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April 5, 2000

Mr. Thomas Essig
Branch Chief
U.S. Nuclear Regulatory Commission
Uranium Recovery Branch
Division of Waste Management
Mail Stop T7J8
Rockville, MD 20850

Re: Annual ALARA Review, Smith Ranch Facility
License SUA-1548
Docket 40-8964

Dear Mr. Essig:

Attached, in accordance with license condition #12.9 of the above referenced license, is the annual ALARA review for the Smith Ranch Facility. The audit was conducted for calendar year 1999 on April 5, 2000.

Paul Goranson, Manager Radiation Safety, Regulatory Compliance and Licensing, conducted the annual ALARA audit on April 5, 2000. The results of the ALARA audit were presented by John McCarthy (RSO) to ALARA committee members Bill Ferdinand (General Manager), Ken Holman (Radiation Safety Technician), John Cash (Supervisor, Environmental & Regulatory Affairs), Pat Drummond (Manager, Plant Operations), Steve Hatten (Manager, Wellfield Operations), Terry Warner (Manager of Administration and Personnel), and Skip Deaderick (Chief Geologist). Copies of the ALARA audit have also been distributed to corporate management for their review. The summary of the ALARA audit is attached to this letter.

All facility process operations and health physics programs are being performed in accordance with license conditions and in keeping with the ALARA philosophy. If you have any questions concerning this ALARA report please call me at (307) 358-3744, ext. 14.

NMSS01 Public

Sincerely,

John McCarthy, RSO

Attachment: As stated

xc: J Cash, RAMC/Smith Ranch
S. Deaderick, RAMC/Smith Ranch
P. Drummond, RAMC/Smith Ranch
B. Ferdinand, RAMC/Smith Ranch
M. Freeman, RAMC/OKC
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RIO ALGOM MINING CORP.
SMITH RANCH FACILITY
ALARA SUMMARY, JANUARY - DECEMBER 1999
LICENSE SUA-1548, DOCKET 40-8964

I. INTRODUCTION

The annual ALARA summary, audit number 25, for the Smith Ranch in-situ leaching (ISL) operation, NRC license SUA-1548, for the calendar year 1999 is hereby submitted for NRC review in accordance with License Condition No. 12.9.

The Smith Ranch Project initiated commercial operations June 20, 1997.

II. HEALTH PHYSICS SAMPLING SUMMARY

A. Bioassay Results

During the calendar year a total of three hundred eighty-five (385) routine bioassay samples were collected. During this same period there were twenty-three (23) baseline bioassays collected for new employees and contractors. Analytical results were below the lower limit of detection for uranium, 5 micrograms per liter (μg/l), for all but eighteen samples. All eighteen (18) samples were above 15μg/l but less than 35μg/l. These are described below.

31.7 μg/l (1/12/99), 23.3 μg/l (1/20/99), 22.3 μg/l (3/20/99), 15.1 μg/l (4/7/99), 18.5 μg/l (4/6/99), 19.2 μg/l (4/19/99), 19.7 μg/l (4/8/99), 15.2 μg/l (5/24/99), 17.8 μg/l (5/25/99, 29.8 μg/l (8/11/99), 32.0 μg/l (9/17/99), 19.9 μg/l (9/3/99), 16.0 μg/l (9/1/99), 22.0 μg/l (11/2/99), 26.0 μg/l (12/15/99), and 16.0 μg/l (12/9/99).

Cause: Interviews were conducted with all of the individuals that had bioassay results greater than 15 μg/l. The results of the interviews can be broken down into three causes. The three causes of the elevated bioassays were associated with the use of proper personal hygiene and personal protective equipment practices, general housekeeping practices, and abnormal problems with the use of Racal respirators.

Improper practices in the use of personal protective equipment (RACAL respirators) and personal hygiene as well as general housekeeping were the most common of the three possible causes. In the case of personal protective equipment, Racal respirators are used in the dryer area to minimize the potential of inhalation of airborne contaminates and it was found that visors were in the up position during the times associated with the elevated bioassay

results. Other related issues include poor cleanup practices on personal equipment and hands leading to contamination of the sample or accidental ingestion of dry yellowcake.

During late August and the month of September the facility was experiencing problems with the batteries used with the Racal respirators. The battery charging station was checked and found to be faulty. The charger was repaired and all batteries returned to service.

Corrective action;
All individuals interviewed were instructed on the importance of personal hygiene and good housekeeping to minimize potential contamination, the health effects of natural uranium when taken internally, how to avoid or minimize a potential intake, and the necessity of maintaining the Racal visor in the down position when in use.

