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Cefas contract report C5078 (MCU1245 and MCU1258)

Radiological Assessment of Dredging Application for Hinkley Point C Power Station, Somerset (2013)

Cefas Environment Report RL 05/13

Authors: K. S. Leonard, P. A. Smedley and S.M. Cogan

Issue date: April 2013

RADIOLOGICAL ASSESSMENT OF DREDGING APPLICATION FOR HINKLEY POINT C POWER STATION, SOMERSET (2013)

Summary

In 2012, EDF Energy PLC lodged a MCAA licensing application to carry out a variety of dredging scenarios, within which dredging and disposal could occur from 1 November 2013 to 31 October 2015 (Hinkley Point C - Proposed Nuclear Development, 2012). The volume of material to be dredged and disposed of at sea is up to 200,000 m^3 for the intakes and outfalls application and 24,885m^3 for the temporary jetty application.

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 Marine and Coastal Access Act (MCAA), 2009 (United Kingdom - Parliament, 2009) 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 the Welsh Government.

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 4.8 μSv/year and 1.6 μSv/year, respectively. The total collective dose was 0.035 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 2012, EDF Energy PLC lodged a MCAA licensing application to carry out a dredging program a variety of dredging scenarios, within which dredging and disposal could occur from a start date of 1 November 2013 to an expected completion date of 31 October 2015; but the duration of dredging/disposal programme for each dredging phase will only be 1 month or potentially up to 12 months (Hinkley Point C - Proposed Nuclear Development, 2012). The volume of material to be dredged and disposed of at sea is up to 200,000 m^3 (280,000 tonnes) for the intakes and outfalls application and 24,885m^3 (38,050 tonnes) for the temporary jetty application. As part of the radiological assessment of the proposed operation, a total 17 sediment samples were taken (12 and 5 sediments were taken for the intakes/outfalls and temporary jetty applications, respectively). The locations of the intakes/outfalls and temporary jetty sampling areas are given in Figures 1 and 2, respectively.

Figure 1. Location Site (intakes and outfalls)

