Rio Algom Mining LLC

March 7, 2005

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ATTN: Document Control Desk
Mr. Gary Janosko, Chief
Fuel Cycle Licensing Branch, NMSS
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Re: **License SUA-1473**
Docket No.-40-8905

Dear Mr.Janosko,

Please find attached the 2004 ALARA Review for the Ambrosia Lake facility. This summary reviews the actions taken to maintain occupational exposures as low as reasonably achievable.

If you have any questions or need additional information, please do not hesitate to call me at (505) 287-8851, extension 205.

Regards,

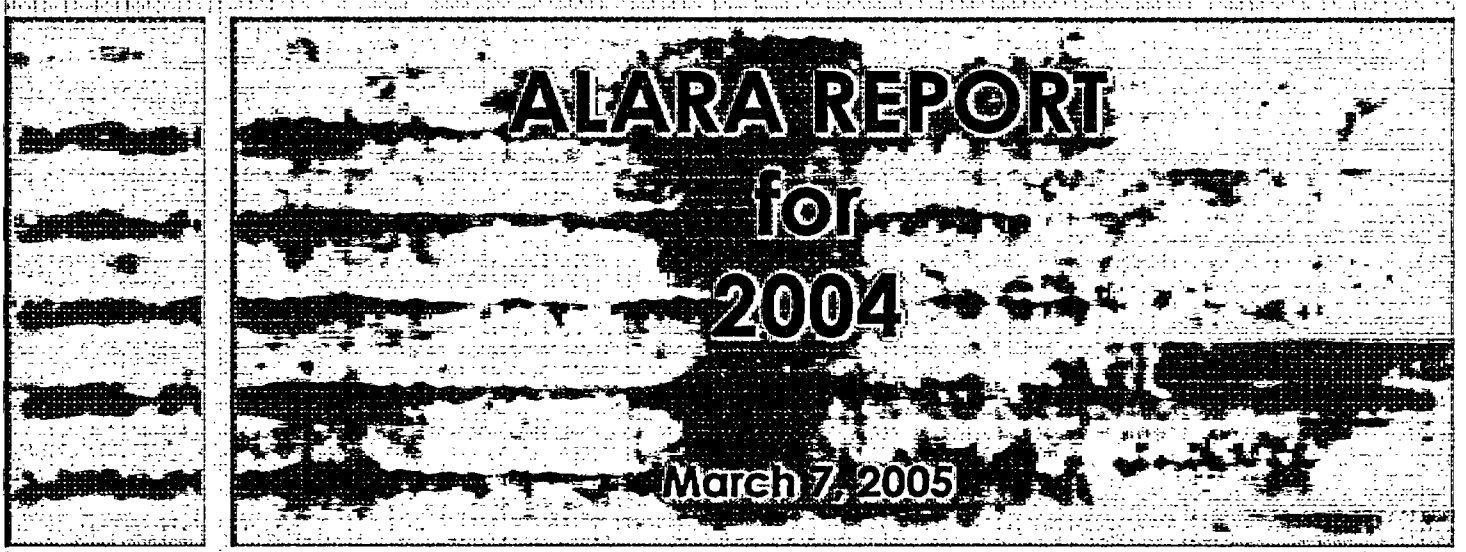
Peter Luthiger
Manager, Radiation Safety
And Environmental Affairs

Attachment: As Stated

xc: J. Caverly (NRC)
A. Delgado
T. Fletcher
K. Lovato
R. Powell
R. Rodriguez
file

RIO ALGOM MINING LLC
AMBROSIA LAKE FACILITY

License SUA-1473 Docket No. 40-8905



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ALARA SUMMARY
January - December 2004

INTRODUCTION

The annual ALARA summary for Rio Algom Mining LLC's Ambrosia Lake facility for calendar year 2003 is submitted for NRC's review in accordance with Quivira's Source Material License Condition #10. License condition #10 contains Rio Algom Mining LLC's ALARA Policy as well as the NRC approved health physics and environmental/effluent monitoring programs required to be implemented at the facility as specified within the *Health Physics and Environmental Programs Manual.*

The formal management ALARA review was conducted on March 7, 2005 by the facility ALARA audit committee. In attendance were Messrs. Terry Fletcher (General Manager), Peter Luthiger (Radiation Safety Officer), Alberto Delgado (Mill Operations Supervisor), Rudy Rodriguez (Maintenance Foreman), Ron Powell (Reclamation Engineer), and Kathy Lovato (Supervisor, Personnel and Administration). Copies of the review were also sent to corporate management.

The primary focus of activities at the site during calendar year 2004 was completing the mill demolition during the first quarter of the year and preparations associated with the Section 4 lined pond closure activities. This report is divided into three sections, each describing the radiation protection program. These sections are: 1)Rio Algom activities not associated with demolition or section 4 project; 2)Demolition project; and 3)Section 4 project.

Section 1 - Rio Algom Activities

I. Health Physics Sampling Summary

A. **Bioassay**

The collection of bioassay samples continued during the year in accordance with the policy statement prescribed in the Bioassay Program section of the facility *Health Physics and Environmental Programs Manual.* This manual outlines the health physics and environmental/effluent monitoring programs required to be implemented at the facility.

As a result of mill demolition, the potential for uranium intake has been reduced. To ensure that the ALARA principle is maintained, employees associated activities in the ion exchange plant continued to submit bioassay samples during 2004.

During the year there were a total of sixty five (65) routine samples collected from Rio Algom employees. Analytical results indicated that all sample concentrations were below the laboratory's lower detectable limit of five (5) micrograms per liter (ug/L). All quality assurance spike samples were within the Regulatory Guide 8.22 suggested variance for acceptable spike result.

The reasons for the continued negligible bioassay concentrations are:

1. The site has completed mill demolition of the former yellowcake processing areas;
2. The work activities were performed under radiation work permits to ensure appropriate radiological controls were instituted;
3. Airborne concentrations within the area are continually well below the DAC for soluble natural uranium.

These bioassay results corroborate the airborne yellowcake sampling program sampling results, which show very low airborne concentrations.

B. Personnel Alpha Contamination Checks

During the pre-demolition phase, there were a total of thirty two (32) random alpha contamination surveys of employees leaving the restricted area. These checks were performed by health physics personnel. The contamination checks were performed at the end of work shift prior to employees leaving the mill facility. All surveys were well below the 1000 disintegrations per minute per 100 square centimeters (dpm/100 cm^2) guideline contained within NRC Regulatory Guide 8.30.

In addition to the random employee surveys by health physics personnel, there were 96 self monitoring checks by the employees. All checks indicated that contamination on personnel and their clothing were also below Regulatory Guide 8.30 suggested limits.

C. **Surface Contamination Checks**

There were 73 surface contamination checks performed during the review period. The surface contamination checks were performed at various places throughout the restricted area including lunch rooms, change rooms, and the guard office. All sample results were below the respective action levels.

