



Grants Project

**Homestake Mining Company of California**

**Alan D. Cox**  
*Project Manager – Grants*

20 August 2007

UPS Next Day Air:

Mr. Ron Linton, Project Manager  
c/o Document Control Desk  
Fuel Cycle Facilities Branch (Mailstop T8-A33)  
Division of Fuel Cycle Safety and Safeguards  
Office of Nuclear Materials Safety and Safeguards  
U. S. Nuclear Regulatory Commission  
11545 Rockville Pike  
Two White Flint North  
Rockville, MD 20852-2738

RE: **Docket No. 40-8903**  
**License No. SUA-1471**  
**Semi-Annual Environmental Monitoring Report**  
**Period – January through June 2007**

Dear Mr. Linton:

Pursuant to US Nuclear Regulatory Commission Regulation 10 CFR 40.85 and Part 20, Homestake Mining Company of California hereby submits two (2) copies of their semi-annual report for the first-half of 2007 (January through June) for the Homestake Grants Reclamation Project.

Groundwater data for the project is filed with the year-end semi-annual report pursuant to our current NRC license condition LC-15.

The 600-gpm reverse osmosis (RO) plant operated at an average rate of 274-gpms during the January through June 2007 reporting period. Operating rates for the plant are related to the existing evaporation pond storage volume capacities and associated seasonal forced evaporative spray systems on Evaporations ponds #1 and #2.

Thank you for your time and attention on this matter. If you have any questions or require additional information, please contact me at the Grants office (505) 287-4456, ext. 25 or via cell phone at (505) 400-2794.

Sincerely yours,

HOMESTAKE MINING COMPANY OF CALIFORNIA  
Alan D. Cox

Enclosures (2)

xc: Mr. B. Spitzberg, Chief, Decommissioning Branch, w/enclosure  
Mr. R. Chase, Barrick - SLC, w/enclosure  
Mr. B. Ferdinand, Barrick - SLC, w/enclosure  
Mr. G. Hoffman, Hydro Engineering - Casper w/enclosure  
Mr. S. Appaji, Region VI EPA - Dallas w/enclosure  
Ms. C. Stafford, Director of Library Services, NMSU Grants, w/enclosure

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**HOMESTAKE MINING COMPANY  
OF  
CALIFORNIA  
GRANTS PROJECT**



**SEMI-ANNUAL ENVIRONMENTAL  
MONITORING REPORT**

**JANUARY – JUNE**

**2007**

**U.S. Nuclear Regulatory Commission License SUA-1471  
State of New Mexico DP-200**

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## 1.0 INTRODUCTION

This Semi-Annual Environmental Monitoring Report summarizes effluent monitoring data recorded for Homestake Mining Company of California - Grants Project (Homestake) from January through June 2007. The submittal of this report to the appropriate Nuclear Regulatory Commission (NRC) Regional Office and State of New Mexico within 60 days after January 1, and July 1 for each year of operation is required for all uranium mill facilities pursuant to 10 CFR Part 40.65. The monitoring data and the report format have been selected by Homestake representatives to satisfy the requirements of 10 CFR Part 40.65.

Homestake's monitoring and surveillance program for radioactive effluent releases have been designed to ensure the project compliance with 10 CFR Part 40, and Part 20 U.S. NRC Standards for Protection Against Radiation and closely approximates programs as described in NRC's Regulatory Guide 4.14, Radiological Effluent and Environmental Monitoring at Uranium Mills. Some effluent monitoring activities differ from those presented in the Regulatory Guide 4.14 as required by Homestake's Radioactive Materials License (SUA-1471).

Recontouring reclamation activities began in September 1993 and mill demolition commenced in late October 1993 and was completed December 10, 1995. A mill decommissioning completion report was submitted in February 1996 and approved by the NRC on January 28, 1999. The large tailings pile has been re-contoured and covered with interim cover on the top and radon barrier on the outcrops. Bedding and erosion protection was placed on the outcrops after placement of the radon barrier. Soil cleanup verification of the off-pile contaminated soil (windblown tailings) is complete; the completion report was submitted December 18, 1995 and approved by the NRC on January 29, 1999. In addition, a decommissioning report for the mine ion-exchange (IX) plant was completed and approved on December 22, 1997.

During this reporting period Homestake operated a reverse osmosis water treatment plant as part of the ongoing ground water restoration program at the site. For the operating period from January through June, the RO plant processed an average 274-gpm while producing an average of 196-gpm of product water that was used for re-injection.

