

Allen, Pam, NMENV



From: Kliphuis, Trais, NMENV
Sent: Tuesday, May 20, 2014 11:04 AM
To: Allen, Pam, NMENV
Cc: Maestas, Ricardo, NMENV; Smith, Coleman, NMENV; Holmes, Steve, NMENV
Subject: FW: Technical Review of attached document
Attachments: NWP potential neutron sources.pdf

Pam,

Please add this email and it's attachment to our WIPP record. Thanks.

From: David Roelant [<mailto:roelantd@fiu.edu>]
Sent: Tuesday, May 20, 2014 11:01 AM
To: Kliphuis, Trais, NMENV
Cc: Ines Triay
Subject: Technical Review of attached document

Trais,

I received the pdf document "NWP potential neutron sources" today from Dr. Triay. The conclusions agree with my earlier remarks to you and others via the conference call. My experience from years ago of trying to identify configurations of fissile material which could go critical or simply create heat and radioactive fission products suggest that it is a challenge to locate enough material in a small enough volume to allow enough fission reactions per second to generate significant heat.

In looking at the isotopes cited and the spacing of containers in the facility, I am even more sure that neutrons (and associated fission reactions) are not the source of sufficient heat in the facility.

I believe that 10 W calculated is likely a very conservative upper limit.

I have found in earlier studies that thin plastic layers lining drums were often sufficient to thermalize neutrons from MeVs to much less than 1 eV. Water in salt and other hydrogen in the facility will ensure thermalization. This will lower max. possible heating rates even more.

Let me know if you have any questions from my comments above.

Dave

From: Ines Triay
Sent: Tuesday, May 20, 2014 12:35 PM
To: David Roelant
Subject: Fwd: Technical Review of attached document

Dave: Please see below. Could you do this review expeditiously?

Cristina: Could you make sure that Dave sees this and responds?

Sent from my iPhone

Begin forwarded message:



From: "Kliphuis, Trais, NMENV" <trais.kliphuis@state.nm.us>

To: "Ines Triay" <triayin@fiu.edu>

Cc: "Maestas, Ricardo, NMENV" <Ricardo.Maestas@state.nm.us>, "Smith, Coleman, NMENV" <coleman.smith@state.nm.us>, "Holmes, Steve, NMENV" <steve.holmes@state.nm.us>

Subject: **Technical Review of attached document**

Dr. Triay,

I would like Dave Roland's review of the attached document. Is this possible? If so, I would like an email response with any questions, concerns and comments that he has. Thanks.

NWP evaluated the potential neutron sources in Panel 7 Room 7 broken down into three categories. 1) Spontaneous Fission, 2) Mixed Sources, and 3) Alpha – Neutron (α , n) reactions. Transuranics with higher spontaneous fission yields include Cf-252, Cm-244, Pu-238, Pu-240, and Pu-242. Nondestructive Assay (NDA) indicated no Cf-252 in Panel 7. Cm-244 is identified in the RH waste emplaced in bore holes in Room 7 and the CH emplaced waste area of concern is located in the exhaust drift portion of Room 7, over 65 feet away. The CH emplaced waste contains Pu-238, Pu-240 and Pu-242, however, their spontaneous fission yields are four orders of magnitude less than Cm-244. In addition, no mixed sources, such as transuranics combined with beryllium or lithium (forming high neutron-yielding [6.8 E7 n/s-g] PuBe, AmBe, or AmLi type sources) were identified in Panel 7. Finally, due to their high activity, Pu-238 (308 Ci) and Am-241 (24 Ci), (α , n) reactions were also evaluated. The Pu-238 (α , n) reactions produces a neutron flux approximately four times more than its spontaneous fission yield but the decay heat generated from 308 Ci of Pu-238 is only 10.2 Watts. Am-241 (α , n) reactions produces about half of the spontaneous fission yield of Pu-238 and less than 1 Watt of decay heat.

This evaluation concludes that there are no identified potential neutron sources that have a sufficient neutron flux to interact with other waste materials to create a heat source.

