Sanitary Survey - Review

Lyme Bay - 2024

Document No. – J0591/22/12/14

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Cover image: Mussels on the ropes of the Lyme Bay Mussel Farm. © Joshua Baker, Carcinus Ltd.

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Document QA and Approval

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Initial Consultation

Consultee	Date of consultation
Torbay Council	September 2022
Mussel Farm Operators	September 2022
Environment Agency	September 2022
Devon and Severn Inshore Fisheries and Conservation Authority	September 2022

Consultation on draft report

Consultee	Date of consultation
Torbay Council	November 2023
Mussel Farm Operators	November 2023
Environment Agency	November 2023

A sanitary survey relevant to the bivalve mollusc areas in Lyme Bay was undertaken in 2015 in accordance with Regulation (EC) 854/2004 (which was replaced by assimilated regulation (EC) 2017/625, with sanitary survey requirements now specified in assimilated regulation (EC) 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, Torbay Council. The report is publicly available via the Carcinus Ltd. website.

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Carcinus Ltd., 2024 Review of the Lyme Bay 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 regulation (EC) 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 regulation (EC) 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 Lyme Bay Review

This report reviews information and makes recommendations for a revised sampling plan for existing mussel (*Mytilus* spp.) classification zones in Lyme Bay (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 Torbay Council (the Local Enforcement Authority) (LEA), Devon & Severn Inshore Fisheries and Conservation Authority (D&S IFCA) and the Environment Agency (EA) responsible for the production area was undertaken in September 2022. In addition, a consultation meeting between representatives from the FSA, Carcinus, the LA, the EA, and operators of the mussel farm took place in October 2022. A site visit of the mussel farm was also undertaken in November 2022. 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 Torbay Council (LA), industry and other Local Action Group (LAG) members was undertaken in November 2023. 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 2015 and the current sampling plan, as necessary. This report should be 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.

The area of study considered in detail within this report (Figure 1.1) extends from the Straight Point Ranges in Exmouth (on the western side of the area) to Chesil Beach (on the eastern side of the area). This includes the Operational Catchments (as defined by the EA) of the Sid, Otter, Lim, Axe and West Dorset Rivers. The study area does not include the full Exe or Teign Catchments. Contamination from the upper reaches of the Exe or Teign Catchments may have some influence on the bacteriological health of the Lyme Bay Bivalve Mollusc Production Area (BMPA), although much of this pollution will only contribute to background levels of contamination in Lyme Bay BMPA. Specific discharges from within the Exe estuary are described in this report where necessary, but the mouth of the Exe is considered a point source contributing the combined effects of all the contamination sources within that catchment. Similarly the mouth of the Teign can be considered a point source of contamination, contributing the combined effects of all contamination in that catchment. More detail of pollution sources within the Exe and Teign catchments can be found in the Sanitary Survey Reviews of those BMPAs (Carcinus, 2021; Carcinus Ltd., 2021). Similarly, pollution from the upper reaches of the Sid, Otter, Lim, Axe and West Dorset Rivers catchments will contribute to background levels of contamination discharged from the mouths of these rivers, each of which can be considered a point source. The pollution sources within these catchments have not however been subject to previous review (as there are no BMPAs within their estuaries) and so it is appropriate to consider them in more detail in this report.

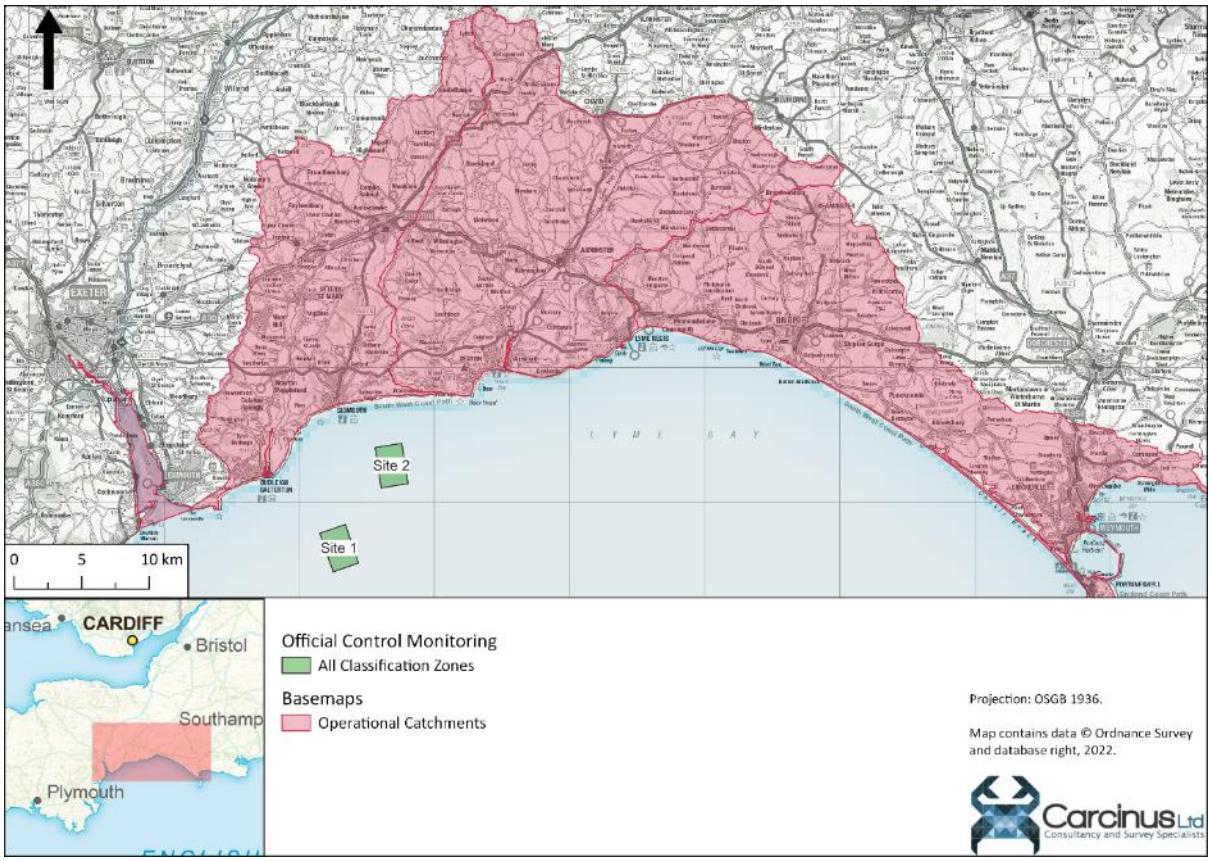


Figure 1.1 Location of Lyme Bay and associated catchments. Also shown are bivalve classification zones within the Lyme Bay BMPA.

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:

- The accuracy of local intelligence provided by the Local Authority and Environment Agency
- Publicly available information and data sources up to and including November 2022
- Only information that may impact on the microbial contamination was considered for this review; and
- Official Control monitoring data taken directly from the Cefas data hub[1], with no additional verification. Results up to and including November 2022 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/.

2 Shellfisheries

2.1 Description of Shellfishery

The Lyme Bay mussel fishery is a unique aquaculture production site in England and Wales in terms of its location, approximately 3 km offshore (Figure 1.1). The original sanitary survey specifies that Crown Estate leases have been granted for three discrete sites within Lyme Bay, Devon. To date, only two of these sites have been developed into active bivalve mollusc harvesting areas; classification zones (CZs) Site 1 and Site 2.

During initial consultations, the Devon and Severn Inshore Fisheries and Conservation Authority (D&S IFCA) indicated that in addition to the private mussel fishery, there are active commercial fishing activities that take place in the bay, including scallop dredging, trawling, diving, potting and netting. There are no byelaws that regulate the harvesting of rope grown mussels in the area, although D&S IFCA stated during initial consultations that the D&S IFCA Byelaw and Permitting Sub-Committee has made the decision to prohibit the use of mobile fishing gear within the Lyme Bay shellfish production area. The proposed changes were subject to formal consultation and due to be implemented in 2022 or early 2023. No information on a formal decision was made available to this review at the time of writing. Mussels may be harvested year-round, although harvesting predominantly takes place from July through to March the following year. The gap in harvesting from April to June is intended to produce a higher quality of stock, as mussels have a shorter shelf life with lower meat content before and after spawning (Offshore Shellfish Ltd (OSL), *pers. comm.*, 2023). Some harvesting may still occur for local consumption.

Shellfish registration documents submitted by the harvester to the LA indicate up to 100 metric tonnes of mussels are harvested from both sites per week, depending on the classification status of the bed (see Section 2.2). At the time of this review, mussels on *Site 1* are concentrated around the northern and southern extremes of the classified area (60 lines total), whereas molluscs on *Site 2* are more uniformly spread across the CZ (187 lines total).

Information submitted by the operator indicates the distribution of mussels and active ropes varies continually; once a rope has been cleared of active, market-sized mussels it will not be harvested from again for approximately 2 years (OSL, *pers. comm.*, 2023). Spat settles in spring each year, is harvested and reseeded onto other ropes in the same summer and autumn, and reaches harvestable size the following year (1 year from seed to harvest). The ropes are then refurbished and reseeded in the summer and autumn. This has been considered in the assessment of representative RMPs as described below.

2.2 Classification History

Both CZs in this BMPA have been classified since 2015 based on samples collected from a single RMP within the boundaries of each zone. Both CZs were awarded Class A in 2015, downgraded to Class B in 2016 and upgraded to a Seasonal Class A in 2017. *Site 1* remained a seasonal Class A from 2017 – September 2022, when it was upgraded to full Class A. *Site 2* was Seasonal A from 2017 – 2021, when it was upgraded to full Class A. At the time of

publication, both sites were year-round Class A. The location of both CZs, along with their respective RMPs is presented in Figure 2.1.

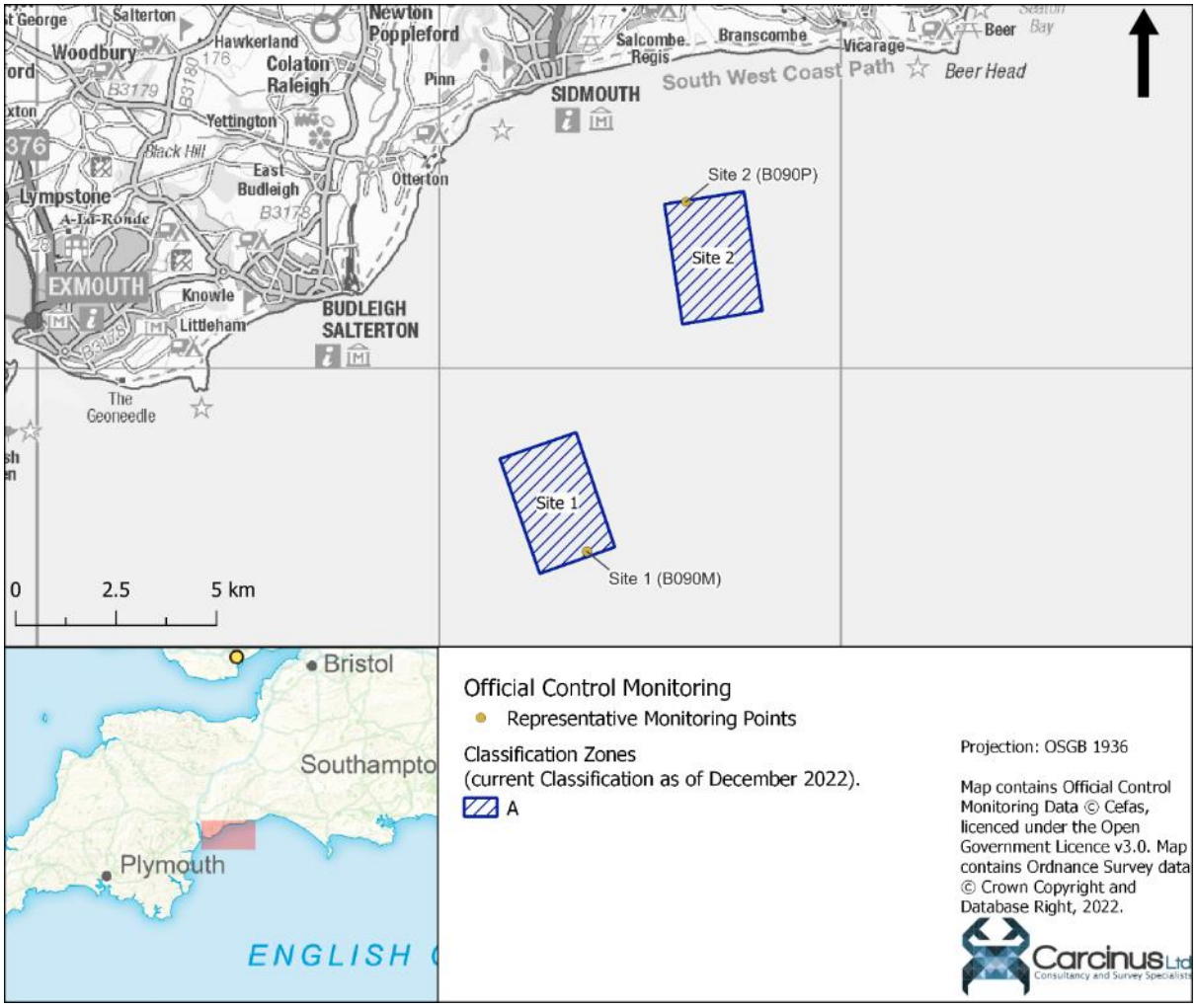


Figure 2.1 Current Classification Zones and associated Representative Monitoring Points (RMPs) in the Lyme Bay BMPA.

3 Pollution sources

The study area presented in Figure 1.1 covers an area of more than 1,000 km² and includes the catchments of the Sid, Otter, Lim, Axe and West Dorset Rivers. It also includes the Exe Estuary but does not include the entirety of the catchment that drains to that estuary. Contamination from pollution sources in the upper reaches of catchments are unlikely to individually influence the positioning of RMPs, but aggregated may have an impact on the bacteriological contamination within the two Lyme Bay CZs, as they will contribute to the background levels of contamination discharged from the mouths of each river. RMP positioning should take account of the point source nature of the mouth of rivers into which many of these discharges drain.

In general, the pollution sources discussed in detail in the following sections are those either within the waters of Lyme Bay itself, or immediately adjacent to the coastline.

3.1 Human Population

The 2015 Sanitary Survey cites population data from the 2011 census of the United Kingdom. Preliminary results from the 2021 census have been made available, and so a comparison of these two surveys is used to give an indication of population trends across the catchment in the last 10 years. Human population density within census Super Output Areas (lower layer) wholly or partially contained within the Lyme Bay catchment between the 2011 and 2021 censuses are shown in Figure 3.1.

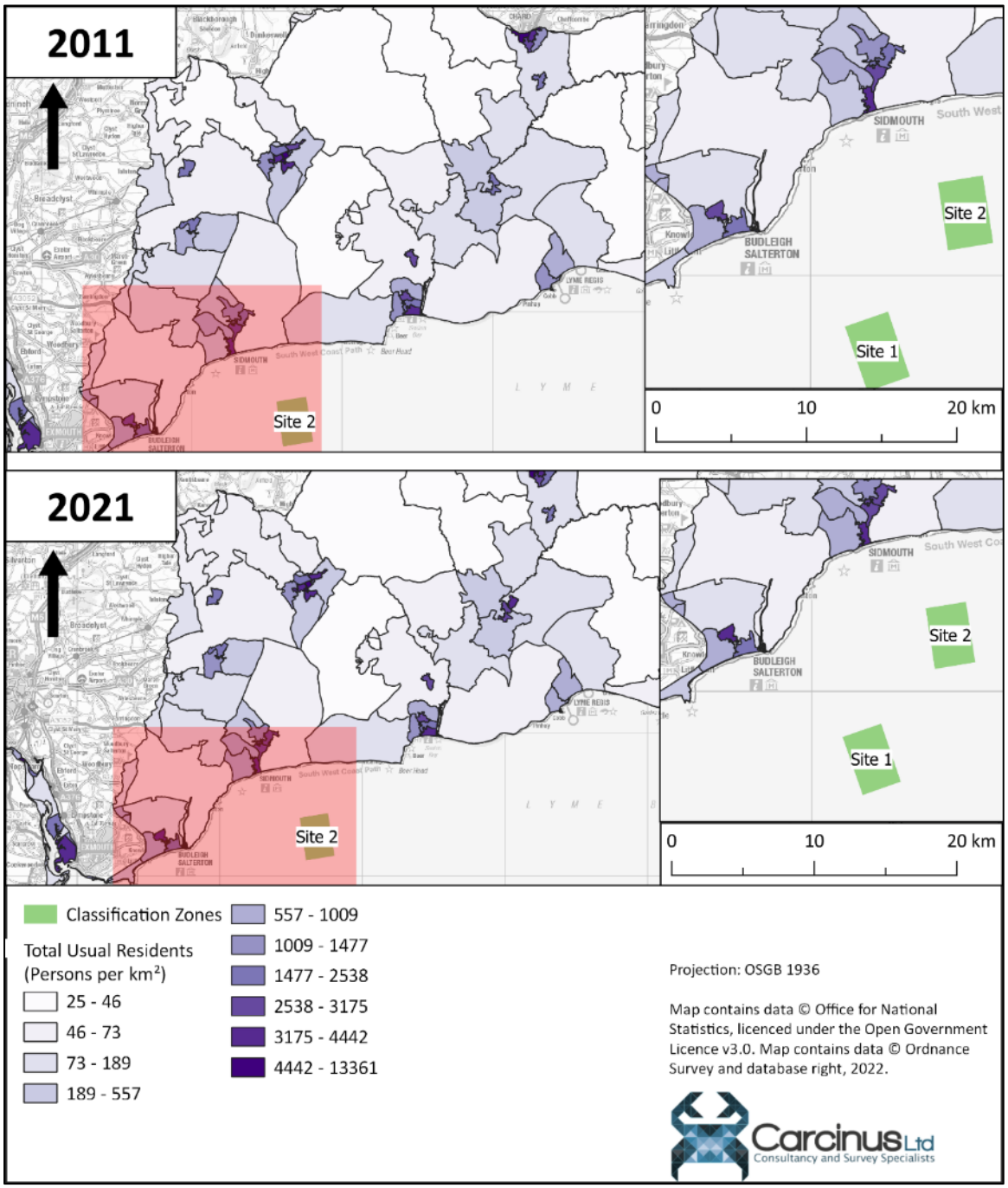


Figure 3.1 Human population density in census Super Output Areas (lower layer) between 2011 and 2021 in the Lyme Bay catchment.