D. **Radon Daughter Sampling**

During 2004, the annual radon daughter exposure for all employees was 0.0 working level months (wlm). The annual allowable occupational exposure limit is 4 wlm. It should also be noted that the radon concentrations measured are inclusive of background concentrations. As a result of mill demolition, the ion exchange plant was the only facility remaining on the routine sampling program for radon daughters.

1. Mill IX Plant

The average radon daughter concentration during 2004 was 0.02 wl. The 2003 average radon concentration averaged 0.03 wl. The 2004 average area concentration represents 6% of the DAC limit of 0.33 wl. Employee occupancy times within the ion exchange plant is typically less than 20 hours per week.

Attached in Appendix A as Chart 1 is a graph plotting the minimal radon daughter concentration average within the mill IX plant. The trend line indicates that the minimal radon concentrations are decreasing slightly through time.

E. **Yellowcake Samples**

As an integral component of the health physics monitoring program outlined within License Condition #10, air sampling is performed to assess potential employee exposure to airborne yellowcake as a result of mill demolition. There were 15 routine air samples taken during 2004 for airborne yellowcake activity. The samples; which were obtained at random times, indicated an annual average concentration for 2004 of 9.4×10^{-13} microcuries per milliliter (uCi/mL), which represents less than 1% of the DAC for soluble natural uranium.

The airborne concentrations are shown in graphical format within Appendix A on Chart 2. As indicated from the graph, the minimal airborne concentrations for yellowcake dust remain constant over time and are well below the allowable limit of 5.0×10^{-10} uCi/mL for soluble uranium.

F. **Soluble Uranium Intake**

To demonstrate compliance with 10 CFR 20.1201(e), which limits soluble uranium intake to 10 milligrams per week, intake values were determined by utilizing data obtained from the air sampling program. For conservatism, the intake values assume continuous occupancy (40 hours) within the area.

During 2004, the average intake of soluble uranium was 0.07 milligrams per week (assuming continuous occupancy); with a maximum intake of 0.18 milligrams per week (assuming continuous occupancy). These results provide confirmation that appropriate radiological controls are implemented and are being followed by employees.

G. **Uranium Ore Dust**

During the review period, there were no routine uranium ore dust samples taken as the crushing circuit was demolished in late 2003.

H. **Gamma Surveys**

There were two semiannual gamma surveys conducted during the year as suggested by Regulatory Guide 8.30 and all areas surveyed were properly posted in accordance with 10 CFR 20.1902 and License Condition 28.

II. Respiratory Protection Program

The facility *Respiratory Protection Program* was reviewed to evaluate the effectiveness of the program in limiting exposures to individuals. This review included evaluating air sampling data, use of engineering controls, bioassay results, and employee acceptance of the using the equipment.

The review determined that, when required, respirators were effective in minimizing employee exposure to radioactive materials.

All employees received refresher training on respiratory protection program including a fit test to determine the best respirator size for each employee. Spirometry testing by a physician indicated that all employees have been deemed physically fit to use respiratory protection equipment. No complaints or comments were received by employees regarding problems with equipment.

During 2004, respirators were not required on any tasks other than mill demolition work. Exposures associated with this task were negligible and are discussed within the Demolition Project Phase of this report.

Air sampling data continues to indicate that airborne concentrations are well below the DAC for soluble natural uranium. The airborne concentrations, which are shown in graphical format within Appendix A, indicate that the minimal airborne concentrations for yellowcake dust remain constant over time. This is attributable to demolishing the mill and following established procedures.

Bioassay results were reviewed to evaluate the effectiveness of the air sampling program presently in place at the facility. Analytical results, all of which were below the laboratory's lower detectable limit of five (5) micrograms per liter (ug/L), reinforce that the air sampling program is effective in evaluating the airborne concentrations in the work areas and that employees are following established procedures, adhering to special work requirements.

III. Exposure Summary

All licensees are required to ensure compliance with the occupational dose limits specified within 10 CFR 20.1201(a). This regulation establishes an annual limit based on internal exposures as well as external exposures. Annual exposure to employees are determined by calculating exposures to radon daughters, soluble airborne yellowcake dust, and gamma radiation. Each component of the annual exposure is discussed in more detail in subsections A through D below.

A. Total Effective Dose Equivalent

The total effective dose equivalent (TEDE) exposure results for all employees is presented in Table 1 below. The TEDE is the sum of the deep dose equivalent (external exposures) and the committed effective dose equivalent (internal exposures).

The highest employee TEDE exposure for 2004 was 0.127 Rems. This exposure represents less than 3% of the annual allowable occupational dose limit specified within 10 CFR 20.1201(a). Review of the results indicates that the TEDE is comprised primarily of the deep dose equivalent component.

Appendix A, Chart 3 contains the maximum annual TEDE exposures for the time period covering 1990 to 2004. The chart demonstrates that occupational exposures are being maintained ALARA.

TABLE 1
2004 TOTAL EFFECTIVE DOSE EQUIVALENT (TEDE)

Exposure (REM)	0 -.05	.051 -.150	.151 -.250	> 0.250
No. of Employees	25	1	0	0

10 CFR 20.1502 requires exposure monitoring of any individual likely to receive a dose in excess of 10% of the occupational dose limits prescribed in 10 CFR 20.1201. Based on the annual exposures determined for facility personnel, individual exposure monitoring of visitors will not be necessary.

B. **Deep Dose Equivalent (Gamma Exposure)**

Gamma exposures are determined by the results of personnel dosimetry worn by all employees and analyzed in accordance with National Voluntary Laboratory Accreditation Program (NVLAP) procedures and specifications by an accredited outside contract laboratory. Table 2 summarizes the 2004 employee gamma dose exposures. The highest annual gamma exposure incurred by an employee was 0.127 Rem, which represents less than 3% of the annual allowable occupational dose limit.

Appendix A Chart 4 contains the maximum annual deep dose equivalent exposures for the time period covering 1990 to 2004. The chart demonstrates that occupational external radiation exposures are being maintained ALARA.

TABLE 2
2004 DEEP DOSE EXPOSURES

Exposure (REM)	< .05	.051-.150	.151-.250	> .250
No. of Employees	25	1	0	0

C. **Radon Daughter Exposures**

All radon daughter exposures for employees are calculated using a time weighted average format as outlined by the Mine Safety and Health Administration (MSHA) in 30 CFR 57.5040. Air samples are obtained in accordance with the facility sampling program outlined within the NRC approved Health Physics and Environmental Programs Manual at various work locations throughout the facility. Occupancy times are then factored into these values in order to obtain an employee's internal exposure to radon daughters for that time period.

All employee radon daughter exposures during 2004 were 0.0 wlm. The annual allowable occupational exposure limit is 4 wlm. These exposures are the result of reduced production within the ion exchange plant and demolition of the mill. The annual radon daughter exposure results are presented below in Table 3.

