

# **Rio Algom Mining LLC**

**Rio Algom  
ALARA Summary  
January – December 2013**

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## Introduction

The annual ALARA summary for Rio Algom Mining LLC's (RAML) Ambrosia Lake facility (ALF) for calendar year 2013 is submitted for NRC's review in accordance with Rio Algom Mining LLC's Source Material License Condition #10. License Condition #10 contains RAML's ALARA Policy as specified within the Health Physics and Environmental Programs Manual (HPEM).

The primary focus of activities at the site during calendar year 2013 was excavation and removal of contaminated material and backfilling with clean material. There was also construction on the interior channel bringing it to 90% completion and a diversion channel to divert storm water from ponds. Rock and Clay were used as erosion protection for several reclaimed evaporating ponds and a disposal area. Two thirds (32 acres) of the shale borrow area was reclaimed.

### I. Health Physics Sampling Summary

#### A. Bioassay

Bioassay samples were collected quarterly in accordance with the HPEM Bioassay Program section. During the year there were a total of 6 routine samples collected and all of them were below the laboratory's lower detectable limit of five (5) micrograms per liter ( $\mu\text{g/L}$ ). All quality assurance spike samples were within the Regulatory Guide 8.22 suggested variance for acceptable spike results.

#### B. Personnel Alpha Contamination Checks

Random quarterly personnel alpha contamination surveys were conducted on March 15<sup>th</sup>, June 27<sup>th</sup>, September 25<sup>th</sup> and November 21<sup>st</sup>. All readings were within the action limits.

#### C. Surface Contamination Checks

There were 468 surface contamination checks performed during 2013. They were performed at various places throughout the restricted area including lunchrooms, change rooms, a guard office, and the IX building. All sample results were below the action levels stated in the NRC Regulatory Guide 8.30.

#### D. Radon Daughter Sampling

Personnel were not monitored for radon during 2013. Area radon monitoring was conducted in buildings such as the office, change rooms, shop areas, etc. The highest values for the area quarterly samples averaged below the working level (wl) limit.

##### a) Mill IX Plant

The IX Plant area was monitored quarterly and the highest reading during this period was .14 wl. This concentration is less than half the DAC limit of .33 wl.

#### E. Uranium Dust

There were twenty-four (24) uranium dust samples taken quarterly in the office, two mechanic shops, IX Plants 1 and 2, and the Chem Lab. The highest concentration sampled was below the acceptable limit referenced in NRC Regulatory Guide 8.30.

#### F. 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 current Respiratory Protection Program is in place and proper training and testing has been done in case the necessary action is needed. In 2013 there was not an occasion to implement this procedure. Air sampling data continues to indicate that airborne concentrations are well below the DAC for soluble natural uranium.

## 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. Dosimetry Badges were used throughout 2013 and were monitored quarterly. There were no remarkable exposures to report.

### A. Total Effective Dose Equivalent

The total effective dose equivalent (TEDE) exposure results for all employees are 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, CEDE).

TABLE 1  
2013 Total Effective Dose Equivalent (TEDE)

Exposure (REM)	0 - .005	.006 - .010	.011 - .050	>.050
No. of Employees	5	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 2013 employee gamma dose exposures.

TABLE 2  
2013 Deep Dose Exposures

Exposure (REM)	0 - .005	.006 - .010	.011 - .050	>.050
No. of Employees	5	1	0	0

### C. Radon Daughter Exposures

Air samples are obtained in accordance with the facility sampling program outlined within the NRC approved HPEM. Occupancy times are then factored into these values in order to obtain an employee's internal exposure to radon daughters for that time period.

Based on occupancy factors, all employee radon daughter exposures during 2013 were below the annual allowable occupational exposure limit of 4 wlm.

#### D. Yellowcake and Uranium Ore Dust

There has been no activity associated with uranium/yellowcake since 2003; therefore, no employee exposures were incurred.

#### E. Dose to Members of the Public

In addition to the occupational exposures discussed above, RAML prepares an annual evaluation for radiation doses to members of the public. These are prepared as per requirements of 10 CFR 20.1301-1302 and 40 CFR 190.10.

RAML submits semi-annual Effluent Monitoring Reports to the NRC. These reports are generally submitted in February and August of each year; exact dates of the submittals are dependent on the dates results are received from the laboratories. RAML would like to incorporate these reports by reference.

Dose to members of the public are prepared for the nearest resident, a typical delivery driver, and the occasional visitor that might spend some time near the boundary of the site property, such as a hunter or rancher. The 2013 results for dose to member of the public are submitted below.

