Schedule of Accreditation

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Cavendish Nuclear Limited

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Testing performed at the above address only

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
AERIAL EFFLUENT MONITORING SAMPLES	Radiochemical and Chemical Analysis	Documented In-House Methods: (Key to Analytical Methods on Page 8)
Air (water bubblers)	^{3}H	QAAM 130 : LSC
	^{14}C	QAAM 680 : LSC
Low density granular materials Including:		
Charcoal granules	^{90}Sr Gamma Emitters (Energy Range: 30-1460 keV)	QAAM 643 : CC QAAM 626 : GS
Zeolites	Gamma Emitters (Energy Range: 30-1460 keV) ^{129}I and ^{131}I only	QAAM 626 : GS
Dissolved GF filter papers	Total Beta (relative to Sr^{90}/Y^{90})	QAAM 523 : PC
Filter papers (2, 4 and 6 cm diameter filter papers and High Volume air sample papers)	Gamma Emitters (Energy Range: 100-1460 keV)	QAAM 620 : GS
High volume air sample filter (borosilicate microfibre)	Total alpha (relative to $Pu^{239+240}$) Total Beta (relative to Sr^{90}/Y^{90})	QAAM 834 : ASC QAAM 834 : PC
	Uranium (U)	QAAM 834 : ICP-MS
	Total Pu Alpha ^{241}Pu ^{241}Am Total Am + Cm	QAAM 835 : AS /LSC

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
AERIAL EFFLUENT MONITORING SAMPLES (cont'd)	Radiochemical and Chemical Analysis (cont'd)	Documented In-House Methods: (Key to Analytical Methods on Page 8)
Glass fibre filter papers	Total Alpha (relative to $Pu^{239+240}$) Total Beta (relative to Sr^{90}/Y^{90}) ^{90}Sr Total Pu Alpha ^{241}Pu Total Am + Cm Alpha	QAAM 523 : ASC QAAM 523 : PC QAAM 643 : CC/PC QAAM 418 : ASC QAAM 418 : LSC QAAM 418 : ASC
Polypropylene HVAS	Pu Isotopics: ^{238}Pu, $^{239+240}Pu$, ^{241}Am ^{241}Pu U Isotopics: ^{234}U, ^{235}U ^{238}U Cm Isotopes: ^{242}Cm, $^{243+244}Cm$ ^{90}Sr ^{137}Cs	QAAM 831 : AS QAAM 831 : LSC QAAM 831 : AS QAAM 831 : ICP-MS QAAM 831 : AS QAAM 831/643 : CC/PC QAAM 831/620 : GS
BIOASSAY AND PERSONNEL MONITORING SAMPLES		
Faeces	Total Pu Alpha ^{241}Am U Nat (assuming natural abundance with direct measurement of ^{238}U)	QAAM 399 : ASC/AS QAAM 399 : AS QAAM 674 : ICP-MS
Urine	Creatinine	QAAM 571 : SP
	^{3}H	QAAM 130 : LSC
	Total Pu Alpha	QAAM 398 : AS QAAM 854 : AS
	^{241}Am	QAAM 398 : AS QAAM 854 : AS
	^{90}Sr	QAAM 643 : PC
	Uranium (^{238}U, $^{235+236}U$, ^{234}U)	QAAM 854 : AS
	Gamma Emitters (Energy Range: 100-1460 keV)	QAAM 627 : GS
	U Nat (assuming natural abundance with direct measurement of ^{238}U)	QAAM 674 : ICP-MS
	U Isotopics: ^{234}U, ^{235}U, ^{236}U, ^{238}U	QAAM 674 : ICP-MS
Nose blows/wound samples/dressings	Total Pu Alpha ^{241}Am Total U Alpha	QAAM 399 : ASC/AS QAAM 399 : AS QAAM 399 : ICP-MS

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
ENVIRONMENTAL SAMPLES AND FOODSTUFFS	Radiochemical and Chemical Analysis	Documented In-House Methods: (Key to Analytical Methods on Page 8)
Environmental samples including: Vegetation, silt and soil Foodstuffs including: Fish and meat	^{238}U	QAAM 819 : ICP-MS
	^{234}U, ^{235}U	QAAM 819 : AS
	$^{239+240}$Pu, ^{238}Pu, ^{241}Am	QAAM 819 : AS
	^{241}Pu	QAAM 819 : LSC
Drinking water, groundwater, surface/fresh water, trade effluent (to controlled water), trade effluent (to sewer) and leachate (from landfill)	Total Alpha (relative to $^{239+240}$Pu)	QAAM 131 : ASC
	Total Beta (relative to ^{90}Sr/^{90}Y or ^{40}K)	QAAM 131 : CC/PC
	^{90}Sr	QAAM 643 : CC/PC
	^{3}H	QAAM 130 : LSC
	^{129}I	QAAM 80 : LSC
	^{14}C	QAAM 680 : LSC
	Total Pu Alpha	QAAM 426/QAAM 484 : AS
	$^{239+240}$Pu ^{238}Pu	QAAM 426 : AS
	^{241}Pu	QAAM 426: LSC
	Total Am + Cm Alpha	QAAM 426/QAAM 484 : AS
	Cm isotopes: ^{242}Cm, $^{243+244}$Cm	QAAM 426 : AS
	^{99}Tc	QAAM 674 ICP-MS
	^{237}Np	QAAM 674 : ICP-MS
	^{36}Cl	QAAM 808 : PC
	Uranium (assuming natural abundance with direct measurement of ^{238}U)	QAAM 674 : ICP-MS
	Gamma Emitters (Energy Range: 30-1460 keV) and LEPS for ^{129}I, ^{241}Am	QAAM 131 : GS QAAM 627: GS
	Fluoride Chloride Nitrite Nitrate Sulphate Phosphate	Documented In-House Method based on DIONEX AS11 column QAAM 837 : IC
	Ammonia	QAAM 843 : IC