Row	Col	Hgt	Cntr #	Cntr Type	Waste Stream	Nuclide	Act (Ci)	SpA (g/Ci)	Grams	DH (W/g)	Watts	SF Yield	Flux (n/s)	Comments
			1263	RH 30GD TBO	AERHDM	Cm-244	1.59E+01	0.01229	0.195	2.85E+00	0.55692135	1.08E+07	2.11E+06	RH Waste in Borehole #37
			1229	RH 30GD TBO	AERHDM	Cm-244	6.79E+00	0.01229	0.083	2.85E+00	0.23782994	1.08E+07	9.01E+05	RH Waste in Borehole #39
			1227	RH 30GD TBO	AERHDM	Cm-244	5.77E+00	0.01229	0.071	2.85E+00	0.20210291	1.08E+07	7.66E+05	RH Waste in Borehole #38
			1228	RH 30GD TBO	AERHDM	Cm-244	5.01E+00	0.01229	0.062	2.85E+00	0.17548277	1.08E+07	6.65E+05	RH Waste in Borehole #38
			1236	RH 30GD TBO	AERHDM	Cm-244	4.89E+00	0.01229	0.06	2.85E+00	0.17127959	1.08E+07	6.49E+05	RH Waste in Borehole #37
			1238	RH 30GD TBO	AERHDM	Cm-244	6.42E-01	0.01229	0.008	2.85E+00	0.02248701	1.08E+07	8.52E+04	RH Waste in Borehole #38
			1266	RH 30GD TBO	AERHDM	Cm-244	4.80E-01	0.01229	0.006	2.85E+00	0.01681272	1.08E+07	6.37E+04	RH Waste in Borehole #44
2	4	B	SR57167702	SLB2	SR-W027-HBL-BOX	Pu-238	3.08E+02	0.05848	18.01	5.68E-01	10	2.59E+03	4.67E+04	
			ANLE30N	RH 55GD TBO	ID-ANLE-S5000	Cm-244	2.96E-01	0.01229	0.004	2.85E+00	0.01036784	1.08E+07	3.93E+04	RH Waste in Borehole #33
5	3	T	BN10493493	SWB	BN510.2	Pu-238	2.46E+02	0.05848	14.37	5.68E-01	8.16465011	2.59E+03	3.72E+04	
			1239	RH 30GD TBO	AERHDM	Cm-244	2.72E-01	0.01229	0.003	2.85E+00	0.00952721	1.08E+07	3.61E+04	RH Waste in Borehole #42
			1256	RH 30GD TBO	AERHDM	Cm-244	2.58E-01	0.01229	0.003	2.85E+00	0.00903684	1.08E+07	3.42E+04	RH Waste in Borehole #40
2	6	B	WMAPSLB046	SLB2	SR-W027-HBL-BOX	Pu-238	1.88E+02	0.05848	10.99	5.68E-01	6.24472832	2.59E+03	2.85E+04	
2	2	B	SR46021Z	SLB2	SR-MD-PAD1	Pu-238	1.61E+02	0.05848	9.415	5.68E-01	5.34787904	2.59E+03	2.44E+04	
7	5	B	SR46029Z	SLB2	SR-MD-PAD1	Pu-238	1.61E+02	0.05848	9.415	5.68E-01	5.34787904	2.59E+03	2.44E+04	
7	3	B	SR57170918	SLB2	SR-W027-HBL-BOX	Pu-238	1.52E+02	0.05848	8.889	5.68E-01	5.04892928	2.59E+03	2.30E+04	
20	2	B	WMAPSLB007	SLB2	SR-W027-HBL-BOX	Pu-238	1.43E+02	0.05848	8.363	5.68E-01	4.74997952	2.59E+03	2.17E+04	
7	1	B	SR46019	SLB2	SR-MD-PAD1	Pu-238	1.29E+02	0.05848	7.544	5.68E-01	4.28494656	2.59E+03	1.95E+04	
13	1	B	BN10493500	SWB	BN510.2	Pu-238	1.04E+02	0.05848	6.082	5.68E-01	3.45453056	2.59E+03	1.58E+04	
20	6	B	SR46020	SLB2	SR-MD-PAD1	Pu-238	1.03E+02	0.05848	6.023	5.68E-01	3.42131392	2.59E+03	1.56E+04	
21	3	T	LA00000092777	55GD TBO	LA-MHD01.001	Pu-240	3.46E+00	4.405	15.24	7.07E-03	0.10775599	1.02E+03	1.55E+04	
9	1	T	LA00000092974	55GD TBO	LA-MHD01.001	Pu-240	3.29E+00	4.405	14.49	7.07E-03	0.10246162	1.02E+03	1.48E+04	
2	2	T	LA00000092644	55GD TBO	LA-MHD01.001	Pu-240	3.05E+00	4.405	13.44	7.07E-03	0.09498722	1.02E+03	1.37E+04	
16	4	T	LA00000068670	55GD	LA-MIN02-V.001	Pu-242	2.98E-02	253.165	7.544	1.17E-04	0.00088269	1.72E+03	1.30E+04	
17	1	T	LA00000068237	SWB	LA-MHD04.001	Pu-240	2.86E+00	4.405	12.6	7.07E-03	0.08906998	1.02E+03	1.29E+04	