Homestake's groundwater monitoring program, as outlined in license Condition No. 35, continued throughout the report period. The requirements set forth in Condition No. 35 include the reporting of both radiological and non-radiological water quality parameters for specified wells, as well as the documentation of water injection and collection volumes of the groundwater cleanup system. The performance review of the corrective action program is submitted annually as a separate document and contains the groundwater monitoring information for January 1 through December 31 of each year. In order to meet NRC's requirement for semi-annual reporting, groundwater-monitoring data for the point-of-compliance (POC) wells and background well P will be included in the second half semi-annual environmental monitoring report. It should be noted that while the POC wells will eventually be used to demonstrate groundwater restoration, they are not currently representative of off-site groundwater quality conditions.

## **2.0 ENVIRONMENTAL MONITORING PROGRAMS**

The monitoring requirements for the site are summarized in Table 1, Table 2, and Table 3 attached. Details of the monitoring program are discussed in the following sections:

### **2.1 Air Particulate Monitoring**

Homestake continuously samples total suspended particulate at six locations around the reclamation site (see Figure 1). Those locations identified as HMC-1, HMC-2 and HMC-3 are areas at the property boundary expected to have the highest predictable concentrations of airborne radioactive particulate. The predominant wind direction is from the Southwest; accordingly, HMC-1, HMC-2 and HMC-3 are generally located down wind from Homestake's reclamation activities. The location identified as HMC-6 represents background conditions, and is located due west of the large tailings pile at the western most side of the property boundary. Locations HMC-4 and HMC-5 are site proximal to the nearest residences. The results are presented in Attachment 1.

Homestake uses a Sierra Instruments Model #305-200 High Volume Air Samplers (or equivalent) to continuously sample the ambient air of the locations shown in Figure 1. The samples are collected on 8-inch by 10-inch Whatman glass fiber filters (or equivalent), which are changed weekly or more frequently as required by dust loading. Energy Laboratories, Inc analyzes the collected samples quarterly for Natural Uranium, Radium-226, and Thorium-230.

### **2.2 Radon Gas Monitoring**

Radon gas concentrations are monitored on a continuous basis at the eight locations identified in Figure 1. The background station for radon gas is HMC #16, located Northwest of the site. Landauer Corporation track-etch passive radon monitors (PRM), or the equivalent, are used to continuously monitor radon gas at each sampling location. Semi-annually Homestake personnel place new alpha particle sensitive detectors at the monitoring locations and the exposed detectors are retrieved and returned to Landauer Corporation for analysis. The technique by which the PRM detectors measure radon gas concentrations consists of exposing an alpha-particle sensitive plastic detector, which is mounted in a plastic container, to ambient air. The decay of radon gas contained in the ambient air causes imprint tracks on the alpha-sensitive detector that can then be counted at a later time. The radon gas concentration can subsequently be calculated by determining the number of tracks per unit area of the detector. A filter is placed over the container opening to inhibit the entrance of any alpha-emitting dust particles. The results are presented in Attachment 2.

## **3.0 WATER QUALITY MONITORING**

Table 2 (8-99, as modified by Amendment 34), as attached, outlines the water quality sampling frequency and parameters monitored. In addition, the volumes of water injected and recovered as part of the ground-water cleanup program are monitored on a weekly frequency and the rates documented. A performance review report is submitted by March 31 of each year according to

License Condition 35E. The groundwater monitoring data for the POC wells and background well P, as required to comply with 10 CFR 40.65, will be included in the July - December Semi-Annual Environmental Report.

#### **4.0 DIRECT RADIATION**

Gamma exposure rates are continuously monitored through the use of optically stimulated luminescence (OSL) dosimeter badges placed at each of the seven locations identified in Figure 1. HMC #16 is considered the background location for direct radiation. Each OSL badge consists of an aluminum oxide detector within a plastic holder. The plastic provides adequate protection from weather for these badges to be used out-of-doors. The OSL's are exchanged semi-annually and analyzed by an approved independent laboratory (currently Landauer Inc.). The levels of direct environmental radiation are recorded for each of the seven locations. Pertinent sample data are reported in Attachment 3.

#### **5.0 SURFACE CONTAMINATION**

The Occupational Monitoring Program requirements are summarized in Table 3. The aspects related to contamination control are discussed briefly below.

##### **5.1 Personnel Skin and Clothing**

The monitoring of personnel for alpha contamination is required as part of all radiation work permits using standard operating procedures. No releases of personnel or clothing above administrative limits were reported during this reporting period.

##### **5.2 Survey of Equipment Prior to Release for Unrestricted Use**

Equipment surveys are required for all equipment that is to be removed from contaminated areas as specified in radiation work permits. Standard Operating Procedures are used for these surveys. No releases of contaminated material above NRC release criteria were reported.