TABLE 3
2004 RADON DAUGHTER EXPOSURES

Exposure (wlm)	0.0	0.1- 0.5	0.6 – 1.0	> 1.0
No. of Employees	25	0	0	0

Appendix A Chart 5 contains a chart depicting the maximum annual radon daughter exposures for the time period covering 1990 to 2004. The chart demonstrates that occupational exposures to radon are being maintained ALARA.

D. **Yellowcake and Uranium Ore Dust**

Internal exposures to soluble uranium are determined by analyzing the yellowcake samples for gross alpha activity to obtain an average air concentration for the area. Air samples are obtained in accordance with the facility sampling program as well as from radiation work permits which may require personnel sampling. Occupancy times are then factored into these values in order to obtain an employee's internal exposure for that time period or task.

Table 4 summarizes the 2004 employee internal exposures to soluble uranium. Due to no activity occurring in 2004 associated with uranium/yellowcake activity, no employee exposures were incurred.

TABLE 4
2004 SOLUBLE URANIUM (YELLOWCAKE) EXPOSURES

Exposure (DAC-Hr)	0	0.1-1.0	1.01-2.0	> 2.0
No. of Employees	25	0	0	0

Appendix A Chart 6 contains a chart depicting the maximum annual exposures to yellowcake dust for the time period covering 1994 to 2004. The chart demonstrates that internal exposures to yellowcake dust are continually being maintained ALARA.

E. **Yellowcake Slurry**

No yellowcake slurry shipments occurred in 2004.

F. **Crushed Yellowcake Drums**

No crushed drum shipments were received in 2004.

IV. Miscellaneous ALARA Activities

A. **Health, Safety, Environment and Community Management System Implementation**

Implementation of the corporate wide Health, Safety, Environment and Community Management environmental management system continued throughout 2004. The management system provides a framework for personal, site and corporate HSEC responsibility and leadership and ensures the continued improvement of HSEC programs and performance.

Integration of the ALARA principle into the site HSEC management system has provided an additional mechanism to monitor progress toward continued improvement in HSEC activities.

Key improvements involved increased employee awareness, incorporating the concept of performing job safety analyses, and expanding the task observation program so that potential exposure concerns are identified and addressed prior to initiation of work. This improvement was reflected in the 2004 HSEC audit conducted by off-site personnel, which culminated in overall improvement of the HSEC management system.

B. Daily and Weekly Inspections

During the year, daily inspections did not result in any mill corrective orders being issued. Mill corrective orders (MCO) are normally issued when an area requires clean up and that item involves radiological conditions which are below the recommended regulatory guide limits. Mill corrective orders are issued when the job does not require a radiation work permit (RWP).

A total of eight (8) RWPs were issued during 2003 involving various tasks primarily associated with preparing the mill for demolition. Exposures associated with these RWPs were negligible as a result of the use of appropriate controls designed to minimize employee exposure. Job safety analyses were typically performed prior to initiation of work to identify potential hazards expected to be encountered with appropriate mitigation controls implemented.

Weekly inspections of pertinent mill areas by the radiation safety officer are performed to observe and ensure that general radiological control practices are being used. The weekly inspections did not identify any unusual conditions or situation that required corrective action.

C. Safety and Training Activities

The annual eight (8) hour refresher course was completed for all employees and included the topics as outlined in Rio Algom Mining LLC's "Radiation Safety Training Program". In conjunction with the annual refresher course, all employees completed a respirator fit test. Three newly hired employees were administered a 24 hour training session, which included radiation safety modules.

In addition to the annual refresher course, all employees and the contract security force successfully completed an 8 hour first aid training session during 2004.

All employees receiving physicals were administered a pulmonary function evaluation during 2004. Results from these spirometry tests indicated that all current employees are medically qualified to wear respiratory protection equipment.

Safety meetings, conducted throughout the year, reviewed various topics pertaining to radiation safety including the upcoming implementation of the company HSEC management system, contamination control, personnel dosimetry, the importance of reporting radiological hazards, personnel survey procedures, bioassay procedures, and the importance of practicing good personal hygiene and housekeeping while working in the mill area to ensure exposures remain ALARA.

D. Performance of Emission Control Equipment

The facility emission control equipment was demolished in late 2003.

E. Operational Procedures & Emergency Response Actions

During the year, all Standard Operating Procedures (SOP) and Emergency Response Procedures were reviewed and updated, if necessary, to ensure that proper radiation protection principles are applied. As part of this review, emergency telephone numbers were verified to ensure accurate and prompt notification channels are in place. Additionally, a fire drill was conducted to test the response actions of employees to real live fire situation.

In addition, all procedures utilized within the radiation safety program were reviewed and updated, as necessary.

Section 2 – Demolition Project

Mill demolition activities were completed in mid-February 2004. Actual demolition of structures and equipment commenced in early November 2003. The asbestos abatement phase of the project was completed in mid-December 2003 and by the end of December 2003, all mill structures were demolished and lowered to the ground. 2004 activities consisted of processing the demolition debris, transport to the disposal cell, and closure of the cell.

The following review provides a comprehensive summary of all health physics and radiological monitoring performed as part of the demolition project occurring in 2004. As a result of the diligent effort undertaken for the contractor selection process along with the pre demolition preparations conducted by Rio Algom employees, the project proceeded without incident and occupational exposures to radioactive materials were negligible.

I. Health Physics Sampling Summary-Demolition Phase

A. **Bioassay-Demolition Phase**

Bioassay samples were collected during the demolition project in accordance with the approved demolition plan, which was consistent with the long standing Bioassay Program established at the site, with the following modifications:

1. Contractor employees associated with demolition activities shall provide a baseline bioassay sample prior to performing any dismantling/demolition activities.

2. Contractor employees associated with demolition activities shall provide a final bioassay sample upon completion of dismantling/demolition activities.

3. Bioassay samples shall be submitted twice a month from employees working on dismantling activities involving the drying/packaging section of the mill, unless a different frequency is established by the facility RSO or required by an RWP.

4. For all other dismantling work involving contaminated materials, bioassay samples shall be submitted monthly.

A total of 26 bioassay samples collected from Contractor and Rio Algom employees in calendar year 2004 associated with demolition activities. Analytical results indicated that all sample concentrations were below the laboratory's lower detectable limit of five (5) micrograms per liter (ug/L). All quality assurance spike samples were within the Regulatory Guide 8.22 suggested variance for acceptable spike result.

These bioassay results corroborate the personnel sampling results, which show very low airborne concentrations.

B. **Personnel Alpha Contamination Checks – Demolition Phase**

During the demolition phase, there were 592 contamination surveys of employees leaving the restricted area. All surveys were below the 1000 disintegrations per minute per 100 square centimeters (dpm/100 cm^2) guideline contained within NRC Regulatory Guide 8.30. Rio Algom utilized an action level of one half the allowable limit for personnel to ensure ALARA principle is maintained.

Radiation surveys of contractor vehicles exiting the restricted area were also performed with all results indicating acceptable levels. A total of 72 surveys were performed.

