THE STATE OF WYOMING

JIM GERINGER
GOVERNOR

Department of Environmental Quality

250 Lincoln Street ● Lander, Wyoming 82520-2848 ● Fax (307) 332-7726

ABANDONED MINES	AIR QUALITY	LAND QUALITY	SOLID & HAZARDOUS WASTE	WATER QUALITY
(307) 332-5085	(307) 332-6755	(307) 332-3047	(307) 332-6924	(307) 332-3144

February 3, 1999

Mr. N. King Stablein, Acting Chief
Uranium Recovery Branch
Division of Waste Management
Office of Nuclear Material Safety
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

40-4492

RE: ANC Gas Hills Site, QA/QC data for Tailings Pile No.2 Radon Flux Test

Dear Mr. Stablein,

This letter is in response to Mr. Holonich's letter of September 1, 1998. Enclosed is a report from Ms. Sheryl Garling of Energy Laboratories which addresses the issues outlined in Mr. Holonich's letter. This report should be appended to the July 30, 1997 Radon Flux Report which was submitted to EPA and NRC on August 20, 1997. I apologize for the delay in responding.

If you or your staff have any questions, please feel free to contact me.

Sincerely,

Mark Moxley
LQD District II Supervisor

NLOS 1/1

Enclosure

cc: Rick Chancellor - DEQ-LQD Cheyenne

120095

9902120105 990203
PDR ADOCK 04004492
C PDR

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SAMPLE NARRATIVE

RECEIVED
JAN 13 199
LAND QUALITY DIV.
DIST. II

Date:	January 10, 1999
Client:	American Nuclear Corporation
Location:	Gas Hills, WY
Laboratory Method:	EPA Method 115
Method Name:	Large Area Activated Charcoal Canister (LAACC) Radon Flux Measurement
Sample Numbers:	97-34951 through 98-35082
Prepared By:	Sheryl A. Garling

The following Quality Assurance data should be forwarded to the USNRC, per their request for this additional information.

The following is the procedure performed by ELI for the LAACC measurement following Method 115.

Charcoal was transferred to all the collectors in the field prior to deployment.
LAACCs were set, date and time recorded, and sealed with tailings material from the vicinity of the LAACC location.

The LAACC collector units did not penetrate the tailings cover.

Each can was sealed with a minimum of two wraps of elastic electrical tape. ELI has previously performed leak tests on this system and the charcoal measurement was not compromised using this method of sealing.

The radon flux charcoal transfer/counting canisters were transported back to the laboratory for counting.

The LAACCs are constructed to the specifications as identified in document EPA 520/5-85-029, *Radon Flux Measurements On Gardinier And Royster Phosphogypsum Piles Near Tampa and Mulberry, Florida*. The collector gap between charcoal and surface of tailings is between ¼" to ½".

Standard laboratory practices were followed when counting the charcoal canisters:

- Counting efficiencies are recorded for the various standards, laboratory blanks, and equipment operation,
- Section 4.0 E of Method 115 states that the precision, accuracy, and completeness shall be within 10%, ±10%, and 85%, respectively, for samples measuring greater than 1.0 pCi/m^2 sec.
- Calculations for precision and accuracy follow, with actual calculations included in this report.

Calculation 1
Accuracy Calculation for Standards as identified by the USNRC:

$$\frac{\text{Measured} - \text{Actual}}{\text{Actual}}$$

Calculation 2
Precision Calculation as identified by the USNRC:
Known as Percent difference:

$$\frac{\text{Duplicate Count \#1} - \text{Duplicate Count \#2}}{\text{Average (Duplicate \#1, Duplicate \#2)}}$$

Calculation 3
Data Counting error 2-sigma as defined by USEPA Standard Operating Procedure for Radon-222 Measurement Using Charcoal Canisters EPA 520/5-87-005is calculated as follows:

@ 95% confidence,
Expressed in decimal percent, or multiply by 100 for %

$$\frac{2 \times \text{square root (Gross Counts + Background Counts)}}{\text{Gross Counts} - \text{Background Counts}}$$

