WASTE STREAM	9E50	Contaminated Gravel

SITE Oldbury

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m^3)
Stocks: At 1.4.2025	= 4.0
Future arisings:	
Total future arisings:	**0.0**
Total waste volume:	**4.0**

OR

Conditioned (m^3)	Packaged (m^3)

Number of waste packages in stock: At 1.4.2025…… - packages

Comment on arising rates: -

Additional information on quantities: Gravel will be removed from the vaults when the wastes accumulated in the vault are retrieved.

Uncertainty factors on volumes:

Stock (upper):	x 1.20	Arisings (upper):	x -
Stock (lower):	x 0.80	Arisings (lower):	x -

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

PHYSICAL CHARACTERISTICS

General description: Contaminated gravel. There are no large items.

Changes since waste generated: -

Bulk density (t/m³): ~ 1.5

Comment on density: The gravel is assumed to be either limestone or silica based. The density range has not been estimated.

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. Fission products, actinides and other activation products will be present as contaminants.

Chemical state: Neutral

Sheet metal proportion / thickness: No bulk or sheet metal items present.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel……	= 0	-	
Other ferrous metals……	= 0	-	
Iron……		-	
Aluminium……	= 0	-	
Beryllium……	NE	-	
Cobalt……		-	
Copper……	= 0	-	
Lead……	= 0	-	
Magnox/Magnesium……	NE	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.	
Nickel……		-	
Titanium……		-	
Uranium……		-	
Zinc……	= 0	-	
Zircaloy/Zirconium……	NE	-	
Other metals……	= 0	No "other" metals are expected.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics	= 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	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials	= 0	-	
Inorganic sludges and flocs	= 0	-	
Soil	= 0	-	
Brick/Stone/Rubble	= 100.0	-	
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	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

	(%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:

	(%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	-
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: -

	(%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		-

Complexing agents (%wt): Yes

	(%wt)	Type(s) and comment
EDTA		-
DPTA		-
NTA		-
Polycarboxylic acids		-
Other organic complexants		-
Total complexing agents	TR	-

Physical components:

	Number	Type(s) and comment
Sources		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1		-
EEE Type 2		-
EEE Type 3		-
EEE Type 4		-
EEE Type 5		-

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off-site	Stream volume %
Size reduction		
Decay storage		
Low force compaction		
Supercompaction (HFC)		
Incineration		
Drying/dewatering/liquid separation	On-site	100.0
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment		
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		

Comments on planned treatments: -

Conditioning method: The waste will be retrieved and packaged after retrieval of Magnox FED from the vault has been completed. The gravel will be retrieved when the rest of the vault contents are retrieved. It might be washed and any LLW material subsequently separated from ILW but in view of the small volume of this stream all of the waste is expected to be managed as ILW.

Conditioning plants:

Plant Name	Location
OLD AVDS	Oldbury

Likely conditioning matrix: -

Further information on the conditioning matrix: -

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m^3)	Payload (m^3)	Number of packages	Estimated start date for packaging
3 m^3 RS box	100.0	2.0	2.5	2	-

Range in container waste loading: No significant variability is expected.

Other information on packaging and conditioning: Appropriate plant will be provided at the Station in accordance with Company strategy. ILW will be placed in a Type VI DCIC and dried, if applicable, any LLW will be placed in a mild steel half height ISO container. The package material is expected to be stainless steel or mild steel if applicable.

Conditioned density (t/m^3): ~ 1.5
Conditioned density comment: This density is expected to vary by not more than 10% from the average.

Management Routes:

Disposal Route	Stream volume %	Raw density t/m^3	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)			
Expected to be Non-NSD HAW managed under Scottish Government's policy			
Expected to be disposed to LLW Vaults NRS Dounreay			
Expected to be consigned to the Geological Disposal Facility	100.0		
Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

Classification codes for waste expected to be consigned to a landfill facility:

Opportunities for alternative disposal routing: Yes

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
GDF	LLWR	100.0	AMBER	Based on experience at Bradwell and expectation that the FED in the vaults above the gravel could be disposed of as LLW, this waste could be disposed of at LLWR subject to demonstrating it meets the WAC.

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.

Uncertainty: The waste is assumed to be ILW. This can be confirmed only when the waste is retrieved. The waste may be rendered LLW by washing.

Measurement of radioactivities: Levels of contamination have been estimated from the activity of the Magnox debris in the vault.

Chemical form of radionuclides:

H-3: Tritium will be present in the form of tritiated water.
C-14: Carbon 14 will be present in the form of graphite dust contamination.
Cl-36: Chlorine 36 will be present in graphite dust contamination.
Se-79: The selenium content is insignificant.
Tc-99: The technetium content is insignificant.
I-129: -
Ra: The radium isotope content is insignificant.
Th: The thorium isotope content is insignificant.
U: Uranium may be present as natural uranium metal contamination.
Np: The neptunium content is insignificant.
Pu: Plutonium may be present as metal or oxide.

WASTE STREAM **9E50** **Contaminated Gravel**

Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	8.63E-05	C C 2			Gd 153		8		
Be 10	2.00E-08	C C 2			Ho 163		8		
C 14	9.99E-06	C C 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26	1.00E-07	C C 2			Tm 171		8		
Cl 36	2.00E-05	C C 2			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		8
K 40		8			Hf 182		8		
Ca 41	< 2.00E-06	C 3			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		8			Pb 205		8		
Fe 55	8.84E-08	C C 2			Pb 210		8		
Co 60	< 2.79E-03	C 3			Bi 208		8		
Ni 59	3.00E-03	C C 2			Bi 210m		8		
Ni 63	3.61E-01	C C 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	2.10E-06	C C 2			Th 227		8		
Zr 93	1.00E-06	C C 2			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	6.75E-07	C C 2			Th 232		8		
Nb 94		8			Th 234	3.00E-09	C C 2		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99		8			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	3.09E-09	C C 2		
Ag 108m	3.90E-07	C C 2			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238	3.00E-09	C C 2		
Cd 113m	< 2.82E-06	C 3			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m	< 1.65E-05	C 3			Pu 238	1.77E-06	C C 2		
Sn 123		8			Pu 239	1.00E-06	C C 2		
Sn 126		8			Pu 240	2.00E-06	C C 2		
Sb 125		8			Pu 241	1.46E-05	C C 2		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241	5.39E-06	C C 2		
Te 127m		8			Am 242m	8.36E-09	C C 2		
I 129		8			Am 243	3.00E-09	C C 2		
Cs 134		8			Cm 242	6.90E-09	C C 2		
Cs 135		8			Cm 243	1.41E-09	C C 2		
Cs 137	3.55E-06	C C 2			Cm 244	1.69E-08	C C 2		
Ba 133	< 1.49E-06	C 3			Cm 245		8		
La 137	< 5.00E-07	C 3			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144		8			Cf 249		8		
Pm 145		8			Cf 250		8		
Pm 147	< 7.59E-08	C 3			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	7.12E-09	C C 2			Unsp a				
Eu 152		8			Unsp b/g				
Eu 154	5.95E-09	C C 2			**Total a**	**1.02E-05**	*	**0**	*
Eu 155		8			**Total b/g**	**3.66E-01**	*	**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 the 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
* Total calculated from the 114 declared radionuclides