Sanitary Survey - Review

Colne – 2021

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Document QA and Approval

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Initial Consultation

Consultee	Date of consultation	Date of response
Colchester Borough Council	27 November 2020	24 December 2020
Tendring District Council	27 November 2020	24 December 2020

Environment Agency	27 November 2020	23 December 2020

Secondary Consultation

Consultee	Date of consultation	Date of response
Colchester Borough Council	18 February 2021	14 April 2021
Tendring District Council	18 February 2021	14 April 2021
Anglian Water	18 February 2021	18 March 2021

A sanitary survey relevant to the bivalve mollusc beds in Colne was undertaken in 2013 under EC Regulation 854/2004 (now superseded by retained EU Law Regulation (EC) 2019/627).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, Colchester City Council; Tendring District Council. The report is publicly available via the Carcinus Ltd. website.

Recommended Bibliographic Citation:

Carcinus Ltd., 2021. Review of the Colne 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 in England and Wales under retained EU Law Regulation (EC) 2019/627.

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1 Introduction

1.1 Background

In line with the EU Good Practice Guide (European Commission, 2017) and Article 58 of retained EU Law Regulation (EC) 2019/627, Carcinus is contracted to undertake reviews of sanitary surveys on behalf of the Food Standards Agency. The FSA undertake targeted sanitary survey reviews to ensure public health protection measures continue to be appropriate.

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 complexity and risk. The desktop assessment is completed through analysis and interpretation of publicly available information, in addition to consultation with stakeholders.

1.2 Colne Review

This report reviews information and makes recommendations for a revised sampling plan for existing cockle (*Cerastoderma edule*), hard clam (*Mercenaria mercenaria*), *Tapes* spp., native oyster (*Ostrea edulis*) and Pacific oyster (*Crassostrea gigas*) classification zones in the Colne Estuary (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 December 2020. 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 March and April 2021. 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 2013 and sampling plan as necessary and the report should read in conjunction with the previous survey.

Specifically, this review considers:

(a) Changes to the shellfishery (if any);

(b) Changes in microbiological monitoring results;

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

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

(e) Change in environmental conditions;

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

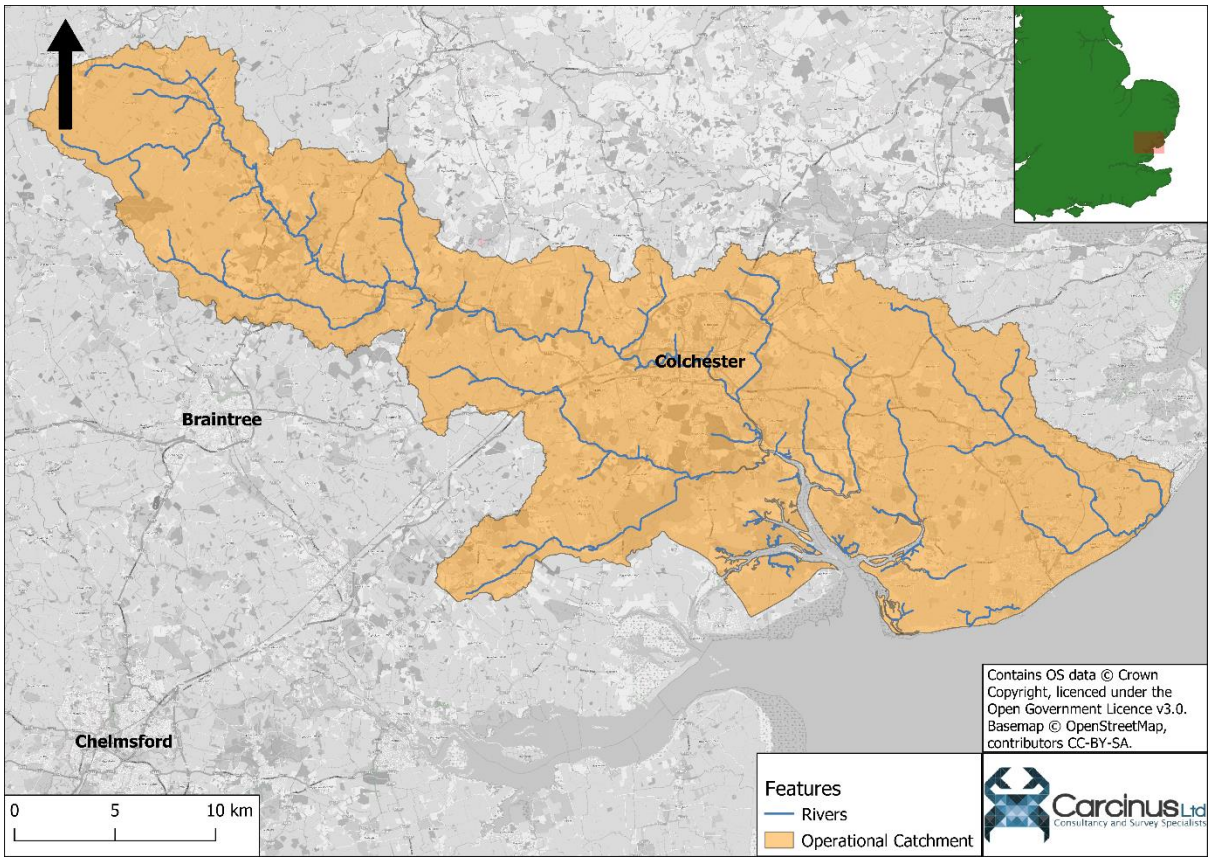

Figure 1.1 Location of the Colne Estuary.

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 December 2020;
- 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 December 2020 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

Harvesting of shellfish within the Colne BMPA is under the jurisdiction of Kent & Essex Inshore Fisheries and Conservation Authority (KEIFCA) and is subject to the Area A Byelaws (KEIFCA, 2021). These byelaws set out the rights and restrictions that apply to fishermen wanting to utilise the fishing waters and applies to the entire area considered in this review. Under the byelaw, limits on harvesting mean that no more than 13.6 m^3 of mussels or cockles can be harvested within a 24 hour period. Additionally, fishermen dredging for shellfish may not operate a dredge that has an opening that exceeds 2 m when fishing for mussels, 85 cm for scallops or 4 m for oysters. The byelaws also impose minimum landing sizes; no more than 10% (by weight) of landed mussels should be able to pass through a space 18 mm width and no native oysters that fit through a circular ring 7 cm diameter may be removed, though this restriction does not apply to Pacific oysters. Furthermore, the KEIFCA reserves the right to close a fishery where the bed "*is so severely depleted as to require temporary closure in order to ensure recovery, or any bed or part of a bed contains mainly immature shellfish which in the interest of the protection and development of the fishery ought not to be disturbed for the time being, or any bed of transplanted shellfish ought not to be fished until it has become established…*". Colchester council leases the rights to much of the fishery within the Colne estuary to Colchester Oyster Fishery Ltd, which has held the rights since 1964 (Colchester Oyster Fishery, 2021). This lease covers virtually the entire BMPA, apart from the waters in Brightlingsea Creek and Point Clear Bay.

The Colne BMPA is located adjacent to two other BMPAs; West Mersea and Blackwater to the south. The BMPA covers the entire estuary, from the coast at Lee-Over-Sands at the mouth of the estuary, up the River Colne to Fingringhoe Wick Nature Reserve, and includes the creeks that drain to the main river; Geedon Creek, Pyefleet Channel and Brightlingsea Creek. The fishery involves both wild and cultured stocks of the harvested species.

Consultation with the LA did not indicate changes to harvesting methods for any of the harvested species. As such, it is assumed that these remain unchanged from the original sanitary survey.

The original sanitary survey, conducted in 2013, gave recommendations for the creation of eight Classification Zones (CZs) in the BMPA. These were *Main Channel Inner*, *Main Channel Central*, *Main Channel Outer*, *Geedon Creek*, *Pyefleet Creek*, *Brightlingsea Creek Inner*, *Brightlingsea Creek Outer* and *Point Clear Bay* for the various species to be classified. *Main Channel Inner* (for hard and manila clams) and *Point Clear Bay* do not possess active classifications. *Pyefleet Creek* has been renamed *Pyefleet Channel*, although the boundaries remain the same. The following paragraphs describe the current classification zones for each of the currently harvested species.

2.1.1 Pacific oyster

There are currently five CZs for Pacific oyster harvesting in the BMPA. These are *Brightlingsea Creek Inner*, *Brightlingsea Creek Outer*, *Main Channel Central*, *Main Channel*

Outer and *Pyefleet Channel*. *Geedon Creek* was closed in October 2020 due to access restrictions caused by MOD closure of the creek. No other changes to the commercial fishery of this species since the original sanitary survey were reported during consultation with the Local Authority.

The Local Authority indicated that 22,400 Kg of Pacific oysters were landed from the *Main Channel Central* and *Pyefleet Creek* zones in 2020, with a further 6,103 kg from the *Brightlingsea Creek* CZ. The landings from other CZs classified for this species are unknown.

2.1.2 Native oyster

The original sanitary survey describes that native oysters primarily occur in the subtidal areas of the BMPA, but with relatively low stock levels. No updated stock maps are available, but it is assumed that the distributions remain relatively similar. There are currently three CZs for native oyster harvesting; *Main Channel Central*, *Main Channel Outer* and *Pyefleet Channel*. The *Geedon Creek* CZ was closed in October 2020 due to access restrictions. No other changes to the commercial fishery of this species since the original sanitary survey were reported during consultation with the Local Authority.

The Local Authority indicated that a total of 250 kg of native oysters were landed from the *Brightlingsea Creek* CZ in 2020. The landings from other zones are unknown.

2.1.3 Hard clams

At the time of the original sanitary survey, industry indicated that the main area of interest for harvesting hard clams was the subtidal area between Batemans Tower and the number 19 buoy. There was also industry interest in harvesting this species from Brightlingsea Creek, and consequently four CZs; *Main Channel Inner*, *Main Channel Central*, *Brightlingsea Creek Inner* and *Brightlingsea Creek Outer* were recommended. *Main Channel Inner* was never classified, although both CZs in Brightlingsea Creek and *Main Channel Central* are still active.

The Local Authority indicated that 21,786 Kg hard clams were landed from the *Main Channel Central* zone in 2020. The landings from other zones are unknown.

2.1.4 Cockles

The original sanitary survey gave recommendations for a single CZ, *Pyefleet Creek* for harvesting of cockles. This CZ has been renamed *Pyefleet Channel*, and is currently active, although is currently classified using mussel samples (Figure 2.1). *Geedon Creek* was classified for the harvesting of this species in 2014, 2015 & 2019, but was declassified in October 2020 due to access restrictions to the creek.

2.1.5 *Tapes* spp.

At the time of the original sanitary survey, Manila clams (*Tapes* spp.) were not subject to commercial harvesting but were occasionally found in dredge catches. The survey recommended classification of the hard clam zones for this species, although currently only the *Main Channel Central* zone has an active classification.

2.2 Classification History

The original sanitary survey recommended the creation of four CZs for hard clams, seven for Pacific oysters, four for native oysters, one each for cockles and mussels and two for manila clams (19 in total). There are currently only 13 CZs in the BMPA with active classifications; *Main Channel Inner* was declassified in 2014 and *Geedon Creek* was declassified in October 2020.

The location of all active CZs in the Colne BMPA are shown in Figure 2.1. The vast majority of CZs hold Class LT-B classifications, with the cockle *Pyefleet Channel* CZ holding a Class C classification and the *Tapes* spp. *Main Channel Central* CZ holding a Class B classification.

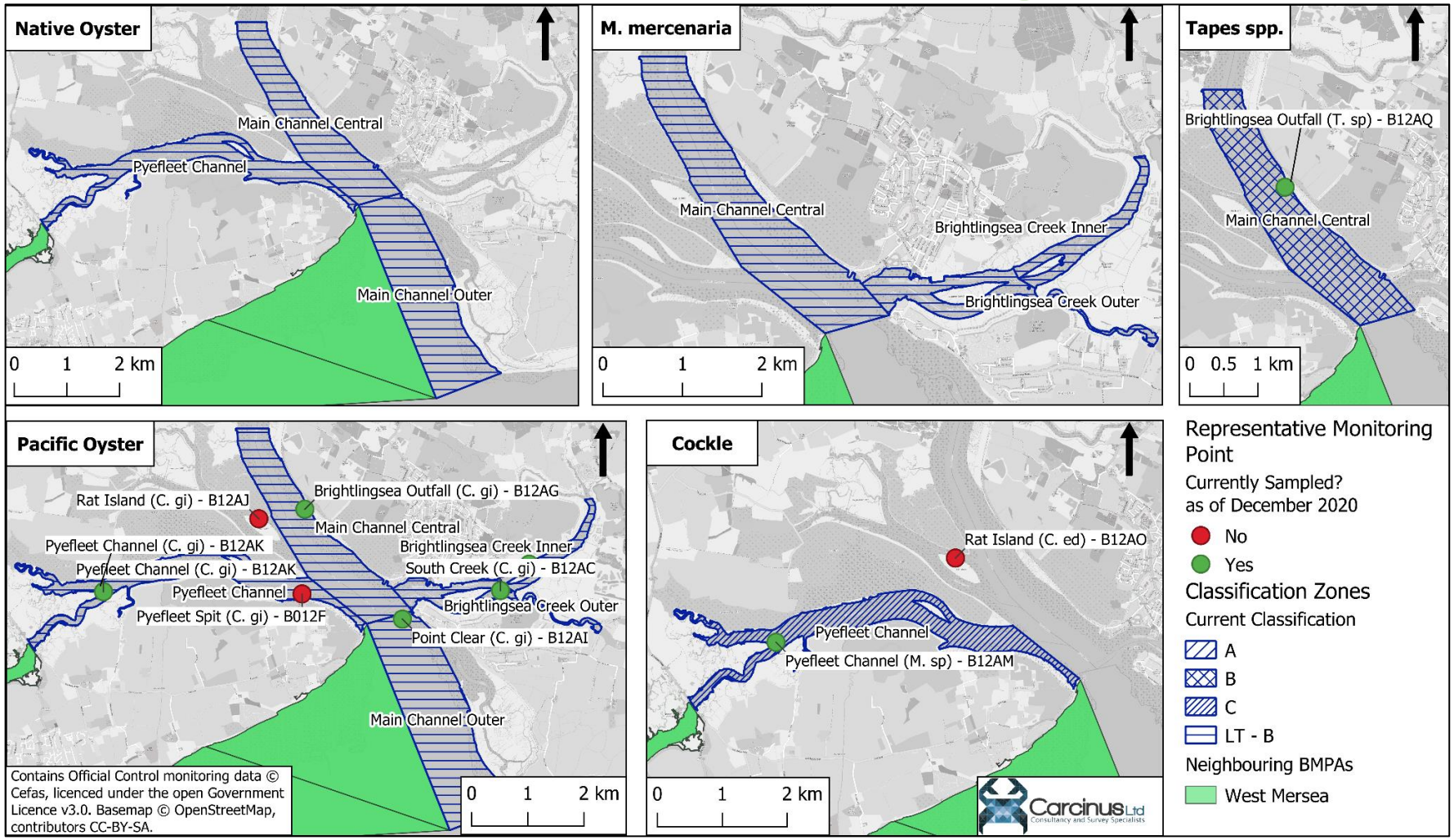

Figure 2.1 Current Classification Zones and associated Representative Monitoring Points (RMPs) for the species harvested in the Colne BMPA.

