Sanitary Survey - classification zone

Anglesey – 2020

Document No. – *J0591/20/10/29*

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Client	Food Standards Agency (FSA)
Project Title	New zone classification – sanitary survey
Document Title	Sanitary Survey - Classification Zone Sanitary Survey - Anglesey
Document Number	J0591/20/10/29
Revision	2.0
Date	13 January 2021

Revisions

Revision No.	Date	Comment
1.0	15 December 2020	Draft
2.0	13 January 2021	Final

Document QA and Approval

	Name	Role	Date
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Approved	Matthew Crabb	Director	13 January 2021

This report was produced by Carcinus Ltd (Carcinus) on behalf of the Food Standards Agency (FSA) for the purposes of providing a sanitary survey for the specific Bivalve Mollusc classification zone (BMCZ) application as detailed in this report. Every effort has been made to ensure the information contained within is as complete and valid as possible at the time of writing. It should be noted that additional information may have existed at the time of publication of this report that was not available, not identified or has subsequently been published after the date of this report. Carcinus 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, Isle of Anglesey County Council. The report is publicly available via the Carcinus Ltd website.

Recommended Bibliographic Citation:

Carcinus Ltd, 2021. Sanitary survey of Anglesey. Carcinus reports 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 EC Regulation 2019/627.

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1 Introduction

This report was produced by Carcinus Ltd (Carcinus) on behalf of the Food Standards Agency (FSA) for the purposes of providing a sanitary survey of classification zone, desktop assessment and recommendation on the need to conduct a shoreline assessment and/or bacteriological survey for the proposed Mussel Production area off Anglesey, Wales, for the harvesting of wild mussels (*Mytilus edulis.*)

1.1 Legislative Requirement

Bivalve molluscs, such as mussels, clams and oysters, are filter feeding organisms that filter the water in which they live to feed on microorganisms. This feeding behaviour increases their ability to accumulate and retain microorganisms, including those that are pathogenic to humans, and other chemical contaminants in the water column. The safety of bivalves harvested for human consumption is therefore strongly influenced by the quality of water in which they have grown. Sources of microbiological contamination from a variety of sources, including human and/or animal origin, can affect Bivalve Mollusc Production Areas (BMPAs), the suitability of shellfish harvested from such areas for human consumption and the post-harvesting processes necessary to make Live Bivalve Molluscs (LBMs) safe.

EC Regulation 2019/627 sets out specific requirements for the classification of new Bivalve Mollusc Classification Zones (BMCZs), including the requirements for a sanitary survey to be conducted. The primary element of a sanitary survey for new areas is a desktop assessment, which will determine a sampling plan to be initiated at a new specific LBM bed with a view to classification. The proposed sampling programme and the sampling locations arising from the desktop assessment are based on the examination of publicly available information on the geographical and hydrological characteristics of the area and potential sources of pollution, as well as any existing sanitary surveys and/or *E. coli* data relating to the area (if available) from Official Control monitoring, or any neighbouring classified production areas (where relevant). Sample numbers, sampling points and sampling frequency ensure the results of the analysis are as representative as possible for the area considered. Thus, the sanitary survey determines a Representative Monitoring Point (RMP) to inform a provisional sampling plan to facilitate the classification of a new production area/bed (Note, the RMP must represent the worst-case scenario of contamination within the production area to be classified); it also confirms the provisional boundary of the area/bed requested to be classified. Although the boundary of the production area or bed is suggested in the harvester's application, it is necessary to define the boundary co-ordinates of the water body based on the available evidence to ensure any identified sources of pollution are considered. The sanitary survey also considers whether there is a need for a shoreline and/or bacteriological survey to be conducted before the sampling plan is finalised.

In England and Wales the Central Competent Authority (CCA) under Regulation (EC) 2019/627 is the FSA. Carcinus is contracted to undertake sanitary surveys for new BMCZs in England and Wales on behalf of the FSA. These assessments are to demonstrate compliance with the requirements stated in Article 56 of EC Regulation 2019/627.

1.2 Scope of assessments

A desktop assessment is the first stage in the sanitary survey process relating to (EC) 2019/627, and is used to provide a basic assessment of contamination risks to the shellfishery as well as a

provisional sampling plan that identifies a Representative Monitoring Point (RMP), sampling frequency, sampling depth, tolerance, species to be sampled and the provisional production area boundaries. The desktop survey focusses on bacterial contamination sources (primarily from faecal origins) and the associated loads of the faecal indicator organism *E. coli* and does not assess chemical contamination, or the risks associated with biotoxins. The assessment also determines whether the area requires a shoreline and/or a bacteriological survey before the sanitary survey can be finalised. The procedure followed is not appropriate to consideration of applications within marinas and docks.

2 Application and Fishery

An application for the classification of a single production area in the waters off the Isle of Anglesey, Wales was received from the Isle of Anglesey County Council – Local Authority (LA). The application was validated by the FSA and passed to Carcinus for undertaking a sanitary survey desktop assessment on the 14th October 2020. The requested application zone is bounded by lines drawn between the coordinates in Table 2.1. The location of the application zone off Anglesey can be seen in Figure 2.1. The application zone is relatively small, approximately 200 m by 190 m.

Table 2.1. Coordinates delineating the application zone.

Point reference	NGR (OSGB 1936, EPSG:27000)	WGS 1984, EPSG:4326 Latitude	WGS 1984, EPSG:4326 Longitude
A	SH 67446 80974	53.309067°	-3.9909163°
B	SH 67401 81159	53.310718°	-3.9916686°
C	SH 67594 81209	53.311215°	-3.9887946°
D	SH 67642 81024	53.309565°	-3.9879974°

There is a large Classification Zone (CZ) classified for mussel harvesting in the Menai Straits – East BMPA, approximately 9 km southwest of the application zone. This CZ has been divided into six smaller CZs due to the layout of different lease areas operated by different mussel companies. These zones are classified from samples from the following RMPs:

- Area A: Craig-y-Don (B055R);
- Area 1: West of Bangor Pier (B055S);
- Areas 2 & B West: Cegin Channel (B055T);
- Areas 3 &4: Gallows Point (B055U);
- Areas 5 & B East: Ogwen Channel (B055V); and
- Areas 6: Beaumaris East (B055W).

There are two further CZs, Lavan West and Lavan East, which are classified for cockles (*Cerastoderma edule*) based on samples from Lavan Sands West (B055Y) and Lavan Sands East (B055X) respectively. Three further CZs for mussel harvesting lay approximately 9 km east-south-east of the application zone within the Conwy BMPA, these are Scabs & Cae Conwy (samples taken from Conwy West (B044V)); Morfa, Gamlyws & Green Island (samples taken from Conwy East (B044U)) and Conwy Bridge (samples taken from Conwy Bridge (B044T)). Finally, a CZ for cockles is located in Red Wharf Bay, approximately 10 km west of the application zone. The All Beds CZ is classified based on samples from Nodwydd (B057J).

The application specifies harvesting of farmed mussels that are grown on rope, using mechanical collection methods that will take place year-round. The area is currently experimental and the expected production is < 100 tonnes. The application zone is situated in the subtidal zone, with water depths of 10 – 16 m (as estimated from nautical charts).

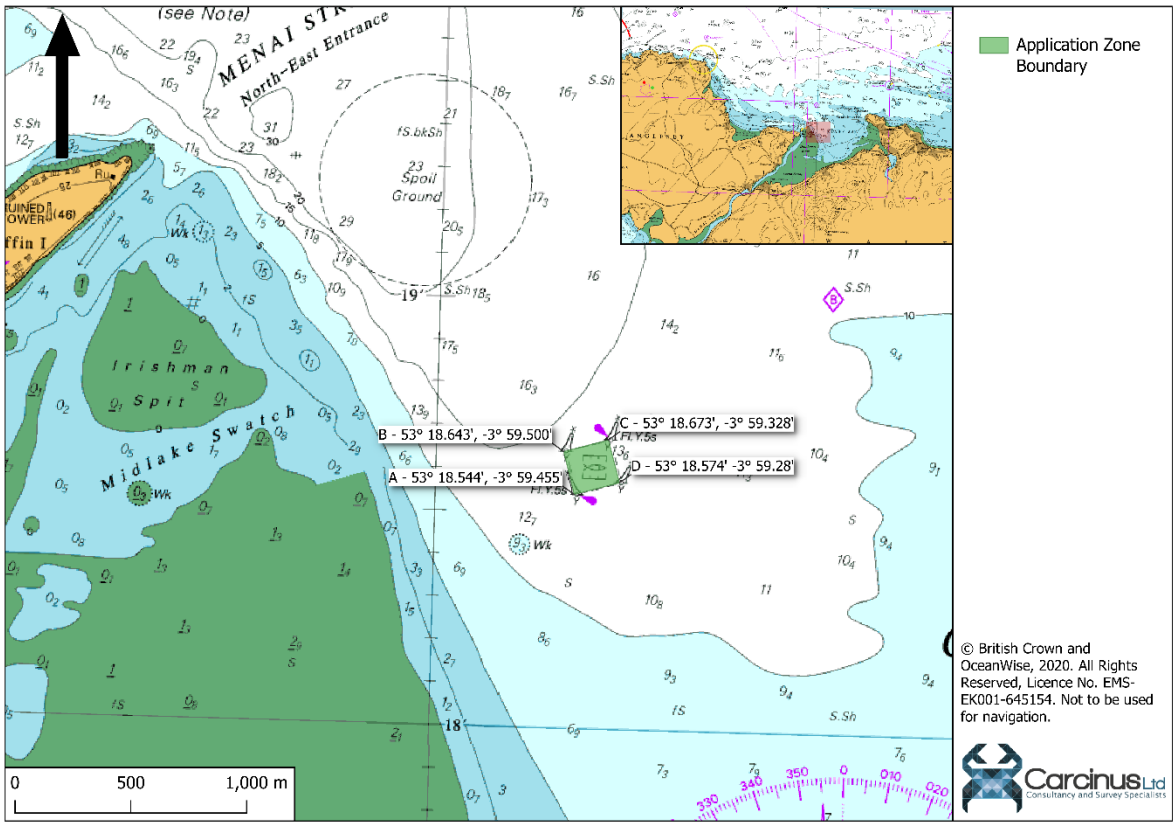

Figure 2.1: Application zone boundary.

3 Sources of Faecal Contamination

A sanitary survey desktop assessment has been conducted to identify potential sources of faecal contamination to the application area. Figure 3.1 presents the location of potentially significant sources of contamination identified as part of this study.

Active consented discharges have been identified through the interrogation of Natural Resources Wales (NRW) permit database[1] (October 2020).

In addition, the Menai Strait East (Cefas, 2013), Anglesey (Cefas, 2014a) and Conwy (Cefas, 2014b) sanitary survey reports have been reviewed and relevant information gathered as part of those studies herein to support this assessment. Those reports do not specifically assess the application zone but to characterise the wider region within which the application zone is situated.

[1] NRW permit data have not been validated and as such the accuracy of such information cannot be guaranteed.

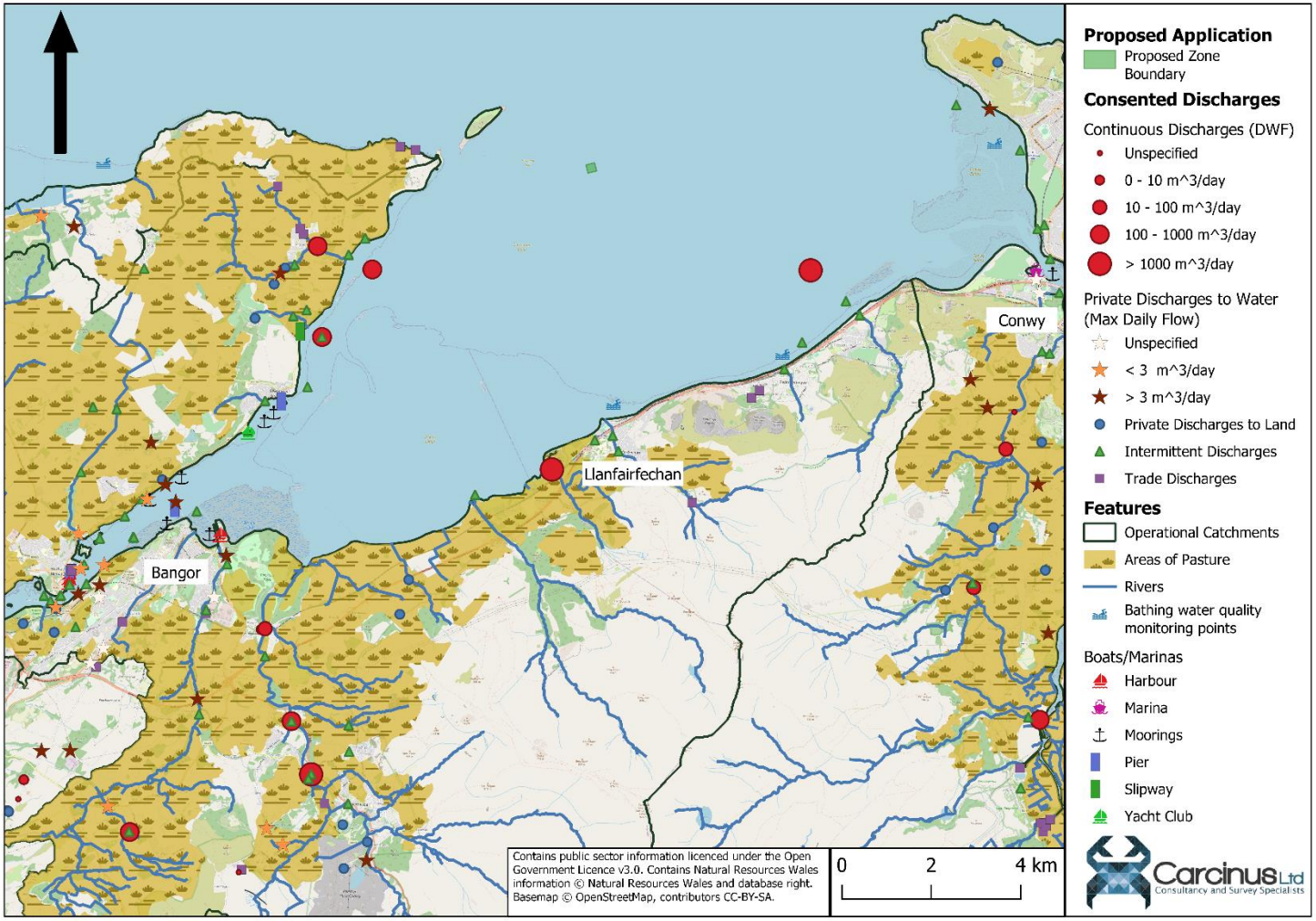

Figure 3.1: Potential sources of faecal and chemical contamination to the application zone.

