CITIZENS MONITORING AND TECHNICAL ASSESSMENT - JUNE 2007

ANALYSIS OF RADIOCHEMICAL CONTAMINANTS IN LOS ALAMOS REGION BIOTA AND ENVIRONMENTAL MATERIALS AT THE PERIMETER OF THE LOS ALAMOS NATIONAL LABORATORY

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Executive Summary

- The Government Accountability Project (GAP) is a non-profit organization based in Washington, D.C. with a branch office in Seattle, Washington. GAP's Nuclear Oversight Program is based in the Seattle Office. GAP's website is www.whisteblower.org. Boston Chemical Data, Inc. is a privately-owned laboratory that specializes in environmental sampling and analysis. Boston Chemical Data, Inc. has posted the report and associated data at its website at www.labs.pro/gap.

- The samples were collected by Marco Kaltofen, of Boston Chemical Data, Inc., and Tom Carpenter, of GAP, from November 14 - 19, 2006. Eighty environmental and indoor samples were taken from homes, farm fields, plants, next to roads, in a park, from vacuum cleaners and in local businesses. Many of the samples were collected in cooperation with various organizations and people, including tribal governments and organizations, the State of New Mexico, the Los Alamos Monitor, Concerned Citizens for Nuclear Safety, the Embudo Valley Environmental Monitoring Group and many individual homeowners. The environmental samples were analyzed by Mr. Kaltofen, and some of the samples were sent for laboratory assay, using a high level of quality assurance. The lab work was conducted by Pace Analytical, Walter Miltz Laboratory.

Findings

- The study found that indoor dust samples had higher radiation levels than surrounding soils. Seven of the eight samples with the highest radiation levels were dusts. Dusts made up only 20 out of the total of 79 samples examined in this study. All six of the highest total alpha screening samples were dust samples.

- Residential dusts from the Picuris Pueblo and from the San Ildefonso Pueblo were among the more elevated radiation levels in the set of residential samples studied.

- Significant Plutonium 239/240 detections were found. Three of the test sites exceeded sediment reference values for Plutonium 239/240 cited by the New Mexico Department of Environment. These and other detections cited in this report were above laboratory uncertainty levels. Portrillo Canyon sediment slightly exceeded the reference value. A sample of wood ash from the San Ildefonso Pueblo was double the reference value (wood burning can concentrate existing radionuclides in the resulting ash). A soil sample from downtown Los Alamos was more than 200 times the reference value, at 2.86 pCi/g +/- 0.43 pCi/g. This sample was collected next to the parking lot of the Los Alamos Inn.

- Uranium 235 levels were very similar to those in a recently published New Mexico Environment Department report.

- Uranium 234 levels exceeded the reference value of 1.4 pCi/g at the San Ildefonso Pueblo (2.0 pCi/g), the NMED bathroom dust (1.64 pCi/g) and in Ancha Canyon (3.13 pCi/g).

- In a comparison of tree rings and in a lichen sample, the South Fork of Acid Canyon in the County of Los Alamos and a cedar juniper from Portrillo Canyon showed significant differences between unexposed and potentially exposed biota samples.

- The number of samples collected and analyzed annually by LANL and NMED on the LANL site is much larger than the number of samples collected in this study. This study serves to supplement, not to replace, the larger data set. GAP's sampling sites are uniformly from offsite and fence line locations, rather than from onsite locations or locations undergoing active remediation. These samples are materials which members of the public have routine contact. Offsite concentrations of radionuclides necessarily are below onsite radionuclide concentrations, since LANL is the source of the bulk of the uncontrolled contamination.

Implications of Study

- Overall, the findings of the study, particularly in dust samples and plant materials, suggest that efforts to reduce airborne transport of radionuclides are not as complete as those for sediments.

- Human exposure to these dusts is significant, as dusts are easily inhaled. Scanning electron microscopy of residential dusts collected by Boston Chemical Data found that the median dust particle size was between 12 and 14 microns, based on 27 samples. The median dust particle size means that they are more readily inhaled.

- For area residents, low offsite levels of radioactivity can translate into higher human health risk levels than onsite materials. Radioactive contaminants collect in residential dusts, and will remain there for long periods unless additional mitigation measures are put in place. LANL employees, who may also experience direct contact with onsite materials, can receive additional exposures from offsite materials.

Recommendations

- Further independent environmental sampling is needed in order to fully understand the off site exposure. Additional biological samples, such as outwash area evergreens, lichens, and crops should be targeted in the next phase of analyses. Lichens are an excellent sample specimen, as they do not receive inputs from contaminated ground, whereas deeper-rooted plants may receive both.

- Radionuclide movement via airborne particulates should be minimized, in the same fashion that previous studies have suggested that soil and sediment erosion prevention measures could reduce water-borne radionuclide movement, such as the NMED reports for the Los Alamos and Pueblo Canyon system.

- Investigation, cleanup and remediation activities should address the results of this study and provide more occupational and residential protections from exposure to LANL offsite contaminants.

Acknowledgements:

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Indoor Dusts and Environmental Materials The objective of this study was to compare levels of radioactivity between indoor dusts and environmental samples. Indoor dusts were collected from residential and workplace locations in the Los Alamos, New Mexico area. Sampling sites included Los Alamos, White Rock, San Ildefonso Pueblo, Picuris Pueblo and surrounding rural locations. Environmental samples were collected from areas known to have elevated radioactivity levels due to operations at the Los Alamos National Laboratory (LANL), as well as from areas reported to be outside the impact zone of the LANL facility. The materials sampled include sediments, biological material and ash.

Indoor dusts were collected in bulk from vacuum cleaner bags and from air handler filters found in appliances including space heaters, fans, and refrigerators. Dust accumulations from various sources collect fine particulates over extended time periods, allowing for a retrospective look at past airborne particulate content.

Figure 1 below is a magnified view of refrigerator dust with an 800 micron field width. The white particle's length is shown compared to the 150 micron, equal to 0.15 millimeters), long scale. Refrigerators collect airborne particulates in a greasy fibrous matrix on the active cooling coils, trapping potentially radioactive airborne particulates.

