Centre for Environment Fisheries & Aquaculture Science

Food Standards Agency
food.gov.uk

Selection of a bivalve shellfish cultivation site
Consideration of faecal pollution issues

Glossary

CSO *Combined Sewer Overflow*
EA *Environment Agency*
FSA *Food Standards Agency*
LEA *Local Enforcement Authority*

General points to note

- This document does not represent Government policy. It is only guidance that aims to provide information to food business operators which may assist them in avoiding selection of areas for cultivation that are problematical for faecal pollution. However, conformity with these suggestions for best practise should not be construed as a legal requirement (it is not), and also does not guarantee that faecal contamination issues will not be subsequently encountered.

- This document does not address algal biotoxin or chemical contaminant issues, however, operators would need to include consideration of these in their overall site selection assessment.

- Relevant permissions for shellfish cultivation should be sought from the local landowner.

- Shellfish farm registration will be required – contact Cefas Fish Health Inspectorate (fhi@cefas.co.uk) for further details.

- Cefas has produced a booklet[1] which provides advice on some of the aspects mentioned above which should also be taken into account.

Introduction

Water quality is one of the main challenges faced today by bivalve shellfish producers. Bivalve shellfish are very effective at concentrating contaminants by their filter-feeding activity. They may accumulate levels of *E. coli,* the faecal indicator bacterium upon which harvesting area classifications are based, by as much as 100 times the concentration in the surrounding water. Given this considerable capacity for accumulation it is clear to see that even a small amount of pollution in a harvesting area may have a significant adverse effect on the quality of bivalves growing there. In reality this means that class A can be difficult to achieve.

There are many sewage outfalls (continuous and intermittent) which discharge either directly or indirectly into shellfish harvesting sites. Whilst billions of pounds have been spent by water companies in recent years to improve water quality in rivers and coastal areas, it is recognised that there is still some way to go. It is important to note that pollution may also arise from sources other than sewage discharges. Land run-off from farmland and urban areas can also create significant microbiological pollution which may impact upon shellfisheries.

Given this situation, it is vital that potential growing sites are carefully selected in order to improve the chances of finding good water quality and, importantly, to help ensure that water is free from micro-organisms that may ultimately be harmful to the shellfish consumer.

The details below list the key factors for consideration to assist in this selection process:

Site investigation

It is recommended that site-specific investigations are performed prior to making a significant investment in potential sites.

- Contact the local Environment Agency (EA) office for information on the location of consented sewage outfalls and storm overflows and on related water quality issues.

- Visually inspect the surrounding area for confirmation of information obtained above on sewage discharges. Assess area for river and stream inputs and agricultural run-off.

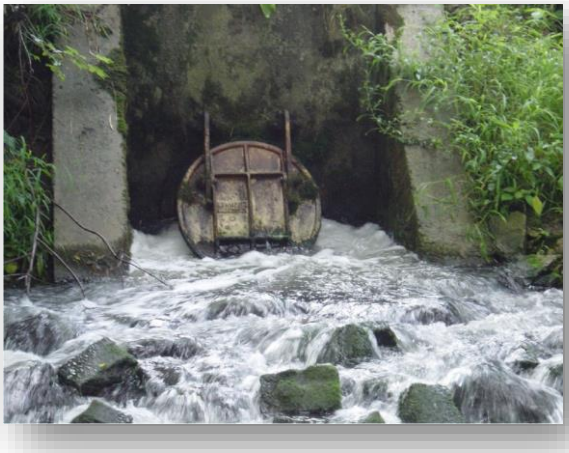
Regular contact with the local EA office is useful to help establish good working relationships and to facilitate effective information exchange. The EA would welcome the immediate reporting of potential pollution events to ensure prompt investigation and remedial action is taken (where possible).