TABLE 3  
2013 Dose to Member of the Public

Individual	Direct Gamma (mrem)	Radon (mrem)	Air Particulate (mrem)	Total TEDE (mrem)
Nearest Resident	3	32	0	35
Delivery Person	0	2	0	2
Occasional Visitor	0	2	0	2

The table shows that the potential dose calculations for members of the public for 2013 were well below the 10 CFR 20.1301 dose limit 100 mrem/yr.

#### IV. Miscellaneous ALARA Activities

##### A. Health, Safety, Environment and Community Management System

Implementation of the corporate wide Health, Safety, Environment and Community Management system (HSEC) continued throughout 2013. The management system provides a framework for personal, site, and corporate HSEC responsibilities and leadership and ensures the continued improvement of HSEC programs and performance.

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

##### B. Daily and Weekly Inspections

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 designated personnel are performed to observe and ensure that general radiological control practices are being used. The weekly inspections did not identify any unusual conditions or situations that required corrective action.

#### C. Safety and Training Activities

The annual training as outlined in Section 2.5 of the 2013 Health Physics and Environmental Program Manual was completed for all employees and included the topics as outlined in RAML's "Radiation Safety Training Program".

All employees receiving physicals were administered a pulmonary function evaluation during 2013. 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 HSEC management system, contamination control, personnel dosimetry, personnel survey procedures, fire extinguisher use, and the importance of practicing good personal hygiene.

#### D. Performance of Emission Control Equipment

The facility emission control equipment was demolished in late 2003.

