

Cefas contract report SLBA1 Marine material disposal – Part II FEPA

Radiological Assessment of Dredging Application for Watchet Harbour, Somerset (2010)

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RADIOLOGICAL ASSESSMENT OF DREDGING APPLICATION FOR WATCHET HARBOUR (2010)

Summary

In 2010, Watchet Harbour Marina Limited lodged a FEPA licensing application to carry out a 3 year dredging program, involving the disposal at sea of 7,791 m³ of sediment from Watchet Harbour in Somerset.

In England, the MMO administers a range of statutory controls that apply to marine works on behalf of the Secretary of State for Environment, Food and Rural Affairs (Defra), this includes issuing licences under the Food and Environmental Protection Act (FEPA), 1985 (United Kingdom - Parliament, 1985) for the disposal of dredged material at sea. Licences for disposals made in Scottish waters and around the coast of Northern Ireland are the responsibility of the Scottish Government (Marine Scotland) and the Department of Environment (NIEA), respectively. As of 1 April 2010 licences for Welsh waters are the responsibility of WAG.

Using the conservative generic radiological assessment procedure developed by the IAEA, to convert radionuclide concentrations in dumped material into radiation doses due to dumping, the total derived total doses to individual members of the crew and public were ~7 µSv/year and ~2 µSv/year, respectively. The total collective dose was 0.034 manSv/year. The values for individual members of the crew and public, and the collective dose, were within the *de minimis* criteria of 10 µSv/year (individual doses) and 1 manSv/year (collective dose), respectively.

Since the conservative generic radiological assessment procedure indicated that doses received were below recommended limits, a subsequent more detailed case specific assessment was not necessary. Therefore, from radiological considerations, there is no objection to this material being dredged and dumped.

Assessment details

In 2010, Watchet Harbour Marina Limited lodged a FEPA licensing application to carry out a dredging program (3 years), involving the disposal at sea of 7,791 m³ of sediment from

Watchet Harbour in Somerset. The dredge site is located at approximately 14 km west of Hinkley Point Nuclear Power Station. As part of the radiological assessment of the proposed operation, three sediment samples within the harbour (and representative of the area to be dredged) were collected in May 2010.

Following freeze-drying and homogenisation, radionuclide assay at the Cefas Lowestoft Laboratory was achieved by γ counting samples on a high purity Ge detector. The results are summarised in Table 1.

Table 1. Radioactivity in sediment dredged from Watchet Harbour, May 2010

Sample Number	Specific activity (Bq/kg, dry weight)					
	^{60}Co	^{137}Cs	^{226}Ra (via ^{214}Pb)	^{232}Th (via ^{228}Ac)	^{238}U (via ^{234}Th)	^{241}Am
1	< 0.41	24	21	28	72	0.82
2	< 0.36	24	23	29	49	0.67
3	< 0.40	23	21	27	100	1.16
*Average	0.4	24	22	28	74	0.88

*Average determinations use < results as positively measured values to produce a conservative estimate

The specific activity of the artificial radionuclides (e.g. ^{137}Cs and ^{241}Am) in these samples was typical of muddy sediments from the combined effects of discharges from the Hinkley Power station, other nuclear establishments discharging into the Bristol Channel and weapons testing (and possibly a small Sellafield derived component), being enhanced above background levels outside the Irish Sea. The Sellafield component is a legacy of large discharges from the Sellafield Limited reprocessing plant (formally British Nuclear Fuels) at Sellafield in the 1970s.

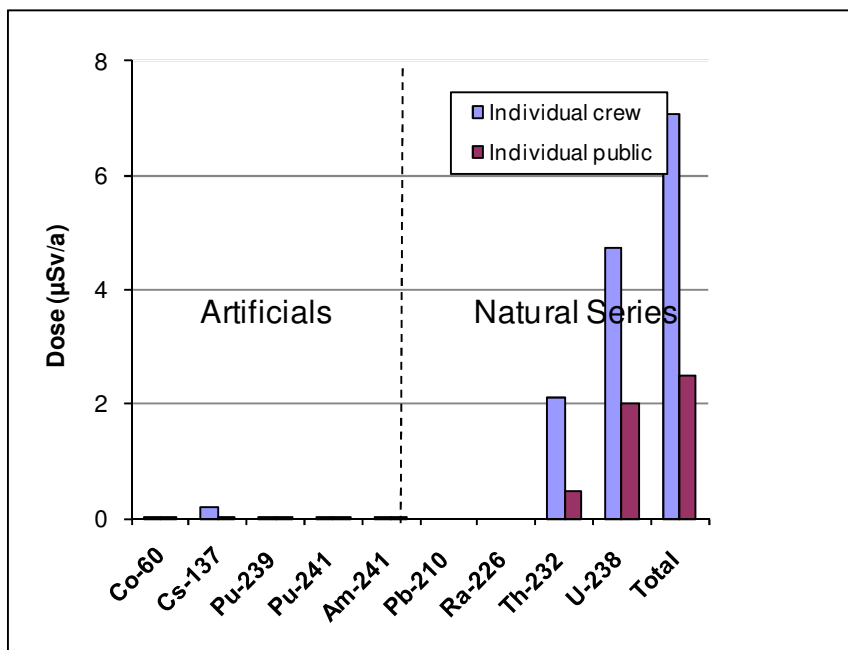
In addition to the nuclides detected by gamma spectrometry, sediments are also known to contain activities of Pu radionuclides. The ^{241}Am data were used to derive estimates for $^{239,240}\text{Pu}$ and ^{241}Pu , assuming their activity was proportional to the ratio in the time integrated Sellafield discharges. This approach is reasonable given that both radionuclides are highly

particle-reactive, hence the fate following discharge is similar. The activity for ^{210}Pb was derived using data for ^{226}Ra and assuming secular equilibrium.

Under the London Convention, only materials with *de minimis* levels of radioactivity may be considered for dumping. Using the conservative generic radiological assessment procedure developed by the IAEA (IAEA, 2004), to convert radionuclide concentrations in dumped material into radiation doses due to dumping, the total derived total doses to individual members of the crew and public were 7.1 $\mu\text{Sv}/\text{year}$ and 2.5 $\mu\text{Sv}/\text{year}$, respectively. The total collective dose was 0.034 manSv/year. The values for individual members of the crew and public, and the collective dose, were within the *de minimis* criteria of 10 $\mu\text{Sv}/\text{year}$ (individual doses) and 1 manSv/year (collective dose), respectively.

The dose estimates for individual crew/public (by nuclide), derived using the generic IAEA model, are shown in Figure 1.

Figure 1. Assessment of dose to individual members of crew and the public arising from Watchet Harbour, Somerset a) Doses were derived using average activities listed in Table 1.



Since the conservative generic radiological assessment procedure indicated that doses received were well below recommended limits, a subsequent more detailed case specific assessment was not necessary. All the derived total dose values were less than the de minimis criteria of 10 $\mu\text{Sv}/\text{year}$ and 1 manSv/year for individual and collective dose, respectively.

Therefore, from radiological considerations, there is no objection to this material being dredged and dumped.

References

IAEA(2004). Sediment distribution coefficients and concentration factors for biota in the marine environment. Tech. Rep. Ser. No. 422, IAEA, Vienna.

United Kingdom - Parliament, 1985. Food and Environment Protection Act, 1985. HMSO, London.

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