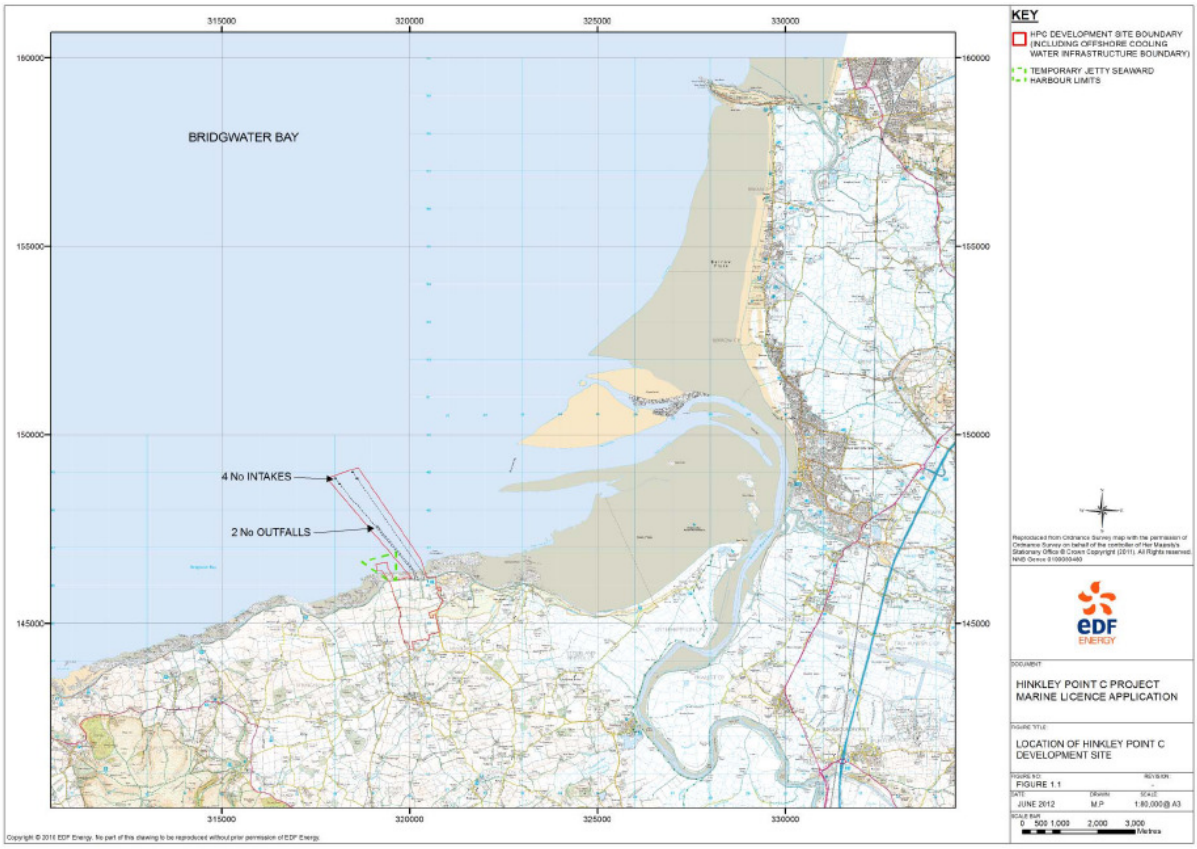
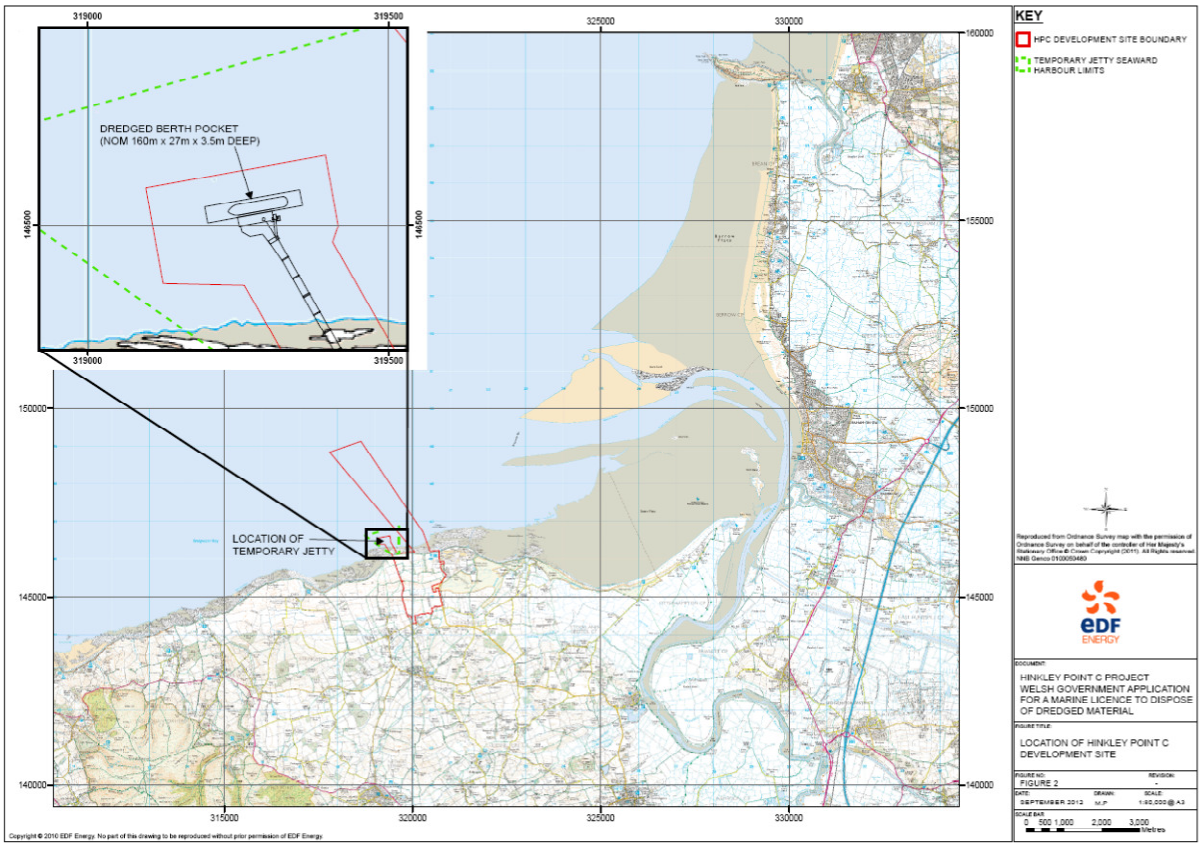


Figure 2. Location Site (temporary jetty)



