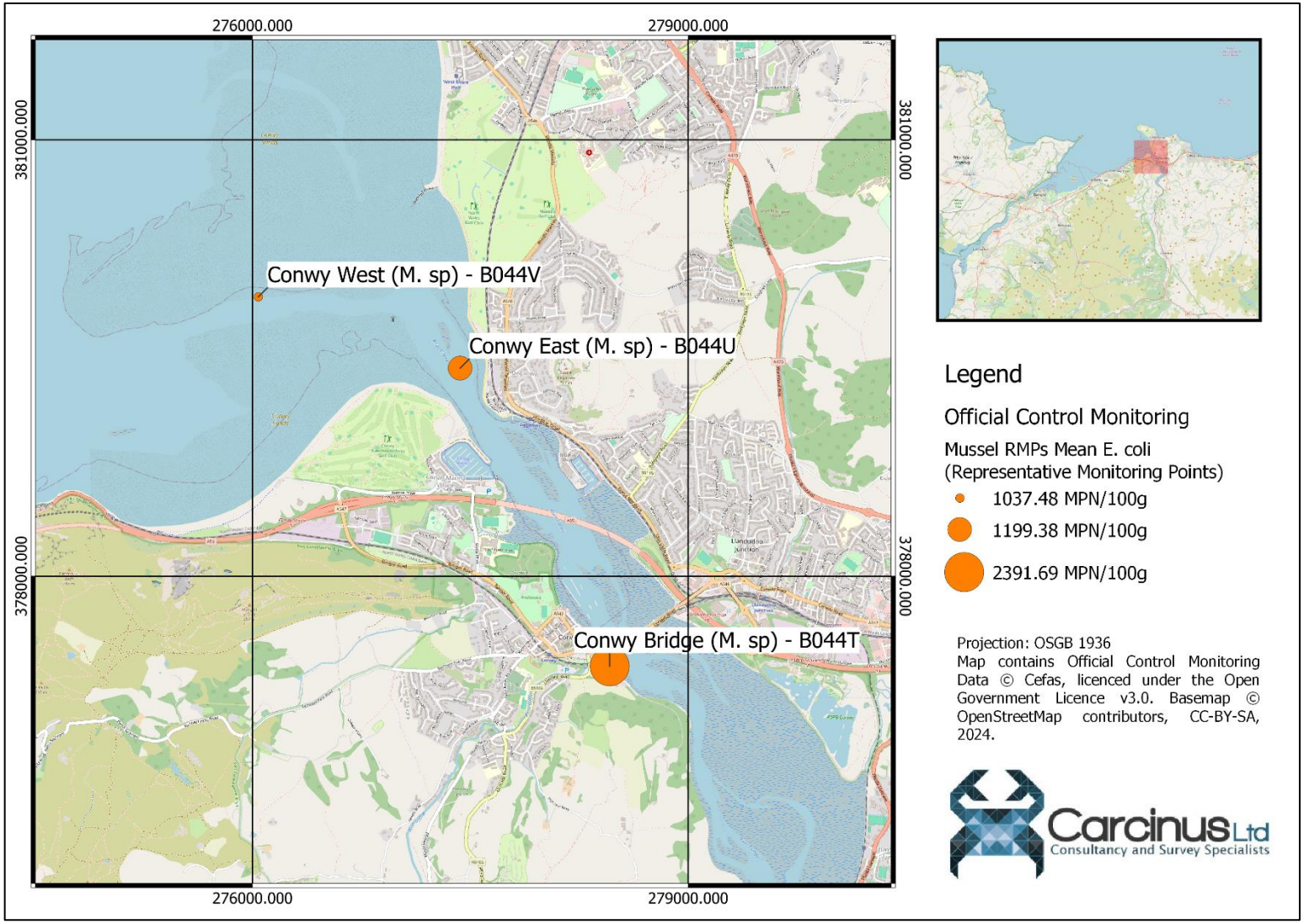

Figure 6.1 Mean E. coli results from Official Control Monitoring at bivalve RMPs in the Conwy BMPA.

A total of three RMPs have been sampled with the Conwy BMPA since 2016. No data is available from any RMPs sampled before this date in the Conwy BMPA. At the time of the 2014 Sanitary survey, CZs were recommended in four zones, with RMPs in each, to best capture contamination. These zones were Conwy Bridge (*Conwy Bridge* CZ), Estuary Mouth (*Morfa, Gamlyws & Green Island* CZ), Outer West (*Scabs & Cae Conwy* CZ), and Outer North (unclassified and only supported seed stocks).