3.1 Freshwater inputs

Freshwater inputs require consideration as part of the assessment, as they act to carry contamination resulting from runoff, urban diffuse and point source pollution and other rural diffuse sources. During the winter, increased rainfall is likely to result in increased levels of runoff and a subsequent increase in bacterial loading carried into coastal waters. Bacterial loading is typically highest during periods of heavy rain occurring following a dry period.

The application zone is located approximately 3.5 km east of the Isle of Anglesey and 6 km north of mainland Wales, where it faces out into the Irish Sea. There are several rivers that drain into the waters near the application zone, including the Rivers Lleiniog, Cadnant, Cegin, Ogwen, Aber, Ddu and Gyrach, as well as several unnamed streams. In addition, the River Conwy discharges to the east-south-east of the application zone, and will drain a significant portion of the catchment, including pollution sources from agriculture (Section 3.4), wildlife (Section 3.5) and any diffuse urban runoff. Given the distance that the application is situated offshore, any contamination carried in freshwater inputs will be dispersed over the wider area.

3.2 Sewage Discharges

3.2.1 Continuous Discharges

There are 45 permitted continuous discharges in the vicinity of the application zone. Details of all discharges are presented in Table 3.1, and the locations of those discharges near to the application zone are presented in Figure 3.1.

Table 3.1: Details of Continuous Discharges within the application zone.

Name	Dry Weather Flow (m3 / day)	Treatment Type	NGR (OSGB 1936, EPSG 27000)	Receiving Environment
BENLLECH WWTW (STW) LSO BENLLECH	1230	01: BIOLOGICAL FILTRATION	SH5379083630	COASTAL WATERS OFF BENLLECH, A
BETHESDA STW (FINAL) BETHESDA	1678.6	01: BIOLOGICAL FILTRATION	SH6125067520	RIVER OGWEN
BETWS Y COED WWTW	592.2	01: BIOLOGICAL FILTRATION	SH7954757003	RIVER LLUGWY
BETWS YN RHOS STW	135	01: BIOLOGICAL FILTRATION	SH9077573719	TRIB OF RIVER DULAS
BRYNSCIENCYN STW	665	01: BIOLOGICAL FILTRATION	SH4936066240	MENAI STRAIT
CAERNARFON STW	3352	01: BIOLOGICAL FILTRATION	SH4802061830	Afon Seiont
CAPEL GARMON STW	Unspecified	01: BIOLOGICAL FILTRATION	SH7997056770	CONWY
CRAIG DINAS STW	3.4	01: BIOLOGICAL FILTRATION	SH8021054430	CONWY
DOLGARROG/TALYBONT STW	477	01: BIOLOGICAL FILTRATION	SH7756068740	CONWY
DOLWYD STW	12.5	06: SEPTIC TANK	SH8170677804	groundwater via infiltration system

Name	Dry Weather Flow (m3 / day)	Treatment Type	NGR (OSGB 1936, EPSG 27000)	Receiving Environment
EGLWYSBACH STW	250	01: BIOLOGICAL FILTRATION	SH8012071020	AFON HIRAETHLYN
GAERWEN WWTW FINAL EFFLUENT	1188.78	01: BIOLOGICAL FILTRATION	SH4574372790	AFON CEFNI
GANOL WWTW (STW) GLAN CONWY CORNER	21686	22: UV DISINFECTION	SH8366083020	COASTAL WATERS OF PENRHYN BAY
GRAIG SEWAGE TREATMENT WORKS	10.08	29: PACKAGE TREATMENT PLANT	SH8024074220	TRIB OF NANT GARREG DDU
GROESFFORDD STW	Unspecified	01: BIOLOGICAL FILTRATION	SH7699075630	GYFFIN
HENRHYD STW	46	01: BIOLOGICAL FILTRATION	SH7680074800	HENRHYD
LLANDEGAI STW	8.2	01: BIOLOGICAL FILTRATION	SH6013070760	TRIB OF AFON OGWEN
LLANEILIAN YN RHOS STW	11	01: BIOLOGICAL FILTRATION	SH8697076390	NANT YSGUBOR NEWYDD
LLANFAES WWTW	702.5	01: BIOLOGICAL FILTRATION	SH6149477308	MENAI STRAIT
LLANFAGLAN WWTW FINAL EFFLUENT	1305.5	01: BIOLOGICAL FILTRATION	SH4662659370	GWYRFAI
LLANFAIR PG WWTW	957.8	01: BIOLOGICAL FILTRATION	SH5302470802	MENAI STRAIT
LLANFAIRFECHAN WWTW	1468	01: BIOLOGICAL FILTRATION	SH6663974343	MENAI STRAIT
LLANGAFFO STW	64	01: BIOLOGICAL FILTRATION	SH4469067710	TRIB OF RIVER BRAINT
LLANGOED STW ACCESS OFF B1509	475.3	01: BIOLOGICAL FILTRATION	SH6139779340	AFON BRENNIN
LLANGOED WWTW	457.3	01: BIOLOGICAL FILTRATION	SH6262078820	MENAI STRAIT
LLANRUG WWTW FINAL	897.6	01: BIOLOGICAL FILTRATION	SH5303364206	AFON RHYTHALLT
LLANRWST STW LLLANWRST CONWY	955	01: BIOLOGICAL FILTRATION	SH7945761794	THE AFON CONWY
MOUNTAIN VIEW STW	Unspecified	01: BIOLOGICAL FILTRATION	SH7997056770	CONWY
MYNYDD LLANDEGAI WTW	Unspecified	06: SEPTIC TANK	SH5963065330	Unnamed Watercourse
NEWBOROUGH STW	570	01: BIOLOGICAL FILTRATION	SH4370064140	ESTUARY OF AFON BRAINT
PENMAENMAWR WWTW PENMAENMAWR	2329.7	01: BIOLOGICAL FILTRATION	SH7243078800	COASTAL WATERS OF CONWY BAY

Name	Dry Weather Flow (m3 / day)	Treatment Type	NGR (OSGB 1936, EPSG 27000)	Receiving Environment
PENTRAETH STW	237	01: BIOLOGICAL FILTRATION	SH5239078800	NANT NODWYDD
PENTREFELIN STW	16.2	01: BIOLOGICAL FILTRATION	SH8032074860	NANT-Y-GARREG DDU
RHIWLAS STW	315	01: BIOLOGICAL FILTRATION	SH5719066230	CEGIN
RHYL (KINMEL BAY) WWTW KINMEL BAY	15941	01: BIOLOGICAL FILTRATION	SH9561083370	COASTAL WATERS - LIVERPOOL BAY
ROWEN STW	95.5	01: BIOLOGICAL FILTRATION	SH7608071700	ROE
SEION NO. 1 NEW STW	4.1	01: BIOLOGICAL FILTRATION	SH5482067400	TRIB. OF NANT Y GARTH
SEION NO.2 SEPTIC TANK/SOAKAWAY	Unspecified	06: SEPTIC TANK	SH5469666965	groundwater via infiltration system
Seion No2 STW	13.1	06: SEPTIC TANK	SH5414667311	Nant Cefn
TALYBONT STW	95	01: BIOLOGICAL FILTRATION	SH6022070780	AFON OGWEN
TREBORTH STW (FINAL) BANGOR	9106.7	22: UV DISINFECTION	SH5379070850	MENAI STRAIT
TREFRIW STW	234.6	01: BIOLOGICAL FILTRATION	SH7879063280	CONWY ESTUARY
TREGARTH	615.5	01: BIOLOGICAL FILTRATION	SH6081068710	OGWEN
TYN Y GROES STW	62.1	01: BIOLOGICAL FILTRATION	SH7852071210	CONWY ESTUARY

The four discharges most likely to contribute significant levels of bacterial contamination to the application area are Llangoed Wastewater Treatment Works (WWTW), Penmaenmawr WWTW, Llanfaes WWTW and Llanfairfechan WWTW, due to their proximity to the application area. All four discharges employ biological filtration and so pose a reduced risk in terms of *E. coli* contamination of shellfish. Given the relative proximity of these discharges to the application area, the contamination that they cause will have connectivity with the application zone and the location of the RMP should be such that contamination from this source is considered in determining its location.

3.2.2 Intermittent Discharges

Intermittent discharges, comprising Combined Storm Overflows (CSOs), storm tank overflows and pumping station emergency overflows have the potential to significantly affect local water quality and subsequently the management of shellfish hygiene within BMCZs. 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. Monthly classification sampling cannot normally reliably characterise the impacts from these spills as they occur sporadically and/or infrequently. Whilst some discharges are screened to remove sewage debris prior to discharge, such screening is unlikely to significantly reduce faecal bacterial loading. These

discharges therefore often spill raw/untreated effluent with high faecal coliform concentrations (7.2 x10^6 CFU/100 ml, Kay *et al.*, 2008).

There are a total of 159 intermittent discharges within the catchments that drain into the waters near the application area. Details of these discharges (including any treatment in place) are presented in Table 3.2, and the positions of those discharges closest to the application zone are presented in Figure 3.1.

Table 3.2: Details of intermittent discharges within the application zone.

Name	Receiving Environment	NGR (OSGB 1936, EPSG 27000)	Treatment (if applicable)
92 PENRHYN ISAF CSO	U. WCOURSE TO PENRHYN BAY	SH8246781405	99: NONE
ABERGWYNGREGYN PUMPING STATION	MENAI STRAIT	SH6492073780	11: SCREENING
ANGLESEY ARMS PUMPING STATION	ESTUARY - AFON SIONT	SH4765062680	11: SCREENING
BALACLAVA ROAD SEWAGE PUMPING ST	MENAI STRAITS	SH4780563232	11: SCREENING
BEACH ROAD CSO BEACH RD COLWYN BAY	COLWYN BAY	SH8699078850	11: SCREENING
BEACH ROAD PS BANGOR ,	MENAI STRAIT	SH5869073410	11: SCREENING
BENLLECH WWTW (STW) LSO BENLLECH	COASTAL WATERS	SH5379083630	11: SCREENING
Berthglyd Combined Sewer Overflow	Unnamed tributary of the Afon Gele	SH9520877791	ZZ: Unspecified
BETHEL CSO BETHEL NEAR CAERNARFON	Afon Cadnant	SH5163065160	11: SCREENING
BETHEL SEWAGE TRANSFER PS	UNNAMED TRIB OF AFON CADNANT	SH5163365156	11: SCREENING
BETHEL SSO NO. 2	CADNANT	SH5221665539	99: NONE
BETHEL SSO NO. 3	CADNANT	SH5260065830	99: NONE
BETHESDA WWTW STORM	AFON OGWEN	SH6125467526	11: SCREENING
Betws y Coed Golf Club PS	River Conwy	SH7972356731	99: NONE
Betws y Coed WwTW Settled Storm	Afon Llugwy	SH7954356996	11: SCREENING
BETWS-YN-RHOS - STORM SEWAGE	TRIB OF AFON DULAS	SH9077673719	11: SCREENING
BETWS-YN-RHOS SEWAGE PS - EO	TRIB OF AFON DULAS	SH9077573718	11: SCREENING
Betwys Y Coed Muriau P.S.	Afon Conwy	SH7998856789	99: NONE
Bontnewydd CSO	River Gwyrfai	SH4810059900	99: NONE
Bontnewydd CSO Ysgol Gynradd Bontne	AFON GWYRFAI	SH4809459914	11: SCREENING
BRYN AFON CSO	AFON NANT-Y-GORON	SH8083360927	11: SCREENING
BRYNSCIENCYN PS , ,	MENAI STRAIT	SH4945066320	11: SCREENING
BRYNSCIENCYN STW	MENAI STRAIT	SH4936066240	11: SCREENING