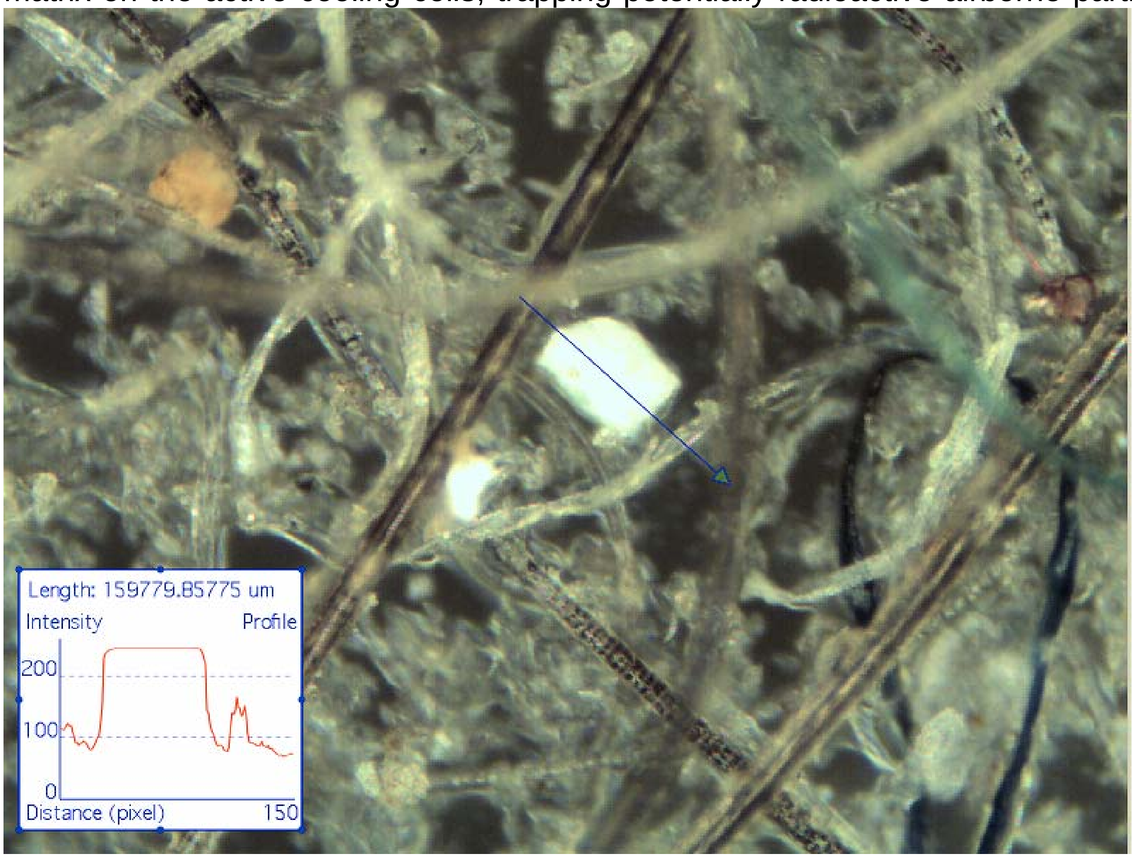
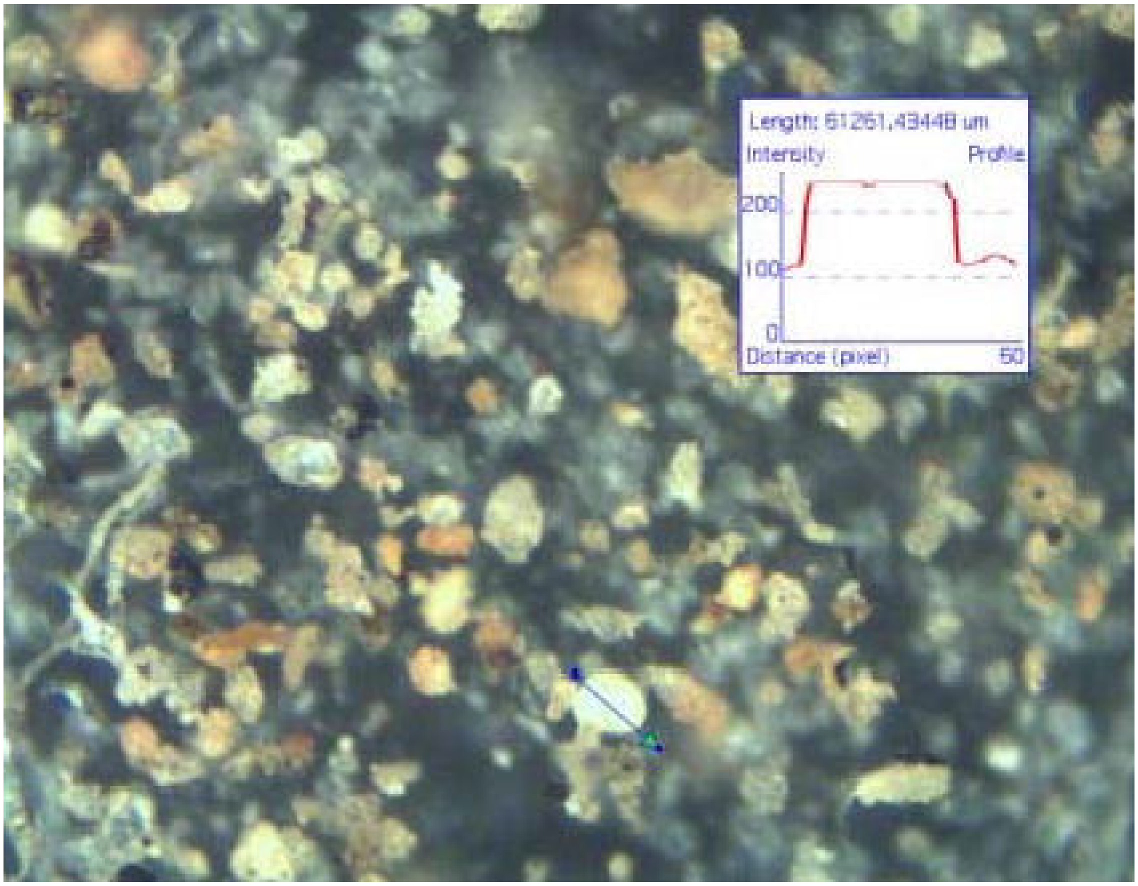


Figure 2 below is a magnified view of fan dust from a private residence, sample number LA0046. As in figure 1, the field width is 800 microns. The white biological artifact is under 50 microns in size. Fan dust samples in the study were generally less fibrous, with smaller median particle sizes. As with the refrigerator dust samples, the fan dust samples represent an accumulation of formerly airborne particulates over time.