Figure 3.1 suggests that in general, the Lyme Bay catchment has remained rural, with most Output Areas having population densities of 25 people per km². The main urban conurbations of the catchment continue to be the seafront towns along the coastline, Budleigh Salterton, Sidmouth, Lyme Regis and Bridport, as well as Honiton, Chard and Axminster farther north in the catchment. The population of the catchment at the 2011 census was estimated to be 288,957; at the time of the 2021 Census this had increased to 299,147. The greatest potential for urban runoff remains from these towns adjacent to the

shoreline, although any direct influence of this source is likely to be fairly limited given the distance that each CZ is offshore (the nearest point of *Site 1* to land is 5.2 km and the nearest point of *Site 2* is 3.3 km from land).

Consultation with the LA and mussel farm operators indicate there has been population growth throughout the South West due to the construction of Cranbrook and Whiterock since the original sanitary survey in 2015. Cranbook is a new town development located 8 km north east of Exeter. It initially consisted of 500 homes when it was completed in December 2013. The site was expanded to 1,000 homes in March 2015 and currently consists of 2,900 residential properties (this is expected to increase to more than 6,500 properties by 2027) (*Regional Spatial Strategy - Devon County Council's Formal Advice to the Regional Assembly in respect of Proposals for the Exeter Area*, 2005). This development is 12.5 km from the nearest coastline, and any contamination from it will reach the CZs via the Exe estuary. It may contribute to the overall background levels of contamination discharged to coastal waters via the Exe, but is not considered to have a direct influence on the siting of the RMPs within either of the CZs.

The Whiterock development is located in Paignton, to the west of the Lyme Bay CZs . It may contribute to the total diffuse contamination of coastal waters from settlements around Torbay, but requires no further consideration in the production of any new sampling plan for this area as it does not directly influence the positioning of the RMPs within the BMPA.

Any increase in population across the study area would place additional loading on the Wastewater Treatment Network, and we are aware that there is local opinion that South West Water have not kept pace with new developments in terms of the capacity of their assets. Impacts from sewage discharges are discussed in the next section.

The original sanitary survey briefly notes that this area of southern England is a very popular tourist destination, with much of the coastline forming part of the Dorset and East Devon UNESCO world heritage site. The towns of Sidmouth and Seaton are also popular tourist destinations. It does not provide any tourism statistics to compare against, although there is local understanding that the volume of tourism has increased, with two locations in the catchment, Sidmouth and Lyme Regis, being in the top 5 planned destinations in the UK in the summer of 2022 (McKeown, 2022). The highest numbers of tourist visits occur during the summer months. No information has come forward during the desk assessment or secondary consultation to suggest the existing capacity of the sewage network is insufficient to handle this increase, but additional bacterial loading during this time may explain any high results in summer months.

The results of the 2021 census compared to that of the 2011 census suggest that the 'total usual residents' of the catchment has increased by approximately 10,000 people. Furthermore, there is local knowledge that new developments outside the catchment have been constructed in recent years, and the volume of tourism the area receives has also increased. During secondary consultation, the operators of the mussel farm advised housing and industrial development in Whiterock is ongoing and there are plans to expand hotel

capacity in Torquay and Paignton. The data indicates the main urban centres of the catchment (the coastal towns of Budleigh Salterton, Sidmouth, Lyme Regis and Bridport) have not changed significantly, and as such the areas at greatest risk of runoff are unchanged. The overall risk of the impact of runoff to the shellfish CZs is very small due to their offshore position (approximately 3km from the coastline), but runoff from these towns will contribute to the background levels of contamination in the coastal waters of Lyme Bay, and so do not specifically influence the positioning of RMPs within the CZs.

3.2 Sewage

Details of all consented discharges in the study area were taken from the most recent update to the Environment Agency's national permit database (December 2022). The locations of these discharges within the BMPA are shown in Figure 3.2.

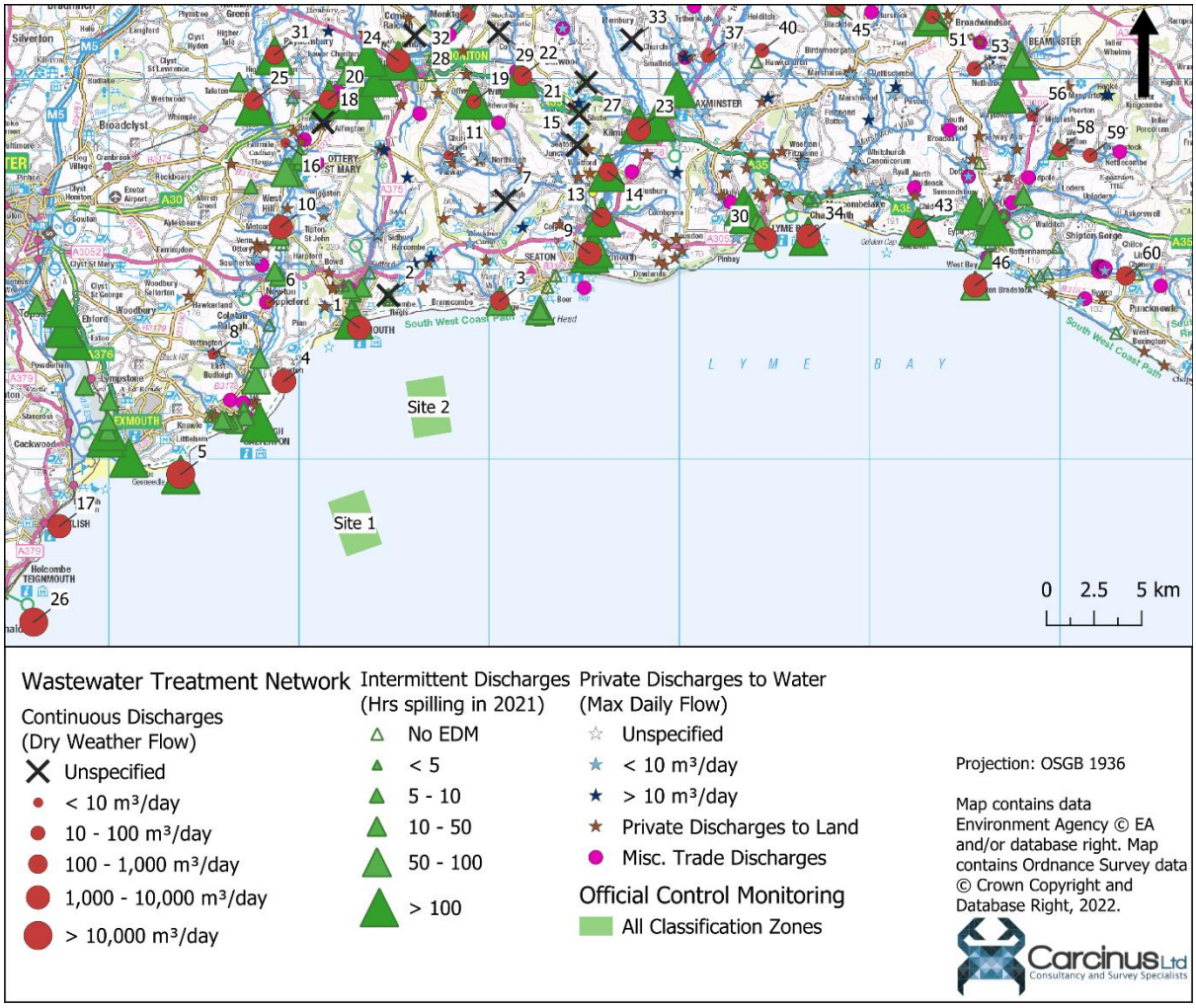


Figure 3.2 Details of all consented discharges in the study area. Labels refer to continuous discharges, details of which can be found in Table 3.1.

Table 3.1 Details of all continuous discharges in the study area, ordered by distance to nearest Lyme Bay CZ

ID	Discharge Name	NGR	Treatment	Dry Weather Flow (m^3/day)	Distance to nearest CZ (km)	Receiving Water
1	SIDMOUTH SEWAGE TREATMENT WKS	SY1317086900	UV DISINFECTION	6331	3.74	LYME BAY (C)
2	SALCOMBE REGIS WWTW CSO	SY1470088600	BIOLOGICAL FILTRATION	103.68	4.62	STREAM TO THE SEA
3	BRANSCOMBE WWTW	SY2055088310	BIOLOGICAL FILTRATION	310	4.91	BRANSCOMBE STREAM
4	OTTERTON SEWAGE TREATMENT WORKS	SY0923084090	UV DISINFECTION	1643	6.38	LYME BAY (C)
5	EXMOUTH SEWAGE TREATMENT WORKS	SY0379079190	UV DISINFECTION	11825	7.86	LYME BAY (C)
6	DOTTON WASTE WATER TREATMENT WORKS	SY0844088220	SEPTIC TANK	1.7	8.29	GROUNDWATER VIA INFILT SYSTEM
7	HILLSIDE STW	SY2085093580	BIOLOGICAL FILTRATION	Unspecified	9.75	TRIB OF RIVER COLY(S)
8	YETTINGTON STW	SY0548085490	BIOLOGICAL FILTRATION	7.2	9.83	BUDLEIGH BROOK(S)
9	SEATON STW	SY2529090810	UV DISINFECTION	2493	10.03	RIVER AXE ESTUARY(E)
10	FLUXTON WASTEWATER TREATMENT WORKS	SY0904092190	BIOLOGICAL FILTRATION	1620	10.45	TRIBUTARY OF THE RIVER OTTER
11	FARWAY STW	SY1786095960	BIOLOGICAL FILTRATION	7.2	11.57	TRIBUTARY OF RIVER COLY(S)

ID	Discharge Name	NGR	Treatment	Dry Weather Flow (m^3/day)	Distance to nearest CZ (km)	Receiving Water
12	NORTHLEIGH WWTW	SY1908095980	BIOLOGICAL FILTRATION	Unspecified	11.69	GROUNDWATER VIA INFILT SYSTEM
13	COLYTON & COLYFORD WWTW	SY2592092700	BIOLOGICAL FILTRATION	783	11.77	RIVER AXE
14	MUSBURY & WHITFORD STW	SY2625095100	BIOLOGICAL FILTRATION	285	13.77	(S) RIVER AXE
15	PARK VIEW STW	SY2464096490	BIOLOGICAL FILTRATION	Unspecified	14.01	UMBORNE BROOK(S)
16	TALEFORD VILLAS STW	SY0929096620	BIOLOGICAL FILTRATION	5	14.05	A TRIBUTARY TO THE RIVER TALE
17	DAWLISH WWTW	SX9742076470	UV DISINFECTION	4856	14.48	LYME BAY
18	PATTESONS CLOSE	SY1127097690		Unspecified	14.30	TRIB OF RIVER OTTER
19	OFFWELL WASTEWATER TREATMENT WORKS	SY1919098790	BIOLOGICAL FILTRATION	80	14.49	TRIB OF OFFWELL BROOK
20	FENITON WASTEWATER TREATMENT WORKS	SY1157098890	ACTIVATED SLUDGE	400	15.36	RIVER OTTER
21	1-19 BAKERS MEAD	SY2473398128	BIOLOGICAL FILTRATION	Unspecified	15.49	TRIB OF THE UMBORNE BROOK
22	WILMINGTON STW	ST2175000140	BIOLOGICAL FILTRATION	101	16.29	(S) UMBORNE BROOK
23	KILMINGTON WWTW	SY2786097340	CHEMICAL - PHOSPHATE STRIPPING	2228.64	16.53	RIVER AXE
24	HONITON WASTEWATER TREATMENT WORKS	ST1522000940	BIOLOGICAL FILTRATION	3115	16.72	RIVER OTTER

ID	Discharge Name	NGR	Treatment	Dry Weather Flow (m^3/day)	Distance to nearest CZ (km)	Receiving Water
25	TALATON WASTEWATER TREATMENT WORKS	SY0761098830	BIOLOGICAL FILTRATION	132	16.79	TRIB OF RIVER TALE
26	BUCKLAND WASTEWATER TREATMENT WORKS	SX9606071430	BIOLOGICAL FILTRATION	21,818	16.80	ENGLISH CHANNEL (COASTAL)
27	DALWOOD STW	SY2510099800	BIOLOGICAL FILTRATION	Unspecified	17.14	CORY BROOK
28	COMBE RALEIGH	ST1610002250		Unspecified	17.92	TRIB OF RIVER OTTER
29	COTLEIGH STW	ST2050102433	BIOLOGICAL FILTRATION	Unspecified	18.28	TRIBUTARY TO UMBORNE BROOK (S)
30	LYME REGIS (UPLYME) STW	SY3454091560	UV DISINFECTION	3022	18.41	LYME BAY&TRIB OF R LIM
31	PAYHEMBURY STW	ST0872001240	BIOLOGICAL FILTRATION	132	18.50	PAYHEMBURY STREAM (S)
32	DUMPDON VIEW STW	ST1884003330	BIOLOGICAL FILTRATION	17.6	18.98	TRIBUTARY OF THE RIVER OTTER
33	MEMBURY STW	ST2750002030	BIOLOGICAL FILTRATION	Unspecified	20.23	ROCK STREAM
34	CHARMOUTH SEWAGE DISPOSAL WORKS	SY3678091710	BIOLOGICAL FILTRATION	1270	20.54	LYME BAY(C) & RIVER CHAR(S)
35	MILLRISE	ST1708005360	BIOLOGICAL FILTRATION	8.4	20.98	DITCH TO RIVER LOVE(S)
36	STOCKLAND STW	ST2490004080	BIOLOGICAL FILTRATION	Unspecified	21.00	TRIB OF RIVER YARTY

ID	Discharge Name	NGR	Treatment	Dry Weather Flow (m^3/day)	Distance to nearest CZ (km)	Receiving Water
37	WAGGS PLOT SEWAGE TREATMENT WORKS	ST3152201201	PACKAGE TREATMENT PLANT	16.63	21.84	DRAINAGE DITCH TO RIVER AXE
38	HILLSIDE SEWAGE TREATMENT WORKS	ST1999006370	BIOLOGICAL FILTRATION	4.8	22.11	TRIB OF RIVER OTTER(S)
39	UPOTTERY STW	ST2053007670	BIOLOGICAL FILTRATION	Unspecified	23.47	RIVER OTTER
40	HAWKCHURCH STW	ST3434001470	BIOLOGICAL FILTRATION	65	23.92	BLACKWATER RIVER/STREAM (S)
41	YARCOMBE STW	ST2472007990	BIOLOGICAL FILTRATION	48	24.65	(S) TRIB RIVER YARTY
42	TATWORTH WWTW	ST3373004530	BIOLOGICAL FILTRATION	937	25.81	FORTON BROOK
43	CHIDEOCK STW	SY4253092140	UV DISINFECTION	290	26.12	RIVER WINNIFORD(S)
44	OPPOSITE THE LODGE	ST2798010630	PACKAGE TREATMENT PLANT	5	28.22	A TRIBUTARY OF THE RIVER YARTY
45	THORNCOMBE WWTW	ST3820003760	ACTIVATED SLUDGE	110	28.29	RIVER SYNDERFORD
46	BRIDPORT SEWAGE TREATMENT WORKS	SY4555089120	ACTIVATED SLUDGE	8050	28.36	LYME BAY(C)
47	CHURCHINFORD STW	ST2202012500	BIOLOGICAL FILTRATION	95.5	28.46	RIVER OTTER
48	WINSHAM WASTEWATER TREATMENT WORKS	ST3752005990	BIOLOGICAL FILTRATION	140	29.39	RIVER AXE