Name	Receiving Environment	NGR (OSGB 1936, EPSG 27000)	Treatment (if applicable)
CAERNARFON BANK QUAY PS	MENAI STRAITS	SH4771062981	11: SCREENING
CAERNARFON MARGARET STREET SSO	Unnamed Watercourse	SH4843362860	11: SCREENING
CAERNARFON PONT SEIONT PS	SEIONT	SH4830061700	11: SCREENING
CAERNARFON WWTW INLET PUMP ST 6MM	Afon Seiont	SH4801061891	11: SCREENING
Caernarfon WWTW Inlet Pump ST 6mm SPS	Afon Seiont	SH4801161882	11: SCREENING
CAERNARFON WWTW STORM TANKS	Afon Seiont	SH4803461826	11: SCREENING
CHURCH RD PS CHURCH RD RHOS ON SEA	PENRHYN BAY	SH8378081480	11: SCREENING
COLEG NORMAL SEWAGE PUMPING STATION	MENAI STRAIT	SH5621971784	11: SCREENING
CONWY ROAD STORM PS	AFON WYDDEN	SH7958077900	11: SCREENING
CROSSVILLE CSO	MENAI STRAITS	SH4780563232	11: SCREENING
CSO AT BETTWYS YN RHOS SPORTS GROUND	TRIBUTARY OF AFON DULAS	SH9067073750	11: SCREENING
CSO at Bontnewydd Glanrafon No10	River Gwyrfai	SH4802760037	99: NONE
CSO at Rowen STW	Afon Roe	SH7605971798	99: NONE
CSO NEAR PS NO 2 TREFRIW	Afon Conwy	SH7802064490	99: NONE
CYNLAI PS LLANGOED ANGLESEY	COASTAL WATERS	SH6246079520	11: SCREENING
DALE ROAD STORM SPS LLANDUDNO	Conwy Bay	SH7712181487	11: SCREENING
DEGANWY BEACH SPS	Unnamed ditch	SH7766079820	11: SCREENING
DEGANWY PS MARINE CRESCENT DEGANWY	AFON CONWY (ESTUARIAL)	SH7779079060	11: SCREENING
DEGANWY ROAD DEGANWY	CONWY ESTUARY	SH7751079730	11: SCREENING
Dolgarreg Tan Y Fford SPS	River Conwy	SH7713467209	99: NONE
Dolgarrog CSO No. 2	Afon Dulyn	SH7730268801	11: SCREENING
DWYRAN BY SCHOOL - SSO	BRAINT	SH4435065320	11: SCREENING
DWYRAN RHYDWYN - SSO	BRAINT	SH4443765048	11: SCREENING
EGLWYSBACH STW	AFON HIRAETHLYN	SH8012071020	99: NONE
EITHINOG PS NO 1 PENRHOSGARNEDD BA	UNNAMED TRIBUTARY OF AFON MENA	SH5598070820	11: SCREENING
FELINHELI PS (ADJ TO QUAY TOILETS)	MENAI STRAIT	SH5243067800	11: SCREENING
FELINHELI PS (OPP SEA CADET CORPS)	MENAI STRAIT	SH5206067240	11: SCREENING
FELINHELI PS (QUAY COTTAGE) , ,	MENAI STRAIT	SH5232067580	11: SCREENING
FRON OGWEN PS	OGWEN	SH6119067420	11: SCREENING

Name	Receiving Environment	NGR (OSGB 1936, EPSG 27000)	Treatment (if applicable)
FRYARS BAY P.S- SCREENED EMERG	Unnamed ditch	SH6115077910	11: SCREENING
Gaerwen Station SPS	A tributary of the Braint	SH4850170738	11: SCREENING
Gaerwen WWTW Settled Storm	AFON CEFNI	SH4574372790	11: SCREENING
GANOL STW PS GLAN CONWY CORNER	AFON GANOL	SH8062077320	22: UV DISINFECTION
GANOL WWTW (STW) GLAN CONWY CORNER	COASTAL WATERS OF PENRHYN BAY	SH8057577210	22: UV DISINFECTION
GLAENTRAETH ESTATE PS BANGOR ,	Afon Cegin	SH5937072230	11: SCREENING
GLAN CONWY SPS	CONWY ESTUARY	SH8012076140	11: SCREENING
GLAN Y MOR PUMPING STATION	NANT GARREG DDU	SH7992675625	11: SCREENING
GLANWYDDAN PUMPING STATION	AFON WYDDEN	SH8197780634	11: SCREENING
GLASINFRYN SPS CSO	Cfgin	SH5874068869	99: NONE
GLYN GARTH PS LLANDEGFAN	ESTUARY - MENAI STRAIT	SH5747073680	11: SCREENING
Gorad Road SPS	MENAI STRAIT	SH5727072840	11: SCREENING
Gorsllwyd Sewage Pumping Station	Afon Cadnant	SH5751478840	11: SCREENING
Gyffin PS Morfa Bach Conwy	Estuarial Waters of the Afon Conwy	SH7862177309	11: SCREENING
HENDRE ROAD SSO	GYFFIN	SH7761076985	11: SCREENING
IND ESTATE LLANDUDNO JUNCTION GLAN	Unnamed Watercourse	SH7979078520	11: SCREENING
LLANDDANIEL PONT Y CRUG SPS	AFON BRIANT	SH5040069900	11: SCREENING
LLANDDULAS PS LLANDULAS	LIVERPOOL BAY	SH9068078790	11: SCREENING
LLANDEGFAN (MENAI) PUMPING STATION	MENAI STRAIT	SH5652072800	11: SCREENING
LLANDUDNO JUNCTION GLAN Y MOR ROAD	CULVERT	SH7890078000	11: SCREENING
LLANDUDNO JUNCTION PS	AFON CONWY (ESTUARY)	SH7921077560	11: SCREENING
LLANDUDNO LLANRHOS SPS	Unnamed ditch	SH7910080100	11: SCREENING
LLANDULAS MILL ST CSO , ,	River Dulas	SH9092078180	99: NONE
LLANDYGAI IND ESTATE PS LLANDYGAI	TRIBUTARY OF AFON CEGIN.	SH5890071200	11: SCREENING
LLANFAES PS (EMERGENCY) , ,	Unnamed Watercourse	SH6085077780	11: SCREENING
LLANFAES WWTW STORM TANK	MENAI STRAIT	SH6149477308	11: SCREENING
Llanfaglan WwTW Settled Storm Overflow	The Afon Gwyrfai	SH4686459447	11: SCREENING

Name	Receiving Environment	NGR (OSGB 1936, EPSG 27000)	Treatment (if applicable)
LLANFAIR PG SPS	BRAINT	SH5100071800	11: SCREENING
Llanfair PG WwTW CSO	The Menai Strait	SH5299770834	11: SCREENING
LLANFAIRFECHAN - SSO	LLANFAIRFECHAN	SH6800075100	11: SCREENING
LLANFAIRFECHAN HOSPITAL SPS	CONWAY BAY	SH6760075000	11: SCREENING
LLANFAIRFECHAN SSO NO. 1	LLANFAIRFECHAN	SH6813074750	99: NONE
LLANFAIRPWLL SSO NO. 2	TRIB. OF BRAINT	SH5302470802	11: SCREENING
LLANGAFFO CAE BERLLAN SPS	Unnamed ditch	SH4420068425	99: NONE
Llangaffo STW CSO	UNNAMED STREAM	SH4468867713	99: NONE
LLANLLECHID SPS , ,	AFON Y LLAN	SH6209068620	11: SCREENING
Llanrug WwTW Settled Storm	Afon Seiont	SH5303364206	11: SCREENING
LLANSADWRN PS	Afon Cadnant	SH5637075741	99: NONE
LLANSADWRN PS	CADNANT	SH5690075700	11: SCREENING
Llanwrst CSO	a culverted tributary of the Afon Conwy	SH8009561501	11: SCREENING
LLEINIOG PS	MENAI STRAIT	SH6209079150	99: NONE
LLYN Y FELIN PS (EMERGENCY)	MENAI STRAIT	SH5526971524	11: SCREENING
LLYN Y FELIN PS (EMERGENCY) , ,	MENAI STRAIT	SH5542071400	11: SCREENING
LLYSFAEN	COASTAL WATERS - IRISH SEA	SH8970078500	99: NONE
MALLTRAETH VILLAGE CSO	CEFNI	SH4090368870	11: SCREENING
MALLTRAETH VILLAGE PUMPING STATION	EASTUARY - AFON CEFNI	SH4090468871	11: SCREENING
MARINE RD CSO MARINE RD COLWYN BAY	COLWYN BAY	SH8488079690	11: SCREENING
MARL DRIVE CSO LLANDUDNO JUNCTION	AFON WYDDEN	SH7973078270	11: SCREENING
Meirion Road PS (Storm/Emerg)	ESTUARIAL WATERS	SH5728272823	11: SCREENING
Mill Rd SPS	Afon Llugwy	SH7952757016	11: SCREENING
MIN-Y-NANT CSO	CADNANT	SH4885662742	11: SCREENING
MOELFRE PS MOELFRE	COASTAL WATERS	SH5139086220	11: SCREENING
MORFA PS MORFA DRIVE MORFA CONWY	CONWY ESTUARY	SH7800078300	11: SCREENING
MOUNT FIELD P.S. BEAUMARIS ,	MENAI STRAIT	SH6117076190	11: SCREENING
NEWBOROUGH MILLBANK SPS	Unnamed ditch	SH4190066100	11: SCREENING
NEWBOROUGH STW	AFON BRAINT (ESTUARY)	SH4370064140	99: NONE
Old Colwyn Beach Rd	Unnamed tributary of Colwyn Bay	SH8698878612	99: NONE
Old Colwyn Queens Road CSO	COLWYN BAY	SH8731478705	99: NONE

Name	Receiving Environment	NGR (OSGB 1936, EPSG 27000)	Treatment (if applicable)
PEBLIG INDUSTRIAL ESTATE CSO	Afon Seiont	SH4915761997	11: SCREENING
PENMAENMAWR PROMENADE PS	COASTAL WATERS	SH7224077190	11: SCREENING
PENMAENMAWR WWTW PENMAENMAWR	COASTAL WATERS OF CONWY BAY	SH7322078110	11: SCREENING
PENMAENMAWR WWTW PENMAENMAWR	GYRACH	SH7353077800	11: SCREENING
PENRHYN BAY LLANDUNDNO ROAD -	GANOL	SH8250080900	11: SCREENING
PENRHYN BAY PS MORFA RD PENRHYN BAY	PENRHYN BAY	SH8287081760	11: SCREENING
PENRHYN HILL PENRHYN BAY	COASTAL WATERS - PENRHYN BAY	SH8250081800	11: SCREENING
PENSARN SPS ABERGELE STORM	COASTAL WATERS	SH9520079300	11: SCREENING
PENTRAETH STW	AFON NODWYDD	SH5239078820	11: SCREENING
PENTRAETH TAN Y GRAIG SPS	NODWYDD	SH5330079300	11: SCREENING
PONT LLANDEGFAN SEWAGE PUMPING STAT	CADNANT	SH5609874287	11: SCREENING
PONT Y BRENIN PS	Y BRENIN	SH6088078930	11: SCREENING
PS NO 1 (FAELOG CAUSEWAY) (EMERGENC	MENAI STRAIT	SH5617072214	11: SCREENING
PS NO 2 (PORTH WRACH) (EMERGENCY)	MENAI STRAIT	SH5584071760	11: SCREENING
PS NO 2 (PORTH WRACH) (EMERGENCY)	MENAI STRAIT	SH5584771766	11: SCREENING
PS NO 3 (SUSPENSION BRIDGE) (EMERGE	MENAI STRAIT	SH5563071520	11: SCREENING
PS NO 3 (SUSPENSION BRIDGE) (EMERGE	MENAI STRAIT	SH5564871526	11: SCREENING
PS OFF LLANELION ROAD COLWYN BAY	NANT Y FFYNNON	SH8693077780	11: SCREENING
QUAY PS CONWY QUAY CONWY	Afon Conwy	SH7824077780	11: SCREENING
RACHUB MAES BLEDDYN CSO	RIVER OGWEN	SH6210068029	99: NONE
RHIANFA PS LLANDEGFAN	ESTUARY - MENAI STRAIT	SH5708073300	11: SCREENING
RHIWLAS STW	Afon Cegin	SH5717566242	11: SCREENING
Rhyd Y Foel PS	AFON DULAS	SH9095976629	99: NONE
RHYL (KINMEL BAY) WWTW KINMEL BAY	COASTAL WATERS - LIVERPOOL BAY	SH9561083370	11: SCREENING
Rock Terrace CSO Bethesda	AFON OGWEN	SH6207666865	11: SCREENING
Settled Storm Storage at Llanrwst STW Llanwrst Conwy	Afon Conwy	SH7947761781	11: SCREENING

Name	Receiving Environment	NGR (OSGB 1936, EPSG 27000)	Treatment (if applicable)
SPS at Llanrwst STW Llanrwst Conwy	Afon Conwy	SH7947761781	11: SCREENING
SPS at Trefriw STW	River Crafnant	SH7878163272	99: NONE
SPS SERVING FORMER HOTPOINT SITE	JACKSONS STREAM	SH8023577615	11: SCREENING
SSO AT MILL LANE CAERNARFON	CADNANT - CAERNARFON	SH4799162715	11: SCREENING
ST. AGNES ROAD CSO	GYFFIN	SH7778176941	11: SCREENING
STATION ROAD CSO	COASTAL WATERS VIA SW CULVERT	SH7184276591	11: SCREENING
TALYBONT STW	AFON OGWEN	SH6021870166	11: SCREENING
Tan Y Fford CSO	River Conwy	SH7713467209	11: SCREENING
TRAETH BYCHAN PS TRAETH BYCHAN ANG	Unnamed Watercourse	SH5133085040	11: SCREENING
TREBORTH STW (FINAL) BANGOR	MENAI STRAIT	SH5379070850	11: SCREENING
Treborth WwTW (Settled Storm)	The Menai Strait	SH5379870860	ZZ: Unspecified
TREFRIW STW	GRAFNANT	SH7879063280	11: SCREENING
TREGARTH WWTW PUMPING STATION EO	AFON OGWEN	SH6081168713	01: BIOLOGICAL FILTRATION
TREGARTH WWTW STORM TANKS	OGWEN	SH6081168712	11: SCREENING
Tyn Y Groes STW - Storm Overflow	Afon Conwy	SH7840171424	ZZ: Unspecified
TYWYN PS	AFON CONWY (ESTUARY)	SH7849078540	11: SCREENING
WATERLOO PORT SEWAGE PUMPING ST	ESTUARY - MENAI STRAIT	SH4863164109	11: SCREENING
Waterloo SPS	Afon Conwy	SH7974955979	99: NONE
WENDON CAR PARK PS BENLLECH , , ,	COASTAL WATERS	SH5256082800	11: SCREENING
WEST END PS BEAUMARIS ANGLESEY	ESTUARY - MENAI STRAIT	SH6022075880	11: SCREENING
WEST SHORE PS ABBEY ROAD LLANDUDNO	CONWY BAY	SH7569082500	11: SCREENING
WOODLANDS P.S WOODLANDS ESTATE MARL	AFON WYDDEN	SH7982079500	11: SCREENING

Several of the intermittent discharges spill out directly into Conwy Bay and the Menai Strait and may cause spikes in faecal contamination levels during a spill. Furthermore, tidal circulation will disperse any contamination over a wider area. Thus, the RMP for the application should be representative of these sources of contamination.