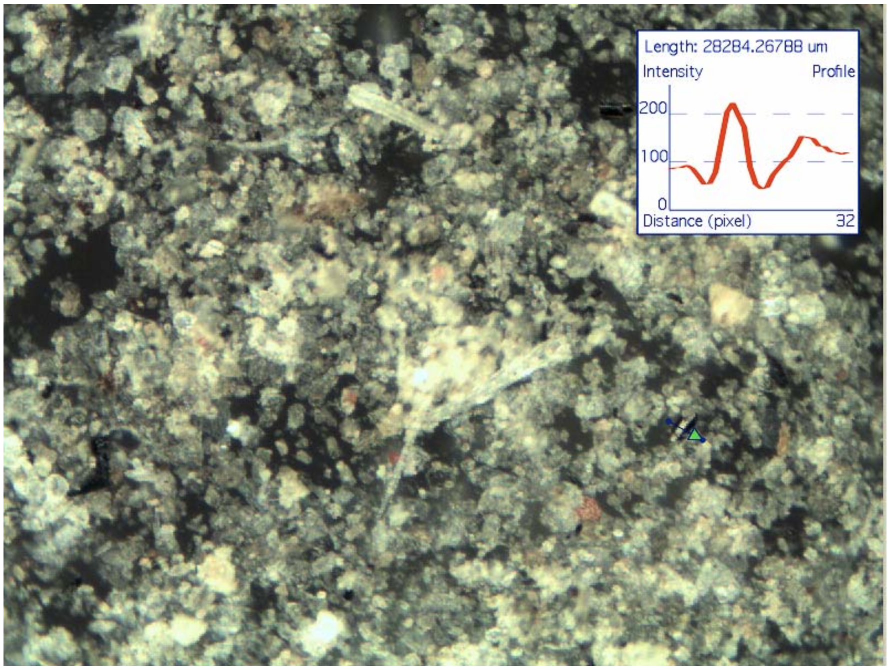


Vacuum cleaner bag dusts were collected at multiple locations. This type of dust is likely accumulated over a shorter period than appliance dusts. A large fraction of this type of dust originates from nearby outdoor soils (ref. 3).

As with other dust samples in the study area, particle sizes were generally small. The samples contained some larger grained material. In order to achieve comparability with existing studies and with other samples collected, vacuum cleaner bag samples were sieved to sizes below 250 microns, eliminating some material which was unlikely to have traveled as airborne particulates. Sediments were also sieved to the same size prior to analysis.

Material tracked-in on footwear is not necessarily eliminated by sieving, thus these samples include both airborne particulates and some outdoor soils. Appliance dusts may well include re-suspended tracked-in soils, but nevertheless still give a measure of airborne particulate-bound radiation exposures.

Figure 3 below, a sample of vacuum cleaner bag dust from a private residence, ID number LA0065, with an 800 micron field width.



Dust samples analyzed are representative of accumulations of airborne exposure. The dust samples selected in this study yield a summation of airborne particulates, house dusts, and tracked-in dusts, as well as dusts and ashes generated by indoor activities. Some of the samples were from residences with dust sources such as indoor wood burning, or from homes of agricultural workers.

Section 1 - White Rock, New Mexico Results

Samples at this location include one interior dust sample, a biota sample, and four sediment samples. The notable sample from this group is the interior dust sample collected from 134 State Road, at the New Mexico Environment Department, LANL Oversight Bureau offices. The sample is of fan dust from a washroom. While sediment and biota samples had elevated radiation levels compared to reference samples (see below), the dust levels were significantly elevated by these measures compared to references and local reference conditions.

These elevated dust levels may reflect bias related to dust particle size compared to soils and potentially the LANL-related activities of building occupants. This result may indicate the need to test other indoor dusts to look for similar results in the homes of others who work on the LANL site.

The measured activity from this interior dust sample was the highest of the entire study set. Total beta activity was measured at 397 disintegrations per minute per gram of material (DPM/g), alpha activity at 21 DPM/g, total activity at 30.5 microRem per hour per gram of material (uR/hr-g). Testing by PACE Analytical, Walter Miltz Laboratory found Strontium-90, Uranium-234, and Uranium-238 all reported in the 1 to 2 picoCuries per gram (pCi/g) range, and all of these exceeding the 2 sigma uncertainty range (see Cesium-137 in ref. 13)The total activity in the dust sample exceeded that in reference dust and bedrock samples. All total activity counts are performed with a screening alpha, beta, gamma probe calibrated to Nickel-63, and corrected to grams dry weight with a constant area. Total alpha and beta DPM were recorded using a Ludlum model 3030 alpha, beta two channel sample counter. Individual radionuclides were analyzed by Pace Analytical, Walter Miltz Laboratory of Madison, PA.

White Rock Area Samples by ID no.	Total Counts (blank corrected) nR/g-120s	alpha DPM/g	beta DPM/g
LA002 NMED fan dust	1,075	21	397
LA003 Parajito Canyon sediment	389	1	49
LA004 Parajito Canyon outwash soil	467	ND	51
LA005 Parajito Canyon purslane	98	ND	26
LA006 Parajito C. C. Juniper	157	1	85
LA007 Buey Canyon, creekbed	340	1.5	66
Bedrock Outcrop -basaltic	ND		
Urban reference dust	ND		
New Mexico reference dust	ND		
Sante Fe River sediment	242	ND	29
USA reference dusts avg.	ND		
Uncorrected detector blank	343	ND	ND

Other studies have found that interior surfaces will have dust loadings of about 1.3 grams per square meter, with levels reaching 20 grams per square meter in very dusty locations such as window channels and entryway floors (reference 7).