21	1	T	LA00000092840	55GD TBO	LA-MHD01.001	Pu-240	2.62E+00	4.405	11.54	7.07E-03	0.08159558	1.02E+03	1.18E+04	
4	4	T	LA00000066776	55GD TBO	LA-MHD01.001	Pu-240	2.54E+00	4.405	11.19	7.07E-03	0.07910411	1.02E+03	1.14E+04	
15	1	T	LA00000057339	55GD TBO-D S/V	LA-CIN01.001	Pu-242	2.54E-02	253.165	6.43	1.17E-04	0.00075236	1.72E+03	1.11E+04	
15	5	B	LA00000068668	55GD	LA-MIN02-V.001	Pu-242	2.50E-02	253.165	6.329	1.17E-04	0.00074051	1.72E+03	1.09E+04	
13	3	B	LA00000068545	55GD	LA-MIN02-V.001	Pu-240	2.31E+00	4.405	10.18	7.07E-03	0.07194114	1.02E+03	1.04E+04	
			ANLE30N	RH 55GD TBO	ID-ANLE-S5000	Pu-240	2.16E+00	4.405	9.515	7.07E-03	0.06726964	1.02E+03	9.71E+03	RH Waste in Borehole #33
3	3	T	LA00000083715	55GD	LA-MHD01.001	Pu-240	2.09E+00	4.405	9.196	7.07E-03	0.06501486	1.02E+03	9.38E+03	
13	3	B	LA00000068548	55GD	LA-MIN02-V.001	Pu-240	1.97E+00	4.405	8.678	7.07E-03	0.0613524	1.02E+03	8.85E+03	
21	5	T	LA00000054271	55GD TBO-D S/V	LA-CIN01.001	Pu-242	8.72E-03	253.165	2.208	1.17E-04	0.00025829	1.72E+03	3.80E+03	
5	1	T	LA00000068605	55GD	LA-MIN02-V.001	Pu-242	7.94E-03	253.165	2.01	1.17E-04	0.00023519	1.72E+03	3.46E+03	
7	1	T	LA00000054096	55GD TBO-D S/V	LA-CIN01.001	Pu-242	6.65E-03	253.165	1.684	1.17E-04	0.00019698	1.72E+03	2.90E+03	
22	2	T	LA00000054260	55GD TBO-D S/V	LA-CIN01.001	Pu-242	6.36E-03	253.165	1.61	1.17E-04	0.00018839	1.72E+03	2.77E+03	
			1263	RH 30GD TBO	AERHDM	Pu-242	5.35E-03	253.165	1.354	1.17E-04	0.00015847	1.72E+03	2.33E+03	RH Waste in Borehole #37
16	4	T	LA00000068607	55GD	LA-MIN02-V.001	Pu-242	4.55E-03	253.165	1.152	1.17E-04	0.00013477	1.72E+03	1.98E+03	
10	4	T	LA00000068573	55GD	LA-MIN02-V.001	Pu-242	3.69E-03	253.165	0.934	1.17E-04	0.0001093	1.72E+03	1.61E+03	
12	6	T	LA00000057624	55GD TBO-D S/V	LA-CIN01.001	Am-241	2.65E+01	0.2915	7.725	1.140E-01	8.81E-01	1.18E+00	9.12E+00	
20	6	T	LA00000053779	55GD TBO-D S/V	LA-CIN01.001	Am-241	2.38E+01	0.2915	6.938	1.140E-01	7.91E-01	1.18E+00	8.19E+00	
20	2	T	LA00000057618	55GD TBO-D S/V	LA-CIN01.001	Am-241	2.31E+01	0.2915	6.734	1.140E-01	7.68E-01	1.18E+00	7.95E+00	
14	4	B	LA00000057645	55GD TBO-D S/V	LA-CIN01.001	Am-241	2.31E+01	0.2915	6.734	1.140E-01	7.68E-01	1.18E+00	7.95E+00	
7	1	T	LA00000061810	55GD TBO-D S/V	LA-CIN01.001	Am-241	2.18E+01	0.2915	6.355	1.140E-01	7.24E-01	1.18E+00	7.50E+00	
18	4	T	LA00000054034	55GD TBO-D S/V	LA-CIN01.001	Am-241	1.99E+01	0.2915	5.801	1.140E-01	6.61E-01	1.18E+00	6.85E+00	
10	6	B	LA00000068618	POP 12-in	LA-MIN02-V.001	Am-241	1.93E+01	0.2915	5.626	1.140E-01	6.41E-01	1.18E+00	6.64E+00	
11	5	T	BN10501798	SWB	BNINW216	Am-241	1.83E+01	0.2915	5.32	1.140E-01	6.06E-01	1.18E+00	6.28E+00	
16	6	T	LA00000054238	55GD TBO-D S/V	LA-CIN01.001	Am-241	1.80E+01	0.2915	5.247	1.140E-01	5.98E-01	1.18E+00	6.19E+00	
16	4	T	LA00000068670	55GD	LA-MIN02-V.001	Am-241	1.74E+01	0.2915	5.072	1.140E-01	5.78E-01	1.18E+00	5.99E+00	