ID	Discharge Name	NGR	Treatment	Dry Weather Flow (m^3/day)	Distance to nearest CZ (km)	Receiving Water
49	BISHOPSWOOD STW	ST2558013080	BIOLOGICAL FILTRATION	Unspecified	29.78	THE RIVER YARTY
50	BUCKLAND ST MARY STW	ST2640013570	BIOLOGICAL FILTRATION	32	30.48	TRIB OF RIVER YARTY(S)
51	BROADWINDSOR WWTW	ST4328003250	REEDBED	97	31.87	TRIBUTARY OF DRIMPTON STREAM
52	DRIMPTON STW	ST4170005700	BIOLOGICAL FILTRATION	102	32.18	(S)DRIMPTON STREAM-RIVER AXE
53	STOKE ABBOTT STW	ST4549000500	BIOLOGICAL FILTRATION	32	32.22	TRIBUTARY OF RIVER BRIT
54	CLAPTON BRIDGE STW	ST4132006280	BIOLOGICAL FILTRATION	46	32.29	RIVER AXE(S)
55	DUNSHAM LANE (WAYFORD) STW	ST4157007010	BIOLOGICAL FILTRATION	3.8	32.97	CLAPTON BROOK(S)
56	MELPLASH SEWAGE TREATMENT WORKS	SY4850098006	PACKAGE TREATMENT PLANT	3	33.78	TRIBUTARY OF THE RIVER BRIT
57	HEWISH STW	ST4207008230	BIOLOGICAL FILTRATION	5	34.17	CLAPTON BROOK(S)
58	WEST MILTON WATER RECYCLING CENTRE	SY4996996244	BIOLOGICAL FILTRATION	36	34.48	TRIB OF MANGERTON RIVER
59	POWERSTOCK	SY5159095960	BIOLOGICAL FILTRATION	34	35.92	
60	PUNCKNOWLE WRC	SY5345989626	BIOLOGICAL FILTRATION	435	36.25	RIVER BRIDE

ID	Discharge Name	NGR	Treatment	Dry Weather Flow (m^3/day)	Distance to nearest CZ (km)	Receiving Water
61	ABBOTSBURY WWTW	SY5890684921	CHEMICAL - PHOSPHATE STRIPPING	300	41.01	ABBOTSBURY BROOK
62	LANGTON HERRING WRC	SY6093382762	BIOLOGICAL FILTRATION	40	42.91	TRIBUTARY OF WEST FLEET
63	WEYMOUTH SEWAGE TREATMENT WORKS	SY6613074360	BIOLOGICAL FILTRATION	32141	48.60	(C) ENGLISH CHANNEL

The 2015 Sanitary Survey identified seven continuous water company discharges with outfalls within Lyme Bay, five of which employ UV disinfection (Dawlish STW (#17), Exmouth STW (#5 in

Table 3.1), Otterton STW (#4), Sidmouth STW (#1), Lyme Regis STW (#28)) and two secondary treatment (Newton Abbot STW and Charmouth STW (#32)). That report identified that the majority of the continuous discharges (in the study area considered in the 2015 Survey discharged to watercourses in the upper reaches of catchments in the study area and so would have limited direct impact on the bacteriological health of the BMPA, beyond the diffuse contamination discharged from each main watercourse. No changes to the treatment methodologies or consented discharge volumes of any of the 5 closest discharges (in terms of distance to one or both CZs) have occurred since the original sanitary survey was published. The stated consented discharge volumes are as Dry Weather Flow. EA has advised that WWTWs should accommodate 'Wet' Weather Flow that is six times the Dry Weather Flow as part of their consent. Three of the continuous WWTWs (Sidmouth, Otterton and Exmouth STWs) discharge directly to Lyme Bay, but employ UV disinfection so *E.coli* loadings in discharges will be low. The other two (Branscome WWTW and Salcombe Regis WWTW) discharge to small streams that ultimately drain to Lyme Bay, but the small consented discharge volumes (<500 m^3/day) mean that very limited direct contamination of the CZs is likely, given the extent to which dilution and bacterial die off will reduce the concentration of faecal indicator organisms (FIOs) in the water column around the BMPA. The specific risk that each discharge within Lyme Bay poses to the bacteriological health of the shellfishery will depend on the water circulation patterns, tidal state and wind conditions. Details of changes to hydrodynamics and water circulation are discussed in Section 4, but overall, it is considered that the overall risk of this source of contamination has remained the same as described in the original sanitary survey. Continuous water company outfalls that do not discharge directly to Lyme Bay (the majority of discharges within the study area) will not have a direct impact on the CZs, but they will contribute to overall aggregated background levels of contamination discharged from the mouth of each of the rivers described in this report. RMP positioning should take account of the point source nature of the mouth of rivers into which many of these discharges drain.

Continuous water company outfalls that discharge to the northern and western parts of Lyme Bay are all at least 3.5 km from a Classification zone, but they may have some impact. Any impact would be worse during spring tides with strong offshore breeze, as this would reduce the travel time and associated opportunity for bacterial dilution and die off. Impacts may be reduced during summer months as the greater UV intensity of the sun will speed up the rate of *E. coli* die off.

In addition to the continuous discharges, the original sanitary survey identified a series of intermittent outfalls associated with the continuous discharges. Intermittent discharges comprise Combined Storm Overflows (CSOs), Storm Tank Overflows (STOs) and Pumping Station Emergency Overflows (PSs). During AMP6 and AMP7, Event Duration Monitoring

(EDM) was installed at several of the discharges within the catchment. Summary data for 2020 and 2021 was published by the Environment Agency in March 2021 and in March 2022, respectively (Environment Agency, 2023). Details of the EDM data from 2021 for those discharges in the study area are presented in Appendix I.

At the time of the original sanitary survey, only one of the 108 intermittent discharges identified as being within the study area of that report, Exmouth STW, was fitted with EDM capability and so comparison is limited. Intermittent discharges identified in the 2015 report were widely distributed across the study area and generally associated with built up areas and the coastal towns (Budleigh Salterton, Sidmouth and Seaton). Between 2010 and 2011, the original sanitary survey describes that the intermittent discharge at Exmouth STW spilled 40 times for a total of 534 hrs. In 2020, this discharge spilled 59 times for a total of 850 hrs. In 2021, this discharge spilled 49 times for a total of 628 hrs. This outfall is located 7.86 km from the nearest CZ (*Site 1*), and so is unlikely to cause significant direct contamination even during a spill event. Other intermittent discharges with the potential to impact the coastal waters of Lyme Bay are the Lime Kiln CSO at Budleigh Salterton (5.5 km from *Site 1*) and the Ham PS at Sidmouth (4 km from *Site 2*), which spilled 48 times for 434 hrs and 72 times for over 1,000 hrs respectively in 2021. Spills from intermittent discharges will cause significant pollution in the immediate vicinity of the outfall as the discharges are typically untreated. However, because none of the intermittent discharges are within 4 km of a CZ, any pollution event will undergo significant dilution/die-off before being carried over the shellfish beds. Overall intermittent discharges are located such that none have a specific individual influence on the siting of RMPs within the CZs. RMPs positioning should take account of the point source nature of the mouth of rivers into which many of these discharges drain.

There are no known private discharges spilling directly to the coastal waters of Lyme Bay, and so pollution from this source is not expected to have any direct impact on the bacteriological health of the shellfishery. Whilst there are almost 140 private discharges in the study area, most (more than 100) are small (<10 m^3/day) and discharge to watercourses in the upper catchment. Discharges to watercourses will ultimately reach the coastal waters of Lyme Bay via the fluvial plume of each river, and so contamination from private discharges will contribute to the background levels of contamination that each river discharges, as an aggregated point source of contamination at the mouth of the rivers. RMP positioning should take account of the point source nature of the mouth of rivers into which many of these discharges drain.

No upgrades or improvements to the storage capacity, treatment methodologies or consented discharge volume of water company assets in the catchment were identified. No direct contamination of the shellfish beds is expected from this source of contamination, but continuous and intermittent discharges within Lyme Bay will contribute to background levels of contamination in the coastal waters via aggregated contamination discharging via the mouth of rivers described in this report. Positioning of RMPs should take account of this

point source. During secondary consultation, the operators of the mussel farm noted that new requirements for continuous monitoring of discharges from storm overflows and WWTW under the Environment Act 2021 may lead to a reduction in contamination in receiving waters in the future.

3.3 Agricultural Sources

The 2015 Sanitary Survey of Lyme Bay presented livestock population information based on the 2013 livestock census of sub-catchments within the survey area. Livestock data of the same spatial scale was not freely available to the authors of this review, and so a data request was made to the Farming Statistics Office of the Department for Environment, Food and Rural Affairs (DEFRA) for livestock populations within the catchment presented in Figure 1.1. This data was made available under the Open Government Licence v3.0. Figure 3.3 presents the changes in livestock populations within the Lyme Bay catchment between 2013 and 2021.

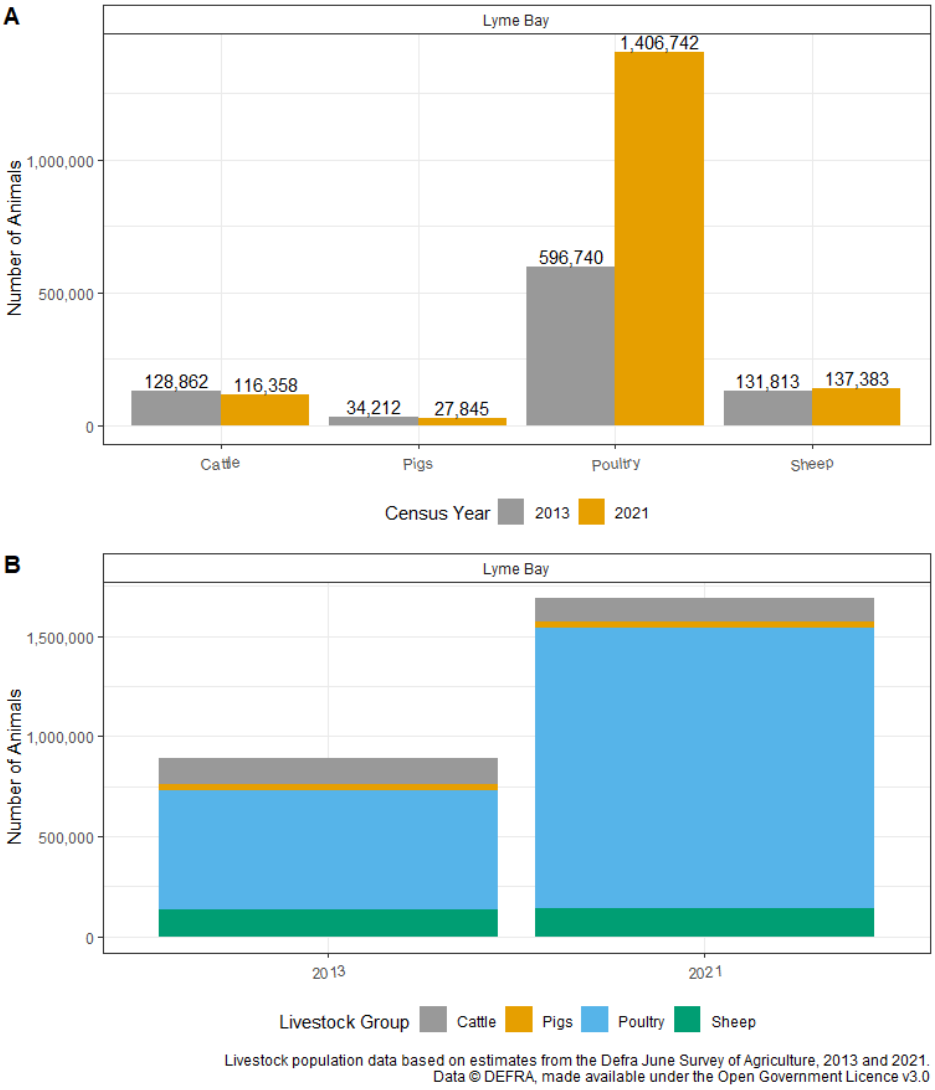


Figure 3.3 Changes in livestock populations within the study area considered in this report. Panel A shows populations broken down by different livestock groups, and panel B shows the aggregated population.

The data presented in Figure 3.3 shows that the dominant livestock group in terms of population size for both census years is poultry, followed by sheep. Livestock populations grew by nearly 90% between 2013 and 2021, although this was driven by a 135% increase in poultry populations. It should be noted that the June Survey[2] represents a snapshot of livestock populations in a single day, but populations will vary throughout the year. Highest numbers of animals will occur in spring, following the birthing season, and the lowest in autumn and winter when animals are sent to market.

[2] June Survey of Agriculture and Horticulture. Further information available at: https://www.gov.uk/guidance/structure-of-the-agricultural-industry-survey-notes-and-guidance#june-survey-of-agriculture-and-horticulture-in-england.

During initial consultation, the LEA passed on anecdotal information from the harvester that the number of intensive outdoor pig units in the area has increased since the original sanitary survey was published. This was identified as a concern as more manure-covered soil is exposed and potentially washed into rivers. Additionally, they relayed information that intensive dairy and beef production has increased, resulting in additional slurry production. During secondary consultation, the EA confirmed that they did not have any registered indoor pig units under Environmental Permitting Legislation (EPR) and no details of new extensive poultry farms in the area. It should be noted that the livestock population data provided by DEFRA suggests that the populations of these two groups have actually fallen slightly.

Typically, the principal route of contamination of coastal waters by livestock is surface runoff carrying faecal matter. The change in land cover in the Lyme Bay catchment between 2012 and 2018 is shown in Figure 3.4. This figure suggests that a significant area of the catchment remains reserved for pasture, particularly between Sidmouth and Beer Head adjacent to the coastline and in the upper reaches of the catchment. Pasture areas adjacent to shorelines generally represent the greatest risk, as runoff into up-catchment rivers will not cause any direct contamination of the CZs but will contribute to background levels of contamination discharged from each of the main rivers in the study area. That being said, neither CZ is at great risk of direct contamination from livestock generated faecal runoff given their positions > 3 km offshore. Furthermore, the coastline within the study area presented in Figure 1.1 and Figure 3.4 is characterised by relatively tall cliffs along much of its length. The lowest elevation points tend to be where the coastal towns/villages are located. This means that even in situations where the land use adjacent to the coast is agricultural, there is little pathway for runoff, as any contamination will be directed down into the rivers identified in Figure 3.4, rather than directly into coastal waters. Pollution from livestock is likely to contribute to background contamination levels of coastal waters but will not necessarily cause direct pollution of either CZ and has minimal influence on the positioning of RMPs within the CZs. The levels of contamination are likely to be highest in winter months, as faecal loading will be higher due to increased rainfall at these times of year, and higher UV levels in summer months will contribute to higher *E. coli* die off.