These numbers translate to loadings of 1.4 to 21 pCi/square meter of Strontium 90, 2.1 to 30 pCi/square meter for Cesium 137, 2.1 to 33 pCi/square meter for Uranium 234, and 1.5 to 23.6 pCi/square meter for Uranium 238.

Section 2 - San Ildefonso Pueblo and Picuris Pueblo

This sample set includes dusts and agricultural materials from San Ildefonso and Picuris Pueblos. These sample sets are more distant from LANL, and generally downstream of the impacted watershed. Dust samples generally yielded higher levels than non-dust samples.

The highest of the Strontium 90 result in the Boston Chemical Data Corporation (BCD) study came from a sample of dust on the Picuris Pueblo, yielding 1.54 pCi/g as Stronium-90 +/- 0.42 pCi/g. This sample yielded 70 % of the total counts per unit mass of sample as the dust from the NMED offices in White Rock.

Ashes from a residential interior wood-burning stove had detectable Plutonium 239/240 (0.024 pCi/g) and Strontium-90 (0.81 pCi/g). Both were about twice the 2 sigma uncertainty level.

A sample of refrigerator coil dust from the San Ildefonso Pueblo had 0.63 +/- 0.45 pCi/g of Strontium-90. More importantly, this sample yielded levels of alpha and beta disintegrations which were exceeded only by the dust sample from the NMED offices in White Rock. The sample was ranked 2nd of 77 total samples by both alpha (9 times the study average) and beta counts (3.6 times the study average).

Unlike the White Rock office sample, where employees are anticipated to come into contact with contaminated materials, there is no obvious similar explanation for the elevated radiation levels in this residential dust sample (Note: The NMED dust's radionuclide content may represent the results of particulate track-in by the building's occupants).

San Ildefonso Samples Screening results	Total Counts by nR/g-120s Blank corrected	alpha DPM/g	beta DPM/g
LA047 - Vacuum bag dusts - resid.	309	1	47
LA051 - Squash field top soil	344	3	67
LA052 - Dried tomatoes	243	ND	28
LA053 - Peppers, yellow hots	425	ND	77
LA054 - Peppers -bell	314	ND	68
LA055 - Fan & countertop dust	181	ND	105
LA056 - Refrigerator dust - resid.	217	15	231
LA057 - Topsoil	331	ND	41
LA058 - Vacuum bag dusts - resid.	256	1	63
LA059 - Clay	274	2	51
LA060 - Mica (silicate) clay	521	4	93
LA061 - Horse manure	80	ND	13
LA062 - Wood stove ash	195	ND	53
LA063 - Cow manure	93	ND	91
LA064 - Volcanic ash	446	ND	81

LA065 - Vacuum bag dusts - resid.	146		ND	12
LA072 - Sediment	155		1	55

Picuris Samples

LA073 - Vacuum bag dusts - resid.		181	7	79
LA074 - Attic dust		102	ND	48
LA075 - Wood ash		203	ND	50
LA076 - Bulk dust - residential		217	ND	41
LA077 - Bulk dust - residential		757	2	129
LA078 - Bulk dust - residential		146	1	32
LA079 - apples		128	ND	108

Additional analyses were performed by PACE Analytical in order to follow up on the initial screening results and to identify which radionuclides were the source of the elevated total radioactivity results.

Additional Laboratory Results in pCi/g:

LA051 - soil 0.008 +/-0.005 Pu239/240
LA056 - dust 0.63 +/- 0.45 Sr90
LA060 - clay 0.005 +/-0.004 Pu239/240 LA062 - ash 0.026 +/-0.014 Pu239/240, 0.81 +/-0.48 Sr90
LA064 - ash 0.074 +/-0.050 U235, 2.00 +/- 0.442 U234, 1.94 +/- 0.43 U238 LA077 - dust 1.54 +/- 0.42 Sr90 *****
LA077 - dust 0.080 +/-0.057 U235, 1.21 +/- 0.311 U234, 0.256 +/-0.109 U238

Section 3 - Los Alamos Canyons and Watershed

Samples from the Los Alamos area watershed and its canyons were collected from Ancho, Water, Sandia, Mortendad, Portrillo, and Los Alamos Canyons.

For comparison, those LANL data which were significantly above background for many of these same sites are listed in the Maps and Notes section (Source: Los Alamos National Laboratory 2005 Environmental Surveillance Report, http://www.lanl.gov/environment/eco/reports.shtml. These represent only the high values among a much larger set of LANL data).

Watershed/Canyons Samples Screening results	Total Counts by nR/g-120s Blank corrected	alpha DPM/g	beta DPM/g
LA008 - Portrillo C. sed. @ Rte. 4	470	3	68
LA028 - Soil - Tech Area 2/41	168	ND	32
LA029 - Frijoles bulk indoor dust	168	ND	52
LA030 - Frijoles C. soil	415	2	35
LA031 - Frijoles Ridgetop soil	367	1	59
LA032 - Jemez Ridge	105	3	14
LA033 - Natural fire debris	168	ND	86
LA034 - Rte. 4 parking lot soil	344	1	64
LA035 - Rte. 4 white tree fungus	124	ND	85
LA044 - Los Al. C. juniper berries	159	ND	51
LA045 - Los Al. C. sediment	384	1	29
LA048 - Mortandad C. Juniper	80	1	23
LA049 - Mortandad C. Sage	115	ND	60
LA050 - Mortandad C. Sediment	569	2.5	58
LA066 - Ancho C. Juniper	98	ND	29
LA067 - Ancho C. @ Rte. 4 sed.	687	2	79
LA068 - Water C. Sediment	164	1	69
LA069 - Mortandad C. Sage	120	ND	57
LA070 - Sandia C. Sediment	309	1	48
LA071 - Sandia C. Juniper	27	ND	54

Additional Laboratory Results in pCi/g:

LA008 - sed. 0.088 +/-0.060 U235, 1.03 +/- 0.274 U234, 0.967 +/-0.261 U238
LA030 - soil 1.13 +/- 0.301 U234, ND U235, 1.54 +/-0.382 U238
LA033 - ash ND U235, 0.477 +/-0.145 U234, 0.426 +/-0.133 U238
LA050 - sed. 0.118 +/-0.062 U235, 1.38 +/- 0.30 U234, 0.948 +/- 0.237 U238
LA067 - sed. 0.125 +/-0.070 U235, 3.13 +/- 0.668 U234, 1.86 +/- 0.428 U238
LA067 - sed. 0.006 +/-0.004 Pu239/240

Section 4 - Los Alamos & Santa Fe Proper

A total of 25 samples were collected from within the County or Town of Los Alamos, including 4 samples from the City of Santa Fe. The 25 samples include 11 sediment and biota samples from the South Fork of Acid Canyon, 7 dust samples, 3 biota samples, and 6 soil and sediment samples beyond those taken from the South Fork of Acid Canyon.