Sewage discharges

Continuous sewage discharges, as their name would suggest, are operating all the time. This generally makes assessment of their impact more straightforward. However, there will be some fluctuation in performance as flows through the sewage treatment works vary according to rainfall, time of day (affecting human activities) and population changes due to effects such as tourism. Environmental factors such as water currents and depth will influence the direction of flow and dilution of faecal contamination in a given area. The level of sewage treatment applied (e.g. primary, secondary, tertiary) will dictate the quality of the final effluent and so the better the level of treatment the less the impact on the shellfish. It should be noted, however, that *E. coli* levels tend to be reduced to a greater extent in sewage treatment than norovirus, the most common human pathogen of concern that may be found in UK shellfish. Low *E. coli* levels in shellfish may not always indicate low levels of norovirus. This should be considered, particularly when selecting sites and interpreting shellfish *E. coli* data from oysters or any other shellfish that are likely to be eaten raw.

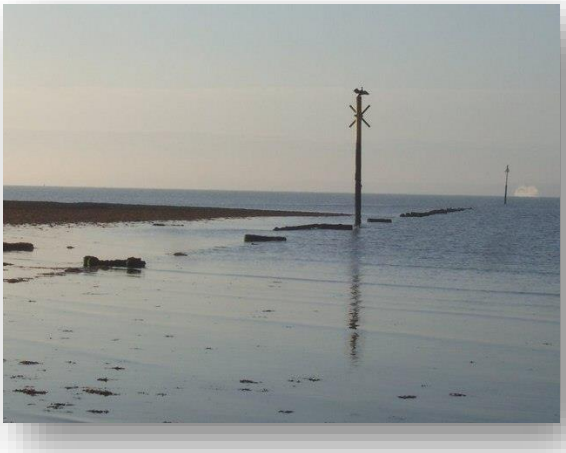
Combined sewer overflows discharge a combination of rainwater and (generally) untreated sewage. The impact of combined sewer overflows, due to their mode of operation, will be intermittent and so any investigatory monitoring at the site selection stage should be targeted

to coincide with times when such discharges are in operation i.e. often during or just after significant rainfall. CSOs discharging directly into formally recognised and designated shellfish growing areas ('shellfish waters') are normally designed to spill less than 10 times per year. In practice, however, some may spill at a higher frequency than this over the course of a year, particularly if it is a wet year.



Operating intermittent sewage discharges

The presence of discharges is not always obvious – not all are identified with buoys or 'isolated danger' marker posts.

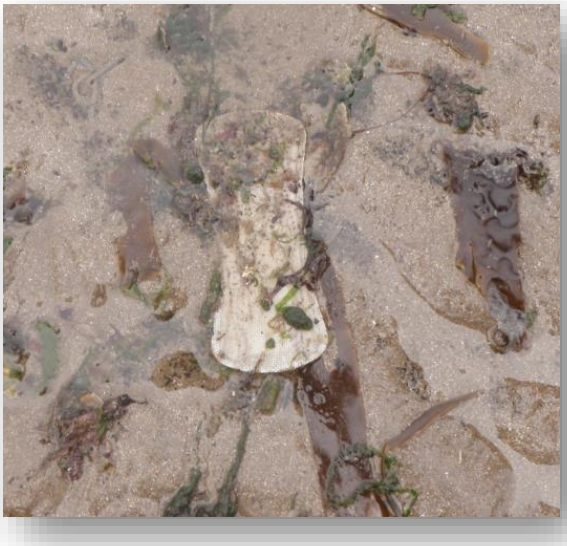


Sewage outfall 'isolated danger' marker post

Cotton bud plastic

Tell-tale signs of sewage contamination:

The presence of cotton buds (often without the cotton wool attached) and other sanitary related debris are typical signs of sewage contamination. Cotton bud plastics are able to pass through the 6mm screens present on some CSOs.



Clearly, it is advisable to select sites as far away from sewage outfalls as possible but the effects of larger discharges can extend several kilometres away. If obvious signs of sewage contamination are regularly found (e.g. sanitary debris on the shoreline) then serious consideration should be given to finding an alternative site. Even if *E. coli* results do not indicate a significant problem, norovirus (and other pathogen) levels might be elevated. It might be useful to discuss sanitary debris issues with the local EA officer to determine whether there are any local sewage discharge problems that may be easily rectified (e.g. blockages leading to sewer overflow etc.).

Septic tanks

Septic tanks may have a significant localised effect if poorly maintained e.g. if they are not emptied regularly. Liaison with the relevant property owners to raise awareness of the issues may help to avoid problems. The Local Enforcement Authority (LEA) and/or EA may have details of the septic tanks in your area.

