

Schlumberger

May 6, 2008

U.S. Nuclear Regulatory Commission
Region 1
Division of Nuclear Material Safety
475 Allendale Road
King of Prussia, PA 19406

Q-5
MS-16

RECEIVED
REGION 1
2008 MAY -7 AM 9:25

ATTN: Ms Betsy Ullrich, Senior Health Physicist
Re: Docket No. 030-03766, Control No. 142056, License No: 06-00807-01
Subject: Additional Information Concerning Application for Termination Amendment to Materials License 06-00807-01

Dear Ms Ullrich:

Below is a detailed response to your request for additional information dated April 8, 2008, concerning our application for a termination amendment to materials license 06-00807-01.

Item #1 – Wells in the ARL

Please note that the word "wells" in our communication may have been misleading. The features in question are just rat-holes or bore-holes and are not connected to the outside ground formation or, more importantly, ground water. They are all insulated from outside by "casings" – plastic or steel walls isolating the bore-hole space from the outside formation or water.

We have 6 such bore-holes in the Advance Research Lab (ARL) Building high bay area. Their sketch of locations was attached in the original document (Final Report). We also showed them and the entire ARL building area to Mr. Dennis Lawyer during his inspection visit on April 18, 2008. The ARL Building was used primarily for accelerator research and development. These bore-holes were used for testing devices or well-logging tools which consist of X-ray generators, small low-energy linear accelerators or neutron generators. The function of these bore-holes was to provide us capability of testing devices in a vertical configuration – commonly as one does for oil-well logging, and in some cases, testing temperature effects on the instruments at an elevated temperature (150°C) with heated oil as a bore-hole fluid.

Bore-holes #1 to #4 are all 60 feet deep. One of them is with plastic wall casing and the rest with steel wall casing. Bore-hole #5 is about 75 feet deep and also insulated with steel casing. This bore-hole was used for instrument testing at elevated temperatures when it was filled with heated oil. Bore-hole #6 is about 50 feet deep, has a 3x3 feet square opening for the top 25 feet depth while the bottom half with a reduced opening. Bore-hole #6 was used for other physics research and was never used with nuclear instruments.

Only sealed deuterium-tritium neutron generators were placed in these bore-holes and leak tests of these generators never detected any leakage of the radioactive material. Additionally, we ran experiments with X-ray generators and small linear low-energy particle accelerators. The purpose of testing the water in these bore-holes was merely to confirm that the neutron flux did not result in the H₂O being activated to T₂O. All water samples in these bore-holes proved to be less than 1000 pCi/L, which is in fact as good as the drinking water

Fax
REC'D IN LAT 5/6/08

142056
NMSS/RGNI MATERIALS-002

standard requires, so that there is no concern to release the water if that would be deemed necessary in future construction activities. This is as expected from simple activation calculations, since our neutron generators deliver about 10^8 neutrons per second flux, and the total experimental time of these neutron generators was not more than 1000 hours.

We additionally compared this to similar experiments in the labs with experimental duration comparable to the experiments in the bore-holes. Our gamma dose rate survey of the building, including around the so-called formation tanks, showed no increases above background as described in the Final Report.

In addition, Schlumberger performed in recent years an internal research program on the neutron activations on the steel alloys used in the drilling collar equipments near drilling bits in oil-wells, as Schlumberger has a commercialized device or tool called "EcoScope" using a neutron generator in a drilling-while-measurement condition in the oil exploration and drilling services. Obviously, these tools have massive steel-alloy collar and chassis which can be used as a conservative model for our lab and bore-holes activation analysis. The data of tool surface dose rate after a long term operation of our neutron generator show that the main activation contributors are Mn-56 (half-life 2.6 hours) and Cu-64 (half-life 12.7 hours). We do not find any activation products with half-life longer than 120 days. This is attributed to the fact that our neutron generators are rather small and merely produce about 1×10^8 neutrons per second.

Item #2 – Lead pigs, lead bricks and tools etc.

All our radioactive materials were in sealed forms. Records of our wipe test results show there was no leaking source in the past. The only radiation of concern is the neutron radiation from D-T neutron generators, but as described in the first section the activation from these neutrons has been proven to be negligible. We are therefore confidently stating that the remaining lead pigs, lead bricks and tools do not have residual contamination from past activities with radioactive materials above the legal limits.

Also, as stated in Item#1, the survey of the building, including around the formation tanks and in the bore-holes showed no increases above background as described in the Final Report.