SOUTH FORK OF ACID CANYON - The South Fork of Acid Canyon samples were taken from the stream bed and from surrounding vegetation. Total alpha counts ranged from ND (in wood samples) to 4 DPM/g in a sample of dry moss. Total beta counts ranged from 13 (in wood) to 79 DPM/g in lichen.

The Acid Canyon wood samples were from a fallen tree in the bank of Acid Canyon, near the former radioactive effluent outfall location at Technical Area 1. The wood was cross-sectioned and divided into heartwood, inner sapwood, and outer sapwood samples, the heartwood being the oldest, and the outer sapwood being the newest wood material. The following screening values were noted in these three samples.

Sample	Total Counts blank cor.'d	Alpha DPM/g	Beta DPM/g	Approx. dates *
Heartwood	0	ND	13	pre-1911
Inner sapwood	81	ND	72	1961 to 1937
Outer sapwood	67	3	36	pre-2006 to 1978

The values are consistent with periods of no added radionuclide content in the oldest period of wood-formation, followed by accumulation of beta emitters, and finally alpha emitters. Strontium 90 is a common source of beta emissions. Alpha emitters include Cesium 137, Plutonium and others. Based on these screening values, there appear to be significant differences between differing portions of the tree's cross-section. Future sampling events should include more tree cross-sections for analysis.

Above: Location of wood samples in fallen tree cross section.

- Dates are approximate based on ring counts and are provided for conceptual purposes only, as the date of tree fall is unknown.

DOWNTOWN - Soils in a publicly-accessible portion of Downtown Los Alamos were found to have the highest Plutonium 239/240 of the entire study sample set, at 2.86 pCi/g +/- 0.43 pCi/g. This value is more than two orders of magnitude above the expected value. Interestingly, other samples did have higher alpha DPM values per gram, but were not among the samples originally targeted for direct Plutonium 239/240 analysis.

DUSTS - The residential and commercial building dust samples showed significant variation based on location sampled. The highest total counts, alpha and beta DPM were found in a commercial building dust sample just East of Los Alamos (LA023, 2.3 uR/g-120s, 10 DPM, and 145 DPM respectively).

Los Alamos/Santa Fe Samples Screening results	Total Counts by nR/g-120s Blank corrected	alpha DPM/g	beta DPM/g
LA001 - Santa Fe River bed	242	ND	29
LA009 - Acid Canyon lichen	371	1	54
LA010 - Acid Canyon moss	213	4	77
LA011 - Acid Canyon lichen	252	2	33
LA012 - Acid Canyon heartwood	ND	ND	13
LA013 - Acid Canyon middle wood	81	ND	72
LA014 - Acid Canyon sapwood	67	3	36
LA015 - Acid Canyon lichen	239	3	79
LA016 - Los Alamos vac. bag dust	174	1	51
LA018 - Home - refrigerator dust	181	ND	67
LA019 - Residence - vac. bag dust	313	2	52
LA020 - soil from LA019 location	133	1	11
LA021 - Yew Los Alamos fmr. gate	27	ND	58
LA023 - Los Alamos - bath fan dust	1,050	1	145
LA024 - Santa Fe -heater duct dust	230	8	123
LA025 - Residence - bath fan dust	137	5	86
LA026 - Fenceline soil	433	3	64
LA027 - Fenceline animal scat	133	ND	15
LA036 - Los Alamos - vac. bag dust	195	1	35
LA037 - Acid Canyon downstream sed.	402	1	40
LA038 - 20 ft. upstream of LA037	380	1	54
LA039 - 20 ft. downstream of LA037	287	1	63
LA041 - berries	120	ND	12
LA042 - soil 0.5 ft. bgs	300	1	53
LA043 - soil - surface	336	ND	43
LA046 - Santa Fe air filter archived	133	2	65
Instrument Blank	NA	ND	ND

Additional Los Alamos/Santa Fe Sample Laboratory Results in pCi/g:

LA016 - dust 0.28 +/- 0.20 Sr90
LA026 - soil 2.83 +/- 0.43 Pu239/240
LA026 - soil 0.075 +/-0.067 U235, 1.57 +/- 0.422 U234, 1.52 +/- 0.413 U238
LA036 - dust 0.24 +/- 0.19 Sr90

Section 5 - Reference Data and Los Alamos Study Results

Radiation levels detected in this sample set have not generally been converted into doses. However, some comparisons help put potential exposures into perspective. For one of our higher level samples, the dust found at the NMED office in White Rock, we assumed a 200 day per year exposure at 8 hours per working day. This translates into an annual exposure of just over 48 millirems per year/per gram of dust.

The site of radiation exposure can be as important as the quantity of exposure. For dusts, the site of exposure is likely to be the respiratory tract as well as the digestive tract. Inhalation of dust is likely as the dust sample itself would have had to travel by air to become trapped on the intake vent, from whence the sample was collected. Digestive system exposures are possible if dusts are ingested from hand-to-mouth activity.

Assuming the same number of exposure hours as the example above, (200 days at 8 hours per day), and further that respiration rates are at 0.45 cubic meters per hour, yields an annual air intake of 720 cubic meters per person. Residential indoor air contains 10 to 100 micrograms/cubic meter of respirable particulates. For example, airport waiting areas, conference center meeting rooms, and bars have been found to contain levels greater than 500 mcg/cubic meter (reference 8).

Using the 100 mcg/cubic meter figure, respiratory dust intake is 0.072 grams per year. At 500 mcg/cubic meter, dust intake is 0.36 grams per year. Using the higher figure and assuming conservative cumulative exposure, in three years one would have breathed in more than a gram of this dust, and would experience a 51 millirem per year dose rate.