#### **6.0 LOWER LIMIT OF DETECTION**

Homestake representatives have calculated the Lower Limit of Detection (LLD) for each measurement system, where applicable, to more accurately evaluate concentrations of radioactive material measured in the environment surrounding the mill site. The lower limit of detection is defined in U.S. Nuclear Regulatory Guide 8.30 – Appendix B as the smallest concentration of radioactive material that has a 95% probability of being detected. Radioactive material is “detected” if the value measured on an instrument is high enough to conclude that activity above the system background is probably present. Since the LLD is a function of sample volume, counting efficiency, radiochemical yield, etc., it varies for different sampling and analysis procedures.

For the individual measurement systems for which Homestake calculates LLDs, the following formula is utilized:

$$LLD = \frac{3+4.66 S_b}{3.7 E 4 EVY \exp(-\lambda t)}$$

Where:

- LLD is the lower limit of detection (microcuries per milliliter);  
 $S_b$  is the standard deviation of the instrument background counting rate (counts per second);  
 $3.7 E 4$  is the number of disintegrations per second per microcurie;  
 $E$  is the counting efficiency (counts per disintegration);  
 $v$  is the sample volume (milliliters);  
 $Y$  is the fractional radiochemical yield (when applicable);  
 $\lambda$  is the radioactive decay constant for the particular radionuclide; and;  
 $t$  is the elapsed time between sample collection and counting

The value of  $S_b$  used in the calculation of the LLD for a particular measurement system will be based on the actual observed variance of the instrument background counting rate. The laboratory has been instructed to report the LLD for each measurement considering all of the parameters associated with the measurement system and the sample size.

The vendor laboratory that performed the analyses reported herein has documented that the LLD for air and water samples will meet or exceed the requirements in Regulatory Guide 4.14. This assumes a minimum water sample size of 1 liter and an air sample volume of 2 E09 ml. Landauer, Inc (vendor lab) reports the LLD for radon-222. The LLDs for the constituents are:

Ra-226, Th-230 in air	1 E-16 $\mu$ Ci/ml
Rn-222 in air	30 pCi(d/l)
U-nat in air	1 E-16 $\mu$ Ci/ml
U-rad in water	2 E-10 $\mu$ Ci/ml
Ra-226, Th-230 in water	2 E-10 $\mu$ Ci/ml

Uranium is analyzed by ICP-MS methods by the current vendor laboratory. In order to determine the LLD, the laboratory has performed the analysis on a blank sample many times and uses the standard deviation of these background measurements to calculate the LLD. This LLD is specified for all analyses as long as the sample size or volume meets the minimum value.

## 7.0 DATA SUMMARY AND CONCLUSIONS

The summaries of Homestake's effluent monitoring program included in this submittal contain data for each of the regulated parameters released to unrestricted areas. DP-200, dated November 15, 1995, and 10 CFR Part 40.65 requires that Homestake submit effluent release monitoring data to the State of New Mexico and the NRC within 60 days of the end of the six-month period ending January 1 and July 1 of each year. Homestake is submitting this report to satisfy the regulatory requirements cited above. The attachments included in this report summarize the results of the effluent monitoring activities conducted by Homestake and pertinent to the required monitoring time period.

The data collected in many of Homestake's effluent monitoring programs can be readily compared to 10 CFR Part 20 values. Homestake has not exceeded 10 CFR Part 20 values in any of their effluents monitored during the period covered by this report. This, of course, does not include the ground water values at the POC wells as discussed earlier.

**Table 1 - Environmental Monitoring Program Excluding  
Groundwater Monitoring**

**Table 1 - Environmental Monitoring Program Excluding Groundwater Monitoring**

Type of Sample	Number	Locations	Method	Frequency	Analytical Parameters
AIR Particulates	3	HMC1, HMC2, HMC3 at or near the site boundary in sectors that have the highest predicted concentrations of radioactive airborne particulates.	Continuous (High Vol.)	Weekly filter change or more frequently as required. Samples composited and analyzed quarterly.	Natural Uranium, Radium-226, Thorium-230
	2	HMC4, HMC5 at nearest occupied residences	Continuous (High Vol.)	Weekly filter change, or more frequently as required. Samples composited and analyzed quarterly.	Natural Uranium, Radium-226, Thorium-230
	1	HMC6 background location	Continuous (High Vol.)	Weekly filter change, or more frequently as required. Samples composited and analyzed quarterly.	Natural Uranium, Radium-226, Thorium-230
Radon Gas	8	Locations described in Air - Particulates & HMC7 on S boundary & HMC16 as a background	Continuous Track-etch	Semi-Annual	Rn-222
DIRECT RADIATION	7	Locations described in Air - Particulates & HMC-16 as a background	OSL	Semi-Annual	Gamma Exposure Rate

