Sanitary Survey - Review

Lune – 2022

Document No. – *J0591/21/12/10*

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Document QA and Approval

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Initial Consultation

Consultee	Date of consultation
Environment Agency	03 November 2021
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Consultation on draft report

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A sanitary survey relevant to the bivalve mollusc beds in Lune was undertaken in 2013 in accordance with Regulation (EC) 854/2004 (which was replaced by retained EU Law Regulation (EU) 2017/625, with sanitary survey requirements now specified in retained EU Law Regulation (EU) 2019/627). 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, Wyre Council. The report is publicly available via the Carcinus Ltd. website.

Recommended Bibliographic Citation:

Carcinus Ltd., 2022. Review of the Lune 2013 Sanitary Survey. Carcinus report on behalf of the Food Standards Agency, to demonstrate compliance with the requirements for classification of bivalve mollusc production areas (BMPA) in England and Wales under retained EU Law Regulation (EU) 2019/627.

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1 Introduction

1.1 Background

The Food Standards Agency (FSA) is responsible for carrying out sanitary surveys in classified production and relay areas in accordance with Article 58 of retained (EU) Regulation 2019/627 and the EU Good Practice Guide (European Commission, 2017). 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 Lune Review

This report reviews information and makes recommendations for a revised sampling plan for existing mussel (*Mytilus* spp.) and cockle (*Cerastoderma edule*) classification zones in the Lune Bivalve Mollusc Production Area (BMPA) (Figure 1.1). This review explores any changes to the main microbiological contamination sources that have taken place since the original sanitary survey was conducted. Data for this review was gathered through a desk-based study and consultation with stakeholders.

An **initial consultation** with Local Authorities (LAs) and the Environment Agency (EA) responsible for the production area was undertaken in November 2021. 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 LAs and Local Action Group (LAG) members was undertaken in April and May 2022. 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 sanitary survey assessment originally conducted in 2013 and sampling plan as necessary and the 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.

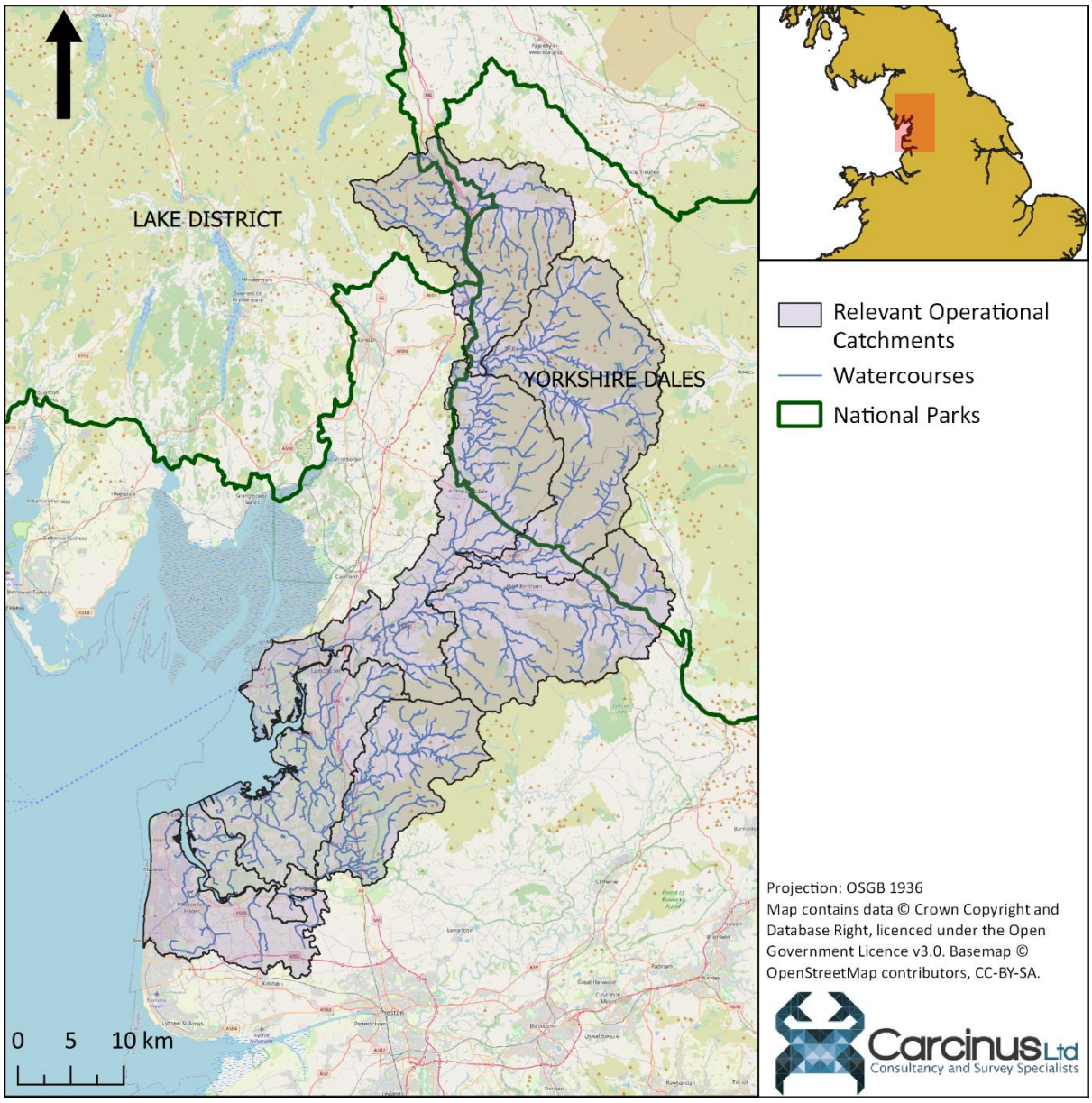


Figure 1.1 Location of the Lune BMPA catchment in the northwest of England.

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

1.3 Assumptions and limitations

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

- Accuracy of local intelligence provided by the Local Authorities and Environment Agency;
- The findings of this report are based on information and data sources up to and including November 2021;
- Only information that may impact on the microbial contamination was considered for this review; and
- Official Control monitoring data have been taken directly from the Cefas data hub[1], with no additional verification of the data undertaken. Results up to and including November 2021 have been used within this study. Any subsequent samples have not been included.

2 Shellfisheries

2.1 Description of Shellfishery

The Lune Bivalve Mollusc Production Area (BMPA) is situated on the southern end of Morecambe Bay in the northwest of England. The two main freshwater sources draining to the area are the Rivers Wyre and Lune, and the embayment is relatively open and consists primarily of intertidal sandflats. Classification Zones within the Morecambe Bay BMPA are found to the north, past Heysham.

Harvesting of shellfish in the BMPA is regulated by the North West Inshore Fisheries and Conservation Authority (NW-IFCA) and is under the jurisdiction of Wyre Council (the Local Enforcement Authority (LEA)) for food hygiene purposes. The shellfishery involves wild harvest of the classified species. The IFCA set out minimum landing sizes of the two shellfish species (NW-IFCA, 2018), whereby no person is permitted to remove cockles that can pass through a gauge with an internal width of 20 mm on each side, or mussels less than 45 mm length. Furthermore, there is a closed season to cockle harvesting between 1st May and 31st August inclusive, and harvesting methods for both species are restricted to hand gathering or using handheld rakes. The following paragraphs detail the current Classification Zones found within the Lune BMPA.

2.1.1 Mussels

The original sanitary survey, conducted in 2013, recommended the creation of four zones for mussels: *Plover Scar*, *Wyre Estuary*, *Wyre Approaches* and *Rossall and Kings Scar*. A much smaller area was recommended for classification for this species than for cockles, as the mussel distribution in the area is restricted by the extent of hard substrate for settlement. Apart from the *Plover Scar* zone, which was located near the mouth of the Lune, the CZs recommended in the original sanitary survey formed one contiguous zone in and around the mouth of the Wyre. The *Plover Scar* and *Rossall and Kings Scar* zones were declassified in

[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/.

2015, and the *Wyre Estuary* and *Wyre Approaches* zones have been subject to periodic classified/declassified status since 2013. They were declassified in 2014 and 2015, classified in 2016 and 2017, before being declassified again. The *Wyre Estuary* and *Wyre Approaches* zones were reclassified in July 2021.

No landing statistics are available for this species as the zones have only recently been re-awarded classifications.

2.1.2 Cockles

The original sanitary survey also recommended the creation of four Classification Zones for cockles: *Middleton Sands*, *Lune Island*, *Pilling Sands* and *Fleetwood*. The area recommended for classification for harvest of this species was much larger than that for mussels, with one large contiguous zone covering the entirety of the southern part of Morecambe Bay, but not extending into either the Wyre or the Lune. All of the zones except for *Pilling Sands* were declassified in 2015.

Landing statistics were available for recent years for this species from the Pilling Sands area and are summarised in Table 2.1. It suggests that whilst landings declined significantly between 2018 and 2020, they have increased markedly since the fishery was opened this in 2021.

Table 2.1 Fishery returns for the Pilling Sands cockle fishery for recent years.

Year	Fishery Returns
13/09/21 – 30/10/2021	76,716 Kg*
2020	34,627 Kg**
2019	100,727 Kg**
2018	185,391.5 Kg**

*Local Authority Records **NW-IFCA records

2.2 Classification History

A total of eight classification zones were recommended in the original sanitary survey, four for cockles and four for mussels. There are currently three zones, two for mussels and one for cockles. As of November 2021, all three zones hold a Class B classification. The location of all active classification zones and associated representative monitoring points (RMPs) within the Lune BMPA are shown in Figure 2.1.

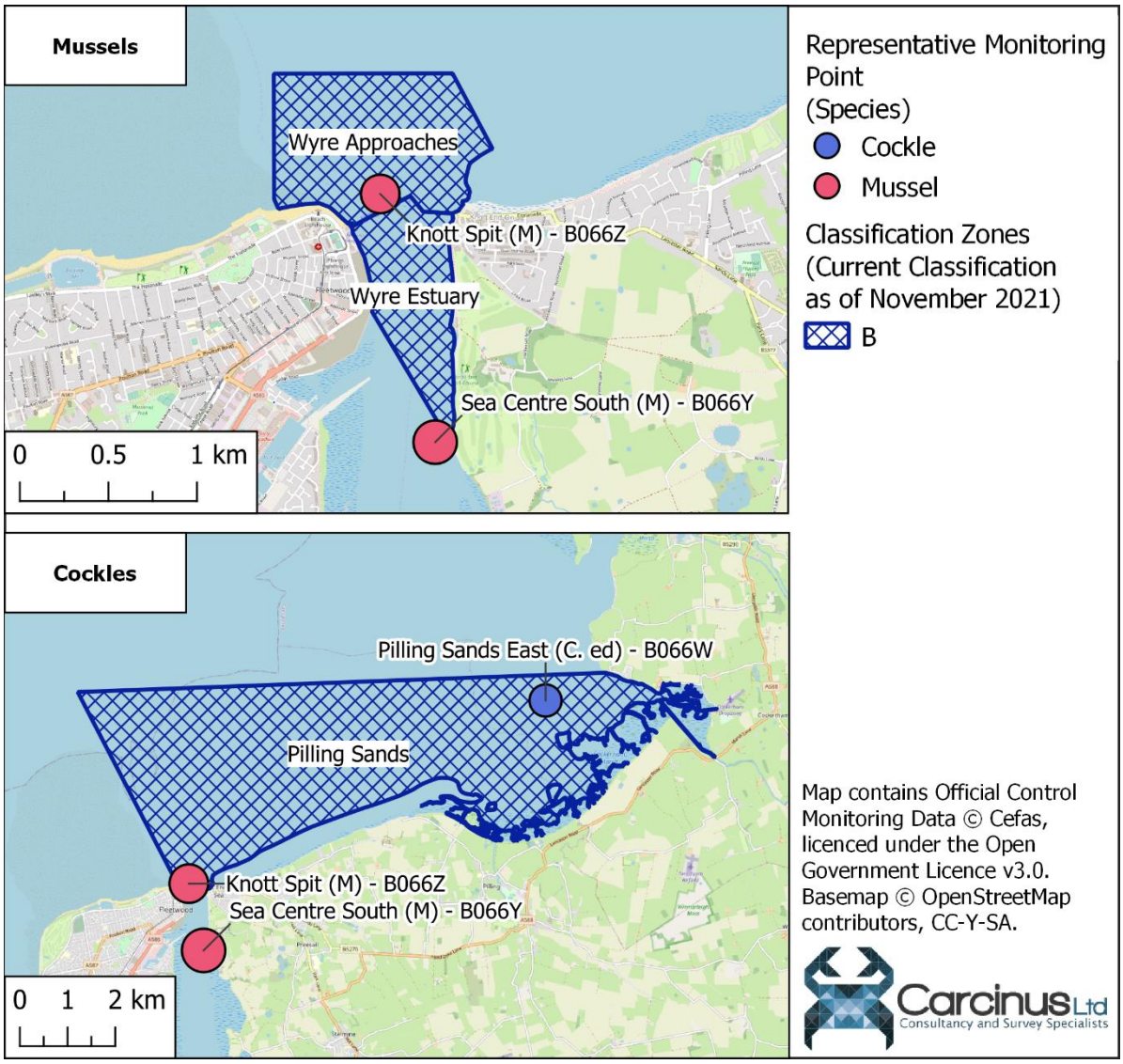


Figure 2.1 Current Classification Zones and associated Representative Monitoring Points in the Lune BMPA. Classification Zone boundaries and classifications are correct as of November 2021.