Prepared By: Sheryl Gurley Date: 1-11-99

American Nuclear Corporation
January 10, 1999

Supplement to Large Area Activated Charcoal Canisters June 24, 1997 Report
Quality Assurance Calculations

Calculation 1 - Standard Accuracy	
Description	**Data**
Equipment Efficiency - cpm/dpm	0.00864
dpm/pCi	2.22
Count Time - minutes	5
Background - gross counts	97
Background - cpm	19.4
Standard 1 - pCi/can, actual	18210
Standard 2 - pCi/can, actual	36420
Standard 1 - average gross counts, measured	1768
Standard 2 - average gross counts, measured	3472
Standard 1 - average gross cpm, measured	353.6
Standard 2 - average gross cpm, measured	694.4
Standard 1 - average net cpm, measured	334.2
Standard 2 - average net cpm, measured	675
Standard 1 - average pCi/can, measured	17418
Standard 2 - average pCi/can, measured	35179
Standard 1 - (Measure-Actual)/Actual, %	-4.35
Standard 2 - (Measured-Actual)/Actual, %	-3.41

Calculation 2 - Precision			
Description	**Count Gross Counts**	**Duplicate Gross Counts**	**(Dup1-Dup2)/ Avg(Dup1&Dup2)**
Duplicate - 34970 - <0.5/<0.5 pCi/m2s	216	207	4.26
Duplicate - 34980 - <0.5/<0.5 pCi/m2s	241	230	4.67
Duplicate - 35010 - <0.5/<0.5 pCi/m2s	239	233	2.54
Average - % Difference			**3.82**

Calculation 3 - Data Counting Error		
Data Precision	**Data**	**Precision, %**
Background gross counts	97	
Count Time - minute	5	
35006 Data - 1.8 pCi/m2s, gross counts	2551	4.19
gross counts + background	2648	
gross counts - background	2454	
35036 Data - 1.1 pCi/m2s, gross counts	785	8.63
gross counts + background	882	
gross counts - background	688	

34951 — 35018
w/ dups

06/24/97

OON FLUX CALCULATIONS
ACC ACCUMULATION METHOD

QUALITY ASSURANCE REPORT

ACC-AVI PC

		SAMPLE ID	ORIGINAL pCi/l	MEASURED pCi/l	RECOVERY DECIMAL	PERCENT DIFFERENCE
TE MEASURED	06/23/97	115	0.2	0.2	1.0287	0.0287
ACC SET DATE	06/21/97	74	0.1	0.2	1.1172	0.1172
ACC END DATE	06/22/97	12	0.2	0.2	1.1043	0.1043
MBDA = RN222 DECAY	2.097E-06	21	0.2	0.2	1.0225	0.0225
ACC AREA m^2	0.0510	111	0.1	0.1	1.3233	0.3233
D COUNTS	1747	39	0.2	0.2	0.9848	-0.0152
ANDARD ACTIVITY	18210	50	0.2	0.2	0.8960	-0.1040
TECTOR EFFICIENCY	0.008643	255	0.2	0.2	0.9735	-0.0265
FACTOR d/s to pCi	0.037	244	0.2	0.2	0.9698	-0.0302
UNT TIME (min)	5	NO TEST	NO TEST	NO TEST	NO TEST	NO TEST
CKGROUND COUNTS	97	NO TEST	NO TEST	NO TEST	NO TEST	NO TEST
CKGROUND CPM	19.4	NO TEST	NO TEST	NO TEST	NO TEST	NO TEST
S OR MCA	MCA	NO TEST	NO TEST	NO TEST	NO TEST	NO TEST
ERAGE pCi Rn222	0.21	NO TEST	NO TEST	NO TEST	NO TEST	NO TEST
NIMUM VALUE	0.07	NO TEST	NO TEST	NO TEST	NO TEST	NO TEST
XIMUM VALUE	1.83					