Success in controlling contamination at the site can be attributed to job design, pre-demolition cleaning of mill process equipment, contractor employees utilizing their radiation safety training, following established work procedures including housekeeping, and practicing good personal hygiene.

C. **Surface Contamination Checks – Demolition Phase**

There were 12 surface contamination checks performed at various places associated with the demolition project including offices, lunch rooms, change rooms, storage areas, vehicles, and the guard office. All sample results were below the respective action levels.

D. **Radon Daughter Sampling – Demolition Phase**

As a result of having all buildings structures demolished in December 2003, no radon daughter sampling was conducted in areas associated with demolition activities. However,

areas/buildings used by the demolition crews were sampled and included the main changerooms, contractor shower trailer, contractor storage area, and the contractor office trailer.

The radon daughter exposure for all contractor employees was 0.0 working level months (wlm). The allowable occupational exposure limit is 4 wlm.

E. Yellowcake Samples – Demolition Phase

During the demolition phase, airborne yellowcake dust sampling was performed on a weekly basis in each work area associated with the demolition project. This consisted of collecting high volume air samples in the vicinity of the work activities. However, employee exposure determinations were based on personnel air samples worn daily, as prescribed by radiation work permits established for each discrete demolition work element.

The samples, which were obtained at random times in the proximity of the active work areas, indicated an average concentration for the demolition project of 4.8×10^{-12} microcuries per milliliter (uCi/mL), which represents 1% of the DAC for soluble natural uranium. The maximum concentration observed represented less than 3% of the DAC limit. A total of 10 samples were collected.

F. Personnel Air Samples – Demolition Phase

Work activities associated with the demolition project that involved the potential for significant exposure to radioactive materials were conducted under a radiation work permit. These RWPs included a requirement to wear a personnel breathing zone air sample unit for the purposes of collecting data associated with potential employee exposures during demolition activities.

Fifteen (15) individual lapel samples were issued on demolition work projects in calendar year 2004. Results indicated an average concentration for the demolition project of 3.1×10^{-12} microcuries per milliliter (uCi/mL), which represents less than 1% of the DAC for soluble natural uranium. The maximum concentration observed measured less than 1% of the DAC limit.

Results from these samples were used to calculate contractor employee exposures associated with the demolition project. Contained in Appendix A as Chart 11 is a chart depicting the

maximum weekly airborne concentration observed on the demolition project.

G. **Soluble Uranium Intake – Demolition Phase**

To demonstrate compliance with 10 CFR 20.1201(e), which limits soluble uranium intake to 10 milligrams per week, intake values were determined for the yellowcake area by utilizing data obtained from the personnel air sampling activities.

The maximum weekly intake from soluble uranium soluble uranium was 0.32 milligrams, or 3.1% of the allowable limit. These results provide confirmation that appropriate radiological controls are implemented and are being followed by contractor employees. Contained in Appendix A as Chart 12 is a chart depicting the maximum weekly intake over time.

H. **Gamma Surveys – Demolition Phase**

Since the majority of the work activity was performed using heavy equipment, which resulted in the effective use of the time, distance, and shielding principle to minimize gamma exposure potential, gamma radiation exposure levels were expected to be well below occupational limits. The maximum external gamma radiation exposure received by a demolition contractor employee was 0.018 Rem, which is less than 1% of the annual allowable limit.

II. Exposure Summary – Demolition Phase

All licensees are required to ensure compliance with the occupational dose limits specified within 10 CFR 20.1201(a). This regulation establishes an annual limit based on internal exposures as well as external exposures. Annual exposure to employees are determined by calculating exposures to radon daughters, soluble airborne yellowcake dust, and gamma radiation. Each component of the annual exposure is discussed in more detail in subsections A through D below.

A. **Total Effective Dose Equivalent – Demolition Phase**

The total effective dose equivalent (TEDE) exposure results for all contractor employees participating in demolition activities is presented in Table 1 below. The TEDE is the sum of the deep dose

equivalent (external exposures) and the committed effective dose equivalent (internal exposures).

The highest employee TEDE exposure for 2004 was 0.018 Rems. This exposure represents less than 1% of the annual allowable occupational dose limit specified within 10 CFR 20.1201(a). Review of the results indicates that the TEDE is comprised primarily of the deep dose equivalent component.

TABLE 1
DEMOLITION PROJECT
2004 TOTAL EFFECTIVE DOSE EQUIVALENT (TEDE)

Exposure (REM)	0 -.05	.051 -.150	.151 -.250	> 0.250
No. of Employees	14	0	0	0

B. **Deep Dose Equivalent (Gamma Exposure) – Demolition Phase**

Gamma exposures are determined by the results of personnel dosimetry worn by all contractor employees and analyzed in accordance with National Voluntary Laboratory Accreditation Program (NVLAP) procedures and specifications by an accredited outside contract laboratory. Table 2 summarizes the contractor employee gamma dose exposures. The highest deep dose gamma exposure incurred by a contractor employee was 0.018 Rem.

TABLE 2
DEMOLITION PROJECT
2004 DEEP DOSE EXPOSURES

Exposure (REM)	< .05	.051-.150	.151-.250	> .250
No. of Employees	14	0	0	0

C. **Radon Daughter Exposures – Demolition Phase**

All contractor employee radon daughter exposures during 2004 were 0.0 wlm. The annual allowable occupational exposure limit is 4 wlm. The annual radon daughter exposure results for the contractor employees are presented below in Table 3.

TABLE 3
DEMOLITION PROJECT
2004 RADON DAUGHTER EXPOSURES

Exposure (wlm)	0.0	0.1 - 0.5	0.6 – 1.0	> 1.0
No. of Employees	14	0	0	0

D. **Yellowcake and Uranium Ore Dust – Demolition Phase**

Internal exposures to soluble uranium are determined by analyzing the personnel lapel samples for gross alpha activity to obtain an average air concentration for the area. Air samples are obtained from radiation work permits which typically required personnel sampling on most demolition tasks. Occupancy times are then factored into these values in order to obtain an employee's internal exposure for that time period or task.

Table 4 summarizes the 2004 demolition contractor employee internal exposures to soluble uranium. The maximum exposure received by an employee during 2004 was 0.001 Rem; which corresponds to less than 1% of the annual limit.

TABLE 4
DEMOLITION PROJECT
2004 SOLUBLE URANIUM (YELLOWCAKE) EXPOSURES

Exposure (DAC-Hr)	0.0	1.0	2.0	> 2.0
No. of Employees	9	5	0	0

IV. Miscellaneous ALARA Activities – Demolition Phase

A. Daily and Weekly Inspections – Demolition Phase

During the demolition project, daily inspections did not result in any abnormal or unacceptable conditions requiring corrective action.

Exposures associated with radiation work permits (RWP) were minimal as a result of the use of appropriate controls designed to minimize employee exposure.

Weekly inspections of pertinent demolition areas by the radiation safety officer were performed to observe and ensure that general radiological control practices are being used. The weekly inspections did not identify any unusual conditions or situation that required corrective action.