3 Pollution sources

3.1 Human Population

The original sanitary survey cites population data from the 2011 Census of the United Kingdom. No updated census data for the catchment were available to the authors of this review; the next full census of the UK took place in March 2021, but the data is not yet available. The original sanitary survey stated that the total population within the catchment was approximately 334,000. The UK government estimates that the national population will have increased by approximately 6.6% between 2011 and 2021 (ons.gov.uk, 2021) and an increase of this proportion would see the total population increase to over 356,000 people.

The original sanitary survey cites that the main population centres within the catchment are located at the mouths of the two main rivers: Morecambe and Lancaster on the Lune and Fleetwood and Blackpool on the Wyre. Figure 3.1 shows how land cover has changed within the catchment between 2012 and 2018, indicating that most of the catchment remains rural, with the only significant conurbations being present near the coastline. The land cover maps suggest that the size of these settlements has increased marginally, and consultation with the LEA indicated that there is recent and planned housing development near the docks in Fleetwood (visitFleetwood, 2021). Any increase in population size will almost certainly have led to an increase in loading to the wastewater treatment network (WWTN), and potential bacteriological contamination of the shellfishery. Given that the main population centres are located either around the main rivers or on the shoreline, there lies the potential for contamination from both dog fouling and utility misconnections. Direct impacts from sewage discharges will depend on the specific nature, volumes and locations of these discharges, changes to which are discussed in the next section.

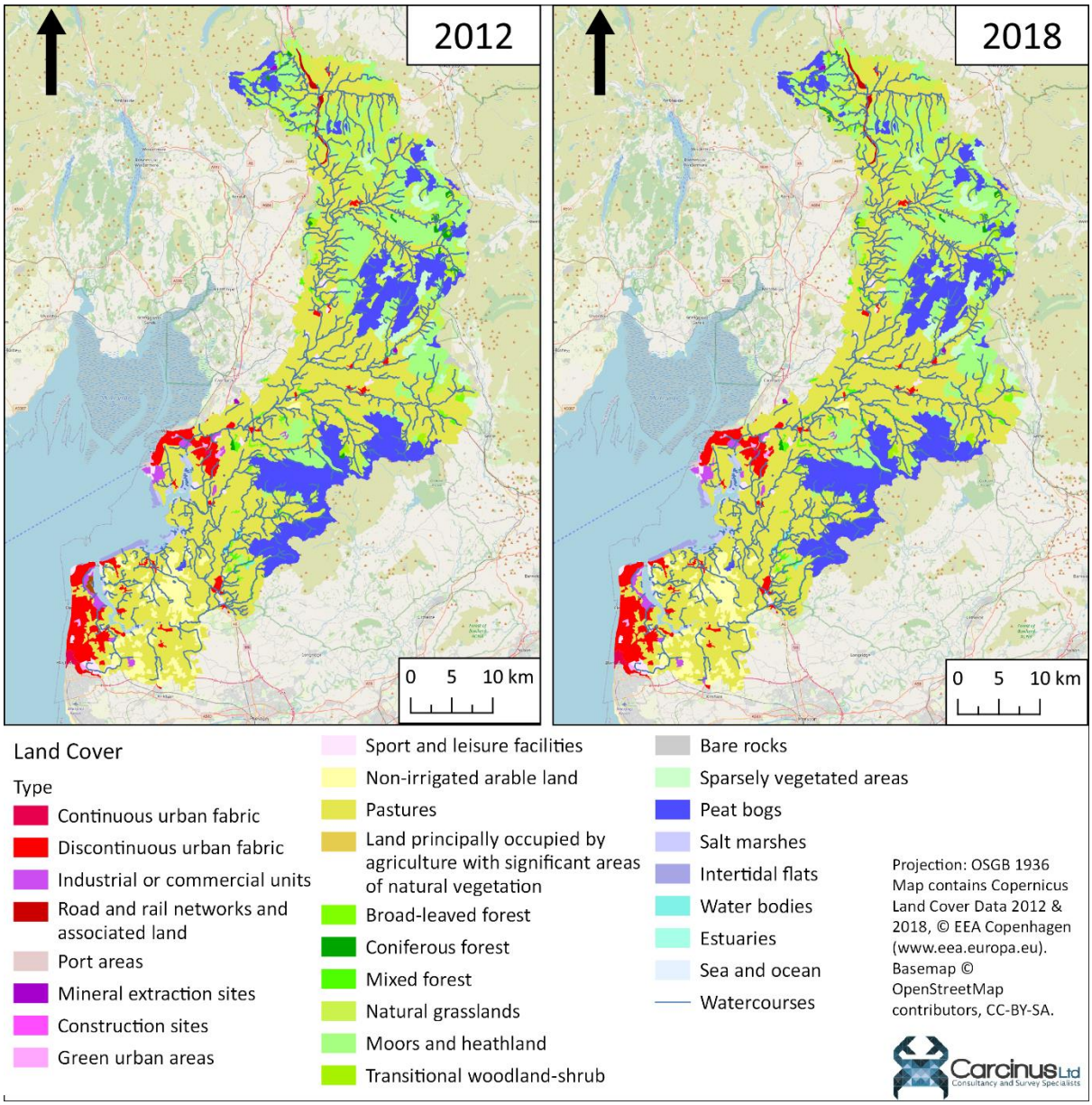


Figure 3.1 Land cover change within the Lune catchment between 2012 and 2018.

Traditionally, the county of Lancashire is a very popular tourist destination, as it contains both the coastal resort of Blackpool and the southern part of the Lake District. The original sanitary survey reported that there were approximately 60 million visitors to the county in 2011. This number had slightly increased in 2018, where there were nearly 70 million visitors annually, although the Covid-19 pandemic caused a significant fall, with only 21.4 million visitors in 2020 (lep.co.uk, 2021). This does however represent a significant population increase each year, and it is likely that the majority of these visits will occur in the summer months, and therefore the associated loading to the sewerage network will also be greatest during this period. However, it is assumed that the current capacity is sufficient to accommodate this increase.

Whilst there is no recently available population data for the catchment, it is likely that the population will have increased since the last sanitary survey was published. However, the distribution of the main population centres within the catchment has not changed, and therefore the recommendations made in the original sanitary survey to account for this source of pollution remain valid.

3.2 Sewage

Details of all consented discharges within the Lune BMPA catchment were taken from the most recent update to the Environment Agency (EA's) national permit database at the time of this report (December 2021). The locations of these discharges are shown in Figure 3.2.

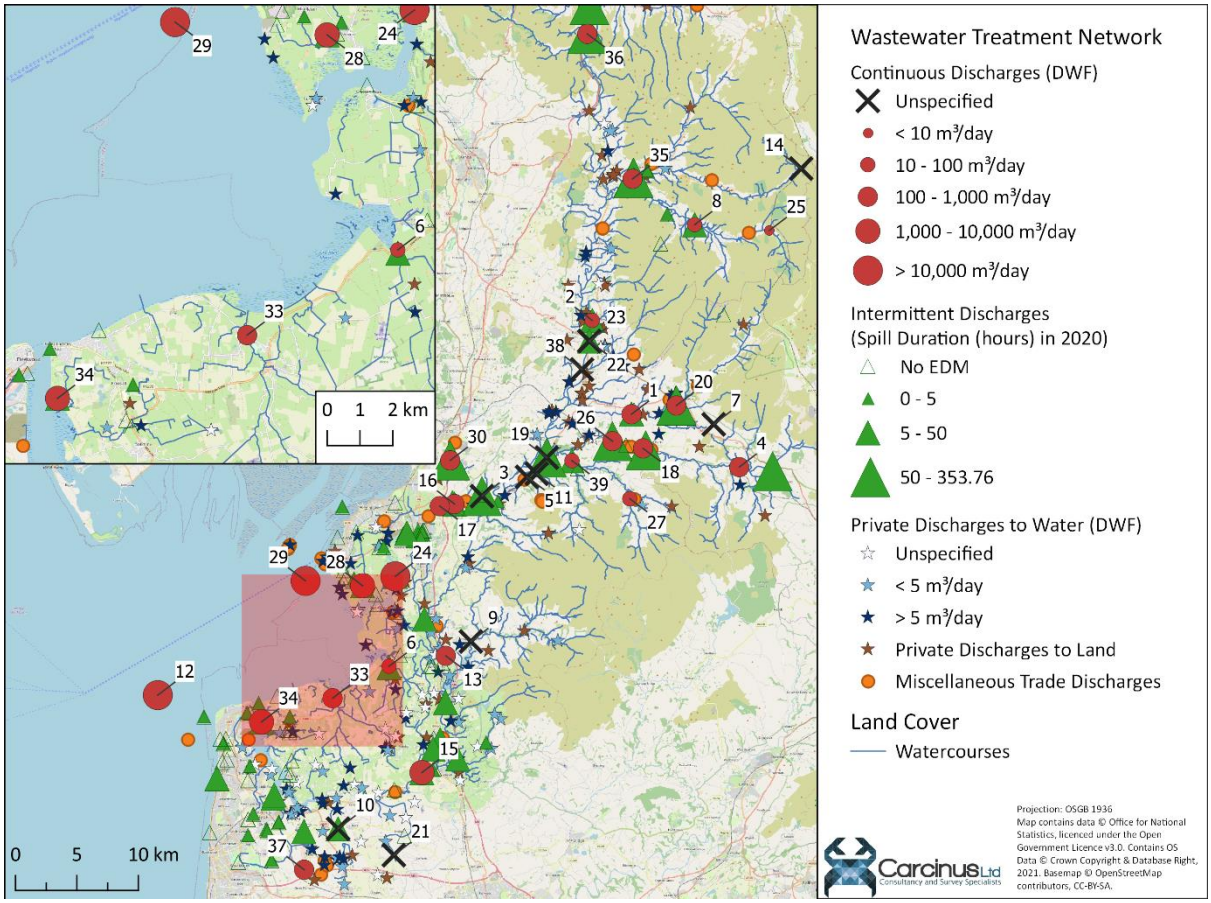


Figure 3.2 Locations of all consented discharges within the Lune catchment. Labels refer to continuous discharges, details of which can be found in Table 3.1.

Table 3.1 Details of all continuous discharges within the Lune catchment.

ID	Sewage Treatment Works	PERMIT NUMBER	NGR	Treatment	DWF (m³/day)
1	BURTON-IN-LONSDALE STW	017260021	SD6495071920	BIOLOGICAL FILTRATION	190
2	CASTERTON WWTW	017270014	SD6175079560	BIOLOGICAL FILTRATION	80

ID	Sewage Treatment Works	PERMIT NUMBER	NGR	Treatment	DWF (m^3/day)
3	CATON WASTEWATER TREATMENT WORKS	017270001	SD5277065250	BIOLOGICAL FILTRATION	Unspecified
4	CLAPHAM WASTEWATER TREATMENT WORKS	EPREP3526XK	SD7372967616	TERTIARY BIOLOGICAL	393
5	CLAUGHTON STW	017270010	SD5644066820	BIOLOGICAL FILTRATION	Unspecified
6	COCKERHAM STW	017260072	SD4520051400	BIOLOGICAL FILTRATION	72
7	COLD COTES STW	017260168	SD7165071100	UNSPECIFIED	Unspecified
8	DENT STW	017270015	SD7010087350	BIOLOGICAL FILTRATION	84
9	DOLPHINHOLME STW	017270045	SD5187053420	BIOLOGICAL FILTRATION	Unspecified
10	ELSWICK STW	017260053	SD4105038170	BIOLOGICAL FILTRATION	Unspecified
11	FARLETON STW	017270011	SD5723067080	BIOLOGICAL FILTRATION	Unspecified
12	FLEETWOOD MARSH WWTW	017280252	SD2636049050	BIOLOGICAL FILTRATION	101,237
13	FORTON STW	017260052	SD4982052250	SAND FILTRATION	390
14	GARSDALE HEAD STW	017270016	SD7877091920	BIOLOGICAL FILTRATION	Unspecified
15	GARSTANG STW	017260046	SD4788042750	UV DISINFECTION	3,550
16	HALTON EAST STW	017270002	SD5053064610	BIOLOGICAL FILTRATION	292
17	HALTON WEST LUNE WWTW	017270003	SD4933564438	BIOLOGICAL FILTRATION	330
18	HIGH BENTHAM WWTW (HGHBE)	017260004	SD6589069140	BIOLOGICAL FILTRATION	840
19	HORNBY STW	017270017	SD5805068390	BIOLOGICAL FILTRATION	Unspecified
20	INGLETON STW	017260005	SD6861072630	BIOLOGICAL FILTRATION	858
21	INSKIP STW	017260054	SD4559036020	BIOLOGICAL FILTRATION	Unspecified
22	KIRKBY LONSDALE STW	017270006	SD6152077880	BIOLOGICAL FILTRATION	Unspecified
23	KIRKBY LONSDALE STW	017270006	SD6152077880	BIOLOGICAL FILTRATION	Unspecified