INPUT LAACC ID	INPUT CAN ID	INPUT FIELD ID	INPUT ELI ID	INPUT GROSS COUNTS	CALC GROSS CPM	CALC NET CPM	CALC CAN ID	INPUT QC DATA	CALC pCi Rn222 m-2 s-1
11	28	206	34951	169	33.8	14	28		0.1
68	99	207	34952	226	45.2	26	99		0.1
63	52	208	34953	261	52.2	33	52		0.2
87	87	209	34954	138	27.6	8	87		0.1
62	119	210	34955	126	25.2	6	119		0.1
81	110	211	34956	280	56.0	37	110		0.2
67	97	212	34957	144	28.8	9	97		0.1
59	86	232	34958	413	82.6	63	86		0.3
35	96	231	34959	263	52.6	33	96		0.2
114	115	230	34960	349	69.8	50	115	OD1	0.2
40	43	229	34961	120	24.0	5	43		0.1
54	88	228	34962	325	65.0	46	88		0.2
36	117	227	34963	163	32.6	13	117		0.1
37	92	226	34964	144	28.8	9	92		0.1
74	95	225	34965	161	32.2	13	95		0.1
23	118	224	34966	247	49.4	30	118		0.2
26	98	223	34967	297	59.4	40	98		0.2
107	109	201	34968	240	48.0	29	109		0.2
30	2	202	34969	186	37.2	18	2		0.1
95	74	203	34970	216	43.2	24	74	OD2	0.1
61	3	204	34971	208	41.6	22	3		0.1
46	81	205	34972	454	90.8	71	81		0.3
4	80	213	34973	273	54.6	35	80		0.2
6	112	214	34974	198	39.6	20	112		0.1
25	8	215	34975	126	25.2	6	8		0.1
41	83	216	34976	453	90.6	71	83		0.3
78	70	217	34977	202	40.4	21	70		0.1
3	114	218	34978	242	48.4	29	114		0.2

all <0.5

STD 2
3451 > 3472
3492

STD 1
1738 > 1768
1799

BLK CPM
87 > 96
106

06/24/97

INPUT LAACC ID	INPUT CAN ID	INPUT FIELD ID	INPUT ELI ID	INPUT GROSS COUNTS	CALC GROSS CPM	CALC NET CPM	CALC CAN ID	INPUT QC DATA	CALC pCi Rn222 m-2 s-1
48	9	219	34979	312	62.4	43	9		0.2
92	12	220	34980	241	48.2	29	12	0D3	0.2
15	56	221	34981	676	135.2	116	56		0.4
22	120	243	34982	238	47.6	28	120		0.2
45	85	242	34983	489	97.8	78	85		0.3
21	55	241	34984	214	42.8	23	55		0.1
105	7	241	34985	243	48.6	29	7		0.2
5	105	240	34986	139	27.8	8	105		0.1
113	27	239	34987	126	25.2	6	27		0.1
58	108	238	34988	334	66.8	47	108		0.2
64	94	237	34989	332	66.4	47	94		0.2
49	21	236	34990	296	59.2	40	21	0D4	0.2
9	23	235	34991	445	89.0	70	23		0.3
27	100	234	34992	680	136.0	117	100		0.4
93	91	233	34993	567	113.4	94	91		0.4
111	32	255	34994	488	97.6	78	32		0.3
28	16	256	34995	236	47.2	28	16		0.2
47	20	256	34996	241	48.2	29	20		0.2
53	26	257	34997	221	44.2	25	26		0.1
97	113	258	34998	359	71.8	52	113		0.2
51	11	259	34999	310	62.0	43	11		0.2
2	111	260	35000	158	31.6	12	111	0D5	0.1
110	25	261	35001	219	43.8	24	25		0.1
71	107	222	35002	279	55.8	36	107		0.2
13	**75**	**244**	**35003**	**195**	**39.0**	**20**	**75**		**0.1**
91	42	245	35004	306	61.2	42	42		0.2
29	116	246	35005	212	42.4	23	116		0.1
33	33	247	35006	2551	510.2	491	33		1.8
65	78	248	35007	386	77.2	58	78		0.3
60	15	249	35008	225	45.0	26	15		0.2
32	45	250	35009	244	48.8	29	45		0.2
112	39	251	35010	239	47.8	28	39	0D6	0.2
77	82	252	35011	499	99.8	80	82		0.4
42	29	253	35012	456	91.2	72	29		0.3
109	10	254	35013	433	86.6	67	10		0.3
75	79	272	35014	466	93.2	74	79		0.3
34	51	271	35015	138	27.6	8	51		0.1
57	35	270	35016	199	39.8	20	35		0.1
31	48	269	35017	133	26.6	7	48		0.1
66	50	268	35018	246	49.2	30	50	0D7	0.2
114	115	230	34960	306	61.2	42	115	D1	0.2
95	74	203	34970	207	41.4	22	74	D2	0.2
92	12	220	34980	230	46.0	27	12	D3	0.2
49	21	236	34990	263	52.6	33	21	D4	0.2
2	111	260	35000	183	36.6	17	111	D5	0.1
112	39	251	35010	233	46.6	27	39	D6	0.2
66	50	268	35018	219	43.8	24	50	D7	0.2
76	237	10	34951		0.0	-19	237		<0.5
77	238	0Q	34951	16644	3328.8	3309	238		12.3
78	239	1Q	34951	320	64.0	45	239		0.2
79	240	1S	34951	432	86.4	67	240		0.3
80	244	3S	34951	298	59.6	40	244	0D9	0.2

