

<b>WASTE STREAM</b>	<b>9D46</b>	<b>Contaminated Gravel and particulate</b>
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**SITE** Hinkley Point A  
**SITE OWNER** Nuclear Decommissioning Authority

**WASTE CUSTODIAN** Magnox Limited

**WASTE TYPE** ILW

Is the waste subject to Scottish Policy: No

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	10.0 m <sup>3</sup>
Total future arisings:		0 m <sup>3</sup>
Total waste volume:		10.0 m <sup>3</sup>

Comment on volumes: Gravel (stone chippings) was placed on the floor of the waste vault before any waste was discharged to the facilities. No more gravel will be added to the cell. Gravel will be removed from the vaults when the wastes accumulated in the vaults are retrieved.

Uncertainty factors on volumes: Stock (upper): x 1.2 Arisings (upper) x  
 Stock (lower): x 0.5 Arisings (lower) x

**WASTE SOURCE** Contaminated gravel (stone chippings) on the floor of the vault. The gravel was applied before any waste was discharged to the facility.

**PHYSICAL CHARACTERISTICS**

General description: Contaminated gravel. There are no large items.  
 Physical components (%vol): 99% contaminated gravel, 1% Sludge. TR Magnox (FED and Sludge), springs & possible fuel  
 Sealed sources: The waste does not contain sealed sources.  
 Bulk density (t/m<sup>3</sup>): ~1.5  
 Comment on density: The gravel is assumed to be either limestone or silica based.

**CHEMICAL COMPOSITION**

General description and components (%wt): The chemical composition of the chippings is not known. It is likely that either silica or limestone based material has been used.  
 Chemical state: Neutral  
 Chemical form of radionuclides: H-3: Tritium will be present as surface contamination possibly in the form of water or as other organic compounds or organic compounds.  
 C-14: Carbon 14 will be present as surface contamination.  
 Cl-36: The chemical form of chlorine 36 has not been assessed.  
 Se-79: The selenium content is insignificant.  
 Tc-99: The chemical form of technetium has not been determined.  
 Ra: Radium isotope content is insignificant.  
 Th: The thorium isotope content is insignificant.  
 U: The chemical form of uranium isotopes has not been assessed but may be in the form of uranium oxides as surface contamination.  
 Np: The neptunium content is insignificant.  
 Pu: The chemical form of plutonium isotopes has not been assessed but may be in the form of plutonium oxides as surface contamination.  
 Metals and alloys (%wt): No bulk metal items present.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	0		
Iron.....			
Aluminium.....	0		
Beryllium.....	NE	Only trace metallic content would be expected to be associated with the	

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original gravel, but there may be contamination from the wastes resting on the gravel.

Cobalt.....	
Copper.....	0
Lead.....	0
Magnox/Magnesium.....	TR
Nickel.....	TR
Titanium.....	
Uranium.....	TR
Zinc.....	0
Zircaloy/Zirconium.....	NE
Other metals.....	0

Only trace metallic content would be expected to be associated with the original gravel, but there may be contamination from the wastes resting on the gravel.

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Organics (%wt):                      Organics may be present in trace quantities. No halogenated plastics or rubbers are present.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	0		
Paper, cotton.....	0		
Wood.....	0		
Halogenated plastics .....	0		
Total non-halogenated plastics.....	0		
Condensation polymers.....	0		
Others.....	0		
Organic ion exchange materials....	0		
Total rubber.....	0		
Halogenated rubber .....	0		
Non-halogenated rubber.....	0		
Hydrocarbons.....			
Oil or grease .....			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	TR		

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Other materials (%wt):                      Probably traces of graphite.

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	1.0		
Soil.....	0		
Brick/Stone/Rubble.....	99.0	gravel - likely to be silica or limestone based material	
Cementitious material.....	0		
Sand.....			
Glass/Ceramics.....	0		
Graphite.....	TR		
Desiccants/Catalysts.....			
Asbestos.....	0		
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....	TR		
Free non-aqueous liquids.....	0		
Powder/Ash.....	TR		

Inorganic anions (%wt):                      Not fully assessed, carbonates and silicates may be present.