The closest discharges to the application zone are on the shore of the Isle of Anglesey near Beaumaris, these are Cynlai Pumping Station (PS), Lleiniog PS, Llanfaes WWTW Storm Tank and

Mount Field PS. All only employ primary screening, and the closest (Cynlai PS) is 5 km south west of the application zone.

3.2.3 Private Discharges

Whilst there are many private discharges throughout the catchment, however the closest to the application zone are ones in the Menai Strait (12 km south-west) and near Llandudno (9 km east). The placement of the RMP is not affected by these sources due to a lack of direct connectivity.

3.3 Boats and Marinas

There are no offshore moorings near the application zone, though there are several scattered moorings and harbours throughout the wider area. The Port of Penrhyn (NGR: SH 59170 72980) is the only commercial port in the area. This port handles a variety of cargo, including slate, sand, aggregates and scrap metal, as well as dealing with boat sales (Dickies Marine Services, 2020) and is able to accept vessels up to 150 m length. In addition to the commercial vessels, this port also has moorings for a further 125 recreational vessels. Two fishing vessels (one >10 m and one <10 m length) list Penryhn as their home port. A further 2 vessels >10 m and 15 <10 m list Conwy as their home port (MMO, 2020). There are two marinas for recreational vessels at the mouth of the River Conwy; Deganwy Marina which has 165 berths for vessels up to 7 m LOA (Deganwy Marina, 2020) and Conwy Marina which has 500 berths for vessels up to 15 m LOA (HarbourGuides.com, 2020). Both of these marinas have pump-out facilities (The Green Blue, 2020).

Merchant shipping vessels are prohibited from making overboard discharges within 3 nautical miles of land[2], meaning that no impact on the application zone is expected from vessels transiting to and from the Port of Penrhyn. 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. The fact that pump-out facilities are present at both marinas in the River Conwy mean that the magnitude of overboard discharges in the marinas themselves will be reduced. Any overboard discharges will therefore be concentrated at the moorings outside of the Conwy and Deganwy marinas, and in the navigation channels to and from the marinas in the Conwy and the Menai Strait.

Peak pleasure craft activity is anticipated during the summer and associated impacts are likely to be most significant during summer months. It is not possible to predict the precise timing and severity of any impacts on the shellfishery as a result of this source of contamination, through the diffuse nature of it, and the fact that the application zone is situated a minimum of 3.5 km offshore, means that it is unlikely to have a significant impact and does not need to be factored into the choice of RMP location.

3.4 Agricultural Sources

The main route through which diffuse sources of agricultural faecal contamination enters waterways (and subsequently BMCZs) is runoff during periods of wet weather. Faecal loading through this source is typically highest during winter months when rainfall and river flows are at their highest levels. However, high loadings are possible at any time of year during significant rainfall events, particularly following a period of prolonged dry weather.

A significant proportion of the land surrounding the application zone is reserved for pasture (Figure 3.1). The Menai Strait – East sanitary survey (Cefas, 2013) reported that more than 200,000 sheep

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

and 22,000 cattle are farmed in the catchments draining to this production area. Additionally, the Conwy sanitary survey (Cefas, 2014b) reported that a further 350,000 animals were farmed in the catchment of the River Conwy. As it is unlikely that land use within the catchment has not changed since the shoreline and sanitary surveys were conducted, contamination from agricultural sources therefore represents a potentially significant source of contamination to the application zone, particularly as many areas of pasture extend to the shoreline. Land runoff from the application of animal slurry to fields within the catchment will also contribute to faecal contaminant loads in the bay after rainfall. Peak contamination levels will likely occur following high rainfall events in summer months, especially when these events follow periods of extended dry weather. Land run-off from areas of pasture during high rainfall events will likely drain into watercourses in the area, many of which ultimately drain into the River Conwy. This represents a potential significant source of contamination and the RMP should take these sources into account. However, as the application zone is located between 3.5 and 6 km offshore (depending on which shoreline is considered), any contamination will be dispersed over the area, and is likely to affect the near-shore classification zones to a greater extent.

3.5 Wildlife

A wide variety of habitats can be found in the area surrounding the application zone, supporting a large diversity of wildlife. Consequently, the area is afforded protection under a variety of internationally and nationally designated sites, including part of the Menai Strait and Conwy Bay Special Area of Conservation (SAC), three Special Protection Areas (SPAs), several Sites of Special Scientific Interest (SSSI), National and Local Nature Reserves (NNR & LNR respectively).

Large numbers of nationally and internationally important species of overwintering birds are known to use the intertidal substrates in the vicinity of the application zone. The average five year count to 2018/2019 of overwintering waterbirds (wildfowl and waders) was 17,424 individuals on the Lavan Sands, approximately 8 km south-south-west of the application zone (Frost *et al.*, 2020). An average of a further 4,208 birds use the Conwy Estuary and Llanfairfechan to Conwy Bay areas (Frost *et al.*, 2020). Whilst it is unlikely that these bird species will defecate on the application zone, the bacterial loading could be carried to the application zone on ebbing tides (Section 5). The diffuse and spatially unpredictable nature of this contamination means that it is difficult to define an RMP that will effectively capture this influence.

In addition to wading birds, significant populations of seabirds (gulls & comorants) are present near the application zone. Puffin Island, 2.4 km north-west of the application zone, is home to approximately 5,900 breeding pairs of seabirds (Puffin Island Seabird Research, 2020). Seabird species include fulmars (*Fulmaris glacialis*), puffin (*Fratercula arctica*), guillemot (*Uria aalge*) and cormorant (*Phalacrocorax carbo*). Faecal inputs from these species are diffuse, given their wide foraging ranges, though concentrations are likely to be closest to their nesting sites on land. Contamination could be carried to the application zone, but without specific information as to the locations, timings and extents of contamination it is difficult to define an RMP that will effectively capture this source of contamination.

Large numbers of grey seals forage in the waters around the application zone, with a minimum of 2688 individuals documented between 1992 and 2016 (Langley *et al.*, 2020), with highest numbers around the application site occurring in winter months (Westcott & Stringell, 2004). The foraging behaviour and associated faecal pollution of seals around the application zone is spatially and

temporally unpredictable, and so it is difficult to define an RMP that will effectively capture the influence.

3.6 Other Sources of Contamination

Urban fabric within the catchments draining near the application zone is comprises four main areas: Bangor, south-west of the application zone in the Menai Strait; Llanfairfechan 6 km south of the application zone; Conwy and Llandudno east of the application zone at the mouth of the River Conwy; and Beaumaris, on the southern side of the Isle of Anglesey. All are situated at least 3 km from the application zone, but it may still be subject to a range of urban diffuse pollution sources as a result of these built-up areas. Dog fouling and utility misconnections within urban catchments are the primary source of contamination with faecal contamination being washed into surface water systems and ultimately into environmental receiving waters. Several of the main freshwater sources run through these urban areas, and thus the pathway for connectivity will most probably be through these watercourses. However, as the application zone is located a significant distance from these sources, any contamination will likely diffuse out over the wider area. The coastlines closest to the application zone are popular locations for dog walking, which is likely to represent a further source of diffuse contamination to the shellfishery, though like with several other sources of contamination to the area, will affect those classification zones nearer to shore to a greater extent.

4 Existing Classifications and Monitoring History

The application zone is in the vicinity three different BMPAs; Menai Strait – East, Conwy and Anglesey – Red Wharf Bay. The CZs within these BMPAS are as follows:

- Menai Strait – East
    - Area A classified for mussel (*Mytilus edulis*) (Class B). Currently classified using samples from Craig-y-Don (B055R) RMP (Figure 4.1). This RMP has been sampled since February 2015. No samples from this RMP have been above the threshold of 4,600 *E. coli*/100 g, and more than 80% of samples have fallen below the threshold of 230 *E. coli*/100 g required for Class A, however fewer than 10 samples have been collected in the last year and therefore the classification is provisional.
    - Area 1 classified for mussel (*Mytilus edulis*) (Class B- LT). This CZ is currently classified based on samples from West of Bangor Pier (B055S) RMP (Figure 4.2). This RMP has been sampled since February 2015, and since then all samples have fallen below the threshold of 4,600 *E. coli*/100 g required for Class B. A Long-Term Classification is awarded when a CZ shows stable compliance over a period of 5 years.
    - Areas 2 & B West classified for mussel (*Mytilus edulis*) (Class B). Currently classified using samples from Cegin Channel (B055T) RMP (Figure 4.3), which has been sampled since February 2015. Since sampling began, no samples have returned *E. coli* levels of greater than 4,600 *E. coli*/100 g, and 14.9% of samples have fallen below 230 *E. coli*/100 g (which is required for Class A). A provisional Class B classification has been awarded as fewer than 10 samples were returned in the last year.
    - Areas 3 & 4 classified for mussel (*Mytilus edulis*) (Class B). Currently classified using samples from Gallows Point (B055U) RMP (Figure 4.4). This RMP has been sampled since February 2015, and since then all samples have fallen below 4,600 *E. coli*/100 g, with 17% falling below the threshold of 230 *E. coli*/100 g required for Class A.

However, a provisional Class B classification has been awarded as fewer than 10 samples were returned in the last year.

- Areas 5 & B East classified for mussel (*Mytilus edulis*) (Class B-LT). Currently classified based on samples from Ogwen Channel (B055V) RMP (Figure 4.5). This RMP has been sampled since March 2015, and since then more than 90% of samples have fallen below the threshold of 4,600 *E. coli*/100 g required for Class B. A Long-Term Classification is awarded when a CZ shows stable compliance over a period of 5 years.
- Area 6 classified for mussel (*Mytilus edulis*) (Class B). This CZ is currently classified based on samples from Beaumaris East (B055W) RMP (Figure 4.6). This RMP has been sampled since February 2015, and since then all samples have fallen below the threshold of 4,600 *E. coli*/100 g required for Class B, however, the threshold of 80% of samples below 230 *E. coli*/100g required for Class A has not been met.
- Lavan East classified for cockle (*Cerastoderma edule*) (Class B). This CZ is currently classified based on samples from Lavan Sands East (B055X) RMP (Figure 4.7). Samples from this RMP have been collected since November 2014, and since then all samples have fallen below the threshold of 4,600 *E. coli*/100 g required for Class B, however, the threshold of 80% of samples below 230 *E. coli*/100g required for Class A has not been met.
- Lavan West classified for cockle (*Cerastoderma edule*) (Class B-LT). Currently classified based on samples from Lavan Sands West (B055Y) RMP (Figure 4.8). This RMP has been sampled since May 2015, and since then more than 90% of samples have fallen below the threshold of 4,600 *E. coli*/100 g required for Class B. A Long-Term Classification is awarded when a CZ shows stable compliance over a period of 5 years.

- Anglesey – Red Wharf Bay
  - All Beds classified for cockle (*Cerastoderma edule*) (Class B-LT). This CZ is classified based on samples from Nodwydd (B057J) RMP (Figure 4.9). Samples from this RMP have been collected from April 2017, and since then all samples have fallen below the threshold of 4,600 *E. coli*/100 g required for Class B. A Long-Term Classification is awarded when a CZ shows stable compliance over a period of 5 years.
- Conwy
  - Conwy Bridge classified for mussel (*Mytilus edulis*) (Class B-LT). Currently classified based on samples from Conwy Bridge (B044T) RMP (Figure 4.10), where sampling started in January 2017. Since then, samples have satisfied the condition of more than 90% of samples being less than 4,600 *E. coli*/100 g that is required for Class B. A Long-Term Classification is awarded when a CZ shows stable compliance over a period of 5 years.
  - Morfa, Gamlyws & Green Island classified for mussel (*Mytilus edulis*) (Class B-LT). Currently classified using samples from Conwy East (B044U) RMP (Figure 4.11), which has been sampled since January 2017. Since then, no samples have exceeded 4,600 *E. coli*/100 g required for Class B.
  - Cae Conwy & Scabs classified for mussel (*Mytilus edulis*) (Class B-LT). Currently sampled based on samples from Conwy West (B044V) RMP (Figure 4.12), where samples have been collected since January 2017. Since sampling began, samples

have satisfied the condition of more than 90% of samples being less than 4,600 *E. coli*/100 g that is required for Class B.

