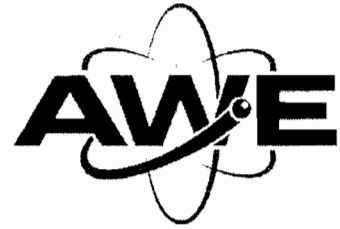


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Reply to: RICC [REDACTED]
Direct Dial: [REDACTED]
Direct Fax: [REDACTED]
E-mail: [REDACTED]
Our Ref: RSA 11- 216N
Your Ref: BZ1994/QB3535DR/PP3790SZ



Mr S Parr
Lead Nuclear Regulator
Nuclear Regulation Group (South)
Environment Agency
Red Kite House
Howbery Park
Wallingford
Oxfordshire OX10 8BD

Aldermaston • Reading
Berkshire • RG7 4PR
Tel 0118 981 4111

20 March 2013

Dear Mr Parr,

**ENVIRONMENTAL PERMITTING REGULATIONS 2010 SI No 675
Permit References BZ1994/QB3535DR and PP3790SZ,
AWE Aldermaston and Burghfield Routine Environmental Monitoring
Environment Monitoring Report October – December 2012.**

I enclose the latest results from our Environmental Monitoring programme for Air, Surface Water, Groundwater, Sediment, Drinking Water, Sewage and Milk.

Further to our meeting at the latter part of last year on environmental monitoring AWE the have ceased taking samples of the fish in the River Kennet.

There have been no results of note in this quarter and AWE's impact on the environment appears indiscernible from background levels.

Please contact me if you have any concerns or matters arising from the reports.

Yours sincerely



Head of Environment

Copies
Site Manager (A)
Site Manager (B)

Encs.
AWE/ASc/L4/PG/EM/EPR/12/Q4

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☉ Secretary of State for Defence

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ENVIRONMENTAL PERMITTING REGULATIONS 2010

**ENVIRONMENT AGENCY REQUIREMENT FOR THE
ATOMIC WEAPONS ESTABLISHMENT ALDERMASTON AND BURGHFIELD**

PERMIT REFERENCES: BZ1994 (SUPERSEDED BY QB3535DR) AND PP3790SZ

RESULTS OF ENVIRONMENTAL MONITORING FOR THE PERIOD OCTOBER TO DECEMBER 2012

SUMMARY

This report contains results from the AWE Environmental Permitting Regulations (EPR) Environmental Monitoring Programme for the period October to December 2012. The monitoring programme is specified in document, AWE Environmental Permitting Regulations Arrangements Document for Environmental Monitoring for Radioactivity within and around AWE Sites Aldermaston and Burghfield (Ref: AWE Report 98/10, AWE/ASc/GE/MAN/GEN/TR/11/216). The permit for Aldermaston (BZ1194) was superseded by a new permit (QB3535DR) which came into effect on 1st November 2012.

The results presented in this report are generally consistent with previously measured values from the defined matrices and locations. There is no evidence to suggest any measurable change in the radiological condition of the matrices sampled and therefore in the environment near to the AWE sites at Aldermaston and Burghfield.

The following are presented in this report

Media	Matrix	Present
Air	HVAS	X
Air	Tritium	X
Surface Water		X
Sediment	Annual	
Sediment	Bi-annual	X
Groundwater		X
Drinking water		X
Soil		
Vegetation		
Sewage		X
Milk		X
Fish		

Prepared by:
[Redacted]

Name (Print)
[Redacted]

Date:
19/03/13

Results
Authorised by:
[Redacted]

Authorised Person (Print)
[Redacted]

Date:
14/03/13

Issue of Report
Authorised by:
[Redacted]

Nominated Person (Print)
[Redacted]

Date:
18/3/13

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ENVIRONMENT AGENCY REQUIREMENT FOR THE
ATOMIC WEAPONS ESTABLISHMENT ALDERMASTON AND BURGHFIELD

PERMIT REFERENCES: BZ1994 (SUPERSEDED BY QB3535DR) AND PP3790SZ

RESULTS OF ENVIRONMENTAL MONITORING FOR THE PERIOD OCTOBER TO DECEMBER 2012

AIRBORNE PARTICULATE SAMPLING

1. Monitoring is primarily carried out using High Volume Air Sampling (HVAS).
2. HVAS are located in Hannington, Thatcham, Reading, Basingstoke, Tadley, Silchester, Mortimer and Aldermaston. There are seven located on-site around the perimeter fence at AWE Aldermaston, and one within AWE Burghfield.
3. HVAS filters are changed fortnightly and routinely analysed for uranium and plutonium isotopes. Results are calculated as mean activity concentrations in air during the sampling period.
4. The indicative Limits of Detection (LoD) for HVAS radiochemistry are:

	<u>HVAS</u>
Total uranium ($U^{234} + U^{235} + U^{238}$)	40 nBq.m ⁻³
Pu ²³⁸ + Pu ⁽²³⁹⁺²⁴⁰⁾	30 nBq.m ⁻³

5. Where the level of radioactivity is less than the LoD, the indicative LoD value is tabulated as a positive result with a < (less than) sign in front of it.
6. Errors in the data are presented as 2 sigma based on counting statistics only.

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Environment Agency Requirement for the Operator Monitoring Programme for Radioactivity in the Environment around AWE Aldermaston and Burghfield:
Results for the Period October to December 2012