No RMP results since 2016 have exceeded the 46,000 MPN/100 g threshold. The Conwy Bridge RMP (B044T) has returned the highest percentage of results > 4,600 MPN/100 g (7.69%) and recorded a maximum value of 35,000 MPN/100g. Given this RMP is upstream in the estuary, it is likely to be most affected by any potential contamination flowing down the river from pollution sources such as surface run-off. Bacteriological die-off will occur the further the water flows out into the Bay and subsequently to the other two CZs. Conwy West (B044V) RMP has the lowest mean *E. coli* and maximum value. It is located furthest out in the estuary/Bay to the West and contamination that reaches this RMP will be subject to die-off and significant water mixing beforehand.

Figure 6.2 presents box and violin plots of *E. Coli* monitoring at RMPs with the Conwy 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[14]. All statistical analysis described in this section was undertaken in R (R Core Team, 2021).

Significant differences in the monitoring results were found between Conwy West and Conwy Bridge ($p = 0.026$).

[14] 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.

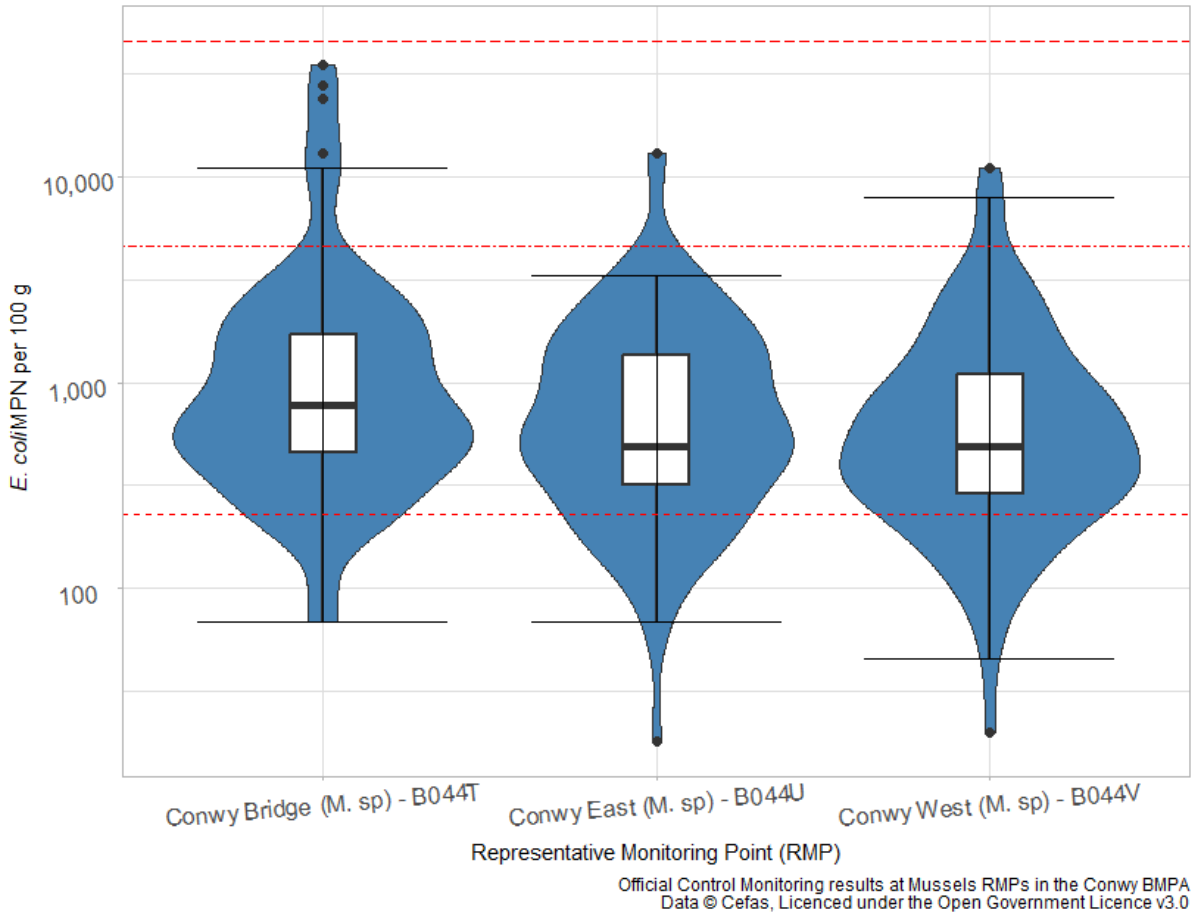

Figure 6.2 Box and violin plots of E. coli monitoring at mussel RMPs in the Conwy BMPA. Central line indicates median value, box indicates lower-upper quartile range and whisker indicates minimum/maximum values, excluding outliers. Boxplots are overlaid on the distribution of the monitoring data. Horizontal dashed lines indicate classification thresholds at 230, 4,600 and 46,000 E. coli MPN/100 g.

6.1.2 Overall temporal pattern in results

The overall temporal pattern in shellfish flesh monitoring results within the Conwy BMPA is show in Figure 6.3.

The monitoring data from the mussels RMPs indicates that concentrations of *E. coli* in shellfish flesh are generally low, with the loess models for all RMPs falling around the 1,000 MPN/100 g mark. The frequency of high results (> 4,600 MPN/100 g) has remained relatively similar since 2016 with all RMPs having results above this threshold recently. There is no clear temporal pattern in the monitoring data for mussels RMPs in the Conwy BMPA.