C. Safety and Training Activities – Demolition Phase

All applicable health, safety, and environmental training was administered to contractor employees prior to any employee initiating work on the demolition project. This training consisted of either an 8 or 24 hour course and included the topics as outlined in Rio Algom Mining LLC's "Radiation Safety Training Program", and Mine Safety and Health Administration approved training plan.

Safety meetings were conducted daily with all contractor personnel present. The contractor Health and Safety representative reviewed various topics pertaining to safety, while the site Radiation Safety Officer highlighted radiation safety information such as contamination control, personnel dosimetry, the importance of reporting radiological hazards, personnel survey procedures, bioassay procedures, and the importance of practicing good personal hygiene and housekeeping while working in the mill area to ensure exposures remain ALARA.

Section 3 – Section 4 Project

The following review provides a comprehensive summary of all health physics and radiological monitoring performed as part of the Section 4 project occurring in 2004. Work activities consisted of enhanced dewatering activities and initiation of sediment consolidation work. All activity occurred under radiation work permits issued for specific tasks.

As a result of establishing radiological exposures controls through the RWP as well as conducting job safety analyses prior to commencing work activities, the project is proceeding without incident and occupational exposures to radioactive materials have been negligible.

Rio Algom submitted a Relocation Plan to the NRC and is awaiting approval to commence transport of the material to Pond 2 for final disposal. The plan included a comprehensive radiation protection program that will be implemented when all infrastructure planned for the site is on site and operational. This includes office trailers, changeroom facilities, and a full contractor work force. During the interim, all radiation safety monitoring is being performed as outlined within the radiation work permits established for the tasks.

I. Health Physics Sampling Summary- Section 4 Project

A. **Bioassay- Section 4 Project**

Bioassay samples were collected during the lined pond project in accordance with the long standing Bioassay Program established at the site, with the following modifications:

A total of 14 bioassay samples were collected from the Contractor employees in calendar year 2004 associated with the Section 4 project. Analytical results indicated that all sample concentrations were below the laboratory's lower detectable limit of five (5) micrograms per liter (ug/L). All quality assurance spike samples were within the Regulatory Guide 8.22 suggested variance for acceptable spike result.

These bioassay results corroborate the personnel sampling results, which show very low airborne concentrations.

B. **Personnel Alpha Contamination Checks – Section 4 Project**

There were 240 contamination surveys of contractor employees. All surveys were below the 1000 disintegrations per minute per 100 square centimeters (dpm/100 cm^2) guideline contained within NRC Regulatory Guide 8.30. Rio Algom utilized an action level of one half the allowable limit for personnel to ensure ALARA principle is maintained. Additionally, Rio Algom Health physics personnel randomly surveyed contractor personnel (51 surveys performed) during the project and all checks were below the action limits specified above.

Success in controlling contamination at the site can be attributed to job design, contractor employees utilizing their radiation safety training, following established work procedures including housekeeping, and practicing good personal hygiene.

C. **Radon Daughter Sampling – Section 4 Project**

As a result of the work being performed in an outdoor environment, no radon daughter sampling was conducted in areas associated with Section 4 pond activities. Radon daughter sampling will be initiated upon establishing the contractor control point near the Section 4 ponds. This is expected to occur in the 2nd quarter of 2005.

D. **Yellowcake Samples – Section 4 Project**

As a result of the work being performed in an outdoor environment, no uranium/yellowcake sampling was conducted in areas associated with Section 4 pond activities. Air sampling will be initiated upon establishing the contractor control point near the Section 4 ponds. This is expected to occur in the 2nd quarter of 2005.

As a result of the pond sediments containing radionuclides in addition to uranium, a site specific concentration limit was developed for the task using data from the pond solutions. Based on this data, a percentage of each air sample activity has been assigned to each radionuclide of concern (natural uranium, radium-226, thorium-230) and all intakes and exposures will be determined using these ratios.

II. Exposure Summary – Section 4 Project

All licensees are required to ensure compliance with the occupational dose limits specified within 10 CFR 20.1201(a). This regulation establishes an annual limit based on internal exposures as well as external exposures. Annual exposure to employees are determined by calculating exposures to radon daughters, soluble airborne yellowcake dust, and gamma radiation. Each component of the annual exposure is discussed in more detail in subsections A through D below.

A. **Total Effective Dose Equivalent – Section 4 Project**

The total effective dose equivalent (TEDE) exposure results for all contractor employees participating in Section 4 activities is presented in Table 1 below. The TEDE is the sum of the deep dose equivalent (external exposures) and the committed effective dose equivalent (internal exposures).

The highest employee TEDE exposure for 2004 was 0.003 Rems. This exposure represents less than 1% of the annual allowable occupational dose limit specified within 10 CFR 20.1201(a). Review of the results indicates that the TEDE is comprised primarily of the deep dose equivalent component.

TABLE 1
SECTION 4 PROJECT
2004 TOTAL EFFECTIVE DOSE EQUIVALENT (TEDE)

Exposure (REM)	0 -.005	.0051 -.01	.011 -.1	> 0.1
No. of Employees	14	0	0	0

B. **Deep Dose Equivalent (Gamma Exposure) – Section 4 Project**

Gamma exposures are determined by the results of personnel dosimetry worn by all contractor employees and analyzed in accordance with National Voluntary Laboratory Accreditation Program (NVLAP) procedures and specifications by an accredited outside contract laboratory. Table 2 summarizes the contractor employee gamma dose exposures. The highest deep dose

gamma exposure incurred by a contractor employee working on the Section 4 project was 0.003 Rem.

TABLE 2
SECTION 4 PROJECT
2004 DEEP DOSE EXPOSURES

Exposure (REM)	0 -.005	.0051 -.01	.011 -.1	> 0.1
No. of Employees	14	0	0	0

C. **Radon Daughter Exposures – Section 4 Project**

All contractor employee radon daughter exposures during 2004 were 0.0 wlm. The annual allowable occupational exposure limit is 4 wlm. The annual radon daughter exposure results for the contractor employees are presented below in Table 3.

TABLE 3
SECTION 4 PROJECT
2004 RADON DAUGHTER EXPOSURES

Exposure (wlm)	0.0	0.1- 0.5	0.6 – 1.0	> 1.0
No. of Employees	14	0	0	0

III. Miscellaneous ALARA Activities – Section 4 Project

A. **Daily and Weekly Inspections – Section 4 Project**

During the demolition project, daily inspections did not result in any abnormal or unacceptable conditions requiring corrective action.

Weekly inspections of pertinent demolition areas by the radiation safety officer were performed to observe and ensure that general radiological control practices are being used. The weekly inspections did not identify any unusual conditions or situation that required corrective action.

C. **Safety and Training Activities – Section 4 Project**

All applicable health, safety, and environmental training was administered to contractor employees prior to any employee initiating work on the Section 4 project. This training consisted of either an 8 or 24 hour course and included the topics as outlined in Rio Algom Mining LLC's "Radiation Safety Training Program", and Mine Safety and Health Administration approved training plan.