**Table 2 – Groundwater Monitoring Program (8-99, as modified by  
Amendment 34)**

**Table 2 – Groundwater Monitoring Program (8-99 as modified by Amendment 34)**

Well Number	Parameters to be Monitored	Frequency of Monitoring
#1 & #2 Deepwells	D	Annually
Broadview Acres Wells 446, SUB1, SUB2, SUB3	G	Annually
Felice Acres Wells 490, 492, 493, 494	G	Annually
Murray Acres Wells 802, 844	G	Annually
Pleasant Valley Wells 688, 846	G	Annually
Regional Wells 920, 942	G	Annually
Site Monitoring Wells F, FB, GH, MO, CW2	G	Annually
Collection System Wells	Total Volume	Monthly
Injection System Wells	Total Volume	Monthly
Reversal Wells B, BA, KZ, KF, SO, SP, S1, S2	Water Level	Weekly
Point of Compliance Wells D1, X, S4	B, F	Annually
Background Well P	B	Annually

B = Water Level, pH, TDS, SO<sub>4</sub>, Cl, HCO<sub>3</sub>, CO<sub>3</sub>, Na, Ca, Mg, K, NO<sub>3</sub>, U, Se, Mo, Ra-226

D = Ca, Mg, K, Na, HCO<sub>3</sub>, CO<sub>3</sub>, Cl, SO<sub>4</sub>, pH, TDS, Al, As, Ba, Cd, Co, Cu, CN, F, Fe, Pb, Mn, Hg, Mo, Ni, NO<sub>3</sub> as N, Se, Ag, Zn, U, Filtered Ra-226