ID	Sewage Treatment Works	PERMIT NUMBER	NGR	Treatment	DWF (m^3/day)
24	LANCASTER WWTW LANCA	017270050	SD4571058720	UV DISINFECTION	38,731
25	LEA YEAT WWTW	017290496	SD7618086880	PACKAGE TREATMENT PLANT	7.95
26	LOW BENTHAM WWTW (LOWBE)	017260007	SD6340169726	BIOLOGICAL FILTRATION	186
27	LOWGILL WWTW	017290603	SD6481065040	BIOLOGICAL FILTRATION	12.8
28	MIDDLETON OVERTON WWTW MIDDL	017270051	SD4304057960	OXIDATION DITCH	1,359
29	MORECAMBE WWTW	017280350	SD3840058350	UV DISINFECTION	13,820
30	NETHER KELLET WTW NETHK	017370074	SD5018068160	BIOLOGICAL FILTRATION	173
31	ORTON STW	017270008	NY6291007660	BIOLOGICAL FILTRATION	143
32	ORTON STW	017270008	NY6291007660	BIOLOGICAL FILTRATION	143
33	PILLING STW	017260137	SD4060048800	BIOLOGICAL FILTRATION	289
34	PREESALL WWTW PREES	017260071	SD3481046870	BIOLOGICAL FILTRATION	2,333
35	SEDBERGH STW	017270009	SD6504091080	BIOLOGICAL FILTRATION	800
36	TEBAY STW	017270018	NY6135002880	BIOLOGICAL FILTRATION	268
37	WEETON WASTEWATER TREATMENT WORKS	017260056	SD3828034840	BIOLOGICAL FILTRATION	122
38	WHITTINGTON STW	017270101	SD6092075560	BIOLOGICAL FILTRATION	Unspecified
39	WRAY WASTEWATER TREATMENT WORKS	017270020	SD6010068140	BIOLOGICAL FILTRATION	68

The original sanitary survey identified a total of 41 continuous discharges within the Lune catchment (Figure II.1, p44; Table II.1, p45-46). Of these, UV disinfection (the most effective at reducing the final bacterial loading caused by a discharge) was installed at four. The survey identified that the most significant discharge in terms of the contamination it caused would be that of Fleetwood Marsh, as it had a consented discharge volume of 62,000 m^3/day, only employed secondary treatment and was situated about 6 km east of the

nearest Classification Zone. Given their proximity to the shellfisheries, the discharge from Preesall STW and Pilling STW were also thought to be of local significance, despite their UV treatment. Based on the database queried for this report, both these discharges are now listed as having only Biological Filtration fitted, but the Environment Agency confirmed during secondary consultation that these discharges do employ UV disinfection. The consented discharge volume from Presall STW and Pilling STW has not changed. Consultation with the EA indicated that Garstang STW was fitted with UV disinfection in 2013, although this was noted in the original sanitary survey.

In addition to the continuous discharges, the original sanitary survey identified a large number (85 no.) of intermittent discharges within 2 km of the BMPA. Intermittent discharges comprise Combined Storm Overflows (CSOs), Storm Tank Overflows (STOs) and Pumping Station Emergency Overflows (PSs). During Asset Management Plans (AMP) 6 and 7, (five-year periods that water companies use to plan performance upgrades etc.) Event Duration Monitoring (EDM) was installed at several of the discharges within the Harbour's catchment, and summary data for 2020 was published by the Environment Agency in March 2021 (Environment Agency, 2021). Details of these data for those discharges in the vicinity of the Harbour are presented in Appendix I. The single datapoint for each discharge was joined to the main database using the permit number. Beyond the data processing described above, the data have been taken at face value, and some locations in the consented discharge database may be erroneous, meaning that the point appears in the wrong location. Some EDM returns had multiple meters on a single discharge activity, in this case we have presented all reported spill counts as individual values, unless the comment indicated that the meters were not working properly in which case the values were nulled. The EDM returns 'Activity Reference' field did not reliably distinguish between emergency overflows and storm overflows, therefore we have included all of these in the intermittent discharge category.

Only a small proportion of the discharges identified by the authors of the original sanitary survey had EDM capability fitted. It identified that the discharges that spilled the most frequently were Lancaster STW Storm Tank, Owen Road CSO and Peddar Far PS, all of which discharge to the Lune estuary upstream of the shellfishery. Based on the 2020 summary data, no EDM is available for the Peddar Far PS, although the data suggest that the Lancaster STW spilled less frequently. EDM capability has also been fitted to Presall WWTW Storm Overflow, near the southern tip of the *Wyre Estuary* mussel zone, and states that this outfall spilled 76 times for a total of 42 hours in 2020. EDM data from the Cockerham CSO, near the mouth of the River Cocker, spilled for a total of 24.84 hrs in 2020. Consultation with the Environment Agency indicated that various improvements were made to intermittent discharges within Lancaster City Centre and the Wyre catchment, meaning that the outfalls should discharge less frequently. Overall, the risk from intermittent discharges in the wider catchment is assessed to have decreased slightly, and this should be taken into consideration in any updated sampling plan.

Finally, in addition to the water company owned assets, the original sanitary survey identified 26 private discharges within 2 km of the BMPA with consented flow rates of > 5 m^3/day. Many of these discharges remain, but most are located at least 1.5 km distance from the BMPA and so will contribute to the background levels of contamination rather than being a point source of concern. There is a private discharge with a spill rate of 54 m^3/day that is located near to the *Pilling Sands* zone around Cockerham Marsh, but it does employ biological filtration.

No upgrades to the treatment methodologies employed at continuous discharges within the catchment were identified, although an apparent downgrade to two STWs of significance was confirmed to be false during secondary consultation with the EA. There is limited comparison possible between EDM data from 2012/2013 and 2020, although the one discharge for which this is possible suggests that it is spilling less frequently. Overall, the main hotspots of contamination from sewage discharges has not changed significantly since the original sanitary survey, and as such the recommendations made in the original report remain valid. .

3.3 Agricultural Sources

Livestock census data have been obtained for 2013 and 2016 (Defra, 2018) for Local Authority Districts that fall within or partially within the Lune catchment. No more recent data are available, but these data have been used to give an indication of livestock population trends in the period since the original sanitary survey was published. As only a small proportion of each district falls within the catchment, the livestock data have been adjusted to reflect the percentage of each district that falls within the catchment. This assumes that the livestock are uniformly distributed throughout each district and therefore some inaccuracies may be present. The percentage change in total livestock population for each district is shown in Figure 3.3. Changes in livestock population for each district, broken down by livestock group, are shown in Table 3.2.

Overall, the total livestock population within the Lune catchment increased by 15.87% between 2013 and 2017, increasing from 1,580,465 animals to 1,831,285 animals. Two districts within the catchment saw their populations increase by more than 100%, and more than half of districts showed an overall increase. The dominant group of livestock in terms of population size remains poultry, with more than 1,000,000 animals in 2016. Across all groups of animals, population size will vary throughout the year, with the highest numbers during Spring and the lowest numbers when animals are sent to market in Autumn and Winter.

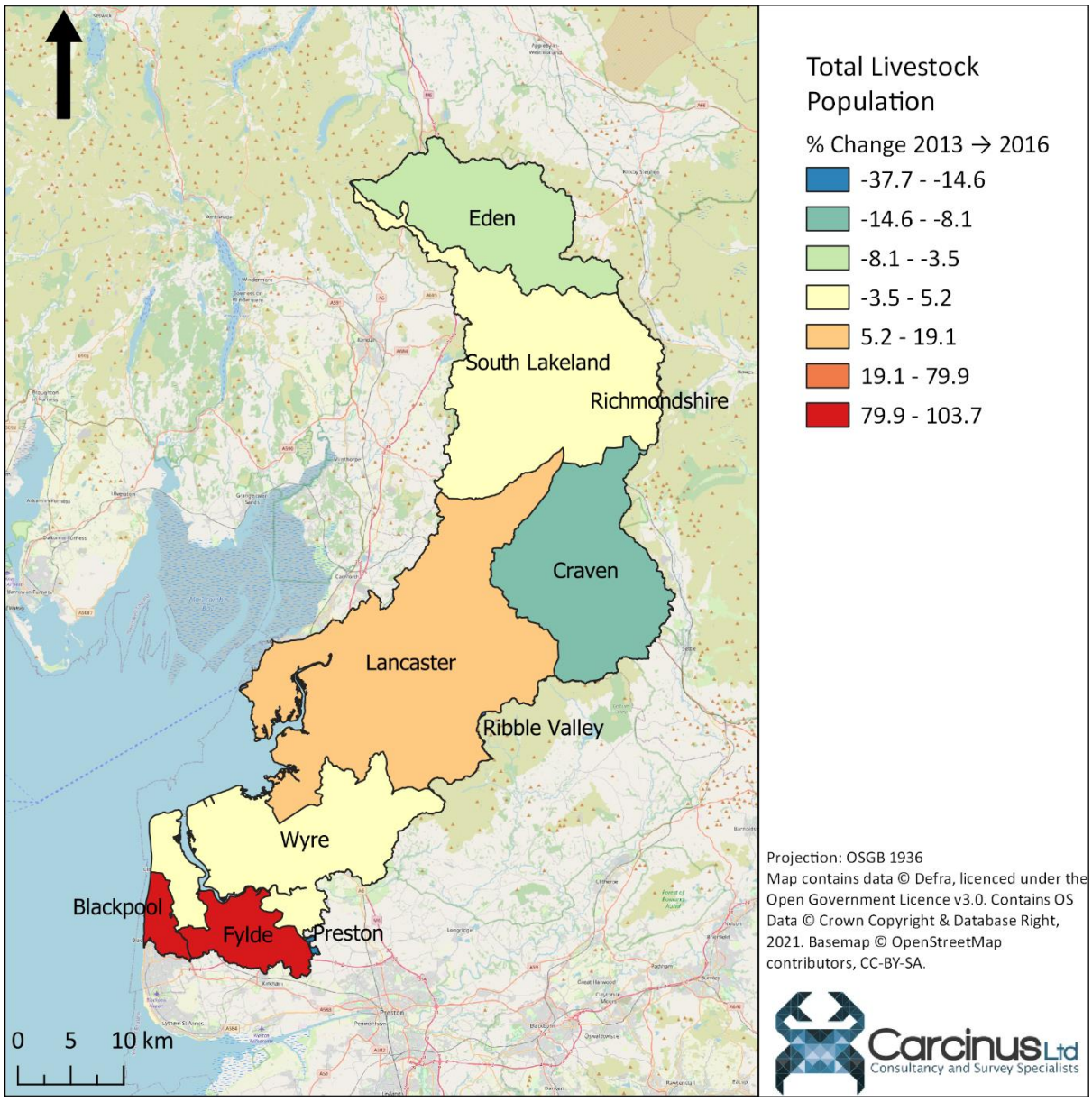


Figure 3.3 Livestock population change between 2013 and 2016 for Local Authority Districts wholly or partially contained within the Lune catchment.

Table 3.2 Livestock population data for Local Authority Districts wholly or partially within the Lune catchment.

					Cattle			Sheep			Pigs			Poultry		
LAD	**Area (Ha)**	**A w/in Ha**	**% Of district in catchment**	**% Of catchment**	**2013**	**2016**	**% Change**	**2013**	**2016**	**% Change**	**2013**	**2016**	**% Change**	**2013**	**2016**	**% Change**
Blackpool*	3490	2039.59	58.44%	*1.32%*	*9,669*	*10,378*	*7.33 %*	*11,720*	*13,797*	*17.72 %*	*11,916*	*11,153*	*- 6.40%*	*109,140*	*254,767*	*133.43 %*
Craven	117987	22769.81	19.30%	*14.75%*	*10,712*	*11,017*	*2.85 %*	*90,209*	*91,029*	*0.91%*	*563*	*895*	*59.11 %*	*53,900*	*30,559*	*- 43.30%*
Eden	215817	17886.81	8.29%	*11.59%*	*10,653*	*10,341*	*- 2.93 %*	*58,112*	*60,467*	*4.05%*	*1,111*	*1,093*	*- 1.59%*	*129,507*	*120,106*	*-7.26%*
Fylde*	16585	5994.51	36.14%	*3.88%*	*5,979*	*6,418*	*7.33 %*	*7,248*	*8,532*	*17.72 %*	*7,369*	*6,897*	*- 6.40%*	*67,493*	*157,551*	*133.43 %*

LAD	Area (Ha)	A w/in Ha	% Of district in catchment	% Of catchment	Cattle			Sheep			Pigs			Poultry		
					2013	2016	% Change	2013	2016	% Change	2013	2016	% Change	2013	2016	% Change
Lancaster	57657	47746.42	82.81%	*30.93%*	*43,011*	*44,452*	*3.35 %*	*147,670*	*159,662*	*8.12%*	*3,774*	*4,494*	*19.06 %*	*108,390*	*148,979*	*37.45%*
Preston	14240	87.62	0.62%	*0.06%*	*108*	*117*	*8.62 %*	*96*	*111*	*15.44 %*	*19*	*22*	*15.88 %*	*1,809*	*1,016*	*-43.83%*
Ribble Valley	58490	56.97	0.10%	*0.04%*	*43*	*44*	*2.22 %*	*221*	*226*	*2.35%*	*2*	*1*	*-25.92 %*	*234*	*154*	*-34.25%*

LAD	Area (Ha)	A w/in Ha	% Of district in catchment	% Of catchment	Cattle			Sheep			Pigs			Poultry		
					2013	2016	% Change	2013	2016	% Change	2013	2016	% Change	2013	2016	% Change
Richmondshire	131976	23.4	0.02%	*0.02%*	*10*	*9*	*-3.08%*	*74*	*72*	*-2.38%*	*8*	*9*	*15.46%*	*177*	*233*	*31.81%*
South Lakeland	155407	34310.87	22.08%	*22.23%*	*16,316*	*16,019*	*-1.82%*	*114,205*	*116,432*	*1.95%*	*601*	*669*	*11.30%*	*38,627*	*41,845*	*8.33%*
Wyre	28231	23441.69	83.04%	*15.19%*	*29,031*	*30,320*	*4.44%*	*40,438*	*41,772*	*3.30%*	*8,568*	*8,680*	*1.31%*	*441,733*	*420,948*	*-4.71%*
Total	*799880*	*154357.69*	*19.30%*	*100.00%*	*125,532*	*129,115*	*2.85%*	*469,993*	*492,099*	*4.70%*	*33,931*	*33,914*	*-0.05%*	*951,009*	*1,176,157*	*23.67%*

LAD	Area (Ha)	A w/in Ha	% Of district in catchment	% Of catchment	Cattle			Sheep			Pigs			Poultry		
					2013	2016	% Change	2013	2016	% Change	2013	2016	% Change	2013	2016	% Change

*** As Blackpool & Fylde**

The principal route of contamination of coastal waters by livestock is surface run-off carrying faecal matter. Figure 3.1 suggests that a significant area of the shoreline adjacent to the shellfishery is land reserved for pasture, and therefore represents a potentially significant diffuse source, particularly where drainage channels will carry run-off out to sea fairly rapidly. There is anecdotal evidence of farm discharge into watercourses, although the EA (the competent authority for enforcing regulations relating to farm discharge) were not aware of any issues with this in the area.