Safety meetings are conducted on a weekly basis at the facility. The following topics were presented during the year and the number of discussions are in parentless: bioassays (6), exit scans (2), housekeeping (8), personal hygiene (3), respirators, and the health effects of natural uranium were discussed at the meetings. These topics were chosen to reiterate to all employees the necessity of and how to minimize potential exposures.

Based on our sampling results, respirators are no longer required in the yellowcake storage area. Respirators in the dryer/press area are now required only during the unloading process and subsequent clean up. Because respirator use is now limited, operators tend to maintain the visor in the down position.

One (1) quality assurance sample on 2/25/99 with a value of 21 µg/l was out of the acceptable range and believed to be either a laboratory or spiking error.

Corrective action: The health physics department conducted an internal training session to assure all individuals involved with spiking samples are using the same methods.

B. Exposure Data

External (Gamma):

Gamma doses for employees are determined by the analysis of individual TLD badges worn by the employees. The TLD badges are analyzed by an accredited outside contract laboratory in accordance with NVLAP procedures and specifications. Summarized in Table 1 below are the employee quarterly gamma doses by incurred dose ranges. The highest individual dose during the year was 205 mrem. Based on the annual dosages within the facility and in accordance with 10 CFR § 20.1501 and § 20.1502, which requires personnel

monitoring only if it is expected that an individual will receive 10 % of the annual limit, it is not necessary to badge visitors.

Table 1
Gamma Dose By Individuals Per Quarter (mRem)

Period	< 10	11-29	30-49	50*-69	70-100>
1st Qtr.1999	76 (67)	8 (9)	3 (5)	0 (1)	0 (1)
2ndQtr.1999	72 (63)	11 (10)	6 (4)	2 (1)	0 (1)
3rdQtr.1999	65 (78)	5 (3)	10 (1)	1 (1)	2 (1)
4thQtr.1999	60 (71)	3 (10)	8 (6)	5 (2)	3 (1)

The corresponding values for 1998 are in parenthesis.
All values of 30 mrem and above can be attributed to plant and wellfield operators. The increased number of exposures above 10 mrem can be attributed to the start up and operation of the satellite plant.

* 50 mrem is 1% of the allowable dose.

Internal - Uranium (Yellowcake):

Employee exposure to airborne uranium are determined by a time weighted average method, which uses air particulate sampling data and employees' time in designated areas of the facility. Final exposure results are recorded in DAC-hours.

As indicated on Table 2, exposures to airborne natural uranium were negligible. The DAC hours were half of the previous year's values. This can be attributed to better housekeeping and personal hygiene, and experienced, well trained operators.

Table 2
Exposure to Airborne Uranium (DAC-Hours)

Employee Category	January - December 1998	January - December 1999
Plant operator	31.4	14.5

As indicated, employee exposure to airborne uranium continues to be limited. 200 DAC hours is 10% of the annual limit.

Internal Radon Daughters:

Exposure to radon daughters are calculated using the time weighted average format as outlined by the Mine Safety and Health Administration (MSHA) in 30

CFR § 57.5040. The total radon exposure summary received by employees during 1999, as compared to 1998, is provided in Table 3.

Table 3
Annual Exposure to Radon Daughters

Exposure (WLM)	January - December 1998	January - December 1999
< 0.10 **	92	93
0.10 - 0. 20	3	5
0.21 - 0.30	2	0
0.31 - 0.40	1	0
> 0.40 *	0	0

* 10 % of the annual DAC (4 WLM), ** 2.5 % of the annual limit (4 WLM)

As indicated, employee exposure to radon daughters continues to be limited.

The overall total effective dose equivalent (TEDE) for the maximally exposed individual during 1999 was 0.301 rems or approximately 6.02 % of the annual limit. During 1998 the maximally exposed individual was 0.483 rems approximately 9.66 % of the annual limit. The slight downward trend may be attributed to improved operating procedures and overall general radiation safety awareness.