	(%wt)	Type(s) and comment
Fluoride.....	NE	
Chloride.....	NE	
Iodide.....	NE	
Cyanide.....	0	
Carbonate.....	NE	
Nitrate.....	NE	
Nitrite.....	NE	
Phosphate.....	NE	
Sulphate.....	NE	
Sulphide.....	NE	

Materials of interest for waste acceptance criteria:                      There may be some Magnox mixed with the gravel. This could ignite under appropriate conditions.

	(%wt)	Type(s) and comment
Combustible metals.....	NE	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	0	
Biological etc. materials.....	0	
Biodegradable materials.....	0	

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Putrescible wastes.....	0
Non-putrescible wastes.....	
Corrosive materials.....	0
Pyrophoric materials.....	0
Generating toxic gases.....	0
Reacting with water.....	NE
Higher activity particles.....	
Soluble solids as bulk chemical compounds.....	

Hazardous substances / non hazardous pollutants: none expected

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		
Chlorinated solvents.....		
Formaldehyde.....		
Organometallics.....		
Phenol.....		
Styrene.....		
Tri-butyl phosphate.....		
Other organophosphates.....		
Vinyl chloride.....		
Arsenic.....		
Barium.....		
Boron.....	0	
Boron (in Boral).....		
Boron (non-Boral).....		
Cadmium.....		
Caesium.....		
Selenium.....		
Chromium.....		
Molybdenum.....		
Thallium.....		
Tin.....		
Vanadium.....		
Mercury compounds.....		
Others.....		
Electronic Electrical Equipment (EEE)		
EEE Type 1.....		
EEE Type 2.....		
EEE Type 3.....		
EEE Type 4.....		
EEE Type 5.....		

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Complexing agents (%wt): Yes

(%wt) Type(s) and comment

EDTA.....  
 DPTA.....  
 NTA.....  
 Polycarboxylic acids.....  
 Other organic complexants.....  
 Total complexing agents..... TR

Potential for the waste to contain discrete items: No. In & of itself not a DI; assumed not likely to contain any "rogue" items that could be.

**PACKAGING AND CONDITIONING**

Conditioning method: Cement encapsulation into 3m3 box using PCF external mixer  
 Plant Name: -  
 Location: Hinkley Point A Site  
 Plant startup date: 2028  
 Total capacity (m³/y incoming waste): -  
 Target start date for packaging this stream: 2032  
 Throughput for this stream (m³/y incoming waste): -  
 Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m³)	Payload (m³)	Number of packages
	3m³ box (round corners)	100.0	1.43	2.9	7

Likely container type comment: -  
 Range in container waste volume: -  
 Other information on containers: -  
 Likely conditioning matrix:  
 Other information: -  
 Conditioned density (t/m³): -  
 Conditioned density comment: -  
 Other information on conditioning: -  
 Opportunities for alternative disposal routing: -

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

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**RADIOACTIVITY**

Source:	Contamination may have been transferred to the chippings via direct contact with waste materials and this may have been enhanced by moisture from the waste. The ability of the chippings to absorb soluble active materials depends on the chemical composition of the chippings themselves. It may not be feasible to totally separate this stream from the FED and Nimonic streams in the vault.
Uncertainty:	The waste may fall into the ILW or LLW category. This depends on the success of any separation and washing.
Definition of total alpha and total beta/gamma:	Where totals are shown on the table of radionuclide activities they are the sums of the listed alpha or beta/gamma emitting radionuclides plus 'other alpha' or 'other beta/gamma'.
Measurement of radioactivities:	Estimation of possible contamination from fuel element debris.
Other information:	-