Item #3, #4 and #5 – Unsealed Am-241 source up to 2 microcuries

We intend to discuss these three items together as they are all related to possible "unsealed" Am 241 alpha sources up to 2 microcuries.

Our License records show that starting 1966 and up to early 2000 with Amendment #49 we were allowed to possess up to 2 microcuries "unsealed" Am-241 alpha sources, and sealed Am-241 sources not exceed 20 curies per source and 50 curies total. However, a detailed search of our inventory records shows that we never possessed any "unsealed" alpha sources. During our license renewal in 2000 we recognized that we had never actually possessed any unsealed alpha sources in the past and did not intend to possess any in the future, so the same item in our license Amendment #50 with "unsealed" Am-241 alpha sources was switched to "sealed" Am-241 alpha sources up to 2 microcuries, while the item of sealed Am-241 sources not exceed 20 curies per source and 50 curies total was kept the same.

Table below shows the detailed information on all sources containing Am-241 that were in our possession. These show up in our inventory records and the comments indicate the sources that are still in our possession in the new MA facility or transferred to another licensed location.

Inventory #	Isotope	Orig. Cal . Date	Orig. Act. (Ci)	Marking	Manufacturer	Model #	Info regarding Seal	Comment
AM-241-01	241Am	28-Jan-69	1.36E-06	3122-2	Radiation Materials Corp.	GS.2	RMC: "chemically sealed"	In possession in MA facility
AM-241-02	241Am	21-May-70	1.60E-06	3171-5	Radiation Materials Corp.	GS.2	RMC: "chemically sealed"	In possession in MA facility
AM-241-03	241Am	1-Sep-81	1.00E-03	6016-LA	Amersham	AMC-62	Sealed ISO.2919: C64545	In possession in MA facility
AM-241-04	241Am	21-Dec-81	1.00E-01	6610-LA	Amersham	AMC-66	Sealed ISO.2919: C64444	In possession in MA facility
AM-241-05	241Am	16-Feb-84	5.00E-01	9537-LA	Amersham	AMC-18	Sealed ISO.2919: C64344	Disposed to NSSI in 2006
(Am-241-06)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Name -06 was reserved for future use
AM-241-07	AmBe	24-Jan-80	3.60E-03	A-849	NEN (New England Nuclear)	A-849	ANSI N5. 10-1968: C54434	In possession in MA facility
AM-241-08	AmBe	15-Mar-76	5.00E-01	2625	Monsanto	AmBe-2625	STC Model NSR-GB	In possession in MA facility
AM-241-09	AmBe		5.00E-01	2518	Received from another STC facility	H222649	STC Model NSR-GB	Transferred to another STC facility May 1980
AM-241-10	AmBe	1-Jan-75	1.60E+01		Monsanto	H209986		Disposed to NSSI in 2006
AM-241-11	AmBe		1.70E+01	1461	Received from another STC facility	AmBe-1461	STC Model NSR-FA	Transferred to another STC facility May 1980
AM-241-12	AmBe	1-Jan-75	5.00E-01		Monsanto	H222649		Disposed to NSSI June 1992
AM-241-13	241Am	15-Jul-91	1.00E-05	S9003004	DuPont - NEN	1" disk	NEN: "sealed"	In possession in MA facility
AM-241-14	241Am		5.00E-08	AL935	Harshaw/ Bicon	Sealed detector package		Disposed to NSSI in 2006
AM-241-15	241Am		5.00E-08	AL936	Harshaw/ Bicon	Sealed detector package		Disposed to NSSI in 2006
AM-241-16	241Am		5.00E-08	BA537	Harshaw/ Bicon	Sealed detector package		Disposed to NSSI in 2006
AM-241-17	241Am	1-Jan-06	1.00E-08	C9-324	Isotope Products	1" foil disk	IPL Model AF series	In possession in MA facility

Our records show that we owned a total of ten pure 241Am sources (Am241-01 to Am241-05 and Am241-13 to Am241-17 in our in-house notation) and six 241Am/Be sources (Am241-07 to Am241-12). The name Am241-06 was reserved for future purchases of pure 241Am before we started to fill the names starting -07 with AmBe sources. Of those sources

shown below (Appendix 1) are the ones that are not inside a welded metal container (i.e., in a sealed form), but still are sealed between two plastic discs (Am241-1, -2 and -13) or in a sealed metal foil (Am-241-17). We attach their photo pictures here for your review. These sources are still in our possession and we have wipe test results to prove that they never leaked. In 2007 these sources have been transferred to our Massachusetts facility and have been listed on our MA State materials license. Note that the MA Radiation Control Program considers Am-241-17 alpha foil source (AF series from Isotope Products Lab) a sealed form. This source also has been wiped in the back before transferring to MA indicating no leakage. For the remaining sources which are in sealed metal containers (regardless whether we still possess or disposed over years) we also have wipe test results in record to prove that they never leaked.