Row	Col	Hgt	Cntr #	Cntr Type	Waste Stream	Nuclide	Act (Ci)	SpA (g/Ci)	Grams	DH (W/g)	Watts	SF Yield	Flux (n/s)	Comments
9	1	T	LA00000092974	55GD TBO	LA-MHD01.001	Pu-239	1.26E+01	16.129	203.2	1.93E-03	0.39222502	2.18E-02	4.43E+00	
2	2	T	LA00000092644	55GD TBO	LA-MHD01.001	Pu-239	1.20E+01	16.129	193.5	1.93E-03	0.37354764	2.18E-02	4.22E+00	
21	3	T	LA00000092777	55GD TBO	LA-MHD01.001	Pu-239	1.20E+01	16.129	193.5	1.93E-03	0.37354764	2.18E-02	4.22E+00	
4	4	T	LA00000066776	55GD TBO	LA-MHD01.001	Pu-239	1.19E+01	16.129	191.9	1.93E-03	0.37043474	2.18E-02	4.18E+00	
21	1	T	LA00000092840	55GD TBO	LA-MHD01.001	Pu-239	9.73E+00	16.129	156.9	1.93E-03	0.30288488	2.18E-02	3.42E+00	
3	3	T	LA00000083715	55GD	LA-MHD01.001	Pu-239	8.63E+00	16.129	139.2	1.93E-03	0.26869282	2.18E-02	3.03E+00	
10	2	T	LA00000067040	55GD	LA-MHD01.001	Pu-239	8.34E+00	16.129	134.5	1.93E-03	0.25961561	2.18E-02	2.93E+00	
15	5	M	LA00000067039	55GD	LA-MHD01.001	Pu-239	8.33E+00	16.129	134.4	1.93E-03	0.25930432	2.18E-02	2.93E+00	
13	3	M	LA00000066912	55GD	LA-MHD01.001	Pu-239	8.29E+00	16.129	133.7	1.93E-03	0.25805916	2.18E-02	2.91E+00	
10	4	T	LA00000068647	55GD	LA-MIN02-V.001	Pu-239	7.53E+00	16.129	121.5	1.93E-03	0.23440114	2.18E-02	2.65E+00	