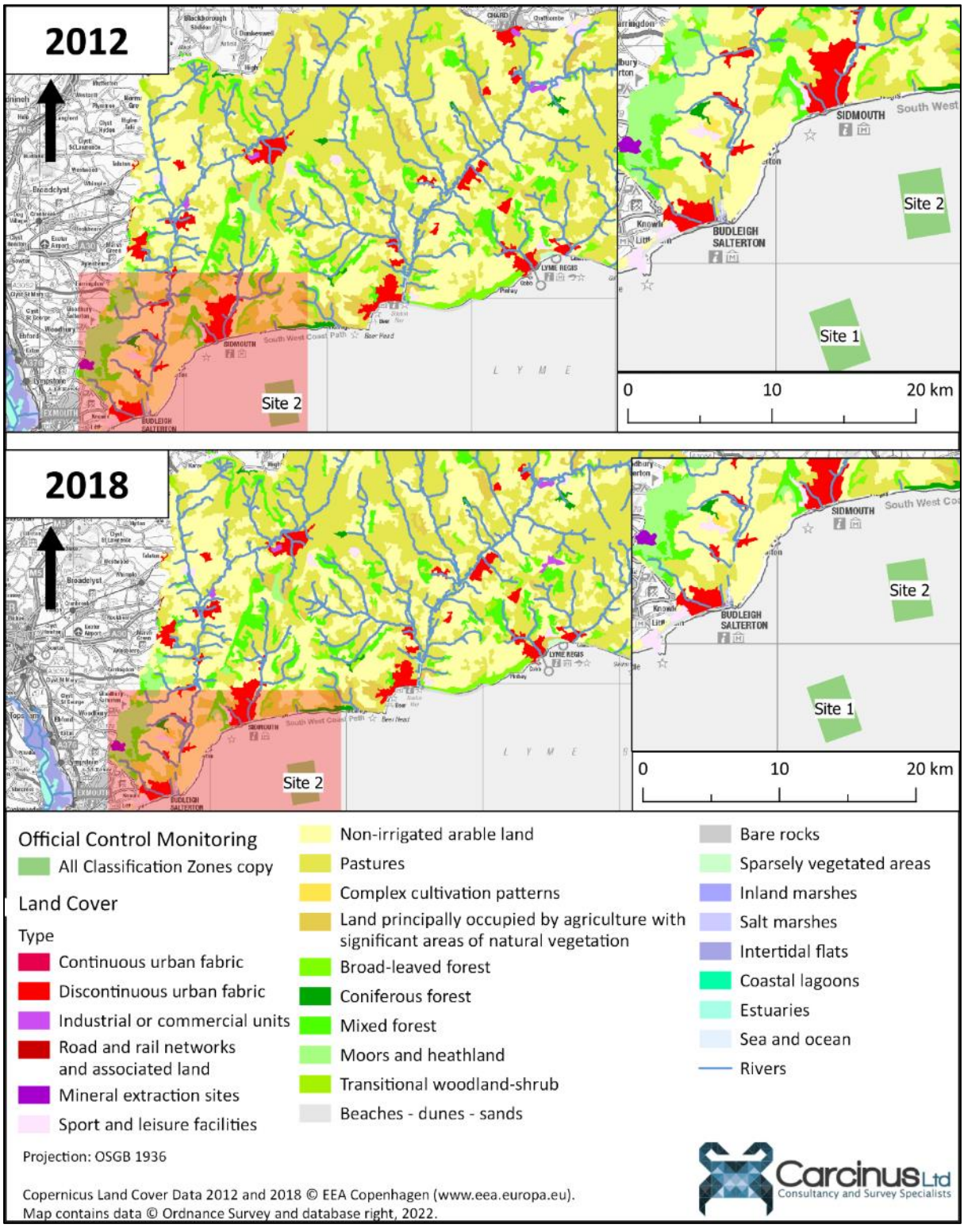


Figure 3.4 Land cover change between 2012 and 2018 within the Lyme Bay catchment.

Another potential route of contamination from livestock-associated factors is slurry spreading. The spreading of slurry to fields is controlled under the Reduction and Prevention of Agricultural Diffuse Pollution (England) Regulations 2018, known as the Farming Rules for Water, which came into force in April 2018. Furthermore, silage and slurry storage for

agricultural purposes is subject to The Water Resources (Silage, Slurry and Agricultural Fuel Oil) (England) Regulations 2010 (SSAFO). All farmers must comply with the SSAFO regulations when building new slurry stores, or substantially altering (e.g. enlarging) existing ones. All stores must be built at least 10m from any watercourse, including field drains or ditches, and be built or altered to last for at least 20 years with proper maintenance. Since 2021, the EA now has ART (Agricultural Regulatory Taskforce) Officers that have all been assigned a catchment and will engage, inspect, advise and if necessary, enforce the Silage, Slurry and Agricultural Fuel Oil regulations and the new (2018) Farming Rules for Water. These legislative changes are intended to reduce the pollution that this activity causes to the wider environment, including to shellfish beds. During consultation, the EA did not indicate that there were any problems associated with slurry use in this area e.g. improper storage, excessive loading of watercourses and during secondary consultation they provided details of improvements to slurry/silage infrastructure (Table 3.2). Legislation governing slurry usage is generally related to storage and there is no data available of when/where it is spread.

Table 3.2 Details of improvements to slurry/silage storage in the catchments neighbouring Lyme Bay since 2019. Data provided by Environment Agency during Secondary Consultation.

Improvement	Catchment		
	Sid & Otter	Lim & Axe	West Dorset Rivers
Slurry store	37	60	6
Silage store	33	35	5

Livestock populations increased by >90% between 2013 and 2021, although this was mostly driven by increases in the poultry. Land cover maps suggest that the areas of pasture have remained broadly similar. Upgrades to slurry-related infrastructure at farms in the Axe catchment should have reduced the pollution that this activity causes to the shellfish CZs, although the overall risk of this source of contamination remains very low given the dilution/die off that will occur to any bacterial species in the water before reaching the shellfish beds.

3.4 Wildlife

The original sanitary survey describes that Lyme Bay encompasses a variety of habitats supporting a significant diversity of wildlife, and consequently falls within several nationally and internationally designated nature conservation areas. It goes onto note that due to the position of the CZs offshore, visiting species will be restricted to seabirds and marine mammals.

The 2015 Sanitary Survey only provided waterbird population statistics for the Axe estuary, with an average of 2,895 birds in the five winters to 2012/2013. An average of 2,088 wading and waterbirds were counted in the Axe estuary over the five winters to 2019/20 (the most recent for which data are available) (Frost *et al.*, 2021), a slight decrease on the average

reported in the original sanitary survey. The Exe estuary supports a much larger population with an average of over 22,000 waterbirds, and this population has increased slightly compared to the period preceding the 2015 sanitary survey. For inshore and estuarine shellfish beds, faecal deposits from wading and waterbirds can represent a significant source of contamination. However, as most species forage in the immediate vicinity of their nesting/roosting sites and there are no inland shellfish classification zones, the impact of these species is likely to be relatively minimal on the offshore location of the Lyme Bay CZs. The original sanitary survey notes that birds may rest on the large navigational buoys that mark the extremities of the farm sites, and so recommended placing RMPs near to these points. During the November 2022 site visit, only 10 seabirds were spotted around the farm during the whole visit, and these were floating on the water rather than on the buoys. Whilst this is only a snapshot, this pattern was confirmed by the operators of the mussel farm on the visit and suggests that any contamination from seabirds is likely to be very minimal.

There are no major colonies of populations of marine mammals known to be resident in Lyme Bay. Individuals from populations along the south coast of England may forage from time to time within the waters of the shellfishery (i.e. both seals (suspected grey seals *Halichoerus grypus*) and dolphins (common dolphin *Delphinus delphis*)) were spotted during the November 2022 site visit). Any contamination from this source is likely to be very temporally and spatially variable and so impossible to reliably capture with an RMP.

Therefore, this review concludes the same as that stated in the original sanitary survey, i.e. that impacts from wildlife species are likely to be very minimal and often impossible to reliably capture in offshore sites with an RMP. The recommendation in the original survey that RMPs should be placed near to navigational buoys as these are likely to be the main resting sites for seabirds in the area, does not need to be adhered to moving forward.

3.5 Boats and Marinas

The discharge of sewage from boats in the vicinity of the Lyme Bay shellfish Classification Zones is a potentially significant source of contamination. Boating activities in the area have been derived through analysis of satellite imagery and various internet sources, and compared to that described in the original sanitary survey. Their geographical positions are presented in Figure 3.5.

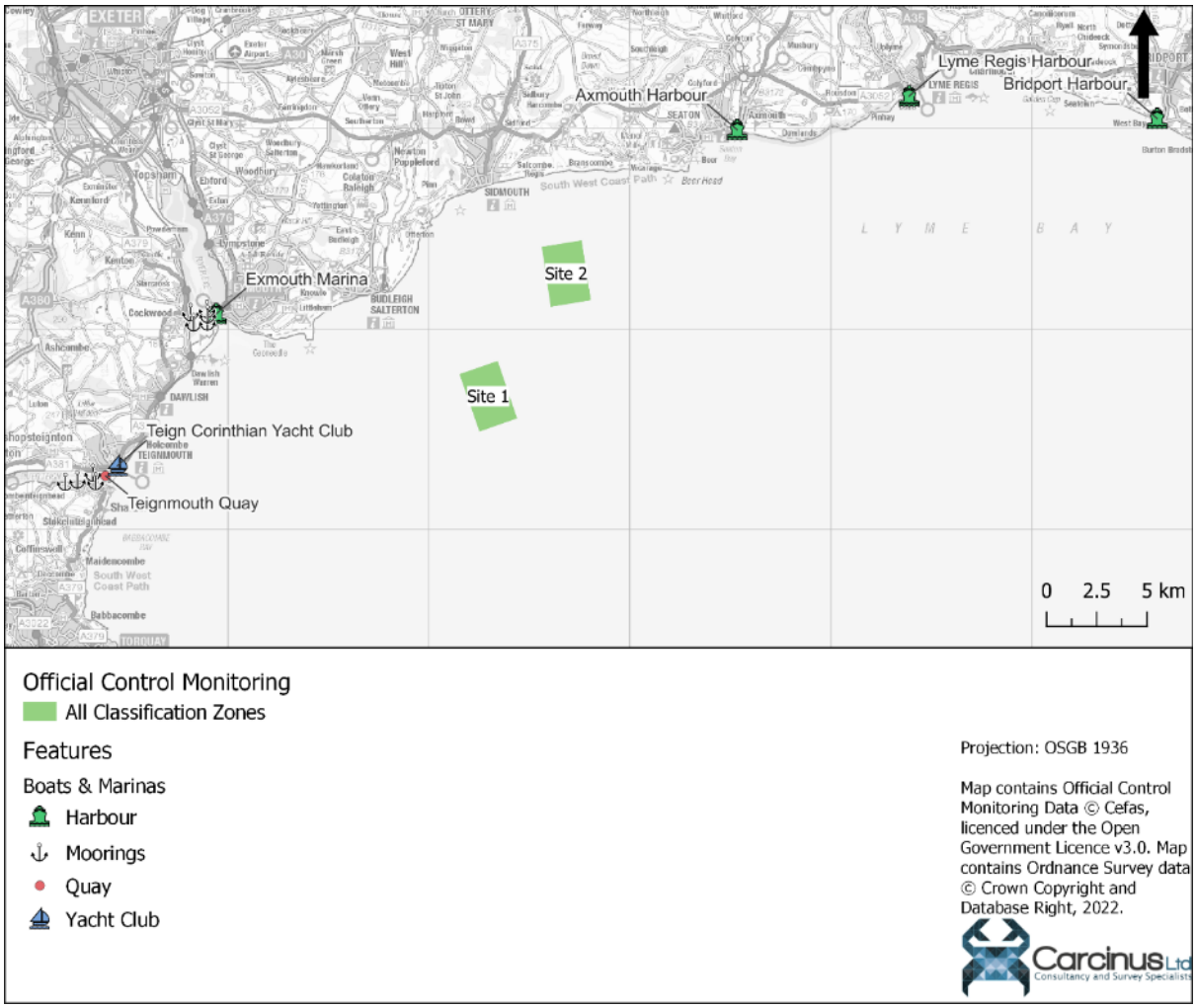


Figure 3.5 Locations of moorings, marinas and other boating activities in the vicinity of the Lyme Bay Classification Zones.

The original sanitary survey describes that the closest commercial port to the area is located at Portland Harbour, 45 km east of the mussel farm. The main shipping channel is located farther south in the English Channel than the mussel farm sits, although several large commercial vessels could be seen during the November 2022 site visit. The regulations governing the release of overboard discharges from merchant shipping vessels[3] only prohibit discharges from within 3 nm of land, and so do not necessarily prohibit discharges over the mussel bed (situated between 2 and 5 nm from the coast). An analysis of AIS (Automatic Identification System) data from 2017 by ABPMer (ABPMer, 2017) suggests that commercial vessels do pass over the area from time to time, and so there is a risk of this type of contamination from commercial vessels. This situation is not considered to have changed significantly since the 2015 survey was published.

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

There also remains significant recreational boat traffic within the Bay, mostly operating out of the harbours and marinas of Exmouth, Lyme Regis, and to a lesser extent Torbay. Neither the marinas at Exmouth or Lyme Regis provide pump out facilities. The number of moorings and anchorages is not considered to be significantly different to the situation described in the original sanitary survey, with several hundred moorings and anchorages across the study area. Vessels of a sufficient size to contain onboard toilets may make occasional overboard discharges when moving past the mussel bed, although it is impossible to determine exactly how many vessels of this type moor or frequent the area. It is impossible to reliably account for this pollution in any updated sampling plan without knowing the exact timing, nature and duration of any discharges. Both Classification Zones are marked on nautical charts of the area and so vessels may well deliberately avoid them so as to reduce the risk of snagging. However, during the November 2022 Site Visit evidence of damage to ropes from vessel strike was seen, suggesting that vessels are moving through the site on occasion, and so some contamination on occasion cannot be ruled out. However, the sporadic and unpredictable nature of this contamination sources has no influence of the positioning of RMPs.

Consultation with D&S IFCA indicated that there is an active commercial fishing fleet operating within Lyme Bay (approximately 100 vessels <10 m LOA and 60 >10 m LOA (gov.uk, 2024)). The D&S IFCA Byelaw and Permitting Sub-Committee has prohibited the use of mobile fishing gear within the Lyme Bay shellfish production areas of the Offshore Shellfish Ltd, which was due to be implemented in 2023. This restriction would minimise any mobile fishing activity around the mussel farm and therefore reduce the impact of any pollution directly from commercial fishing vessels.

As concluded in the original sanitary survey, impacts from boat traffic in the area remain possible and are likely to occur from time to time. Discharges from recreational traffic will be greatest in summer months as the numbers of boats are highest, although as discussed previously in this report, higher atmospheric UV levels will increase rates of *E. coli* die off during these times. It remains impossible to reliably account for this pollution source without definitive information as to the exact timing, nature, and extent of any discharges, but some level of background contamination of coastal waters from this source is expected.

3.6 Other Sources of Contamination

Urban fabric within Lyme Bay's catchment consists of the seafront towns along the East Devon/Dorset coastline, as well as some towns further inland. There are not expected to be any significant impacts from utility misconnections or dog fouling along shorelines as both Classification Zones are located >3 km offshore. These sources do not require further consideration in any updated sampling plan.

4 Hydrodynamics/Water Circulation

The large, open embayment of Lyme Bay makes it challenging to accurately predict the patterns of water circulation within it. Whilst they are principally driven by tidal currents

(and many hydrodynamic models rely on this), the reality is that the embayment is a chaotic system that is affected daily by variables such as wind direction and velocity, atmospheric pressure gradients, vertical density gradients and mixing patterns. Interrogation of freely available nautical charts indicates that both CZs are in approximately 20 – 25 m water depth. This means that remobilisation of sediments (and by extension sediment bound contaminants) is relatively unlikely apart from in significant storm conditions. The charts interrogated indicate that the bathymetry of the area has remained similarly to that described in the 2015 sanitary survey, and as such the degree of horizontal and vertical mixing and other hydrodynamic patterns will have remained the same as described in the 2015 sanitary survey. The presence of the mussel ropes in the farm themselves may disrupt the patterns of water movement slightly, but not significantly.

A study aiming to back-track a pollution event within Lyme Bay (Land *et al.*, submitted) found that in general, water movement flows on an east-west axis, more or less parallel with the coastline, gradually moving farther offshore with each tidal cycle. This is broadly in agreement with the findings of the original sanitary survey, but it is impossible to reliably predict exactly where contamination events will converge on the shellfish beds. As such, the sampling plan presented at the end of this report will provide a general recommendation of where pollution is, on balance, more likely to occur.

5 Rainfall

Rainfall data for the Bredy Farm RG (rain gauge) (at NGR SY507899,) and Exmouth Maer Lane RG (at NGR SY024803) monitoring stations (#351124 & #354876 respectively) were requested from the Environment Agency for the period 2008 – Present (data from the Exmouth Maer Lane station is only available from 2009). These stations were chosen as they were considered to adequately represent patterns of rainfall across the wider catchment, with Bredy Farm being on the eastern side of the catchment (approximately 30 km from *Site 2*) and Exmouth Maer Lane situated near the mouth of the Exe (approximately 10 km from *Site 1*), one of the main watercourses draining to Lyme Bay. These data were subdivided into 2008 – 2014 (pre sanitary survey) and 2015 – 2022 (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 surveys were published. There is an additional monitoring station situated at Beer Quarry, closer to the shellfish beds, but monitoring data is only available from this station from 2020, and so it would not facilitate comparison.

Summary statistics from these monitoring stations are presented in Table 5.1 and Table 5.2, and the mean daily rainfall per month for the periods preceding and following the original sanitary surveys are shown in Figure 5.1 and Figure 5.2.