3 Pollution sources

3.1 Human Population

The original sanitary survey cites population data from the 2001 Census of the United Kingdom. Since the publication of that document, the data from the subsequent full Census of 2011 has been made available, and so this data has been compared to that of the 2001 census to give an indication of the changes in human population within the catchment. These censuses have been used as no further population data are freely available. Changes in human population densities in census Super Output Areas (lower layer) and total population within wards wholly or partially contained within the Colne catchment between the 2001 and 2011 censuses are shown in Figure 3.1 and Figure 3.2.

In general, population density has increased across the entire catchment, with nearly two thirds of wards showing an increase in population size. Population densities remain low, at an average of only 14.8 people per hectare and much of the catchment having population densities of < 6 people per hectare. The main population centres remain around Colchester and Clacton-on-Sea, with some small towns in the upper catchment. A detailed breakdown of population change for individual wards is shown in Appendix I.

At the 2001 census, the total resident population within wards wholly or partially contained within the Colne catchment was 327,914. By the 2011 census, this had increased to 348,041 people, an increase of 6.14%. The population data for the 2011 census was collected two years before the original sanitary survey was published and so could be considered more relevant to that document. The next full census of the United Kingdom is scheduled to take place in the 2021 and the UK government estimates that the national population will increase by approximately 6.6% between 2011 and 2021 (Office for National Statistics, 2018). An increase of this proportion would see the approximate population residing within the Colne catchment increase to 371,012 people. The potential for urban runoff remains highest from the city of Colchester at the head of the Colne estuary. Impacts from sewage will depend on the specific locations and nature of discharges, changes to which are discussed in Section 3.2. Consultation with the LA did not indicate that any additional significant housing developments had either occurred, were underway or planned. However, without upgrades to the wastewater treatment network (WWTW), an increase in population would almost certainly lead to an increase in the loading to the WWTW and would therefore potentially cause increased bacterial loading to coastal waters.

The original sanitary survey describes that the area sees a significant increase in its population during summer months due to its popularity as a tourist destination. Whilst no recent tourism statistics are available, it is expected that tourist numbers will have remained similar or increased slightly. The peak tourism season is during the summer months, and so it is expected that the loading to the wastewater treatment network will also peak during this time.

Whilst there is no recently available population data for the catchment, it is likely that the population will have increased by a small proportion since the last sanitary survey. However, the distribution of main population centres within the catchment has not changed, and as such the recommendations for RMP location are still valid.

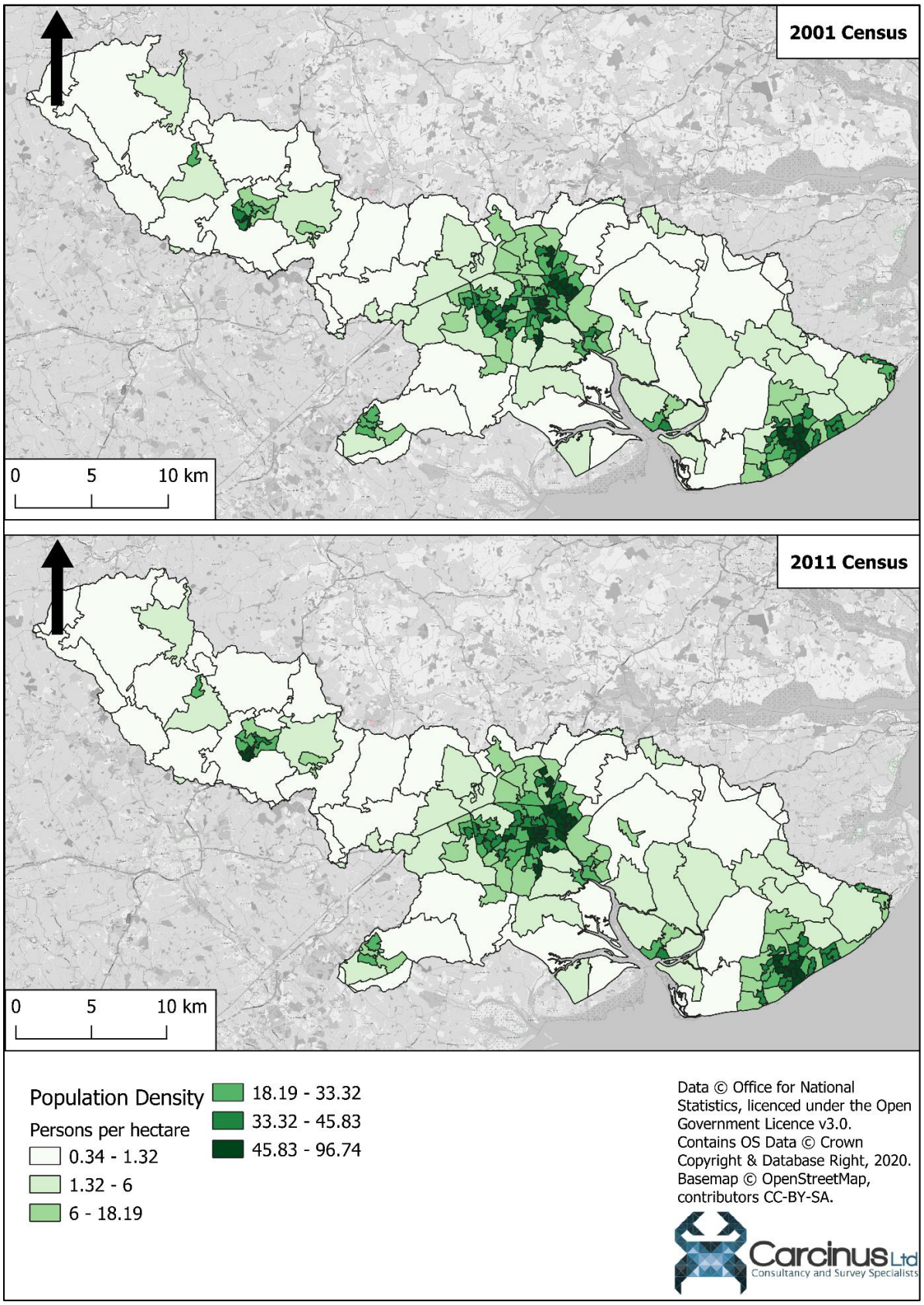

Figure 3.1 Human population density in 2001 and 2011 census Super Output Areas (lower layer) that intersect the Colne catchment.

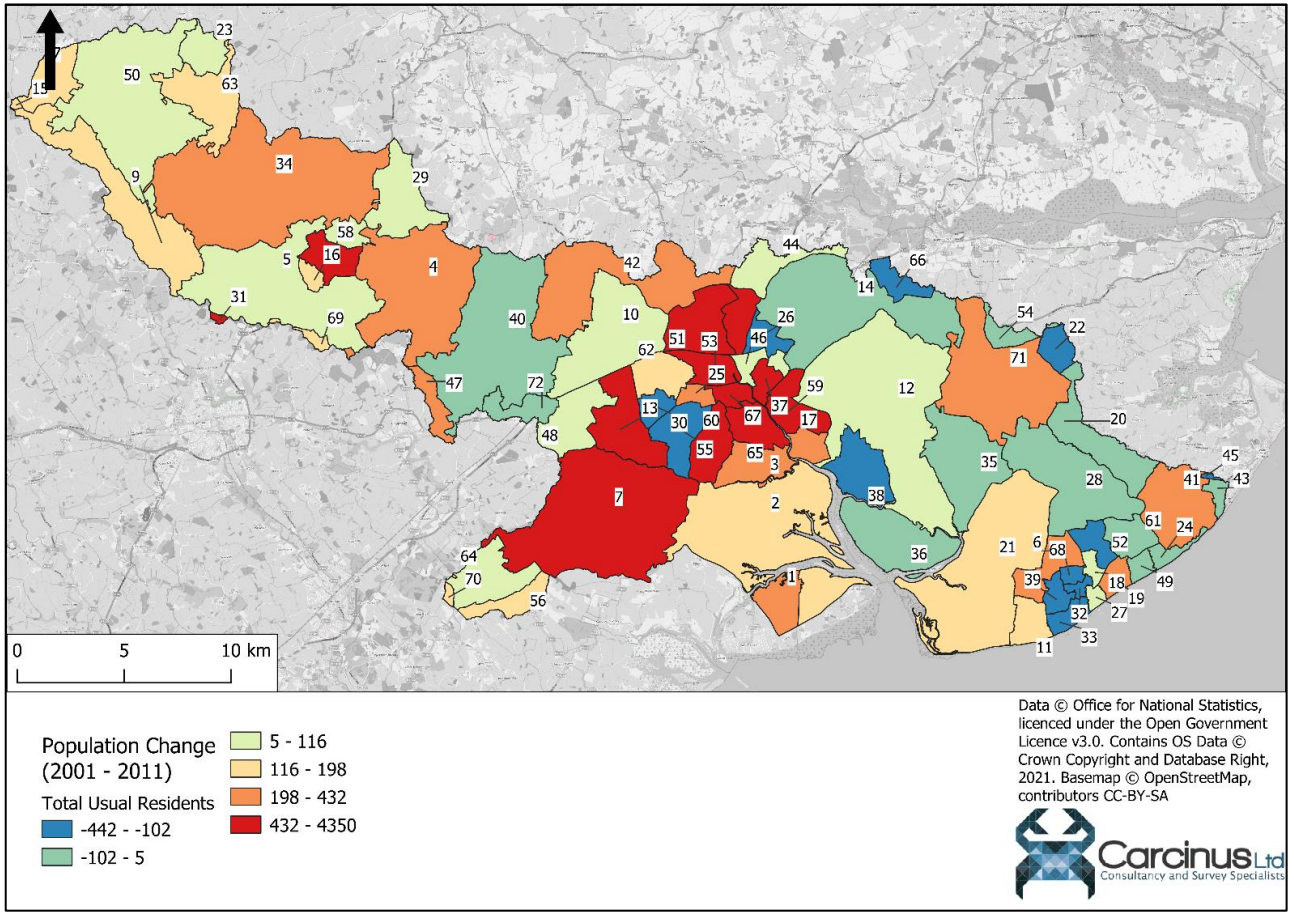

Figure 3.2 Population change between the 2001 and 2011 censuses for Wards and Electoral divisions (based on 2011 boundaries) that are within or partially within the Colne hydrological catchment (wards have been clipped to the boundary of the hydrological catchment). 2001 Census data have been transposed to 2011 wards using the UK Data Service's GeoConvert tool (UK Data Service, 2020) to facilitate comparison. Numbers within wards are identifiers that can be used in combination with Appendix I to provide more detail.

3.2 Sewage

Details of all consented discharges in the Colne catchment were taken from the most recent update to the EA's national permit database at the time of writing (November 2020). The locations of these discharges are shown in Figure 3.3. Specific information about continuous discharges is presented in Table 3.1.

The original sanitary survey identified a total of 28 continuous discharges within the Colne catchment (p44, Figure II.1; p46, Table II.1). The majority of the sewage discharges (in terms of volume) had outfalls upstream of the shellfishery, either farther up the main estuary or to watercourses draining upstream of the classification zones. The area was undergoing some upgrades to the WWTW at the time of the original sanitary survey, with Brightlingsea and Colchester Sewage Treatment Works (STWs) being fitted with UV disinfection March 2013. The consented discharge database queried for this review indicates that both new treatment works are now operational. At the time of the original sanitary survey, the most significant discharges in terms of the risk posed to the BMPA were the Brightlingsea, St Osyth and Jaywick STWs, due to their proximity to classification zones. Brightlingsea and St Osyth STWs are still active, although the consented DWF of Brightlingsea STW has decreased from 2726 m^3/day to 2160 m^3/day. Three discharges were identified during this review that were not included in the original sanitary survey (Table 3.1), although all are unlikely to have a significant influence on the BMPA, either due to the distance from the shellfishery (Clacton WRC) or the low volume of discharge (Little Bentley STW and Tendring Green Water Recycling Centre). Consultation with the LAs and EA did not indicate any further changes to the continuous discharges within the catchment.

Table 3.1 Details of all continuous discharges in the Colne catchment. Those discharges not listed in the original sanitary survey are highlighted in yellow.