F = V, Ra-228, Th-230

G = Water Level, SO<sub>4</sub>, U, Se, TDS, Mo

**Table 3 - Occupational Monitoring Program (6-00)**

**Table 3 – Occupational Monitoring Program (6-00)**

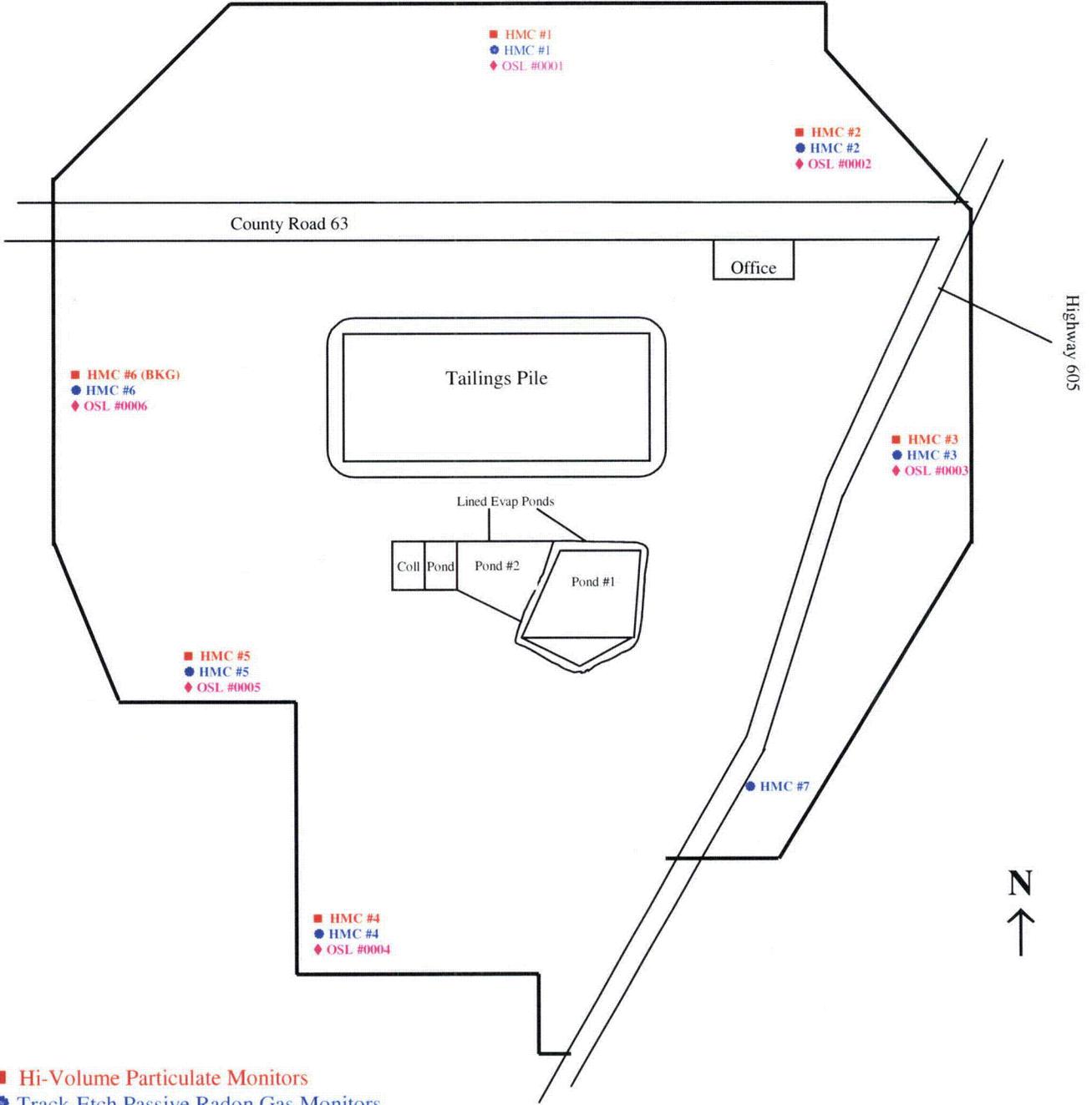
Type of Sample	Number	Locations	Method	Frequency	Analytical Parameters
Lapel Personal Air Sample	As required by RWP	As required by RWP (2 L/min or equivalent)	HP-1	As required by RWP	Alpha, U-Nat
Lapel Personal Air Sampler Calibration	As required by RWP	N/A	HP-1	As required by RWP	Flow rate
Release of Equipment	As required by RWP	Potentially Contaminated Equipment and Materials	HP-4	As required by RWP	Alpha, beta gamma
ALARA	N/A	As required by RPA	HP-6	N/A	As required by RPA
Respiratory Protection	As required by RWP	As required by RWP	HP-7	N/A	N/A
Bioassay	As required by RWP	As required by RWP	HP-8 after mill decommissioning; termination	Baseline, Semi-annual	U-Nat in urine
Instrument Calibration	Variable	Radiation Detection Instruments in use	HP-10	Annually	N/A
Personnel Gamma (OSL)	Variable	Personnel	HP-11	Quarterly	Gamma
Personnel Contamination	As required by RWP	As required by RWP	HP-12	As required by RWP	Alpha
Radiation Protection Training	As required	Mill Site taught by RPA (certified individual) subjects as per Reg Guide 8.31	HP-14 for people working with groundwater or physical work with tailings sand/slimes	Initial & annual refresher	Training Class & Written Test

HP-# = Homestake procedure number; RPA = Radiation Protection Administrator;  
RWP = Radiation Work Permit; OSL = Optically Stimulated Luminescence dosimeter

**Figure 1 – Monitoring & Sampling Locations**

# HOMESTAKE MINING COMPANY GRANTS PROJECT Monitoring & Sampling Locations

● HMC #0016 (BKG)  
◆ OSL #0016 (BKG)



■ Hi-Volume Particulate Monitors  
● Track-Etch Passive Radon Gas Monitors  
◆ OSL Gamma Badges

**FIGURE 1**

**Attachment 1 – High Volume Air Sampling Results**

**HIGH VOLUME AIR SAMPLING REPORT**

**CLIENT: HOMESTAKE MINING COMPANY - GRANTS, NEW MEXICO**

**REPORT DATE: May 09, 2007**

**SAMPLE ID: HMC 1**

Quarter/Date Sampled Air Volume	Radionuclide	Concentration μCi/mL	Error Estimate μCi/mL	L.L.D. μCi/mL	Effluent Conc.* μCi/mL	% Effluent Concentration
C07040032-001 First Quarter 2007 Air Volume in mLs 1.27E+11	<sup>nat</sup> U	2.62E-16	N/A	1.00E-16	9.00E-14	2.91E-01
	<sup>230</sup> Th	< 1.00E-16	1.02E-17	1.00E-16	2.00E-14	< 5.00E-01
	<sup>226</sup> Ra	< 1.00E-16	1.02E-17	1.00E-16	9.00E-13	< 1.11E-02
C07070020-001 Second Quarter 2007 Air Volume in mLs 1.38E+11	<sup>nat</sup> U	4.84E-16	N/A	1.00E-16	9.00E-14	5.38E-01
	<sup>230</sup> Th	< 1.00E-16	2.90E-18	1.00E-16	2.00E-14	< 5.00E-01
	<sup>226</sup> Ra	< 1.00E-16	1.74E-17	1.00E-16	9.00E-13	< 1.11E-02