**HIGH VOLUME AIR SAMPLER RESULTS FOR OCTOBER TO DECEMBER 2012
INTERNAL LOCATIONS TO AWE(A)**

UKAS	Location	Period	$^{238}\text{Pu} + (^{239+240})\text{Pu}$ nBq.m ⁻³ (air)	Total Uranium nBq.m ⁻³ (air)	Dust Loading on Filter µg.m ⁻³
N	R001H	20/09/12 - 04/10/12	<30	112 ± 23	7.27
N		04/10/12 - 18/10/12	<30	128 ± 33	7.00
N		18/10/12 - 01/11/12	<30	116 ± 22	5.00
N		01/11/12 - 15/11/12	<30	155 ± 26	7.53
N		15/11/12 - 29/11/12	<30	96 ± 22	5.38
N		29/11/12 - 13/12/12	<30	85 ± 19	4.28
N	R002H	20/09/12 - 04/10/12	<30	105 ± 24	8.02
N		04/10/12 - 18/10/12	<30	134 ± 36	7.51
N		18/10/12 - 01/11/12	<30	127 ± 26	6.47
N		01/11/12 - 15/11/12	<30	173 ± 30	8.36
N		15/11/12 - 29/11/12	<30	138 ± 26	7.43
N		29/11/12 - 13/12/12	<30	95 ± 23	5.99
N	R006H	20/09/12 - 04/10/12	<30	476 ± 51	10.48
N		04/10/12 - 18/10/12	<30	322 ± 50	10.54
N		18/10/12 - 01/11/12	<30	114 ± 23	5.54
N		01/11/12 - 15/11/12	<30	256 ± 37	7.62
N		15/11/12 - 29/11/12	<30	127 ± 26	6.24
N		29/11/12 - 13/12/12	<30	102 ± 22	4.99
N	R007H	20/09/12 - 04/10/12	<30	273 ± 43	11.28
N		04/10/12 - 18/10/12	<30	259 ± 48	10.75
N		18/10/12 - 01/11/12	<30	359 ± 43	12.19
N		01/11/12 - 15/11/12	36 ± 32	413 ± 56	13.96
N		15/11/12 - 29/11/12	<30	480 ± 52	13.44
N		29/11/12 - 13/12/12	<30	487 ± 54	10.79
N	R009H	20/09/12 - 04/10/12	<30	184 ± 32	9.35
N		04/10/12 - 18/10/12	<30	178 ± 41	8.59
N		18/10/12 - 01/11/12	<30	161 ± 27	6.60
N		01/11/12 - 15/11/12	<30	196 ± 29	8.93
N		15/11/12 - 29/11/12	<30	124 ± 23	7.15
N		29/11/12 - 13/12/12	<30	129 ± 25	5.28
N	R011H	20/09/12 - 04/10/12	57 ± 30	177 ± 30	9.25
N		04/10/12 - 18/10/12	<30	44 ± 18	2.68
N		18/10/12 - 01/11/12	<30	52 ± 20	2.00
N		01/11/12 - 15/11/12	<30	81 ± 20	3.23
N		15/11/12 - 29/11/12	<30	196 ± 28	7.62
N		29/11/12 - 13/12/12	<30	120 ± 24	5.11

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HIGH VOLUME AIR SAMPLER RESULTS FOR OCTOBER TO DECEMBER 2012

INTERNAL LOCATIONS - Continued

UKAS	Location	Period	²³⁸Pu + (²³⁹+²⁴⁰)Pu nBq.m⁻³ (air)	Total Uranium nBq.m⁻³ (air)	Dust Loading on Filter µg.m⁻³
N	R072H	20/09/12 - 04/10/12	<30	151 ± 29	8.21
N		04/10/12 - 18/10/12	<30	130 ± 34	7.13
N		18/10/12 - 01/11/12	<30	123 ± 24	5.56
N		01/11/12 - 15/11/12	<30	95 ± 21	6.60
N		15/11/12 - 29/11/12	<30	117 ± 23	6.96
N		29/11/12 - 13/12/12	<30	120 ± 29	5.20

Comment: Uranium detected in all samples had a ²³⁸U / ²³⁴U ratio ≈ 1, which indicated that the two isotopes were in equilibrium, implying a natural origin.

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HIGH VOLUME AIR SAMPLER RESULTS FOR OCTOBER TO DECEMBER 2012

EXTERNAL LOCATIONS

UKAS	Location	Period	$^{238}\text{Pu} + (^{239}+^{240})\text{Pu}$ nBq.m ⁻³ (air)	Total Uranium nBq.m ⁻³ (air)	Dust Loading on Filter µg.m ⁻³
N	Hannington	20/09/12 - 04/10/12	<30	71 ± 20	4.84
N		04/10/12 - 18/10/12	<30	65 ± 26	9.13
N		18/10/12 - 01/11/12	<30	128 ± 30	5.13
N		01/11/12 - 15/11/12	<30	71 ± 18	5.70
N		15/11/12 - 29/11/12	<30	101 ± 23	3.72
N		29/11/12 - 13/12/12	<30	129 ± 24	5.23
N	Thatcham	20/09/12 - 04/10/12	<30	216 ± 33	15.49
N		04/10/12 - 18/10/12	<30	229 ± 45	4.86
N		18/10/12 - 01/11/12	<30	152 ± 27	7.26
N		01/11/12 - 15/11/12	<30	246 ± 33	6.78
N		15/11/12 - 29/11/12	<30	163 ± 28	8.53
N		29/11/12 - 13/12/12	<30	152 ± 27	5.59
N	Reading	20/09/12 - 04/10/12	<30	122 ± 24	6.77
N		04/10/12 - 18/10/12	<30	146 ± 33	7.32
N		18/10/12 - 01/11/12	<30	135 ± 25	6.22
N		01/11/12 - 15/11/12	<30	142 ± 27	6.54
N		15/11/12 - 29/11/12	<30	153 ± 25	6.72
N		29/11/12 - 13/12/12	<30	157 ± 27	7.00
N	Basingstoke	20/09/12 - 04/10/12	<30	164 ± 30	5.92
N		04/10/12 - 18/10/12	<30	108 ± 31	9.28
N		18/10/12 - 01/11/12	<30	159 ± 25	8.50
N		01/11/12 - 15/11/12	<30	84 ± 20	7.71
N		15/11/12 - 29/11/12	<30	148 ± 40	7.44
N		29/11/12 - 13/12/12	<30	195 ± 60	15.42
N	Tadley	20/09/12 - 04/10/12	<30	80 ± 21	4.71
N		04/10/12 - 18/10/12	<30	79 ± 27	9.52
N		18/10/12 - 05/11/12	<30	61 ± 15	6.43
N		05/11/12 - 15/11/12	<30	124 ± 29	6.47
N		15/11/12 - 29/11/12	<30	89 ± 22	0.69
N		29/11/12 - 13/12/12	<30	83 ± 19	4.71
N	Silchester	20/09/12 - 04/10/12	<30	93 ± 64	8.28
N		04/10/12 - 18/10/12	<30	66 ± 25	4.59
N		18/10/12 - 01/11/12	<30	<40	6.32
N		01/11/12 - 15/11/12	<30	74 ± 21	6.81
N		15/11/12 - 29/11/12	<30	115 ± 24	3.80
N		29/11/12 - 13/12/12	<30	104 ± 21	4.64
N	Mortimer	20/09/12 - 04/10/12	<30	112 ± 25	5.68
N		04/10/12 - 18/10/12	<30	163 ± 35	6.87
N		18/10/12 - 01/11/12	<30	156 ± 27	9.86
N		01/11/12 - 15/11/12	<30	161 ± 27	7.87
N		15/11/12 - 29/11/12	<30	125 ± 24	13.97
N		29/11/12 - 13/12/12	<30	112 ± 24	7.98