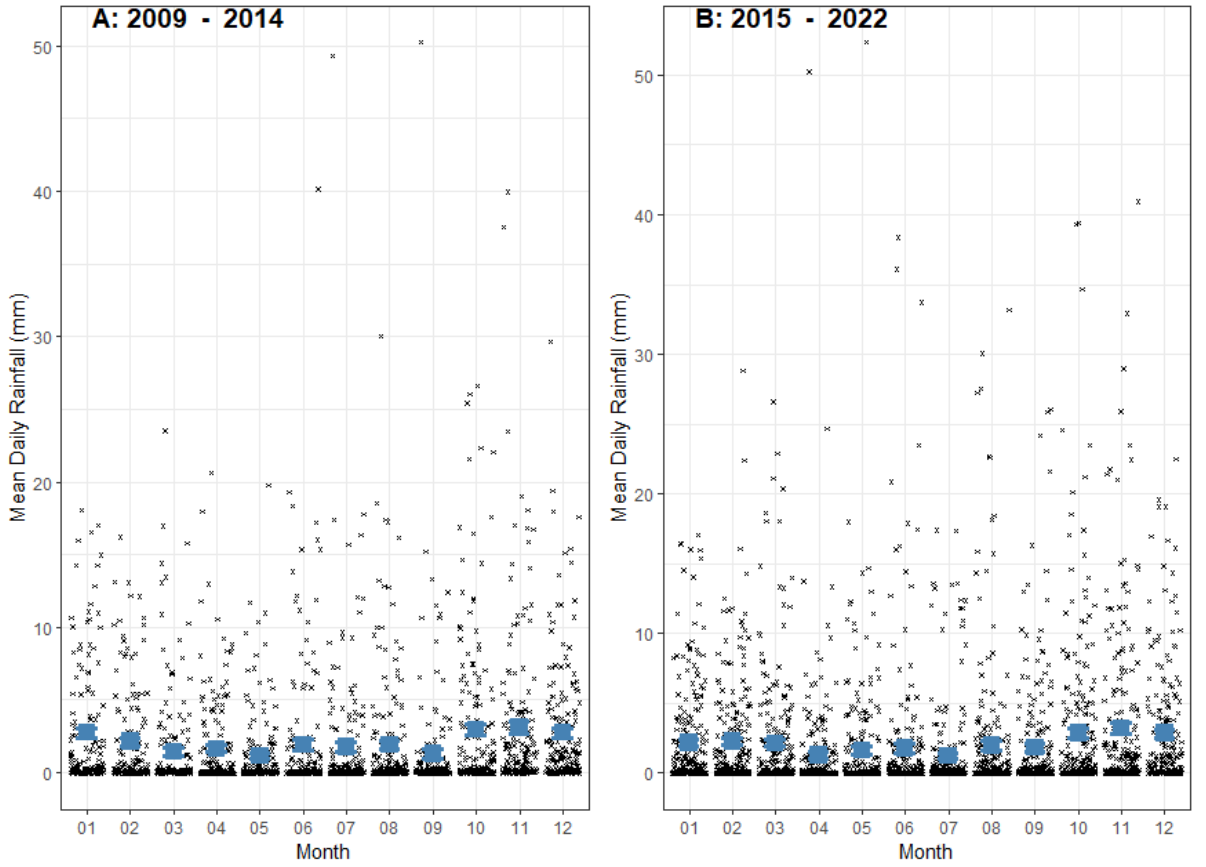
Table 5.1 Summary statistics for rainfall for the period preceding and following the publication of the original sanitary survey from the Bredy Farm RG monitoring station.

Period	Mean Annual Rainfall (mm)	Percentage Dry Days	Percentage Days Exceeding 10 mm	Percentage Days Exceeding 20 mm
2008 - 2014	798.1714	47.047	27.571	16.699
2015 - 2022	778.7463	48.717	26.04	15.638

Table 5.2 Summary statistics for rainfall for the period preceding and following the publication of the original sanitary survey from the Exmouth Maer Lane monitoring station.

Period	Mean Annual Rainfall (mm)	Percentage Dry Days	Percentage Days Exceeding 10 mm	Percentage Days Exceeding 20 mm
2009 - 2014	730.9667	47.501	24.988	15.086
2015 - 2022	752.7375	44.067	25.33	15.579

Figure 5.1 Mean daily rainfall per month for the Bredy Farm RG monitoring station (NGR: SY5072889984) for the periods (A) 2008 – 2014 and (B) 2015 – 2022.



Archive Daily Rainfall from the Exmouth Maer Lane RG monitoring station (#354876) at NGR: SY0242080390
Data provided by the Environment Agency, licenced under the Open Government Licence v3.0

Figure 5.2 Mean daily rainfall per month for the Exmouth Maer Lane RG monitoring station (NGR: SY0242080390) for the periods (A) 2009 – 2014 and (B) 2015 – 2022.

These data indicate that farther inland (Bredy Farm), rainfall has reduced slightly since the publication of the original sanitary survey, but that nearer the sea (Exmouth Maer Lane), annual rainfall has increased slightly. Two-sample t-tests indicated that there was no significant difference ($p>0.05$) in the mean daily rainfall per month for the pre- and post-sanitary survey periods, therefore rainfall has remained broadly similar pre and post 2015.

Rainfall leads to increased loading through two factors, elevated levels of surface runoff and more frequent and significant spill events from intermittent discharges, particularly during periods of heavy or extremely heavy rain. During initial consultations, the FBO suggested that the area "had the wettest and warmest winters and springs on record over the last 8 years". The authors of this review have not been able to verify this claim, although it is true that the decade 2011 – 2020 was on average 4% wetter than 1981 – 2010 and 9% wetter than 1961 – 1990 for the whole of the UK (Kendon *et al.*, 2021). However, as the rainfall patterns have remained (statistically) similar across the two time periods, significantly altered bacterial loading due to these factors is unlikely and as such RMP recommendations made in the original sanitary surveys to capture the influence of runoff and spill events remain valid. As discussed previously in this report, direct impacts from shoreline sources (runoff) are expected to be minimal and the fluvial plume from each of the main rivers

which will carry runoff from farther up each respective catchment can be considered in effect a point source and the positioning of RMPs should take account of the point source nature of these aggregated contamination sources.

6 Microbial Monitoring Results

6.1 Summary Statistics and geographical variation

The mean results of Official Control Monitoring for *E. coli* concentrations at RMPs sampled in the Lyme Bay BMPA since the original sanitary survey was published is presented in Figure 6.1 and summary statistics are presented in Table 6.1.

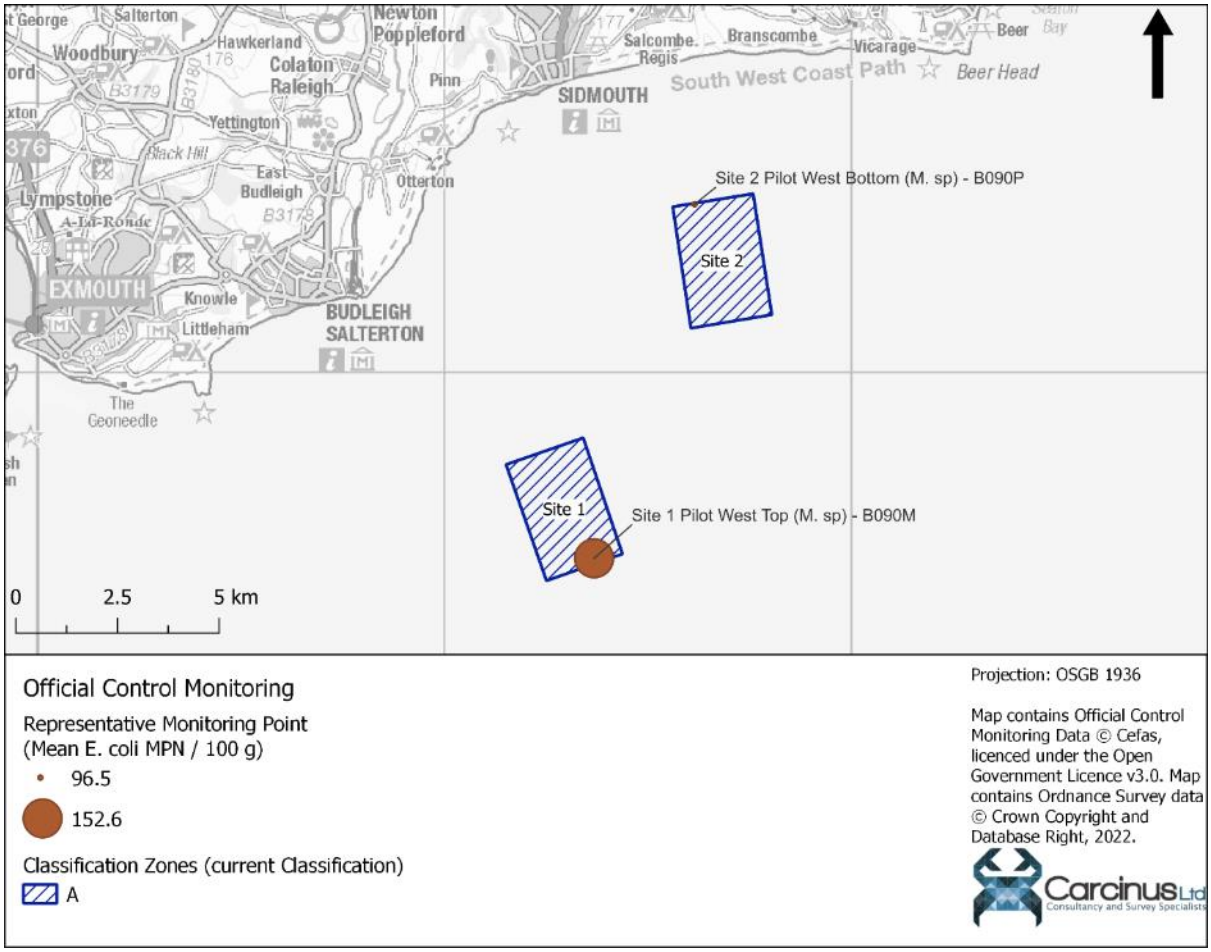


Figure 6.1 Mean E. coli results from Official Control Monitoring at bivalve RMPs in the Lyme Bay BMPA.

Table 6.1 Summary statistics of E. coli concentrations at bivalve RMPs sampled in the Lyme Bay BMPA.

RMP (Species)	NGR	Species	No.	First Sample	Last Sample	Mean	Min Value	Max Value	% > 230	% > 4,600	% > 46,000
Site 1 Pilot West Top (M. sp) - B090M	SY13687543	Mussel	95	16/03/2015	22/11/2022	152.6	18	3300	13.68	0	0
Site 2 Pilot West Bottom (M. sp) - B090P	SY16158413	Mussel	96	16/03/2015	22/11/2022	96.5	18	1300	10.42	0	0

The data presented above have been taken directly from the Cefas datahub[1] and have been taken at face value. Two RMPs have been sampled since the original sanitary survey was published, with the first sample being collected in 2015 and both are still in use. Compared to other BMPAs around the country, *E. coli* concentrations are low, with mean values <230 MPN/100 g and the maximum result ever recorded 3,300 MPN/100 g. Considered spatially, the monitoring results from Site 1's RMP (B090M) have been, on average higher than that of Site 2. This is a surprising result as logically one might expect the more near-shore position to capture greater contamination levels. A snapshot of contamination levels across both sites was captured during the November 2022 site visit (see Section 6.5), to give a greater understanding of the patterns of contamination across the site.

Figure 6.2 presents a boxplot of *E. coli* monitoring results from the two RMPs in the 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. The median and interquartile range for each of the sites were calculated and found to be very similar. Analysis of these indicates that it is unlikely that the differences between them have any statistical significance ($p>0.05$)[4].

[4] Significance was taken at the 0.05 level. All statistical analyses described in this section was undertaken in R (R Core Team, 2021). No statistically significant differences were found in the data ($p > 0.05$).

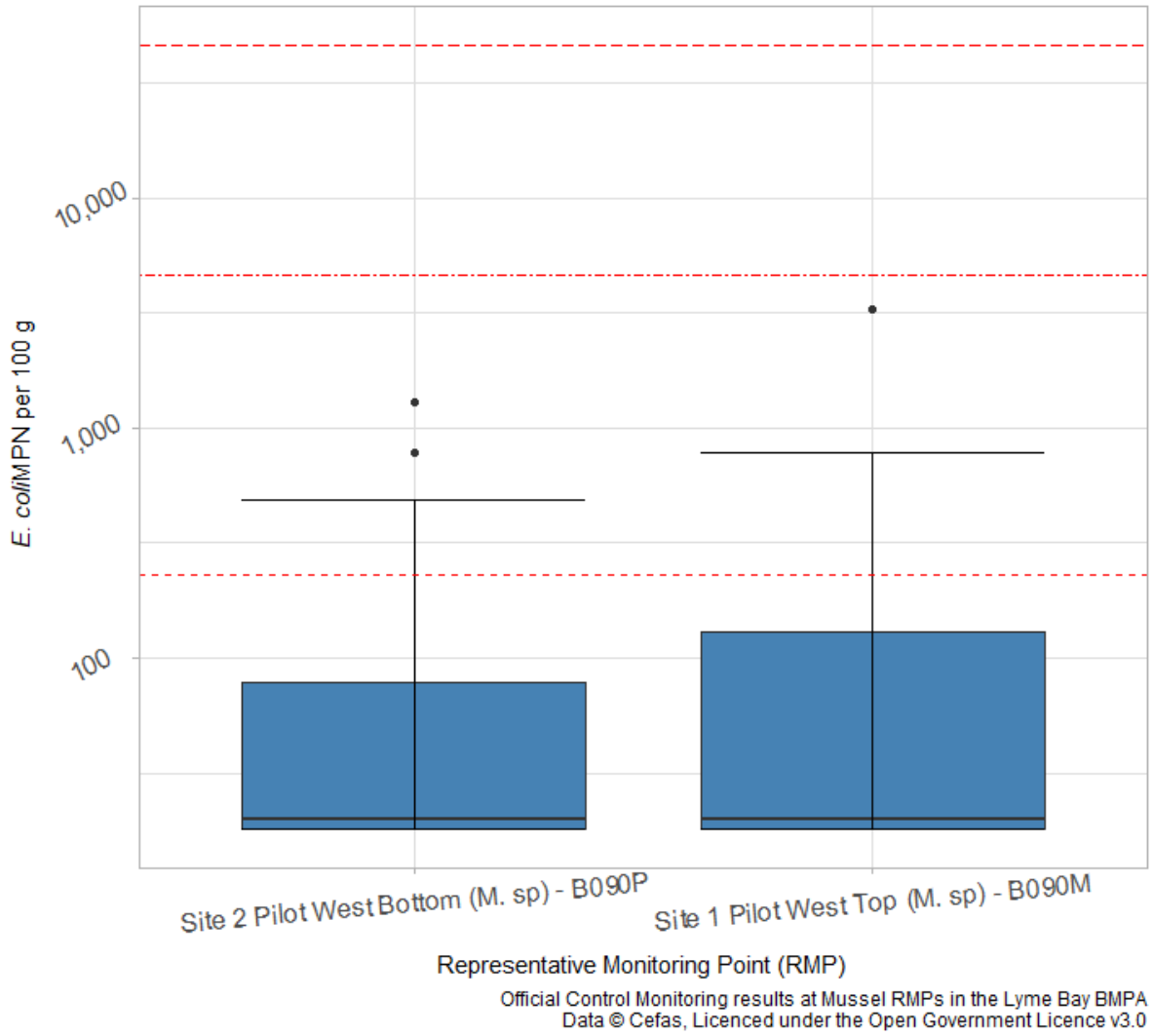


Figure 6.2 Boxplots of E. coli concentrations at mussel RMPs in the Lyme Bay BMPA since 2015. Central line indicates median value, box indicates lower-upper quartile range and whisker indicates minimum/maximum values, excluding outliers (points >1.5 x the interquartile range). Horizontal dashed lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g respectively.

6.2 Overall temporal pattern in results

The overall temporal pattern in shellfish flesh monitoring results for RMPs sampled in the Lyme Bay BMPA since monitoring began in 2015 is shown in Figure 6.3. No shellfish flesh monitoring data for this BMPA is available pre-2015 as no CZs were classified or RMPs designated. The model fitted to this data shows that water quality at both RMPs is very similar, with the trend lines consistently falling well below the 230 *E. coli* MPN/100 g threshold. This trend also illustrates that the majority of monitoring results are at or only slightly above the limit of detection (18 *E. coli* MPN/100 g), with 29 of 191 results across both RMPs at or above the 230 *E. coli* MPN/100 g lower class A limit and 9 of 191 across both RMPs above the upper class A limit of 700 *E.coli* MPN/100 g . The data also suggest that the Site 1 monitoring point returns these elevated results more frequently.