ID	Sewage Works	NGR	Treatment	DWF (m^3/day)
1	BIRCH WATER RECYCLING CENTRE	TL9390019300	TERTIARY BIOLOGICAL	300
2	BOXMILL LANE STW	TL8090031100	UNSPECIFIED	24
3	BRIGHTLINGSEA STW	TM0635017600	UV DISINFECTION	2160
4	CLACTON (HOLLAND HAVEN) WRC	TM2226016500	ACTIVATED SLUDGE	10546
5	COLCHESTER WATER RECYCLING CENTRE	TM0225023610	UV DISINFECTION	29284
6	COPFORD WATER RECYCLING CCENTRE	TL9330023400	CHEMICAL - PHOSPHATE STRIPPING	1650
7	CORNISH HALL END STW	TL6870036600	UNSPECIFIED	Unspecified
8	EARLS COLNE WATER RECYCLING CENTRE	TL8644029220	REEDBED	934

ID	Sewage Works	NGR	Treatment	DWF (m^3/day)
9	EIGHT ASH GREEN STW	TL9300027150	BIOLOGICAL FILTRATION	650
10	FINGRINGHOE STW	TM0401021080	BIOLOGICAL FILTRATION	367
11	GOSFIELD STW	TL7826028980	TERTIARY BIOLOGICAL	290
12	GREAT BROMLEY WRC	TM0828025870	ACTIVATED SLUDGE	365
13	GREAT TEY STW	TL8910025500	BIOLOGICAL FILTRATION	142
14	GREENSTEAD GREEN STW	TL8263027600	BIOLOGICAL FILTRATION	48
15	GT.MAPLESTEAD STW	TL8100033650	BIOLOGICAL FILTRATION	Unspecified
16	HALSTEAD (LANGLEY) WRC	TL8368029670	CHEMICAL - PHOSPHATE STRIPPING	2900
17	HIGH STREET GREEN STW	TL7643034980	UNSPECIFIED	Unspecified
18	JAYWICK STW	TM1374512188	BIOLOGICAL FILTRATION	Unspecified
19	LAYER DE-LA-HAYE STW	TL9872120511	CHEMICAL – PHOSPHATE STRIPPING	380
20	LITTLE BENTLEY STW	TM1252025290	BIOLOGICAL FILTRATION	27
21	PEBMARSH WATER RECYCLING CENTRE	TL8537032890	BIOLOGICAL FILTRATION	120
22	RIDGEWELL STW	TL7545039530	BIOLOGICAL FILTRATION	102
23	SIBLE HEDINGHAM STW	TL7934032970	TERTIARY BIOLOGICAL	1700
24	ST OSYTH STW	TM1038013260	BIOLOGICAL FILTRATION	1600
25	ST OSYTH STW	TM1042013230	BIOLOGICAL FILTRATION	1600
26	STAMBOURNE STW	TL7235038740	BIOLOGICAL FILTRATION	70
27	TENDRING GREEN WATER RECYCLING CENT	TM1428725867	PACKAGE TREATMENT PLANT	9
28	THORRINGTON WATER RECYCLING CENTRE	TM0796020530	ACTIVATED SLUDGE	2400
29	TOPPESFIELD STW	TL7406036540	BIOLOGICAL FILTRATION	80

ID	Sewage Works	NGR	Treatment	DWF (m^3/day)
30	WEST BERGHOLT STW	TL9596026570	BIOLOGICAL FILTRATION	1430

In addition to the continuous discharges, the original sanitary survey identified a total of 37 intermittent discharges within ~ 2km of the estuary. Intermittent discharges comprise Combined Storm Overflows (CSOs), storm tank overflows and pumping station emergency overflows, and can contribute significant levels of bacteriological contamination due to the frequent lack of significant treatment. Only 2 of the intermittent discharges active at the time of the original sanitary are no longer active, both of which are in the town of Brightlingsea. No additional intermittent discharges within a similar distance of the estuary were identified. No spill event monitoring was available to either the authors of the original sanitary survey or this review. However, as patterns of rainfall have remained similar (see Section 5), the frequencies of spill events are predicted to have remained similar. As such, the impact on bacterial loading as a result of spills is not expected to have increased, particularly as consultation with the LA and EA did not indicate any upgrades to the wastewater treatment network.

Finally, the original sanitary survey identified eight private discharges with consented discharges of > 10 m^3/day in the vicinity of the estuary, although concluded that the overall impact of these was relatively low. Whilst the actual identities and locations of private discharges have changed since the original sanitary survey, the at-risk areas and overall level of contamination is similar.

The most at-risk areas to contamination from this source of pollution remain those CZs closest to the head of the estuary, given the probability of a higher level of background contamination, and those CZs near to Brightlingsea. Areas of individual CZs closest to shore are likely to receive the greatest faecal loading, although as the likely extent of this loading is not expected to have increased, the recommendations made in the original sanitary survey to capture this source of pollution remain valid.

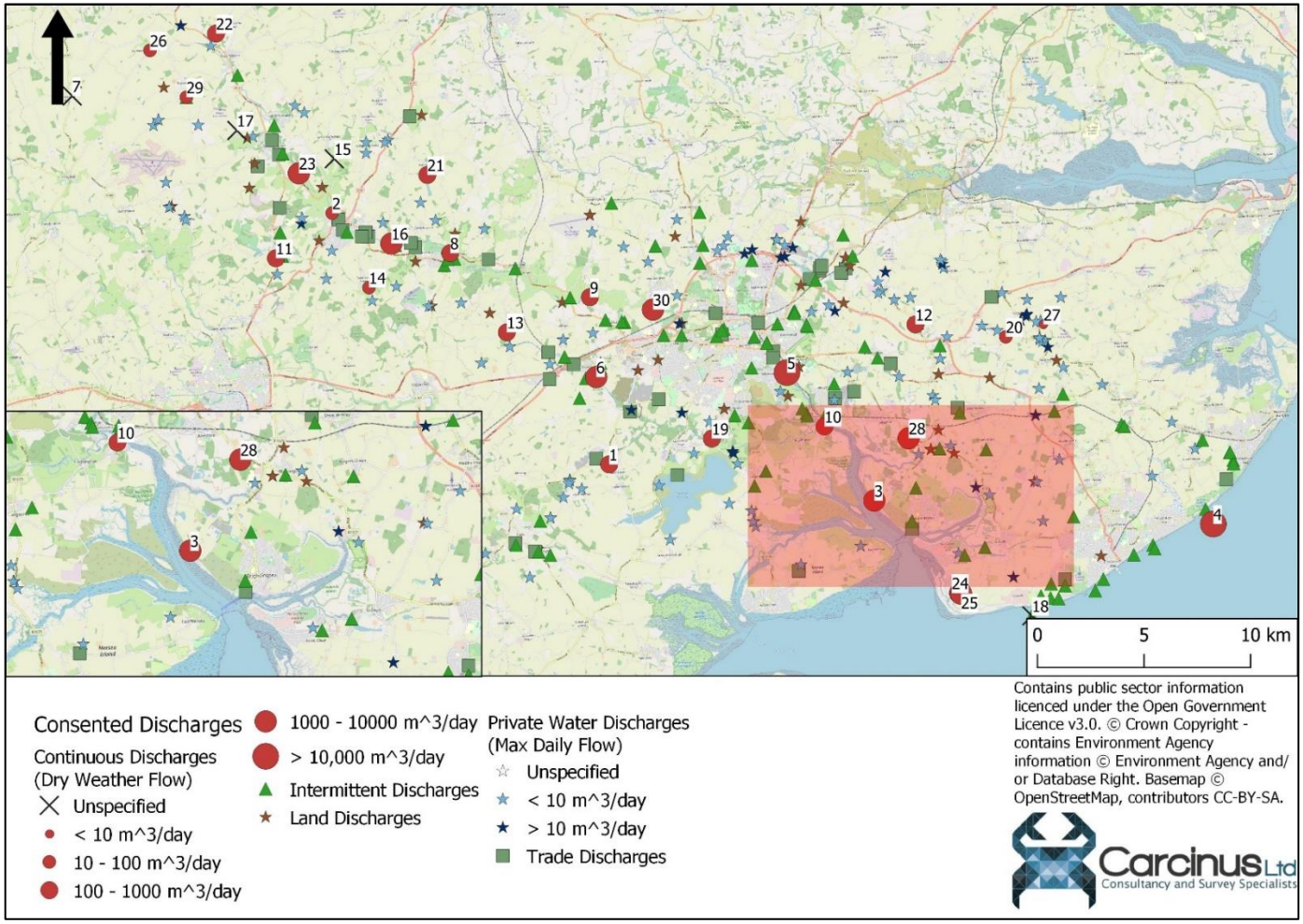

Figure 3.3 Locations of all consented discharges in the Colne catchment. Labels refer to continuous discharges, details of which can be found in Table 3.1.

3.3 Agricultural Sources

The original sanitary survey provides livestock population data based on the 2010 agricultural census. Updated data at the same spatial scale were not freely available at to the authors of this review, however livestock data for the Local Authority Districts that fall within or partially within the Blackwater catchment were available for 2013 and 2016 (DEFRA, 2018). As only a small proportion of some of the districts falls within the catchment, the livestock data have been adjusted to reflect the % of each district that falls within the catchment. This assumes that livestock are distributed uniformly throughout the district and, therefore, some inaccuracies may be present. Aggregate adjusted livestock population change data are shown in Figure 3.4 and Table 3.2.

Overall, livestock populations increased by 31.48% between 2013 and 2016, though within this figure are significant differences between both districts and species. The Colchester and Tendring districts saw increases in total population of 66.73% and 77.95% respectively, whereas the Braintree district saw a decrease of 23.34%. Overall, poultry showed the largest increase (35.25%) and remains the dominant species in terms of population size, whereas the population of pigs decreased by 26.71%. The average livestock density in the catchment is 9.1 animals per hectare.

The principal route of contamination of coastal waters by livestock is surface run-off carrying faecal matter to coastal waters. Based on 2018 land cover data, only a relatively small proportion of the catchment is covered by pasture (Figure 3.4), although there are some areas, particularly around Brightlingsea and south of Rowhedge, where pasture sits directly adjacent to the estuary. Whilst the overall effect of this form of contamination is likely to be relatively minor, point source impacts may occur following high rainfall events, particularly following a prolonged dry period. These pasture locations have not changed since the original sanitary survey. The livestock population within the catchment will also vary throughout the year, with highest numbers occurring during Spring and lowest numbers when animals are sent to market in Autumn and winter.

Despite the fact that livestock populations have increased since the original sanitary survey, livestock densities are still relatively low and the probable routes of contamination remain unchanged. As such, the recommendations made in the original sanitary survey to capture this source of pollution remain valid.

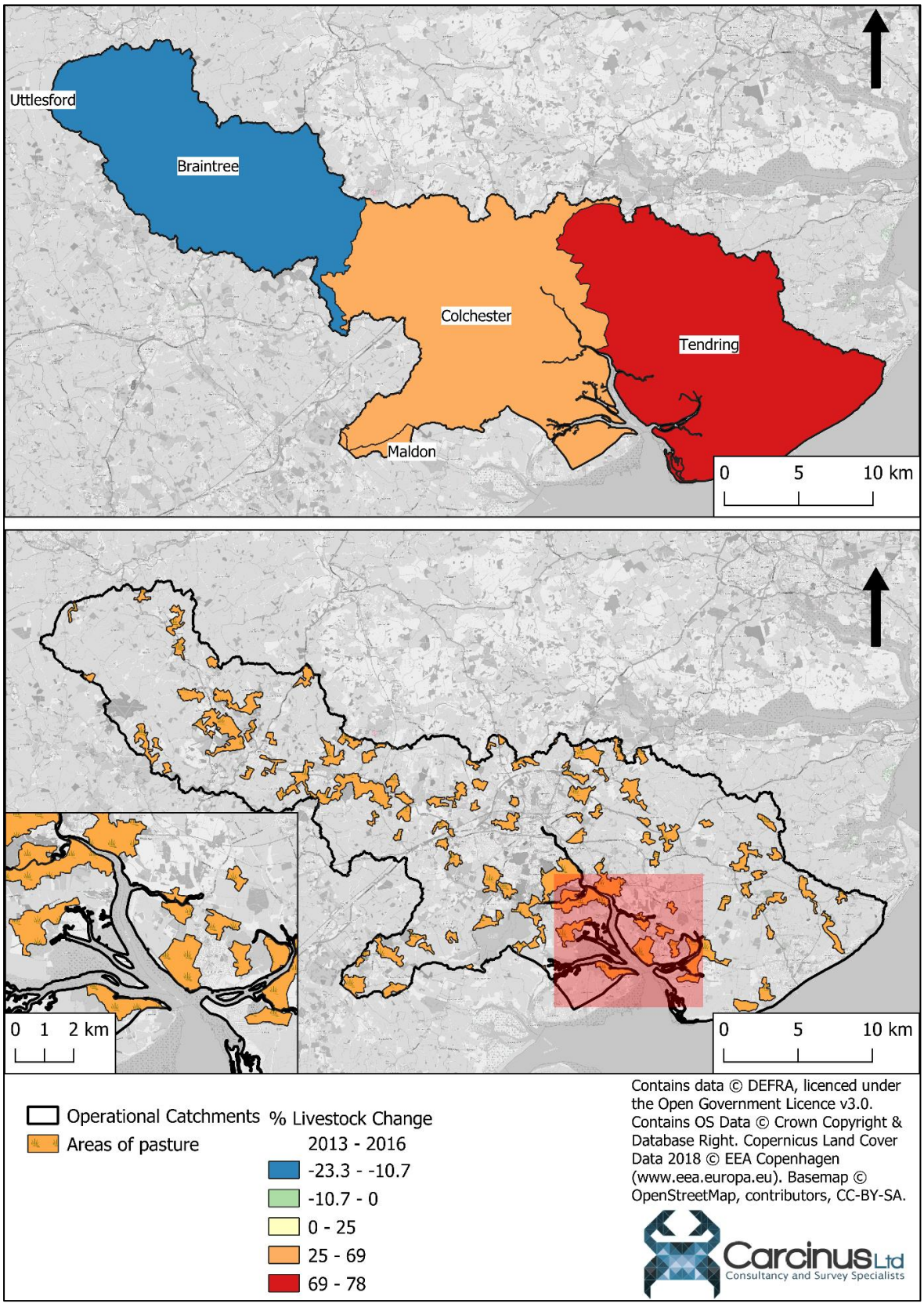

Figure 3.4 Livestock population change between 2013 and 2016 for Local Authority Districts and areas of pasture within the Colne Catchment.