#### E. Operational Procedures & Emergency Response Actions

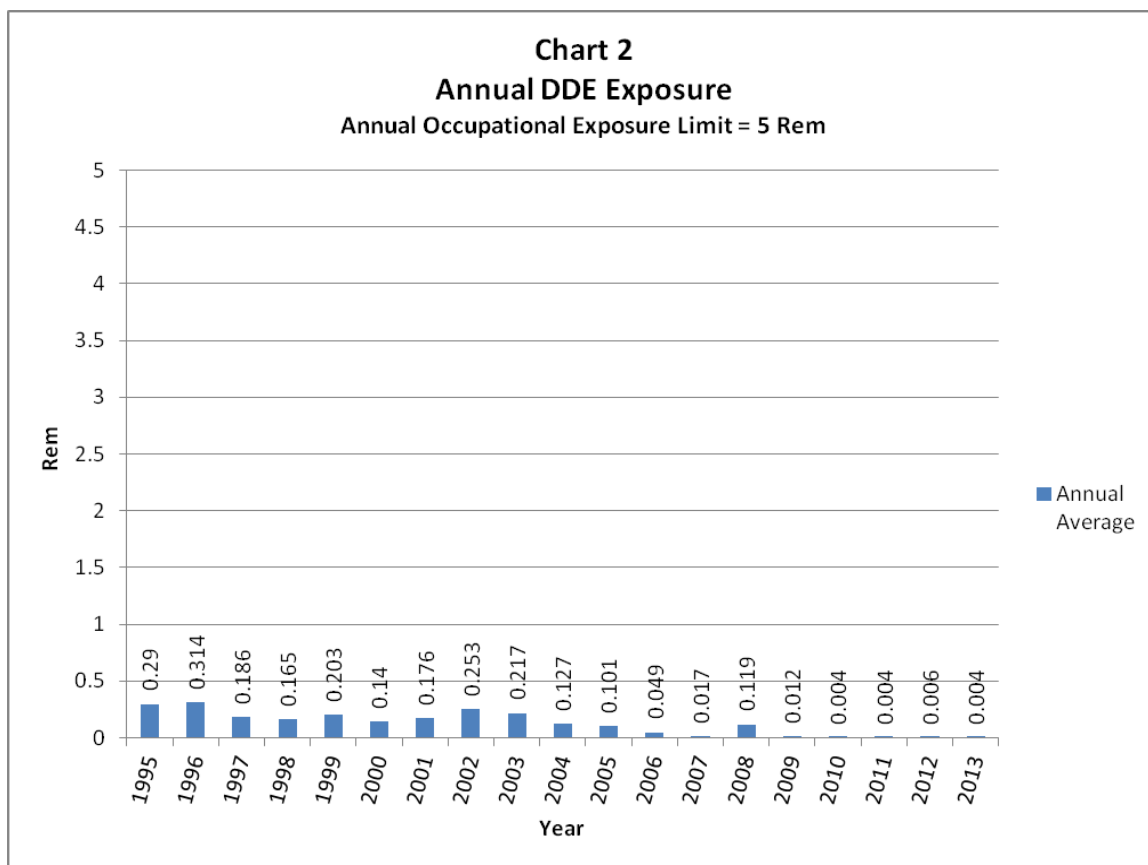
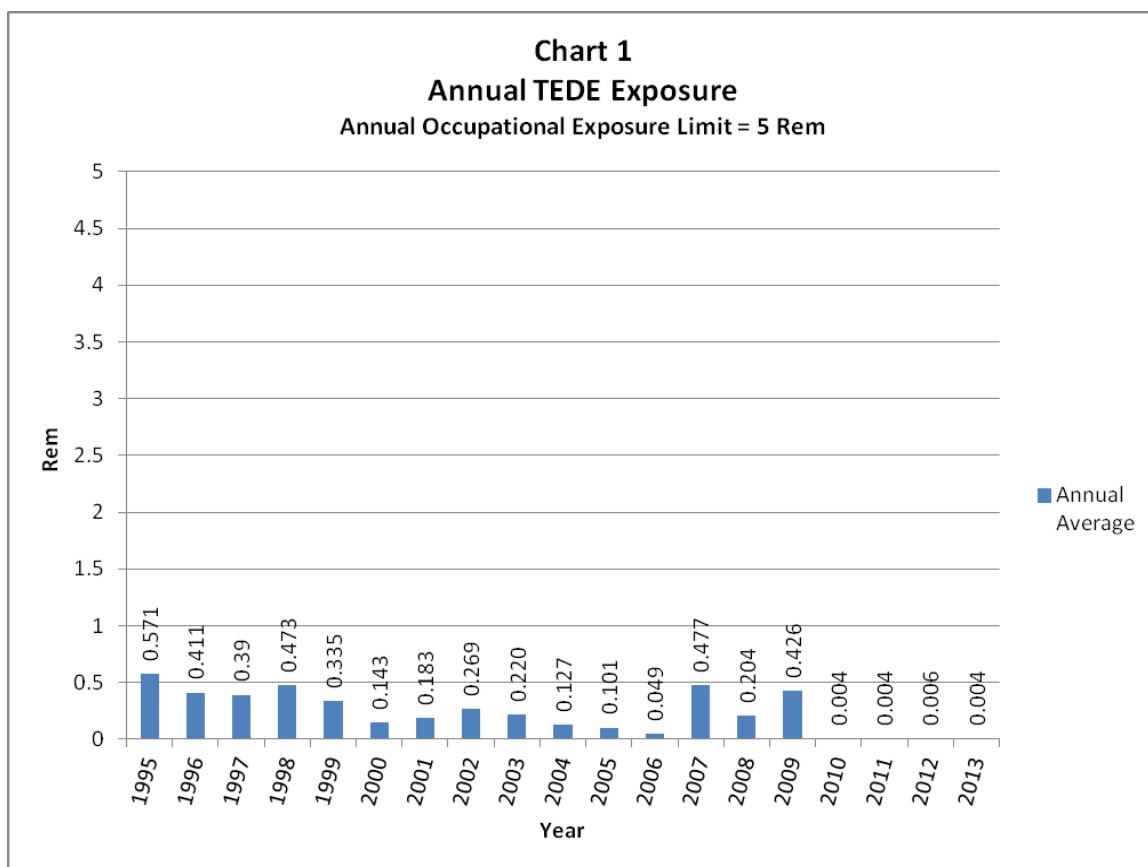
During the year all Standard Operating Procedures (SOP) and Emergency Response Procedures were reviewed and updated, if necessary, to better conform to the corporate HSEC management guidelines. In addition, all procedures utilized within the radiation safety program were reviewed, updated, as necessary, and signed in June 2013.