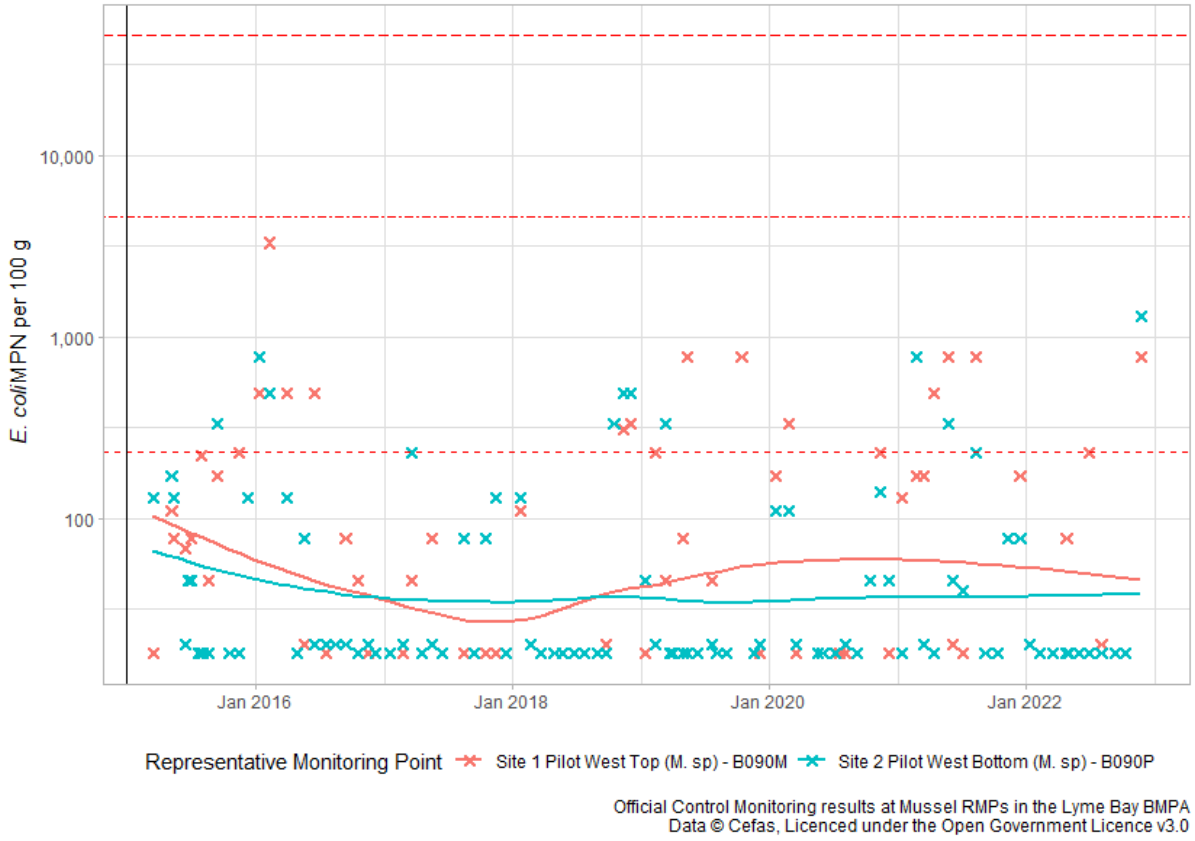


Figure 6.3 Timeseries of E. coli levels at mussel RMPs sampled in the Lyme Bay BMPA since 2015. Scatter plots are overlaid with a loess model fitted to the data. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g respectively.

6.3 Seasonal patterns of results

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

At both RMPs, median results are slightly higher in autumn and winter months, with summer generally returning the lowest *E. coli* concentrations. However, no statistically significant differences in the data were found, either when the data were pooled between RMPs or the RMPs considered individually. The desk-based assessment found that discharges of pollution to coastal waters in this BMPA were likely to be highest in summer months due to increased population size and vessel numbers because of tourism. The lower results in summer months are likely to be reflective of the additional UV irradiance of the water column, stimulating increased die-off of bacterial contamination during summer.

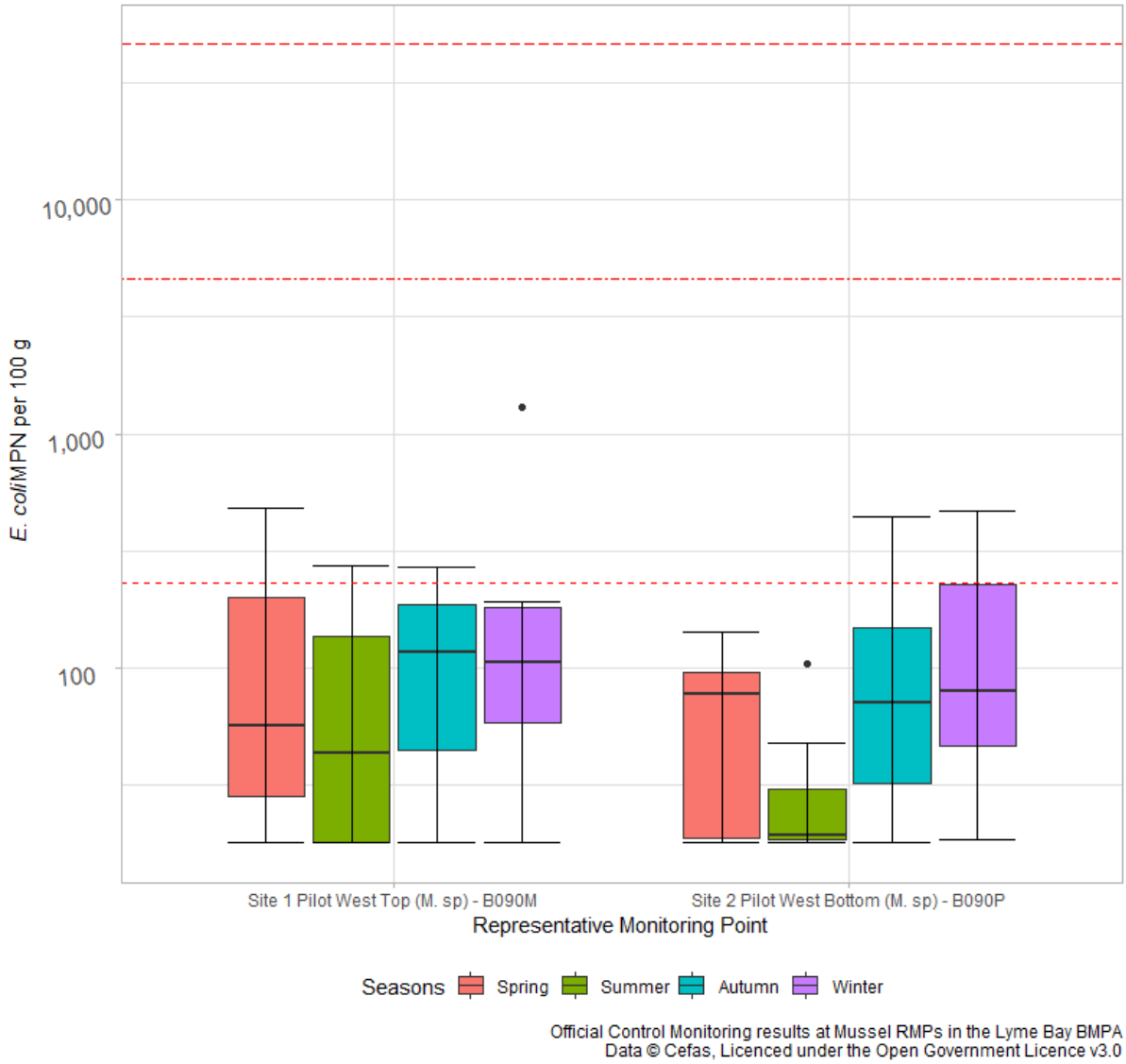


Figure 6.4 Boxplots of E. coli levels per season at mussel RMPs sampled within the Lyme Bay. Horizontal dashed lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g respectively.

6.4 Action States

An Action State was triggered within both *Site 1* and *Site 2* following a result of 490 and 790 *E. coli* MPN / 100 g respectively on 13th January 2016. Subsequent Action State Sampling recorded continued elevated results indicating contamination was ongoing. The following results were recorded:

- 20 and 1,300 *E. coli* MPN/100 g from Site 1 and Site 2 respectively on 19 January 2016.
- 310 *E. coli* MPN/100 g from Site 1 on 28 January 2016.
- 780 and 130 *E. coli* MPN/100 g from Site 1 and Site 2 respectively on 02 February 2016.

An Action State was triggered at *Site 1* following a result of 35,000 *E. coli* MPN/100 g on 16 October 2018.

An Action State was triggered at *Site 1* following a result of 780 *E. coli* MPN/100 g at on 13 May 2019.

An Action State was triggered at *Site 2* following a result of 780 *E. coli* MPN/100 g on 22 February 2021.

An Action State was triggered at *Site* 1 following a result of 780 *E. coli* MPN/100 g on 10 August 2021. Subsequent Action State Samples on 16 and 23 August both returned results of 20 *E. coli* MPN/100 g.

These Action State results suggest that occasional results above 700 *E.coli/*100g do occur at CZs within this BMPA. The work done by *Lamb et al.* found that it is challenging to reliably track back pollution incidents to specific outfalls given the distance offshore that Lyme Bay CZs are situated.

6.5 November 2022 Site Visit

A visit to the Lyme Bay shellfish farm was facilitated by the operator of the mussel farm on 29 November 2022. During this visit, replicate shellfish flesh and water samples were collected and analysed for the concentration of *E. coli* within them. Shellfish samples were collected in accordance with standard sampling protocols for this site but should not be considered Official Control samples. Water samples were taken from a mixed sample from surface – 7 m water depth. A summary of the results is tabulated in Table 6.2 and presented spatially in Figure 6.5.

During the visit, some of the specific details of this site were explained to both Carcinus and FSA representatives, particularly relating to the nature of the harvesting operation. Mussels on *Site 1* are located primarily at the northern and southern ends of this CZ, but at *Site 2* they are more uniformly distributed. Once a line has been cleared of mussels, it will not be harvested again for approximately 3 years whilst the mussels on that line grow to harvestable size. Evidence of rope damage by external vessels moving through the site was also seen.

Water sample results represent a snapshot of conditions on the day of survey, whereas shellfish flesh samples are indicative of contamination levels in the area in the days preceding as it takes time for the shellfish to bioaccumulate contamination. The results indicate that, in terms of *E. coli* concentrations in shellfish flesh, there is a gradient of increasing concentrations toward the nearshore extent of each of the mussel zones. This pattern does however not correlate with the water sample results which show no clear pattern. It should be noted that are a snapshot, the pattern of results may not always match those reported here. Furthermore, the monitoring results illustrate the inherent variability in *E. coli* concentration analysis of both shellfish flesh and water samples, with replicate samples collected from the same locations showing very different results, i.e., the shellfish flesh samples collected from the NW corner of *Site 1* returned results of 230 MPN/100 g

(the Class A threshold) and 1,100 MPN/100 g, well above the maximum permitted for a Class A zone. This illustrates the importance of considering shellfish flesh results over an extended period of time. It should also be noted that the results from sampling during the site visit were preceded by results above the class A limit from OC sampling on 22 November (780 MPN/100g and 1300 MPN/100g at Site 1 and Site 2, respectively).

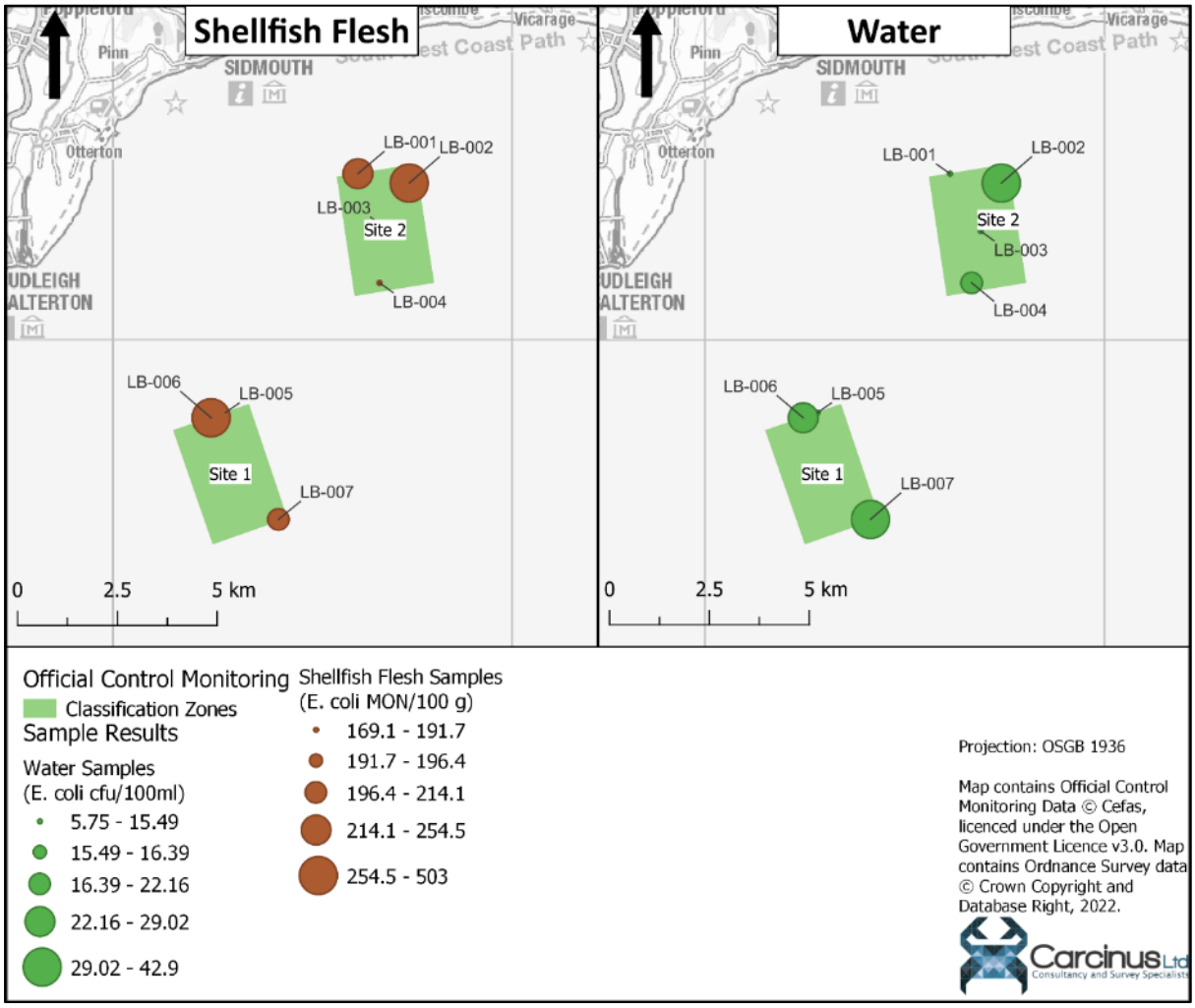


Figure 6.5 *Results of water and shellfish flesh samples collected at the Lyme Bay mussel farm on 29 November 2022.*

Table 6.2 Sample log of shellfish flesh and water sample collection at the Lyme Bay mussel farm on 29 November 2022.

Date / Time	Latitude	Longitude	Sample Name	Notes	Water Samples *E. coli* cfu/100 ml				Shellfish Flesh Samples *E. coli* MPN/100 g			
					A	B	Mean	Difference	1	2	Mean	Difference
29/11/2022 13:05	50.65091	-3.18755	LB-001	Site 2 RMP	11	3	5.745	8	220	230	224.944	10
29/11/2022 13:20	50.64898	-3.16935	LB-002	Site 2 NE Corner	40	46	42.895	6	490	140	261.916	350
29/11/2022 13:35	50.63815	-3.17642	LB-003	Site 2 Mid Point	15	16	15.492	1	78	490	195.499	412
29/11/2022 13:55	50.62645	-3.17928	LB-004	Site 2 South End	15	21	17.748	6	220	130	169.115	90
29/11/2022 14:20	50.59673	-3.23303	LB-005	Site 1 NE Corner	30	8	15.492	22	130	280	190.788	150
29/11/2022 14:30	50.59552	-3.23808	LB-006	Site 1 NW edge	30	21	25.1	9	230	1100	502.991	870
29/11/2022 14:40	50.57292	-3.2137	LB-007	Site 1 RMP	60	15	30	45	170	230	197.737	60

7 Conclusion and overall assessment

The area of study considered in detail within this report extends from the Straight Point Ranges in Exmouth (on the western side of the area) to Chesil Beach (on the eastern side of the area). This includes the Operational Catchments (as defined by the EA) of the Sid, Otter, Lim, Axe and West Dorset Rivers. The report has considered point sources from within these catchments, but in general only point sources that discharge directly to the coastal waters of Lyme Bay have been considered in detail. Sources of both point and diffuse contamination for the inland sections of each river catchment are considered to contribute to the background level of contamination that each river discharges to Lyme Bay.