Livestock populations increased by nearly 16% between 2013 and 2016, with a livestock density of approximately 12 animals per hectare. The original sanitary survey identified that pollution from livestock grazing near to the BMPA was likely to be a significant source of contamination, and this remains true, and the impact may have increased slightly due to the increase in overall population size. However, the distribution of pasture areas near to the shellfish beds have not changed significantly, and therefore the recommendations made in the original sanitary survey to account for it remain valid.

3.4 Wildlife

The Lune and Wyre Estuaries, as well as the wider Morecambe Bay contain a variety of intertidal and subtidal habitats that support a significant diversity of wildlife. As a consequence of this, they are conferred protection under a variety of national and international designations, including as a Ramsar site, Site of Special Scientific Importance (SSSI), Special Area of Conservation (SAC) and Special Protection Area (SPA). No additional designations have been awarded since the original sanitary survey was undertaken.

These designations are due, in part, to the significant populations of overwintering waterbirds and gulls. Waterbirds represent a potentially significant source of faecal contamination to the BMPA as they typically forage (and defecate) directly on intertidal shellfish beds. The original sanitary survey cites data from the Wetland Bird Survey (WeBS), reporting that in the five winters to 2010/2011, an average of 209,498 overwintering birds and wildfowl were recorded in the Morecambe Bay area. In the five winters to 2019/2020 (the most recent for which data are available), the average total count was 170,261 (a decrease of 18.7%). Despite this decrease, the Morecambe Bay area (which includes the waters classified as part of the Lune BMPA) supports internationally significant populations of several species, and nationally important populations of many more. Contamination from birds will therefore represent a continual diffuse source as well as periodic acute one. These ‘hotspot’ areas of contamination source will vary from year to year as the avian species forage for food on the shifting shellfish beds, and as such it is impossible to define RMP positions that will reliably account for the pollution that bird species cause, although the effects are likely greatest in winter months when the migratory species are present.

Similar to that reported in the original sanitary survey, there are no major seal populations in the vicinity of the BMPA. The national population of seals has been increasing in recent years (SMRU, 2021), and seals are likely to forage in the area from time to time. However, they do not represent a significant source of contamination and require no material

consideration within any updated sampling plan. No other wildlife species of significance are noted.

3.5 Boats and Marinas

The discharge of sewage from boats around the Lune BMPA 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 3.4.

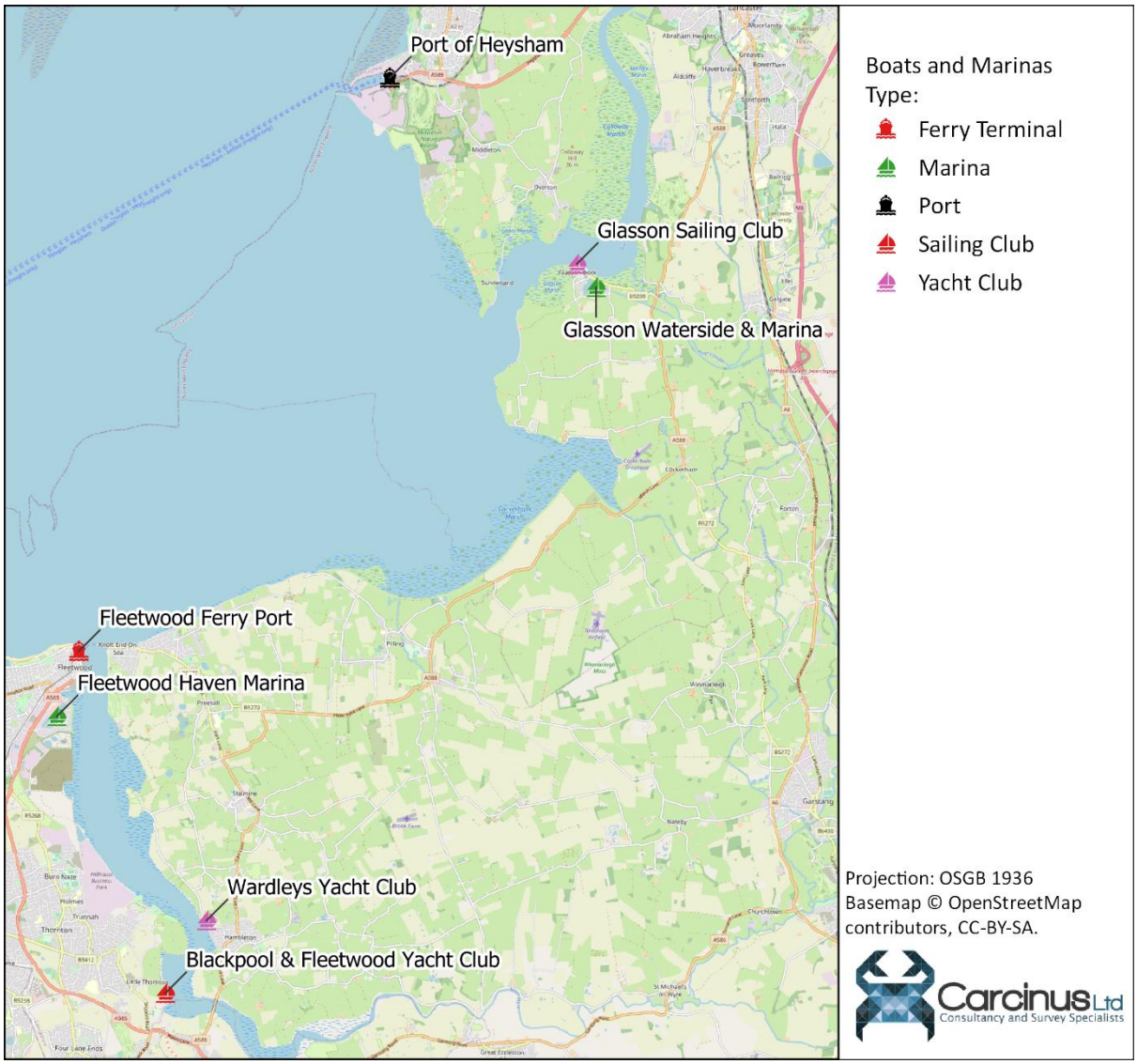


Figure 3.4 Locations of moorings, marinas and other boating activities in the vicinity of the Lune BMPA.

The major port in the area is located at Fleetwood, which receives a large volume of marine traffic, with dock space for commercial vessels up to 107 m length and 420 marina berths for recreational craft (ABP, 2021), approximately the same as the original sanitary survey reports. There is also a ferry port in the area that runs between the UK and the Isle of Mann,

and an active fishing fleet consisting of 25 vessels over 10 m and 83 under 10 m (gov.uk, 2021). The size of the fishing fleet has increased slightly since the original sanitary survey, although as commercial vessels are prohibited from making overboard discharges within three nautical miles of land[2], and so it is likely that the highest risk to the bacteriological health of the shellfishery will come from recreational vessels. Recreational vessels of a sufficient size to contain onboard toilets are liable to make occasional overboard discharges, particularly when moving through the main navigational channels or when moored offshore. Glasson marina, near the mouth of the Lune, does contain pump out facilities. The overall risk of pollution from boats is not likely to have increased significantly, and the greatest risk will continue to occur in summer months. The recommendations made in the original sanitary survey to account for this source of pollution remain valid.

3.6 Other Sources of Contamination

Urban fabric in the catchment remains centred around the coastlines at the mouths of the two main rivers, and these are therefore the areas most likely to contribute diffuse microbiological contamination through either utility misconnections or dog fouling. Land cover maps (Figure 3.1) suggest that broadly the extent of these settlements have not changed significantly. The LEA stated during initial consultations that there has been some housing development near the water in Fleetwood, although this does not require additional consideration in any updated sampling plan as new developments will have considered waste disposal in their planning process. The coastline between the Wyre estuary and Cockerham is very popular with dog walkers, and there may be some additional diffuse contamination from this source, although it is likely to be minor. Overall, the risk of contamination from these sources remains similar to that described in the original sanitary survey.

4 Hydrodynamics/Water Circulation

The Classification Zones within the Lune BMPA situated on the southern end of Morecambe Bay. In terms of freshwater courses, the Rivers Lune and Wyre will carry the majority of contamination from up-catchment sources. The subtidal entrance channels of both rivers flank a wide expanse of intertidal mudflat, which has occasional drainage channels that cut across it. Hotspots of contamination will therefore occur in the estuary approach and intertidal drainage channels at low water. This is the same situation present at the time of the original sanitary survey.

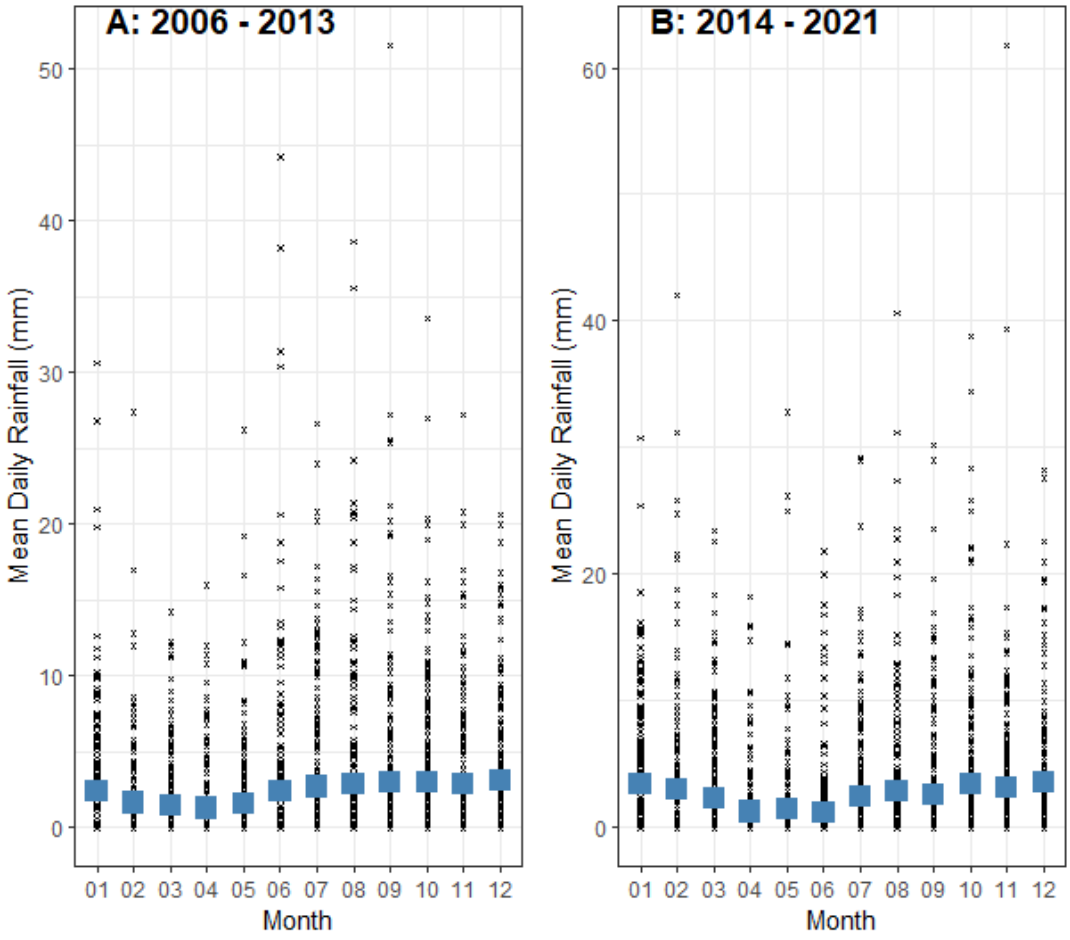
Tidal circulation is likely to be the dominating force of water circulation in the area, as the area sees a large tidal range (8.2 m during springs and 4.2 m during neap tides), although the dilution potential will be much greater in the main river channels than on the intertidal mudflats. Flooding water from the Irish Sea is carried in a north-easterly direction over the shellfish beds in the embayment, before being carried up the estuaries. The reverse is true on the ebbing tide.