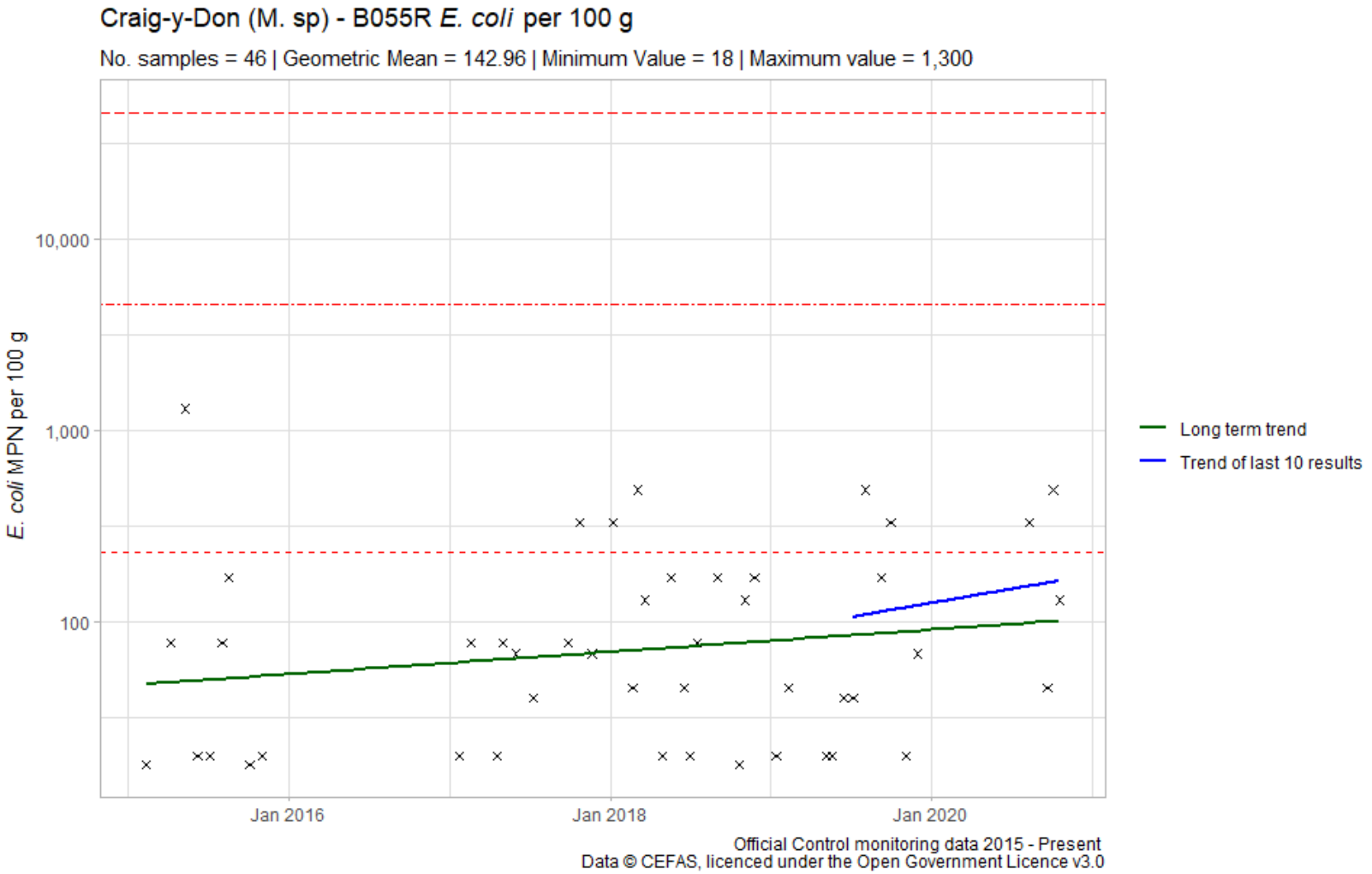

Figure 4.1: Monitoring history for Craig-y-Don (M. sp) – B055R. Horizontal lines indicate classification thresholds (<230 CFU/100 ml = A, <4600 CFU/100 ml = B & <46000 CFU / 100 ml = C).

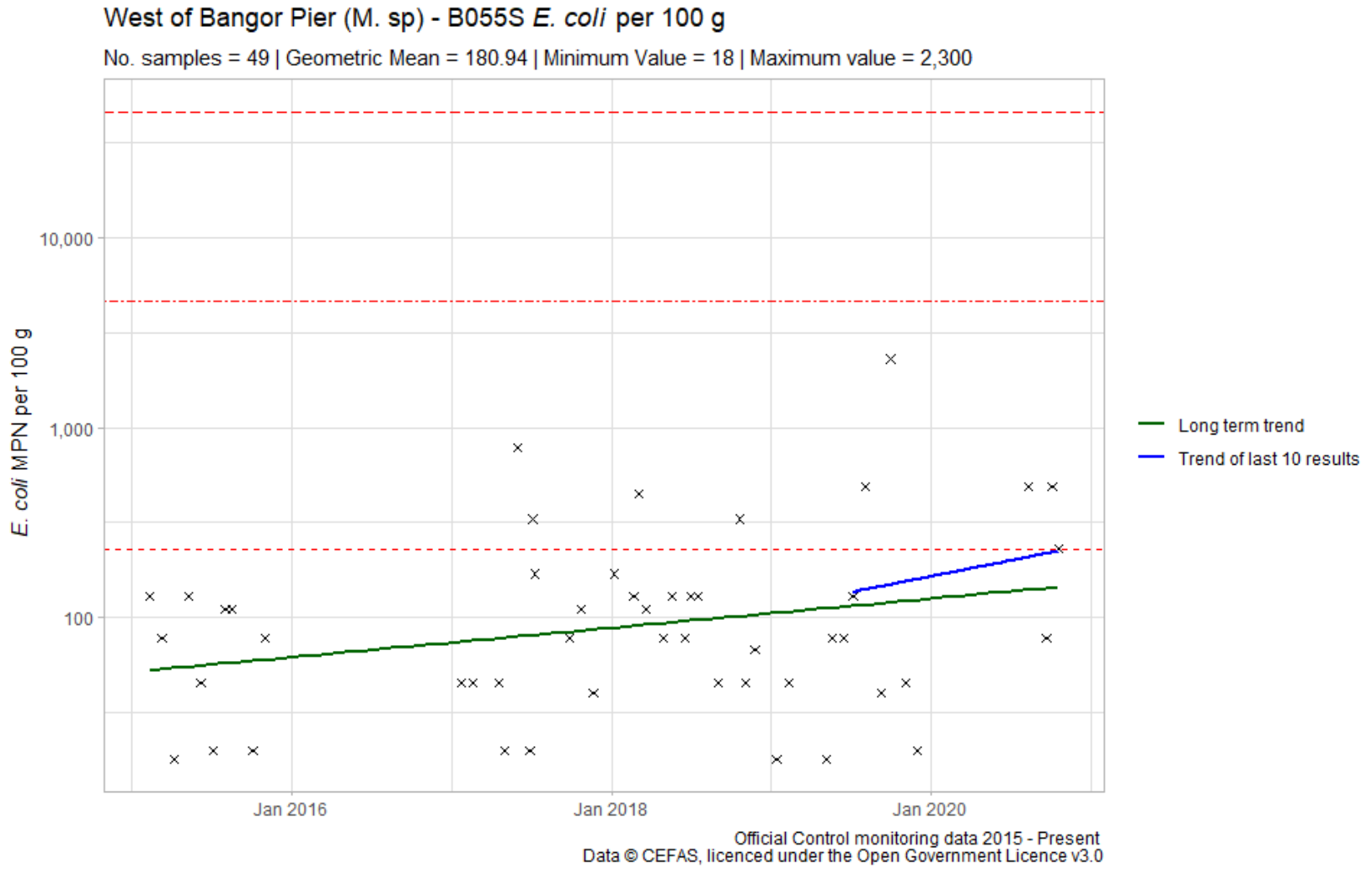

Figure 4.2: Monitoring history for West of Bangor Pier (M. sp) – B055S. Horizontal lines indicate classification thresholds (<230 CFU/100 ml = A, <4600 CFU/100 ml = B & <46000 CFU / 100 ml = C).

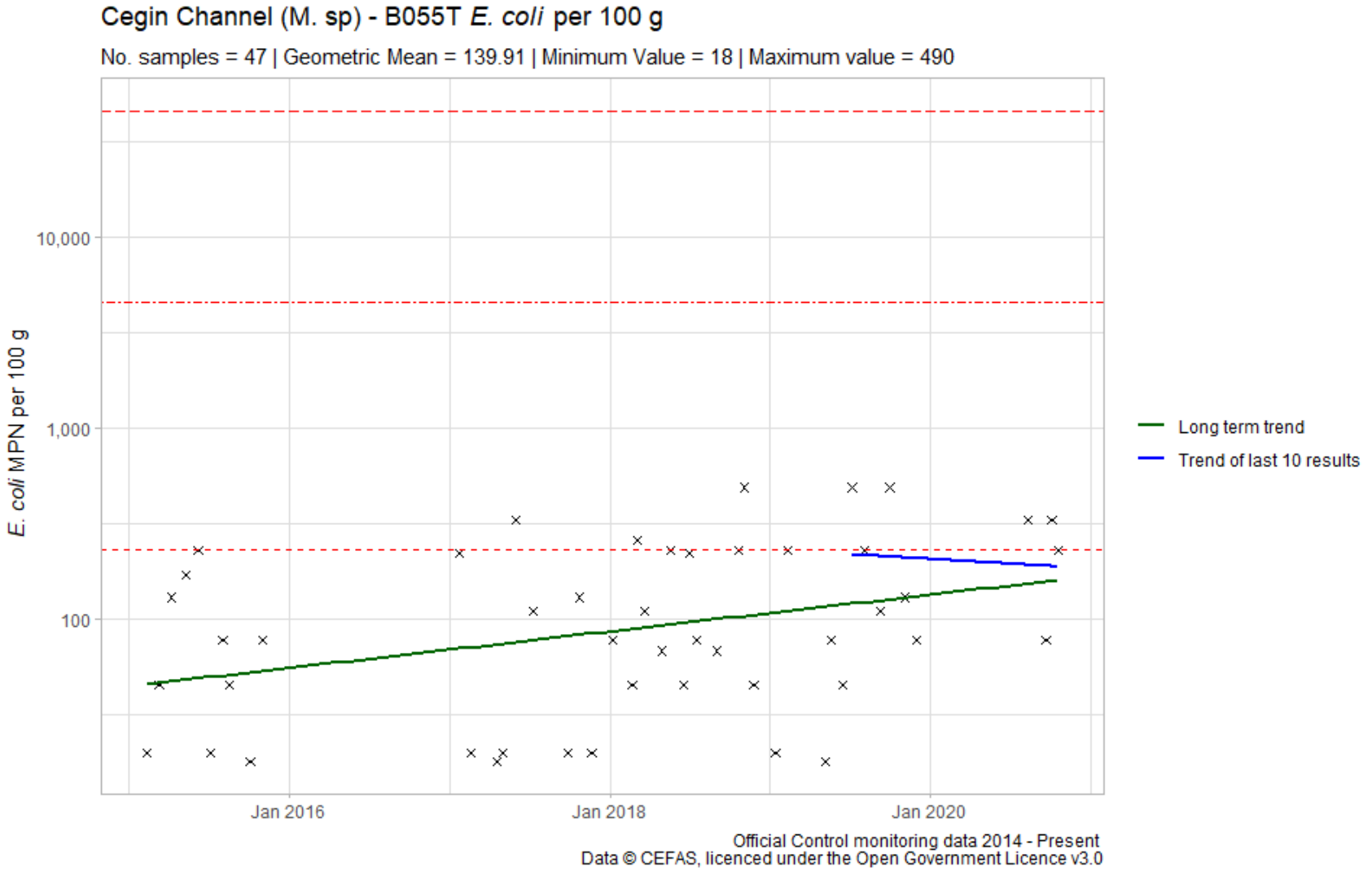

Figure 4.3: Monitoring history for Cegin Channel (M. sp) – B055T. Horizontal lines indicate classification thresholds (<230 CFU/100 ml = A, <4600 CFU/100 ml = B & <46000 CFU / 100 ml = C).

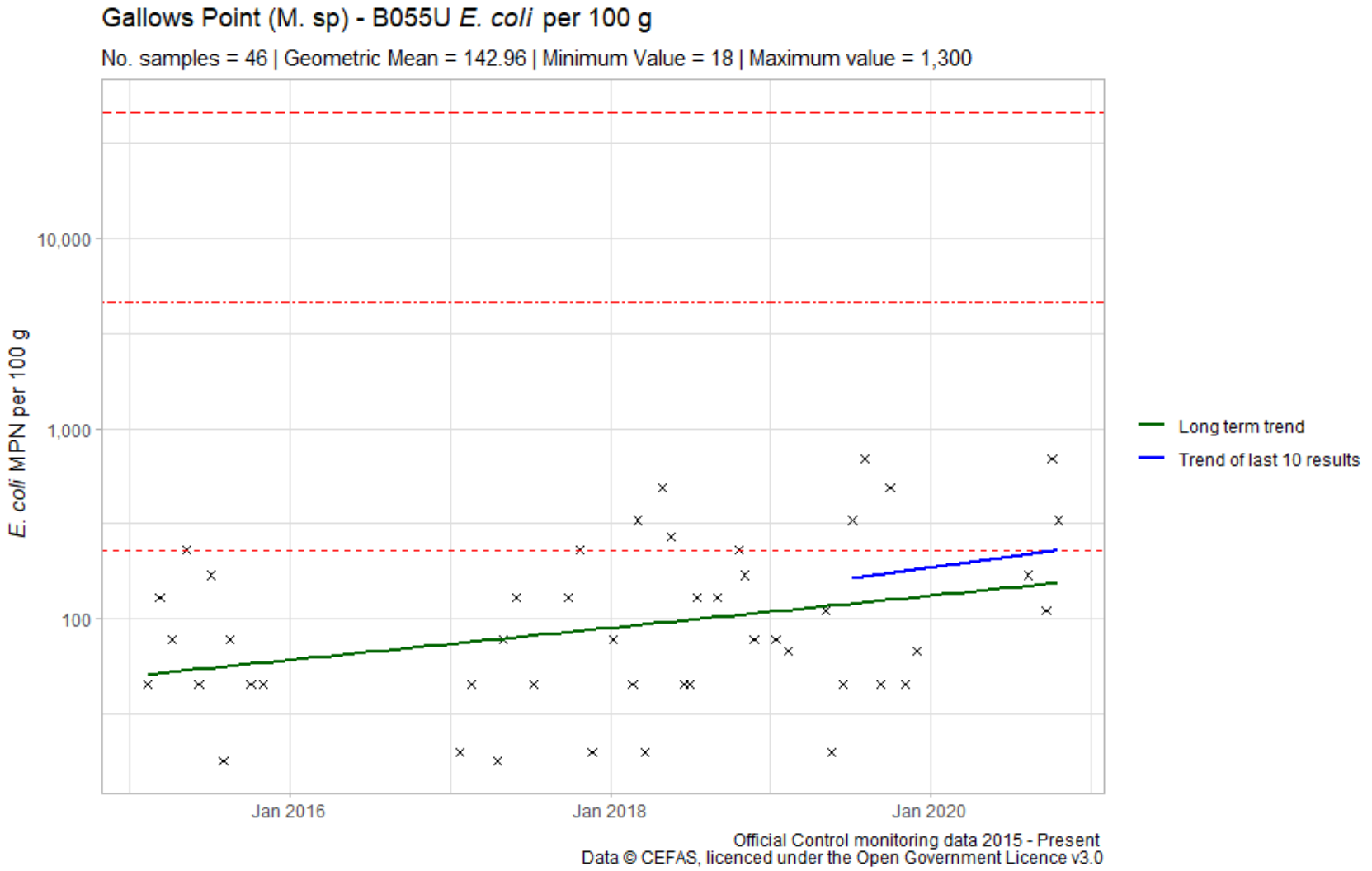

Figure 4.4: Monitoring history for Gallows Point (M. sp) – B055U. Horizontal lines indicate classification thresholds (<230 CFU/100 ml = A, <4600 CFU/100 ml = B & <46000 CFU / 100 ml = C).