N/A not applicable for ICP-MS

LLD = Lower Limit of Detection per Regulatory Guide 4.14

All LLDs were met

\*Effluent Concentrations per 10 CFR Part 20 Appendix B Table 2, Effluent Concentration



LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company  
 Project: 2nd Quarter 2007 Comp  
 Lab ID: C07070020-001  
 Client Sample ID: HMC-1 Hi Vol Filter

Report Date: 08/02/07  
 Collection Date: Not Provided  
 Date Received: 07/02/07  
 Matrix: Filter

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
<b>RADIONUCLIDES - TOTAL</b>							
Radium 226	4.7	pCi/Filter		0.2		E903.0	07/19/07 07:49 / crw
Radium 226 precision (±)	2.4	pCi/Filter				E903.0	07/19/07 07:49 / crw
Thorium 230	ND	pCi/Filter		0.2		E907.0	07/13/07 15:00 / dmf
Uranium, Activity	66.8	pCi/Filter		0.2		SW6020	07/11/07 01:11 / bws

Report Definitions: RL - Analyte reporting limit.  
 QCL - Quality control limit.

MCL - Maximum contaminant level.  
 ND - Not detected at the reporting limit.

**HIGH VOLUME AIR SAMPLING REPORT**

**CLIENT: HOMESTAKE MINING COMPANY - GRANTS, NEW MEXICO**

**REPORT DATE: May 09, 2007**

**SAMPLE ID: HMC 2**

Quarter/Date Sampled Air Volume	Radionuclide	Concentration μCi/mL	Error Estimate μCi/mL	L.L.D. μCi/mL	Effluent Conc.* μCi/mL	% Effluent Concentration
C07040032-002 First Quarter 2007 Air Volume in mLs 1.38E+11	<sup>nat</sup> U	7.90E-16	N/A	1.00E-16	9.00E-14	8.78E-01
	<sup>230</sup> Th	< 1.00E-16	1.09E-17	1.00E-16	2.00E-14	< 5.00E-01
	<sup>226</sup> Ra	< 1.00E-16	1.30E-17	1.00E-16	9.00E-13	< 1.11E-02
C07070020-002 Second Quarter 2007 Air Volume in mLs 1.45E+11	<sup>nat</sup> U	6.59E-16	N/A	1.00E-16	9.00E-14	7.32E-01
	<sup>230</sup> Th	< 1.00E-16	1.59E-17	1.00E-16	2.00E-14	< 5.00E-01
	<sup>226</sup> Ra	< 1.00E-16	1.79E-17	1.00E-16	9.00E-13	< 1.11E-02

N/A not applicable for ICP-MS

LLD = Lower Limit of Detection per Regulatory Guide 4.14

All LLDs were met

\*Effluent Concentrations per 10 CFR Part 20 Appendix B Table 2, Effluent Concentration



LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company  
 Project: 2nd Quarter 2007 Comp  
 Lab ID: C07070020-002  
 Client Sample ID: HMC-2 Hi-Vol Filter

Report Date: 08/02/07  
 Collection Date: Not Provided  
 Date Received: 07/02/07  
 Matrix: Filter

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
<b>RADIONUCLIDES - TOTAL</b>							
Radium 226	5.9	pCi/Filter		0.2		E903.0	07/19/07 07:49 / crw
Radium 226 precision (±)	2.6	pCi/Filter				E903.0	07/19/07 07:49 / crw
Thorium 230	5.5	pCi/Filter		0.2		E907.0	07/13/07 15:00 / dmf
Thorium 230 precision (±)	2.3	pCi/Filter				E907.0	07/13/07 15:00 / dmf
Uranium, Activity	95.5	pCi/Filter		0.2		SW6020	07/11/07 01:15 / bws

Report Definitions: RL - Analyte reporting limit.  
 QCL - Quality control limit.

MCL - Maximum contaminant level.  
 ND - Not detected at the reporting limit.