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 Hinkley Point C, 2013

Sample Identifier	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
In/Out (MCU 12/45) Sample 1	<0.43	21.7	23.1	28.4	45.4	<1.51
In/Out (MCU 12/45) Sample 2	<0.40	27.4	22.3	26.5	43.3	<1.62
In/Out (MCU 12/45) Sample 3	<0.44	17.4	20.6	24.5	40.6	0.63
In/Out (MCU 12/58) Sample 4	<0.25	7.2	11.2	13.8	19.0	<0.96
In/Out (MCU 12/45) Sample 5	<0.44	32.2	26.0	34.2	41.5	<1.64
In/Out (MCU 12/45) Sample 6	<0.42	23.3	23.8	30.6	43.3	<1.49
In/Out (MCU 12/45) Sample 7	<0.45	20.5	24.0	28.0	32.5	<1.57
In/Out (MCU 12/45) Sample 8	<0.41	18.9	23.4	26.2	45.7	<1.50
In/Out (MCU 12/45) Sample 9	<0.45	20.8	24.1	26.2	44.4	<1.62
In/Out (MCU 12/45) Sample 10	<0.46	22.1	22.2	25.7	38.7	<1.71
In/Out (MCU 12/45) Sample 11	<0.44	23.0	23.9	26.4	42.2	<1.56
In/Out (MCU 12/45) Sample 12	<0.41	18.5	21.8	26.8	42.4	<1.45
NNB (MCU 12/58) Sample 1	<0.43	20.1	24.4	27.2	39.9	<0.71
NNB (MCU	<0.43	21.2	22.6	25.7	42.8	<1.59

12/58) Sample 2						
NNB (MCU 12/58) Sample 3	<0.49	19.4	23.5	25.9	41.0	0.97
NNB (MCU 12/48) Sample 4	<0.45	21.2	24.2	28.4	39.0	3.16
NNB (MCU 12/58) Sample 5	<0.45	21.7	24.5	27.4	44.4	<0.66
***Average**	**0.43**	**21**	**23**	**27**	**40**	**1.59**

*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 Point 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 ^{241}Am result for one sample (NNB (MCU 12/48) Sample 4) was relatively high in comparison to other samples obtained, however this activity concentration is still very low compared to sediments in other areas of the NE 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.

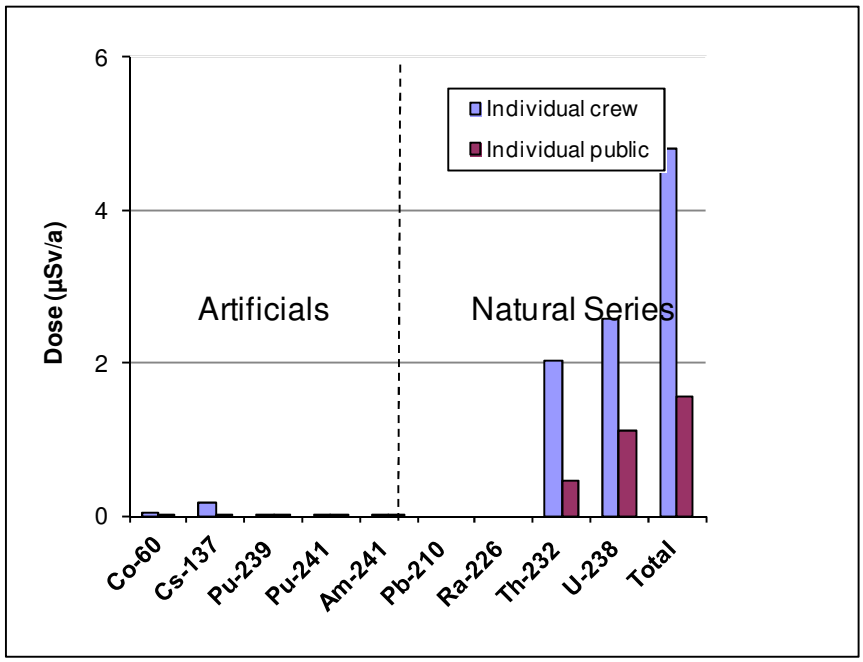
In addition to the nuclides detected by gamma spectrometry, sediments are also known to contain activities of Pu radionuclides. The ^{241}Am data were used to derive estimates for ^{239,240}Pu and ^{241}Pu, assuming their activity was proportional to the ratio in the time integrated Sellafield discharges. 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 4.8 µSv/year and 1.6 µSv/year, respectively. The total

collective dose was 0.035 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.

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 Hinkley Point Power Station 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 µSv/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

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Head office
Centre for Environment, Fisheries & Aquaculture Science
Pakefield Road, Lowestoft,
Suffolk NR33 0HT UK

Tel +44 (0) 1502 56 2244
Fax +44 (0) 1502 51 3865

Web www.cefas.defra.gov.uk

Centre for Environment, Fisheries & Aquaculture Science
Barrack Road, The Nothe
Weymouth, DT4 8UB

Tel +44 (0) 1305 206600
Fax +44 (0) 1305 206601

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