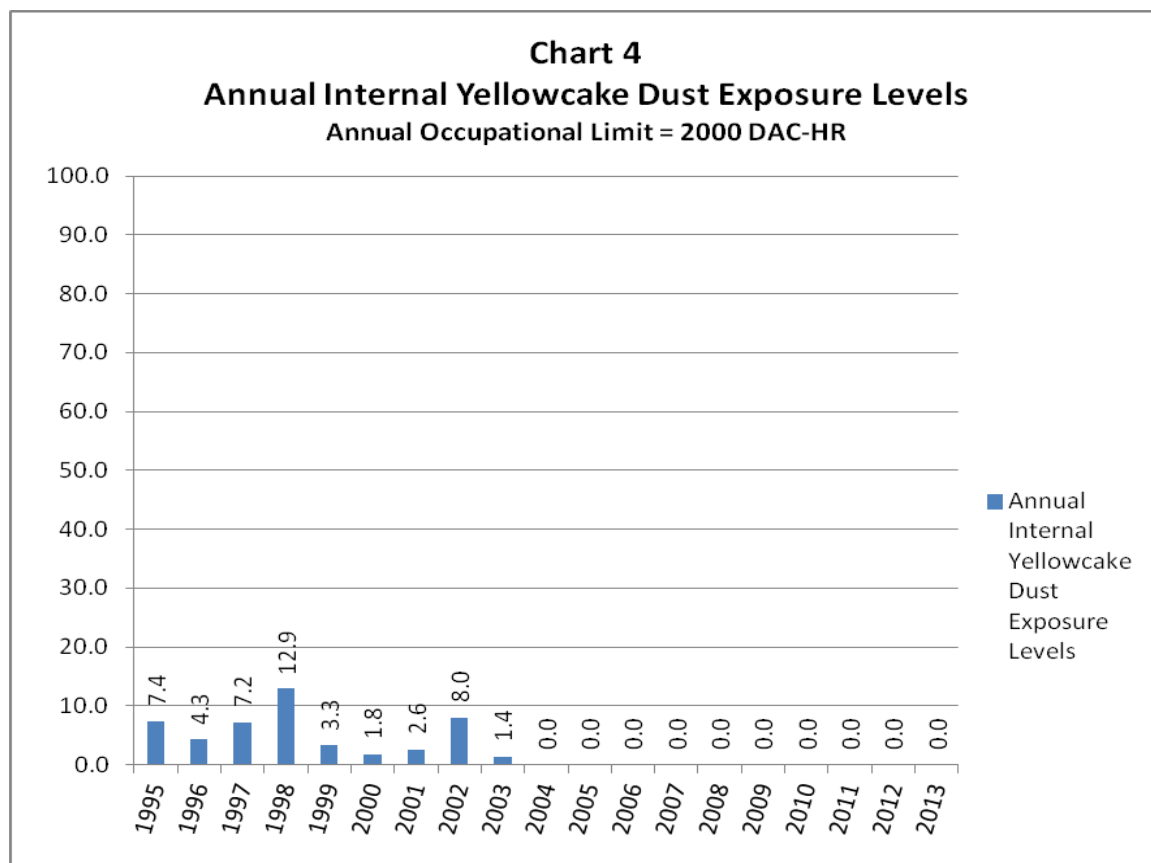
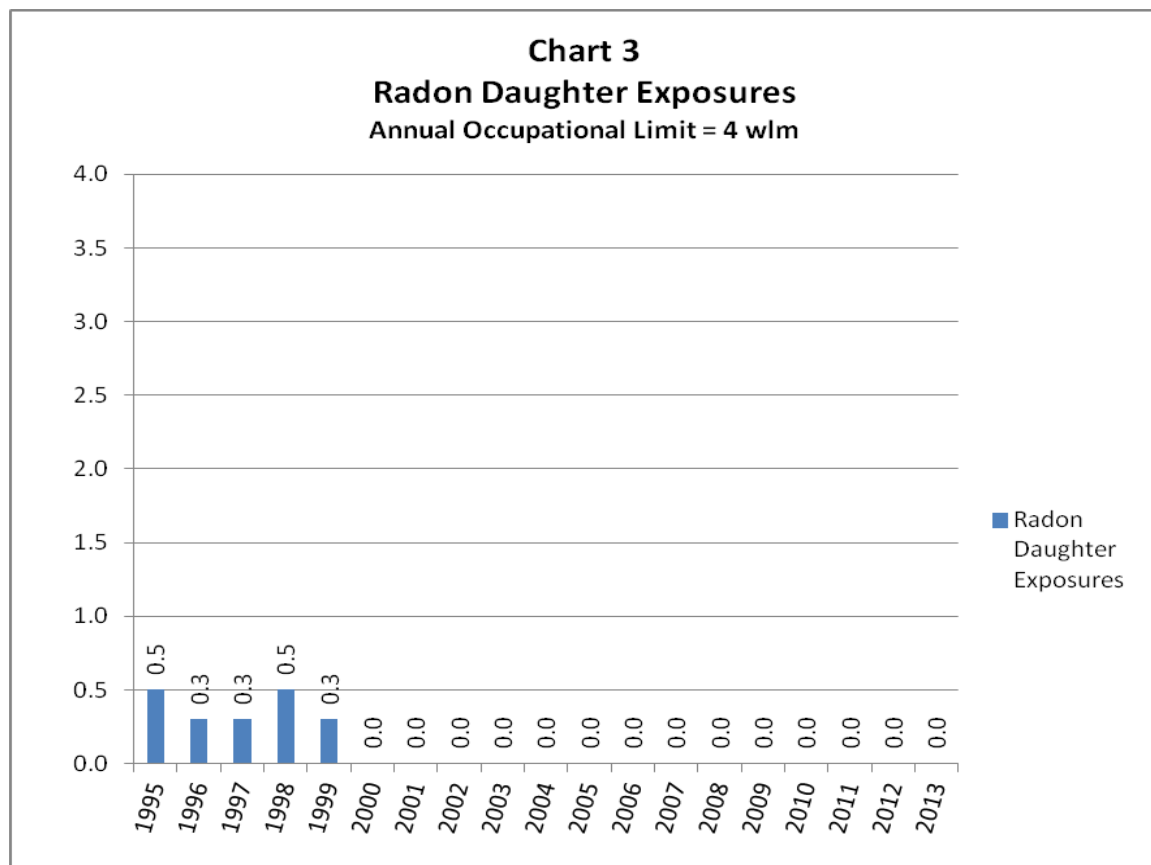
### V. Other Health Physics Sampling

