

WASTE STREAM	3M10	Oily Sludge
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SITE Heysham 2

SITE OWNER EDFE NGL

WASTE CUSTODIAN EDFE NGL

WASTE TYPE LLW; SPD1

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	2.4 m ³
Future arisings -	1.4.2019 - 31.3.2030.....	2.2 m ³
	1.4.2030 - 31.3.2032.....	0.8 m ³
Total future arisings:		3.0 m ³
Total waste volume:		5.4 m ³

Comment on volumes: Rates of arising are dependent upon station operations. Station operation is expected to end in 2030 and defuelling to last 2 years.

Uncertainty factors on volumes: Stock (upper): x 1.25 Arisings (upper) x 1.5
 Stock (lower): x 0.75 Arisings (lower) x 0.5

WASTE SOURCE Waste is in the form of sludges arising from plant operations.

PHYSICAL CHARACTERISTICS

General description: Oily sludge. There are no large items that may require special handling.

Physical components (%vol): Oily sludge (% vol not assessed). No other materials identified.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Oily sludge which is essentially inorganic debris bound with oil.

Chemical state: Acid

Chemical form of radionuclides: H-3: Tritiated water
 C-14: Contamination by activated graphite and metallic particulate
 Cl-36: Not determined
 Se-79: Not expected to be significant
 Tc-99: Not expected to be significant
 I-129: Not expected to be significant
 Ra: Not determined
 Th: Not determined
 U: Not determined
 Np: Not determined
 Pu: Not determined

Metals and alloys (%wt): -

Stainless steel.....	NE
Other ferrous metals.....	NE
Iron.....	NE
Aluminium.....	NE
Beryllium.....	NE
Cobalt.....	NE
Copper.....	NE
Lead.....	NE
Magnox/Magnesium.....	NE
Nickel.....	NE

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	Titanium.....	NE
	Uranium.....	NE
	Zinc.....	NE
	Zircaloy/Zirconium.....	NE
	Other metals.....	NE
Organics (%wt):	To be further assessed following operational experience. Oil and grease will be present.	
	Total cellulosics.....	NE
	Paper, cotton.....	
	Wood.....	
	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.....	NE
	Oil or grease	NE
	Fuel.....	
	Asphalt/Tarmac (cont.coal tar)...	
	Asphalt/Tarmac (no coal tar)....	
	Bitumen.....	
	Others.....	
	Other organics.....	NE
Other materials (%wt):	-	
	Inorganic ion exchange materials.	0
	Inorganic sludges and flocs.....	~100.0
	Soil.....	0
	Brick/Stone/Rubble.....	0
	Cementitious material.....	0
	Sand.....	NE
	Glass/Ceramics.....	
	Graphite.....	0
	Desiccants/Catalysts.....	0
	Asbestos.....	NE
	Non/low friable.....	
	Moderately friable.....	
	Highly friable.....	
	Free aqueous liquids.....	P
	Free non-aqueous liquids.....	P
	Powder/Ash.....	0
Inorganic anions (%wt):	-	

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Fluoride.....	TR
Chloride.....	~0.40
Iodide.....	TR
Cyanide.....	0
Carbonate.....	<0.40
Nitrate.....	TR
Nitrite.....	NE
Phosphate.....	TR
Sulphate.....	~2.8
Sulphide.....	TR

Materials of interest for waste acceptance criteria:

The waste is not expected to present a fire hazard or non-radiological hazard, but this remains to be confirmed in the light of operating experience. Free oil associated with the waste will be removed from the waste tank and transferred to a liquid waste processing system.

Combustible metals.....	0	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	0	
Biological etc. materials.....	NE	
Biodegradable materials.....	0	
Putrescible wastes.....	0	
Non-putrescible wastes.....	0	
Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....	0	
Reacting with water.....	0	
Active particles.....	0	Not expected
Soluble solids as bulk chemical compounds.....	0	

Hazardous substances / non hazardous pollutants:

-	
Acrylamide.....	NE
Benzene.....	NE
Chlorinated solvents.....	NE
Formaldehyde.....	NE
Organometallics.....	NE
Phenol.....	NE
Styrene.....	NE
Tri-butyl phosphate.....	NE
Other organophosphates.....	NE
Vinyl chloride.....	NE
Arsenic.....	NE
Barium.....	NE

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Boron.....	NE
Cadmium.....	NE
Caesium.....	NE
Selenium.....	NE
Chromium.....	NE
Molybdenum.....	NE
Thallium.....	NE
Tin.....	NE
Vanadium.....	NE
Mercury compounds.....	NE
Others.....	NE
Electronic Electrical Equipment (EEE)	
EEE Type 1.....	0
EEE Type 2.....	0
EEE Type 3.....	0
EEE Type 4.....	0
EEE Type 5.....	0
Complexing agents (%wt):	Not yet determined
EDTA.....	NE
DPTA.....	NE
NTA.....	NE
Polycarboxylic acids.....	NE
Other organic complexants.....	NE
Total complexing agents.....	NE

Expect only trace quantities, if any.

TREATMENT, PACKAGING AND DISPOSAL

Planned on-site / off-site treatment(s):

Treatment	On-site / Off site	Stream volume %
Low force compaction Supercompaction (HFC) Incineration Solidification Decontamination Metal treatment Size reduction Decay storage Recycling / reuse Other / various None	Off-site	100.0

Comment on planned treatments:

Further treatments not yet determined but assumed to be encapsulation. The waste will be incinerated if possible or high force compaction may be used to condition the waste depending on the oil content and other factors which may affect these methods of treatment.