In summary we never had any Am241 source of which the source material was not contained in some kind of sealed container. Even if some of the sources that were 'grandfathered in' would not qualify as sealed by today's more rigid standards (that is being registered as sealed sources) the material was clearly not exposed and the frequent leak test confirm that these sources could not have possibly caused contaminations in the laboratory in the Ridgefield facility. Therefore, the surveys described in the Final Report were planned and performed using the guidance from NUREG/CR-5849 for sealed sources only. We considered such surveys as sufficient.

Please advise if we need to provide any additional information regarding this topic. In particular, please advise if we still need to perform additional surveys using NUREG-1757 guidance or if the information provided above is sufficient to prove that we never used unsealed 241Am.

Item #6 – MDA Calculation

We have communicated this request to the Radiation Safety Associates who conducted the survey and produced the Final Report for us. Below is a direct quote from their reply -- the equation for the MDA calculation that was used in the Report:

$$\text{MDA} = \frac{k_1^2 + 2 k_1 \sqrt{R_b t_s \left(1 + \frac{t_s}{t_b}\right)}}{(t_s) (E) (C)}$$

Here, MDA = minimum detectable activity in units of dpm at a stated Confidence Level (CL)

k_1 = the one-sided confidence factor at CL = 95% (= 1.645)

R_b = background count rate in cpm

t_s = sample count time in minutes

t_b = background count time in minutes

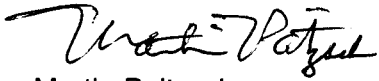
E = detector efficiency in counts per disintegration

C = conversion factor from dpm to other desired activity unit, if applicable

Note: MARSSIM says to use 3 in place of k_1^2 (=2.71) in the numerator of this equation.

We hope that the information provided here can satisfy your request. Please advise us if we need to perform further surveys using NUREG-1757 guidance for unsealed sources. If you need further information concerning the termination application, please feel free to contact us as well.

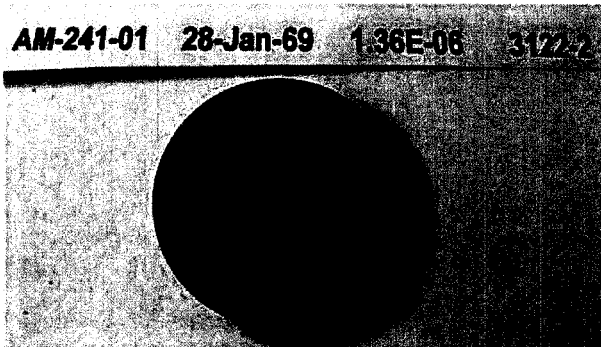
Sincerely,



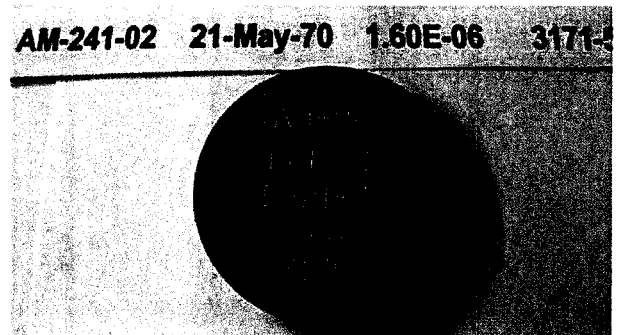
Martin Poitzsch
Chairperson of Radiation Safety Committee
Departmental Research Director (Sensor Physics)
Schlumberger-Doll Research
One Hampshire St., MD-B313
Cambridge, MA 02139
Tel: 1 617 768 2220
Fax: 1 617 768 2382
Email: poitzsch1@boston.oilfield.slb.com

Appendix 1

Am241-01 (sealed plastic disk):



Am241-02 (sealed plastic disk):



Am241-13 (sealed plastic disk):



Am241-17 (sealed foil disk):