Attached in Appendix B is additional health physics sampling data showing trends for:

1. Surface Contamination Surveys
2. Quarterly Uranium Dust Sampling
3. Quarterly Radon monitoring in the office areas
4. Quarterly Radon monitoring in the IX building
5. Bioassay Data including the QC checks.

## Appendix A

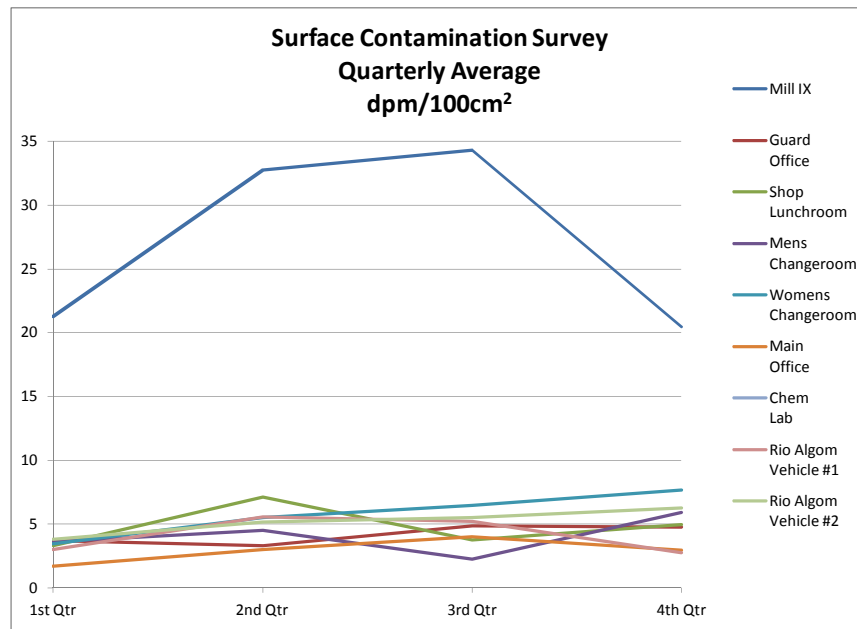
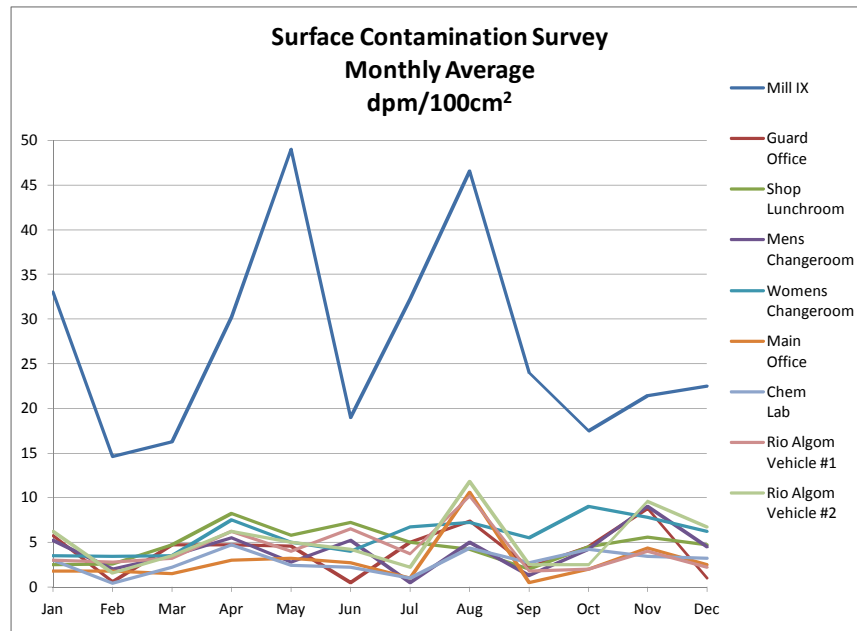