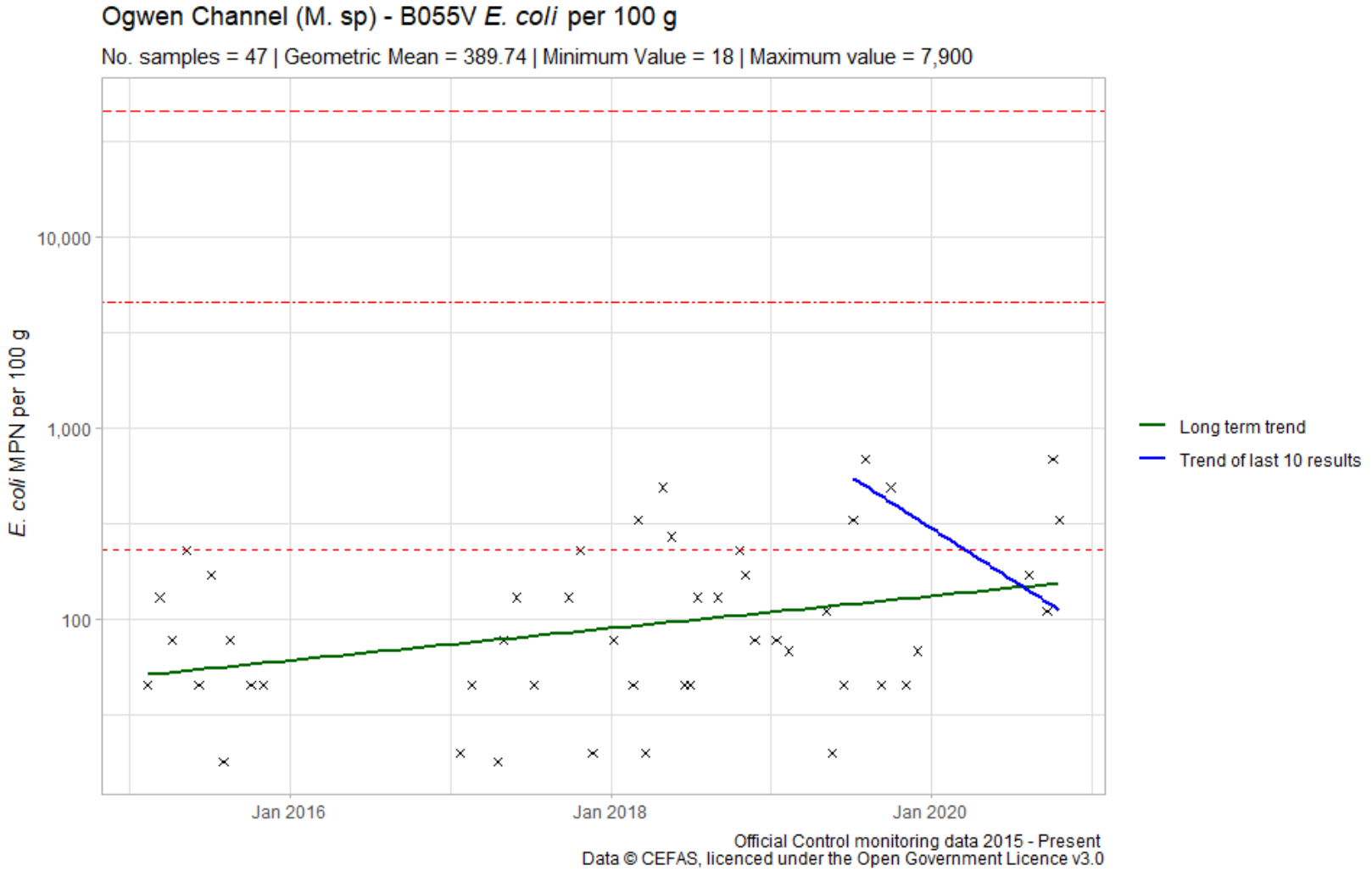

Figure 4.5: Monitoring history for Ogwen Channel (M. sp) – B055V. Horizontal lines indicate classification thresholds (<230 CFU/100 ml = A, <4600 CFU/100 ml = B & <46000 CFU / 100 ml = C).

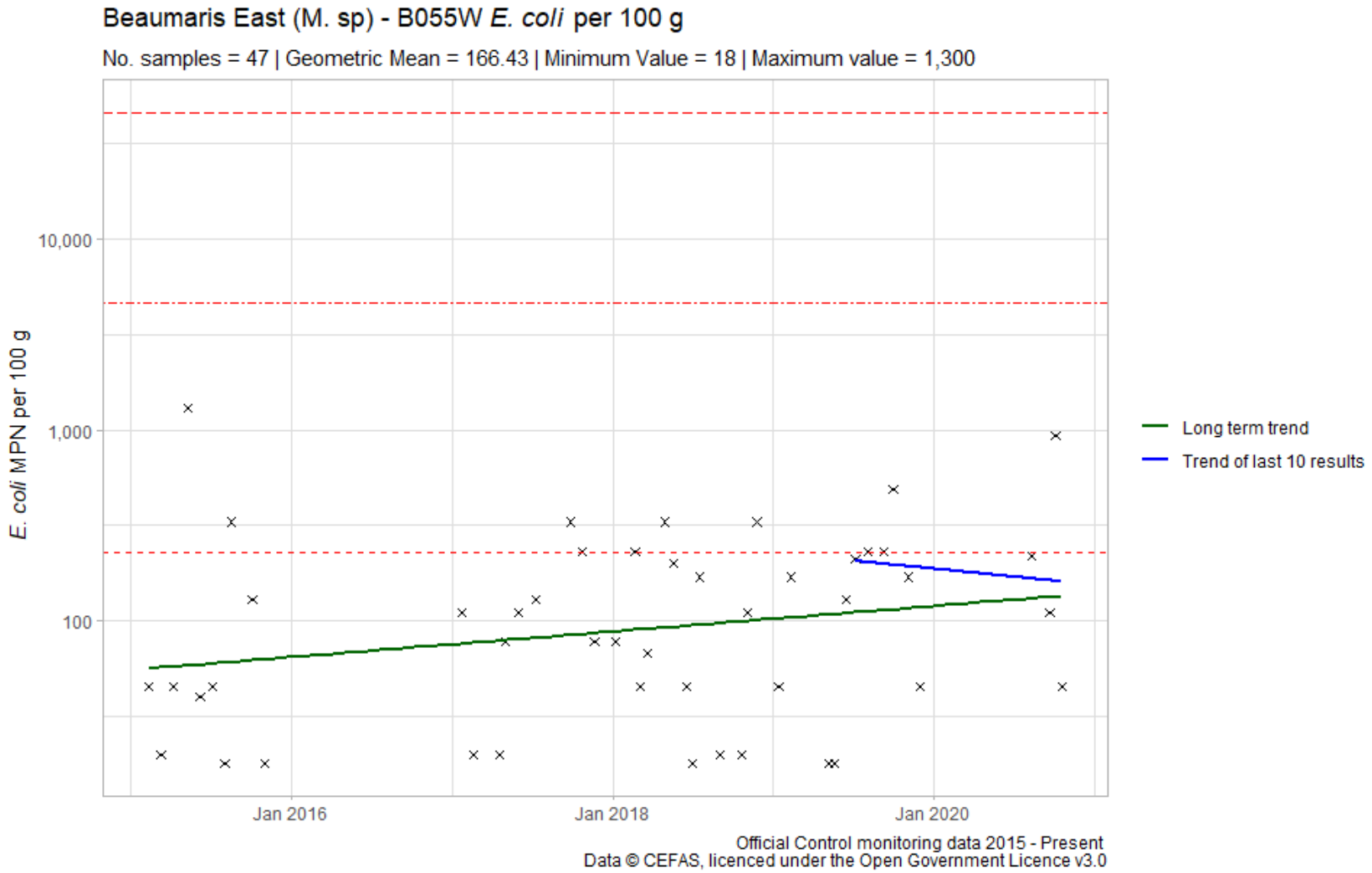

Figure 4.6: Monitoring history for Beaumaris East (M. sp) – B055W. Horizontal lines indicate classification thresholds (<230 CFU/100 ml = A, <4600 CFU/100 ml = B & <46000 CFU / 100 ml = C).

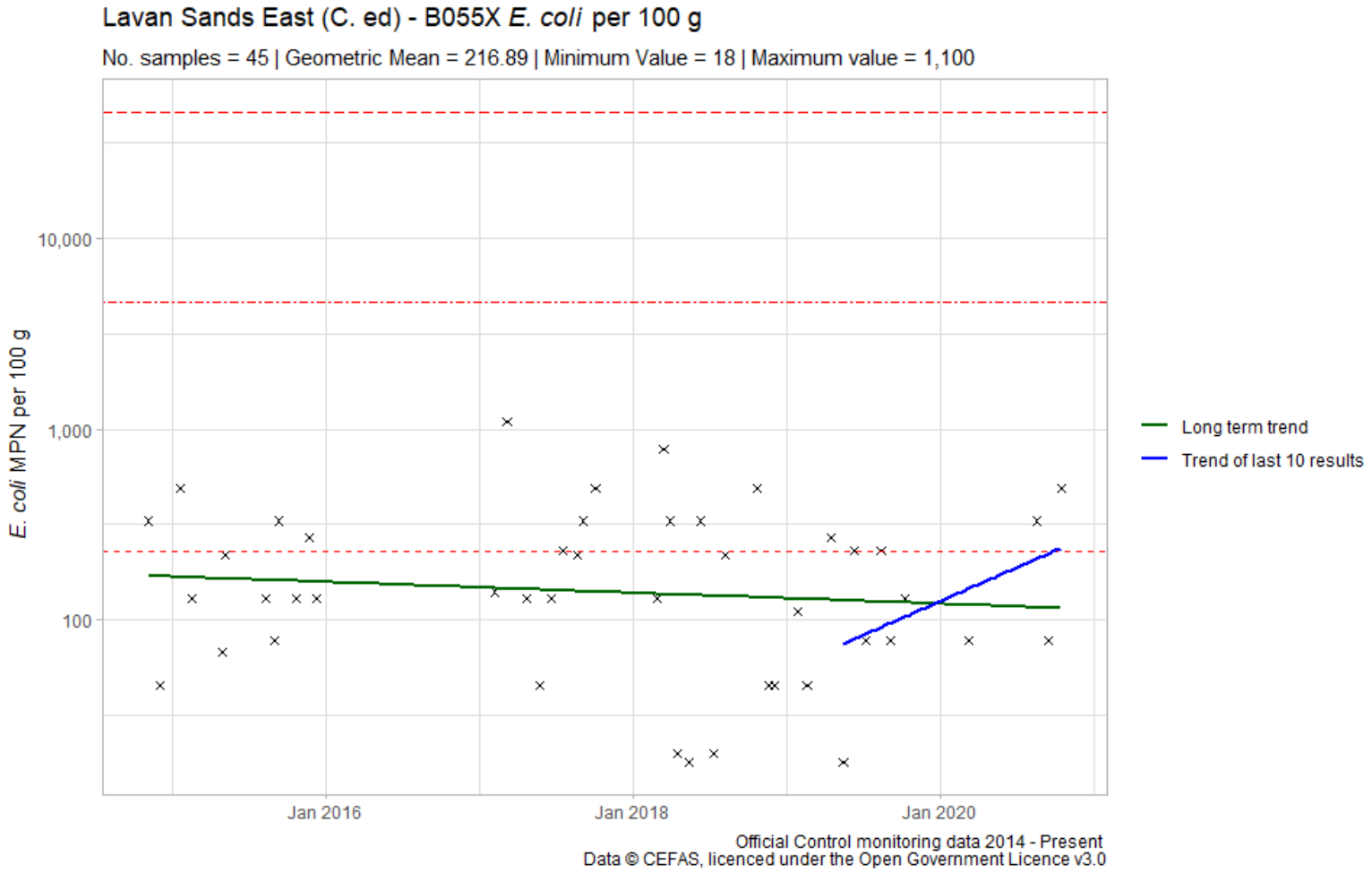

Figure 4.7: Monitoring history for Lavan Sands East (M. sp) – B055X. Horizontal lines indicate classification thresholds (<230 CFU/100 ml = A, <4600 CFU/100 ml = B & <46000 CFU / 100 ml = C).

