

## Concentration of contaminants in the water column



### Key message

**Concentrations of contaminants monitored in water, such as metals, pesticides and industrial chemicals, are below levels deemed to impact on the aquatic environment in almost all Scottish Marine Regions (SMRs). Only concentrations of chromium VI in the inner Clyde Estuary failed to meet the environmental quality standard (EQS).**



Water samples being processed in SEPA's Angus Smith Laboratory © SEPA

### Background

Contaminants can enter the marine environment from a number of different sources including: riverine inputs, contaminated sediment, direct discharges to marine waters and atmospheric deposition. The ecological impact of contaminants in the water column depends on their concentration. Contaminant concentrations are assessed against Environmental Quality Standards (EQS), i.e. the concentration of contaminant in water above which adverse environmental effects are likely to occur.

In coastal and transitional waters, levels of contaminants in the water column are legislated by the Water Framework Directive (WFD) (2000/60/EC), with EQS for priority substances

set as part of the Priority Substances Directive (2013/39/EU). Concentrations of priority substances in the environment are compared to the EQS and reported as either good or less than good chemical status. In addition to meeting the EQS, there is a requirement to reduce emissions of all priority substances and cease emissions of priority hazardous substances by 2020. The priority substances and specific pollutants include metals, pesticides, industrial chemicals and pharmaceuticals.

The UK has also identified EQS for other Specific Pollutants (substances discharged in significant quantities). Concentrations of specific pollutants

in the environment are compared to the EQS and reported as part of overall ecological status.

This assessment evaluates concentrations of contaminants in each of the Scottish Marine Regions (SMRs) within the context of EQS values set out by the Scotland River Basin District (Standards) Directions 2014.

Given the recent reduction in WFD monitoring in Scotland there are insufficient data to assess temporal trends at the Scottish Marine Region (SMR) scale. Therefore results of WFD chemical classification are presented from 2007 - 2017.

## Results

Contaminants (metals, pesticides, industrial chemicals and pharmaceuticals) are measured in water samples to assess the chemical status of WFD water bodies. Across Scotland, 503 of the 504 (99.8%) coastal and transitional water bodies have met EQS since WFD classification started in 2007, meaning that, in most cases observed, concentrations are not likely to have adverse effects on the aquatic environment. Concentrations of most contaminants in transitional and coastal waters are low and often not detected. Therefore, contaminant monitoring in most water bodies has been discontinued, with routine monitoring continuing only in the most industrialised and urbanised SMRs (Clyde, and Forth and Tay) where contaminant pressures are greater.

The one failing waterbody is the Inner Clyde estuary, which failed for one heavy metal (chromium VI) in 2015, 2016 and 2017. The Annual Average (AA) EQS for chromium VI is  $0.6 \mu\text{g l}^{-1}$ . In the latest classification (2017), observed levels of chromium VI in the inner Clyde were double those permitted by the EQS.

The presence of chromium VI in the Inner Clyde is primarily associated with a known localised land contamination pressure in south east Glasgow. The chromium is in waste deposits from a historical chemical manufacturing facility that closed in the 1960s. Remedial work is underway that aims to reduce levels of chromium VI in soil and groundwater by converting it to the less toxic, less soluble chromium III. These remediation works are part of a long term 15-20 year redevelopment plan by the Clyde Gateway which commenced in 2012.

In the Marine Atlas (Baxter *et al.*, 2011) hazardous substances in water were only assessed using data from 2009 for cadmium, lead, zinc, copper and lindane. None of the samples from 2009 breached EQS, which is comparable to findings from this assessment. In 2011 chromium VI, the only contaminant to breach EQS in this assessment, was not assessed.