**HIGH VOLUME AIR SAMPLING REPORT**

**CLIENT: HOMESTAKE MINING COMPANY - GRANTS, NEW MEXICO**

**REPORT DATE: May 09, 2007**

**SAMPLE ID: HMC 3**

Quarter/Date Sampled Air Volume	Radionuclide	Concentration μCi/mL	Error Estimate μCi/mL	L.L.D. μCi/mL	Effluent Conc.* μCi/mL	% Effluent Concentration
C07040032-003 First Quarter 2007 Air Volume in mLs 1.33E+11	<sup>nat</sup> U	1.66E-15	N/A	1.00E-16	9.00E-14	1.85E+00
	<sup>230</sup> Th	< 1.00E-16	1.13E-17	1.00E-16	2.00E-14	< 5.00E-01
	<sup>226</sup> Ra	< 1.00E-16	1.28E-17	1.00E-16	9.00E-13	< 1.11E-02
C07070020-003 Second Quarter 2007 Air Volume in mLs 1.44E+11	<sup>nat</sup> U	3.40E-15	N/A	1.00E-16	9.00E-14	3.77E+00
	<sup>230</sup> Th	< 1.00E-16	2.22E-17	1.00E-16	2.00E-14	< 5.00E-01
	<sup>226</sup> Ra	< 1.00E-16	2.22E-17	1.00E-16	9.00E-13	< 1.11E-02

N/A not applicable for ICP-MS

LLD = Lower Limit of Detection per Regulatory Guide 4.14

All LLDs were met

\*Effluent Concentrations per 10 CFR Part 20 Appendix B Table 2, Effluent Concentration



LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company  
 Project: 2nd Quarter 2007 Comp  
 Lab ID: C07070020-003  
 Client Sample ID: HMC-3 Hi-Vol Filter

Report Date: 08/02/07  
 Collection Date: Not Provided  
 Date Received: 07/02/07  
 Matrix: Filter

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
<b>RADIONUCLIDES - TOTAL</b>							
Radium 226	9.4	pCi/Filter		0.2		E903.0	07/19/07 07:49 / crw
Radium 226 precision (±)	3.2	pCi/Filter				E903.0	07/19/07 07:49 / crw
Thorium 230	11.0	pCi/Filter		0.2		E907.0	07/13/07 15:00 / dmf
Thorium 230 precision (±)	3.2	pCi/Filter				E907.0	07/13/07 15:00 / dmf
Uranium, Activity	489	pCi/Filter		0.2		SW6020	07/11/07 01:19 / bws

Report Definitions: RL - Analyte reporting limit.  
 QCL - Quality control limit.

MCL - Maximum contaminant level.  
 ND - Not detected at the reporting limit.

**HIGH VOLUME AIR SAMPLING REPORT**

**CLIENT: HOMESTAKE MINING COMPANY - GRANTS, NEW MEXICO**

**REPORT DATE: May 09, 2007**

**SAMPLE ID: HMC 4**

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Error Estimate µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C07040032-004 First Quarter 2007 Air Volume in mLs 1.35E+11	<sup>nat</sup> U	9.63E-16	N/A	1.00E-16	9.00E-14	1.07E+00
	<sup>230</sup> Th	< 1.00E-16	1.26E-17	1.00E-16	2.00E-14	< 5.00E-01
	<sup>226</sup> Ra	< 1.00E-16	1.26E-17	1.00E-16	9.00E-13	< 1.11E-02
C07070020-004 Second Quarter 2007 Air Volume in mLs 1.39E+11	<sup>nat</sup> U	1.06E-15	N/A	1.00E-16	9.00E-14	1.18E+00
	<sup>230</sup> Th	< 1.00E-16	1.51E-17	1.00E-16	2.00E-14	< 5.00E-01
	<sup>226</sup> Ra	< 1.00E-16	2.23E-17	1.00E-16	9.00E-13	< 1.11E-02

N/A not applicable for ICP-MS

LLD = Lower Limit of Detection per Regulatory Guide 4.14

All LLDs were met

\*Effluent Concentrations per 10 CFR Part 20 Appendix B Table 2, Effluent Concentration



### LABORATORY ANALYTICAL REPORT

**Client:** Homestake Mining Company  
**Project:** 2nd Quarter 2007 Comp  
**Lab ID:** C07070020-004  
**Client Sample ID:** HMC-4 Hi-Vol Filter

**Report Date:** 08/02/07  
**Collection Date:** Not Provided  
**Date Received:** 07/02/07  
**Matrix:** Filter

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
<b>RADIONUCLIDES - TOTAL</b>							
Radium 226	8.7	pCi/Filter		0.2		E903.0	07/19/07 08:55 / crw
Radium 226 precision (±)	3.1	pCi/Filter				E903.0	07/19/07 08:55 / crw
Thorium 230	4.5	pCi/Filter		0.2		E907.0	07/13/07 15:00 / dmf
Thorium 230 precision (±)	2.1	pCi/Filter				E907.0	07/13/07 15:00 / dmf
Uranium, Activity	147	pCi/Filter		0.2		SW6020	07/11/07 01:23 / bws

**Report** RL - Analyte reporting limit.  
**Definitions:** QCL - Quality control limit.

MCL - Maximum contaminant level.  
ND - Not detected at the reporting limit.