C. Safety Meetings and Training

Eighty-three (83) radiation topics were discussed during weekly safety and staff meetings during 1999, as opposed to fifty-nine (59) in 1998. Discussion topics included in the meetings were: results of NRC inspections (3), PPE (5), fire drills, radon (4), sample taking, SOPs (11 reviewed), RWPs, release of equipment, exit scans (2), YC storage area (2), MSDS (3), scanning stations, washing cloths, contamination, lock-out/tag-out, bio assays (6), TLD badges (4), restricted areas (2), housekeeping (8), fit tests, pulmonary function tests (5), annual exposures, time cards, confined space entry (5), posting regulations (2), resin trailer scans, effects of natural uranium on the body, personal hygiene (3), emergency response procedures, dryer entry, lapel samplers, respirators, sample labeling, and first aid. Topics discussed and attendance records are recorded and maintained on file. Safety or staff meetings are conducted each day during the week and a session is attended by all employees present on their scheduled workdays.

The annual radiation safety and MSHA refresher training courses were conducted at various times during the year. The MSHA training includes a radiation safety review in addition to first aid and industrial safety procedures and rules. Three hundred seventy-one (371) man-hours of Health Physics were presented during the year for radiation refresher and new employee training. Sixty-four (64) man-hours of Hazmat Awareness Training were presented

during the year. First Aid and CPR training comprised two hundred forty (240) man-hours. Respiratory lung function checks were performed during May 1999 to employees who may be called upon to utilize respiratory protection.

D. Weekly and Daily Inspection Log Entries and Monthly Summary Reports.

During "Commercial Operations" daily walk through inspections were conducted by the RSO, RST, or trained designee. A review of the inspections indicated there were minimal problems and housekeeping was the only action required.

The RSO's monthly report summarizes the results of health physics activities and environmental monitoring. The facility manager reviews the RSO's monthly report and takes any actions deemed appropriate regarding radiation, or industrial safety, or environmental concerns. No major items of concern were noted during the reporting period.

E. Radiological Surveys and Monitoring Data

Contamination Surveys:

There were three thousand three hundred and thirty-nine (3,339) surface contamination surveys performed during the review period in both the controlled and restricted areas of the facility. During "Commercial Operations" eating areas, change rooms, laboratories, and offices are surveyed weekly.

Removable contamination exceeding 2,000 dpm/100 cm^2 requires decontamination in restricted areas outside of the yellowcake area. During this reporting period no surveys exceeded the action level.

Personnel exiting the restricted area of the plants scan or "frisk" themselves for alpha contamination prior to entering the uncontrolled areas. During this report period a total of twenty-three thousand five-hundred eighteen (23,518) alpha contamination surveys were logged, for an average of one thousand five-hundred fifty-nine (1,959) per month. No incident of contamination was reported. Additionally, during each quarter, the RSO or designee randomly performs an alpha contamination "spot check" on the personnel present in the controlled area that day. A total of one-thousand two-hundred seventeen (1,217) scans were preformed.

There were a total of three hundred seventy (370) surveys on equipment released from within the restricted and controlled areas.

Gamma Monitoring:

Gamma surveys are performed quarterly at various locations within the facility. The results of the in-plant surveys (inclusive of background) are shown in Table 4.

Table 4
In-Plant Gamma Exposure Rates (average mR/hr)

Area[1]	1st 1999	2nd 1999	3rd 1999	4th 1999	Average
1 Pilot	0.11	0.04	0.04	0.04	0.06
2 Pilot	0.12	0.04	0.08	0.08	0.08
3 Pilot	0.10	0.06	0.12	0.12	0.10
4 Pilot	0.35	0.14	0.27	0.31	0.27
5 Pilot	0.13	0.05	0.03	0.03	0.06
1 CPP	0.12	0.04	0.15	0.16	0.12
2 CPP	0.19	0.14	0.10	0.16	0.15
3 CPP	0.22	0.11	0.20	0.18	0.18
4 CPP	0.17	0.08	0.09	0.16	0.13
5 CPP	0.29	0.10	0.08	0.11	0.15
6 CPP	0.07	0.04	0.03	0.14	0.07
7 CPP	0.05	0.04	0.02	0.09	0.05
8 CPP	0.12	0.04	0.02	0.14	0.08
9 CPP	0.04	0.03	0.03	0.09	0.05
10 CPP	0.80*	0.06	0.09	0.11	0.08
11 CPP	0.40*	0.08	0.16	0.60*	0.12
12 CPP	0.45*	0.05	0.05	0.06	0.15
13 CPP	0.08*	0.02	0.02	0.05	0.04
14 CPP	0.46*	0.05	0.04	0.07	0.05
15 CPP	1.00*	0.50*	0.05	0.04	0.05
1 Sat	0.04	0.03	0.02	0.05	0.04
2 Sat	0.13	0.10	0.14	0.13	0.13

