WASTE STREAM 9G71 Diversion Culvert Silt

SITE Trawsfynydd

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE LLW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	35.0 m³
Future arisings -	1.4.2022 - 31.3.2028.....	74.6 m³
Total future arisings:		74.6 m³
Total waste volume:		109.6 m³

Comment on volumes: -

Uncertainty factors on volumes:

Stock (upper):	x 1.2	Arisings (upper)	x 1.2
Stock (lower):	x 0.8	Arisings (lower)	x 0.8

WASTE SOURCE Non-oily sludge and silt accumulations in the Diversion Culvert and Diversion Culvert Oil Interceptor (DCOI) along with associated waste such as piping, valve sections, scaffolding, softwaste, rubber and control instrumentation. The sludge manifests from the collection of site-wide surface water drainage from non-active areas. Some asbestos contaminated materials may be present e.g. gratings, cements, insulation covers.

PHYSICAL CHARACTERISTICS

General description: The sludge/silt material ranges from powdery silt submerged in the water to the semi-dry loamy consistency. From chemical analysis it has been confirmed that the petroleum hydrocarbon content in the material ranges from 420-300mg/kg with total organic carbon of 80-860mg/kg based on a range of samples taken from various location within the DCOI prior to cleaning.

Physical components (%wt): Wet silty/loamy material

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 2.17

Comment on density: WCH mass divided by volume

CHEMICAL COMPOSITION

General description and components (%wt): Metal 5%, Soil 76%, Biodegradable- non putrescibles 1%, Plastics (halogenated) <1% Plastics (non-halogenated) <1%, Rubber 1%, Other organic (including oily contaminated sludges and silts) 14% others (some asbestos contamination) <1%

Chemical state: -

Chemical form of radionuclides:
H-3: The chemical form of tritium has not been determined.
C-14: The chemical form of carbon has not been determined.
Se-79: The selenium content is insignificant.
Tc-99: The technetium content is insignificant.
Ra: The radium content is insignificant.
Th: The thorium content is insignificant.
U: The uranium content is insignificant.
Np: The neptunium content is insignificant.
Pu: The plutonium content is insignificant.

Metals and alloys (%wt): -

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....			
Other ferrous metals.....	4.6	7920 kg mild steel scaffolding, pipework and valve sections	
Iron.....			
Aluminium.....			

WASTE STREAM 9G71 Diversion Culvert Silt

Beryllium.....			
Cobalt.....			
Copper.....			
Lead.....			
Magnox/Magnesium.....			
Nickel.....			
Titanium.....			
Uranium.....			
Zinc.....			
Zircaloy/Zirconium.....			
Other metals.....			

Organics (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	0		
Paper, cotton.....			
Wood.....			
Halogenated plastics	0.25	Pipework, plastic sheeting & valves	
Total non-halogenated plastics.....	0.25	PPE, sample bottles visqueen	
Condensation polymers.....	0.13		
Others.....	0.13		
Organic ion exchange materials....			
Total rubber.....	1.0		
Halogenated rubber	~0.50		
Non-halogenated rubber.....	~0.50		
Hydrocarbons.....	0.02		
Oil or grease	0.02	White mineral oil	
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar).....			
Bitumen.....			
Others.....			
Other organics.....	10.1	Oily silt and sludge	

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..			
Inorganic sludges and flocs.....	3.9	Sludge/silt and soil	
Soil.....	76.0	silty loamy material and legacy road gully sludge.	
Brick/Stone/Rubble.....			
Cementitious material.....			
Sand.....			

WASTE STREAM 9G71 Diversion Culvert Silt

Glass/Ceramics.....		
Graphite.....		
Desiccants/Catalysts.....		
Asbestos.....	<<0.05	
Non/low friable.....	<<0.05	Asbestos contaminated material, gratings, cements, insulation covers. Equal portions of white, brown and blue asbestos asssumed.
Moderately friable.....	0	
Highly friable.....	0	
Free aqueous liquids.....		
Free non-aqueous liquids.....		
Powder/Ash.....		

Inorganic anions (%wt): -

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

Materials of interest for waste acceptance criteria: -

	(%wt)	Type(s) and comment
Combustible metals.....		
Low flash point liquids.....		
Explosive materials.....		
Phosphorus.....		
Hydrides.....		
Biological etc. materials.....		
Biodegradable materials.....	1.0	
Putrescible wastes.....		
Non-putrescible wastes.....	1.0	
Corrosive materials.....		
Pyrophoric materials.....		
Generating toxic gases.....		
Reacting with water.....		
Higher activity particles.....		

WASTE STREAM 9G71 Diversion Culvert Silt

Soluble solids as bulk chemical compounds.....

Hazardous substances / non hazardous pollutants: -

	(%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.....	0.55	19 off Stripped down circuit boards (950kg)
EEE Type 2.....		
EEE Type 3.....		
EEE Type 4.....		
EEE Type 5.....		

Complexing agents (%wt): Yes

	(%wt)	Type(s) and comment
EDTA.....		
DPTA.....		
NTA.....		
Polycarboxylic acids…….		
Other organic complexants.....	0.06	Decon-90

WASTE STREAM 9G71 Diversion Culvert Silt

Total complexing agents..... 0.06

Potential for the waste to contain discrete items: Yes. Large Metal Items (LMIs)/"substantial" thickness items considered "durable" assumed DIs; Stainless items assumed DIs.Sludge/soil - In & of itself not a DI; assumed not likely to contain any "rogue" items that could be.