Table 3.2 Livestock data for the Colne catchment between 2013 and 2016.

Local Authority District	Total LA Area (Ha)	Area LA within Catchment (Ha)	Proportion LA within Catchment	Proportion of Catchment Area	Population (Adjusted)											
					Cattle			Sheep			Pigs			Poultry		
					2013	2016	% Diff	2013	2016	% Diff	2013	2016	% Diff	2013	2016	% Diff
Braintree	61,170.80	18,525.38	30.28%	28.76%	1,648	1,439	-12.70%	2,250	2,078	-7.66%	3,489	2,758	-20.96%	145,497	110,925	-23.76%
Colchester	34,677.32	23,153.02	66.77%	35.94%	2,060	1,933	-6.18%	6,929	6,546	-5.54%	3,619	1,775	-50.95%	101,284	179,642	77.36%
Maldon	42,804.92	394.57	0.92%	0.61%	40	37	-6.98%	66	62	-6.77%	30	80	171.90%	6,168	8,221	33.29%
Tendring	36,617.03	22,320.69	60.96%	34.65%	2,106	2,506	18.96%	3,023	2,752	-8.96%	3,636	3,283	-9.72%	84,978	158,278	86.26%

Local Authority District	Total LA Area (Ha)	Area LA within Catchment (Ha)	Proportion LA within Catchment	Proportion of Catchment Area	Population (Adjusted)											
					Cattle			Sheep			Pigs			Poultry		
					2013	2016	% Diff	2013	2016	% Diff	2013	2016	% Diff	2013	2016	% Diff
Uttlesford	64,118.29	20.44	0.03%	0.03%	1	1	-4.09%	2	2	-1.36%	2	2	-3.56%	45	41	-8.01%
TOTAL	**239,388.35**	**64,414.10**	**26.91%**	100.00%	5,856	5,916	1.03%	12,270	11,439	-6.78%	10,776	7,898	-26.71%	337,972	457,107	35.25%

3.4 Wildlife

The Colne estuary falls within a variety of statutory and non-statutory designated area for nature conservation, reflecting the variety of habitats and wildlife that the estuary supports. These include Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and National Nature Reserves (NNRs). These designations are in part due to a significant number of overwintering waterbirds. The original sanitary survey reports that in the five winters to 2010/2011, an average of 22,562 waterbirds utilised the Colne estuary (Holt *et al.*, 2011). In the five winters to 2018/2019, this had increased to 23,313 birds, an increase of 3.3%. Additionally, the Blackwater estuary and Dengie flats to the south are home to a further internationally significant population of waterbirds.

Wading birds forage for food directly on intertidal shellfish beds, which leads to direct faecal contamination of that area of shellfish bed. However, the precise distribution of the birds will vary both throughout the winter and year-on-year, as it is driven by the distributions of their prey. This makes it challenging to accurately define an RMP to reliably capture this source of pollution.

In addition to the populations of waterbirds, significant numbers of grey and harbour seals use the area around the BMPA. The most recent population estimate puts the number of grey seals at 3,243 and the number of harbour seals at 932 (Cox *et al.*, 2020). This number has increased by > 180% since 2013. However, these species show wide foraging ranges and as such any contamination is likely to be spatially and temporally variable, and as such will have limited impact on the overall level of bacteriological contamination experienced by the BMPA.

Despite the fact that bird and marine mammal populations have increased significantly since the original sanitary survey was conducted, it remains challenging to accurately account for this source of pollution in any updated sampling plan. No other wildlife species are likely to represent a significant source of contamination and as such the recommendations for RMP location made in the original sanitary survey are still valid.

3.5 Boats and Marinas

The discharge of sewage from boats is a potential significant source of bacterial contamination of shellfisheries within the North Kent Coast BMPA. Boating activities within 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 distributions are presented in Figure 3.5.

There are several water-sports, sailing and yacht clubs distributed throughout the estuary, however most of the vessels operating from these locations will be too small to have on-board facilities and therefore are very unlikely to make any overboard discharges. The original sanitary survey reported that Brightlingsea Harbour had up to 500 berths available for larger recreational vessels. No updated statistics are available, but it is anticipated the

number has remained similar. Vessels large enough to contain onboard toilets are liable to make occasional overboard discharges, particularly when transiting through the main navigational routes of the estuary or when moored overnight. Peak activity levels are likely to remain in the summer months, and the associated risk of contamination is therefore also highest at these times.

There is some commercial shipping activity within the Colne, several companies operating an aggregates transport industry in the Colne. In addition, the waters around the BMPA are home to a fishing fleet of about 35 vessels, most < 10 m total length (UK Government, 2020). There have been no changes to the legislation governing overboard discharges from vessels, with restrictions placed on commercial vessels against overboard discharges within three nautical miles of land and guidance given to pleasure craft users to follow the same advice (RYA, 2020).

The main areas at risk of contamination from overboard discharges have not changed significantly, and consultation with the LA did not indicate a significant increase in the extent of shipping activity. The original sanitary survey was not able to make concrete recommendations about RMP locations to capture this source of pollution due to the lack of specific data. The same is true for this review, and as such this source of contamination does not carry any additional weighting for consideration in any updated sampling plan.

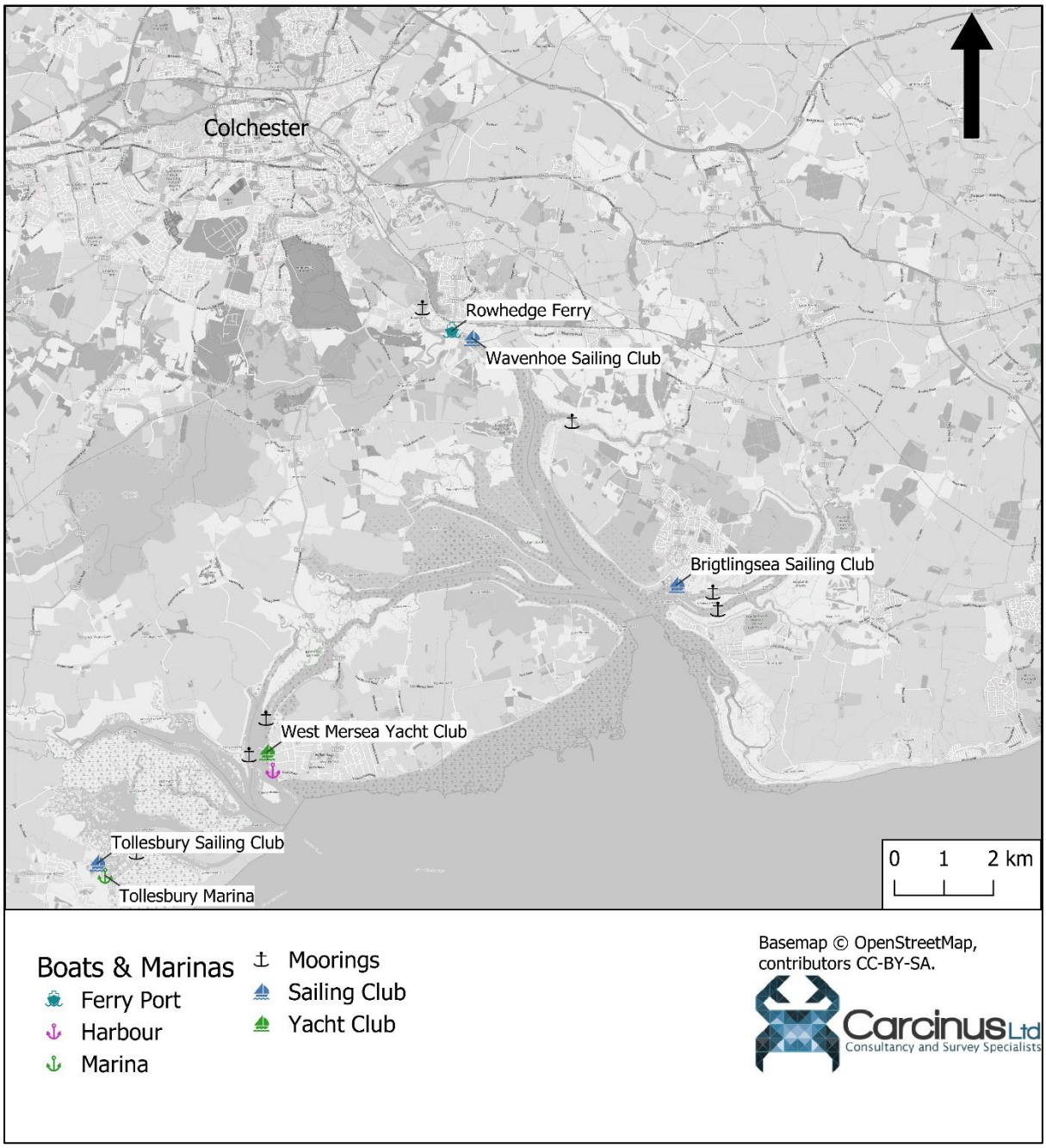

Figure 3.5 Locations of moorings, marinas and other boating activities near the Colne BMPA.

3.6 Other Sources of Contamination

Urban fabric within the catchment remains centred around the city of Colchester, at the head of the Colne estuary. There are some smaller towns further away from the estuary, such as Halstead and Tiptree. Settlements near to waterbodies represent a potential source of diffuse pollution via utility misconnections and dog fouling. The geographical extent of urban settlements within the catchment have not increased significantly since the original sanitary survey (despite new housing developments), and therefore the risk that these settlements pose remains broadly similar.

Several coastal paths run along the shoreline of the estuary, and whilst it is unlikely to represent a significant source of pollution, some impact of dog fouling may be present in the nearshore zone. There is no evidence that the use of these paths or the extent of the pollution has changed since the original sanitary survey.

No evidence of significant changes to these sources of contamination exists. Therefore, it can be assumed that the RMP location recommendations made in the original sanitary survey will still capture the influence of these sources.

4 Hydrodynamics/Water Circulation

The bathymetry presented in the original sanitary survey (p63, Figure IX.1) is based on data gathered in the 1980's. It is unlikely that significant changes to the bathymetry have occurred, and the hydrographic description contained in the original sanitary survey likely remains valid. Tidal currents are likely to remain the dominating force of water circulation in the estuary, and will generally carry water north up the River Colne on flooding tides before ebbing south. Shoreline sources will therefore impact both the up- and downstream areas of their locations.

Given that the hydrodynamic circulation in the BMPA is considered unlikely to have changed significantly since the original sanitary survey, the recommendations made in that document to capture circulating pollution remain valid.

5 Rainfall

Rainfall data for the Colne at Lexden weather station (NGR: TL962261) from 2010 – 2013 (pre sanitary survey) and 2014 – 2017 (post sanitary survey) were used to determine whether any changes in rainfall patterns had occurred since the original sanitary survey. Figure 5.1 shows the shows the average daily rainfall totals for each month at the Langford monitoring station. Whilst rainfall has decreased slightly since the publication of the original sanitary survey, two sample t-tests indicated that there was no significant difference ($p = 0.391$) between the mean daily rainfall per month between the 2010 – 2013 and 2014 – 2017 periods. Table 5.1 summarises the rainfall at the Lexden monitoring station for the two periods.

Rainfall leads to increased faecal loading through two factors; elevated levels of surface runoff and spill events from intermittent discharges. However, as the rainfall patterns have remained consistent across the two time periods, significantly increased bacterial loading due to these factors are unlikely and as such RMP recommendations made in the original sanitary survey to capture the influence of runoff and spill events remain valid.

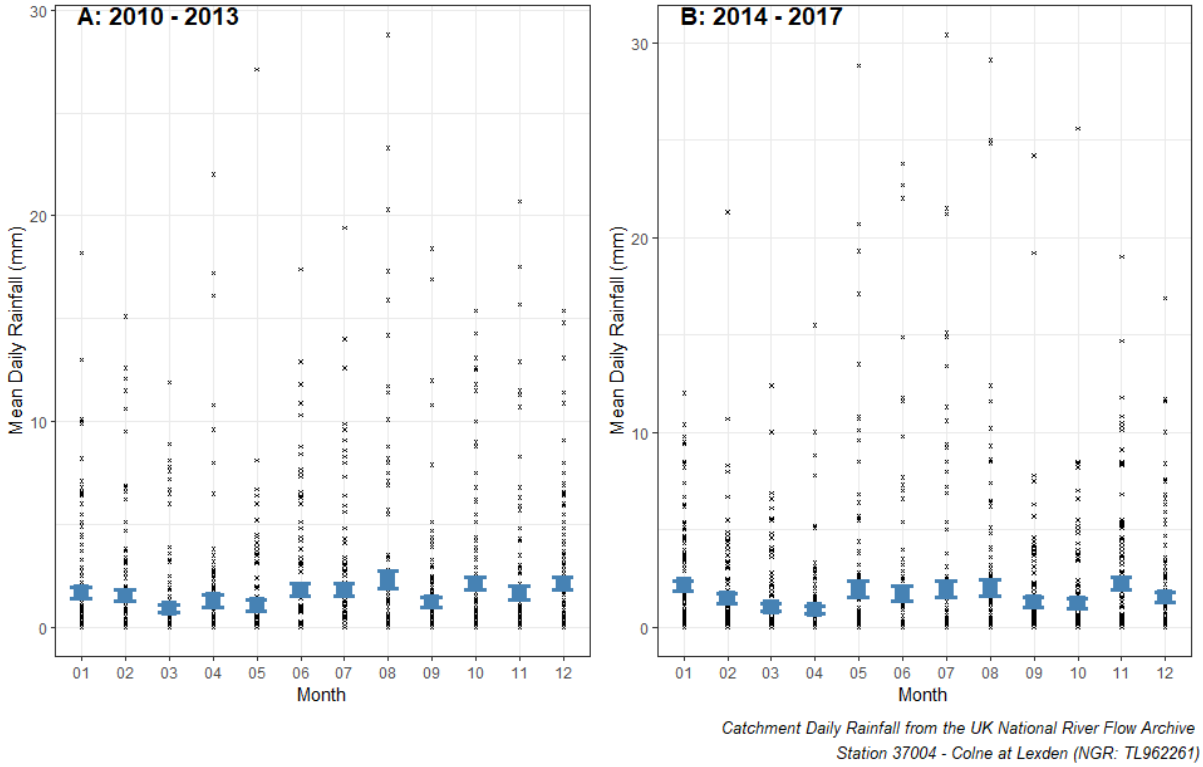

Figure 5.1 Mean daily rainfall (mm) per month for the Colne at Lexden monitoring station (NGR: TL962261) for the period (A) 2010 – 2013 and (B) 2014 – 2017.