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HIGH VOLUME AIR SAMPLER RESULTS FOR OCTOBER TO DECEMBER 2012

EXTERNAL LOCATIONS - Continued

UKAS	Location	Period	²³⁸ Pu + (²³⁹ + ²⁴⁰)Pu nBq.m ⁻³ (air)	Total Uranium nBq.m ⁻³ (air)	Dust Loading on Filter µg.m ⁻³
N	Aldermaston	20/09/12 - 04/10/12	<30	162 ± 29	7.04
N		04/10/12 - 18/10/12	<30	129 ± 32	7.64
N		18/10/12 - 01/11/12	<30	110 ± 25	16.51
N		01/11/12 - 15/11/12	<30	106 ± 66	5.86
N		15/11/12 - 29/11/12	N/R	102 ± 21	0.00
N		29/11/12 - 13/12/12	<30	174 ± 27	6.29
N	AWE Burghfield	20/09/12 - 04/10/12	<30	462 ± 56	22.77
N		04/10/12 - 18/10/12	<30	621 ± 76	24.22
N		18/10/12 - 01/11/12	<30	408 ± 44	13.80
N		01/11/12 - 15/11/12	<30	651 ± 63	19.19
N		15/11/12 - 29/11/12	48 ± 34	413 ± 46	15.16
N		29/11/12 - 13/12/12	<30	190 ± 30	8.70

Comment: Tadley HVAS filter was left for an extended period (18/10/12- 05/11/12) due to access issues to the HVAS.

N/R Denotes No Result. No result was obtained for plutonium at Aldermaston HVAS (for the collection period 15/11/12-29/11/12) as both the original result and repeat analysis had low recovery. Therefore the result was not viable.

Uranium detected in all samples had a ²³⁸U / ²³⁴U ratio ≈ 1, which indicated that the two isotopes were in equilibrium, implying a natural origin.

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**ENVIRONMENT AGENCY REQUIREMENT FOR THE
ATOMIC WEAPONS ESTABLISHMENT ALDERMASTON AND BURGHFIELD**

PERMIT REFERENCES: BZ1994 (SUPERSEDED BY QB3535DR) AND PP3790SZ

RESULTS OF ENVIRONMENTAL MONITORING FOR THE PERIOD OCTOBER TO DECEMBER 2012

TRITIUM IN AIR MONITORING

1. Sampling is by a passive tritium in air sampling system.
2. There are eight tritium in air samplers located at AWE(A). Six samplers are for the analysis of tritium as HTO and two samplers are for the analysis of tritium as HT. Four HTO samplers are located at northerly, easterly, southerly and westerly on site locations respectively and samplers are located close to major tritium facilities "H" (old facility) and "L" (new facility). The two HT samplers are located at AWE(A) close to major tritium facilities "H" and "L". There is one HTO sampler located in Tadley and one at an external control location in Newbury.
3. The tritium samplers are changed every four weeks and routinely analysed for tritium as HTO and HT as specified, results reported are expressed as mBq.m^{-3} .
4. The indicative Limit of Detection (LoD) for the determination of tritium in air using the passive method is:

Tritium (as HTO)	35 mBq.m^{-3}
Tritium (as HT)	35 mBq.m^{-3}
5. Where the level of radioactivity is less than the LoD, the indicative LoD value is tabulated as a positive result with a < (less than) sign in front of it.
6. Errors in the data are presented as ± 1 standard deviation.

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TRITIUM IN AIR SAMPLING RESULTS FOR OCTOBER TO DECEMBER 2012

Table 1 HTO Tritium Results

UKAS	Location	Period	Tritium (as HTO) mBqm⁻³
N	AWE – North	Sep- Oct (06/09/12 - 04/10/12)	60 ± 10
N		Oct- Nov (04/10/12 to 01/11/12)	<30
N		Nov (01/11/12 to 29/11/12)	40 ± 10
N		Nov-Jan (29/11/12 to 02/01/13)	35 ± 5
N	AWE – East	Sep- Oct (06/09/12 - 04/10/12)	<30
N		Oct- Nov (04/10/12 to 01/11/12)	<30
N		Nov (01/11/12 to 29/11/12)	<25
N		Nov-Jan (29/11/12 to 02/01/13)	<20
N	AWE – South	Sep- Oct (06/09/12 - 04/10/12)	<30
N		Oct- Nov (04/10/12 to 01/11/12)	<30
N		Nov (01/11/12 to 29/11/12)	<25
N		Nov-Jan (29/11/12 to 02/01/13)	<25
N	AWE – West	Sep- Oct (06/09/12 - 04/10/12)	30 ± 5
N		Oct- Nov (04/10/12 to 01/11/12)	<30
N		Nov (01/11/12 to 29/11/12)	30 ± 5
N		Nov-Jan (29/11/12 to 02/01/13)	<25
N	AWE – H (Old)	Sep- Oct (06/09/12 - 04/10/12)	40 ± 10
N		Oct- Nov (04/10/12 to 01/11/12)	<35
N		Nov (01/11/12 to 29/11/12)	<30
N		Nov-Jan (29/11/12 to 02/01/13)	<25
N	AWE – L (New)	Sep- Oct (06/09/12 - 04/10/12)	60 ± 10
N		Oct- Nov (04/10/12 to 01/11/12)	<30
N		Nov (01/11/12 to 29/11/12)	80 ± 10
N		Nov-Jan (29/11/12 to 02/01/13)	50 ± 10
N	Tadley	Sep- Oct (06/09/12 - 04/10/12)	40 ± 10
N		Oct- Nov (04/10/12 to 05/11/12)	<35
N		Nov (05/11/12 to 29/11/12)	<25
N		Nov-Jan (29/11/12 to 02/01/13)	<25
N	Control	Sep- Oct (06/09/12 - 04/10/12)	<30
N		Oct- Nov (04/10/12 to 01/11/12)	<30
N		Nov (01/11/12 to 29/11/12)	<25
N		Nov-Jan (29/11/12 to 02/01/13)	<25

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Table 2 HT Tritium Results

UKAS	Location	Period	Tritium (as HT) mBqm⁻³
N	AWE – To	Sep- Oct (06/09/12 - 04/10/12)	<35
N		Oct- Nov (04/10/12 to 01/11/12)	<35
N		Nov (01/11/12 to 29/11/12)	<90
N		Nov-Jan (29/11/12 to 02/01/13)	<65
N	AWE – Tn	Sep- Oct (06/09/12 - 04/10/12)	30 ± 20
N		Oct- Nov (04/10/12 to 01/11/12)	<85
N		Nov (01/11/12 to 29/11/12)	380 ± 40
N		Nov-Jan (29/11/12 to 02/01/13)	30 ± 15

Note: Tadley location was left on for an extended period (04/10/12-05/11/12) due to access issues to the sampler.