This example assumes no radioactive decay, and that no dust, or the radionuclide burden in the dust, is cleared from the body. In fact there will be some decay and clearance, so the true cumulative exposure number will be lower. Average medical radiation exposures are about 54 millirem per year/per person, the exposure to dusts at this location results in a measurable increased radiation dose, which is significant compared to other typical exposures for the general population.

LANL calculates that the 2005 maximum individual annual radiation dose from onsite activities is about 6.5 millirem (vs. 1.68 in 2004, a 280% increase - see reference 4). It would be useful to recalculate this dose using New Mexico State workers' indoor dust exposures, as New Mexico State workers could exceed this level with quite modest dust levels of 64 mcg/cubic meter in office air.

For comparison, historic nuclear testing adds 2 mrem per capita. Nuclear power plants generally add about a millirem per year, cosmic rays add 27 millirems per year. The total from all sources is about 360 mrem per year per person, but this is mostly from radon gas, which varies considerably per person (reference 9).

In the region around LANL, the 2005 average combined dose to the 280,000 people within 80 kilometers of Los Alamos is 2.46 person-rems, a 46% increase over the 2004 total population dose.

This additional dose is incomplete, as the number of offsite investigations is limited. For example, LANL collected only two soil samples and no indoor dust samples on the San Ildefonso Pueblo. This is a fairly small number for producing a radiation exposure dose estimate, especially since LANL uses average background plus three standard deviations as reference level. With small sample sets, standard deviations rise, and it is more difficult to detect increases in exposure.

Section 6 - Summary and Future Follow up

6.1 - Indoor dust samples had higher radiation levels than surrounding soils. Seven of the eight samples with the highest radiation levels were dusts. Dusts made up only 20 out of the total of 79 samples examined in this study. All six of the highest total alpha screening samples were dust samples.

6.2 - Human exposure to these dusts is significant, as dusts are fine and respirable. Scanning electron microscopy of residential dusts collected by Boston Chemical Data found that the median dust particle size was between 12 and 14 microns, based on 27 samples.

6.3 - Residential dusts from the Picuris Pueblo and from the San Ildefonso Pueblo were among the more elevated radiation levels in the set of residential samples studied.

6.4 - Significant Plutonium 239/240 detections were found. Three of the test sites exceeded sediment reference values (0.013 pCi/g) for Plutonium 239/240 cited by the New Mexico Department of Environment. These and other detections cited in this section, were above laboratory uncertainty levels (reference 10).

Portrillo Canyon sediment slightly exceeded the reference value. A sample of wood ash from the San Ildefonso Pueblo was double the reference value (wood burning can concentrate existing radionuclides in the resulting ash). A soil sample from downtown Los Alamos was more than 200 times the reference value, at 2.86 pCi/g +/- 0.43 pCi/g. The sample was located at N 35 52.706 W 106 18.241.

6.5 - Uranium 235 levels were very similar to those in the NMED report, with a maximum of 0.125 pCi/g for Ancha Canyon in the BCD study versus 0.126 pCi/g in the NMED Ancha Canyon maximum sample. A BCD study sample also found a similarly elevated level of 0.118 pCi/g of Uranium 235 in Mortandad Canyon surficial sediment. The NMED reference level was 0.07 pCi/g.

6.6 - Uranium 234 levels exceeded the reference value of 1.4 pCi/g at the San Ildefonso Pueblo (2.0 pCi/g), the NMED bathroom dust (1.64 pCi/g) and in Ancha Canyon (3.13 pCi/g).

Testing results released on May 18, 2007 by the New Mexico Environment Department showed that, "239/240 plutonium was the most persistent radionuclide found in terraces downstream of LANL. By far, the largest concentrations were found at the Cañada Ancha site followed by the Frijoles site, and then the Water Canyon site. Elevated 137cesium and uranium isotope concentrations were also found at Cañada Ancha, followed by the Frijoles Site. Strontium-90 was found to be elevated at the Cañada Ancha site and 241americium was elevated at the Frijoles site." The NMED study found that contaminant measurements at the Pajarito and Rio Grande sites were below background references (reference 10).

6.7 – The South Fork of Acid Canyon in the Town of Los Alamos and a cedar juniper from Portrillo Canyon showed significant differences between unexposed and potentially exposed biota samples, particularly in a comparison of tree rings and in a lichen sample. Additional biological samples such as outwash no area evergreens, lichens, and crops should be targeted in the next phase of analysis. Lichens are a good target, as they do not receive inputs from contaminated ground, whereas deeper-rooted plants may receive both.

6.8 - Radionuclide movement via airborne particulates should be minimized in the same fashion that previous studies have suggested that soil and sediment erosion prevention measures could reduce water-borne radionuclide movement (ref. 11).

The number of samples collected and analyzed by LANL and NMED on the LANL site is much larger than the number of samples collected in this study. This study serves to supplement, not to replace, the larger data set. BCD's sampling sites are uniformly from offsite and fence line locations, rather than from onsite locations or locations undergoing active remediation. These samples are materials which members of the public have routine contact. Offsite concentrations of radionuclides necessarily are below onsite radionuclide concentrations, since LANL is the source of the bulk of the uncontrolled contamination.

Overall, the findings of BCD's study, particularly in dust samples and plant materials, suggest that efforts to reduce airborne transport of radionuclides are not as complete as those for sediments. Future sampling efforts should concentrate on tree ring, dust, residential ash, and food chain samples. For area residents, low offsite levels of radioactivity can translate into higher human health risk levels than onsite materials. LANL employees, who may also experience direct contact with onsite materials, can receive additional exposures from offsite materials.

Radioactive contaminants remain in residential dusts, and will remain there for long periods unless additional mitigation measures are put in place. Investigation, cleanup and remediation activities should address this issue.