Row	Col	Hgt	Cntr #	Cntr Type	Waste Stream	Nuclide	Act (Ci)	SpA (g/Ci)	Grams	Alpha Yield	# of Alphas	(α , n) yield	Flux (n/s)	Comments
2	4	B	SR57167702	SLB2	SR-W027-HBL-BOX	Pu-238	3.08E+02	0.05848	18.01	6.40E+11	1.15E+13	1.34E+04	2.41E+05	
5	3	T	BN10493493	SWB	BNS10.2	Pu-238	2.46E+02	0.05848	14.37	6.40E+11	9.20E+12	1.34E+04	1.93E+05	
2	6	B	WMAPSLB046	SLB2	SR-W027-HBL-BOX	Pu-238	1.88E+02	0.05848	10.99	6.40E+11	7.04E+12	1.34E+04	1.47E+05	
7	5	B	SR46029Z	SLB2	SR-MD-PAD1	Pu-238	1.61E+02	0.05848	9.415	6.40E+11	6.03E+12	1.34E+04	1.26E+05	
2	2	B	SR46021Z	SLB2	SR-MD-PAD1	Pu-238	1.61E+02	0.05848	9.415	6.40E+11	6.03E+12	1.34E+04	1.26E+05	
7	3	B	SR57170918	SLB2	SR-W027-HBL-BOX	Pu-238	1.52E+02	0.05848	8.889	6.40E+11	5.69E+12	1.34E+04	1.19E+05	
20	2	B	WMAPSLB007	SLB2	SR-W027-HBL-BOX	Pu-238	1.43E+02	0.05848	8.363	6.40E+11	5.35E+12	1.34E+04	1.12E+05	
12	6	T	LA00000057624	55GD TBO-D S/V	LA-CIN01.001	Am-241	2.65E+01	0.2915	7.725	1.30E+11	1.00E+12	2.69E+03	2.08E+04	
7	1	B	SR46019	SLB2	SR-MD-PAD1	Pu-238	1.29E+02	0.05848	7.544	6.40E+11	4.83E+12	1.34E+04	1.01E+05	
20	6	T	LA00000053779	55GD TBO-D S/V	LA-CIN01.001	Am-241	2.38E+01	0.2915	6.938	1.30E+11	9.02E+11	2.69E+03	1.87E+04	
20	2	T	LA00000057618	55GD TBO-D S/V	LA-CIN01.001	Am-241	2.31E+01	0.2915	6.734	1.30E+11	8.75E+11	2.69E+03	1.81E+04	
14	4	B	LA00000057645	55GD TBO-D S/V	LA-CIN01.001	Am-241	2.31E+01	0.2915	6.734	1.30E+11	8.75E+11	2.69E+03	1.81E+04	
7	1	T	LA00000061810	55GD TBO-D S/V	LA-CIN01.001	Am-241	2.18E+01	0.2915	6.355	1.30E+11	8.26E+11	2.69E+03	1.71E+04	
13	1	B	BN10493500	SWB	BNS10.2	Pu-238	1.04E+02	0.05848	6.082	6.40E+11	3.89E+12	1.34E+04	8.15E+04	
20	6	B	SR46020	SLB2	SR-MD-PAD1	Pu-238	1.03E+02	0.05848	6.023	6.40E+11	3.86E+12	1.34E+04	8.07E+04	
18	4	T	LA00000054034	55GD TBO-D S/V	LA-CIN01.001	Am-241	1.99E+01	0.2915	5.801	1.30E+11	7.54E+11	2.69E+03	1.56E+04	
10	6	B	LA00000068618	POP 12-in	LA-MIN02-V.001	Am-241	1.93E+01	0.2915	5.626	1.30E+11	7.31E+11	2.69E+03	1.51E+04	
11	5	T	BN10501798	SWB	BNINW216	Am-241	1.83E+01	0.2915	5.32	1.30E+11	6.92E+11	2.69E+03	1.43E+04	
16	6	T	LA00000054238	55GD TBO-D S/V	LA-CIN01.001	Am-241	1.80E+01	0.2915	5.247	1.30E+11	6.82E+11	2.69E+03	1.41E+04	
16	4	T	LA00000068670	55GD	LA-MIN02-V.001	Am-241	1.74E+01	0.2915	5.072	1.30E+11	6.59E+11	2.69E+03	1.36E+04	

Room 5

705

ppc

Panel 7
as of 2/3/14

bulkhead 444 is
91' from rib line

waste is 81'
from bulkhead



(16)
Room 6
1/25 filled
(9)

10'
dist = 69'



Room 7
16/50 filled