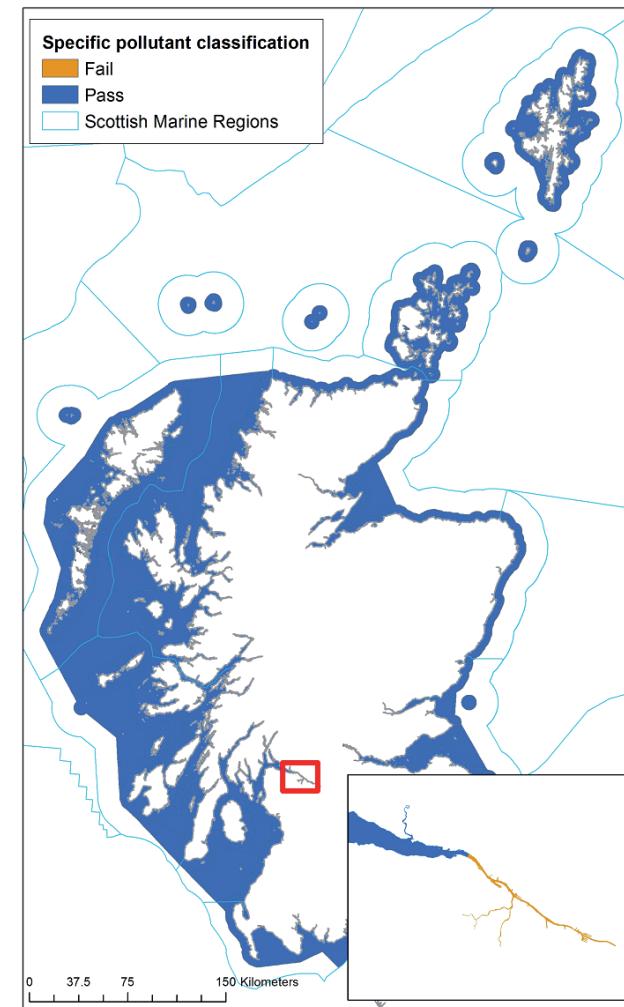


Figure 1:  
Water Framework Directive Classification  
- Specific Pollutants (2017)

## Conclusion

99.8% of Scotland's transitional and coastal water bodies have achieved Good chemical status as part of the Water Framework Directive. The only failing waterbody is in the Clyde and is caused by chromium VI from a known land contamination issue that has a remediation plan.

## Knowledge gaps

Monitoring as part of the WFD is targeted as it is not possible to monitor for all hazardous substances in all water bodies every year. Targeted monitoring relies on knowledge of known contaminant sources and ecological data where there may be unknown pressures. Likewise, certain contaminants

have physico-chemical properties that mean they move to sediment or biota and cannot be measured in the water column.

The substances listed as part of the WFD only represent a small fraction of the chemicals that are released into the environment.

Many of the EQS for metals in marine waters are for dissolved metals (e.g. copper and zinc). At present SEPA analyse only total metals. This monitoring has in some cases produced results above the dissolved EQS in the Forth and Clyde estuaries, and it is unclear whether collection of dissolved data would produce EQS failures.

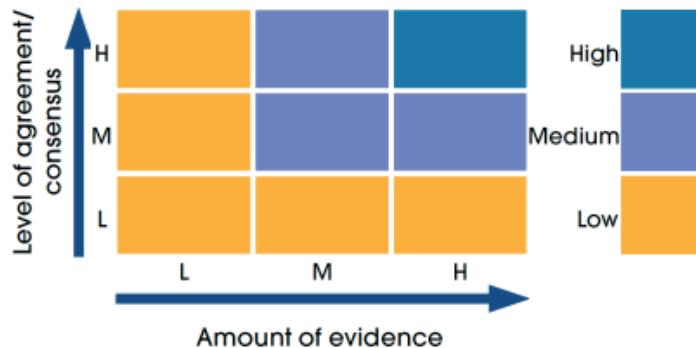
## Status and trend assessment

The concentration of contaminants in the water column assessment is based on waterbody classifications which cannot be scaled to Scottish Marine Regions. As such SMR status and trends are not presented.