References:

Additional data and laboratory test results are available for free download at: www.labs.pro/gap

1) CITIZENS MONITORING AND TECHNICAL ASSESSMENT - ANALYSIS OF CHEMICAL CONTAMINANTS IN HANFORD REACH BIOTA AND ENVIRONMENTAL MATERIALS AT THE PERIMETER OF THE HANFORD NUCLEAR RESERVATION AND ON THE COLUMBIA RIVER, Marco Kaltofen, Boston Chemical Data Corp., url: www.labs.pro, Tom Carpenter, Government Accountability Project, url: www.whistleblower.org, June 2005

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3) Agency for Toxic Substances and Disease Registry, Health Consultation, Chestnut Street Property near Abex Lead Site, Portsmouth, Virgina, Background and Statement of Issues. June 5, 1998

4) Environmental Surveillance at Los Alamos During 2005, Ex. Sum. p.7, LA14304-ENV

5) Attics as Archives for House Infiltrating Pollutants: Trace Elements and Pesticides in Attic Dust and Soil from Southern Nevada and Utah, James V. Cizdziela, Vernon F. Hodge, Environmental Science and Health Program 199, University of Nevada Reno, Reno, NV 89557-0187, USA, Department of Chemistry, University of Nevada Las Vegas, 4505 Maryland Pkwy, Las Vegas, NV 89154-4003, USA , Microchemical Journal 64 2000 85 92

6) Use of Olive Oil for Soil Extraction and Ultraviolet Degradation of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans. Pirjo Isosaari, Environmental Science and Technology 2001, 35, 1259-1265.

7) Dust: A Metric for Use in Residential and Building Exposure Assessment and Source Characterization, Paul J. Lioy, Natalie C.G. Freeman,1and James R. Millette, Environmental and Occupational Sciences Institute, University of Medicine and Dentistry of New Jersey-Robert Wood Johnson Medical School, Piscataway, New Jersey, USA; 2MVA, Inc., Norcross, Georgia, USA

8) AAO-HNS, American Academy of Otolaryngology, Head and Neck Surgery, Indoor Air Pollution and Health, Environment Committee article, Steven T. Kmucha, MD, MS, Chair, http://www.entnet.org/education/resources/airpollution.cfm

"The current EPA standard is 75 mcg/m3. The 24 hour EPA maximum allowable is 265mcg/m3. The average home level of particulates is 10-100mcg/m3. Airport waiting areas, conference center meeting rooms, and bars have been found to have levels greater than 500mcg/m3."

9) . Stephen Cass and Corrina Wu, *Discover: Science, Technology, and the Future,* June 2007, p. 76 (general science publication)

10) *Distribution of Radionuclides in Northern Rio Grande Fluvial Deposits near Los Alamos National Laboratory, New Mexico,* David Englert, Michael Dale, Kim Granzow, and Richard Mayer, Department of Energy Oversight Bureau New Mexico Environment Department, 2905 Rodeo Park Drive East Santa Fe, New Mexico 87505, April 2007

11) *Post Cerro Grande Fire Channel Morphology in Lower Pueblo Canyon, Reach P-4 West: and Storm Water Transport of Plutonium 239/240 in Suspended Sediments, Los Alamos County, New Mexico*, by Dave Englert, Ralph Ford-Schmid, and Kenny, Department of Energy Oversight Bureau New Mexico Environment Department, October 2004

12) Map of sample locations prepared by Xiaoxiao Peng for the Government Accountability Project, Seattle, WA, May 2007, www.whistleblower.org

13) Pace Analytical, Laboratory test data, Walter Miltz Laboratory, method PGHR-023-B, Cs137 detected above MDL but below PQL. Feb. 2, 2007.

Maps and Notes

Following page - The first of two site photographs (top photo) is from the boundary of the LANL facility, illustrating the lack of physical access to certain washes and other locations. Some of these locations would be likely to have generated radionuclide levels above those cited in this study.

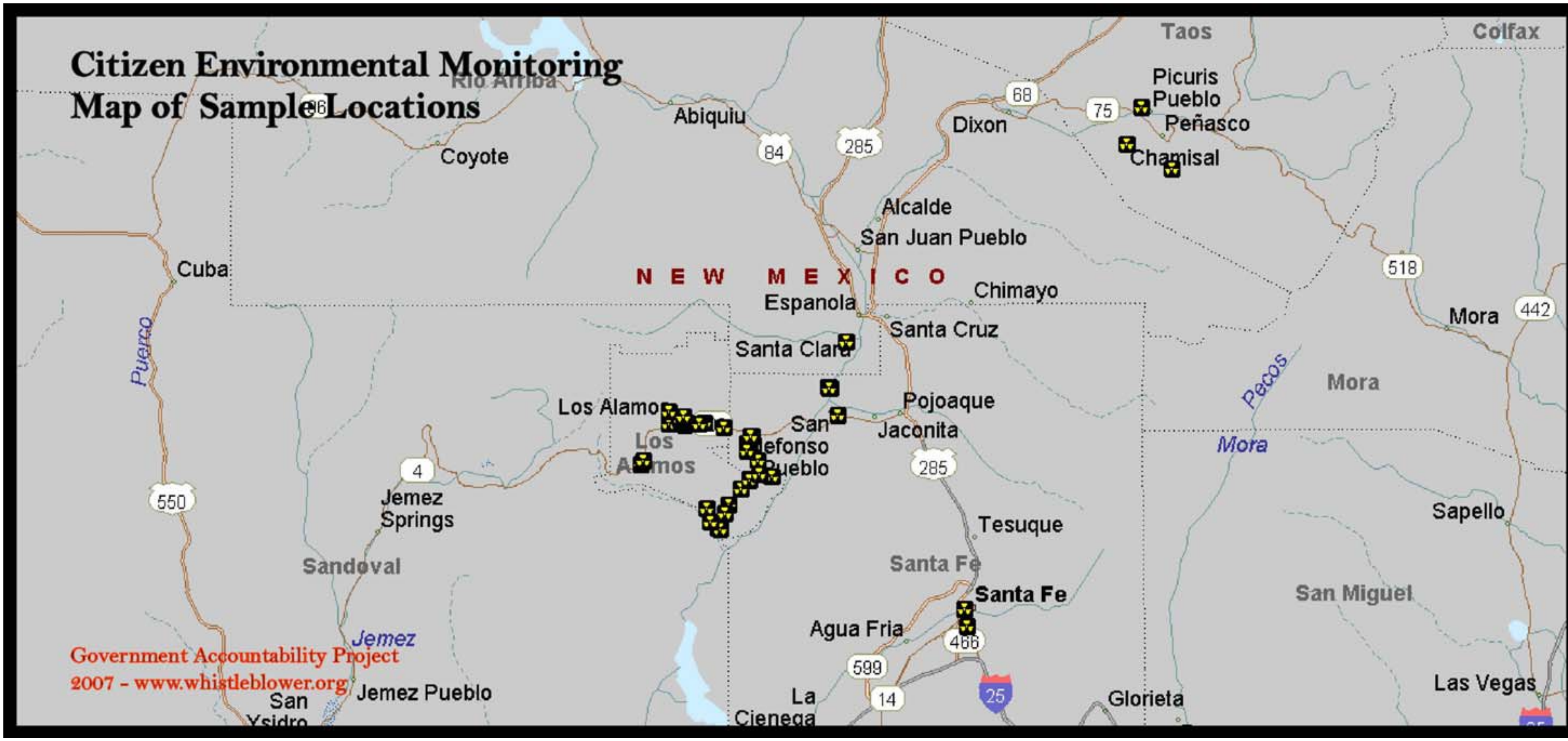
The lower photo is a typical depiction of the semiarid landscape with varying degrees of vegetation available to reduce wind erosion of surface soils and sediments, both of which contribute to the formation of airborne particulates.