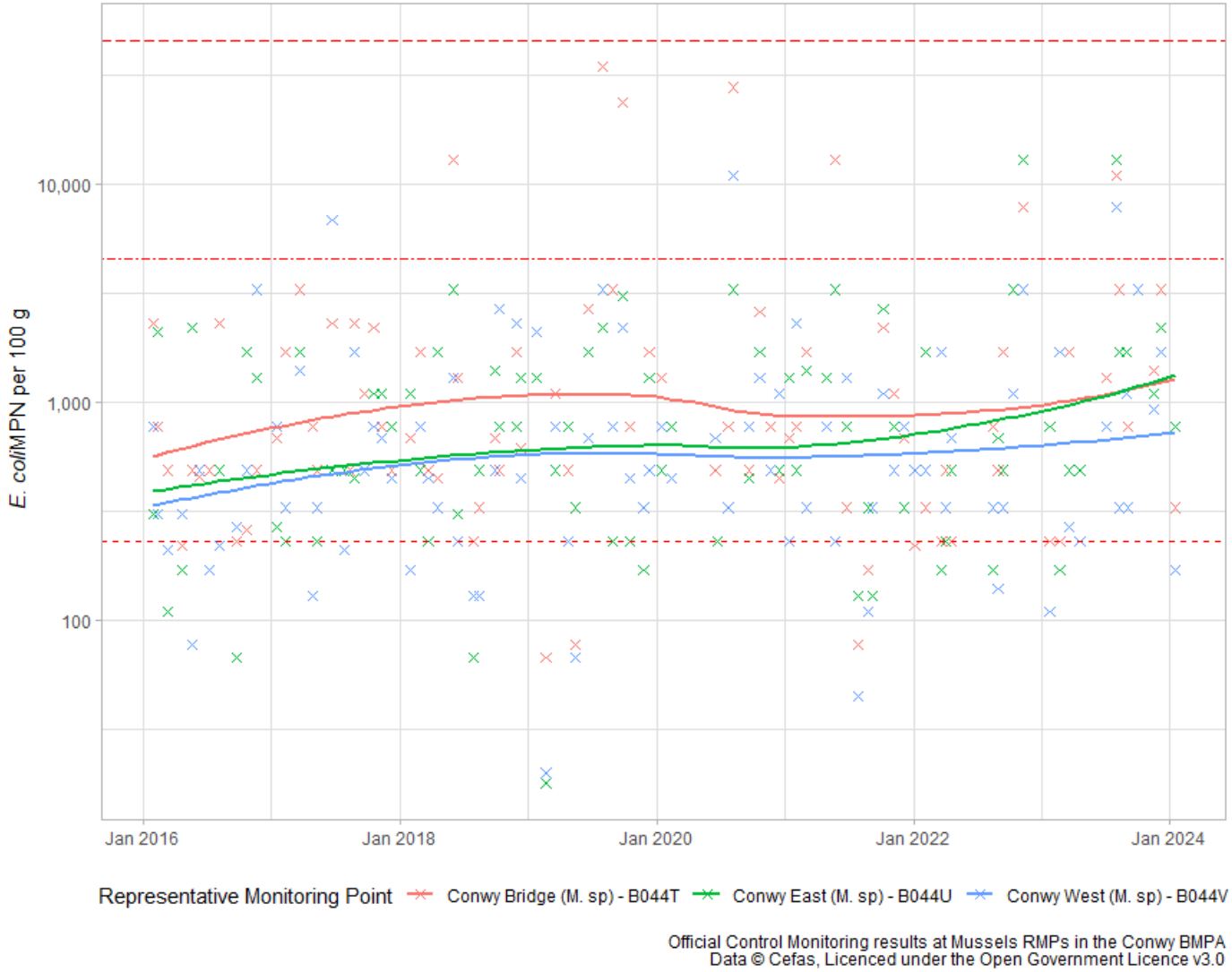

Figure 6.3 Timeseries of E. coli levels at mussel RMPs sampled in the Conwy BMPA since 2016. Scatter plots are overlaid with a loess model fitted to the data. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 E. coli MPN/100 g respectively.

6.1.3 Seasonal patterns of results

Seasonal patterns of *E. coli* concentrations at RMPs in the Conwy 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 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.

No significant differences were found seasonally in the monitoring results for all mussel RMPs in the Conwy BMPA ($p > 0.05$).