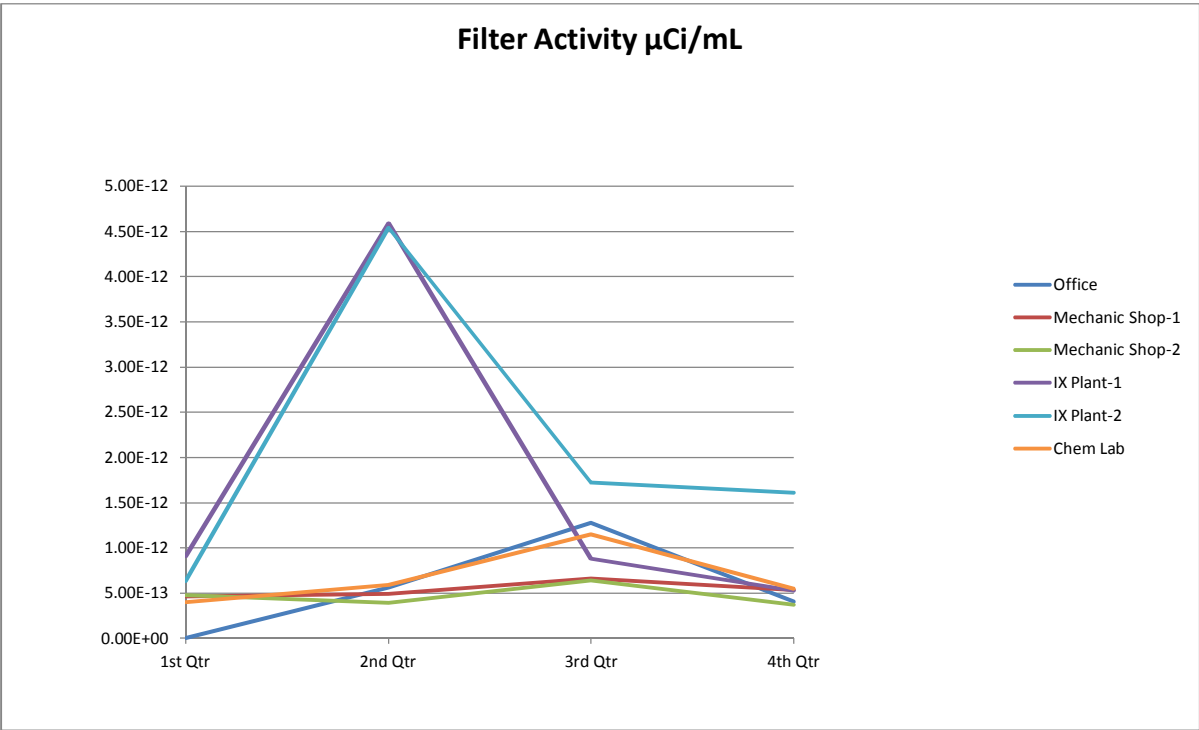
Appendix B  
Other Health Physics Sampling Trends

Monthly & Quarterly Average									
by Location									
dpm/100cm <sup>2</sup>									
Date	Mill IX	Guard Office	Shop Lunchroom	Mens Changeroom	Womens Changeroom	Main Office	Chem Lab	Rio Algom Vehicle #1	Rio Algom Vehicle #2
Jan	33	6	3	5	4	2	3	3	6
Feb	15	1	3	2	3	2	0	3	2
Mar	16	5	5	4	4	2	2	3	4
<b>1st Qtr</b>	<b>21</b>	<b>4</b>	<b>3</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>4</b>
Apr	30	5	8	6	8	3	5	6	6
May	49	5	6	3	5	3	2	4	5
Jun	19	1	7	5	4	3	2	7	4
<b>2nd Qtr</b>	<b>33</b>	<b>3</b>	<b>7</b>	<b>5</b>	<b>6</b>	<b>3</b>	<b>3</b>	<b>6</b>	<b>5</b>
Jul	32	5	5	1	7	1	1	4	2
Aug	47	7	4	5	7	11	4	10	12
Sep	24	2	2	1	6	1	3	2	3
<b>3rd Qtr</b>	<b>34</b>	<b>5</b>	<b>4</b>	<b>2</b>	<b>6</b>	<b>4</b>	<b>3</b>	<b>5</b>	<b>6</b>
Oct	18	5	5	4	9	2	4	2	3
Nov	21	9	6	9	8	4	3	4	10
Dec	23	1	5	5	6	3	3	2	7
<b>4th Qtr</b>	<b>20</b>	<b>5</b>	<b>5</b>	<b>6</b>	<b>8</b>	<b>3</b>	<b>4</b>	<b>3</b>	<b>6</b>