<0.5 except where boxed

35019 – 35081
w/ TRIP BLANKS

06/24/97

ADON FLUX CALCULATIONS
IACC ACCUMULATION METHOD

QUALITY ASSURANCE REPORT

IACC-AVI PC2

		SAMPLE ID	ORIGINAL pCi/L	MEASURED pCi/L	RECOVERY DECIMAL	PERCENT DIFFERENCE
TE MEASURED	06/23/97	68	0.5 —	Error 8	Error 7	Error 7
IACC SET DATE	06/21/97	73	0.2	Error 8	Error 7	Error 7
ACC END DATE	06/22/97	31	0.6 —	Error 8	Error 7	Error 7
MBDA = RN222 DECAY	2.097E-06	14	0.3	Error 8	Error 7	Error 7
ACC AREA m^2	0.0510	Error 8	Error 8	Error 8	Error 7	Error 7
D COUNTS	805	Error 8	Error 8	Error 8	Error 7	Error 7
ANDARD ACTIVITY	18210	Error 8	Error 8	Error 8	Error 7	Error 7
TECTOR EFFICIENCY	0.003983	Error 8	Error 8	Error 8	Error 7	Error 7
FACTOR d/s to pCi	0.037	Error 8	Error 8	Error 8	Error 7	Error 7
UNT TIME (min)	5	Error 8	Error 8	Error 8	Error 7	Error 7
CKGROUND COUNTS	103	Error 8	Error 8	Error 8	Error 7	Error 7
CKGROUND CPM	20.6	Error 8	Error 8	Error 8	Error 7	Error 7
S OR MCA	total ave. with without SCA	Error 8	Error 8	Error 8	Error 7	Error 7
ERAGE pCi Rn222	0.3 0.3 ~~0.39~~ 0.38 (with / without)	Error 8	Error 8	Error 8	Error 7	Error 7
NIMUM VALUE	0.15	Error 8	Error 8	Error 8	Error 7	Error 7
XIMUM VALUE	1.05					