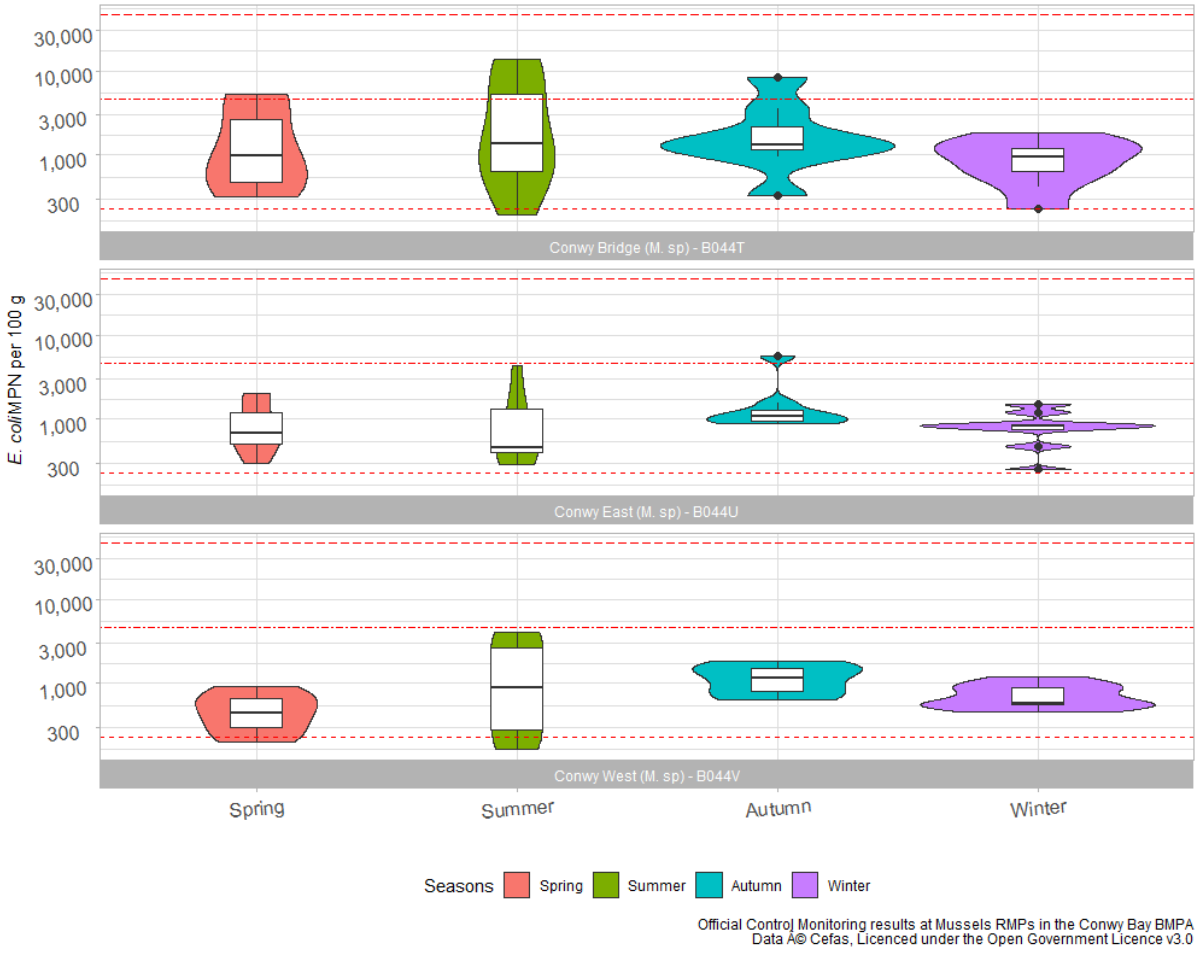

Figure 6.4 Box and violin plots of E. coli levels per season at mussel RMPs sampled within the Conwy BMPA since 2010. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 E. coli MPN/100 g.

6.2 Action States

Since the publication of the 2014 Sanitary Survey of Conwy, the following Action States have been triggered within the BMPA.

- On 31 July 2019, a result of 35,000 E. coli MPN/100 g was recorded at Conwy Bridge B044T. No other high results were recorded in the area, and no subsequent monthly sampling had been undertaken. Subsequent action state sampling produced results of 780 MPN/100 g on 6 August 2019, and 3,300 MPN/100 g on 28 August 2019. The bed was under seasonal closure, and the 1- and 5-year compliances with 4,600 MPN/100 g were above 90% so no change in classification occurred.
- On 25 September 2019, a result of 24,000 MPN/100 g was recorded at Conwy Bridge B044T. No other high results were recorded in the area. Subsequent monthly sampling produced a result of 780 MPN/100 g on 17 October 2019. Subsequent action state sampling produced a result of 690 MPN/100 g on 7 October 2019. The 3-year compliance with 4,600 MPN/100 g was above 90%, therefore no change in classification was recommended for this site.
- On 6 August 2020, a result of 28,000 MPN/100 g was recorded at Conwy Bridge B044T. A high result of 11,000 MPN/100 g was also recorded at B044V Scabs & Cae Conwy. Subsequent Action State sampling on 12 August 2020 produced a result of 2,300 MPN/100 g, and 3,300 MPN/100 g on 25 August 2020. No subsequent monthly sampling was undertaken. As the 5-year compliance with 4,600 MPN/100 g was above 90%, no change in classification was recommended for this site.