Farming activities

Farming activities can present potential pollution problems e.g. inadequate slurry stores, muck spreading too close to water courses or just before or during heavy rain. Good liaison with local farmers and explanation of the issues may help to avoid pollution.

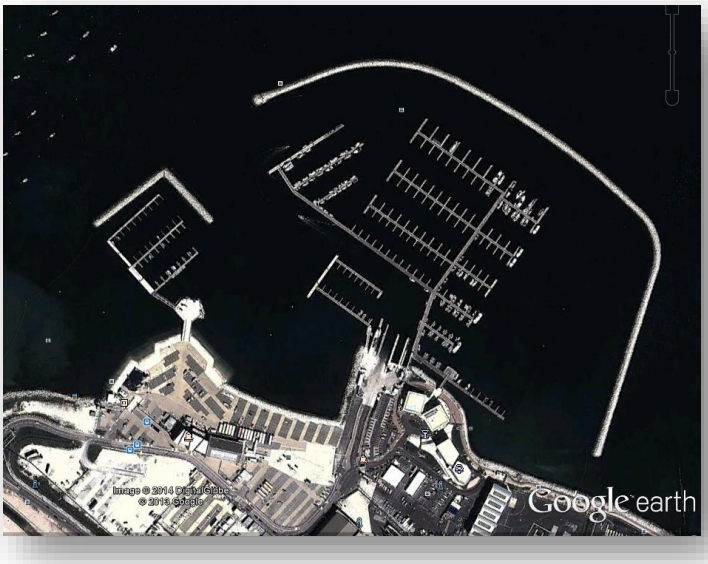
Streams

Cattle and other livestock tend to be attracted to streams to drink and, once there, often cause them to become contaminated. The presence of a stream entering the vicinity of the harvesting area might therefore indicate a potential source of pollution and would warrant further investigation. Fencing to prevent livestock defecating directly into the watercourse is an important control measure.

Boating activity

The presence of boat moorings or an anchorage may indicate a source of potential contamination. The generally accepted convention is that recreational boats should either use pump-out facilities (if they have onboard storage) or, alternatively, should discharge waste at least 3 nautical miles from shore. However, in practice, many boats including small commercial boats such as dive and angling charter boats do not have holding tanks and therefore cannot comply with this requirement. Just one person infected with norovirus onboard a nearby boat may be enough to contaminate a significant proportion of your shellfishery if they are discharging sanitary waste. Appropriate education of boat users with regard to the potential for contamination of your shellfish beds may help to avoid costly pollution problems.

Marinas will be a source of faecal contamination for the same reasons given above and so the establishment of shellfish areas in the proximity of these should be avoided.



The appropriate 'safe' distance or 'buffer zone' for establishing a shellfishery from marinas will vary according to the size of the facility and local dilution factors. No minimum distance is currently specified in EU legislation, however, the Good Practice Guide(2) suggests a buffer zone of at least 300m. Suitable water and shellfish *E. coli* testing may be needed to validate any dilution assessments.

Wildlife

Whilst there is little that may be done about the presence of wildlife it is nevertheless important to be aware of its potential effects in terms of faecal contamination. The current *E. coli* method cannot differentiate between human or animal sources. The direct impact of seals, birds and other wildlife may be avoided by discouraging the presence of these animals in the direct vicinity of the shellfish beds through appropriate means. Advice on this should be sought from relevant wildlife bodies such as RSPB and Wildlife Trusts.

Preliminary investigative monitoring

If the outcome of the investigations above appear favourable, then it would be advisable to undertake some preliminary *E. coli* monitoring of the shellfish species of interest. This testing should preferably be carried out using one of the three recognised approved shellfish methods (5 x 3 tube Most Probable Number, impedance, and pour-plate-based methods) to ensure that results are meaningful. Your local LEA or Cefas can provide further advice on this.