Table 5.1 Summary statistics for rainfall before and after the original sanitary survey.

Period	Mean Annual Rainfall (mm)	% Dry Days	% Days >10 mm	% Days > 20 mm
2010 - 2013	595.23	46.00	22.31	13.83
2014 - 2017	590.88	41.96	22.31	14.44

6 Microbial Monitoring Results

6.1 Summary Statistics and geographical variation

There is a total of 10 RMPs that have been sampled within the Colne BMPA since the original sanitary survey. Seven of these are for Pacific oyster (*Crassostrea gigas*) and one each is for mussel (*Mytilus edulis*), cockle (*Cerastoderma edule*) and *Tapes* spp. Only one RMP (Pyefleet Spit (B012F)) was sampled prior to the original sanitary survey. Sampling at a further 7 RMPs began in the first half of 2013, immediately following the publication of the original sanitary survey. Cockle sampling at Rat Island (B12AO) began in July 2014 and sampling at Brightlingsea Outfall (B12AQ) began in December 2018. Sampling at the two RMPs in Geedon Creek (Rat Island (B12AJ & B12AO) was suspended in September 2020, due to access restrictions. Summary statistics for all RMPs are presented in Table 6.1, and the

geometric mean results of Official Control monitoring for all RMPs sampled since the original sanitary survey are presented in Figure 6.1. All data have been taken directly from the Cefas datahub[1] and have been taken at face value.

Table 6.1 Summary statistics of E. coli (MPN/100 g) from RMPs sampled from 2003 onwards (data cut off at December 2020).

Site (Species)	NGR	Species	No.	First Sample	Last Sample	*E. coli* MPN/100 g					
						Geometric Mean	Min Value	Max Value	% > 230	% > 4,600	% > 46,000
Pyefleet Spit (C. gi) - B012F	TM06201600	Pacific Oyster	102	23/01/2003	10/07/2018	177.76	18	1700	24.51	0	0
South Creek (C. gi) - B12AC	TM09741606	Pacific Oyster	82	09/04/2013	16/12/2020	715.80	18	13000	47.56	2.44	0
Flag Creek (C. gi) - B12AD	TM10251653	Pacific Oyster	82	09/04/2013	16/12/2020	581.57	18	7900	51.22	2.44	0
Brightlingsea Outfall (C. gi) - B12AG	TM06251751	Pacific Oyster	83	01/08/2013	25/11/2020	565.71	18	7900	46.99	2.41	0
Point Clear (C. gi) - B12AI	TM07991555	Pacific Oyster	83	04/06/2013	25/11/2020	282.34	18	2200	26.51	0	0
Rat Island (C. gi) - B12AJ	TM05431734	Pacific Oyster	77	01/08/2013	15/09/2020	1074.30	18	13000	53.25	5.19	0
Pyefleet Channel (C. gi) - B12AK	TM02661604	Pacific Oyster	85	02/07/2013	25/11/2020	740.35	18	16000	23.53	4.71	0
Pyefleet Channel (M. sp) - B12AM	TM02661604	Mussel	40	01/08/2013	25/11/2020	639.03	18	5400	35	7.50	0
Rat Island (C. ed) - B12AO	TM05431734	Cockle	37	14/07/2014	15/09/2020	2673.24	18	35000	64.86	10.81	0

Site (Species)	NGR	Species	No.	First Sample	Last Sample	*E. coli* MPN/100 g					
						Geometric Mean	Min Value	Max Value	% > 230	% > 4,600	% > 46,000
Brightlingsea Outfall (T. sp) - B12AQ	TM06251751	*Tapes* spp.	21	04/12/2018	25/11/2020	1190.71	20	3300	61.90	0	0

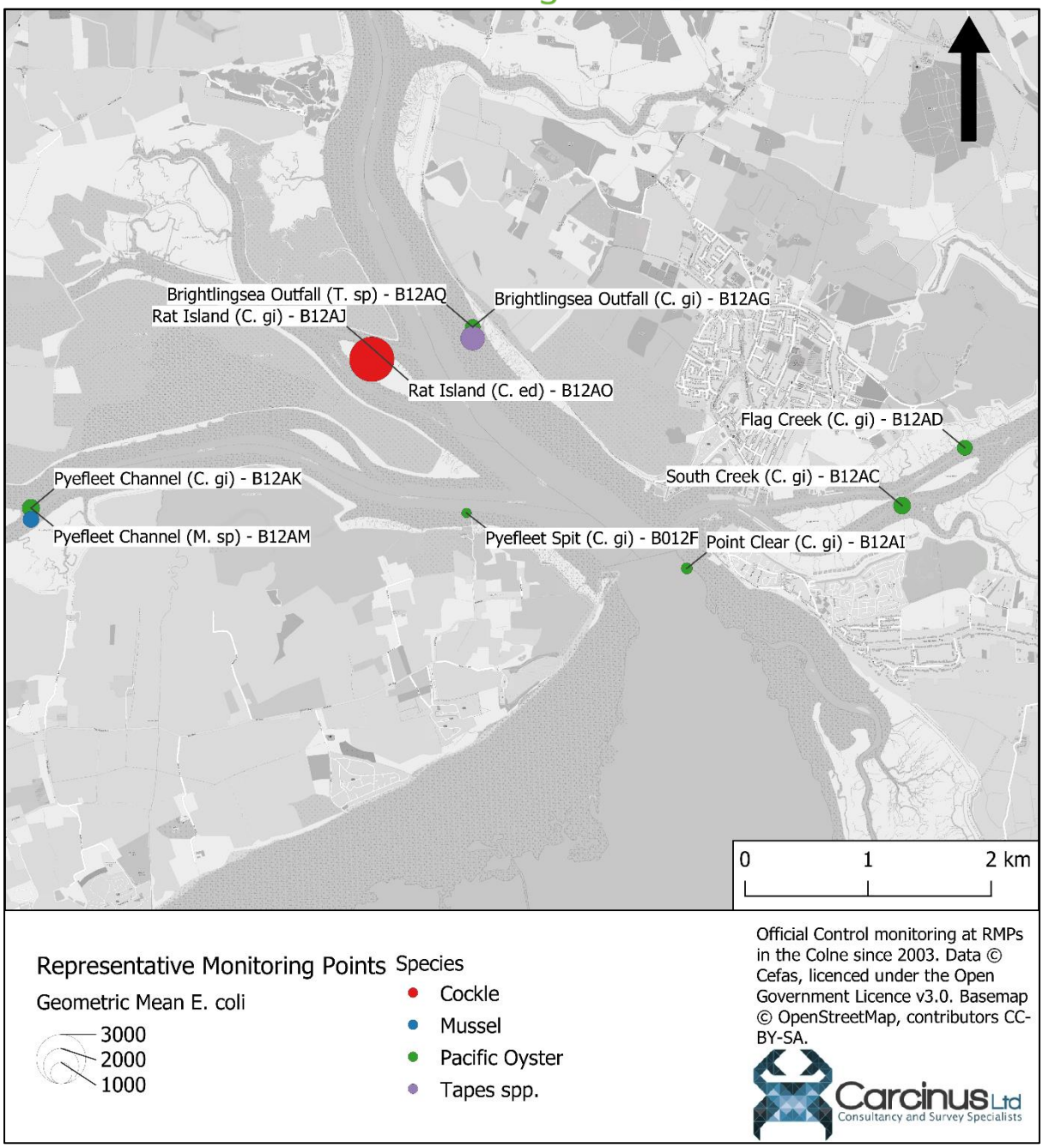

Figure 6.1 Geometric mean E. coli results from Official Control monitoring at bivalve RMPs within the Colne BMPA.

Mean *E. coli* levels are generally low across all RMPs, with every RMP having a mean value of less than the middle threshold of 4,600 MPN/100 g (Table 6.1), and only three RMPs returning a mean result of > 1000 MPN/100 g. No RMPs have returned results greater than 46,000 MPN/100 g. There appears to be a general trend of decreasing *E. coli* levels as you move down the estuary into more saltwater-dominated areas. The highest *E. coli* levels were found near to Rat Island within Geedon Creek, though the CZ to which these RMPs refer are currently declassified. It is not clear what may have caused this pattern as no

consented discharges are nearby. There does not appear to be clear differences between species, although in the case of Brightlingsea Outfall and Rat Island, results from Pacific oyster samples (B12AG & B12AJ respectively) were lower than the other species monitored there (B12AQ & B12AO respectively).

Figure 6.2 and Figure 6.3 present boxplots of *E. coli* monitoring results for RMPs sampled for Pacific oyster (Figure 6.2), cockle, mussel and *Tapes* spp. (all Figure 6.3). One-way analysis of variance (ANOVA) tests indicated that results from Rat Island (B12AJ) were significantly greater than Point Clear (B12AI) ($p = 0.029$) and Pyefleet Spit (B012F) ($p = 0.0039$). It is not clear from the contamination sources identified through this review what has caused elevated results at Rat Island (B12AJ). No other significant differences between Pacific oyster RMPs were identified. The level of variation (interquartile range) of pacific oyster RMPs was broadly similar (Figure 6.2).

No ANOVA tests were performed on the RMPs for other species as only one RMP existed for each one, and it is not appropriate to compare across species given the different rates of *E. coli* uptake. Results from the cockle RMP indicated greater variation at this location (Figure 6.3)

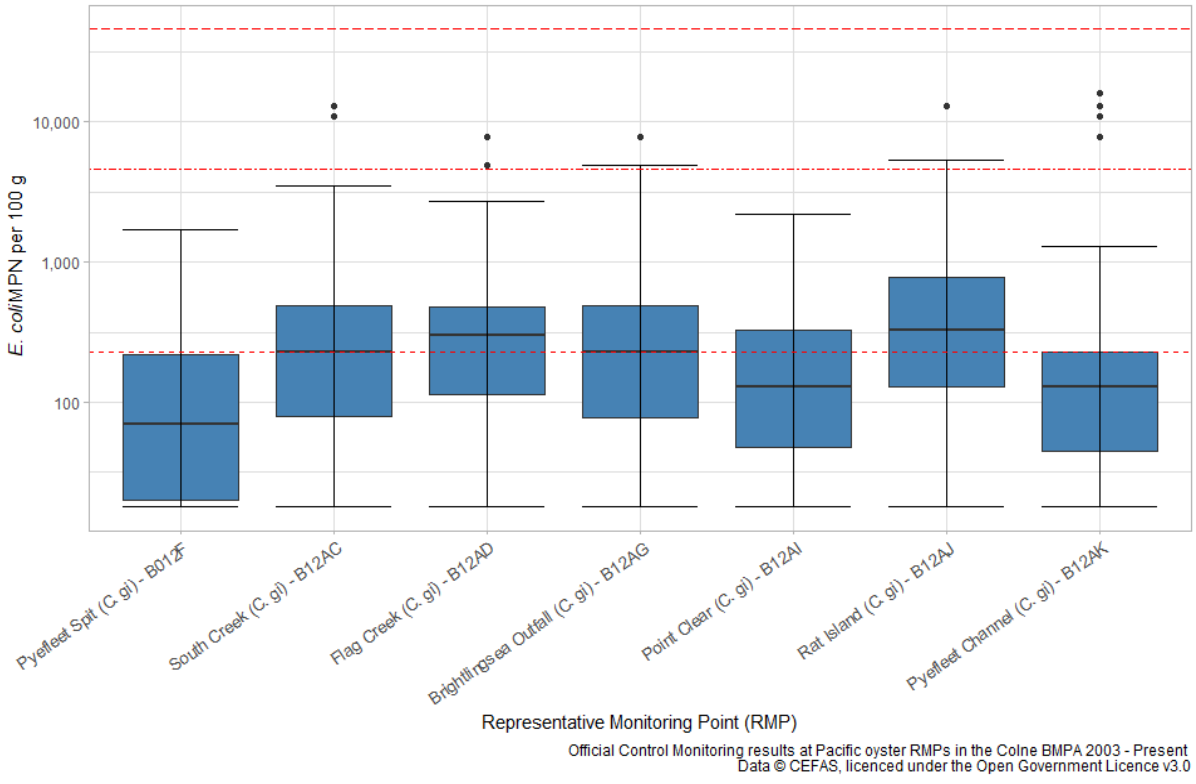

Figure 6.2 Boxplots of E. coli levels at Pacific oyster RMPs sampled within the Colne BMPA 2003-Present. Central line indicates median value, box indicates lower – upper quartile range and whisker indicates minimum/maximum value excluding outliers (points >1.5 x interquartile range).