The investigations that followed the action state events that are described above did not identify significant (above the 1-in-5 year threshold) rainfall or significant releases from water company assets. Consideration should therefore be given to significant point sources of contamination (such as sewage discharges or riverine inputs carrying potential agricultural pollution) in any updated sampling plan.

7 Conclusion and overall assessment

Conwy estuary, which drains into Conwy Bay, is situated along the north coast of Wales. The BMPA is currently classified for one species (*Mytilus* spp.) which is subject to hand/rake gathering in a wild fishery. The fishery is closed for the 2023/2024 season for fishery management purposes.

The results of the 2021 Census were compared to that of the 2011 Census to give an indication of changes in human population in the catchment since the publication of the 2014 Sanitary Survey. These data show little change in the population of the catchment between 2011 and 2021. The main population centres continue to be coastal with the majority of the catchment being rural. Urban associated runoff is not considered to be a significant source of contamination within this area, although Conwy does see a significant increase in population seasonally in the summer months from tourism. No concerns were expressed regarding the wastewater treatment network's ability to handle seasonal population increases.

The wastewater treatment network was studied to reveal a number of consented discharges in the Conwy catchment. The previous 2014 Sanitary Survey identified the Penmaenmawr STW as a potentially significant source of contamination to the shellfisheries. The DWF and treatment of this discharge remains unchanged, however it is not inside the catchment considered in this report. Any bacterial loading from this discharge is likely to experience die-off and dilution before reaching the nearest CZ (2.5 km away). Other continuous discharges in the Conwy catchment are > 3 km from the nearest CZ and have relatively low DWF, therefore do not need consideration in the placement of RMPs.