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
ENVIRONMENTAL SAMPLES AND FOODSTUFFS (cont'd)	Radiochemical and Chemical Analysis (cont'd)	Documented In-House Methods: (Key to Analytical Methods on Page 8)
Drinking water, groundwater, surface/fresh water, trade effluent (to sewer) and trade effluent (to controlled water), leachate (from landfill) (cont'd)	Calcium (Ca) Magnesium (Mg) Potassium (K) Sodium (Na)	QAAM 843 : IC
	Trace elements: Li, Be, B, Al, P, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Sr, Mo, Ag, Cd, Sn, Sb, Ba, Hg, Pb, Gd	QAAM 674 : ICP-MS
	Total Alkalinity COD Conductivity at 25 °C pH Suspended Solids	QAAM 824 QAAM 806 : Sp QAAM 827 QAAM 826 QAAM 827
Drinking water, groundwater, surface/fresh water and trade effluent (to controlled water)	^{241}Am	QAAM 426 : AS
Drinking water	Colour Turbidity	QAAM 827 : HACH 8025 QAAM 827 : HACH 8237
	Total Hardness	QAAM 827
Groundwater, surface/fresh water and leachate (from landfill)	Dissolved Oxygen	QAAM 845 : DOE
Groundwater, leachate (from landfill)	Ca, Mg, K and Na	QAAM 847 : ICP-OES
Groundwater, leachate (from landfill), drinking water (non-regulatory)	Sulphate measured as Sulphur	QAAM 847 : ICP-OES
Groundwater, surface/fresh water	U Isotopics: ^{234}U, ^{235}U, ^{236}U, ^{238}U	QAAM 674 : ICP-MS
Trade effluent (to sewer and to controlled water)	Gross Alpha	QAAM 131: GFPC
Saline/seawater	% Seawater Conductivity at 25 °C pH	QAAM 76 : Titration QAAM 827 QAAM 826

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
ENVIRONMENTAL SAMPLES AND FOODSTUFFS (cont'd)	Radiochemical and Chemical Analysis (cont'd)	Documented In-House Methods: (Key to Analytical Methods on Page 8)
Saline/seawater (cont'd)	Fluoride	Documented In-House Method based on DIONEX AS11 column
	Chloride	QAAM 837 : IC
	Nitrite	
	Nitrate	
	Sulphate	
	Phosphate	
	Total Alpha: relative to $^{239+240}$Pu	QAAM 131 : ASC
	Total Beta (relative to ^{40}K)	QAAM 131 : CC/PC
	^{14}C	QAAM 680 : LSC
	^{90}Sr	QAAM 822 : PC
	^{238}Pu, $^{239+240}$Pu, ^{241}Pu and ^{241}Am	QAAM 844 : AS
	Uranium (assuming natural abundance with direct measurement of ^{238}U)	QAAM 674 : ICP-MS
	Gamma Emitters (Energy Range: 30-1460 keV) and LEPS for ^{129}I, ^{241}Am	QAAM 131 : GS QAAM 627 : GS
	Boron	QAAM 674 : ICP-MS
	^{99}Tc	QAAM 674 : ICP-MS
Milk	Gamma Emitters (Energy Range: 30-1460 keV)	QAAM 627 : GS
	Carbon (Bq kg^{-1}) by ^{14}C	QAAM 828 : LSC
	^{3}H	QAAM 130 : LSC
	^{129}I	QAAM 80 : LSC
	^{35}S	QAAM 68 : LSC
	^{90}Sr	QAAM 822 : PC
	Total ^{14}C	QAAM 839 : Pyr/LSC
Milk, soil, potato	Total ^{3}H (organically bound tritium)	QAAM 838 : Pyr/LSC
Potato	Total ^{14}C	QAAM 839 : Pyr/LSC
Meat	Pu Alpha: ^{238}Pu, $^{239+240}$Pu	QAAM 460 : AS
	^{241}Am	QAAM 460 : AS