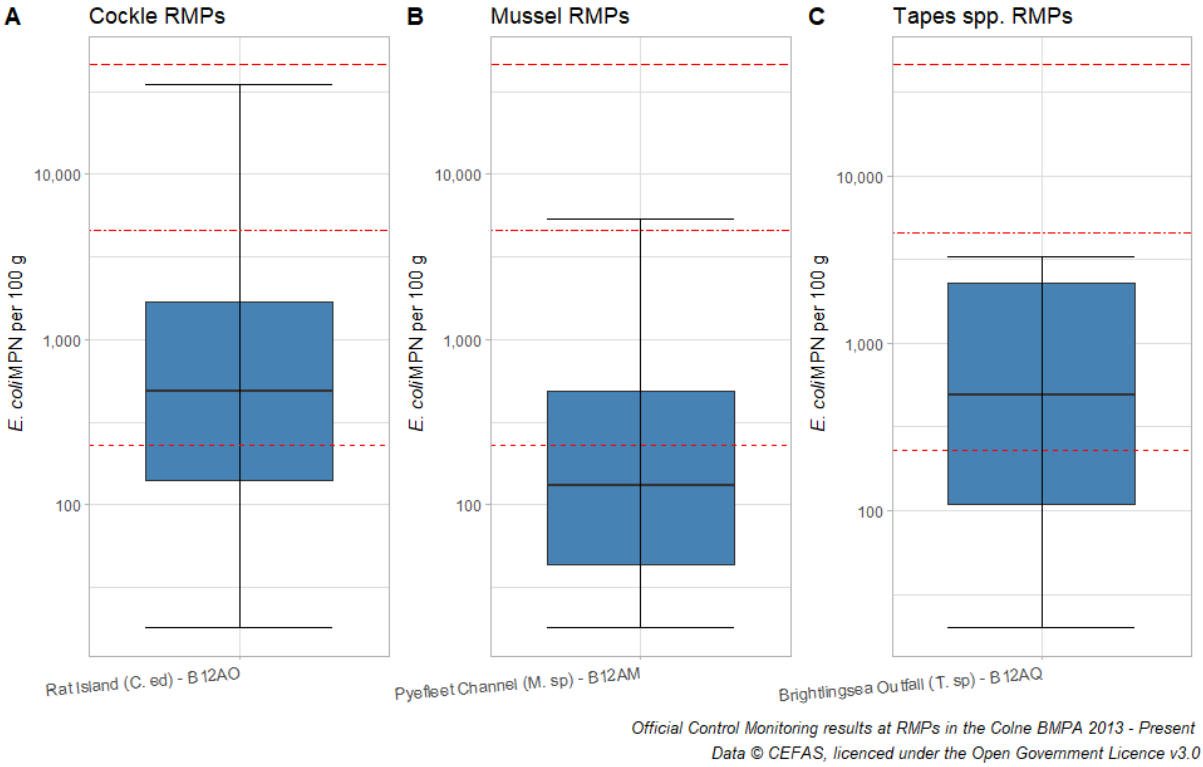

Figure 6.3 Boxplots of E. coli levels at (A) cockle, (B) mussel and (C) Tapes spp. RMPs sampled within the Colne BMPA 2013-Present. Central line indicates median value, box indicates lower – upper quartile range and whisker indicates minimum/maximum value excluding outliers (points >1.5 x interquartile range).

6.2 Overall temporal pattern in results

The overall temporal pattern in shellfish flesh monitoring results for Pacific oyster RMPs is shown in Figure 6.4. Figure 6.5 presents the overall temporal pattern for the other three species sampled within the BMPA.

The loess models fitted to the *E. coli* monitoring results from Pacific oyster RMPs indicate that *E. coli* levels have been broadly stable, remaining around the lower threshold of 230 MPN/100 g (Figure 6.4). In recent years, most of the RMPs show a trend of increasing *E. coli* results. There is no clear separation of the trend lines with respect to the RMP's geographical location.

The trend of *E. coli* results at Rat Island (B12AO) shows a gradual decline, from around the middle threshold of 4,600 MPN/100 g, to below the lower threshold of 230 MPN/100 g (Figure 6.5 A). Results from Pyefleet Channel (B12AM) decreased between 2013 and 2019, but have shown a slight increase in the past 12-18 months (Figure 6.5 B). Since monitoring began in August 2018, *E. coli* results from Brightlingsea Outfall (B12AQ) have shown a gradual increase. No definitive evidence of the cause of any trend for either species is available, although as *E. coli* levels are not reaching dangerous levels (i.e. ~46,000 MPN/100 g), no specific investigation is warranted at this point in time.

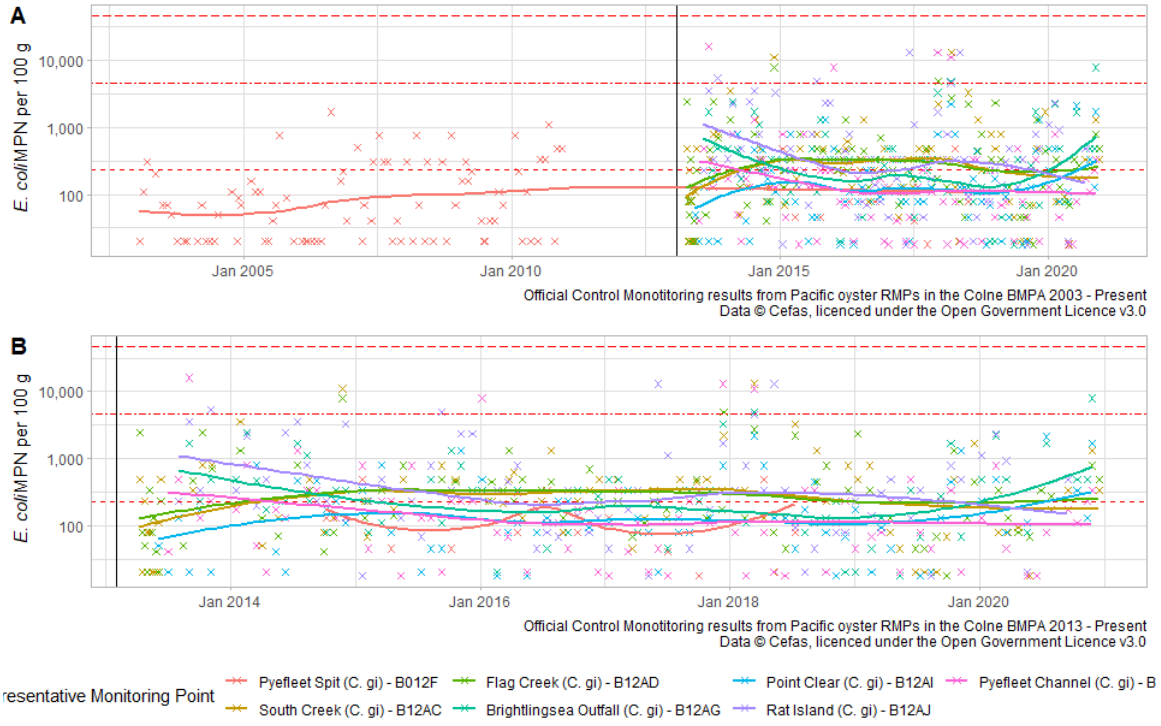

Figure 6.4 Timeseries of E. coli levels at Pacific oyster RMPs sampled within the Colne BMPA (A) 2003 – Present and (B) 2013 - Present. Scatter plots are overlaid with loess model fitted to data.

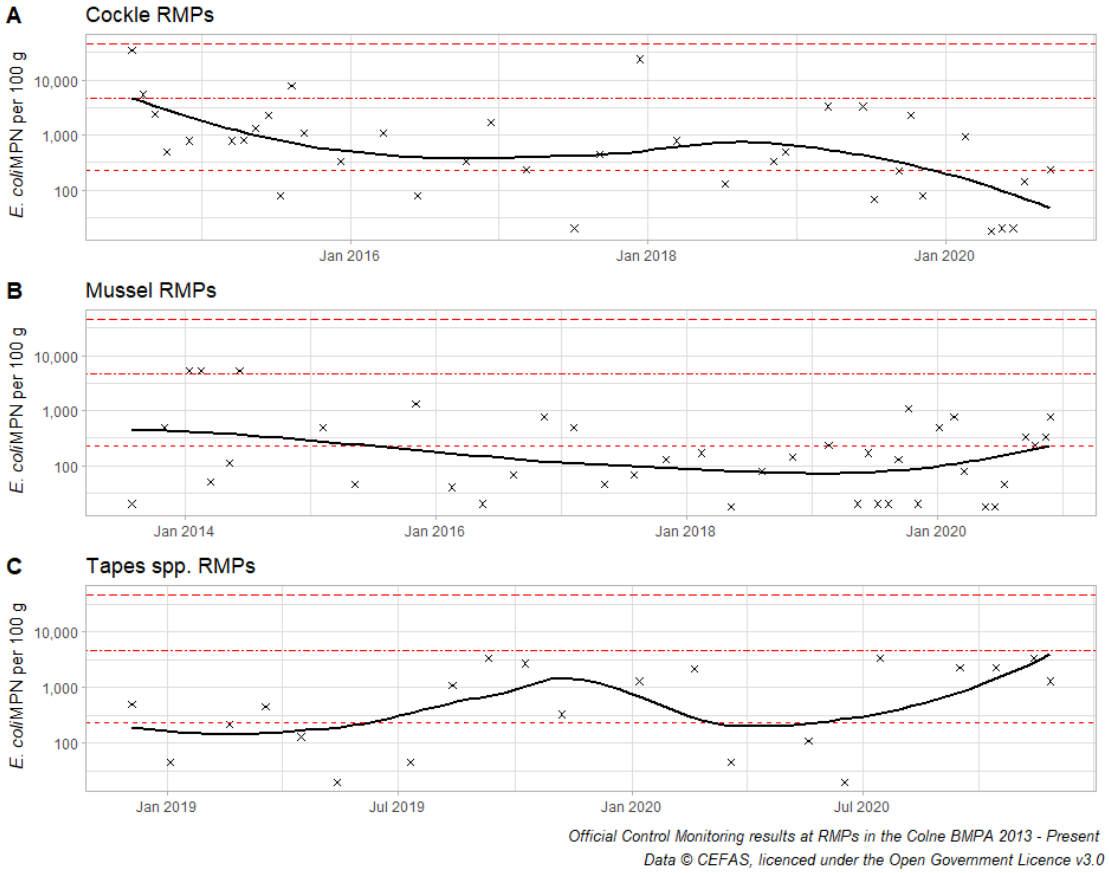

Figure 6.5 Timeseries of E. coli levels at (A) cockle, (B) mussel and (C) Tapes spp. RMPs sampled within the Colne BMPA 2013-Present. Scatter plots are overlaid with loess model fitted to data.

6.3 Seasonal patterns of results

The seasonal patterns of *E. coli* levels at the various RMPs within the Colne BMPA were investigated and are presented in Figure 6.6 (Pacific oyster) and Figure 6.7 (cockle, mussel and *Tapes* spp.). The data for each year were averaged into the four seasons, with Winter comprising data from January – 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 as independent factors (i.e. pooling the database across RMP and season respectively), as well as the interaction between them (i.e. exploring seasonal differences within a given RMP). Significance has been taken at the 0.05 level.

Despite some apparent differences in monitoring results per season (i.e. at South Creek (B12AC) (Figure 6.6)), two-way ANOVA tests did not indicate any significant differences in seasonal levels of *E. coli* when data were pooled or within RMP for any of the four sampled species ($p > 0.5$), indicating that seasonal classifications are not appropriate for any of the active CZs.

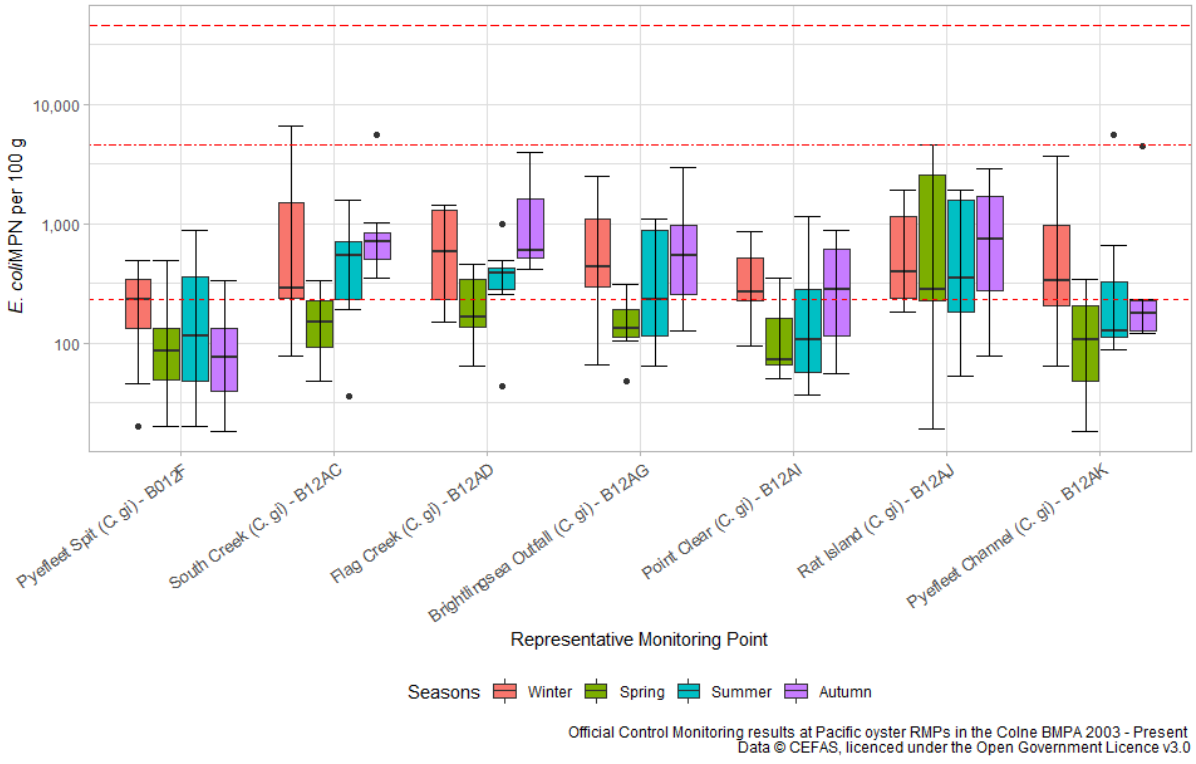

Figure 6.6 Boxplots of E. coli levels per season at Pacific oyster RMPs sampled within the Colne BMPA 2003 - present.