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

It is considered unlikely that the hydrodynamics of the area will have changed significantly since the original sanitary survey, and as such the recommendations made in that document to account for the hydrodynamics of the area remain valid.

5 Rainfall

Rainfall data for the Fleetwood Auto monitoring station (NGR: SD 33031 46039) were requested from the Environment Agency for the period 2000 – present. These data were then subdivided into 2006 – 2013 (pre sanitary survey) and 2014 – 2021 (post sanitary survey)[3], and processed in R (R Core Team, 2021). These data were used to determine whether any changes in rainfall patterns had occurred since the original sanitary survey. Figure 5.1 shows average daily rainfall totals per month at the Fleetwood Auto monitoring station. The monitoring results are summarised in Table 5.1.



Archive Daily Rainfall from the Fleetwood Auto monitoring station (NGR: SD 33031 46039)
Data provided by the Environment Agency, licenced under the Open Government Licence v3.0

Figure 5.1 Mean daily rainfall per month for the Fleetwood Auto monitoring station (NGR: SD 33031 46039) for the periods (A) 2006 – 2013 and (B) 2014 – 2021.

[3] Data from January – April 2010 (inclusive) were not used in this analysis as the rainfall gauge was in a construction site during that time.

Table 5.1 Summary statistics for rainfall for the period preceding and following the original sanitary survey, from the Fleetwood Auto monitoring station.

Period	Mean Annual Rainfall (mm)	Percentage Dry Days	Percentage Days Exceeding 10 mm	Percentage Days Exceeding 20 mm
2006 - 2013	837.45	42.67	31.93	20.01
2014 - 2021	929.93	45.12	30.71	19.68

The data suggest that the area has seen increased rainfall in the years following the original sanitary survey, although the percentage of dry days (days with no rainfall at all) has increased and the days with heavy rainfall (> 10 mm/day) has fallen slightly. Two-sample t-tests indicated that the there was no significant difference ($p > 0.05$) in the mean daily rainfall per month between the 2010-2013 and 2014 – 2021 periods.

Rainfall leads to increased faecal loading through two factors: elevated levels of surface runoff and spill events from intermittent sewage discharges. 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 survey to capture the influence of runoff and spill events remain valid.

6 Microbial Monitoring Results

6.1 Summary Statistics and geographical variation

A total of three RMPs have been sampled within the Lune BMPA since the original sanitary survey was published. Two of these are for mussels (*Mytilus* spp.) and one is for cockles (*Cerastoderma edule*). None of the RMPs were sampled prior to the publication of the original sanitary survey; sampling at both mussel RMPs began in July 2014 and the cockle RMP (Pilling Sands East, B066W) has been sampled since October 2016. All three RMPs are currently sampled. The geometric mean results of Official Control Monitoring for all RMPs sampled since the original sanitary survey (that have had a sample taken in the last five years) are presented in Figure 6.1 and summary statistics are presented in Table 6.1. All data have been taken directly from the Cefas datahub[1] and have been taken at face value. The datahub only presents data from RMPs where a sample has been taken in the last five years, and so it is possible that other data exists, but is not considered here.

There is a distinct geographical pattern in the mean *E. coli* monitoring results, with the two mussel RMPs, both of which are located in and around the mouth of the Wyre Estuary, returning a higher geometric mean *E. coli* result than the cockle RMP, which is located farther from land on the intertidal mudflat. Generally, results from RMPs in this BMPA are high, with all three points returning a mean value of more than 2,000 *E. coli* MPN/100 g.

Approximately 90% of the results from the two mussel RMPs have been above the lowest threshold, 230 MPN/100 g, and both RMPs have returned results above the maximum threshold, 46,000 MPN/100 g. There are no instances of an RMP being collocated for more than one species, and the apparent differences in *E. coli* levels between the cockle RMP (B066W) and the two mussel MRPs (B066Y & B066Z) are more likely due to their geographical placement than differences in rate of *E. coli* uptake by the two species.

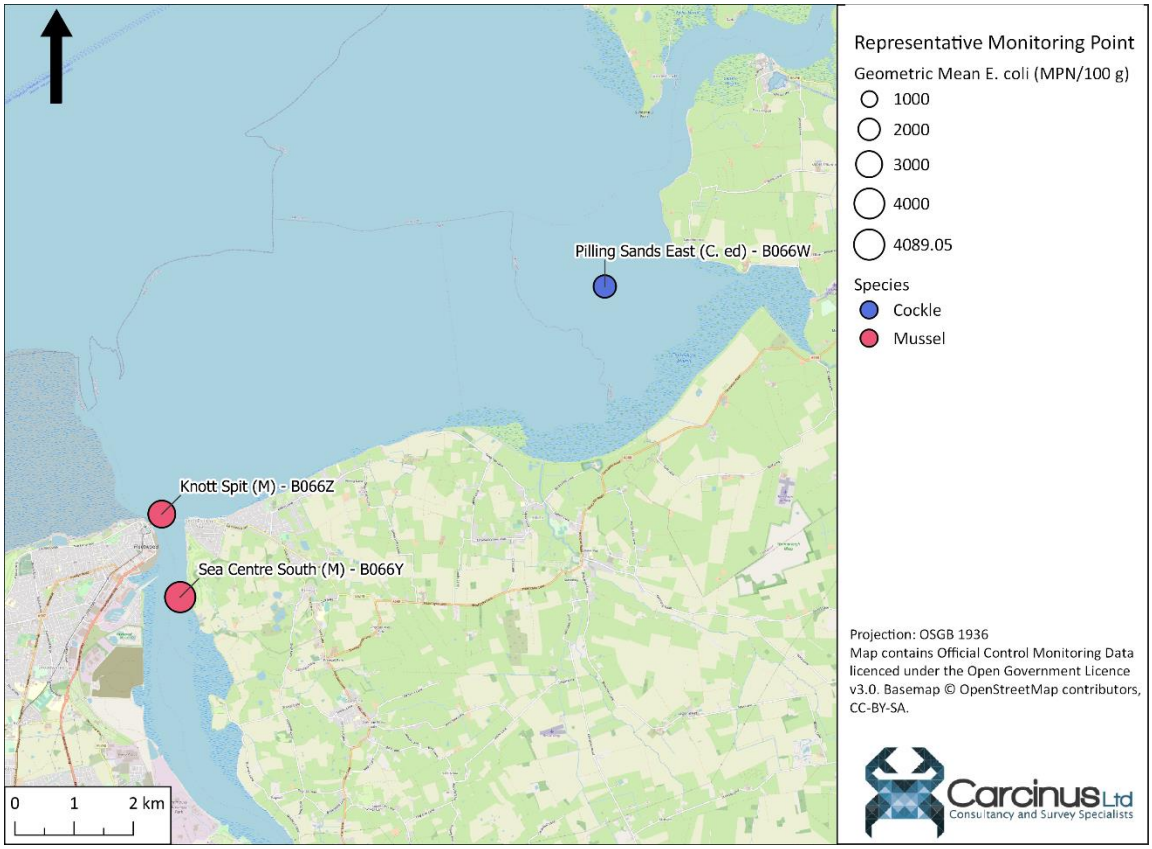


Figure 6.1 Geometric mean E. coli results from Official Control Monitoring at bivalve RMPs within the Lune BMPA.

Table 6.1 Summary statistics of Official Control Monitoring (E. coli MPN/100 g) at bivalve RMPs sampled since the original sanitary survey. Data was cut off at November 2021.

RMP (Species)	NGR	Species	No.	First Sample	Last Sample	Geometric Mean	Min Value	Max Value	% > 230	% > 4,600	% > 46,000
Pilling Sands East (C. ed) - B066W	SD41675246	Cockle	73	03/10/2016	09/11/2021	2173.41	18	35000	60.27	15.07	0.00
Sea Centre South (M) - B066Y	SD34504722	Mussel	42	30/07/2014	08/11/2021	4089.05	220	54000	95.24	16.67	2.38
Knott Spit (M) - B066Z	SD34194862	Mussel	37	30/07/2014	08/11/2021	3205.14	50	54000	89.19	16.22	2.70

Figure 6.2 and Figure 6.3 present boxplots of *E. coli* monitoring results from the various mussel and cockle RMPs, respectively. 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 various RMPs. Comparisons are only appropriate between RMPs using the same species due to the differences in *E. coli* uptake between different species. Significance has been taken at the 0.05 level. All statistical analysis described in this section was undertaken in R (R Core Team, 2021). ANOVA tests indicated that there were no significant differences between the two mussel RMPs ($p > 0.05$). No comparison is possible for the cockle data as there is only one RMP that utilises this species.

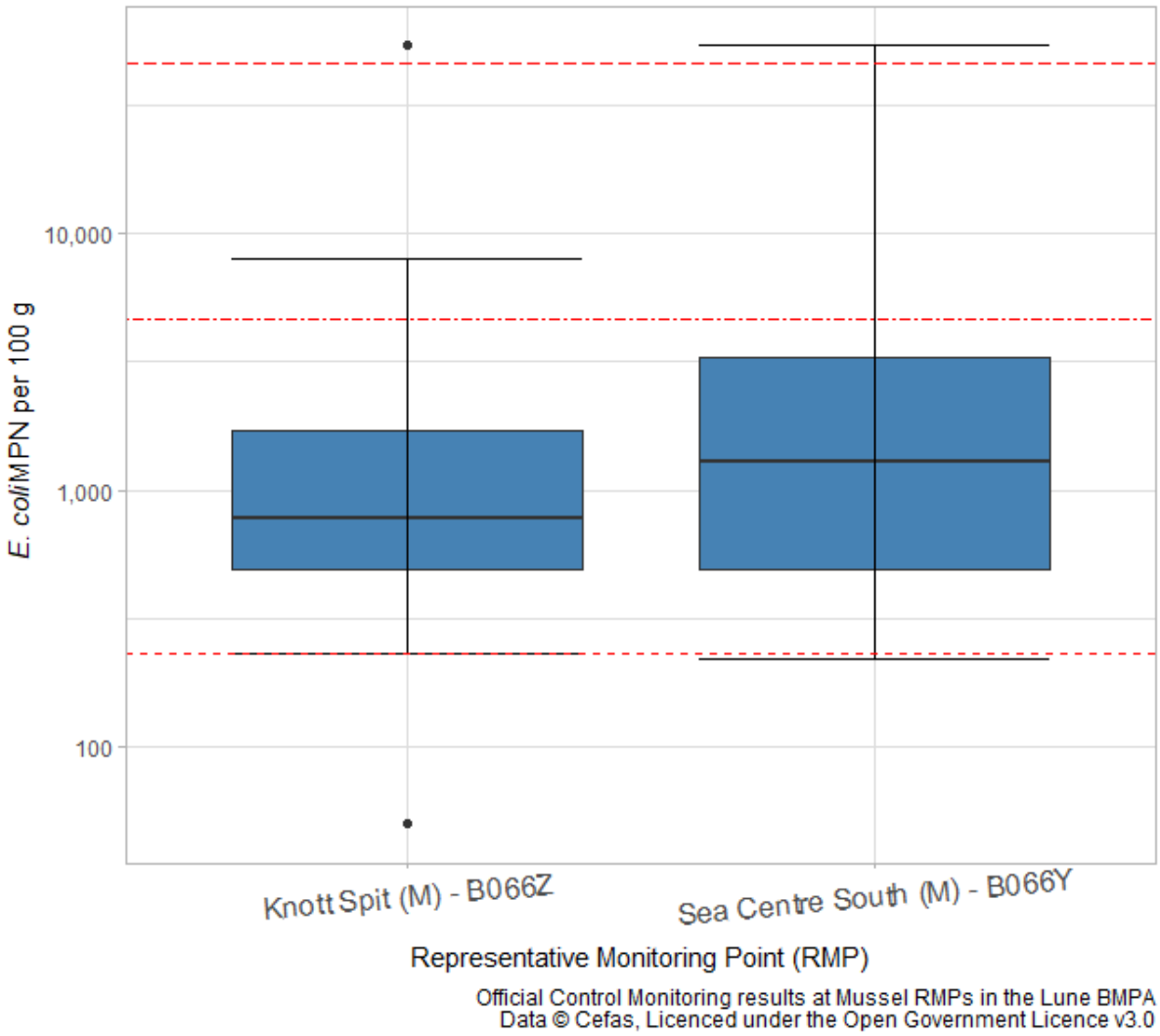


Figure 6.2 Boxplots of E. coli levels at mussel RMPs sampled within the Lune BMPA since the original sanitary survey. Central line indicates median value, box indicates lower-upper quartile range and whisker indicates minimum/maximum values, excluding outliers (points >1.5x the interquartile range). Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g.