Only two intermittent discharges in the catchment have a spill count > 100. The CSO at Rowen STW is 6.44 km away from the nearest CZ and spilled 108 times for a total of 311.25 hours. This discharge is untreated, however given its distance from the nearest CZ any bacterial loading will experience significant dilution and die-off before reaching any CZ. The CSO and EO at Deganwy Pumping Station is 1.34 km from the nearest CZ, and spilled 115 times for 88.75 hours in 2022. Despite undergoing screening treatment, it is suggested the potential contamination from this intermittent discharge be considered in the placement of RMPs given the high spill volume/duration, and short distance to the *Morfa, Gamlwys & Green Island* CZ.

At the time of writing (April 2024) no recent livestock data was available to the authors of this review to compare between the situation at the time of publication of the 2014 Sanitary Survey and now.

The majority of land cover in the catchment area was previously identified as rural which remains the case today. The Conwy catchment is a mixture of pasture and arable farmland, with the Snowdonia National Park to the south-west. The Water Resources (Control of Agricultural Pollution) (Wales) Regulations 2021 restricts silage storage within 10 m of a coastal or inland water. There are unlikely to have been large reductions, if any, in the overall bacteriological contamination caused by silage stored < 10 m from coastal or inland water before 2021. The winter months are likely to see higher levels of contamination from agricultural runoff due to increased rainfall and animal grazing, however Official Control monitoring results showed no significant differences seasonally. Agricultural sources remain a likely source of bacteriological contamination within the Conwy BMPA but the level of contamination will be similar to that described in the 2014 Sanitary Survey.

Waterbird counts show the area to be nationally significant for populations of Redshank. Some minor impacts can be expected from avian species, and potentially marine mammals in the area. However, these are impossible to reliably predict and will experience great variation both spatially and temporally and are therefore challenging to account for in any updated sampling plan.

There is a small number of fishing vessels that list Conwy as their main port. There are no commercial ports near the BMPA and impacts from passing merchant vessels are unlikely because merchant vessels are prohibited from making overboard discharges within 3 nm of land. There are some small anchorages marked on navigational charts. Discharges from

recreational vessels of a sufficient size to contain on board toilets are unlikely to occur as both marinas within the catchment have pump out facilities. The highest risk of this source of pollution will occur during summer months.

There is monitoring data available for three RMPs sampled within the Conwy BMPA. All of these are currently sampled. Significant differences were found between the monitoring data for Conwy West RMP B044V and Conwy Bridge RMP B044T. Conwy Bridge is higher up the estuary, and so is likely to experience more contamination from upstream sources and runoff. The Conwy West RMP is further offshore in the shallow subtidal of Conwy Bay and so significant bacterial dilution and die off will likely occur before contamination reaches this CZ. There were no seasonal differences in RMP data. Based on this geographical pattern, a general recommendation of placing RMPs at the upstream extent of CZs should be followed, unless significant point sources of contamination exist.

Based on the information available, there do not appear be any significant knowledge gaps that would justify a shoreline survey. There have been no notable changes to sources of pollution since the 2014 Sanitary Survey was published.

Having reviewed and compared the desk-based study with the findings of the original sanitary surveys in 2014, the FSA are also content that a shoreline assessment is not required unless further information following secondary consultation suggests there may be an increase in the level of public health risk.

8 Recommendations

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

8.1 Mussels

Conwy Bridge

This zone is in the upper area of the estuary and is approx. 0.3 km^2 in size. It is likely to receive contamination from upstream catchment sources. There are two watercourses draining to either side of the estuary and subsequently through the mussel beds (Gyffin and Wydden). The 2014 Sanitary Survey identified that there are 6 intermittent discharges to the Wydden. There are also two intermittent discharges and two small STWs discharging to the Gyffin. It was recommended the RMP be located on the lower intertidal immediately adjacent to the drainage channel from the Gyffin for this reason. The current RMP (Conwy Bridge B044T) remains representative of contamination sources and should therefore be retained.

Morfa, Gamlyws & Green Island

The *Morfa, Gamlyws & Green Island* CZ is approx. 1.6 km^2 in size. This zone is at the estuary mouth and is therefore likely to capture contamination from the ebb plume from the estuary. The 2014 Sanitary Survey recommended the RMP be located at the upstream end of the Green Island Bed as hygiene monitoring result indicated higher average results toward the estuary mouth. Provided that the mussel bed does not extend any farther into

the mouth of the Conwy, the current RMP (Conwy East RMP B044U) will still be representative of contamination affecting this zone, and should therefore be retained. At secondary consultation, the LEA confirmed that mussel stock does not exist farther upstream, and that the RMP is well positioned to monitor the full extent of the mussel stock in this CZ.