The Lyme Bay mussel farm is the largest offshore aquaculture production site in England and Wales. It is a privately operated fishery, with the bed areas leased from the Crown Estate. No Devon and Severn IFCA byelaws apply to the harvest of shellfish from this fishery, and the output is estimated at 80-100 metric tonnes during the harvest season (July to March the following year). The Local Enforcement Authority with jurisdiction for this BMPA in terms of food hygiene and Official Control Purposes is Torbay Council. There are currently two Classification Zones in this BMPA, both approximately 6 km² and holding Class A classifications. Both CZs are more than 3 km from the nearest coastline.

Since the publication of the original report, the results of the 2021 Census have been collected and made available. Comparison of this data, with that of the 2011 census as reported in the original sanitary survey, suggests that the population of the catchment has increased by around 10,000 people. The main population centres however continue to be the seafront towns along the East Devon and Dorset coastlines. No comparison of tourist statistics was available although two towns (Sidmouth and Lyme Regis) in the catchment area were in the top-5 most searched tourist destinations in the UK for the summer of 2022. Limited direct impacts from surface runoff from these towns are expected however, as the CZs are located >3 km offshore. Runoff from urban areas of the study area will reach the coastal waters of Lyme Bay via the main rivers (the Axe, Otter, Exe and Sid). The fluvial plume of each river can be considered a point source that discharges the contamination from the aggregation of point sources farther up the catchment of each river.

No upgrades or improvements to the storage capacity, treatment methodologies or consented discharge volume of water company assets in the catchment have occurred since the 2015 sanitary survey, based on the October 2022 update to the EA's consented discharge database. Limited comparison of EDM data is possible as only one asset (Exmouth STW) was fitted with this capability at the time of the original sanitary survey. EDM data suggests that this discharge is spilling less frequently in recent years than at the time of the original sanitary survey. Overall, the direct impact of pollution from outfalls on the wastewater treatment network are expected to be minor, given that no outfall is located within 3.5 km of the CZs. The assets that discharge directly to Lyme Bay will contribute to the background levels of contamination in the coastal waters. A study aiming to back-track a pollution event within Lyme Bay found it was very challenging to link a specific pollution

event at either CZ to a defined discharge location, given the complex hydrodynamic regime of Lyme Bay. Contamination from point sources in Lyme Bay will generally move offshore with each tidal cycle, and so there may be a slight gradient of increasing contamination levels as you move toward the coast but no single discharge is expected to have a significant direct impact.

Livestock populations within the catchment (based on the annual June Survey of Agriculture) were provided by DEFRA under the Open Government Licence v3.0 for 2013 and 2021 to give an indication of changes in livestock populations in the catchment. These data show that livestock populations increased significantly, although most of this increase was driven by a 130% increase in poultry populations. Pasture areas remain similar in size; there is a significant area of pasture immediately adjacent to the shoreline between Sidmouth and Seaton, as well as several areas in the upper reaches of the catchment. During initial consultations, the Environment Agency indicated that since the publication of the original sanitary survey there have been several improvements to slurry/muck storage infrastructure in the catchment, as well as new legislation brought in that should all have reduced the overall risk of contamination from this source. As with run-off from urban areas, there are expected to be limited direct impacts from agricultural run-off given the offshore position of both Classification Zones. Furthermore, because most of the coastline of Lyme Bay consists of relatively tall cliffs, agricultural runoff will be restricted to the main rivers, the Sid, Axe, Lim and Exe. This diffuse contamination will therefore contribute to the overall pollution discharged by each river/estuary.

The coastline of Lyme Bay contains a variety of habitats that support a significant diversity of wildlife, including water and wading birds. The average count of waterbirds in the Axe estuary in the five winters to 2019/2020 was a reduction on the value reported in the original sanitary survey report. These wading bird species generally forage (and defecate) relatively close to their roosting/nesting locations, and so limited impacts on the Lyme Bay Classification Zones are expected. During the November 2022 site visit, very few (<10) seabirds were counted, and these were distributed relatively uniformly across the site, rather than aggregating at the navigational buoys at the edge as was predicted in the original sanitary survey. Some marine mammals may forage in the area, although for all groups of wildlife it is impossible to define RMP locations that will reliably capture this source of contamination, and any contamination is likely to be minor.

The main shipping routes of the English Channel are located >10 km south of the Classification Zones, and so whilst some merchant shipping vessels may enter the area from time-to-time, and are legally permitted to make overboard discharges in this area, impacts are expected to be minor as the main shipping routes are located to the south and the entry/exit routes of the main commercial ports of the south coast do not require moving through either CZ or the waters around them. During summer months, Lyme Bay is extremely popular with recreational boaters and vessels of a sufficient size to contain onboard toilets may make overboard discharges from time to time. However, the long lines of the mussel farm do represent a potential snag risk, and so it may be that vessels choose

to avoid the area, although evidence of damage caused by passing vessels was noted in the November site visit. During initial consultations, D&S IFCA stated that from 2023, a byelaw prohibiting the use of towed fishing gear within the boundaries of the mussel bed will be imposed, which should reduce any impact from overboard discharges from fishing vessels. Overboard discharges from vessels will contribute to the background levels of contamination of the Lyme Bay coastal waters, and in instances where a discharge is made in the immediate vicinity of the mussel farm, will have some direct impact. Without information of the exact nature, timing and extent of such discharges it is impossible to reliably account for it in any RMP location.

Official Control monitoring results are available from both RMPs within the Lyme Bay BMPA from 2015 present. These results indicate results above the class A limit have been recorded at both RMPs Site 1 (B090M) and Site 2 (B090M), although boxplots suggest that the median values are very similar and there are no significant differences between the data. Occasional Action State results have been reported at both RMPs.

Samples collected during a site visit on 29 November 2022 indicated that there was generally higher concentrations of *E. coli* in shellfish samples at nearshore sampling locations, though the trend was not clear, and was also not supported by the water sample results collected. A correlation between water and shellfish flesh samples would not necessarily be expected as water samples are an indication of contamination levels on the day of sampling, whereas shellfish bioaccumulate *E. coli* and so the concentration in these samples is more indicative of the preceding days.

Based on the information available, there do not appear to have been any significant changes to the main sources of contamination to this BMPA since the 2015 sanitary survey. There are no direct sources of contamination due to the position of both CZs more than 3 km from the nearest coastline. Point and diffuse sources of contamination from inland sources will reach the coastal waters of Lyme Bay via the fluvial plume from each of the main rivers within the study area. Contamination from sewage discharges with outfalls in Lyme Bay will also contribute to the level of contamination in coastal waters. Some direct contamination from vessel discharges may occur as they have the capacity to move within a short distance of the CZs, but it is impossible to reliably account for this in any updated sampling plan. Water sample results collected during the November 2022 site visit indicate that the Lyme Bay shellfish beds are in relatively 'clean' waters, but occasional high results are still occurring that cannot be definitely tied to one specific source due to the bioaccumulation of *E.* coli within shellfish and the complex hydrodynamics of Lyme Bay. The authors of this review do not feel that a shoreline survey is warranted as it would not provide additional information for use in determining a sampling plan. This is because of the limited direct influence of shoreline sources on the bacteriological health of this BMPA.

Having reviewed and compared the findings of the desk-based study with the original sanitary survey, the FSA is content that a shoreline assessment is not required.

8 Recommendations

Recommendations for the Classification Zones within the Lyme Bay BMPA are described below and are summarised in Table 8.1.

8.1 Mussels

Site 1

This CZ covers an area of approximately 6 km² and is the further west of the two Lyme Bay Classification Zones, sitting approximately 5 km from the nearest coastline. At the time of the original sanitary survey, the zone consisted of two pilot lines in the south eastern corner, but it has since expanded to its current distribution of several lines at the southern end, no lines in the middle section and then another set of lines at the northern end. Across Site 1 there are 60 lines in total. The original sanitary survey recommended that for initial monitoring of the pilot lines, the RMP should be positioned at the western end, but that as the site expanded, the RMP should be moved as far inshore, and as far west as possible. However, to date the only monitoring point that has been used is the pilot position, Site 1 Pilot West B090M. It is not clear why the RMP was never moved as the plot expanded.

It is challenging to reliably define a single RMP location that is adequately representative of the contamination affecting this zone and is also adequately representative of the stock being harvested. This is because there are no direct shoreline contamination sources in the vicinity, any contamination from boats or wildlife is spatially and temporally variable, and it is virtually impossible to model how contamination from sewage discharges will affect the zone. Furthermore, harvesting of the lines takes place in such a way that only a proportion of each site has harvestable size mussels at any one time. Once a line has been cleared of stock and spat re-laid, it takes approximately 3 years before that line is harvested again.

Both the original sanitary survey and this review confirm there are no direct sources of contamination impacting the Lyme Bay BMPA. Any contamination is likely a result of the combined effect of contamination from indirect coastal sources. A 'fixed' sampling point may therefore be replaced by a 'virtual sampling point' identified within the classification zone. This will allow for samples to be collected from 'non-fixed points' in the zone depending on where harvesting is currently taking place. The actual location of sampling must be recorded in the same manner as if from a 'fixed' RMP on each sampling occasion. If a comparison between samples taken over time indicates markedly different results, the use of a virtual sampling point should be reviewed and a fixed RMP location considered.

Site 2

This CZ also covers an area of approximately 6 km² and is the further east and inshore of the two zones, sitting approximately 3 km from the nearest coastline. At the time of the original sanitary survey, the zone consisted of one pilot line in the north west corner, although it has since expanded so that mussel lines now fill the majority of the zone, with 187 lines currently populated (as of November 2023). The original sanitary survey recommended initially placing the RMP at the western end of the pilot lease lines, but gave a general recommendation of placing the RMP as far inshore, and as far west as possible within the

zone. The pilot RMP, Site 2 Pilot West B090P, is still in use, although it still represents the furthest inshore and furthest west extent of harvesting stock in the zone. As with site 1, a virtual sampling point within the boundary of the zone depending on where harvesting is taking place should be used. If a comparison between samples taken over time indicate markedly different results, the use of a virtual sampling point should be reviewed and a fixed RMP location considered.

8.2 General Information

8.2.1 Location Reference

Production Area	**Lyme Bay**
Cefas Main Site Reference	M090
Ordnance survey 1:25,000	Explorer 115 & 116
Admiralty Chart	3315

8.2.2 Shellfishery

Species	Culture Method	Seasonality of Harvest
Mussels (*Mytilus* spp.)	*Cultured*	*Year round, though avoiding spawning season April – June.*

8.2.3 Local Enforcement Authority(s)

Name	**Torbay Council** Town Hall, Castle Circus, Torquay, TQ1 3DR
Website	https://www.torbay.gov.uk
Telephone number	01803 201201
E-mail address	Food.safety@torbay.gov.uk

*Table 8.1 Proposed sampling plan for the Lyme Bay BMPA. Suggested changes are given in **bold red** type.*

Classification Zone	RMP	RMP Name	NGR (OSGB 1936)	Lat / Lon (WGS 1984)	Species Represented	Harvesting Technique	Sampling Method	Sampling Species	Tolerance	Frequency
Site 1	B090M	Site 1-VMP	**Actual location of sampling**	**Actual location of sampling**	Mussels	Rope	Hand	*Mytilus* spp.	NA (within the boundary of the zone)	Monthly
Site 2	B090P	Site 2-VMP	**Actual location of sampling**	**Actual location of sampling**	Mussels	Rope	Hand	*Mytilus* spp.	NA (within the boundary of the zone	Monthly

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Appendices

Appendix I. Annual summary of EDM data from intermittent discharges in the Lyme Bay catchment recorded in 2021.

Asset Name	Permit Reference	Asset Type	NGR	Receiving Water	No. spills in 2021	Duration (hrs) spills in 2021	Distance (km) to nearest CZ
HONITON WASTEWATER TREATMENT WORKS	NRA-SW-3869	Storm tank at WwTW	ST 1522 0094	RIVER OTTER	192	3709.13	16.72
TALATON WASTEWATER TREATMENT WORKS	SWWA 2064	Inlet SO at WwTW	SY 0765 9855	TRIB OF RIVER TALE	118	1981.82	16.53
TATWORTH WWTW	203249	Storm tank at WwTW	ST 3371 0479	FORTON BROOK	135	1968.61	26
KILMINGTON WWTW	DRA 1559	Storm tank at WwTW	SY 2786 9759	RIVER AXE	186	1482.3	16.73
EXTON NORTH PS	203229	Storm discharge at pumping station	SX 9769 8689	RIVER CLYST (ESTUARINE)	110	1423.08	16.58
MAER ROAD CSO EXMOUTH	200125/CS/01	SO on sewer network	SY 0107 8006	LITTLEHAM BROOK	74	1128.35	10.7
HONITON WASTEWATER TREATMENT WORKS	NRA-SW-3869	Inlet SO at WwTW	ST 1522 0094	RIVER OTTER	130	1050.15	16.72
THE HAM PS TANK & CSO - SIDMOUTH	200835	Storm discharge at pumping station	SY 1288 8732	(S) RIVER SID AND (C) LYME BAY	74	1028	4.25
SEATON STW	202563	Storm tank at WwTW	SY 2529 9081	RIVER AXE ESTUARY(E)	61	882.44	10.03
FENITON WASTEWATER TREATMENT WORKS	NRA-SW-3706	Storm tank at WwTW	SY 1160 9890	RIVER OTTER	71	878.18	15.36

Asset Name	Permit Reference	Asset Type	NGR	Receiving Water	No. spills in 2021	Duration (hrs) spills in 2021	Distance (km) to nearest CZ
COLYTON & COLYFORD WWTW	DRA 441	Storm tank at WwTW	SY 2592 9270	RIVER AXE	74	858.63	11.77
EBFORD PUMPING STATION	202365	Storm discharge at pumping station	SX 9758 8794	RIVER CLYST (ESTUARINE)	261	703.69	17.27
CHIDEOCK STW	401068	Storm tank at WwTW	SY4254092240	RIVER WINNIFORD(S)	62	700	26.16
BROADWINDSOR WWTW	NRA-SW-4946	Storm tank at WwTW	ST 4328 0325	TRIBUTARY OF DRIMPTON STREAM	41	673.96	31.87
PERRY STREET CSO	201826	SO on sewer network	ST 3360 0537	STREAM (S)	76	655.58	26.39
EXMOUTH SEWAGE TREATMENT WORKS	201965	Storm tank at WwTW	SY 0379 7919	LYME BAY(C)	49	628.34	7.86
GITTISHAM PUMPING STATION	201142	Storm discharge at pumping station	SY 1342 9887	TRIBUTARY OF RIVER OTTER	62	548.81	14.96
PAYHEMBURY STW	SWWA 2498	Storm tank at WwTW	ST0873001220	PAYHEMBURY STREAM (S)	95	499.33	18.48
LYME REGIS (UPLYME) STW	3269	Storm tank at WwTW	SY 3338 9329	TRIBUTARY OF THE RIVER LIM	30	468.54	18.13
SOUTHGATE PUMPING STATION	401557	Storm discharge at pumping station	ST4791700952	RIVER BRIT	56	440	34.56
LIME KILN TANK CSO	200111/CS/01	SO on sewer network	SY 0794 8192	ENGLISH CHANNEL	48	432.95	5.51

Asset Name	Permit Reference	Asset Type	NGR	Receiving Water	No. spills in 2021	Duration (hrs) spills in 2021	Distance (km) to nearest CZ
AWLISCOMBE PUMPING STATION	201638	Storm discharge at pumping station	ST 1364 0112	TRIB OF RIVER WOLF	37	417.78	17.15
BROADHEMBURY PUMPING STATION	201640	Storm discharge at pumping station	ST 0987 0467	RIVER TALE	42	401	21.39
HORSLEARS PUMPING STATION	203701	Storm discharge at pumping station	SY 2881 9773	RIVER AXE(S)	52	396.53	17.43
EXTON SOUTH PUMPING STATION	203230	Storm discharge at pumping station	SX 9809 8624	WOODBURY BROOK (ESTUARINE)	36	377.77	15.89
CHARD ROAD COMBINED SEWER OVERFLOW	DRA 1560	SO on sewer network	SY 2989 9949	RIVER AXE	44	351	19.48
MUSBURY & WHITFORD STW	NRA-SW-6684	Inlet SO at WwTW	SY 2624 9507	(S) RIVER AXE	85	326.01	13.74
NETHERBURY PUMPING STATION	402106	Storm discharge at pumping station	SY4721899206	RIVER BRIT	33	292.85	33.13
TATWORTH WWTW	203249	Inlet SO at WwTW	ST 3368 0481	FORTON BROOK	54	249.89	26
DRIMPTON PUMPING STATION	201669	Storm discharge at pumping station	ST 4164 0516	TEMPLE BROOK	23	249.23	31.78
WEST ROAD FOUNDRY PUMPING STATION	402031	Storm discharge at pumping station	SY4546993064	RIVER SIMENE	36	228.23	29.2