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
ENVIRONMENTAL SAMPLES AND FOODSTUFFS (cont'd)	Radiochemical and Chemical Analysis (cont'd)	Documented In-House Methods: (Key to Analytical Methods on Page 8)
Fish, shellfish	^{90}Sr ^{99}Tc ^{237}Np Uranium (assuming natural abundance with direct measurement of ^{238}U)	QAAM 643 : PC QAAM 679 : PC QAAM 803 : ICP-MS QAAM 821 : ICP-MS
Fish	Carbon (Bq kg^{-1}) by ^{14}C Total Pu Alpha ^{241}Am Total ^{3}H (organically bound tritium) Total ^{14}C	QAAM 828 : LSC QAAM 460 : ASC QAAM 460 : AS QAAM 838 : Pyr/LSC QAAM 839 : Pyr/LSC
Shellfish	Total Pu Alpha, ^{238}Pu, $^{239+240}$Pu ^{241}Pu ^{241}Am Cm isotopes: ^{242}Cm, $^{243+244}$Cm	QAAM 417 : LSC/AS QAAM 417 : LSC QAAM 417 : GS/AS QAAM 417 : AS
Shellfish (Alpha < 50 Bq/Kg)	Total Pu Alpha ^{241}Am	QAAM 460 : ASC QAAM 460 : AS
Mollusca, crustacea, seaweed	Total ^{14}C	QAAM 839 : Pyr/LSC
Vegetation	Carbon (Bq kg^{-1}) by ^{14}C ^{3}H ^{35}S ^{90}Sr Pu Alpha: ^{238}Pu, $^{239+240}$Pu ^{241}Am Total ^{3}H (organically bound tritium) Total ^{14}C ^{99}Tc	QAAM 828 : LSC QAAM 130 : LSC QAAM 68 : LSC QAAM 643 : PC QAAM 460 : AS QAAM 460 : AS QAAM 838 : Pyr/LSC QAAM 839 : Pyr/LSC QAAM 679 : PC
Environmental samples including: vegetation, silt and soil Foodstuffs including: shellfish, fish and meat Granular materials: concrete and brick	Total Alpha: relative to $^{239+240}$Pu Total Beta: relative to ^{40}K	QAAM 482 : ASC QAAM 483 : GM

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
ENVIRONMENTAL SAMPLES AND FOODSTUFFS (cont'd)	Radiochemical and Chemical Analysis (cont'd)	Documented In-House Methods: (Key to Analytical Methods on Page 8)
Granular materials: concrete and brick	Gamma Spectrometry (Energy Range: 100-1460 keV)	QAAM 626 : GS
Environmental samples including: silt and soil	Gamma Spectrometry (Energy Range: 30-1460 keV) on samples with densities <1	QAAM 626 : GS
Environmental samples including: vegetation	^{241}Am & ^{129}I Gamma Spectrometry (Energy Range: 100-1460 keV and LEPS)	QAAM 626 : GS
Foodstuffs, including: shellfish, fish, meat	^{241}Am & ^{129}I Gamma Spectrometry (Energy Range: 100-1460 keV and LEPS)	QAAM 626 : GS
Silts, sands and sediments	^{90}Sr Total Pu Alpha ^{241}Pu ^{241}Am	QAAM 643 : CC QAAM 417 : ASC QAAM 417 : LSC QAAM 417 : GS
	Uranium (assuming natural abundance with direct measurement of ^{238}U)	QAAM 821 : ICP-MS

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
ENVIRONMENTAL SAMPLES		
Soils, silts and sediments	^{99}Tc	QAAM 846 : ICP-MS
Soil (distilled)	^{3}H	QAAM 130 : LSC
Soil	Metals: As, Ba, Be, Cd, Co, Cr, Cu, Fe, Hg, Mo, Mn, Ni, Pb, Se, Sn, Sb, V, Zn	QAAM 676/674 : ICP-MS
	Metals: As, Ba, Cr, Co, Cu, Fe, Pb, Mn, Ni, V, Zn	QAAM 847 : Microwave Dissolution/ICP-OES
	Total ^{14}C Total Pu Alpha ^{241}Pu ^{241}Am	QAAM 839 : Pyr/LSC QAAM 417 : ASC QAAM 417 : LSC QAAM 417 : GS
END		

KEY TO ANALYTICAL METHODS / ASSOCIATED INSTRUMENTAL INSTRUCTIONS:

AS	Alpha Spectrometry/ASI9E, GSI040/43/34
ASC	Alpha Scintillation Counting/ASI5E
CC	Cerenkov Counting/ASI8E
DOE	Dissolved Oxygen Electrode
GM	Geiger-Muller Counting/ASI6E
GS	Gamma or Low Energy Photon Spectrometry/GSI047
IC	Ion Chromatography/GSI061
ICP-MS	Inductively Coupled Plasma-Mass Spectrometry/ASI82E, ASI355E
ICP-OES	Inductively Coupled Plasma-Optical Emission Spectrometry/GSI064
ISE	Ion Selective Electrode
LSC	Liquid Scintillation Counting/ASI8E
PC	Gas Flow Proportional Counting/ASI49E, GSI038
Sp	Colorimetric Technique/Spectrophotometry
Pyr	Pyrolyser