Scabs & Cae Conwy

The CZ is to the West of the estuary mouth and is approx. 3.6 km^2. Its main contaminating influence is likely to be the ebb plume from the estuary. This CZ is also likely to be most affected by the Penmaenmawr STW which is 2.5 km west of the CZ. The Conwy West B044V RMP is currently situated closer to the estuary mouth toward the east of the CZ due to increased likely contamination in this area. The RMP should remain located at the upstream east end of the bed, immediately adjacent to the estuary approach channel as recommended by the previous sanitary survey. At secondary consultation, the LEA confirmed that mussel stock does not exist farther upstream, and that the RMP is well positioned to monitor the full extent of the mussel stock in this CZ.

9 General Information

9.1 Location Reference

Production Area	**Conwy**
Cefas Main Site Reference	M044
Ordnance survey 1:25,000	OS Explorer 105
Admiralty Chart	Admiralty 148 Admiralty 442

9.2 Shellfishery

Species	Culture Method	Seasonality of Harvest
Mussels (*Mytilus* spp.)	Wild	Seasonally (Season opens 1 September and closes 30 April)

9.3 Local Enforcement Authority(s)

Name	**Food & Health and Safety Team,** Conwy County Borough Council PO Box 1 Conwy LL30 9GN
Website	www.conwy.gov.uk
Telephone number	-
E-mail address	foodsafety-healthandsafety@conwy.gov.uk

9.4 Recommended Sampling Plan

*Table 9.1 Proposed sampling plan for the Conwy BMPA. Suggested changes are given in **bold red** type. Please note, location of RMPs is unchanged, however NGRs have been amended from 10-figures to 8-figures.*

Classification Zone	RMP	RMP Name	NGR (OSGB 1936)	Lat / Lon (WGS 1984)	Species Represented	Harvesting Technique	Sampling Method	Sampling Species	Tolerance	Frequency
Conwy Bridge	B044T	Conwy Bridge	SH784677 38	53°16'46" N, 03°49'28" W	*Mytilus spp.*	Hand	Hand picked	*Mytilus* spp.	50 m	Monthly
Morfa, Gamlwys & Green Island	B044U	Conwy East	**SH773279 32**	53°17'48" N , 03°50'32" W	*Mytilus spp.*	Hand	Hand picked	*Mytilus* spp.	50 m	Monthly
Cae Conwy & Scabs	B044V	Conwy West	**SH763079 72**	53°18'00" N , 03°51'27" W	*Mytilus spp.*	Hand	Hand picked	*Mytilus* spp.	50 m	Monthly

10 References

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Appendices

Appendix I. Conwy Sanitary Survey Report 2014

Centre for Environment Fisheries & Aquaculture Science

www.cefas.co.uk

EC Regulation 854/2004

CLASSIFICATION OF BIVALVE MOLLUSC PRODUCTION AREAS IN ENGLAND AND WALES

SANITARY SURVEY REPORT

Conwy

October 2014

Food Standards Agency

About Carcinus Ltd

Carcinus Ltd is a leading provider of aquatic environmental consultancy and survey services in the UK.

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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Carcinus provides environmental consultancy services for both freshwater and marine environments. Our freshwater and marine environmental consultants provide services that include scoping studies, Environmental Impact Assessment (EIA) for ecological and human receptors, Habitats Regulations Appraisal (HRA), Water Framework Directive (WFD) assessments, project management, licensing and consent support, pre-dredge sediment assessments and options appraisal, stakeholder and regulator engagement, survey design and management and site selection and feasibility studies.

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Carcinus delivers ecology surveys in both marine and freshwater environments. Our staff are experienced in the design and implementation of ecological surveys, including marine subtidal and intertidal fish ecology and benthic ecology, freshwater fisheries, macro invertebrate sampling, macrophytes, marine mammals, birds, habitat mapping, River Habitat Surveys (RHS), phase 1 habitat surveys, catchment studies, water quality and sediment sampling and analysis, ichthyoplankton, zooplankton and phytoplankton.

In addition, we provide aerial, topographic, bathymetric and laser scan surveys for nearshore, coastal and riverine environments.

Our Vision

"*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*"