The choice of monitoring location(s) should aim to highlight the worst-case scenario from the contamination perspective i.e. monitoring points should be located at a point(s) on the site of interest nearest the influence of any faecal pollution inputs that you have identified. Be wary of low results from single samples. Shellfish results in most areas can be very variable as pollution plumes are affected by tides and currents. Occasional low results are possible even in the most contaminated areas. If you do get some high results in initial monitoring experience suggests that you are likely to get more. In this case caution is warranted if your business requires a classification of class B or better. To give a reasonable initial indication of quality it would be advisable to take six or so samples at least one week apart covering a range of weather conditions. It should be noted, however, that this would only be a limited initial assessment and may not take account of seasonal variation.

It should be noted that different species of shellfish concentrate *E. coli* to differing extents. For example mussels would normally be expected to show slightly higher results than oysters growing at the same site[3]. In some cases this can lead to different levels of classification being assigned (e.g. mussels class C, Pacific oysters class B).

If monitoring indicates that the area may produce the desired level of classification (i.e. usually class A or B) then the LEA should be contacted regarding formal monitoring towards a provisional classification. A form is required to be completed and submitted to the Food Standards Agency (FSA) (shellfishharvesting@foodstandards.gsi.gov.uk) for consideration. This should be completed by the LEA in conjunction with the applicant. A copy of the form may be downloaded from the FSA's website at:

Shellfish classification | Food Standards Agency

- Once the application has been validated by the FSA, an assessment of the monitoring requirements will be made by Cefas. This may require the completion of a sanitary survey which documents all sources of human and animal faecal pollution likely to affect the area of interest. After assessing the influence of current patterns and seasonality it then sets out the shellfish *E. coli* monitoring requirements for the area in the form of a 'sampling plan'.

- Harvesting area classifications are established on the basis of this monitoring. As a guide, ten samples taken at least 1 week apart are normally required for an initial classification to be given. The FSA award a classification category to each harvesting area in accordance with the levels of faecal contamination determined by EU Regulation 854/2004.

- Contact the LEA to obtain up-to-date information on shellfish hygiene requirements and further information on water quality.

Once classified, *E. coli* monitoring data for your site can be obtained at:

Shellfish monitoring results - Cefas (Centre for Environment, Fisheries and Aquaculture Science)

Final points to note

- Large areas of population will bring with them a greater potential for faecal contamination – in general therefore it is best to locate sites as far away from residential areas and their sewer inputs as is possible.

- Human faecal inputs (eg sewer pipes, septic tanks, boats) are the source of norovirus, whereas human and agricultural inputs (e.g. livestock, wildlife) can contribute *E. coli* loadings.

- Small localised sources of contamination can be just as significant as large distant sources of contamination so all sources should be investigated, considered and, where possible, their effects mitigated e.g. by selecting a site an appropriate distance away or by liaising with the local EA officer to determine whether remedial action can be taken in relation to the polluting source.

- Shellfish can concentrate contamination in the surrounding water by up to 100x so even a comparatively small amount of pollution can have a significant effect on shellfish *E. coli* results. This could mean the difference between class B and C.

- The classification of areas only just conforming to the upper limits for class B may be more likely to change i.e. to potentially be downgraded to class C as monitoring continues.

- As the extent of contamination reduces towards class A compliance, the risk of illness associated with harvested shellfish will also decline, although zero risk may be unobtainable for shellfish eaten raw.

- Contact your LEA and/or Cefas at an early stage if you wish to discuss your proposals for classification of a new area.

References and other useful sources of information

1. Laing I and Spencer B, 1997. *Bivalve cultivation: criteria for selecting a site*. Lowestoft: Centre for Environment, Fisheries and Aquaculture Science.

2. Microbiological Monitoring of Bivalve Mollusc harvesting Areas. Guide to Good Practice: Technical Application https://eurlcefas.org/public-documents/official-control-guides.aspx

3. Younger and Reese, 2013. Comparison of Escherichia coli Levels Between Bivalve Mollusc Species across Harvesting Sites in England and Wales. Journal of Shellfish Research, 32(2):527-532. 2013.

4. Bowes, M and Pyke, M. Coastal Characterisation & the CSO Text Alert Initiative. Good Manufacturing Practice Guidelines. September 2013. http://www.seafish.org/media/publications/GMPG_coastal_characterisation.docx.pdf

Weymouth Laboratory, October 2021