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off site	Stream volume %
Low force compaction		
Supercompaction (HFC)		
Incineration	Off-site	89.1
Solidification		
Decontamination		
Metal treatment		
Size reduction		
Decay storage		
Recyling / reuse		
Other / various		
None		10.9

Comment on planned treatments: 10.76% of the stream is expected to be disposed of to landfill as VLLW

Disposal Routes:

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository	0.10	2.2
Expected to be consigned to a Landfill Facility	10.8	2.2
Expected to be consigned to an On-Site Disposal Facility		
Expected to be consigned to an Incineration Facility	89.1	0.40
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		

Classification codes for waste expected to be consigned to a landfill facility: 17 05 03* or 17 05 04

Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):

Disposal Route	Stream volume %		
	2022/23	2023/24	2024/25
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			

Opportunities for alternative disposal routing: -

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

WASTE STREAM 9G71 Diversion Culvert Silt

Waste Packaging for Disposal:

Container	Stream volume %	Waste loading m³	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	0.10	10	< 1

Other information: -

Waste Planned for Disposal at the LLW Repository:

Container voidage: -

Waste Characterisation Form (WCH): The waste meets the LLWR's Waste Acceptance Criteria (WAC).
The waste has a current WCH.
Inventory information is consistent with the current WCH.

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

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: -

RADIOACTIVITY

Source: -

Uncertainty: -

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: Specific activities have been calculated from measurements. Data taken from WCH 1MXN-3TRA-0-WCH-0-4765 V3 and decayed 1 year for RWI 2022

Other information: -

WASTE STREAM 9G71 Diversion Culvert Silt

Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	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	1.73E-07	C C 2	1.73E-07	C C 2	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	1.66E-08	C C 2	1.66E-08	C C 2	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36	4.31E-08	C C 2	4.31E-08	C C 2	Lu 174		8		8
Ar 39		8		8	Lu 176		8		8
Ar 42		8		8	Hf 178n		8		8
K 40		8		8	Hf 182		8		8
Ca 41		8		8	Pt 193		8		8
Mn 53		8		8	Tl 204		8		8
Mn 54		8		8	Pb 205		8		8
Fe 55	1.61E-08	C C 2	1.61E-08	C C 2	Pb 210		8		8
Co 60	6.39E-08	C C 2	6.39E-08	C C 2	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63		8		8	Po 210		8		8
Zn 65		8		8	Ra 223		8		8
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226		8		8
Kr 85		8		8	Ra 228		8		8
Rb 87		8		8	Ac 227		8		8
Sr 90	1.81E-06	C C 2	1.81E-06	C C 2	Th 227		8		8
Zr 93		8		8	Th 228		8		8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m		8		8	Th 232		8		8
Nb 94	8.51E-08	C C 2	8.51E-08	C C 2	Th 234	3.8E-09	C C 2	3.8E-09	C C 2
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233		8		8
Tc 99		8		8	U 232		8		8
Ru 106		8		8	U 233		8		8
Pd 107		8		8	U 234	4.05E-09	C C 2	4.05E-09	C C 2
Ag 108m		8		8	U 235	1.51E-08	C C 2	1.51E-08	C C 2
Ag 110m		8		8	U 236	4.81E-09	C C 2	4.81E-09	C C 2
Cd 109		8		8	U 238	3.8E-09	C C 2	3.8E-09	C C 2
Cd 113m		8		8	Np 237		8		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	1.98E-07	C C 2	1.98E-07	C C 2
Sn 123		8		8	Pu 239	2.96E-07	C C 2	2.96E-07	C C 2
Sn 126		8		8	Pu 240	3.81E-07	C C 2	3.81E-07	C C 2
Sb 125	3.88E-08	C C 2	3.88E-08	C C 2	Pu 241	5.5E-06	C C 2	5.5E-06	C C 2
Sb 126		8		8	Pu 242		8		8
Te 125m	9.56E-09	C C 2	9.56E-09	C C 2	Am 241	1.68E-06	C C 2	1.68E-06	C C 2
Te 127m		8		8	Am 242m		8		8
I 129	1.27E-09	C C 2	1.27E-09	C C 2	Am 243		8		8
Cs 134	8.08E-09	C C 2	8.08E-09	C C 2	Cm 242		8		8
Cs 135		8		8	Cm 243		8		8
Cs 137	2.47E-05	C C 2	2.47E-05	C C 2	Cm 244	7.92E-09	C C 2	7.92E-09	C C 2
Ba 133	4.22E-08	C C 2	4.22E-08	C C 2	Cm 245		8		8
La 137		8		8	Cm 246		8		8
La 138		8		8	Cm 248		8		8
Ce 144		8		8	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147		8		8	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151		8		8	Other a				
Eu 152	5.34E-08	C C 2	5.34E-08	C C 2	Other b/g				
Eu 154	5.58E-08	C C 2	5.58E-08	C C 2	**Total a**	**2.59E-06**	**C C 2**	**2.59E-06**	**C C 2**
Eu 155	7.01E-08	C C 2	7.01E-08	C C 2	**Total b/g**	**3.27E-05**	**C C 2**	**3.27E-05**	**C C 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