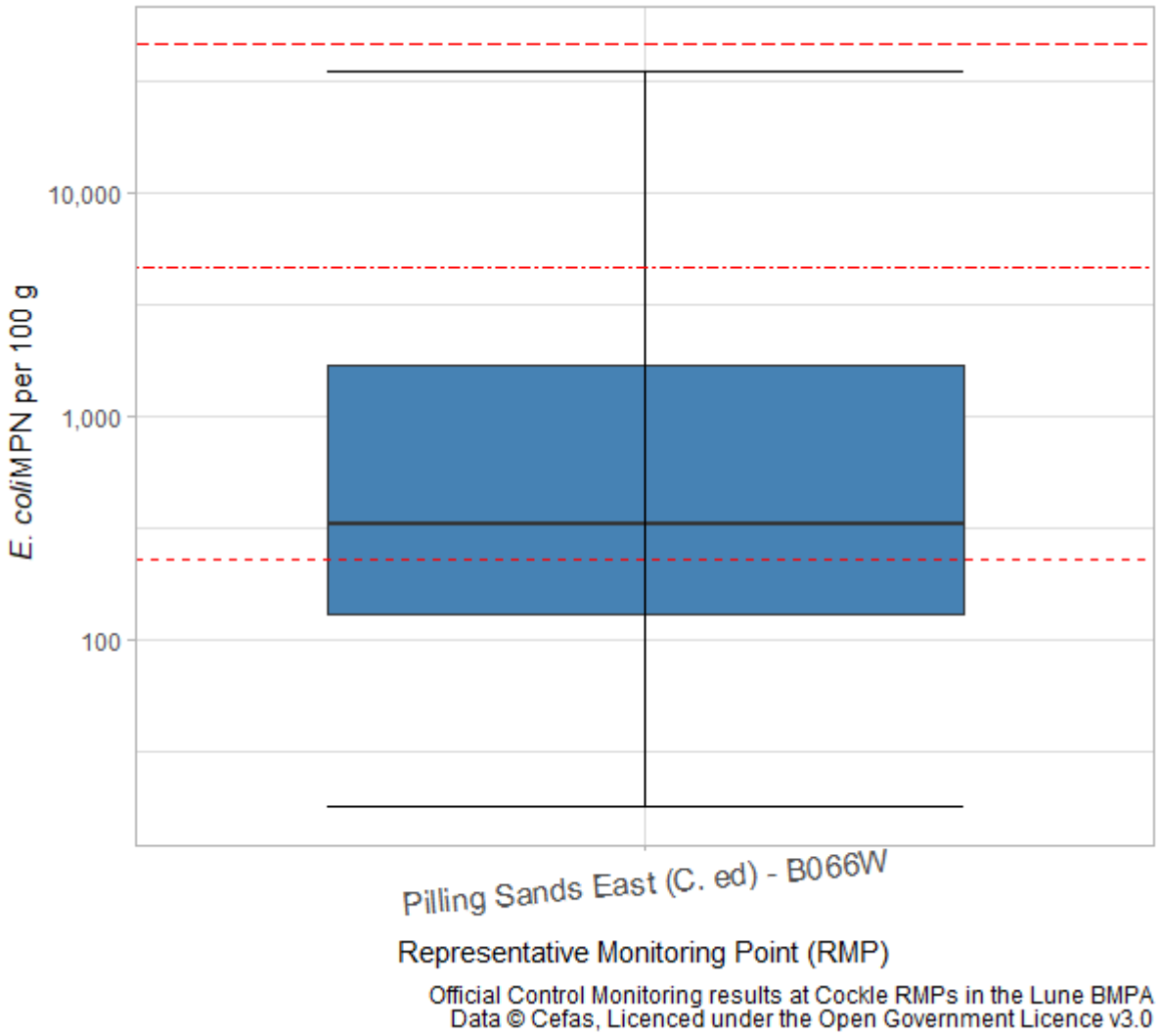


Figure 6.3 Boxplots of E. coli levels at cockle RMPs sampled within the Lune BMPA since the original sanitary survey. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g.

6.2 Overall temporal pattern in results

The overall temporal pattern in shellfish flesh monitoring results for RMPs sampled within the Lune BMPA is shown in Figure 6.4 (mussels) and Figure 6.5 (cockles).

The loess models fitted to the mussel data (Figure 6.4) suggest that from the outset of sampling (July 2014) until sampling stopped temporarily in late 2017, water quality at the two mussel RMPs was declining, including a two results that exceed the upper threshold of 46,000 MPN/100 g. Results from both RMPs during this time are broadly similar. Since sampling recommenced in late 2020, water quality has been improving and it appears that water quality is higher at the Knott Spit (B066Z) RMP. This is likely because this RMP is located farther out of the Wyre estuary than Sea Centre South (B066Y).

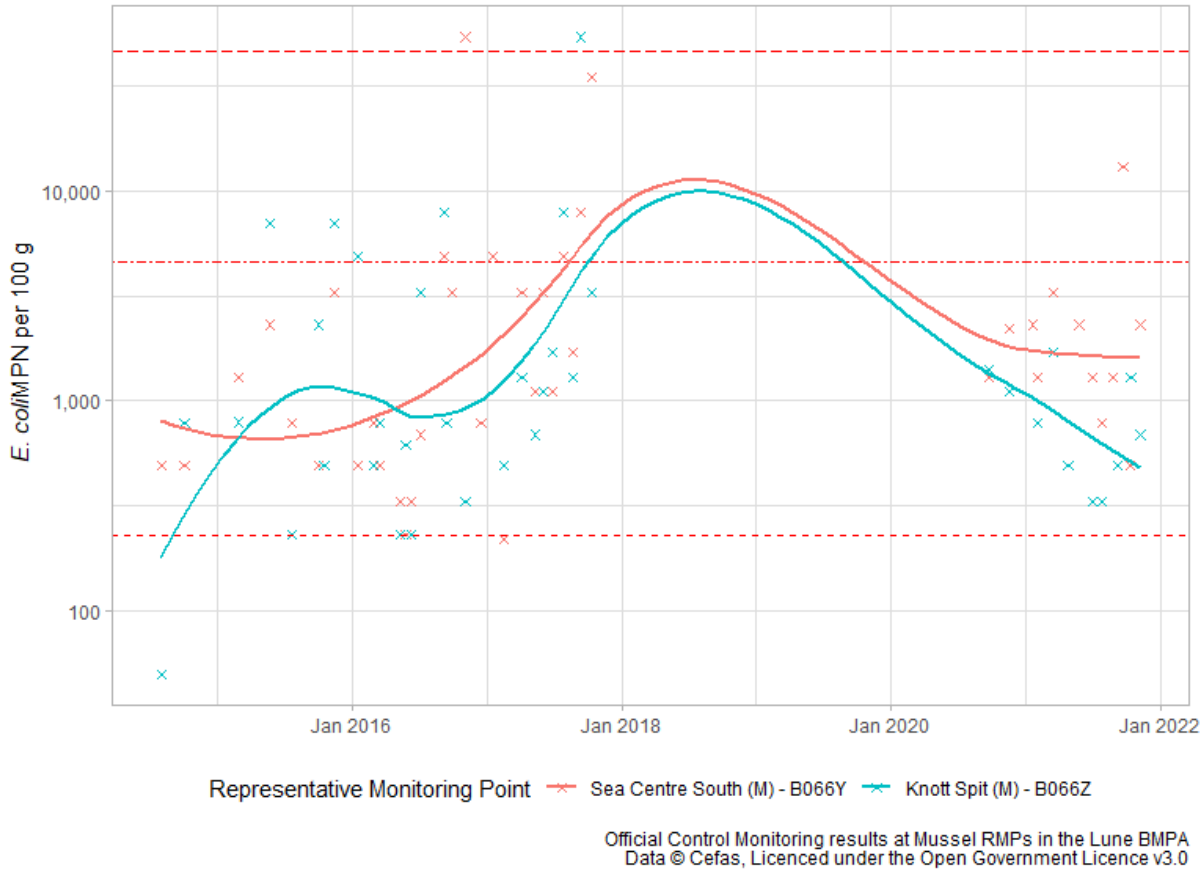


Figure 6.4 Timeseries of E. coli levels at mussel RMPs sampled in the Lune BMPA since the original sanitary survey. Scatter plots are overlaid with loess models fitted to the data. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g.

The only cockle RMP for which data is available on the Cefas datahub has been sampled continually since the outset of sampling in October 2016. Whilst the scatter plot of *E. coli* results from this RMP (Figure 6.5) shows that results have been quite variable, the loess model indicates an improvement in water quality between 2016 and late 2019, followed by a temporary rise in *E. coli* until mid-2020. From this point, water quality at this location has been improving.

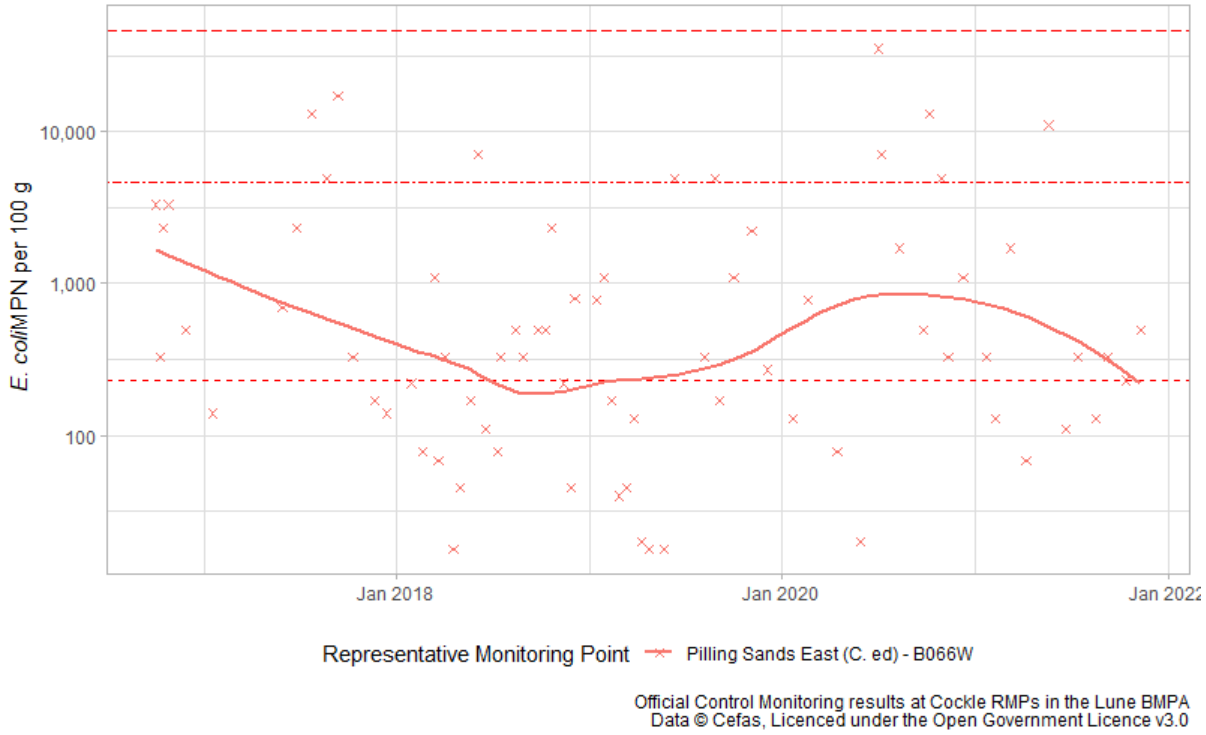


Figure 6.5 Timeseries of E. coli levels at mussel RMPs sampled in the Lune BMPA since the original sanitary survey. Scatter plots are overlaid with loess models fitted to the data. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g.

6.3 Seasonal patterns of results

The seasonal patterns of *E. coli* levels at the various RMPs within the Lune BMPA were investigated and are shown for mussel RMPs in Figure 6.6 and for cockles in Figure 6.7. The data for each year were averaged into the four seasons, with Winter comprising data from January to March, Spring from April – June, Summer from July – September and autumn from October – December. 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.

No significant differences ($p > 0.05$) were found in the data, either when compared for a single RMP or when data for the different RMPs was pooled together.

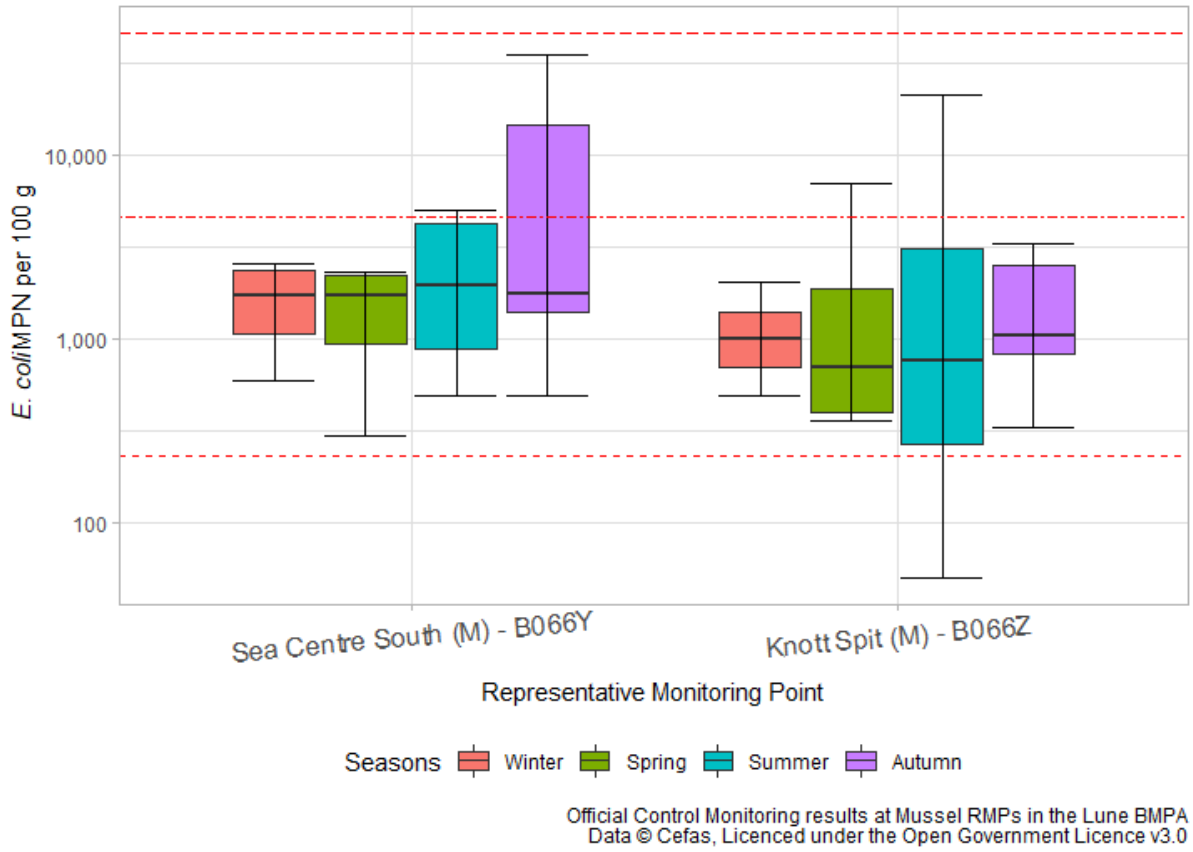


Figure 6.6 Boxplots of E. coli levels per season at mussel RMPs sampled within the Lune BMPA since the original sanitary survey. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g.