Asset Name	Permit Reference	Asset Type	NGR	Receiving Water	No. spills in 2021	Duration (hrs) spills in 2021	Distance (km) to nearest CZ
WILMINGTON STW	NRA-SW-2877	Inlet SO at WwTW	ST2161000010	(S) UMBORNE BROOK	19	189.78	16.13
SOUTH STREET CSO	402084	SO on sewer network	SY4645092280	RIVER BRIT	59	183.67	29.92
MOSTERTON PUMPING STATION	201546	Storm discharge at pumping station	ST 4575 0527	RIVER AXE	48	162.56	35.06
AXMOUTH PSCSO/EO	201605	Storm discharge at pumping station	SY 2553 9107	RIVER AXE (S)	22	160.56	10.38
OFFWELL WASTEWATER TREATMENT WORKS	200366	Storm tank at WwTW	SY1919098870	TRIB OF OFFWELL BROOK	27	145.46	14.57
SOUTH BRIDGE COMB. STORM OVERFLOW	400444	Storm discharge at pumping station	SY4660092240	RIVER ASKER(S)	35	141.42	30.05
WESTON PUMPING STATION	202181	Storm discharge at pumping station	ST 1422 0006	RIVER OTTER	18	134.8	16.01
HORN BRIDGE PSEO/CSO	003956/PC/01	Storm discharge at pumping station	SY 3366 9286	RIVER LIM	34	130.29	18.17
CHARMOUTH SEWAGE DISPOSAL WORKS	401625	Inlet SO at WwTW	SY3678091710	LYME BAY(C) & RIVER CHAR(S)	65	123.41	20.54
HARTOPP ROAD CSO	200122/CS/01	Storm discharge at pumping station	SX 9996 8146	EXE ESTUARY	50	118.9	12.14
CHURCHINFORD STW	002728/FN/01	Inlet SO at WwTW	ST2178012410	RIVER OTTER	16	116.37	28.33

Asset Name	Permit Reference	Asset Type	NGR	Receiving Water	No. spills in 2021	Duration (hrs) spills in 2021	Distance (km) to nearest CZ
IMPERIAL ROAD TANK CSO	200123/CS/01	SO on sewer network	SX 9986 8111	EXE ESTUARY	15	102.4	12.14
BROADWINDSOR WWTW	NRA-SW-4946	Inlet SO at WwTW	ST 4328 0325	TRIBUTARY OF DRIMPTON STREAM	81	97.6	31.87
OTTERY ST MARY ATTENUATION TANK	DRA 96	SO on sewer network	SY 0947 9510	THE RIVER OTTER	10	91.53	12.63
GLEBE FARM PUMPING STATION	201641	Storm discharge at pumping station	ST 1272 0040	TRIB OF THE RIVER OTTER	42	86.62	16.59
WEST BANK PUMPING STATION	201380	Storm discharge at pumping station	SY 0929 9508	TRIB OF RIVER OTTER	12	82.21	12.7
BRIDPORT WEST STREET CSO	402083	SO on sewer network	SY4632093020	RIVER BRIT	47	76.07	30
BRANSCOMBE WWTW	003101/FN/01	Storm tank at WwTW	SY 2059 8832	BRANSCOMBE STREAM	17	75.55	4.95
GUN CLIFF PSEO/CSO	200061/PC/01	Storm discharge at pumping station	SY 3426 9207	RIVER LIM	10	72.89	18.36
THE HAM PS TANK & CSO - SIDMOUTH	200835	Storm discharge at pumping station	SY 1288 8732	(S) RIVER SID AND (C) LYME BAY	35	62.88	4.25
EAST BUDLEIGH PUMPING STATION	201671	SO on sewer network	SY 0774 8419	RIVER OTTER	17	60.67	7.48
BEER CAR PARK PUMPING STATION	202698	Storm discharge at pumping station	SY 2268 8783	LYME BAY/SEATON BAY(C)	29	60.52	6.14

Asset Name	Permit Reference	Asset Type	NGR	Receiving Water	No. spills in 2021	Duration (hrs) spills in 2021	Distance (km) to nearest CZ
BRIDPORT SEWAGE TREATMENT WORKS	400673	Storm tank at WwTW	SY4555089120	LYME BAY(C)	9	59.75	28.36
BRIDPORT WATER RECYCLING CENTRE PS	400678	Storm discharge at pumping station	SY4555089120	LYME BAY (C)	9	59.5	28.36
FORTESCUE COMBINED SEWER OVERFLOW	201185	SO on sewer network	SY 1331 8903	THE RIVER SID VIA SWS	23	48.27	5.47
TIPTON ST JOHN PUMPING STATION	201651	SO on sewer network	SY 0899 9174	RIVER OTTER	22	47.98	10.13
LEE LANE PUMPING STATION	402029	Storm discharge at pumping station	SY4808993847	RIVER ASKER	9	46	31.93
TALATON PUMPING STATION	201650	Storm discharge at pumping station	SY 0685 9982	TRIBUTARY OF RIVER CLYST	16	45.79	18.02
RECREATION GROUND CSO	201843	SO on sewer network	SY 0873 8987	BACK BROOK	10	40.13	9
WEST BAY SLUICES	402047	Storm discharge at pumping station	SY4621090490	BRIDPORT HARBOUR(WEST BAY)(C)	13	36.92	29.26
MARINE PARADE CSO	200114/CS/01	SO on sewer network	SY 0664 8186	KNOWLE STREAM	11	31.18	6.39
SHAND PARK CSO	203642	SO on sewer network	SY 2938 9843	TRIB OF THE RIVER AXE	15	30	18.34
HARBOUR ROAD SPS (SEATON)	SWWA 248	Storm discharge at pumping station	SY 2532 9024	RIVER AXE ESTUARY	20	29.26	9.7

Asset Name	Permit Reference	Asset Type	NGR	Receiving Water	No. spills in 2021	Duration (hrs) spills in 2021	Distance (km) to nearest CZ
PHEAR PARK PSEO/CSO	200124/PC/01	Storm discharge at pumping station	SX 9996 8146	EXE ESTUARY	18	27.44	12.14
THE GREEN COMBINED SEWER OVERFLOW	201842	SO on sewer network	SY 0793 8529	RIVER OTTER	14	27.33	7.78
ASH GROVE CSO	200127/CS/01	SO on sewer network	SY 0003 8307	A TRIBUTARY OF THE EXE ESTUARY	22	26.86	12.66
WINSHAM WASTEWATER TREATMENT WORKS	DRA 1539	Inlet SO at WwTW	ST 3752 0599	RIVER AXE	14	25.92	29.39
WINSHAM WASTEWATER TREATMENT WORKS	DRA 1539	Inlet SO at WwTW	ST 3752 0599	RIVER AXE	14	25.92	29.39
BUTTS HILL PUMPING STATION	201378	Storm discharge at pumping station	SY 1005 9599	GROUNDWATER VIA INFILT SYSTEM	16	23.91	13.16
FOLLET ROAD CSO	201636	SO on sewer network	SX 9622 8814	RIVER EXE (E)	34	23.68	18.5
COBB GATE PUMPING STATION	3965	Storm discharge at pumping station	SY 3384 9143	LYME BAY (C)	18	22.34	17.71
MEMORIAL GARDENS PS	202679	Storm discharge at pumping station	SY 2268 8783	LYME BAY AND SEATON BAY (C)	28	21.59	6.14
GRARY LANE CSO	201689	SO on sewer network	SY 0718 8227	TRIB OF RIVER OTTER (S)	16	20.24	6.28

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HAMS PATH COMBINED SEWER OVERFLOW	401558	SO on sewer network	ST4799401077	RIVER BRIT(S)	16	17.73	34.68
MANSTONE LANE CSO	201835	SO on sewer network	SY 1262 8895	WOOLBROOK	37	17.6	5.73
WEST BRIDGE CSO	402082	SO on sewer network	SY4627093030	RIVER BRIT	18	17.17	29.95
SEATOWN PUMPING STATION	43190	Storm discharge at pumping station	SY4208091780	WINNIFORD (S)	6	16.5	25.58
CLAPTON PUMPING STATION	203475	Storm discharge at pumping station	ST 4131 0639	CLAPTON STREAM	5	15.53	32.35
MEADOW ROAD TANK CSO	200112/CS/01	SO on sewer network	SY 0597 8206	KNOWLE STREAM	14	15.39	7.03
THORNCOMBE WWTW	NRA-SW-3897	Storm tank at WwTW	ST 3820 0376	RIVER SYNDERFORD	13	15.15	28.29
LYMPSTONE OUTFALL PUMPING STATION	202165	SO on sewer network	SX 9874 8386	RIVER EXE ESTUARY	13	14.23	14.17
WEST MILTON WATER RECYCLING CENTRE	41658	Inlet SO at WwTW	SY4989696271	TRIB OF MANGERTON RIVER	5	14.07	34.42
MILLSTREET CSO	201381	SO on sewer network	SY 0939 9511	RIVER OTTER VIA SWS	12	13.55	12.67
EXETER ROAD CSO - EXMOUTH	200128/CS/01	SO on sewer network	SX 9997 8201	WITHYCOMBE BROOK	12	13.47	12.31
THE GREEN TANK CSO	200113/CS/01	SO on sewer network	SY 0617 8199	KNOWLE STREAM	9	11.82	6.83

Asset Name	Permit Reference	Asset Type	NGR	Receiving Water	No. spills in 2021	Duration (hrs) spills in 2021	Distance (km) to nearest CZ
MILLMOOR LANE COMBINED SEWER OF	201844	SO on sewer network	SY 0896 8961	TRIB OF RIVER OTTER VIA SWS	15	10.77	8.66
WHITFORD ROAD COMBINED SEWER O/F	SWWA 115	SO on sewer network	SY 2625 9506	RIVER AXE	3	10.67	13.74
CHARMOUTH SEWAGE DISPOSAL WORKS	401625	Storm tank at WwTW	SY3678091710	LYME BAY(C) & RIVER CHAR(S)	2	9.17	20.54
27 OAKLEA COMBINED SEWER OVEFLOW	201850	SO on sewer network	ST 1577 0070	THE GISSAGE	12	9.13	16.41
JERICHO CSO	003955/CS/01	SO on sewer network	SY 3402 9251	RIVER LIM	12	7.7	18.33
CHAPEL STREET CSO	201885	SO on sewer network	SY 2581 9109	TRIB OF RIVER AXE	7	6.97	10.61
CASTLE COPSE PUMPING STATION	201379	Storm discharge at pumping station	SY 0748 9432	TRIBUTARY OF RIVER OTTER	5	6.14	13.09
BATTS LANE COMBINED SEWER OVERFLOW	201383	SO on sewer network	SY 0996 9545	TRIBUTARY OF RIVER OTTER	14	4	12.71
FENITON WASTEWATER TREATMENT WORKS	NRA-SW-3706	Inlet SO at WwTW	SY 1160 9890	RIVER OTTER	3	3.71	15.36
CHAPEL LANE COMBINED SEWER OVERFLOW	201382	SO on sewer network	SY 1014 9551	TRIBUTARY OF THE RIVER OTTER	16	3.16	12.68
BUCKERELL PUMPING STATION	201642	Storm discharge at pumping station	ST 1223 0085	TRIBUTARY OF RIVER OTTER	2	2.84	17.12

Asset Name	Permit Reference	Asset Type	NGR	Receiving Water	No. spills in 2021	Duration (hrs) spills in 2021	Distance (km) to nearest CZ
GRARY LANE (NORTH) CSO	200115	SO on sewer network	SY 0711 8274	KERSBROOK CHANNEL	6	1.04	6.67
TEMPLE STREET CSO	201828	SO on sewer network	SY 1296 8857	RIVER SID	5	0.83	5.22
THE STREET CSO, CHARMOUTH	401594	SO on sewer network	SY3679093690	RIVER CHAR(S)	3	0.75	21.34
VICARAGE ROAD CSO	201832	SO on sewer network	SY 1277 8806	RIVER SID VIA SWS	3	0.7	4.9
EAST BRIDGE COMBINED SEWER OVERFLOW	402081	SO on sewer network	SY4705492852	RIVER ASKER(S)	3	0.4	30.66
BYES LANE COMBINED SEWER OVERFLOW	201837	SO on sewer network	SY 1372 8979	RIVER SID VIA SWS	0	0	6.03
FORE STREET CSO	200117/CS/01	SO on sewer network	SY 0649 8188	KNOWLE STREAM	0	0	6.52
LITTLE KNOWLE CSO	200116/CS/01	SO on sewer network	SY 0535 8226	KNOWLE STREAM	0	0	7.65
COLATON RALEIGH COMBINED SEWER OF	201882	SO on sewer network	SY 0844 8704	TRIB OF THE RIVER OTTER	0	0	7.76
MAER PUMPING STATION & TANK CSO	200126/PC/01	Storm discharge at pumping station	SY 0111 7968	ENGLISH CHANNEL	0	0	10.59
MILL LANE CSO	201817	SO on sewer network	SY 3312 9331	RIVER LIM (S)	0	0	17.91
GOSLINGS BRIDGE CSO	003957/CS/01	SO on sewer network	SY 3411 9232	RIVER LIM(S)	0	0	18.33

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FERRY ROAD PUMPING STATION	201634	Storm discharge at pumping station	SX 9623 8814	RIVER EXE	0	0	18.49
WEST BAY ROAD CSO	41198	SO on sewer network	SY4635191351	RIVER BRIT	0	0	29.59
FISHWEIR FIELDS PS	402030	Storm discharge at pumping station	SY4789193755	RIVER ASKER VIA SWS	0	0	31.72
TRACK CSO	201840	SO on sewer network	SY 1473 8854	STREAM (S)	Unspecified	Unspecified	4.56
SALCOMBE REGIS WWTW CSO	NRA-SW-1505	Inlet SO at WwTW	SY1472088650	SALCOMBE REGIS STREAM	Unspecified	Unspecified	4.67
BRANSCOMBE PSCSO/EO	201531	Storm discharge at pumping station	SY 2076 8816	BRANSCOMBE (C)	Unspecified	Unspecified	4.93
R/O 68 WOOLBROOK ROAD CSO	201829	SO on sewer network	SY 1235 8912	WOOLBROOK (S)	Unspecified	Unspecified	6.01
COLYFORD PSCSO/EO	201643	Storm discharge at pumping station	SY 2535 9266	RIVER COLY(S)	Unspecified	Unspecified	11.34
BRIDGE HOUSE CSO	201881	SO on sewer network	SY 2536 9266	RIVER COLY (S)	Unspecified	Unspecified	11.35
FIRE STATION CSO	201879	SO on sewer network	SY 2478 9378	RIVER COLY (S)	Unspecified	Unspecified	11.83
COLYTON CHANTRY CSO	NRA-SW-1138	SO on sewer network	SY 2458 9423	RIVER COLY	Unspecified	Unspecified	12.07

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WATERLEAT PARK PSCSO/EO	202180/PC/01	Storm discharge at pumping station	ST 1691 0018	TRIB OF RIVER OTTER	Unspecified	Unspecified	15.81
VENTURA CSO	201848	SO on sewer network	ST 1502 0026	DITCH	Unspecified	Unspecified	16.08
191 HIGH STREET CSO	201849	SO on sewer network	ST 1595 0054	THE GISSAGE (S)	Unspecified	Unspecified	16.23
WILLOWDALE PSCSO/EO	202182	Storm discharge at pumping station	ST1556200923	TRIB OF RIVER OTTER (S)	Unspecified	Unspecified	16.66
DALWOOD PUMPING STATION	203072	Storm discharge at pumping station	SY 2501 9988	THE CORRY BROOK (S)	Unspecified	Unspecified	17.18
RAILWAY STATION COMBINED SEWER OF	DRA 1563	SO on sewer network	SY2937098305	RIVER AXE	Unspecified	Unspecified	18.23
STOCKLAND STW	DRA 1435	Storm tank at WwTW	ST 2490 0408	WATERCOURSE	Unspecified	Unspecified	21
HAWKCHURCH STW	SWWA 2412	Inlet SO at WwTW	ST3406000880	BLACKWATER RIVER/STREAM (S)	Unspecified	Unspecified	23.31
YARCOMBE STW	NRA-SW-0273	Inlet SO at WwTW	ST 2472 0799	(S) TRIB RIVER YARTY	Unspecified	Unspecified	24.65
BUCKLAND ST MARY STW	NRA-SW-2517	Inlet SO at WwTW	ST 2669 1340	TRIBUTARY TO THE RIVER YARTY	Unspecified	Unspecified	30.41

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EC Regulation 854/2004

CLASSIFICATION OF BIVALVE MOLLUSC PRODUCTION AREAS IN ENGLAND AND WALES

SANITARY SURVEY REPORT

Lyme Bay

January 2015

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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Environmental Consultancy

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.

Ecological and Geophysical Surveys

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*"