[1]Areas are: 1 - Injection Area, 2 - Lab, 3 - Elution Area, 4 - Column Areas, 5 - Yellowcake Press, 1 CPP through 4 CPP - Injection Area, 5 CPP through 9 CPP - Elution Area, 10 CPP and 11 CPP - Thickener Area, 12 CPP through 14 CPP - Dryer Area, and 15 CPP - Yellowcake Storage. 1Sat- control-room / change-room, 2Sat- plant area

* Values listed were taken directly adjacent to tanks, drums and vessels rather than at 3 meters from surface. These values were not included in the annual average

In addition to the required gamma survey locations, there were four hundred twenty-nine (429) spot gamma surveys conducted during 1999.

Exposure rates in all areas were similar to previous gamma values. At this time trending is premature as the facility is still in the infancy stage.

Airborne Uranium and Radon Daughters:

During the reporting period, there were four hundred eighty-seven (487) and five hundred eighty-three (583) samples taken for airborne uranium and radon daughters respectively. The average and highest concentrations detected for the period are listed in Table 5.

Table 5
In-Plant Airborne Radionuclide Concentrations

Pilot Plant

Parameter	Area	Average	High
Unat (% DAC)	Yellowcake Filter Press	0.29	1.35
Unat (% DAC)	General Process Plant	0.34	2.10
Radon Daughters (WL)	General Process Plant	0.01	0.03

Satellite Plant

Parameter	Area	Average	High
Unat (% Dac)	General Satellite	0.28	0.96
Radon Daughters (WL)	General Satellite	0.02	0.27

Central Processing Plant

Parameter	Area	Average	High
Unat (% DAC)	Yellowcake Filter Press / Dryer	5.89	93.98
Unat (% DAC)	General Process Plant	0.38	2.09
Radon Daughters (WL)	General Process Plant	0.02	0.19

- Racal respirators are required when unloading the dryer or filter press areas and during cleanup.

Attached, as Figures 1 and 2, are the graphical representations for the yellowcake filter press and general process plant areas for natural uranium and radon daughter's concentrations. As previously noted, yellowcake natural uranium concentrations are elevated over past years as a result of the Operational Status of the facility.

Environmental Radon:

Radon monitored is conducted on a continuous basis using a Track-etch cup. The cup is exchanged on a quarterly frequency for analysis. As this is the second full year of operation at the Smith Ranch Facility, any recognition of trending is premature.

TABLE 6

Environmental Radon Concentrations 1999 (pCi/liter)

Location	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	Average
Dave's WW	0.7	0.4	1.1	1.1	0.83
Fence	0.5	0.9	1.3	1.2	0.98
Volman	0.4	0.8	1.3	1.1	0.90

Environmental Gamma:

Direct radiation (gamma) is measured on a quarterly basis at the following locations: 1 - Upwind from the plant, 2 - Down-wind from the plant, 3 - Leach tank, 4 - East Evaporation Pond, and 5 - West Evaporation Pond. The results of the quarterly surveys for this reporting period indicate that the gamma values are essentially at background values and no significant trends were noted. The data is present in Table 7.

Table 7
Environmental Gamma Concentrations (mR/hr)

	1st	2nd	3rd	4th	Period
Area	1999	1999	1999	1999	Average
1	0.018	0.010	0.020	0.020	0.017
2	0.028	0.020	0.015	0.020	0.021
3	0.040	0.030	0.020	0.030	0.030
4	0.046	0.030	0.018	0.024	0.029
5	0.097	0.018	0.017	0.024	0.039

Continuous environmental gamma TLD badges are used for monitoring. The TLD badges are analyzed by an accredited outside contract laboratory in accordance with NVLAP procedures and specifications. A summary of the environmental monitoring results is presented in Table 8.

TABLE 8
Environmental Gamma TLD Concentrations (mR/quarter)

AREA	1st 1999 mR/Qtr.	2nd 1999 mR/Qtr.	3rd 1999 mR/Qtr.	4th 1999 mR/Qtr.	Period Average
Dave's ww	23.53	26.39	21.58	21.32	23.20
Fence	30.16	28.86	27.43	24.05	27.63
Vollman	24.31	24.31	22.75	23.79	23.79
Wellfield I	28.08	24.57	23.14	21.06	24.21
Pond	25.61	26.39	23.27	22.75	24.51
Wellfield 3	24.70	24.70	20.28	20.80	22.62
Wellfield 4	28.60	24.70	21.84	25.09	25.06

During "Commercial Operations" continuous air-monitoring samples were collected at three locations, Dave's WW, Vollman Ranch, and at the controlled area boundary fence. The air sample filters area collected at a minimum of once a month. The air sample filters are analyzed by an accredited outside contract laboratory in accordance with NVLAP procedures and specifications. A summary of the environmental air sampling monitoring results is presented in Table 9.