INPUT LAACC ID	INPUT CAN ID	INPUT FIELD ID	INPUT ELI ID	INPUT GROSS COUNTS	CALC GROSS CPM	CALC NET CPM	CALC CAN ID	INPUT QC DATA	CALC pCi Rn222 m-2 s-1
96	72	262	35019	167	33.4	13	72		0.2
44	13	263	35020	168	33.6	13	13		0.2
52	59	371	35021	125	25.0	4	59		0.2
56	84	281	35022	295	59.0	38	84		0.4
24	24	280	35023	143	28.6	8	24		0.2
72	34	279	35024	153	30.6	10	34		0.2
69	69	278	35025	163	32.6	12	69		0.2
98	71	277	35026	169	33.8	13	71		0.2
1	47	276	35027	352	70.4	50	47		0.5
99	68	275	35028	346	69.2	49	68	OD1	0.5
50	4	274	35029	376	75.2	55	4		0.5
12	41	273	35030	353	70.6	50	41		0.5
108	38	289	35031	367	73.4	53	38		0.5
79	17	290	35032	428	85.6	65	17		0.6
8	49	291	35033	482	96.4	76	49		0.7
43	6	292	35034	295	59.0	38	6		0.4
73	77	293	35035	362	72.4	52	77		0.5
20	37	267	35036	785	157.0	136	37		1.1
90	102	266	35037	159	31.8	11	102		0.2
55	73	265	35038	180	36.0	15	73	OD2	0.2
106	90	264	35039	109	21.8	1	90		0.1
14	44	282	35040	151	30.2	10	44		0.2
10	40	283	35041	130	26.0	5	40		0.2
38	106	284	35042	183	36.6	16	106		0.2
80	103	285	35043	270	54.0	33	103		0.4
86	46	286	35044	263	52.6	32	46		0.4
70	1	287	35045	255	51.0	30	1		0.3
85	65	288	35046	203	40.6	20	65		0.3

<05 except where boxed

06/24/97

INPUT LAACC ID	INPUT CAN ID	INPUT FIELD ID	INPUT ELI ID	INPUT GROSS COUNTS	CALC GROSS CPM	CALC NET CPM	CALC CAN ID	INPUT QC DATA	CALC pCi Rn222 m-2 s-1
94	31	BG	35047	435	87.0	66	31	OD3	0.6
82	93	294	35048	335	67.0	46	93		0.5
7	30	295	35049	153	30.6	10	30		0.2
39	5	296	35050	243	48.6	28	5		0.3
88	36	297	35051	194	38.8	18	36		0.3
84	19	297	35052	392	78.4	58	19		0.5
19	89	298	35053	456	91.2	71	89		0.6
17	22	299	35054	255	51.0	30	22		0.4
76	**18**	**300**	**35055**	**464**	**92.8**	**72**	**18**		**0.6**
18	14	370	35056	229	45.8	25	14	OD4	0.3
89	101	TP23	35057	492	98.4	78	101		0.7
1	*	*	35058	77	15.4	-5	*		<0.5
2	*	*	35059	121	24.2	4	*		0.2
3	*	*	35060	103	20.6	0	*		<0.5
4	*	*	35061	109	21.8	1	*		0.2
5	*	*	35062	99	19.8	-1	*		<0.5
6	*	*	35063	103	20.6	0	*		<0.5
7	*	*	35064	92	18.4	-2	*		<0.5
8	*	*	35065	82	16.4	-4	*		<0.5
9	*	*	35066	119	23.8	3	*		0.2
10	*	*	35067	94	18.8	-2	*		<0.5
11	*	*	35068	102	20.4	0	*		<0.5
12	*	*	35069	102	20.4	0	*		<0.5
13	*	*	35070	92	18.4	-2	*		<0.5
14	*	*	35071	81	16.2	-4	*		<0.5
15	*	*	35072	92	18.4	-2	*		<0.5
16	*	*	35073	109	21.8	1	*		0.2
17	*	*	35074	93	18.6	-2	*		<0.5
18	*	*	35075	74	14.8	-6	*		<0.5
19	*	*	35076	88	17.6	-3	*		<0.5
20	*	*	35077	93	18.6	-2	*		<0.5
21	*	*	35078	96	19.2	-1	*		<0.5
22	*	*	35079	94	18.8	-2	*		<0.5
23	*	*	35080	89	17.8	-3	*		<0.5
24	*	*	35081	87	17.4	-3	*		<0.5