

Analytical notes
Sellafield Environmental Materials

Prepared for:

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Samples received:

- 1) Sampler description: “under railway bridge @ River Calder, Sellafield site, moss growing under railway bridge in the water flowing in the Calder River”
54.410428 -3.504013
- 2) Sampler description: “Jetty@ Beach, Seascale, chips of wood scraped from piling in Irish Sea”
54.394475 -3.485333
- 3) Sampler description: “House dust, Barrow in Furnace, 18 km away, 1600’s house”
- 4) Sampler description: “Processed Construction Material, Newbiggin River ESK estuary @ RR Bridge”
54.335783 -3.404685
- 5) Sampler description: “seaweed”

Methods:

All samples collected March 12, 2015 by Arnie Gundersen of Fairewinds Energy Education Foundation. Sample descriptions provided by field sampler. Gamma screening by NaI: Gamma photon analyses used Ortec® NaI well and cylinder type detectors. Count efficiency @ 662 keV was 0.30 for the Ortec® NaI well detector with a Spectech® 2K MCA. Samples were standardized against identically-prepared soils of known activities, as well as known commercial ²²⁶Ra and ¹³⁷Cs standards. Samples and standards were normalized to 8.0 grams dry weight where sample sizes permitted. Energy (keV) assignments for the MCA were also calibrated against a ¹³⁷Cs standard. Sample 4 also examined via CdTe X-ray analysis.

Soil and dust samples were analyzed by scanning electron microscopy with energy dispersive X-ray detection (SEM/EDS) at Microvision Laboratories of N. Billerica, MA. Analyses proceeded with a LEO/Brucher® SEM/EDS system, using a lithium drifted silicon semiconductor X-ray detector. A small number of surface dust samples were analyzed via lift tape sampling.

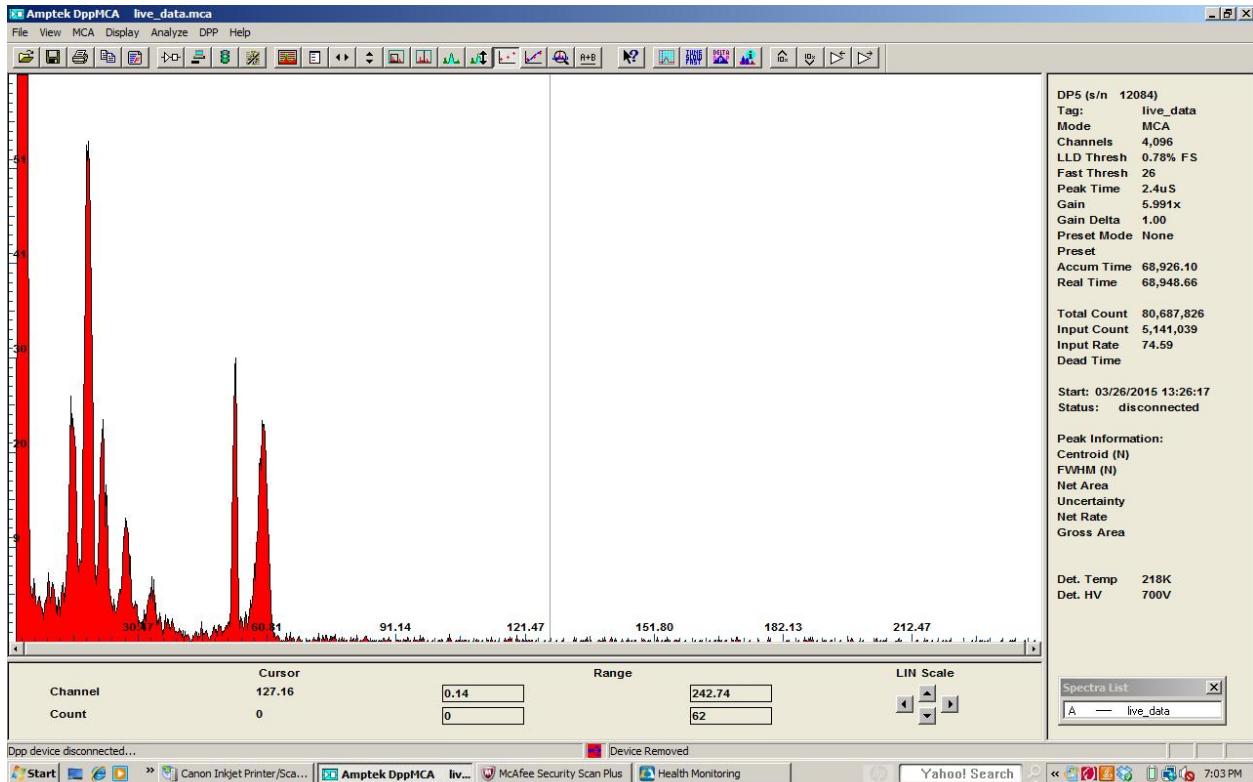
Microscopy subsamples were prepared using pre-labeled single use microscopy Bioslides® with two-sided adhesive segments or equivalent Pella® stub tapes. These were mounted on aluminum stubs and carbon coated prior to analyses.