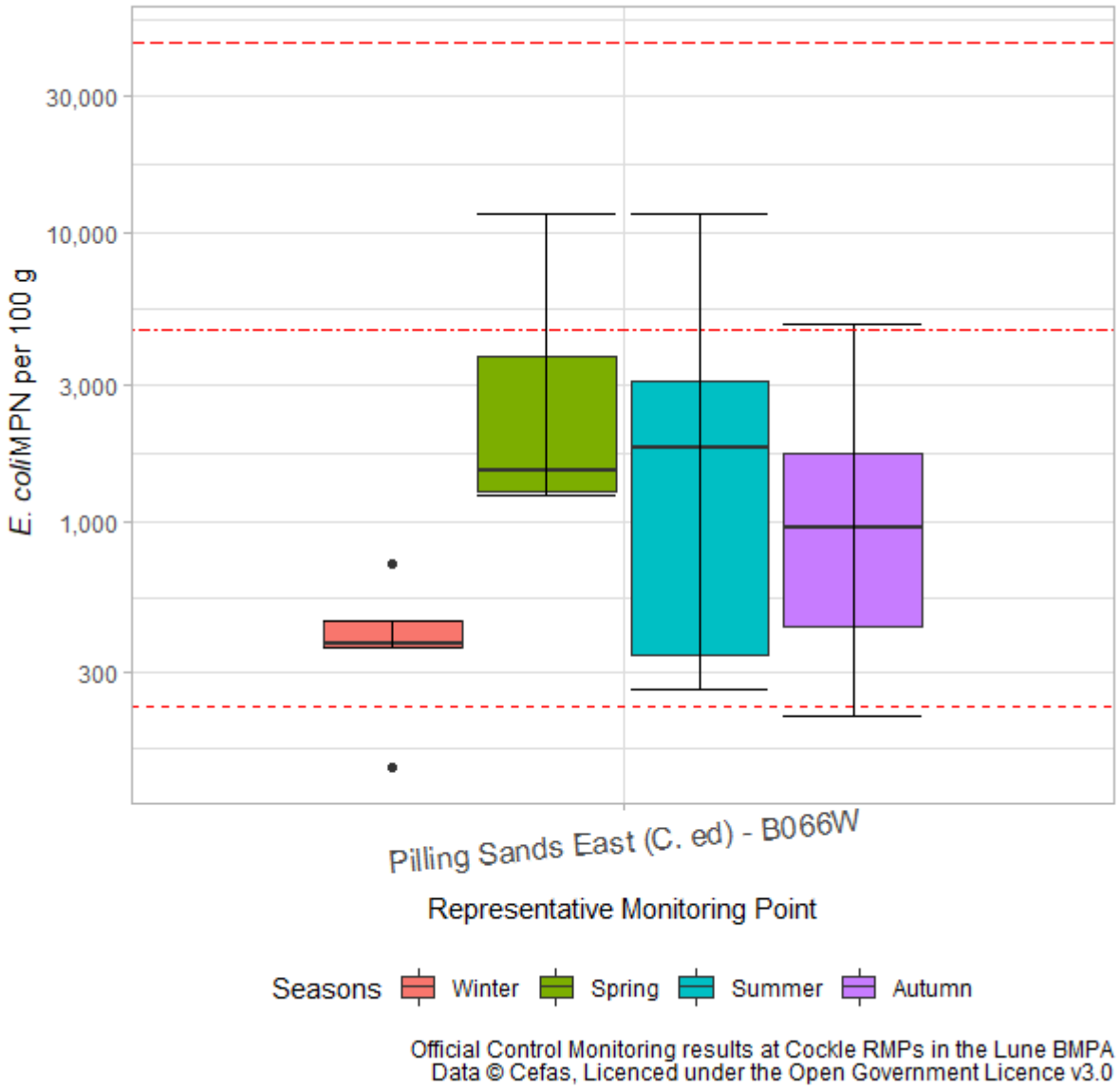


Figure 6.7 Boxplots of E. coli levels per season at cockle RMPs sampled within the Lune BMPA since the original sanitary survey. Horizontal lines indicate classification thresholds at 230, 4,600 and 46,000 MPN/100 g.

7 Conclusion and overall assessment

The Lune BMPA covers the southern part of Morecambe Bay in northwest England. Two main sources drain the catchment, the River Wyre to the south and the River Lune to the north, which flank a wide expanse of intertidal mudflat. Historically, the area has supported boom and bust cycles of cockle stocks. At the time of the original sanitary survey, there had been no significant cockle recruitment for five years, although at present there is ongoing commercial harvesting and stocks are reliable (Table 2.1). The mussel classification zones recommended in the 2013 survey have been periodically classified and declassified, most recently becoming reclassified in July 2021, although at present no commercial harvesting is taking place. The fishery is managed and regulated by the North West Inshore Fisheries and

Conservation Authority, who impose gear restrictions and minimum landing sizes, as well as imposing a closed season for cockles and holding the power to close the fishery for conservation reasons. There are currently three CZs in the BMPA, two for mussels and one for cockles.

No more recent population data than that reported in the original sanitary survey was available to the authors of this review, as the results of the 2021 Census have not yet been published. However, the UK government estimate that the national population will have increased 6.6% between 2011 and 2021, which would see the total estimated population of the catchment rise to over 356,000 people. The main urban areas in the catchment are located around the mouths of the two main rivers, and the LEA indicated during initial consultations that there has been some waterside housing development in Fleetwood, that may have led to increased pollution through utility misconnections etc. Any increase in population size will have led to an increase in loading to the wastewater treatment network. The coastal towns of the catchment are popular tourist destinations, and despite the fact that the Covid-19 pandemic has caused a significant fall in the number of tourists visiting the area, there will be a significant population increase during summer months. It is assumed however that the existing capacity of the wastewater treatment network is sufficient to handle this increase.

All the main continuous discharges within the catchment remain active, and have not had any upgrades to their treatment methodologies since the original sanitary survey.. Limited comparison of EDM data is possible, although what there is suggests spills are occurring less frequently. Overall, the main hotspots of contamination from this source have not changed significantly.

Changes in the livestock population of the catchment were investigated by comparing the data from 2013 and 2016 (no more recent data are available). These data showed that the total livestock population of the catchment increased by 15.87% over the time period. The dominant livestock group in terms of population size remains poultry, with over 1 million animals in 2016. Much of the land within the catchment is reserved for pasture, and there are several areas immediately adjacent to the waters of the BMPA, which represent the greatest risk in terms of run-off. However, the areas most at risk, and the extent of that risk have not changed significantly since the original sanitary and therefore the recommendations made in that document remain valid.

The BMPA is situated at the southern end of Morecambe Bay and contains a variety of habitats, including intertidal mudflat, sand banks and saltmarsh, that support a significant diversity of wildlife. One group of animals that is most likely to contribute contamination to the BMPA are overwintering and waterbirds. The winter counts conducted by the Wetland Bird Survey show that the average count of waterbirds in Morecambe Bay over the five winters to 2019/2020 fell by 18.7% compared to the five winters to 2010/2011. However, the area still supports internationally and nationally significant populations of many species. Where a flock of waterbirds defecate directly on shellfish beds, significant pollution could

occur, although it is impossible to define RMP locations that will reliably capture the pollution as the precise locations will vary from year to year with the shifting distributions of the birds' prey. Seals may forage in the area from time to time, although there is no significant seal colony in the area and any pollution is likely to be diffuse and intermittent. No other wildlife species of significance to the sampling plan were identified.

The waters of the BMPA receive a significant volume of shipping traffic, both recreational and commercial, although this will be spatially restricted to the river entrance channels given the wide expanse of intertidal mudflat, that is shallow even at high tide. Commercial vessels are prohibited from making overboard discharges within 3 nautical miles of land, and so any contamination would originate from private vessels of a sufficient size to contain onboard toilets. Vessels of this type are liable to make overboard discharges, either when moored overnight or moving through the main navigational channels. The risk of this source of pollution is not assessed to have increased significantly, and it remains challenging to account for it in any updated sampling plan.

A total of three RMPs have been sampled within the Lune BMPA since the original sanitary survey, none of which were sampled prior and all of which are still in use. Mean monitoring results from the two mussel RMPs (B066Y & B066Z) have been higher than those from the cockle RMP (B066W), most probably because the mussel RMPs are situated within the Wyre Estuary and are therefore more exposed to shoreline contamination sources than the cockle RMP that is on the intertidal mudflat. Relative to other BMPAs around the country, monitoring results are quite high, with all three RMPs having a mean result of more than 2,000 MPN/100 g, and both mussel RMPs having returned results in excess of 46,000 MPN/100 g, the maximum threshold. Despite differences in the mean results, no significant differences were found between any of the RMPs. Timeseries plots of the results suggest that water quality at all RMPs has been improving in recent years. No seasonal differences were found in the data.

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 original sanitary survey was published. The authors of this review have not identified any knowledge gaps that would justify a full shoreline survey. Having reviewed and compared the desk based study with the findings of the previous sanitary survey of 2013, the FSA are also content that an updated shoreline assessment is not required.

8 Recommendations

The Lune BMPA currently has three active RMPs that are used to classify a total of three classification zones, two for mussels and one for cockles. Recommendations for all active CZs are described below and are summarised in Table 8.1. In cases where shellfish are collected for classification purposes by hand, a tolerance of 10 m is generally applied. However, NWIFCA indicated that a wider tolerance would be necessary to reliably sample in this Production Area, and the distances in Table 8.1 have been adjusted accordingly. This is due to the shifting/patchy nature of the shellfish beds.

8.1 Mussels

Wyre Approaches

This zone covers an area of 0.85 km² on at the mouth of the Wyre Estuary, it meets the *Wyre Estuary* zone at its southern boundary. The current boundary is smaller than that proposed in the original sanitary survey, and it is assumed that this reflects the current stock distribution. The original sanitary survey identified that the main contaminating influence on this zone would be the ebb plume from the Wyre Estuary, and recommended placing an RMP at the southern extremity of the Knott Spit mussel bed. This RMP (Knott Spit, B066Z) has been used since then whenever classification has been required. It is recommended that this RMP be retained as the ebb plume from the Wyre will still be the main contaminating influence on this zone.

Wyre Estuary

This zone covers an area of 0.45 km² just inside the mouth of the Wyre Estuary, meeting the *Wyre Approaches* zone at its northern boundary, and extending southwards to the southern end of the Knott End golf course. It extends farther down the eastern side of the estuary than the western side, due to the presence of Fleetwood Port on the western side. The original sanitary survey identified that the main contaminating influence on this zone would be the ebb plume from the river, as well as the plume from the Preesall STW discharge to a lesser degree. It recommended placing an RMP at the southern extremity of the mussel bed. The RMP recommended in that report (Sea Centre South, B066Y) has been used since then whenever classification was required. This point is still representative of the main contaminating influences on this zone and should be retained.

8.2 Cockles

Pilling Sands

This zone is much larger than either of the two mussel zones, covering an area of 31.58 km² on the intertidal mudflat, including the Pilling Sands cockle bed. The original sanitary survey identified that the main contaminating influences would originate from the River Cocker and the Cockerham marshes, rather than the ebb plume from either the Lune or the Wyre. It recommended placing the RMP adjacent to the Cocker drainage channel (or as close to as possible). This RMP (Pilling Sands East, B066W) has been in use since then and continues to be representative of the contamination sources affecting this zone. However, during initial consultation, the LEA recommended moving the RMP 800 m on a bearing of 300° to SD 4115 5201, as the shifting drainage channels can cut off access to the current location. This move is acceptable should it provide more reliable access.

