WASTE STREAM 6J01 Contaminated Slag and Other Materials

SITE Sheffield

SITE OWNER Minor Waste Producers

WASTE CUSTODIAN Minor Waste Producers

WASTE TYPE LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	~647.6 m³
Future arisings -	1.4.2019 - 31.3.2020.....	NE m³
Total future arisings:		0 m³
Total waste volume:		647.6 m³

Comment on volumes: Rate of arisings can not be estimated as the waste is stainless steel slag contaminated through accidental melts of radioactive sources that pass undetected through the scrap metal supply chain. The waste comprises 1 slag pot in a steel box (total weight of 105 tonnes with a volume of 86m³) and secondary waste (36 HHISOs of primarily soft waste).

Uncertainty factors on volumes:

Stock (upper):	x 1.0	Arisings (upper)	x
Stock (lower):	x 1.0	Arisings (lower)	x

WASTE SOURCE Contamination of material resulting from incidents where radioactive sources were accidentally smelted at a Sheffield steelworks.

PHYSICAL CHARACTERISTICS

General description: A contamined slag pot, slag and other materials.

Physical components (%wt): The waste comprises 1 slag pot in a steel box (total weight of 105 tonnes with a volume of 86m³), and secondary waste (36 HHISOs of primarily soft waste).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): NE

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Mild steel slag pots, contaminated slag and other contaminated material. The steel slag comprises ~CaO+MgO (59%wt) and SiO+Al2O3 (38%wt).

Chemical state: Alkali

Chemical form of radionuclides: -

Metals and alloys (%wt): Bulk metal items will include 1 large mild steel slag pot.

Stainless steel.....	NE	The metal content of the waste has not been assessed.
Other ferrous metals.....	NE	The metal content of the waste has not been assessed.
Iron.....		
Aluminium.....	NE	
Beryllium.....		
Cobalt.....	0	
Copper.....	NE	
Lead.....	NE	
Magnox/Magnesium.....		
Nickel.....		
Titanium.....		
Uranium.....		
Zinc.....	NE	

WASTE STREAM	6J01	Contaminated Slag and Other Materials	
	Zircaloy/Zirconium.....	0	
	Other metals.....	NE	
Organics (%wt):	Not yet determined.		
	Total cellulosics.....	NE	
	Paper, cotton.....		
	Wood.....		
	Halogenated plastics	NE	
	Total non-halogenated plastics.....	NE	
	Condensation polymers.....		
	Others.....		
	Organic ion exchange materials....	0	
	Total rubber.....	NE	
	Halogenated rubber		
	Non-halogenated rubber.....		
	Hydrocarbons.....		
	Oil or grease		
	Fuel.....		
	Asphalt/Tarmac (cont.coal tar)...		
	Asphalt/Tarmac (no coal tar).....		
	Bitumen.....		
	Others.....		
	Other organics.....	NE	
Other materials (%wt):	Steel slag ~CaO+MgO = 59%, SiO+Al2O3 = 38%		
	Inorganic ion exchange materials.	0	
	Inorganic sludges and flocs.....	0	
	Soil.....	NE	
	Brick/Stone/Rubble.....	NE	
	Cementitious material.....	<2.0	Grouting for the slag pot
	Sand.....	NE	
	Glass/Ceramics.....	NE	
	Graphite.....	0	
	Desiccants/Catalysts.....		
	Asbestos.....	0	
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	NE	
	Free non-aqueous liquids.....	NE	
	Powder/Ash.....	NE	
Inorganic anions (%wt):	Not yet determined.		

Fluoride	NE
Chloride	NE
Iodide	NE
Cyanide	NE
Carbonate	NE
Nitrate	NE
Nitrite	NE
Phosphate	NE
Sulphate	NE
Sulphide	NE

Materials of interest for waste acceptance criteria: The presence of hazardous materials has not been determined.

Combustible metals	0
Low flash point liquids	
Explosive materials	0
Phosphorus	
Hydrides	
Biological etc. materials	
Biodegradable materials	
Putrescible wastes	
Non-putrescible wastes	
Corrosive materials	
Pyrophoric materials	
Generating toxic gases	
Reacting with water	0
Active particles	
Soluble solids as bulk chemical compounds	

Hazardous substances / non hazardous pollutants: -

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

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.....

Complexing agents (%wt): Not yet determined

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids……

Other organic complexants.....

Total complexing agents..... NE

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 Recyling / reuse Other / various	Off-site	87.0
None		13.0

Comment on planned treatments: -

WASTE STREAM 6J01 Contaminated Slag and Other Materials

Disposal Routes:

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository	80.0
Expected to be consigned to a Landfill Facility	20.0
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	

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 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	~67.0	15.6	28
2m box (no shielding)			
4m box (no shielding)			
Other (Steel box)	~13.0	NE	

Other information: Approximately 20% of the waste will be consigned as VLLW to landfill.

Waste Planned for Disposal at the LLW Repository:

Container voidage: Less than 10%.

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: No.

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: -

RADIOACTIVITY

WASTE STREAM 6J01 Contaminated Slag and Other Materials

Source:	The Pu-238 activity became associated with the waste as a result of an accidental melting of a radioactive source(s) at a Sheffield steelworks. The Am-241 activity is associated with accidental melting of radioactive sources that pass undetected through the scrap metal supply chain. Historical and current controls of some Pu-238 and Am-241 sources means that similar incidents are likely in the future.
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:	Pu-238 and Am-241 specific activities have been estimated based on estimates of total Pu-238 and Am-241 activity in the waste.
Other information:	-

WASTE STREAM 6J01 Contaminated Slag and Other Materials

Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3					Gd 153				
Be 10					Ho 163				
C 14					Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36					Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54					Pb 205				
Fe 55					Pb 210				
Co 60					Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90					Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m					U 235				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	~7.63E-04	C C 2		
Sn 123					Pu 239				
Sn 126					Pu 240				
Sb 125					Pu 241				
Sb 126					Pu 242				
Te 125m					Am 241	~9.90E-06	C C 2		
Te 127m					Am 242m				
I 129					Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137					Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147					Cf 251				
Sm 147					Cf 252				
Sm 151					Other a				
Eu 152					Other b/g				
Eu 154					**Total a**	**~7.73E-04**		**0**	
Eu 155					**Total b/g**	**NE**		**0**	

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