Results:

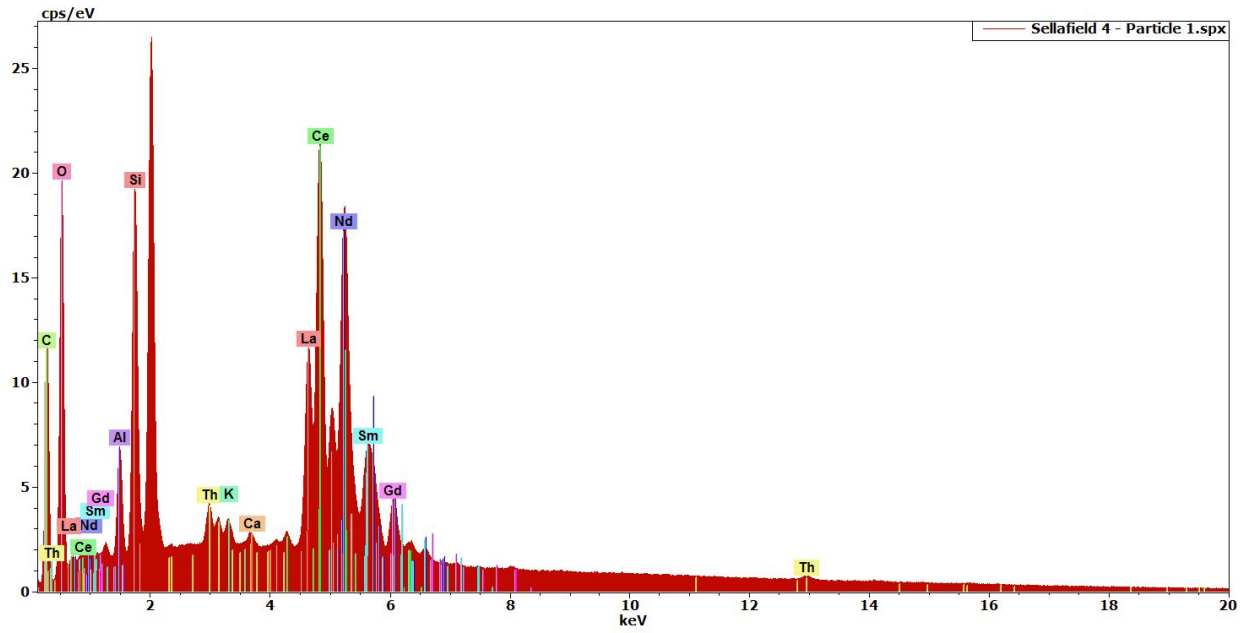
- 1) Gross gamma counts per minute: 202.3
Calculated net total activity < 5 Bq / g
Confirmed isotopes detected: ⁴⁰K
- 2) Gross gamma counts per minute: 208.2
Calculated net total activity < 5 Bq / g
Confirmed isotopes detected: ⁴⁰K
- 3) Gross gamma counts per minute: 210.3
Calculated net total activity < 5 Bq / g
Confirmed isotopes detected: ⁴⁰K
- 4) Gross gamma counts per minute: 1878.4
Calculated net total activity 395.4 Bq / g
Confirmed isotopes detected: ²⁴¹Am, ¹³⁷Cs
- 5) Gross gamma counts per minute: 225.8
Calculated net total activity < 5 Bq / g
Confirmed isotopes detected: ⁴⁰K

Figures:

Below: CdTe spectrum, sample 4 showing low energy ^{137}Cs line and $^{239}\text{Pu}/^{241}\text{Am}$ lines



Below: X-ray spectrum, sample 4, showing thorium monazite particle (typical)



Below: Sodium Iodide (NaI) spectrum, sample 4, showing ^{241}Am band (left, 59 keV) and ^{137}Cs band (center 662 keV)