Figure 4.8: Monitoring history for Lavan Sands West (C. ed) – B055Y . Horizontal lines indicate classification thresholds (<230 CFU/100 ml = A, <4600 CFU/100 ml = B & <46000 CFU / 100 ml = C).

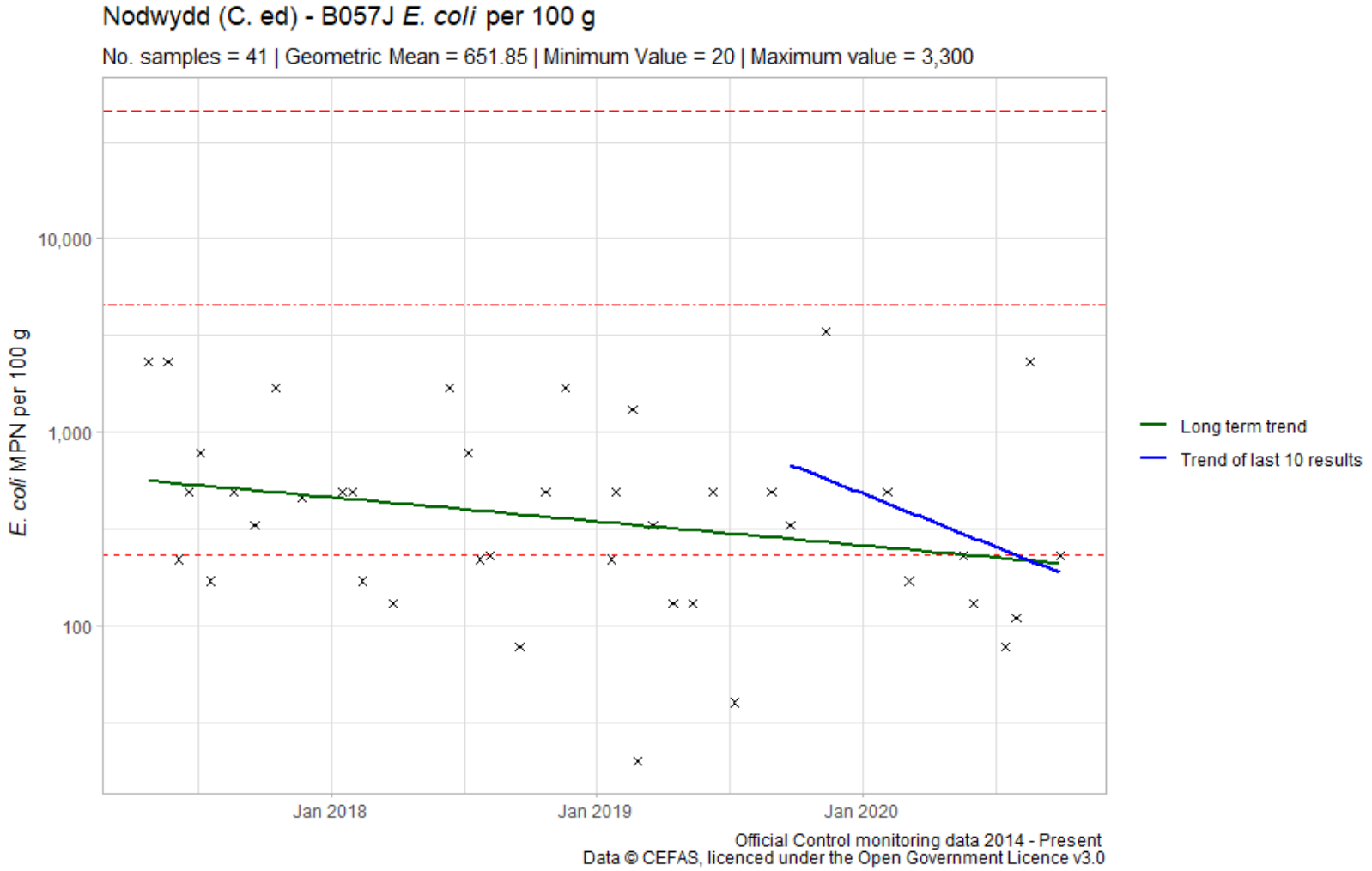

Figure 4.9: Monitoring history for Nodwydd (C. ed) – B057J. Horizontal lines indicate classification thresholds (<230 CFU/100 ml = A, <4600 CFU/100 ml = B & <46000 CFU / 100 ml = C).

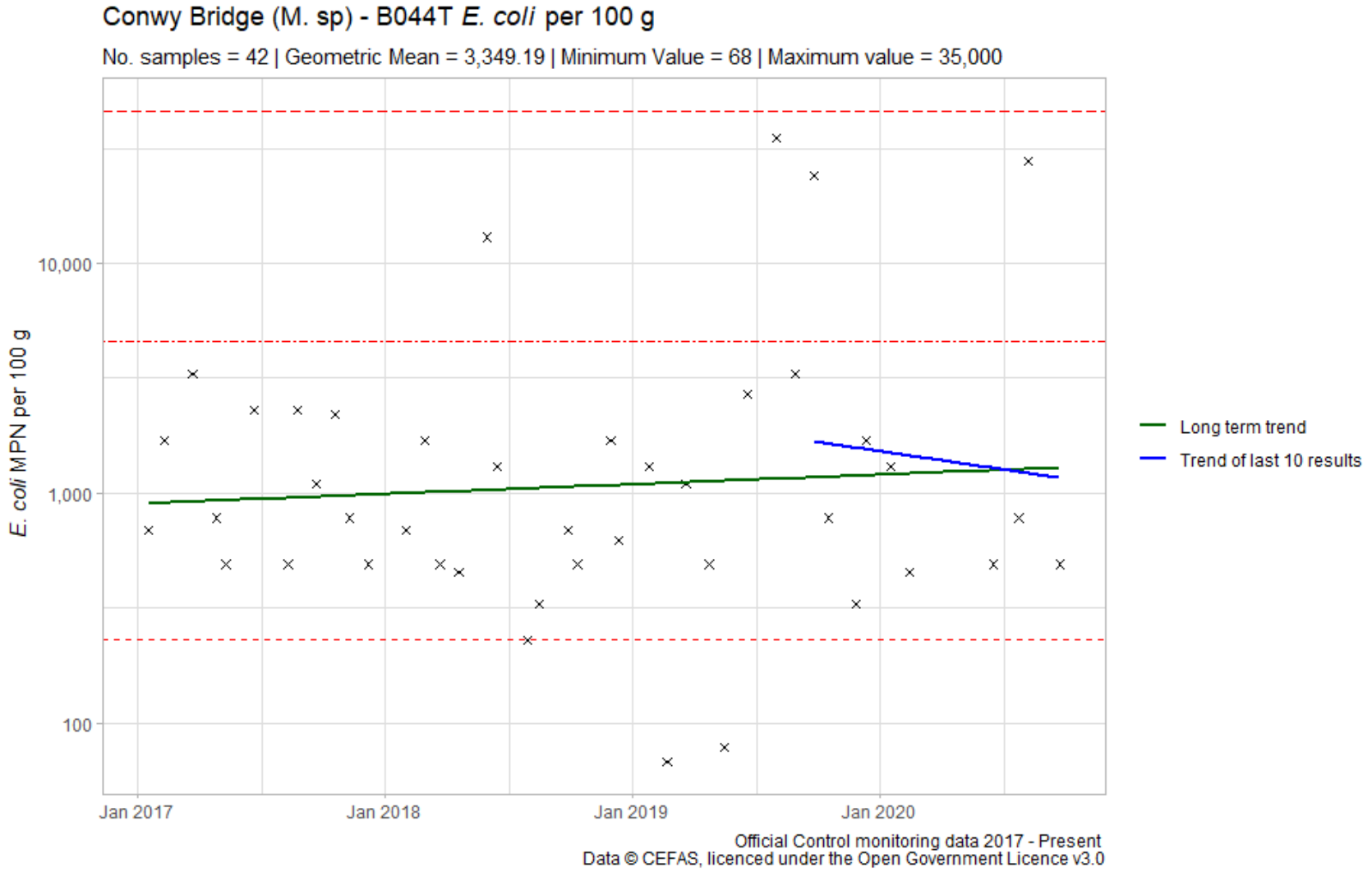

Figure 4.10: Monitoring history for Conwy Bridge – B044T. Horizontal lines indicate classification thresholds (<230 CFU/100 ml = A, <4600 CFU/100 ml = B & <46000 CFU / 100 ml = C).

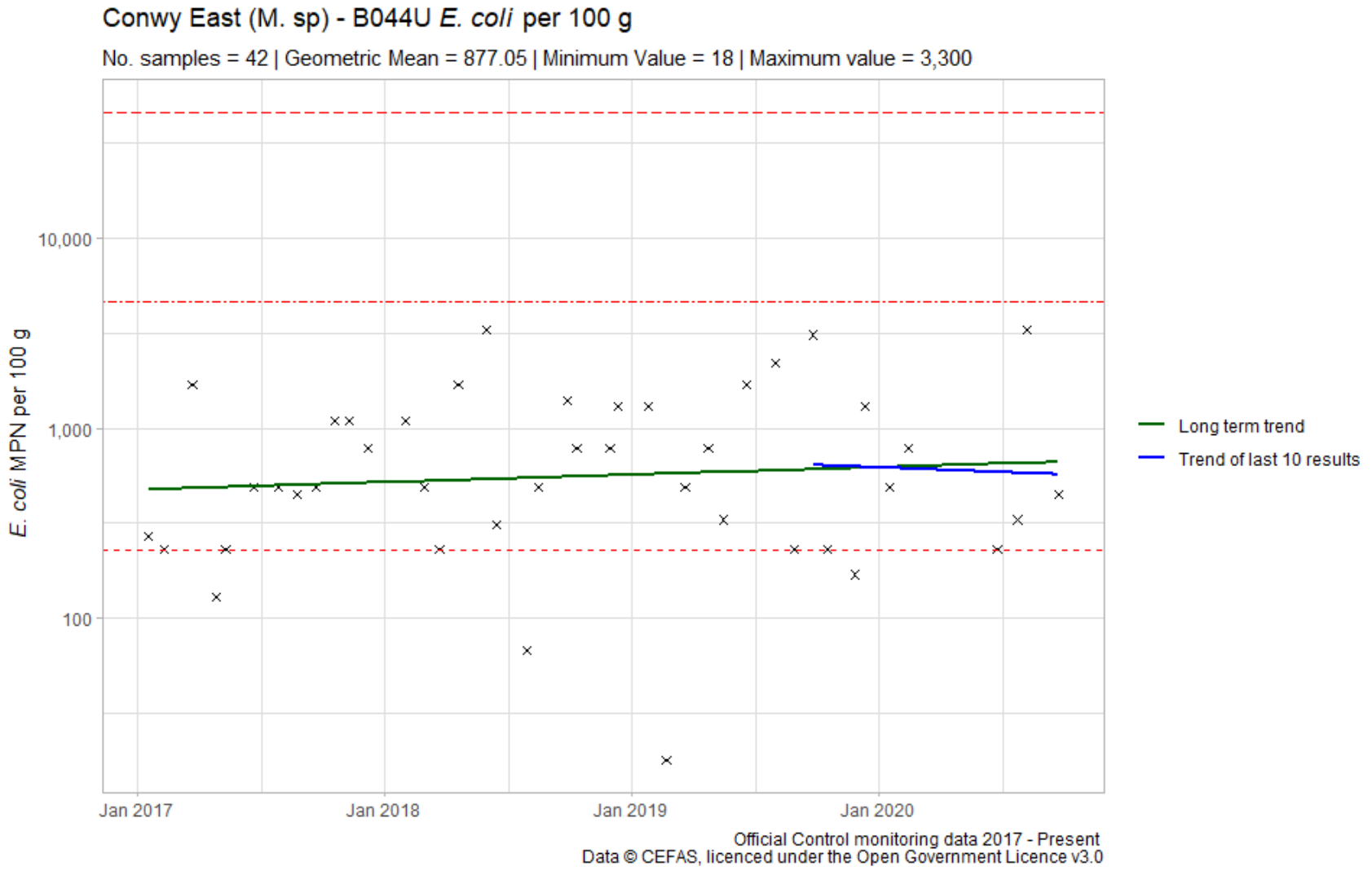

Figure 4.11: Monitoring history for Conwy East – B044U. Horizontal lines indicate classification thresholds (<230 CFU/100 ml = A, <4600 CFU/100 ml = B & <46000 CFU / 100 ml = C).