WASTE STREAM**3M10****Oily Sludge****Disposal Routes:**

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known	100.0

Upcoming (2019/20-2021/22) Waste Routing (if expected to change from above):

Disposal Route	Stream volume %		
	2019/20	2020/21	2021/22
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known			

Waste Packaging for Disposal:

Container	Stream volume %	Waste loading m ³	Number of packages
1/3 Height IP-1 ISO 2/3 Height IP-2 ISO 1/2 Height WAMAC IP-2 ISO 1/2 Height IP-2 Disposal/Re-usable ISO 2m box (no shielding) 4m box (no shielding) Other	100.0	~10.36	< 1

Other information: -

Waste Planned for Disposal at the LLW Repository:

Container voidage: -

Waste Characterisation Form (WCH): It is not yet determined if the waste meets LLWR's Waste Acceptance Criteria (WAC).

Requires treatment / conditioning to make suitable for disposal at LLWR.

Waste consigned for disposal to LLWR in year of generation: -

Potential for the waste to contain discrete items: No

Non-Containerised Waste for In-Vault Grouting: (Not applicable to this waste stream)

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume:

Inaccessible voidage: -

Other information: -

WASTE STREAM**3M10****Oily Sludge****RADIOACTIVITY**

Source:	Contaminated sludge. Contamination by activation products will be the main source of activity.
Uncertainty:	Specific activity is a function of station operating history. Present analysis based predominantly on collected samples.
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:	Predominantly radiochemical analysis of samples.
Other information:	-

WASTE STREAM 3M10 Oily Sludge

Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3	2.65E-04	CC 2	5.35E-04	DD 2	Gd 153				
Be 10					Ho 163				
C 14	8.1E-07	CC 2	8.1E-07	DD 2	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36	<2.2E-08	C 3	<2.2E-08	D 3	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40	9.8E-07	CC 2	9.8E-07	DD 2	Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54	1.89E-07	CC 2	3.16E-06	DD 2	Pb 205				
Fe 55	1.57E-04	CC 2	1.29E-03	DD 2	Pb 210	<3.5E-07	C 3	<5.32E-07	D 3
Co 60	1.64E-05	CC 2	6.17E-05	DD 2	Bi 208				
Ni 59					Bi 210m				
Ni 63	1.04E-04	CC 2	1.04E-04	DD 2	Po 210				
Zn 65	<1.7E-07	C 3	<3.32E-06	D 3	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226	<6.4E-07	C 3	<6.4E-07	D 3
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	4.02E-05	CC 2	5.59E-05	DD 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94	<3.8E-08	C 3	<3.8E-08	D 3	Th 234	<3.1E-07	C 3	<9.3E-06	D 3
Mo 93					Pa 231				
Tc 97					Pa 233	<1.4E-07	C 3	<4.2E-06	D 3
Tc 99					U 232	<3.4E-08	C 3	<9.94E-07	D 3
Ru 106	<8.1E-07	C 3	<1.20E-05	D 3	U 233	<9.6E-08	C 3	<9.6E-08	D 3
Pd 107					U 234	<7.1E-08	C 3	<7.1E-08	D 3
Ag 108m					U 235	9.9E-10	CC 2	9.9E-10	DD 2
Ag 110m	<8.9E-08	C 3	<1.69E-06	D 3	U 236	6E-10	CC 2	6E-10	DD 2
Cd 109					U 238	2.4E-08	CC 2	2.4E-08	DD 2
Cd 113m					Np 237	<3.8E-07	C 3	<3.8E-07	D 3
Sn 119m					Pu 236				
Sn 121m					Pu 238	2.5E-05	CC 2	2.8E-05	DD 2
Sn 123					Pu 239		6		6
Sn 126					Pu 240	<4.69E-05	C 3	<4.69E-05	D 3
Sb 125	<3.4E-07	C 3	<2.24E-06	D 3	Pu 241	1.93E-03	CC 2	3.57E-03	DD 2
Sb 126					Pu 242	<4E-07	C 3	<4E-07	D 3
Te 125m					Am 241	7.33E-05	CC 2	7.33E-05	DD 2
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	1.79E-07	CC 2	1.53E-06	DD 2	Cm 242	2.7E-07	CC 2	6.36E-06	DD 2
Cs 135					Cm 243	4.29E-06	CC 2	5.92E-06	DD 2
Cs 137	1.98E-05	CC 2	2.71E-05	DD 2	Cm 244	4.29E-06	CC 2	7.08E-06	DD 2
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	<2.4E-07	C 3	<4.24E-06	D 3	Cf 249				
Pm 145					Cf 250				
Pm 147	8.1E-05	CC 2	5.69E-04	DD 2	Cf 251				
Sm 147					Cf 252				
Sm 151	1.2E-05	CC 2	1.33E-05	DD 2	Other a		8		8
Eu 152	<1.4E-07	C 3	<2.67E-07	D 3	Other b/g	5.77E-07	CC 2	5.77E-07	DD 2
Eu 154	6.05E-06	CC 2	1.54E-05	DD 2	Total a	1.56E-04	CC 2	1.70E-04	DD 2
Eu 155	3.54E-06	CC 2	1.45E-05	DD 2	Total b/g	2.64E-03	CC 2	6.30E-03	DD 2

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