The tritium samplers were left out for an extended period (29/11/12-02/01/13) due to the Christmas and New Year shutdown.

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**ENVIRONMENT AGENCY REQUIREMENT FOR THE
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RESULTS OF ENVIRONMENTAL MONITORING FOR THE PERIOD OCTOBER TO DECEMBER 2012

SURFACE WATER AND DRINKING WATER

1. All major surface water outfalls at AWE(A) are sampled close to the site boundary by automatic samplers (with the exception of South Road Sewer and R019W which are collected by grab sample) which collect a composite sample over a monthly period. At AWE(B) the Burghfield Brook is sampled where it enters and leaves the site by automatic samplers (as above). Major surface water outfalls, which either enter the Burghfield Brook within the site boundary or outfall from the site perimeter are sampled monthly by grab sampling.
2. Grab samples are collected quarterly from water courses external to AWE(A) and AWE(B).
3. The AWE plc premises of Aldermaston and Burghfield each contain two deep drinking water boreholes which are sampled quarterly.
4. All water samples are routinely analysed for total alpha, total beta and tritium activity. If the total alpha activity exceeds 40 Bq.m^{-3} the sample undergoes radiochemical analysis and alpha spectrometry for plutonium and uranium isotopes.
5. The indicative Limits of Detection (LoD) for surface water analyses are as follows:

Gross alpha	20 Bq.m^{-3}
Gross beta	40 Bq.m^{-3}
Total uranium	3.0 Bq.m^{-3}
Total plutonium	2.5 Bq.m^{-3}
Tritium	6 kBq.m^{-3}
6. Where the level of radioactivity is less than the LoD, the indicative LoD value is tabulated as a positive result with a < (less than) sign in front of it.
7. Errors for the data represent 2 sigma counting statistics only.

UKAS ACCREDITATION

The results for surface water and drinking water samples, contained in the following 4 tables, were produced within the scope of UKAS accreditation.

The following accredited methods were used: Gross Alpha and Beta Activity AWE/ASc/L3/RCS/EM/AB/OP/E114, Tritium Activity AWE/ASc/L3/RCS/EM/3H/OP/E102, Uranium and Plutonium Activity AWE/ASc/L3/RCS/EM/ACT/OP/E103.

Any interpretations, opinions and comments presented are not within the scope of UKAS accreditation.

Any reported values in these tables outside the scope of the stated accredited methods are marked with the symbol N in the first column of data table, (or for individual values adjacent to the excluded value, (eg 1.234 N*))

For other general information concerning UKAS accreditation see Appendix 1.

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SURFACE WATER RESULTS FOR OCTOBER TO DECEMBER 2012
INTERNAL LOCATIONS TO AWE(A)

UKAS	Location	Period	Total Alpha Bq.m ⁻³	Total Beta Bq.m ⁻³	Tritium kBq.m ⁻³	²³⁸ Pu + (²³⁹ + ²⁴⁰)Pu Bq.m ⁻³	Total Uranium Bq.m ⁻³
	R001W	Oct	223 ± 75	639 ± 42	<6	<2.5	117 ± 5
		Nov	114 ± 38	322 ± 35	<6	<2.5	91 ± 4
		Dec	167 ± 29	159 ± 31	9 ± 3	<2.5	285 ± 9
	R002W	Oct	19 ± 11	216 ± 31	<6	<2.5	6 ± 1
		Nov	40 ± 13	206 ± 32	<6	<2.5	
		Dec	<20	124 ± 30	<6	<2.5	
	R003W	Oct	<20	120 ± 32	6 ± 3		
		Nov	25 ± 11	130 ± 30	<6		
		Dec	<20	115 ± 30	<6		
	R004W	Oct*	<20	118 ± 35	<6		<3
		Nov	49 ± 15	143 ± 35	<6	<2.5	
		Dec	32 ± 15	131 ± 36	<6	<2.5	
	R005W	Oct	<210	619 ± 42	<6	<2.5	10 ± 2
		Nov	46 ± 17	170 ± 31	<6	<2.5	9 ± 1
		Dec	58 ± 22	198 ± 33	<6	<2.5	6 ± 1
	R006W	Oct	<20	212 ± 31	14 ± 3		
		Nov	<20	173 ± 31	9 ± 2		
		Dec	34 ± 14	169 ± 33	18 ± 4		
	R008W	Oct	<20	143 ± 31	7 ± 3		
		Nov	<20	127 ± 32	<6		
		Dec	<20	126 ± 30	6 ± 3		
	R009W	Oct	29 ± 15	293 ± 38	6 ± 3		
		Nov	<20	223 ± 38	<6		
		Dec*	33 ± 18	178 ± 37	6 ± 3		
	R010W	Oct	<20	166 ± 29	7 ± 3		
		Nov	<20	130 ± 28	<6		
		Dec	36 ± 16	158 ± 30	6 ± 3		
	R019W	Oct	40 ± 14	129 ± 31	13 ± 3	<2.5	12 ± 2
		Nov	22 ± 11	67 ± 29	<6	<2.5	12 ± 2
		Dec	32 ± 16	137 ± 32	9 ± 3	<2.5	12 ± 2
	South Road Sewer	Oct	<20	814 ± 49	<6		
		Nov	35 ± 22	515 ± 43	<6		
		Dec	37 ± 22	478 ± 47	8 ± 3		

*Indicates sample obtained using automatic sampler and supplemented by grab sample to obtain required sample volume.