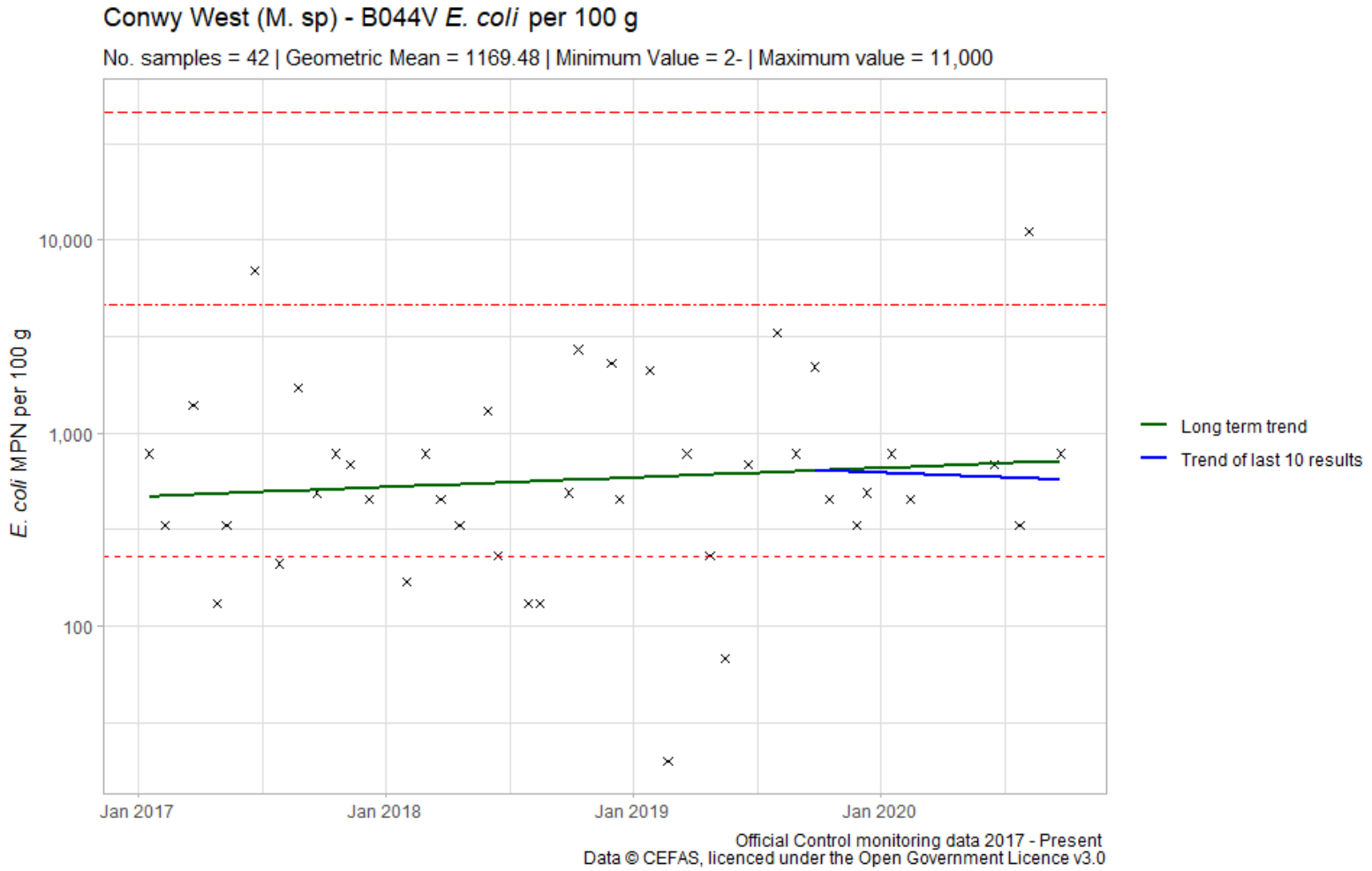

Figure 4.12: Monitoring history for Conwy West – B044V. Horizontal lines indicate classification thresholds (<230 CFU/100 ml = A, <4600 CFU/100 ml = B & <46000 CFU / 100 ml = C).

Whilst the application zone is located a significant distance offshore, the status of EC Bathing Waters nearby are still relevant to this assessment. There are several EC Bathing Water monitoring points in the vicinity of the application zone (Figure 3.1), all have consistently been classified as excellent, with low levels of faecal coliforms (including *E. coli*) recorded in samples collected for classification purposes under the EC Bathing Waters Directive (2006/7/EC).

It should be noted that Bathing Water sampling is focussed on water concentrations of *E. coli* and only occurs during the summer period (May to September inclusive) and therefore may not represent the potential for increased faecal loading during periods of increased rainfall during winter months. However, bathing water results do provide an indication of water quality in the area during the bathing water season.

5 Hydrodynamics/Water Circulation

The application zone is located approximately 3 km east of the south-east corner of the Isle of Anglesey, on the Irishman Spit. The Menai Strait, a large tidal channel approximately 30 km long and 500 m wide, sits 15 km south-west of the application zone. Tidal streams are likely the dominating force of water circulation under most conditions. Tidal streams within the vicinity of the application zone are best characterised by the following data:

- The most relevant tidal prediction location for the application zone is located at Trwyn Dinmor, Wales (53°19'00"N , 004°03'00"W, UKHO Total Tide (Trwyn Dinmor – 0476)). Tidal ranges for this location are as follows (all referenced to Chart Datum:
    - Mean Spring Range, 6.6 m; and
    - Mean Neap Range, 3.4 m.

Tidal patterns in the vicinity of the application zone are complex, but at the closest tidal diamond (SN048K – 053° 18.32' N, 004° 02.27'W), peak tidal currents flood at 2.0 kn on a heading of 196° (south-south-west) and ebb at 1.4 kn on a heading of 026° (north-north-east) during spring tides. The precise direction of tidal currents varies during the tidal cycle, but generally flows along a north-north-east/south-south-west axis Contamination from shoreline sources near the Menai straight will be carried eastwards on an ebbing tide, and similarly shoreline sources near the Conwy estuary will be carried in a north-westerly direction. All contamination will disperse over a wide area, before being carried to the application zone.

6 Other Considerations

The application zone falls within the boundaries of the Notice of Confirmed Designation for Anglesey Caernarfonshire for *Bonamia ostreae* under The Aquatic Animal Health (England and Wales) Regulations, 2009 (Cefas, 2016). Under this notice, the movement of bivalve mollusc species into, out of or within this area is prohibited, except for the purposes as defined under the notice, including that "the species… may be taken from the area for direct human consumption, and must not be re-immersed".

7 Recommendations for a RMP and Classification Zone

7.1 Provisional Classification Zone

The application zone to be used as a production area for mussels is delineated by coordinates as outlined in Table 2.1. These coordinates define an area 3 km east of the Isle of Anglesey in North Wales (see Figure 2.1 and Figure 3.1). It is recommended that the boundary of the classification zone remains the same as defined within the application.

7.2 Representative Monitoring Point (RMP)

The location of the RMP has been informed based on the identified contamination sources described within this assessment, likely connectivity with the provisional classification zone outlined above, seasonality of inputs and faecal contamination loadings.

Given the distance offshore that the application zone is located, there will be very little in the way of direct contamination from shoreline sources. There are some intermittent discharges located approximately 5 km south-west of the application zone, and several continuous discharges throughout the Menai Strait and Conwy Bay. In addition, there are several significant watercourses that drain into the bay, that will serve to carry contamination from land run-off from the extensive pastures within the catchment. However, any contamination will be diluted by the time ebbing tidal currents carry it to the application area. Given the relatively small size of the application zone, and the lack of direct contaminating influences acting upon it, the choices for RMP location are limited. It is our recommendation that the RMP be located in the middle of the zone with a small tolerance distance (Figure 7.1).

There is no evidence to determine if water column stratification occurs within the vicinity of the application zone. The sources of potential faecal contamination identified are of a freshwater nature and therefore would have a higher buoyancy than the marine receiving waters. It is therefore recommended that as a precautionary approach, sampling is undertaken from the shallowest depth within the water column where mussels are to be farmed. As such samples should be taken from the top of mussel line droppers or from a buoyed sample bag placed such as to represent this depth.

7.3 Classification Species

A report commissioned by the FSA (Cefas, 2014) to examine the suitability of other shellfish species as indicator species has been reviewed to determine the suitability of indicators for classification purposes. The recommendations for indicator species in relation to *E. coli* accumulation are generally limited by data availability and recommendations can only be made where sufficient data are available to compare *E. coli* accumulation and clearance in two or more species.

The application is for the harvesting of mussels (*Mytilus edulis*), and the acquisition of *M. edulis* for classification purposes via mechanical collection is not anticipated to be problematic as the proposed RMP location is situated within the proposed relay area. Therefore, the use of indicator species has not been considered.

7.3.1 Criteria for Sampling

The following criteria should be applied to sampling at the designated RMP:

- Each sample should comprise only individuals of harvestable / marketable size; and
- Sample collection of *M. edulis* to be undertaken by mechanical collection within a tolerance of 10 m from the RMP.

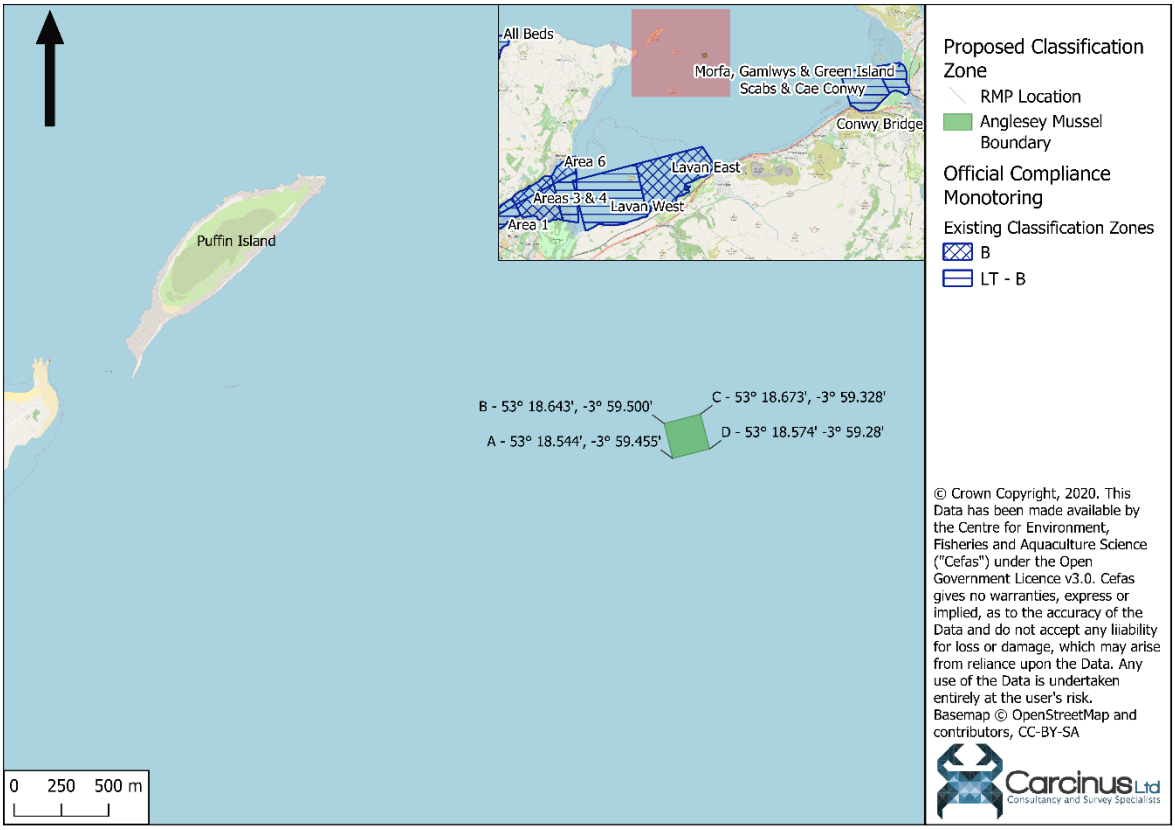

Figure 7.1: Location of RMP within application zone.

The RMP, sampling plan and provisional Classification Zone boundary are presented in Table 7.1.

Note - All coordinates in WGS1984, EPSG: 4326 are in dd.dddddd° format and those presented in OSGB 1936, EPSG:27700: are presented as Eastings and Northings (m).

Table 7.1: Provisional Sampling Plan

Production area	Menai Straight - East
Provisional Classification Zone	Anglesey Mussels
RMP name(s)	Anglesey Mussels (M. sp)
RMP	Latitude / Longitude (WGS 1984, EPSG:4326): 53.310146° , -3.9898557° Ordnance Survey National Grid (OSGB 1936, EPSG:27000) 267520E 381092N
Classification species	*M. edulis*
Sampling species	*M. edulis*
Sampling depth	Samples should be taken from the top of the mussel ropes, <1 m water depth
Collection method	Mechanical collection of ropes
Sampling tolerance	*M. edulis* are to be collected from within a tolerance of 10 m of the RMP
Sampling frequency	Monthly – year round
Provisional Classification Zone Boundaries	Delineated by lines between these points (WGS 1984, EPSG 4326): 53.309067° N, -3.990917° W

	53.310717° N , 3.991667° W 53.311267° N , 3.988889° W 53.309567° N, 3.988889° W Delineated by lines between these points (OSGB 1936 EPSG:27000): 267446 E, 380974 N 267401 E, 381159 N 267594 E, 381209 N 267642 E, 381024 N
Notes	None

8 Recommendations for a Shoreline Survey

The proposed classification zone is of a relatively small size (200 m x 190 m), which limits the placement of the RMP. Given the location of the application zone at least 3 km offshore, pollution from shoreline sources is likely to diffuse out and reduce in concentration before it reaches the application zone. There is a significant body of existing classification data for nearshore classification zones, and the water quality offshore is likely to be equal or better than the nearshore quality. Nearshore CZs have stable B or LT-B classifications, indicating a general stability in the area in terms of potential microbial contamination sources.

It is therefore our recommendation that in this case, further physical assessment of the zone to confirm existing sources of contamination or identify any unknown sources, in the form of a shoreline survey, is not considered of significant value. Physical assessment would provide limited additional information as no significant changes in bathymetry, land use or population via urban development were identified since the previous shoreline surveys of the surrounding areas in 2013 and 2014 (Cefas 2013; 2014a&b). Furthermore, as the application zone is located offshore, the impact of any additional nearshore contamination sources would not necessarily impact the proposed application zone. In view of the long term monitoring data available for the wider production areas, it is unlikely there are unknown additional potential sources of contamination that will influence the boundary of the zone or the placement of the RMP. The assessment has identified sufficient information to enable the placement of the RMP in a location representative of faecal contamination sources within the area. The assessment is further strengthened by classification monitoring data from the other classified zones nearby. The placement of the RMP is also limited due to the very small size of the classification zone within which the RMP can be located.

9 References

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About Carcinus Ltd

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