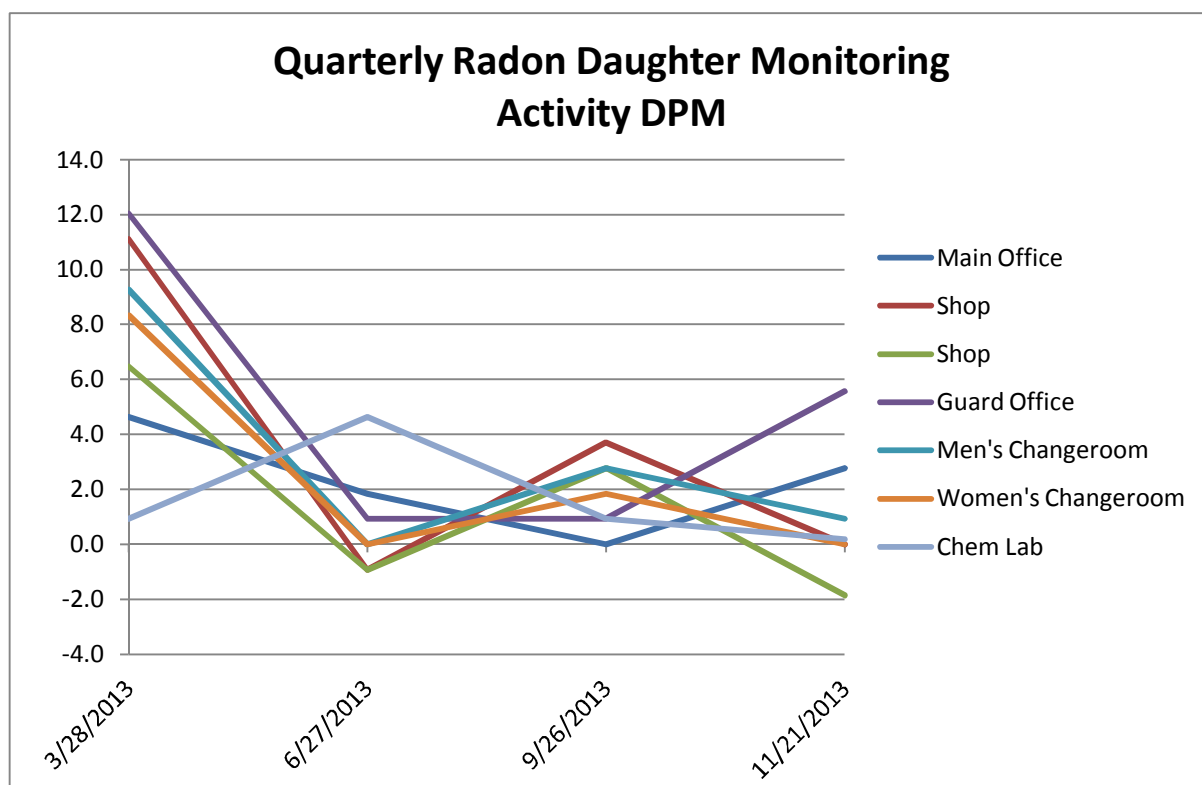


Location										
Reading $\mu\text{R}/\text{Hr}$										
Date	Main Office	Main Office	IX Plant	IX Plant	IX Plant	Shop	Water Treatment Bldg	Guard Office	Men's Changeroom	Women's Changeroom
	Room 14	Room 12	Office	12" Water Line (7ft up)	Bottom of Stairway	Wash Bay Table	#1 Sand Filter	Table	Laundry Rm Door	East Window
1/30/2013	18	19	265	4000	19	3200	16	18	32	800
12/4/2013	18	20	300	3800	320	17	1850	22	25	40