Comment: Uranium detected in the samples collected from R001W in October, November and December had a ²³⁸U / ²³⁴U ratio <1, which indicated that the two isotopes were not in equilibrium. This may indicate the trace presence of uranium due to AWE's discharges in addition to uranium already present naturally.

Uranium detected in all other samples had a ²³⁸U / ²³⁴U ratio ≈ 1, which indicated that the two isotopes were in equilibrium, implying a purely natural origin.

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**SURFACE WATER RESULTS FOR OCTOBER TO DECEMBER 2012
INTERNAL LOCATIONS TO AWE(B)**

UKAS	Location	Period	Total Alpha Bq.m ⁻³	Total Beta Bq.m ⁻³	Tritium kBq.m ⁻³	²³⁸ Pu + (²³⁹ + ²⁴⁰)Pu Bq.m ⁻³	Total Uranium Bq.m ⁻³
	Burghfield Inlet R201W	Oct*	<20	280 ± 33	<6		
		Nov	<20	232 ± 32	<6		
		Dec	33 ± 13	274 ± 33	12 ± 3		
	Burghfield Outlet R202W	Oct	49 ± 21	481 ± 43	<6	<2.5	17 ± 3
		Nov	47 ± 16	323 ± 39	<6	<2.5	18 ± 2
		Dec	65 ± 22	321 ± 40	<6	<2.5	16 ± 2
	Burghfield Outfall 1 ROF01W	Oct	72 ± 54	183 ± 34	<6	<2.5	27 ± 3
		Nov	44 ± 20	211 ± 35	<6	<2.5	42 ± 3
		Dec	78 ± 33	192 ± 35	<6	<2.5	34 ± 3
	Burghfield Outfall 2 ROF02W	Oct	29 ± 16	312 ± 34	<6		
		Nov	48 ± 17	446 ± 38	<6	<2.5	42 ± 3
		Dec	91 ± 26	414 ± 37	7 ± 3	<2.5	47 ± 4
	Burghfield Outfall 3 ROF03W	Oct	50 ± 23	714 ± 43	<6	<2.5	17 ± 2
		Nov	37 ± 19	465 ± 37	<6		
		Dec	112 ± 43	628 ± 42	6 ± 3	<2.5	58 ± 4
	Burghfield Outfall 4 ROF04W	Oct	<20	341 ± 38	<6		
		Nov	67 ± 19	248 ± 36	<6	<2.5	52 ± 4
		Dec	109 ± 24	266 ± 37	<6	<2.5	45 ± 4
	Burghfield Outfall 5 ROF05W	Oct	22 ± 16	154 ± 33	<6		
		Nov	67 ± 21	139 ± 33	<6	<2.5	87 ± 5
		Dec	116 ± 32	159 ± 36	<6	<2.5	74 ± 4
	Burghfield Outfall 6 ROF06W	Oct	<20	70 ± 27	<6		
		Nov	20 ± 14	123 ± 29	<6		
		Dec	40 ± 18	176 ± 30	<6	N/A	N/A
	Burghfield Outfall 7 ROF07W	Oct	N/S	N/S	N/S	N/S	N/S
		Nov	N/S	N/S	N/S	N/S	N/S
		Dec	N/S	N/S	N/S	N/S	N/S
	Burghfield Outfall 8 ROF08W	Oct	51 ± 25	246 ± 35	<6	<2.5	29 ± 3
		Nov	38 ± 20	301 ± 37	<6		
		Dec	105 ± 39	393 ± 38	<6	<2.5	49 ± 3

Sampling problem: N/S Denotes No Sample. Outfall ROF07W had no flow at time of sampling. N/A Denotes sample not sent on for further analysis.

*Indicates sample obtained using automatic sampler and supplemented by grab sample to obtain required sample volume.

Comment: Uranium detected in the samples collected from ROF01W and ROF08W in October, R202W, ROF01W, ROF02W, ROF04W and ROF05W in November, and ROF01W, ROF02W, ROF05W and ROF08W in December had a ²³⁸U / ²³⁴U ratio <1, which indicated that the two isotopes were not in equilibrium. This may indicate the trace presence of uranium due to AWE's discharges in addition to uranium already present naturally.

Uranium detected in all other samples had a ²³⁸U / ²³⁴U ratio ≈ 1, which indicated that the two isotopes were in equilibrium, implying a natural origin.

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SURFACE WATER RESULTS FOR OCTOBER TO DECEMBER 2012

EXTERNAL LOCATIONS

UKAS	Location	Period	Total Alpha	Total Beta	Tritium	²³⁸ Pu +	Total
			Bq.m ⁻³	Bq.m ⁻³	kBq.m ⁻³	(²³⁹ + ²⁴⁰)Pu	Uranium
			Bq.m ⁻³	Bq.m ⁻³		Bq.m ⁻³	Bq.m ⁻³
	Aldermaston Fishermans Lane	Oct	<20	184 ± 34	10 ± 3		
	Aldermaston Bridge	Oct	<20	89 ± 28	8 ± 3		
	Aldermaston Soke	Oct	27 ± 11	131 ± 28	7 ± 3		
	Silchester Sewage Works	Oct	24 ± 16	539 ± 43	6 ± 3		
	Red Lane	Oct	<20	171 ± 34	6 ± 3		
	Fobney Works	Oct	<20	89 ± 28	12 ± 3		
	Stratfield Mortimer	Oct	<20	324 ± 37	6 ± 3		

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DRINKING WATER DEEP BOREHOLE RESULTS FOR OCTOBER TO DECEMBER 2012

UKAS	Sample ID	Period	Total alpha Bq.m ⁻³	Total beta Bq.m ⁻³	Tritium kBq.m ⁻³	²³⁸ Pu + (²³⁹ + ²⁴⁰)Pu Bq.m ⁻³	Total Uranium Bq.m ⁻³
	AWE(A) R017W	Oct	<20	184 ± 31	<6	<2.5	<3
	AWE(A) R020W	Oct	N/S	N/S	N/S	N/S	N/S
	AWE(B) R203W	Oct	50 ± 17	344 ± 39	<6	<2.5	<3
	AWE(B) R204W	Oct	N/S	N/S	N/S	N/S	N/S

Sampling problem: N/S Denotes No Sample. Boreholes R020W and R204W were not in use

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ENVIRONMENTAL PERMITTING REGULATIONS 2010