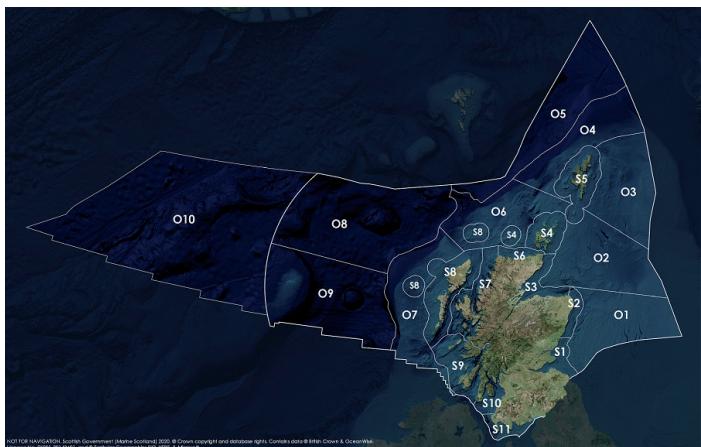
## Status and trend assessment legend

Status assessment (for Clean and safe, Healthy and biologically diverse assessments)		Trend assessment (for Clean and safe, Healthy and biologically diverse and Productive assessments)	
	Many concerns		No / little change
	Some concerns		Increasing
	Few or no concerns		Decreasing
	Few or no concerns, but some local concerns		No trend discernible
	Few or no concerns, but many local concerns		All trends
	Some concerns, but many local concerns	<b>Confidence assessment</b>	
	Lack of evidence / robust assessment criteria	Symbol	Confidence rating
	Lack of regional evidence / robust assessment criteria, but no or few concerns for some local areas		Low
	Lack of regional evidence / robust assessment criteria, but some concerns for some local areas		Medium
	Lack of regional evidence / robust assessment criteria, but many concerns for some local areas		High

## Overall confidence



## Assessment regions

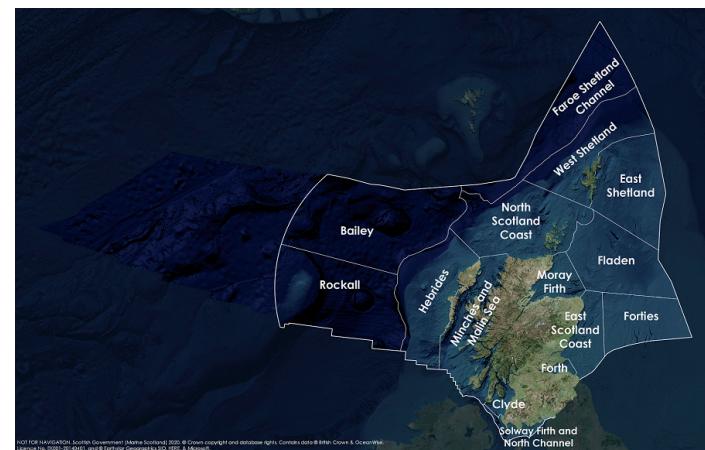


The Scottish Marine Regions (SMRs; S1 – S11) and the Scottish Offshore Marine Regions (OMRs; O1 – O10)

Key: S1, Forth and Tay; S2, North East; S3, Moray Firth; S4 Orkney Islands, S5, Shetland Isles; S6, North Coast; S7, West Highlands; S8, Outer Hebrides; S9, Argyll; S10, Clyde; S11, Solway; O1, Long Forties, O2, Fladen and Moray Firth Offshore; O3, East Shetland Shelf; O4, North and West Shetland Shelf; O5, Faroe-Shetland Channel; O6, North Scotland Shelf; O7, Hebrides Shelf; O8, Bailey; O9, Rockall; O10, Hatton.



Biogeographic, Charting Progress 2 (CP2) Regions. These have been used as the assessment areas for hazardous substances.



Scottish Sea Areas as used in Scotland's Marine Atlas 2011. These are sub divisions of the biogeographic, or Charting Progress 2 (CP2), Regions.



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