THE IMPACT OF LIQUID RADIOACTIVE WASTE DISCHARGES FROM SELLAFIELD TO THE IRISH SEA IN RECENT YEARS

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Summary

This paper looks at changes in liquid radioactive waste discharges from Sellafield to the Irish Sea between 1993 and 2002.

It gives an overview of

- why discharges have changed
- how they have affected concentrations in the local marine environment
- how doses to local people have changed
- what the future trends are likely to be.

Discharges

BNFL Sellafield *© BNFL*

Sellafield carries out reprocessing of irradiated nuclear fuel from Magnox and oxide fuel reactors in the UK and abroad. The Thermal Oxide Reprocessing Plant (THORP) began operation in 1994. The site also includes the Calder Hall nuclear power station, which operated between 1956 and 2003, and mixed oxide fuel production. A number of facilities are being decommissioned, including the Windscale Advanced Gas-cooled Reactor (WAGR). Treatment facilities include the Site Ion Exchange Effluent Plant (SIXEP) and the Enhanced Actinide Removal Plant (EARP).

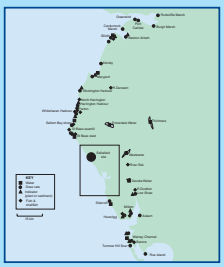
Discharges of liquid radioactive wastes require authorisation under UK law. The most recent major change in the Sellafield authorisation occurred in 1994.

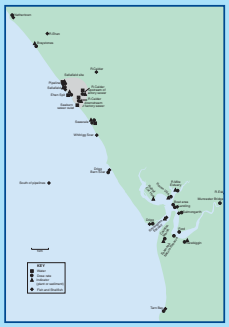
Recent changes in Sellafield's liquid waste discharge authorisations

- Authorisation changed in 1994
  - Decreases for total α, total β and 9 radionuclides including ^{137}Cs, Pu-α and ^{241}Am (due to EARP)
  - Increases for ^{3}H, ^{60}Co and ^{129}I (for operation of THORP)
  - Increases for ^{14}C (for diversion from gaseous wastes)
  - Increases for ^{90}Sr and ^{99}Tc (for treatment of waste backlogs)
- Authorisation decreased in 2000 for ^{3}H and ^{99}Tc

Environmental monitoring

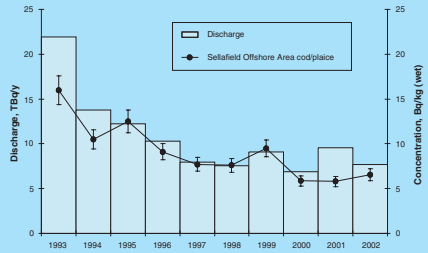
Above: CEFAS Laboratory, Lowestoft
Below and Right: Monitoring locations around Sellafield



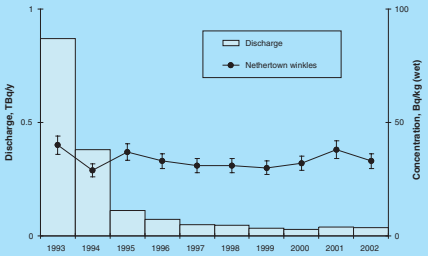


On behalf of the Food Standards Agency, CEFAS carries out an extensive programme for monitoring radioactivity due to Sellafield in the marine environment. Results are published annually in the RIFE series of reports. The monitoring programme is regularly reviewed particularly in light of information from local habits surveys which CEFAS undertake. These surveys provide information from local people about the seafood they consume and the inter-tidal areas they use.

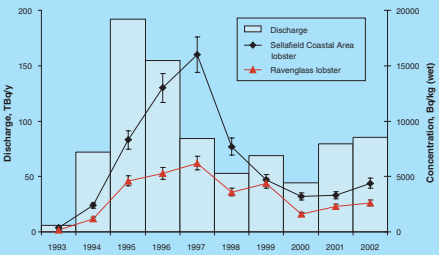
Annual monitoring report (RIFE)



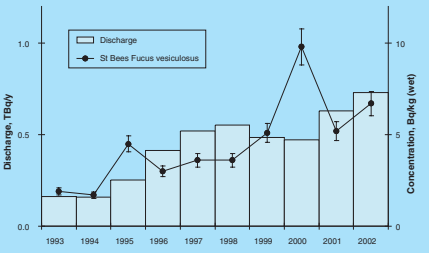
Sellafield ^{137}Cs discharges and concentrations in Sellafield Offshore Area cod/plaice



Sellafield ^{241}Am discharges and concentrations in Nethertown winkles



Sellafield ^{99}Tc discharges and concentrations in Sellafield Coastal Area and Ravenglass lobsters

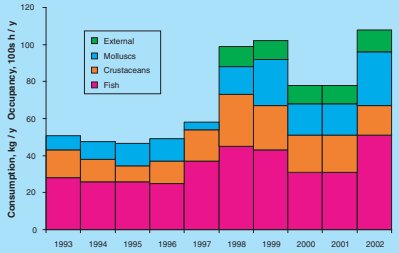


Sellafield ^{129}I discharges and concentrations in St Bees Fucus vesiculosus

Concentrations of ^{99}Tc and ^{129}I reflect recent discharges whereas ^{241}Am concentrations are governed by past discharges, particularly from the 1970s and 1980s, still present in the environment. Concentrations of ^{137}Cs appear to reflect recent discharges but are in fact similarly due to past discharges.

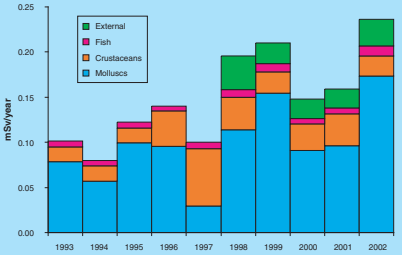
Radiological significance

Doses were assessed by combining the results of monitoring and habits surveys with dosimetric data.



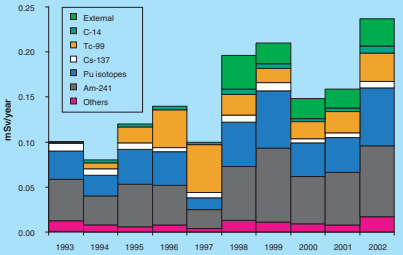
Habits of local critical group

Habits of the local critical group relevant to liquid radioactive waste discharges from Sellafield are reviewed annually. The group eat local seafood and spend time on intertidal areas.



Doses to local critical group by pathway

The dominant pathway throughout has been consumption of shellfish, particularly molluscs. Doses from external exposure pathways have contributed more in recent years.



Doses to local critical group by radionuclide

Most of the dose has been due to Pu-isotopes and ^{241}Am, with ^{99}Tc contributing more in recent years.

Future trends

Discharges from Sellafield will continue to reduce. Particular influences are:

- The 1998 OSPAR Radioactive Substances Strategy which requires discharges to be reduced by 2020 such that they result in 'close to zero' additional concentrations in the marine environment above historic levels
- The UK Strategy for Radioactive Discharges 2001 – 2020 which details intended reductions
- The Environment Agency's review of Sellafield's discharge limits.

However, apart from ^{99}Tc, doses to the local population are predominantly due to the residual effect of Sellafield's discharges in the 1970s and 1980s. Discharge reductions are therefore unlikely to significantly affect doses. In future, doses will depend on people's habits and the environmental behaviour of radioactivity discharged in the past.

Continued environmental monitoring will enable the situation to be kept under review.

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