**ENVIRONMENT AGENCY REQUIREMENT FOR THE
ATOMIC WEAPONS ESTABLISHMENT ALDERMASTON AND BURGHFIELD**

PERMIT REFERENCES: BZ1994 (SUPERSEDED BY QB3535DR) AND PP3790SZ

RESULTS OF ENVIRONMENTAL MONITORING FOR THE PERIOD OCTOBER 2012

FRESHWATER SEDIMENT BIENNIAL SURVEY

1. Sediments are collected annually from most surface water monitoring locations, both internal and external. Samples are taken six monthly at locations close to discharge points.
2. Sediments are routinely analysed for gross alpha, gross beta, and isotopes of uranium and plutonium. Results are reported as activity concentrations in the dried sediment samples.
3. The indicative Limits of Detection (LoD) for sediment analyses are as follows:

Gross alpha	0.30 kBqkg ⁻¹
Gross beta	0.25 kBqkg ⁻¹
Total uranium	0.0015 kBqkg ⁻¹
Total plutonium	0.001 kBqkg ⁻¹

1. Where the level of radioactivity is less than the LoD, the LoD value is tabulated as a positive result with a < (less than) sign in front of it.
2. Errors for the data represent 2 sigma counting statistics only.

UKAS ACCREDITATION

The results for sediment samples, contained in the following 2 tables, were produced within the scope of UKAS accreditation.

The following accredited methods were used: Gross Alpha and Beta Activity AWE/SAC32/L3/AB/001, Uranium and Plutonium Activity AWE/SAC32/L3/RC/001.

Any interpretations, opinions and comments presented are not within the scope of UKAS accreditation.

Any reported values in these tables outside the scope of the stated accredited methods are marked with the symbol N in the first column of data table, (or for individual values adjacent to the excluded value, (eg 1.234 N*))

For other general information concerning UKAS accreditation see Appendix 1.

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FRESHWATER SEDIMENT RESULTS FOR BIANNUAL SURVEY OCTOBER 2012

INTERNAL LOCATIONS TO AWE(A)

UKAS	Location	Date of Sample	Total Alpha kBqkg ⁻¹	Total Beta kBqkg ⁻¹	²³⁸ Pu + (²³⁹ + ²⁴⁰)Pu kBqkg ⁻¹	Total Uranium in dry kBqkg ⁻¹
	R006S	Oct	0.72 ± 0.20	0.81 ± 0.05	<0.002	0.024 ± 0.002

Comments: R006S sampling location was approximately 14 metres from that stated in the EPR Arrangements Document.

Uranium detected in all samples had a ²³⁸U / ²³⁴U ratio ≈ 1, which indicated that the two isotopes were in equilibrium, implying a purely natural origin.

FRESHWATER SEDIMENT RESULTS FOR BIANNUAL SURVEY OCTOBER 2012

EXTERNAL LOCATIONS

UKAS	Location	Date of Sample	Total Alpha kBqkg ⁻¹	Total Beta kBqkg ⁻¹	²³⁸ Pu + (²³⁹ + ²⁴⁰)Pu kBqkg ⁻¹	Total Uranium in dry kBqkg ⁻¹
	Aldermaston Sewage Works	Oct	0.92 ± 0.21	0.87 ± 0.05	0.004 ± 0.001	0.027 ± 0.002
	Silchester Sewage Works	Oct	0.94 ± 0.20	0.63 ± 0.04	<0.001	0.018 ± 0.002

Comments: Uranium detected in all samples had a ²³⁸U / ²³⁴U ratio ≈ 1, which indicated that the two isotopes were in equilibrium, implying a purely natural origin.

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ENVIRONMENTAL PERMITTING REGULATIONS 2010

ENVIRONMENT AGENCY REQUIREMENT FOR THE ATOMIC WEAPONS ESTABLISHMENT ALDERMASTON AND BURGHFIELD

PERMIT REFERENCES: BZ1994 (SUPERSEDED BY QB3535DR) AND PP3790SZ

RESULTS OF ENVIRONMENTAL MONITORING FOR THE PERIOD OCTOBER TO DECEMBER 2012

GROUNDWATER

1. Groundwater samples are taken quarterly from shallow boreholes located on-site at AWE(A) and AWE(B).
2. The Programme comprises 28 lined boreholes; 18 at AWE(A) and 10 at AWE(B) designed for monitoring purposes, and uses purging operations and dedicated tubing to prevent cross contamination.
3. All groundwater samples are analysed for total alpha, total beta and tritium activity. If the total alpha activity exceeds 40 Bq.m^{-3} and there is sufficient sample, it undergoes radiochemical analysis and alpha spectrometry for plutonium and uranium isotopes.
4. The indicative Limits of Detection (LoD) for groundwater activities are as follows

Gross alpha	20 Bq.m^{-3}
Gross Beta	40 Bq.m^{-3}
Total uranium	3.0 Bq.m^{-3}
Total plutonium	2.5 Bq.m^{-3}
Tritium	6 kBq.m^{-3}
5. Where the level of radioactivity is less than the LoD, the LoD value is tabulated as a positive result with a < (less than) sign in front of it.
6. Errors for the data represent 2 sigma counting statistics only.
7. A map of tritium concentration contours in shallow groundwater will be produced for this data if this is possible and if it is required.

UKAS ACCREDITATION

The results for groundwater samples, contained in the following table, were produced within the scope of UKAS accreditation.

The following accredited methods were used: Gross Alpha and Beta Activity AWE/ASc/L3/RCS/EM/AB/OP/E114, Tritium Activity AWE/ASc/L3/RCS/EM/3H/OP/E102, Uranium and Plutonium Activity AWE/ASc/L3/RCS/EM/ACT/OP/E103.

Any interpretations, opinions and comments presented are not within the scope of UKAS accreditation.

Any reported values in these tables outside the scope of the stated accredited methods are marked with the symbol N in the first column of data table, (or for individual values adjacent to the excluded value, (eg 1.234 N*))

For other general information concerning UKAS accreditation see Appendix 1.