Safety meetings were conducted daily with all contractor personnel present.

The contractor Health and Safety representative reviewed various topics pertaining to safety, while the site Radiation Safety Officer highlighted radiation safety information such as contamination control, personnel dosimetry, the importance of reporting radiological hazards, personnel survey procedures, bioassay procedures, and the importance of practicing good personal hygiene and housekeeping while working in the mill area to ensure exposures remain ALARA.

APPENDIX A

Time Versus Concentration Plots

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Historical Exposure Results

CHART 1
ION EXCHANGE PLANT
wl-Concentrations - 2004

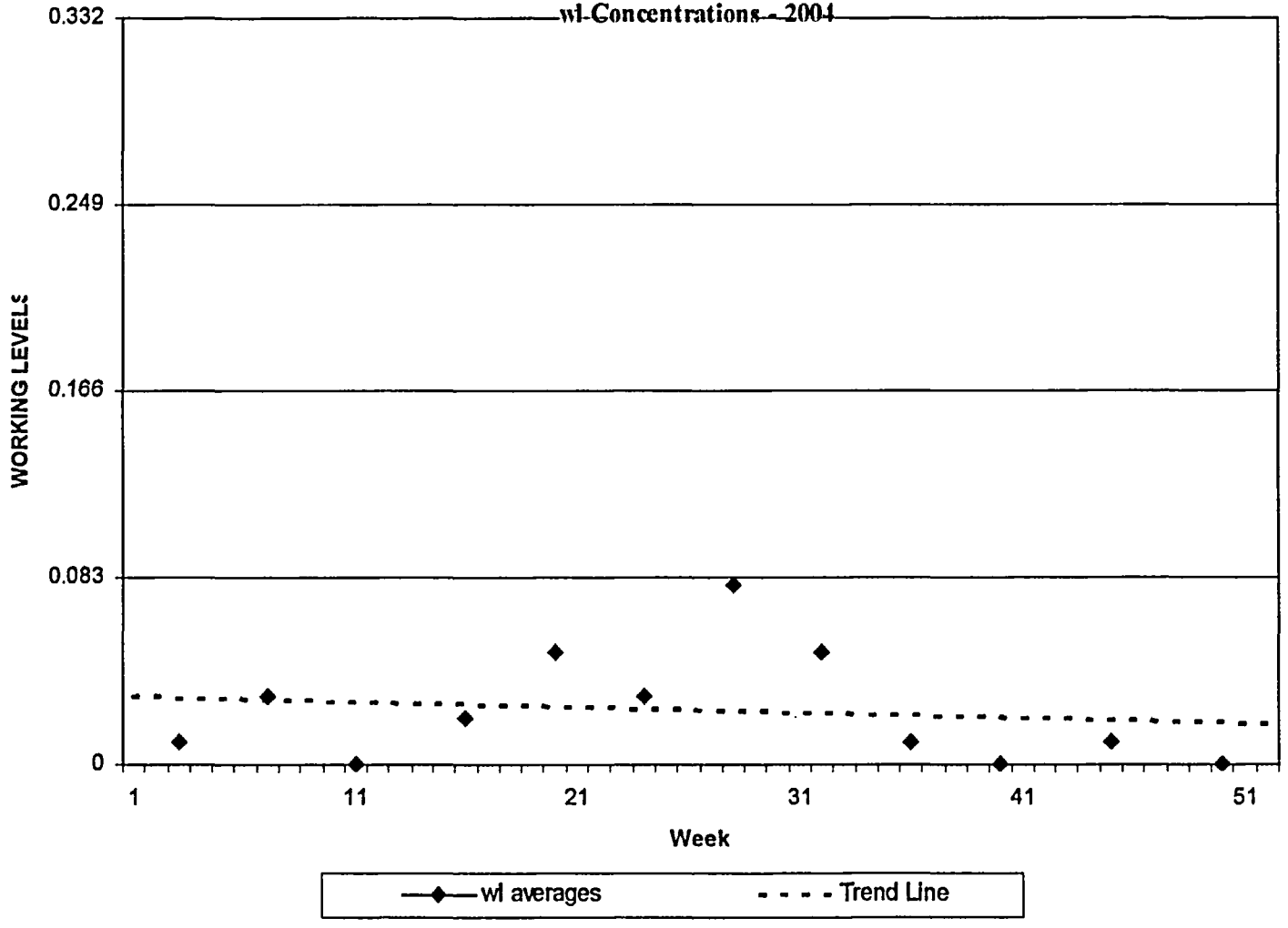

CHART 2
Airborne Yellowcake Concentrations - 2004

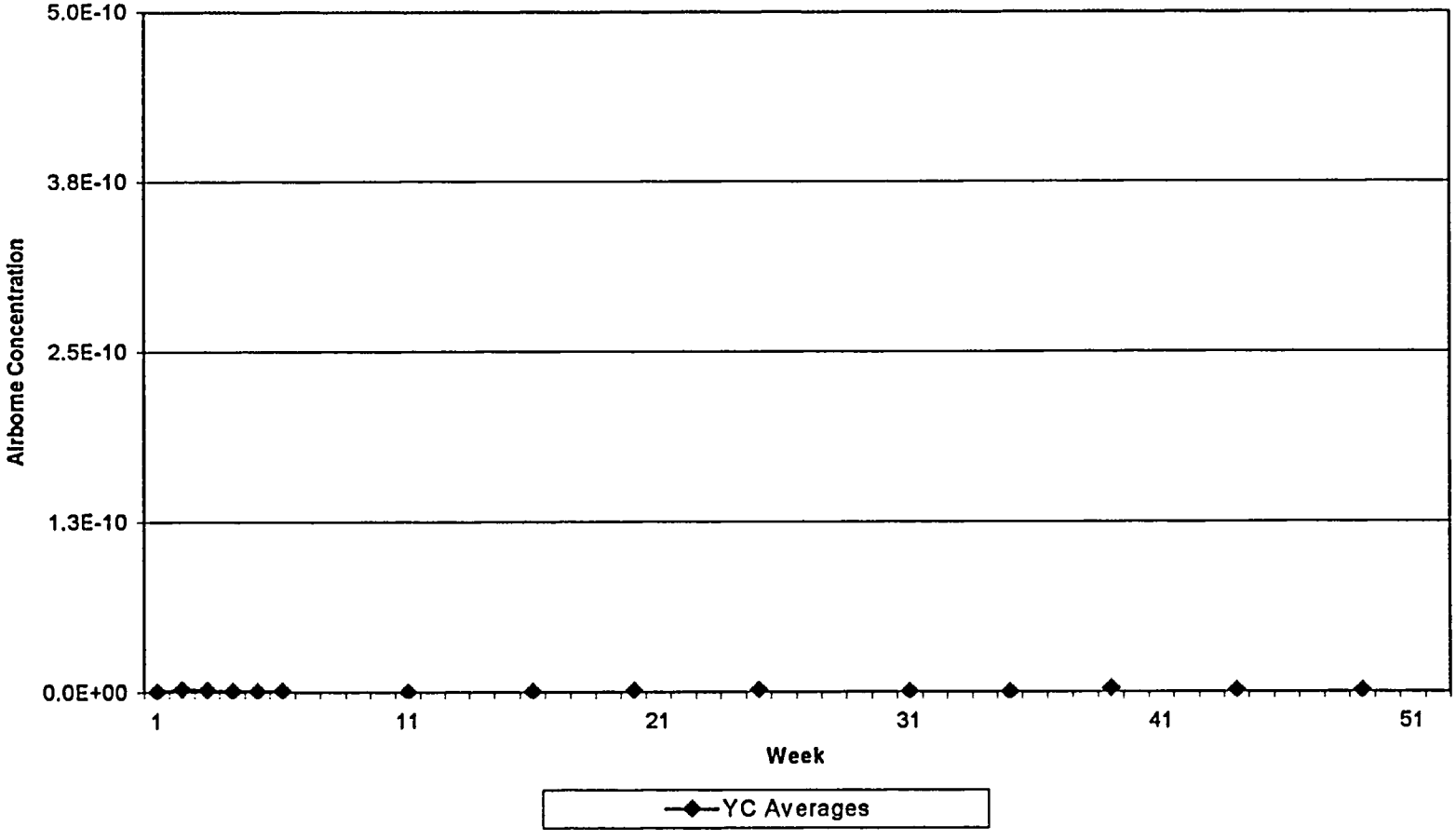

CHART 3