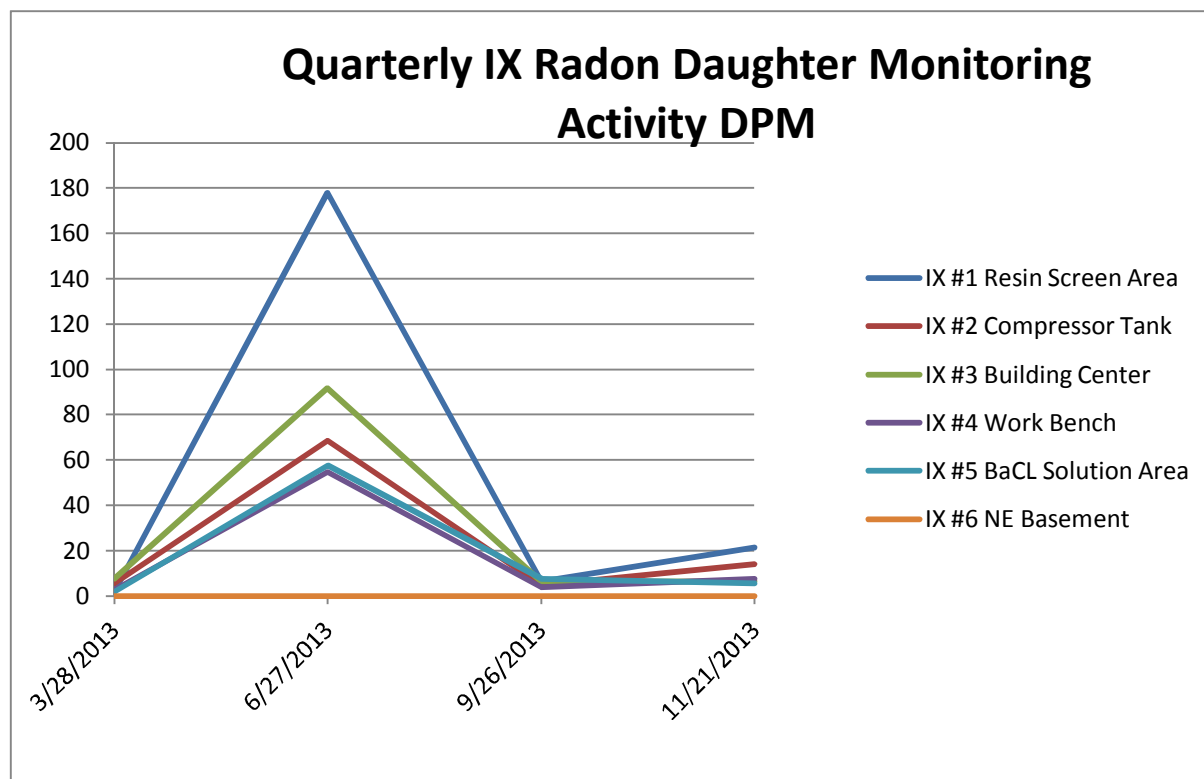
Quarterly Uranium Dust Sampling												
Quarter	Filter Activity DPM/L						Filter Activity µCi/mL					
	Office	Mechanic Shop-1	Mechanic Shop-2	IX Plant-1	IX Plant-2	Chem Lab	Office	Mechanic Shop-1	Mechanic Shop-2	IX Plant-1	IX Plant-2	Chem Lab
1st Qtr	0.0000	0.0010	0.0011	0.0020	0.0014	0.0009	0.00E+00	4.65E-13	4.78E-13	9.09E-13	6.31E-13	3.98E-13
2nd Qtr	0.0013	0.0011	0.0009	0.0102	0.0101	0.0013	5.65E-13	4.91E-13	3.93E-13	4.59E-12	4.54E-12	5.89E-13
3rd Qtr	0.0028	0.0015	0.0014	0.0020	0.0038	0.0026	1.28E-12	6.63E-13	6.38E-13	8.84E-13	1.72E-12	1.15E-12
4th Qtr	0.0009	0.0012	0.0008	0.0012	0.0036	0.0012	4.06E-13	5.36E-13	3.72E-13	5.28E-13	1.61E-12	5.48E-13



Quarterly Radon Daughter Monitoring							
Activity DPM							
Date	Main Office	Shop	Shop	Guard Office	Men's Changeroom	Women's Changeroom	Chem Lab
3/28/2013	4.6	11.1	6.5	12.0	9.3	8.3	0.9
6/27/2013	1.9	-0.9	-0.9	0.9	0.0	0.0	4.6
9/26/2013	0.0	3.7	2.8	0.9	2.8	1.9	0.9
11/21/2013	2.8	0.0	-1.9	5.6	0.9	0.0	0.2



Quarterly IX Radon Daughter Monitoring Activity DPM						
Date	IX #1	IX #2	IX #3	IX #4	IX #5	IX #6
	Resin Screen Area	Compressor Tank	Building Center	Work Bench	B <sub>a</sub> CL Solution Area	NE Basement
3/28/2013	1.9	5.6	7.4	2.8	1.9	No sample
6/27/2013	177.8	68.5	91.7	54.6	57.4	No sample
9/26/2013	6.5	4.6	6.5	3.7	7.4	No sample
11/21/2013	21.3	13.9	6.5	7.4	5.6	No sample



Bioassay Reports									
For Natural Uranium - Results in µg/L									
Date	Client ID#								
	196	442	509	515	529	119	424 QC	437 QC	Limit
2/7/2013	0.0	0.0	0.0	0.0	0.0	0.0	15.0	43.8	5.0
6/26/2013	0.0	0.0	0.0	0.0	0.0	0.0	15.1	44.3	5.0
9/23/2013	0.0	0.0	0.0	0.0	0.0	0.0	15.6	45.9	5.0
12/16/2013	0.0	0.0	0.0	0.0	0.0	0.0	33.6	44.0	5.0