## WASTE STREAM

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	<1.42E-03	C 3			Gd 153			8	
Be 10	1E-08	CC 2			Ho 163			8	
C 14	5.00E-05	CC 2			Ho 166m			8	
Na 22		8			Tm 170			8	
Al 26	<4E-08	C 3			Tm 171			8	
Cl 36	2E-05	CC 2			Lu 174			8	
Ar 39		8			Lu 176			8	
Ar 42		8			Hf 178n			8	
K 40		8			Hf 182			8	
Ca 41	<2E-06	C 3			Pt 193			8	
Mn 53		8			Tl 204			8	
Mn 54		8			Pb 205			8	
Fe 55	<1.70E-06	C 3			Pb 210			8	
Co 60	<3.49E-03	C 3			Bi 208			8	
Ni 59	6E-04	CC 2			Bi 210m			8	
Ni 63	5.48E-02	CC 2			Po 210			8	
Zn 65		8			Ra 223			8	
Se 79		8			Ra 225			8	
Kr 81		8			Ra 226			8	
Kr 85		8			Ra 228			8	
Rb 87		8			Ac 227			8	
Sr 90	2.91E-06	CC 2			Th 227			8	
Zr 93	7E-06	CC 2			Th 228			8	
Nb 91		8			Th 229			8	
Nb 92		8			Th 230			8	
Nb 93m	6.27E-06	CC 2			Th 232			8	
Nb 94		8			Th 234	3E-09		8	
Mo 93	6.99E-06	CC 2			Pa 231			8	
Tc 97		8			Pa 233			8	
Tc 99	1E-06	CC 2			U 232			8	
Ru 106		8			U 233			8	
Pd 107		8			U 234	3.08E-09	CC 2		
Ag 108m	2.94E-07	CC 2			U 235			8	
Ag 110m		8			U 236			8	
Cd 109		8			U 238	3E-09	CC 2		
Cd 113m	<1.03E-05	C 3			Np 237			8	
Sn 119m		8			Pu 236			8	
Sn 121m	<4.21E-05	C 3			Pu 238	1.80E-06	CC 2		
Sn 123		8			Pu 239	1.00E-06	CC 2		
Sn 126		8			Pu 240	2.00E-06	CC 2		
Sb 125	3.15E-08	CC 2			Pu 241	3.16E-05	CC 2		
Sb 126		8			Pu 242			8	
Te 125m	7.88E-09	CC 2			Am 241	4.84E-06	CC 2		
Te 127m		8			Am 242m	8.43E-09	CC 2		
I 129		8			Am 243	3.00E-09	CC 2		
Cs 134		8			Cm 242	6.95E-09	CC 2		
Cs 135		8			Cm 243	2.21E-09	CC 2		
Cs 137	4.43E-06	CC 2			Cm 244	2.41E-08	CC 2		
Ba 133	<2.50E-06	C 3			Cm 245			8	
La 137	<4E-07	C 3			Cm 246			8	
La 138		8			Cm 248			8	
Ce 144		8			Cf 249			8	
Pm 145	1.79E-06	CC 2			Cf 250			8	
Pm 147	<1.19E-06	C 3			Cf 251			8	
Sm 147		8			Cf 252			8	
Sm 151	8.12E-06	CC 2			Other a				
Eu 152	1.51E-04	CC 2			Other b/g				
Eu 154	6.90E-04	CC 2			<b>Total a</b>	<b>9.68E-06</b>	<b>CC 2</b>	<b>0</b>	
Eu 155	4.54E-06	CC 2			<b>Total b/g</b>	<b>6.13E-02</b>	<b>CC 2</b>	<b>0</b>	

**Bands (Upper and Lower)**

- A a factor of 1.5
- B a factor of 3
- C a factor of 10
- D a factor of 100
- E a factor of 1000

Note: Bands quantify uncertainty in mean radioactivity.

**Code**

- 1 Measured activity
- 2 Derived activity (best estimate)
- 3 Derived activity (upper limit)
- 4 Not present
- 5 Present but not significant
- 6 Likely to be present but not assessed
- 7 Present in significant quantities but not determined
- 8 Not expected to be present in significant quantity