ANNUAL TEDE EXPOSURE
MAXIMUM EXPOSURE FOR ANY EMPLOYEE

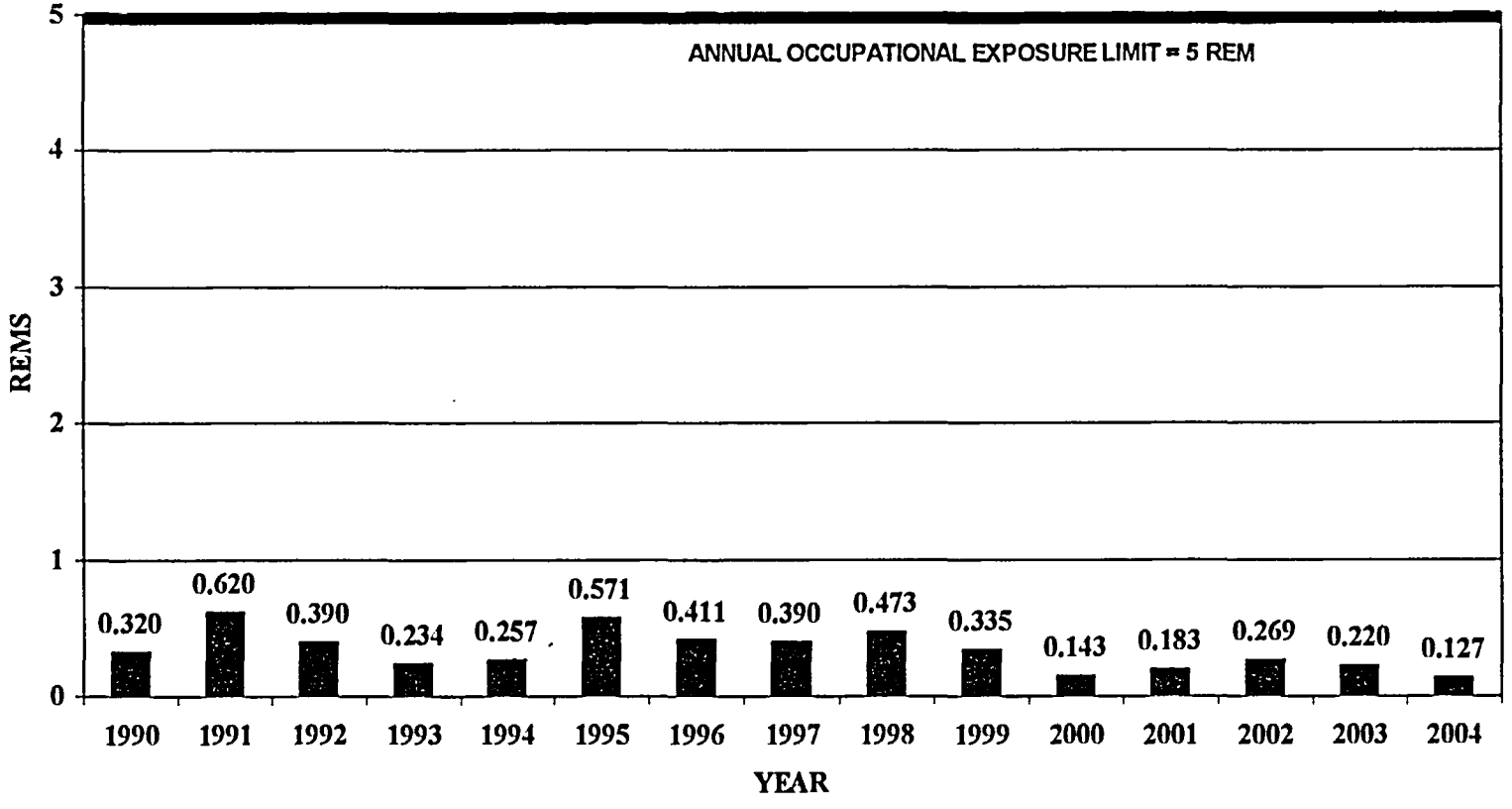

CHART 4
ANNUAL EXTERNAL RADIATION EXPOSURE
MAXIMUM DEEP DOSE EXPOSURE LEVEL FOR ANY EMPLOYEE

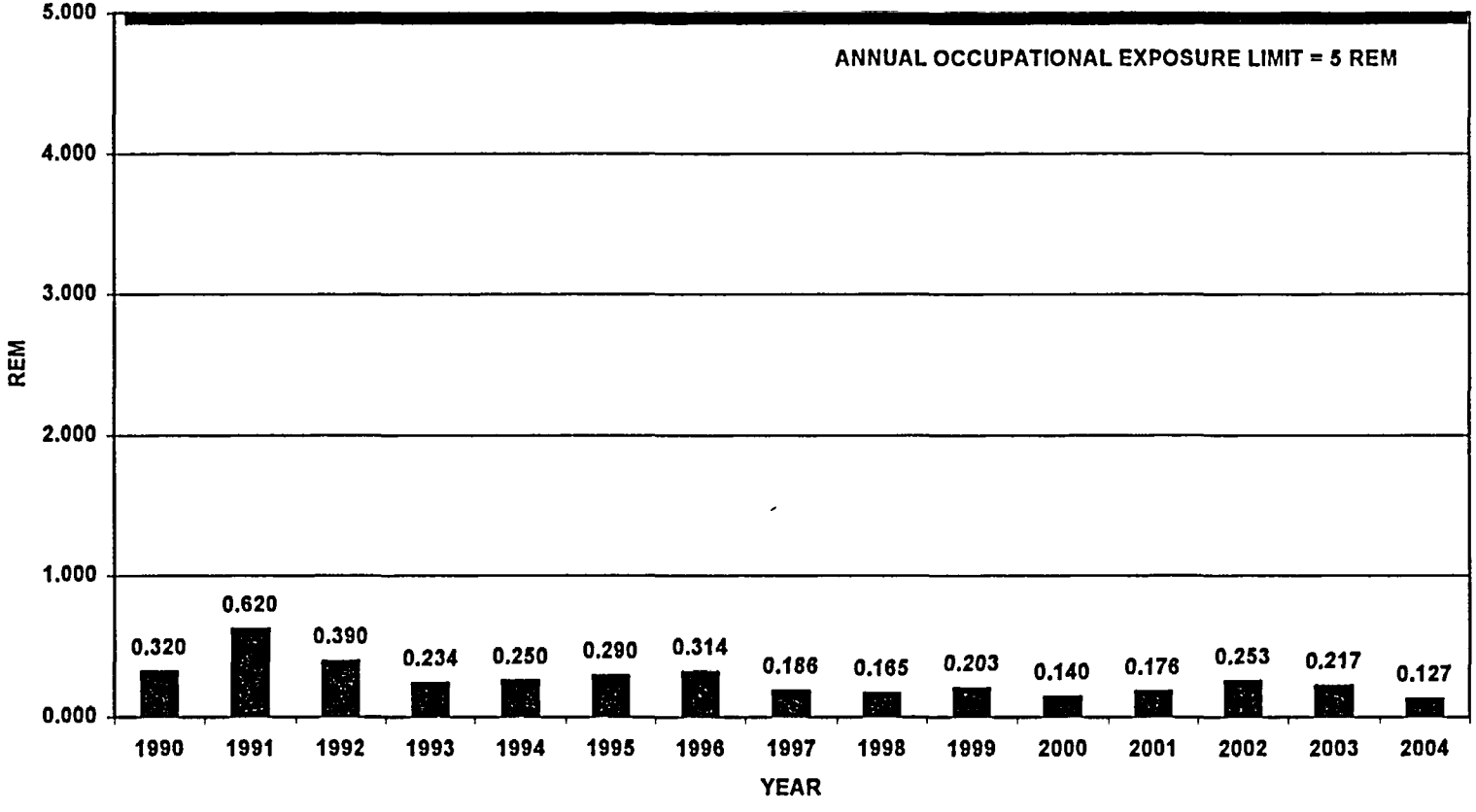

CHART 5
RADON DAUGHTER EXPOSURES
MAXIMUM EXPOSURE FOR ANY EMPLOYEE

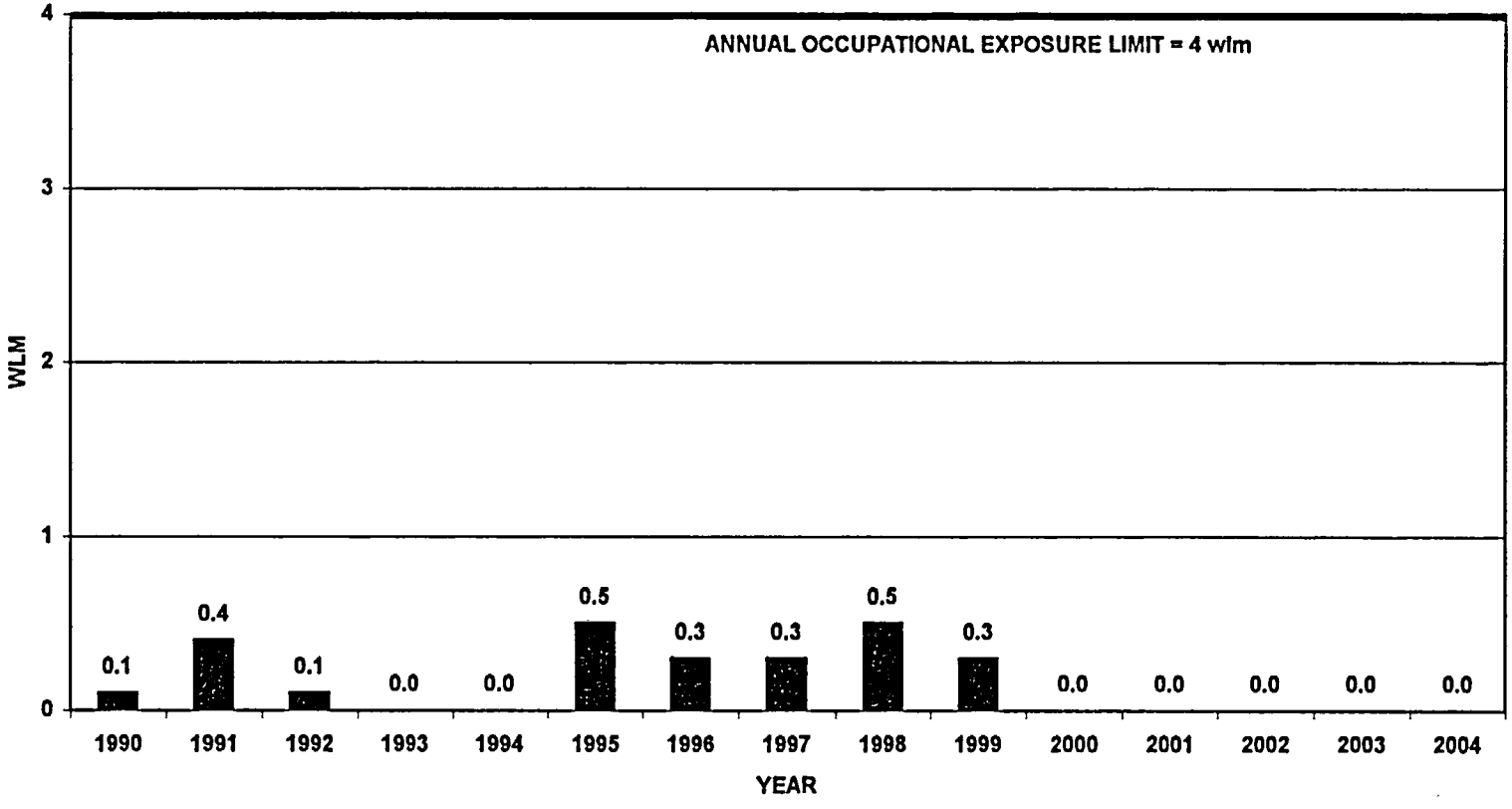

CHART 6
ANNUAL INTERNAL YELLOWCAKE DUST EXPOSURE LEVELS
MAXIMUM EXPOSURE FOR ANY EMPLOYEE