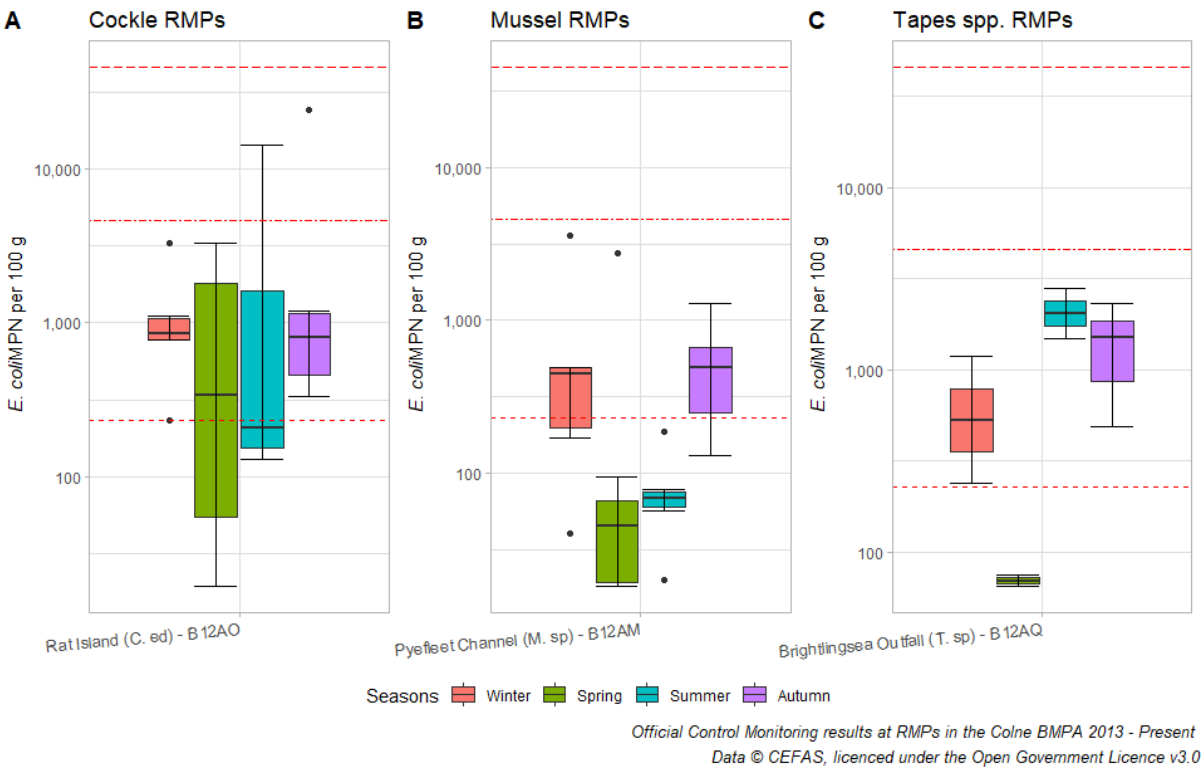

Figure 6.7 Boxplots of E. coli levels per season at (A) cockle, (B) mussel and (C) Tapes spp. RMPs sampled within the Colne BMPA 2013-Present.

7 Conclusion and overall assessment

The vast majority of the estuary is currently classified for shellfish harvesting, and there is a total of 13 CZs in the estuary, 5 for Pacific oyster, 3 each for native oyster and hard clams, and 1 each for cockles and *Tapes* spp. *Geedon Creek* was classified for cockle and Pacific oyster harvesting until October 2020, when it was declassified due to access restrictions. The dominant fishery by weight is the Pacific oyster fishery, followed by native oyster and other species.

The total population in Electoral Wards contained within or partially within the Colne catchment increased by 6.14% between the 2001 and 2011 censuses (the most recent for which data are available). This population increase has been fairly consistent across the catchment, with two thirds of wards showing a population increase. However, population density across the catchment remains low, at 14.8 persons per hectare. Consultation with the Local Authority did not indicate that any significant housing developments have occurred since the original sanitary survey was conducted, although any increase in population without upgrades to the wastewater treatment network would result in an increase in faecal loading to the estuary. Tourism is a key part of the economy in the region, and population numbers increase significantly during summer months which will further increase the load on the sewerage network.

Consultation with both the LA and EA did not indicate any significant upgrades to the wastewater treatment network within the Colne. Two of the intermittent discharges near to the estuary identified in the original sanitary survey to be most likely to contribute contamination are no longer active. No spill event monitoring data has been available for comparison. It is assumed that the increase in loading caused by increasing population has been captured in the overheads of the consented discharge volumes. As such, the loading experienced by the estuary is not predicted to have changed significantly.

The number of livestock living in Local Authority Districts wholly or partially contained within the Blackwater catchment increased by 31.48% between 2013 and 2016 (the most recent for which data are available), though within this are significant differences both within LAD and species. Livestock densities have remained low relative to other areas of the country, at 9.1 animals per hectare. Run off areas of pasture are located immediately adjacent to the estuary, particularly following significant rainfall events, may constitute a significant point source of bacteriological contamination. However, the overall risk from this source of contamination remains low.

The BMPA is situated within or near several internationally designated areas for wildlife conservation, including important populations of wading and overwintering birds. The 5-year average count of overwintering birds to 2018-2019 has increased 3.3% compared to the 5 winters to 2010. However, the precise distributions of these species are directly related to the distributions of their prey, and as such it is difficult to define the areas most at risk of pollution from avian faeces.

The Colne hosts a small but active commercial shipping operation, with aggregates moved around the wider Thames estuary to and from the estuary. In addition, a small fishing fleet of ~35 vessels utilise the waters around the estuary. No changes to permitted discharges from commercial or recreational vessels have occurred since the original sanitary survey. As such, occasional overboard discharges by recreational vessels may still occur, with the highest risk time of year during summer months.

A total of 10 RMPs have been sampled within the Colne BMPA since the original sanitary survey was published, of which only one was sampled prior. There appears to be a slight trend of decreasing *E. coli* levels as you move into more saltwater dominated areas, suggesting that most pollution arises from up-estuary sources. Relative to other BMPAs around the country, mean *E. coli* levels are low. Only three RMPs have mean values of >1,000 MPN/100 g. Given the spatial trend, a general approach of selecting RMPs at the up-estuary end of CZs should be taken, unless other point sources are more specific to that location.

No statistically significant seasonal variation in *E. coli* levels was found at any of the RMPs, both within a given RMP and between RMPs of a certain species. Seasonal classifications are therefore not appropriate for RMPs in this BMPA.

Based on the information available, there do not appear to have been any significant changes to the 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 the recommendations of the 2021 report and compared with the findings of the 2013 sanitary survey review for the Colne Estuary, the FSA are content that the level of risk posed by the findings is low and there have been minimal changes to the BMPA to warrant changing the location of RMPs, therefore does not warrant a further review of the existing shoreline assessment.

8 Recommendations

8.1 Pacific oyster

The original sanitary survey recommended the classification of seven classification zones for Pacific oyster harvesting. *Geedon Creek* was declassified in October 2020, and it is not clear whether *Point Clear Bay* was ever awarded a classification for this species. Recommendations for the remaining CZs are given below. A summary of the sampling plan is given in Table 8.1.

Brightlingsea Creek Inner

This CZ covers an area of 47.24 Ha in the upper region of the Brightlingsea Creek. It meets the *Brightlingsea Creek Outer* CZ at the south-western point of Cindery Island. The

boundaries of this CZ match the Hard Clam CZ of the same name. The original sanitary survey initially recommended an RMP located in the upstream section of the zone (at TM 1134 1767), although at the time the LA advised that the closest available sampling location was at TM 1025 1653. The RMP was defined at this location (Flag Creek (B12AD)) and has been used since then. The LA advised at the time that no harvesting was taking place farther up the creek than this point. Consultation with the Local Authorities indicated that no stock exists farther up than this point. As such, we would recommend modifying the CZ boundaries to reflect the available stock (Figure 8.1), as the contamination in the zone will likely originate from upstream sources.

Brightlingsea Creek Outer

This CZ covers an 81.5 Ha area of the lower reaches of Brightlingsea Creek. It meets the *Brightlingsea Creek Inner* CZ at the south-western point of Cindery Island. The boundaries of this CZ match the Hard Clam CZ of the same name. The main contaminating influences remain an intermittent discharge at the head of St Osyth Creek, and the harbour at the mouth of Brightlingsea Creek. The RMP recommended in the original sanitary survey, at South Creek (B12AC), remains a compromise of the pollution sources and should be retained.

Main Channel Central

This CZ covers an area of 293.4 Ha in the main channel of the River Colne. The northern boundary of the CZ is a line drawn from TM 0503 1895 to TM 0561 1895 and the southern boundary meets the northern boundary of the *Main Channel Outer CZ.* The original sanitary survey recommended classifying this zone based on Pacific oyster samples from next to the Brightlinsea STW continuous discharge, and an RMP at this location (Brightlingsea Outfall (B12AG)) has been used since then. The Pacific oyster samples are used to classify the native oyster and hard clam CZs of the same name, although there is a separate RMP for *Tapes* spp. It is recommended that this RMP be retained as this is outfall is still likely to be the dominating source of contamination to this CZ.

Main Channel Outer

This CZ is the most southerly of any in the Colne BMPA and covers an area of 417.8 Ha. The northern boundary of this CZ meets the *Main Channel Central* CZ. The western edge of this CZ meets the *Mersea Flats East* CZ, which is in the West Mersea BMPA. The original sanitary survey identified that the main contaminating influences to this zone originate from a combination of Brightlingsea Creek and the main river channel, and recommended an RMP by Point Clear, near the northern boundary of the CZ. This RMP (Point Clear (B12AI)) is still in use, although it is recommended that the RMP be moved ~700 m south-south-east, to better capture any contamination originating from Ray Creek

Pyefleet Channel

This CZ covers the entirety of Pyefleet creek, from its congruence with the main Colne channel, up to the Mersea Island causeway, where it meets the *Strood Channel* CZ in the West Mersea BMPA. There are few pollution sources to this zone, and it is currently

sampled from Pyefleet Channel (B12AK) RMP, which is located near to where the channel splits in two. It is recommended that this RMP be retained. This RMP just represents the Pacific and native oyster CZs, with a separate RMP for the cockle CZ of the same name.

8.2 Native oyster

The original sanitary survey recommended the creation of four CZs for native oyster harvesting in the Colne estuary. Three of these are still active, and the *Geedon Creek* CZ was declassified in October 2020. The remaining CZs; *Main Channel Central*, *Main Channel Outer* and *Pyefleet Channel*, share boundaries with the Pacific oyster CZs of the same name. They are all classified using Pacific oyster RMPs, recommendations for which are described in the previous section. It is recommended that this practice continue.

8.3 Hard clams

With the exception of *Main Channel Inner* (which was never awarded a classification), all the CZs for *M. mercenaria* harvesting in the Colne BMPA recommended in the original sanitary survey are still active. These are *Brightlingsea Creek Inner*, *Brightlingsea Creek Outer* and *Main Channel Central*, all of which share boundaries with the Pacific oyster CZs of the same name. They are all classified using Pacific oyster RMPs, recommendations for which are described in Section 8.1. It is recommended that this practice continue.

8.4 Cockles

The original sanitary survey recommended the creation of one CZ for cockle harvesting, *Pyefleet Creek* (since renamed *Pyefleet Channel*). *Geedon Creek* was also classified for this species, until its declassification in October 2020. Recommendations for the remaining CZ are given below and summarised in Table 8.1.

Pyefleet Channel

This CZ covers the same area as the oyster CZ of the same name. It was noted in the original sanitary survey that the preferred option would be to sample cockles directly as there was some concern of the representativeness of mussels for cockle classifications. However, since the original sanitary survey, this zone has been classified based on bagged samples of mussels from Pyefleet Channel (B12AM) RMP. If sufficient cockle stocks exist, it is recommended that cockles be used moving forwards, with a tolerance of 100 m. If not, it is recommended that the current RMP be retained. The RMP location does not need to change.

8.5 *Tapes* spp.

There were two classification zones for manilla clams recommended in the original sanitary survey, although currently only one holds an active classification. Recommendations for this zone are given below and summarised in Table 8.1.

Main Channel Central

The boundaries of this zone align with the oyster and hard clam CZ of the same name. The original sanitary survey recommended sampling of this species, from the same location, in addition to the Pacific oyster RMP. The RMP recommended in that document (Brightlingsea

Outfall (B12AQ)) is still in use, and it is recommended that this RMP be retained as the STW outfall represents the greatest risk of contamination to this zone.