TABLE 9
Environmental Air Sample Concentrations (μCi/mL)
Vollman Station (Downwind)

Radionuclide	1st Quarter μCi/mL	2nd Quarter μCi/mL	3rd Quarter μCi/mL	4th Quarter μCi/mL	Average μCi/mL
U^{nat}	< 1.00E-16	<1.00E-16	4.46E-15	4.41E-15	2.27E-15
Th^{230}	<1.00E-16	<1.00E-16	2.70E-15	7.24E-16	9.06E-16
Ra^{226}	<1.00E-16	<1.00E-16	1.43E-15	8.69E-16	6.25E-16
Pb^{210}	8.47E-15	8.10E-15	5.30E-13	1.18E-13	1.66E-13

Dave's WW Station (Upwind-Background Location)

Radionuclide	1st Quarter µCi/mL	2nd Quarter µCi/mL	3rd Quarter µCi/mL	4th Quarter µCi/mL	Average µCi/mL
U^{nat}	<1.00E-16	<1.00E-16	5.11E-15	3.81E-15	2.28E-15
Th^{230}	<1.00E-16	<1.00E-16	4.52E-15	1.10E-15	1.46E-15
Ra^{226}	<1.00E-16	<1.00E-16	3.68E-15	1.10E-15	1.25E-15
Pb^{210}	7.83E-15	1.19E-14	4.56E-13	3.77E-13	2.13E-13

Fence Line Station

Radionuclide	1st Quarter µCi/mL	2nd Quarter µCi/mL	3rd Quarter µCi/mL	4th Quarter µCi/mL	Average µCi/mL
U^{nat}	1.10E-15	6.08E-16	1.31E-13	7.80E-14	5.27E-14
Th^{230}	<1.00E-16	<1.00E-16	3.28E-15	1.72E-15	1.30E-15
Ra^{226}	<1.00E-16	<1.00E-16	7.99E-15	2.72E-15	2.73E-15
Pb^{210}	6.59E-15	5.49E-15	5.22E-13	2.26E-13	1.90E-13

It was noted that there are occasional periods of time that the hi-vol samplers used for the environmental air sampling had stopped during the sampling period as a result of electrical problems. There is no means to estimate the downtime on these samplers.

F. Surveys Requiring Radiation Work Permits

Thirteen (13) RWP's were issued during the report period. Fifty-five (55) associated samples were collected in conjunction with the RWP's. All samples were within acceptable range.

H. Reports of Overexposures

There were no overexposures during the reporting period.

I. Transportation

There were fifty-one (51) yellowcake shipments made during the year with five thousand nine hundred sixty-four (5,964) associated alpha and gamma surveys. Six thousand twenty-one (6,021) alpha scans were preformed on yellowcake drums before their release for shipment. There were four hundred sixty-seven (467) barren and pregnant resin shipments made from the plant and satellite with thirteen thousand thirty-four (13,034) associated alpha and gamma surveys.

J. Review of Operating and Monitoring Procedures

A review of the Standard Operating Procedures (SOPs) for production and monitoring activities were performed in September 1999.

III. CONCLUSIONS AND RECOMMENDATIONS FOR THE ALARA PROGRAM

The Conclusions of the ALARA Audit are as follows:

- Improved housekeeping in the yellowcake handling areas have reduced the airborne uranium concentrations levels significantly lower than 1997 and 1998, which represent the operational periods of the dryers.
- Improved housekeeping in the yellowcake packaging areas has allowed the personnel to enter those areas without respirators during times when no packaging is occurring. No additional engineering controls were necessary.
- Continued training for personal hygiene and personal protective equipment practices has continued to improve awareness of proper practices. This improvement has been evident by the reduction in the number of bioassays over 35 μg/l from 4 to 0.
- Radon daughter concentrations continued the general trend downward that was historically reported in earlier ALARA reports. This continued improvement can be attributed to improved ventilation controls and training.