8.3 General Information

8.3.1 Location Reference

Production Area	**Lune**
Cefas Main Site Reference	M066
Ordnance survey 1:25,000	296
Admiralty Chart	2010, 1552

8.3.2 Shellfishery

Species	Culture Method	Seasonality of Harvest
Mussels (*Mytilus* spp.)	Wild	Year Round
Cockles (*Cerastoderma edule*)	Wild	Closed Season 1st May – 31st August

8.3.3 Local Enforcement Authority(s)

Name	**Wyre Borough Council** Civic Centre Breck Road Poulton-le-Fylde Lancashire FY6 7PU
Website	https://www.wyre.gov.uk/environmental-health-community-safety
Telephone number	01253 887403
E-mail address	

*Table 8.1 Proposed sampling plan for the Lune 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
Wyre Approaches	B066Z	Knott Spit	SD 3419 4862	53°55.77N, 03°00.23W	Mussels	Hand (rake)	Hand (rake)	*Mytilus* spp.	50 m	Monthly
Wyre Estuary	B066Y	Sea Centre South	SD 3450 7522	53°05.18'N, 02°59.92W	Mussels					
Pilling Sands	B066W	Pilling Sands East	**SD 4115 5201**	**53°57.65N 2°53.90W**	Cockles	Hand (rake)	Hand (rake)	*C. edule*	100 m	Monthly

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Appendices

Appendix I. Event Duration Monitoring Data Summary for 2020

Site Name	NGR	Treatment (if any)	Receiving Environment	Folio (permit number)	Total Duration of Spills	Count of Spills	% of reporting period operational
ANCHORSHOLME PS	SD3118042240	NONE	IRISH SEA	17160288	10.074	32	99.93%
ANCHORSHOLME PS	SD3118042260	NONE	IRISH SEA	17160288	10.074	32	99.93%
ARTLE BECK COMBINED SEWER OVERFLOW	SD5339064880	SCREENING	ARTLE BECK, TRIB OF RIVER LUNE	17290459	0.204	13	95.42%
AUSTWICK PUMPING STATION CRA0010	SD7645167284	SCREENING	TRIB FEN BECK VIA DRYING BEDS	EPREP3526GE	90.293	116	99.93%
BACK OF WOODLAND DRIVE CSO	SD3521238110	NONE	UNNAMED TRIBUTARY OF MAIN DYKE	01WYR0023	0.125	4	93.74%
BULK ROAD CSO 25097	SD4798662078	SCREENING	RIVER LUNE EST (VIA MILL RACE)	17280370	3.027	17	100.00%
BULL BECK BROOKHOUSE CSO	SD5408064800	NONE	BULL BECK	17280284	1.244	8	49.86%
BURTON-IN-LONSDALE STW	SD6495171921	UNSPECIFIED	RIVER GRETA	17260021	34.295	205	99.99%

Site Name	NGR	Treatment (if any)	Receiving Environment	Folio (permit number)	Total Duration of Spills	Count of Spills	% of reporting period operational
BURTON-IN-LONSDALE STW	SD6495271922	NONE	RIVER GRETA	17260021	34.295	205	99.99%
CABLE STREET CSO 251H9	SD4759661954	SCREENING	LUNE ESTUARY	17280369	2.884	26	100.00%
CALDER VALE PUMPING STATION	SD5311045170	SCREENING	RIVER CALDER	17290476	2.306	22	99.99%
CASTERTON WWTW	SD6176079550	PRIMARY SETTLEMENT	RIVER LUNE	17270014	8.691	55	99.97%
CATON WASTEWATER TREATMENT WORKS	SD5277065250	NONE	RIVER LUNE	17270001	86.899	147	100.00%
CHAIN LANE PUMPING STATION 19046	SD3563035590	NONE	TRIB OF WYRE	01FYL0040	4.802	41	99.93%
CHAIN LANE PUMPING STATION 19046	SD3563035591	NONE	TRIB OF WYRE	01FYL0040	4.802	41	99.93%
CHATSWORTH AVENUE SPS	SD3012047280	NONE	IRISH SEA	17260171	2.288	35	100.00%
CHILTERN AVENUE CSO	SD3414039350	NONE	HORSE BRIDGE DYKE	17280299	0.068	5	96.23%

Site Name	NGR	Treatment (if any)	Receiving Environment	Folio (permit number)	Total Duration of Spills	Count of Spills	% of reporting period operational
CLAPHAM WASTEWATER TREATMENT WORKS	SD7372967616	SCREENING	RIVER WENNING	EPREP3526XK	1.432	2	100.00%
COCKERHAM CSO	SD4520051300	NONE	TRIB RIVER COCKER	17280280	24.836	111	97.85%
DAMSIDE SCREENING CSO 25076	SD4756662037	SCREENING	MILL RACE	17280278	5.143	28	100.00%
DENT STW	SD7010087350	NONE	TRIB RIVER DEE	17270015	28.471	181	99.90%
DOCK STREET CSO 52567	SD3363347575	SCREENING	COPSE BROOK CULVERT	17290502	0.361	7	100.00%
EAST OF COUNCIL OFFICE	SD4937045420	UNSPECIFIED	RIVER WYRE	01WYR0039	14.742	76	99.97%
EJEC STN, NEWBIGGIN-ON-LUNE	NY7034005380	UNSPECIFIED		01EDE0065	9.250	49	99.91%
ELSWICK STW	SD4105038170	NONE	THISTLETON BROOK	17260053	44.959	308	100.00%
GALLOPER POOL PS	NY6142604628	NONE	GALLOPER POOL	17680341	5.509	34	99.92%
GARSTANG STW	SD4787042730	PRIMARY SETTLEMENT	RIVER WYRE	17260046	36.278	376	100.00%
HALTON EAST SEWAGE	SD5036064720	SCREENING	RIVER LUNE	01LAN0060	8.666	91	100.00%

Site Name	NGR	Treatment (if any)	Receiving Environment	Folio (permit number)	Total Duration of Spills	Count of Spills	% of reporting period operational
PUMPING STATION							
HALTON EAST STW	SD5053064610	SCREENING	RIVER LUNE	17270002	10.556	70	99.98%
HALTON WEST PUMPING STATION HLTWE	SD5001064630	SCREENING	RIVER LUNE	17280287	3.536	85	100.00%
HEATON BRIDGE CSO BOLTON	SD6787088200	NONE	MIDDLE BROOK	16982883	0.413	28	93.83%
HIGH BENTHAM WWTW (HGHBE)	SD6611168985	PRIMARY SETTLEMENT	RIVER WENNING	17260004	101.593	160	100.00%
HIGHCROSS ROAD CSO	SD3622038690	NONE	MAIN DYKE TRIB OF WYRE ESTUARY	17280298	0.039	4	100.00%
HOLTS LANE DETENTION TANK	SD3621038690	SCREENING	MAIN DYKE	NPSWQD001283	2.010	13	99.94%
HORNBY STW	SD5805068390	NONE	RIVER WENNING	17270017	52.583	112	100.00%
IN FIELD POULTON M.H. 292 CSO	SD3528337969	NONE	UNNAMED TRIBUTARY OF MAIN DYKE	01WYR0020	0.483	17	79.09%
INGLETON STW	SD6861072630	SCREENING	RIVER GRETA	17260005	230.964	258	100.00%
KENLIS STW	SD5079043860	NONE	LITTLE CALDER	17260145	16.334	72	98.56%
KEPPLE LANE(OVERFLOW	SD4879044673	SCREENING	RIVER WYRE	17260029	19.255	99	99.88%

Site Name	NGR	Treatment (if any)	Receiving Environment	Folio (permit number)	Total Duration of Spills	Count of Spills	% of reporting period operational
C GARSTANG)CSO							
KIRKBY LONSDALE STW	SD6152077880	PRIMARY SETTLEMENT	RIVER LUNE	17270006	32.980	89	99.95%
KNOTT END PUMPING STATION	SD3458048370	SCREENING	RIVER WYRE ESTUARY	17260103	1.779	10	99.99%
LANCASTER WWTW LANCA	SD4571058720	SCREENING	LUNE ESTUARY	17270050	32.577	47	100.00%
LOW BENTHAM WWTW (LOWBE)	SD6340169726	SCREENING	RIVER WENNING	17260007	105.882	216	98.53%
LUNE STREET PUMPING STATION 25030	SD4757362174	SCREENING	RIVER LUNE ESTUARINE WATERS	17270195	0.093	4	100.00%
MIDDLE POOL PS MIDDP LAN0099	SD4348058330	SCREENING	LADES POOL	17280289	0.242	3	99.92%
MIDDLETON OVERTON WWTW MIDDL	SD4304057960	SCREENING	LADES POOL ESTUARINE WATERS	17270051	6.673	13	100.00%
MORTAR PITS COMBINED SEWER OVERFLOW	SD6526091404	SCREENING	RIVER RAWTHEY	17290473	3.072	51	99.99%

Site Name	NGR	Treatment (if any)	Receiving Environment	Folio (permit number)	Total Duration of Spills	Count of Spills	% of reporting period operational
MORTAR PITS COMBINED SEWER OVERFLOW	SD6624291743	SCREENING	RIVER RAWTHEY	17290473	3.072	51	99.99%
NETHER KELLET WTW NETHK	SD5018068160	SCREENING	NETHER BECK, TRIB RIVER KEER	17370074	53.466	125	98.69%
NETHER KELLET WTW NETHK	SD5018068160	SCREENING	NETHER BECK, TRIB RIVER KEER	17370074	53.466	125	98.69%
ORTON STW	NY6291007680	PRIMARY SETTLEMENT	CHAPEL BECK	17270008	125.995	175	99.89%
ORTON STW	NY6291007700	NONE	CHAPEL BECK	17270008	125.995	175	99.89%
OWEN ROAD COMBINED SEWER OVERFLOW	SD4788062360	SCREENING	RIVER LUNE ESTUARY	17280424	0.104	3	100.00%
OXCLIFFE RD PS NO 1 & EO TO OVERTON	SD4476061080	SCREENING	RIVER LUNE ESTUARY	01LAN0028	1.256	19	99.95%
PREESALL WWTW PREES	SD3481046870	SCREENING	WYRE ESTUARY	17260071	42.851	76	99.98%
RAILWAY FARM CSO 25051	SD4808055240	SCREENING	RIVER CONDOR	17220120	6.255	31	100.00%
RAVENSWOOD CSO 52568	SD3371037610	SCREENING	HORSEBRIDGE DYKE	17290504	1.047	22	100.00%

Site Name	NGR	Treatment (if any)	Receiving Environment	Folio (permit number)	Total Duration of Spills	Count of Spills	% of reporting period operational
REAR OF SUNNYSIDE TERRACE CSO	SD3711647280	NONE	TRIBUTARY OF COCKERS DYKE	17280303	0.114	10	100.00%
ROSEMARY LANE CSO 252PG	SD4778361876	SCREENING	MILL RACE	17280276	0.544	12	100.00%
ROSSALL SCHOOL PUMPING STATION	SD3172145104	NONE	UNNAMED DYKE	01WYR0007	0.075	2	100.00%
SCALE HALL PUMPING STATION	SD4643562242	SCREENING	LUNE ESTUARY	17270196	0.465	6	100.00%
SCHOLA GREEN LANE PS	SD4139064370	SCREENING	MORECAMBE BAY	17370197	2.516	18	
SCORTON VILLAGE PUMPING STATION	SD4980248452	NONE	RIVER WYRE	17260047	24.500	82	100.00%
SEDBERGH STW	SD6510091160	PRIMARY SETTLEMENT	RIVER RAWTHEY	17270009	353.757	351	11.10%
SEDBERGH STW	SD6512091160	SCREENING	RIVER RAWTHEY	17270009	353.757	351	11.10%
SETTLEBECK SEDBERGH CSO	SD6624191742	NONE	RIVER RAWTHEY	01LAK0014	0.054	6	100.00%
SINGLETON PS	SD3826037940	SCREENING	UNNAMED TRIB OF MAIN DYKE	17290649	12.756	183	99.99%

Site Name	NGR	Treatment (if any)	Receiving Environment	Folio (permit number)	Total Duration of Spills	Count of Spills	% of reporting period operational
SKIPPOOL PUMPING STATION	SD3576540672	NONE	WYRE ESTUARY	17260059	40.967	76	99.99%
SKIPPOOL PUMPING STATION	SD3584140922	SCREENING	WYRE ESTUARY	17260059	40.967	76	99.99%
TEBAY PUMPING STATION	NY6153005230	NONE	RIVER LUNE	17280240	68.106	119	99.99%
TEBAY STW	NY6135202882	NONE	RIVER LUNE	17270018	109.154	233	99.93%
THE AVENUE (CHURCHTOWN) CSO	SD4877042971	NONE	RIVER WYRE	17290551	4.683	18	100.00%
THURTELL COTTAGES CSO LAN0091	SD5280065240	SCREENING	RIVER LUNE	01LAN0091	3.936	48	99.99%
TRUNNAH ROAD PUMPING STATION	SD3386043240	SCREENING	ROYALS BROOK	17290503	2.186	23	100.00%
WEETON WASTEWATER TREATMENT WORKS	SD3829034800	NONE	TRIB MAIN DYKE	17260056	4.573	90	99.96%
WILLOW LANE SEWAGE	SD4664962235	SCREENING	RIVER LUNE ESTUARY	17280342	15.784	45	97.67%

Site Name	NGR	Treatment (if any)	Receiving Environment	Folio (permit number)	Total Duration of Spills	Count of Spills	% of reporting period operational
PUMPING STATION							
WILLOW LANE SEWAGE PUMPING STATION	SD4665662215	SCREENING	RIVER LUNE ESTUARY	17280342	15.784	45	97.67%
WRAY WASTEWATER TREATMENT WORKS	SD6010068140	PRIMARY SETTLEMENT	RIVER HINDBURN	17270020	17.139	238	99.97%

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CLASSIFICATION OF BIVALVE MOLLUSC PRODUCTION AREAS IN ENGLAND AND WALES

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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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