8.6 General Information

8.6.1 Location Reference

Production Area	**Colne**
Cefas Main Site Reference	M012
Ordnance survey 1:25,000	Explorer 184
Admiralty Chart	1975

8.6.2 Shellfishery

Species	Culture Method	Seasonality of Harvest
P oysters (*Crassostrea gigas*)	Wild & Cultured	Year Round
N oysters (*Ostrea edulis*)	Wild & Cultured	September - April
Hard clams (*Mercenaria mercenaria*)	Wild	Year Round
Manila clams (*Tapes* spp.)	Wild	Year Round
Cockles (*Cerastoderma edule*)	Wild	Year Round

8.6.3 Local Enforcement Authority(s)

Name	**Colchester Borough Council** Rowan House, 33 Sheepen Road, Colchester, Essex CO3 3WG
Website	https://www.colchester.gov.uk/business/environmental-health/
Telephone number	01206 282581/2
E-mail address	customerservicecentre@colchester.gov.uk
Name	Tendring District Council Environment **88-90 Pier Avenue** **Clacton-on-Sea,** **Essex** **CO15 1TN**
Website	https://www.tendringdc.gov.uk/environment
Telephone number	01255 686868
E-mail address	N/A

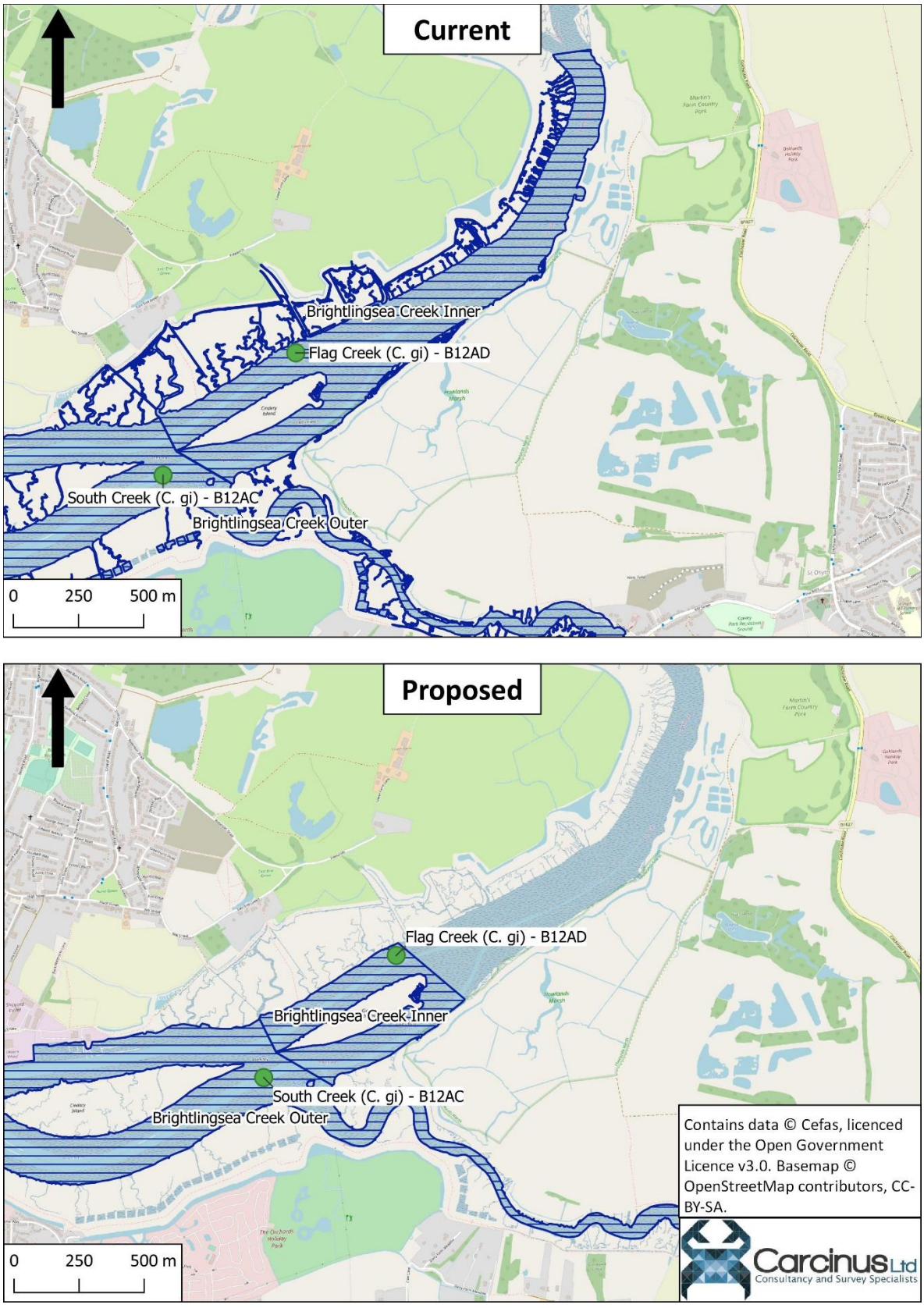

Figure 8.1 Proposed alterations to the Brightlingsea Creek Classification Zone.

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

Classification Zone	*RMP*	*RMP Name*	*NGR (OSGB 1936)*	*Lat/Long (WGS 1984)*	*Species Represented*	*Growing Method*	*Harvesting Technique*	*Sampling Method*	*Sampling Species*	*Tolerance*	*Frequency*
Brightlingsea Creek Inner	B12AD	Flag Creek	TM 1025 1653	51°48.47'N, 01° 02.90'E	*C. gigas; M. mercenaria*	Wild / culture	Dredge /Hand	Bagged	P. oyster	10 m	Monthly
Brightlingsea Creek Outer	B12AC	South Creek	TM 0974 1606	51° 48.23N, 01° 02.44E	*C. gigas; M. mercenaria*	Wild / culture	Dredge /Hand	Bagged	P. oyster	10 m	Monthly
Main Channel Central	B12AG	Brightlingsea Outfall	TM 0625 1751	51° 49.09'N, 00° 59.46'E	*C. gigas*; *O. edulis*; *M. mercenaria*	Wild / culture	Dredge /Hand	Bagged	P. oyster	10 m	Monthly
	B12AQ				*Tapes spp.*	Wild / culture	Dredge /Hand	Bagged	*Tapes* spp.	10 m	Monthly
Main Channel Outer	**TBC**	**Off Point Clear Bay**	**TM 0850 1511**	**51°47'45"N, 001°01'20"E**	*C. gigas; O. edulis;*	Wild / culture	Dredge /Hand	Bagged	P. oyster	10 m	Monthly
Pyefleet Channel	B12AK	Pyefleet Channel	TM 0266 1604	51° 48.38'N, 00° 56.29'E	*C. gigas; O. edulis*	Wild / culture	Dredge / Hand	Bagged	P. oyster	10 m	Monthly

Classification Zone	*RMP*	*RMP Name*	*NGR (OSGB 1936)*	*Lat/Long (WGS 1984)*	*Species Represented*	*Growing Method*	*Harvesting Technique*	*Sampling Method*	*Sampling Species*	*Tolerance*	*Frequency*
	B12AM / **TBC**				*C. edule*	Wild	Dredge	Bagged / **Dredge/Hand rake**	Mussel / **Cockle**	10 m / **100 m**	Monthly

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Appendices

Appendix I. Population Breakdown

ID	Electoral Ward	Total Population				Population Density		
		2001 Census	2011 Census	Absolute Change	% Change	2001 Census	2011 Census	Absolute Change
1	West Mersea	6,925	7,183	258	3.73%	6.52	6.8	0.28
2	Pyefleet	2,435	2,596	161	6.61%	0.61	0.7	0.09
3	East Donyland	2,376	2,633	257	10.82%	4.49	5	0.51
4	The Three Colnes	4,848	5,241	393	8.11%	1.74	1.9	0.16
5	Gosfield and Greenstead Green	2,460	2,465	5	0.20%	0.75	0.8	0.05
6	Bockings Elm	4,337	4,549	212	4.89%	9.24	9.7	0.46
7	Birch and Winstree	4,846	5,651	805	16.61%	0.77	0.9	0.13
8	Highwoods	7,592	9,987	2,395	31.55%	22.39	29.5	7.110001
9	Three Fields	3,818	3,967	149	3.90%	0.59	0.6	0.01
10	West Bergholt and Eight Ash Green	5,044	5,074	30	0.59%	2.99	3	0.01
11	Golf Green	4,665	4,799	134	2.87%	14.09	14.5	0.41
12	Thorrington, Frating, Elmstead and Great Bromley	4,642	4,687	45	0.97%	1.17	1.2	0.03
13	Stanway	7,553	8,283	730	9.67%	8.29	9.1	0.81
14	Ardleigh and Little Bromley	2,370	2,311	-59	-2.49%	0.85	0.8	-0.05
15	The Sampfords	1,782	1,900	118	6.62%	0.35	0.4	0.05
16	Halstead Trinity	4,773	4,892	119	2.49%	42.3	43.3	1.000001
17	Wivenhoe Quay	4,989	5,402	413	8.28%	20.93	22.7	1.77
18	St Marys	4,968	5,018	50	1.01%	46.85	47.3	0.450002
19	St Pauls	4,552	4,751	199	4.37%	23.77	24.8	1.03

ID	Electoral Ward	Total Population				Population Density		
		2001 Census	2011 Census	Absolute Change	% Change	2001 Census	2011 Census	Absolute Change
20	Beaumont and Thorpe	2,399	2,300	-99	-4.13%	0.75	0.7	-0.05
21	St Osyth and Point Clear	4,119	4,277	158	3.84%	1.28	1.3	0.02
22	Great and Little Oakley	2,306	2,188	-118	-5.12%	1.26	1.2	-0.06
23	Stour Valley North	2,131	2,166	35	1.64%	0.33	0.3	-0.03
24	Haven	2,108	2,051	-57	-2.70%	14.45	14.1	-0.35
25	Christ Church	4,201	4,482	281	6.69%	29.82	31.8	1.98
26	St John's	5,194	4,807	-387	-7.45%	21.05	19.5	-1.55
27	Pier	4,810	4,836	26	0.54%	59.82	60.1	0.28
28	Little Clacton and Weeley	4,612	4,590	-22	-0.48%	2.71	2.7	-0.01
29	Stour Valley South	2,065	2,180	115	5.57%	0.5	0.5	0
30	Prettygate	7,730	7,396	-334	-4.32%	39.27	37.6	-1.67
31	Bocking North	4,215	4,728	513	12.17%	3.44	3.9	0.46
32	Alton Park	5,178	4,841	-337	-6.51%	72.08	67.4	-4.68
33	St James	4,334	4,200	-134	-3.09%	22.3	21.6	-0.7
34	Hedingham and Maplestead	6,207	6,550	343	5.53%	1.04	1.1	0.06
35	Great Bentley	2,259	2,253	-6	-0.27%	1.73	1.7	-0.03
36	Brightlingsea	8,146	8,076	-70	-0.86%	7.21	7.1	-0.11
37	St Andrew's	9,362	10,991	1,629	17.40%	49.61	58.2	8.589999
38	Alresford	2,125	2,009	-116	-5.46%	3.12	3	-0.12
39	Rush Green	4,979	4,787	-192	-3.86%	27.53	26.5	-1.03

ID	Electoral Ward	Total Population				Population Density		
		2001 Census	2011 Census	Absolute Change	% Change	2001 Census	2011 Census	Absolute Change
40	Great Tey	2,764	2,695	-69	-2.50%	0.75	0.7	-0.05
41	Holland and Kirby	4,519	4,724	205	4.54%	3.05	3.2	0.15
42	Fordham and Stour	5,113	5,332	219	4.28%	1.09	1.1	0.01
43	Frinton	4,089	4,002	-87	-2.13%	20.41	20	-0.41
44	Dedham and Langham	2,906	2,943	37	1.27%	1.29	1.3	0.01
45	Hamford	4,032	3,847	-185	-4.59%	29.96	28.6	-1.36
46	St Anne's	8,761	8,874	113	1.29%	39.79	40.3	0.509999
47	Coggeshall and North Feering	4,778	5,201	423	8.85%	1.61	1.8	0.19
48	Copford and West Stanway	1,876	1,915	39	2.08%	1.7	1.7	-4.8E-08
49	St Bartholomews	4,417	4,390	-27	-0.61%	33.96	33.8	-0.16
50	Upper Colne	2,121	2,145	24	1.13%	0.49	0.5	0.01
51	Mile End	6,215	10,565	4,350	69.99%	8.12	13.8	5.68
52	St Johns	4,799	4,662	-137	-2.85%	18.97	18.4	-0.57
53	Castle	7,032	9,996	2,964	42.15%	20.05	28.5	8.450001
54	Bradfield, Wrabness and Wix	2,229	2,233	4	0.18%	0.86	0.9	0.04
55	Shrub End	10,528	10,086	-442	-4.20%	19.09	18.3	-0.79
56	Tolleshunt D'Arcy	3,926	4,065	139	3.54%	0.83	0.9	0.07
57	Bumpstead	2,418	2,558	140	5.79%	0.79	0.8	0.01
58	Halstead St Andrew's	6,280	7,014	734	11.69%	15.91	17.8	1.89

ID	Electoral Ward	Total Population				Population Density		
		2001 Census	2011 Census	Absolute Change	% Change	2001 Census	2011 Census	Absolute Change
59	Wivenhoe Cross	4,146	4,623	477	11.51%	8.48	9.5	1.02
60	Berechurch	8,367	9,014	647	7.73%	16.91	18.2	1.29
61	Burrsville	2,109	2,027	-82	-3.89%	5.91	5.7	-0.21
62	Lexden	5,433	5,549	116	2.14%	11.88	12.1	0.22
63	Yeldham	2,041	2,175	134	6.57%	1.57	1.7	0.13
64	Tiptree	7,516	7,583	67	0.89%	9.02	9.1	0.08
65	Harbour	5,701	6,181	480	8.42%	13.2	14.3	1.1
66	Lawford	4,476	4,302	-174	-3.89%	4.07	3.9	-0.17
67	New Town	8,625	10,682	2,057	23.85%	48.59	60.2	11.61
68	Peter Bruff	4,693	4,436	-257	-5.48%	54.71	51.7	-3.01
69	Cressing and Stisted	2,155	2,311	156	7.24%	0.94	1	0.06
70	Great Totham	3,463	3,660	197	5.69%	1.14	1.2	0.06
71	Manningtree, Mistley, Little Bentley and Tendring	4,365	4,603	238	5.45%	1.51	1.6	0.09
72	Marks Tey	2,566	2,551	-15	-0.58%	4.21	4.2	-0.01
Total / (Average)		**327,914**	**348,041**	**20,127**	**6.14%**	**(13.46)**	**(14.03)**	**(0.57)**

Cefas

EC Regulation 854/2004

CLASSIFICATION OF BIVALVE MOLLUSC PRODUCTION AREAS IN ENGLAND AND WALES

SANITARY SURVEY REPORT

Colne

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