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SHALLOW GROUNDWATER BOREHOLE RESULTS FOR OCTOBER TO DECEMBER 2012
INTERNAL LOCATIONS TO AWE(A)

UKAS	Internal Location	Date of Sample	Total alpha Bq.m ⁻³	Total beta Bq.m ⁻³	Tritium kBq.m ⁻³	²³⁸ Pu + (²³⁹ + ²⁴⁰)Pu Bq.m ⁻³	Total Uranium Bq.m ⁻³
	BH0049	Oct	<20	117 ± 32	<6		
	BH0054	Oct	52 ± 13	449 ± 37	8 ± 3	<2.5	<3
	BH0141	Oct	73 ± 21	2127 ± 68	<6	<2.5	<3
	BH0145	Oct	55 ± 21	177 ± 34	28 ± 4	<2.5	<3
	BH0165	Oct	90 ± 25	213 ± 38	<6	<2.5	<3
	BH0170	Oct	26 ± 12	504 ± 39	<6		
	BH0178	Oct	62 ± 17	282 ± 33	6 ± 3	<2.5	30 ± 2
	BH0201RD	Oct	63 ± 15	204 ± 33	8 ± 3	<2.5	19 ± 2
	BH0242	Oct	<20	216 ± 36	<6		
	BH0302	Oct	22 ± 13	213 ± 32	6 ± 3		
	BH0372	Oct	60 ± 15	323 ± 32	<6	<2.5	<3
	BH0398	Oct	72 ± 22	251 ± 32	6 ± 3	<2.5	18 ± 2
	BH0404	Oct	95 ± 24	266 ± 37	<6	<2.5	46 ± 4
	BH0495	Oct	35 ± 15	350 ± 35	7 ± 3		
	BH0550	Oct	110 ± 32	265 ± 33	6 ± 3	<2.5	45 ± 4
	BH0576	Oct	31 ± 12	345 ± 40	<6		
	BH43	Oct	49 ± 14	778 ± 46	6 ± 3	<2.5	<3
	GRIFFRDBH3	Oct	47 ± 13	198 ± 32	<6	<2.5	<3

Comment: Uranium detected in the sample collected from BH0178 had a ²³⁸U / ²³⁴U ratio <1, which indicated that the two isotopes were not in equilibrium. This may indicate the trace presence of uranium due to AWE's discharges in addition to uranium already present naturally.

Uranium detected in all other samples had a ²³⁸U / ²³⁴U ratio ≈ 1, which indicated that the two isotopes were in equilibrium, implying a purely natural origin.

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**SHALLOW GROUNDWATER BOREHOLE RESULTS FOR OCTOBER TO DECEMBER 2012
INTERNAL LOCATIONS TO AWE(B)**

UKAS	Internal Location	Date of Sample	Total alpha Bq.m ⁻³	Total beta Bq.m ⁻³	Tritium kBq.m ⁻³	²³⁸ Pu + (²³⁹ + ²⁴⁰)Pu Bq.m ⁻³	Total Uranium Bq.m ⁻³
	BB11	Nov	378 ± 105	285 ± 34	<6	<2.5	387 ± 12
	BH111	Nov	33 ± 19	118 ± 32	<6		
	BH115	Nov	46 ± 32	117 ± 36	<6	<2.5	78 ± 4
	BH117	Nov	24 ± 13	59 ± 31	<6		
	BH123	Nov	50 ± 25	851 ± 51	6 ± 3	<2.5	56 ± 4
	BH201S	Nov	212 ± 127	763 ± 48	<6	<2.5	182 ± 8
	BH203S	Nov	23 ± 145	807 ± 48	<6		
	BH225S	Nov	225 ± 120	672 ± 51	6 ± 3	<2.5	129 ± 6
	BHCMR009	Nov	130 ± 27	222 ± 31	<6	<2.5	131 ± 7
	BHOCT001	Nov	89 ± 26	280 ± 31	<6	<2.5	73 ± 5
	BH202D	Nov	83 ± 24	253 ± 31	<6	<2.5	42 ± 3

Comment: Isotopic ratios in uranium from AWE(B) boreholes are consistent with previously measured values. Deviations observed are believed to be a result of secular disequilibrium as no additional anthropogenic isotopes were found to be present in previous samples sent on for further analysis (see QTR 3 2011 report for more detailed information).

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ENVIRONMENTAL PERMITTING REGULATIONS 2010

**ENVIRONMENT AGENCY REQUIREMENT FOR THE
ATOMIC WEAPONS ESTABLISHMENT ALDERMASTON AND BURGHFIELD**

PERMIT REFERENCES: BZ1994 (SUPERSEDED BY QB3535DR) AND PP3790SZ

RESULTS OF ENVIRONMENTAL MONITORING FOR THE PERIOD OCTOBER TO DECEMBER 2012

SILCHESTER SEWAGE WORKS SAMPLING

1. Liquid and Solid sewage samples are collected quarterly from Silchester Sewage Works.
2. Samples are routinely analysed for gross alpha, gross beta, isotopes of uranium and plutonium, and tritium. For the solid samples, results are reported as activity concentrations per unit mass in the dried samples. For the liquid samples, results are reported as activity concentrations per unit volume of the sample.
3. The indicative Limits of Detection (LoD) for analyses are as follows:

	Solid sample	Liquid sample
Gross alpha	0.10 kBq.kg ⁻¹	20 Bq.m ⁻³
Gross beta	0.10 kBq.kg ⁻¹	40 Bq.m ⁻³
Total uranium	0.0015 kBq.kg ⁻¹	3 Bq.m ⁻³
Total plutonium	0.001 kBq.kg ⁻¹	2.5 Bq.m ⁻³
Total tritium	20 Bq.kg ⁻¹	6 kBq.m ⁻³
	Water-bound tritium	

4. Where the level of radioactivity is less than the LoD, the LoD value is tabulated as a positive result with a < (less than) sign in front of it.
5. Errors for the data represent 2 sigma counting statistics only.

UKAS ACCREDITATION

The results for sewage samples, contained in the following table, were produced within the scope of UKAS accreditation.

The following accredited methods were used: Tritium Activity AWE/ASc/L3/RCS/EM/3H/OP/E102, Uranium and Plutonium Activity AWE/ASc/L3/RCS/EM/ACT/OP/E102 (solid sample) and AWE/ASc/L3/RCS/EM/ACT/OP/E103 (liquid sample).

Any interpretations, opinions and comments presented are not within the scope of UKAS accreditation.

Any reported values in these tables outside the scope of the stated accredited methods are marked with the symbol N in the first column of data table, (or for individual values adjacent to the excluded value, (eg 1.234 N*))

For other general information concerning UKAS accreditation see Appendix I.