The recommendations of the ALARA Audit are as follows:

- Maintain the training program on personal hygiene and protective equipment practices.
- Continue to verify housekeeping in the yellowcake area through monitoring.
- Examine electrical problems with the environmental air samplers to provide better monitoring results.
- Examine the relocation of ventilation fans from present location to a position closer to the floor in both the satellite and central processing plant.
- Examine relocation of vacuum pumps and heaters from the dryer area to the main plant.

Figure 2 Filter Press & Dryer Airborne Concentrations
Average U-Nat. Conc. (Fraction MPC or DAC)

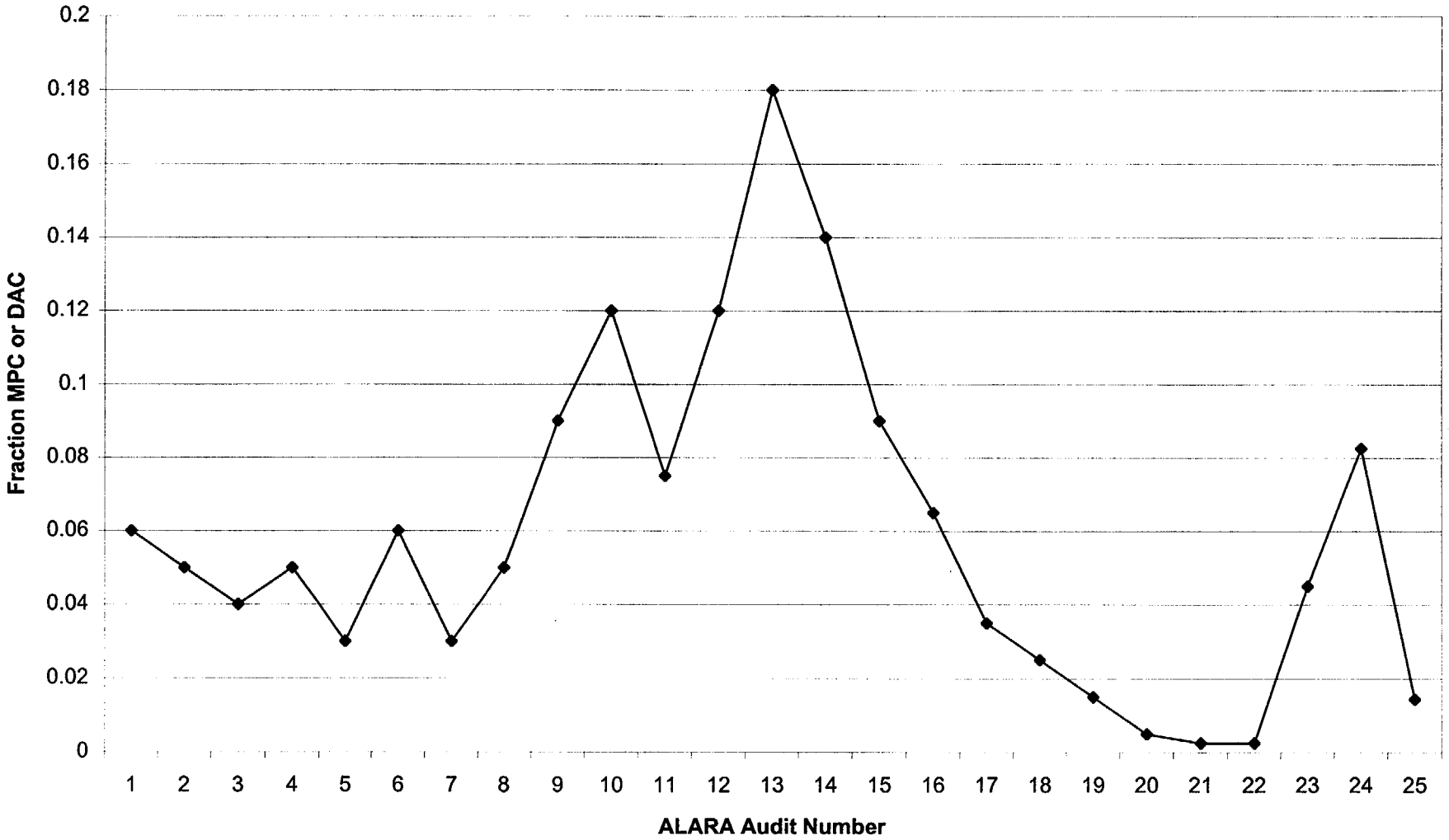

Figure 2 General PlantAirborne Concentrations
Average Radon Daughter Conc. (WL)