This view is the location from which sample LA057 was collected.

Second page following - Map of the sampling locus (See reference 12). Produced by Xiaoxiao Peng, GAP 2007.

For additional data including GIS fields, original laboratory analyses, and screening data, please see www.labs.pro/gap.


No Trespassing
United States
Department Of Energy


Citizen Environmental Monitoring
Map of Sample Locations
Government Accountability Project
2007 - www.whistleblower.org
Taos
Colfax
Rio Arriba
Abiquiu
Coyote
Cuba
Puerco
550
96
84
285
68
75
Dixon
Picuris
Pueblo
Peñasco
Chamisal
Alcalde
San Juan Pueblo
518
Mora
442
N E W M E X I C O
Espanola
Chimayo
Santa Clara
Santa Cruz
Pecos
Mora
Los Alamos
Los
Alamos
San
Ildefonso
Pueblo
Pojoaque
Jaconita
285
4
Jemez
Springs
Sandoval
Tesuque
Santa Fe
Santa Fe
San Miguel
Sapello
Agua Fria
466
599
14
25
Jemez
Jemez Pueblo
San
Ysidro
La
Cienega
Glorieta
Las Vegas

Radionuclide Concentrations Above Background Levels - 2005
LANL Environmental Surveillance Report, Table S6-5.

Location Name	Date	Analyte	Std Result	Std Uncert
DP above Los Alamos Canyon	7/7/05	Cs-137	1.39	0.0585
Mortandad west of GS-1	7/11/05	Cs-137	0.792	0.0535
Mortandad below Effluent Canyon	7/11/05	Cs-137	10.6	0.436
Mortandad at MCO-8.5	7/11/05	Cs-137	2.63	0.122
Pajarito above SR-4	7/5/05	Cs-137	5.87	0.249
Pajarito above SR-4	7/5/05	Cs-137	3.91	0.179
Acid above Pueblo	7/6/05	Pu-238	0.0461	0.0159
Mortandad west of GS-1	7/11/05	Pu-238	0.282	0.0337
Mortandad below Effluent Canyon	7/11/05	Pu-238	3.06	0.171
Mortandad at MCO-8.5	7/11/05	Pu-238	0.845	0.0606
MDA G-8	7/13/05	Pu-238	0.233	0.0275
MDA G-6 Retention Pond Lower	7/13/05	Pu-238	0.0509	0.0121
MDA G-7	7/19/05	Pu-238	0.133	0.0217
Rio Grande at Otowi Upper (bank)	7/27/05	Pu-239,240	0.0894	0.0203
Cochiti Upper	8/3/05	Pu-239,240	0.0311	0.008
Cochiti Middle	8/3/05	Pu-239,240	0.0279	0.00766
Guaje Canyon	7/26/05	Pu-239,240	0.0548	0.0149
Guaje above Rendija	7/26/05	Pu-239,240	0.0508	0.0162
Acid above Pueblo	7/6/05	Pu-239,240	12.5	0.477
Hamilton Bend Spring	7/6/05	Pu-239,240	1.98	0.102
Hamilton Bend Spring	7/6/05	Pu-239,240	1.99	0.103
Pueblo above SR-502	7/6/05	Pu-239,240	0.3	0.0307
Los Alamos above DP Canyon	7/7/05	Pu-239,240	0.261	0.0326
DP above Los Alamos Canyon	7/7/05	Pu-239,240	0.236	0.0278
Los Alamos above SR-4	7/7/05	Pu-239,240	0.138	0.0218
Mortandad west of GS-1	7/11/05	Pu-239,240	0.163	0.0243
Mortandad below Effluent Canyon	7/11/05	Pu-239,240	5.56	0.289
Mortandad at MCO-8.5	7/11/05	Pu-239,240	2.98	0.163
Mortandad at SR-4 (A-9)	7/27/05	Pu-239,240	0.0474	0.0224
MDA G-8	7/13/05	Pu-239,240	1.18	0.0717
Twomile above SR-501	6/28/05	Pu-239,240	0.0252	0.00747
Twomile above SR-501	6/28/05	Pu-239,240	0.0356	0.00709
Pajarito below SR-501	6/28/05	Pu-239,240	0.0274	0.00783
MDA G-6 U West	7/13/05	Pu-239,240	0.076	0.0157
MDA G-6 U West	7/13/05	Pu-239,240	0.102	0.0172
MDA G-6 Retention Pond Lower	7/13/05	Pu-239,240	0.0621	0.014
MDA G-7	7/19/05	Pu-239,240	0.737	0.0548
Pajarito above SR-4	7/5/05	Pu-239,240	0.174	0.0187
Pajarito above SR-4	7/5/05	Pu-239,240	0.202	0.0192
Canon de Valle above SR-501	6/28/05	Pu-239,240	0.0309	0.00952
Sandia above SR-4	6/28/05	U-234	2.71	0.169
Sandia above SR-4	6/28/05	U-238	2.66	0.166

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