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**RESULTS OF SILCHESTER SEWAGE WORKS SAMPLING FOR THE PERIOD
OCTOBER TO DECEMBER 2012**

UKAS	Location	Date of Sample	²³⁸ Pu + (²³⁹ + ²⁴⁰)Pu dry sample kBq.kg ⁻¹	Total Uranium dry sample kBq.kg ⁻¹	Total Tritium dry sample Bq.kg ⁻¹
		Silchester Sewage Works Solid Sample	11/10/12	<0.001	<0.0015
	Location	Date of Sample	²³⁸ Pu + (²³⁹ + ²⁴⁰)Pu Bq.m ⁻³	Total Uranium Bq.m ⁻³	Water- bound Tritium kBq.m ⁻³
	Silchester Sewage Works Liquid Sample	11/10/12	<2.5	4 ± 2	<6

Comments: Uranium detected had a ²³⁸U / ²³⁴U ratio ≈ 1, which indicated that the two isotopes were in equilibrium, implying a natural origin.

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ENVIRONMENTAL PERMITTING REGULATIONS 2010

ENVIRONMENT AGENCY REQUIREMENT FOR THE ATOMIC WEAPONS ESTABLISHMENT ALDERMASTON AND BURGHFIELD

PERMIT REFERENCES: BZ1994 (SUPERSEDED BY QB3535DR) AND PP3790SZ

RESULTS OF ENVIRONMENTAL MONITORING FOR THE PERIOD OCTOBER TO DECEMBER

MILK SAMPLING

1. Subject to continuing availability, one litre of unprocessed milk is taken quarterly from six farms. Two farms are located to the south east, two to the east, one farm is located to the north east of AWE Aldermaston and one more distant from the AWE Aldermaston site in Compton acts as a control (background reference) location.
2. Samples are routinely analysed for tritium activity in free water, and isotopes of uranium and plutonium. Results are reported as activity concentrations in the free water of unprocessed milk as appropriate.
3. The indicative Limit of Detection (LoD) for activities in milk are:

Total uranium	3.0 Bq.m ⁻³
Total plutonium	2.5 Bq.m ⁻³
Tritium	6 kBq.m ⁻³
4. Where the level of radioactivity is less than the LoD, the LoD value is tabulated as a positive result with a < (less than) sign in front of it.
5. Errors in the data are presented as 2 sigma based on counting statistics only.

UKAS ACCREDITATION

The results for milk samples, contained in the following table, were produced within the scope of UKAS accreditation.

The following accredited methods were used: Tritium Activity AWE/ASc/L3/RCS/EM/3H/OP/E103, Uranium and Plutonium Activity AWE/ASc/L3/RCS/EM/ACT/OP/E119.

Any interpretations, opinions and comments presented are not within the scope of UKAS accreditation.

Any reported values in these tables outside the scope of the stated accredited methods are marked with the symbol N in the first column of data table, (or for individual values adjacent to the excluded value, (eg 1.234 N*))

For other general information concerning UKAS accreditation see Appendix 1.

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MILK SAMPLING RESULTS FOR OCTOBER TO DECEMBER 2012

UKAS	Location	Date taken	Tritium Activity in Free Water. kBq.m ⁻³	²³⁸ Pu + (²³⁹ + ²⁴⁰) Pu Bq.m ⁻³ (milk)	Total uranium alpha Bq.m ⁻³ (milk)
	Tadley	16/10/12	<6	<2.5	<3
	Compton	16/10/12	<6	<2.5	<3
	Farley Hill	16/10/12	<6	N/R	<3
	Padworth	16/10/12	<6	N/R	<3
	Sherfield on Loddon	16/10/12	<6	N/R	<3

Comments: N/R Denotes No Result. No result was obtained for plutonium at Farley Hill, Padworth and Sherfield on Loddon as the analysis had low recovery. Therefore the result was not viable.

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Environment Agency Requirement for the Operator Monitoring Programme for Radioactivity in the Environment around AWE Aldermaston and Burghfield: Results for the Period October to December 2012		

ENVIRONMENTAL PERMITTING REGULATIONS 2010

**ENVIRONMENT AGENCY REQUIREMENT FOR THE
ATOMIC WEAPONS ESTABLISHMENT ALDERMASTON AND BURGHFIELD**

PERMIT REFERENCES: BZ1994 (SUPERSEDED BY QB3535DR) AND PP3790SZ

RESULTS OF ENVIRONMENTAL MONITORING FOR THE PERIOD OCTOBER TO DECEMBER 2012

SAMPLER DOWNTIME

Automatic Water Samplers

The following table details the automatic water samplers which, experienced downtime during the period September to November 2012 (the period surface water samples in this report were collected).

Location	Estimated Period of Sampler Downtime	Sampler Fault	Corrective Action
R001W	06/09/12-16/10/12	Unit not sampling	Repair work to the sampler carried out
R201W	12/09/12-17/09/12	Unit not sampling	Repair work to the sampler and the sampling hose re-positioned
R004W	03/10/12	Unit not sampling	Repair work to the sampler carried out

High Volume Air Samplers

There were no high volume air samplers which experienced downtime during the period October to December 2012 (the period high volume air filter samples in this report were collected).

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Appendix 1.

General Notes on UKAS Accreditation

Results within the scope of UKAS accreditation are clearly marked as such within the text of the report. In addition the relevant data tables are marked with the UKAS accreditation symbol.

The accredited methods used, and exclusions to these, are as stated in the report.

Results outside the scope of UKAS accreditation are marked *N*.

The errors and detection limits presented in this report are based on counting errors only and with a confidence limit of 1.96 sigma (95%). A full uncertainty estimation is available from the laboratory on request.

The address of the accredited laboratory is:

Analytical Sciences
HTS/ DS
Building [REDACTED]
AWE Aldermaston, Reading, Berks. RG7 4 PR

Tritium in Air monitoring results have been provided under contract by Radio Carbon Dating. These results as indicated in the report table are not UKAS accredited.

These results are produced on behalf of the Head of Environment (HoE), Assurance Directorate, AWE.

These results shall not be reproduced without the permission of HoE and the originator.

The reported measurement results, only, are within the scope of accreditation. Opinions, comments and interpretations are not part of the scope of accreditation

Those results, not contained in tables marked with the accreditation symbol, or so stated, are not within the scope of accreditation's currently held by the laboratory.