**HIGH VOLUME AIR SAMPLING REPORT**

**CLIENT: HOMESTAKE MINING COMPANY - GRANTS, NEW MEXICO**

**REPORT DATE: May 09, 2007**

**SAMPLE ID: HMC 5**

Quarter/Date Sampled Air Volume	Radionuclide	Concentration μCi/mL	Error Estimate μCi/mL	L.L.D. μCi/mL	Effluent Conc.* μCi/mL	% Effluent Concentration
C07040032-005 First Quarter 2007 Air Volume in mLs 1.23E+11	<sup>nat</sup> U	1.26E-15	N/A	1.00E-16	9.00E-14	1.40E+00
	<sup>230</sup> Th	< 1.00E-16	1.22E-17	1.00E-16	2.00E-14	< 5.00E-01
	<sup>226</sup> Ra	< 1.00E-16	1.06E-17	1.00E-16	9.00E-13	< 1.11E-02
C07070020-005 Second Quarter 2007 Air Volume in mLs 1.44E+11	<sup>nat</sup> U	1.68E-15	N/A	1.00E-16	9.00E-14	1.87E+00
	<sup>230</sup> Th	< 1.00E-16	2.22E-17	1.00E-16	2.00E-14	< 5.00E-01
	<sup>226</sup> Ra	< 1.00E-16	1.60E-17	1.00E-16	9.00E-13	< 1.11E-02

N/A not applicable for ICP-MS

LLD = Lower Limit of Detection per Regulatory Guide 4.14

All LLDs were met

\*Effluent Concentrations per 10 CFR Part 20 Appendix B Table 2, Effluent Concentration



LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company  
 Project: 2nd Quarter 2007 Comp  
 Lab ID: C07070020-005  
 Client Sample ID: HMC-5 Hi-Vol Filter

Report Date: 08/02/07  
 Collection Date: Not Provided  
 Date Received: 07/02/07  
 Matrix: Filter

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
<b>RADIONUCLIDES - TOTAL</b>							
Radium 226	4.2	pCi/Filter		0.2		E903.0	07/19/07 08:55 / crw
Radium 226 precision (±)	2.3	pCi/Filter				E903.0	07/19/07 08:55 / crw
Thorium 230	8.1	pCi/Filter		0.2		E907.0	07/13/07 15:00 / dmf
Thorium 230 precision (±)	3.2	pCi/Filter				E907.0	07/13/07 15:00 / dmf
Uranium, Activity	242	pCi/Filter		0.2		SW6020	07/11/07 01:27 / bws

Report Definitions: RL - Analyte reporting limit.  
 QCL - Quality control limit.

MCL - Maximum contaminant level.  
 ND - Not detected at the reporting limit.

**HIGH VOLUME AIR SAMPLING REPORT**

**CLIENT: HOMESTAKE MINING COMPANY - GRANTS, NEW MEXICO**

**REPORT DATE: May 09, 2007**

**SAMPLE ID: HMC 6**

Quarter/Date Sampled Air Volume	Radionuclide	Concentration μCi/mL	Error Estimate μCi/mL	L.L.D. μCi/mL	Effluent Conc.* μCi/mL	% Effluent Concentration
C07040032-006 First Quarter 2007 Air Volume in mLs 1.36E+11	<sup>nat</sup> U	1.93E-16	N/A	1.00E-16	9.00E-14	2.14E-01
	<sup>230</sup> Th	< 1.00E-16	8.09E-18	1.00E-16	2.00E-14	< 5.00E-01
	<sup>226</sup> Ra	< 1.00E-16	1.03E-17	1.00E-16	9.00E-13	< 1.11E-02
C07070020-006 Second Quarter 2007 Air Volume in mLs 1.24E+11	<sup>nat</sup> U	5.39E-16	N/A	1.00E-16	9.00E-14	5.99E-01
	<sup>230</sup> Th	< 1.00E-16	2.10E-17	1.00E-16	2.00E-14	< 5.00E-01
	<sup>226</sup> Ra	< 1.00E-16	2.26E-17	1.00E-16	9.00E-13	< 1.11E-02

N/A not applicable for ICP-MS

LLD = Lower Limit of Detection per Regulatory Guide 4.14

All LLDs were met

\*Effluent Concentrations per 10 CFR Part 20 Appendix B Table 2, Effluent Concentration



LABORATORY ANALYTICAL REPORT

**Client:** Homestake Mining Company  
**Project:** 2nd Quarter 2007 Comp  
**Lab ID:** C07070020-006  
**Client Sample ID:** HMC-6 Hi-Vol Filter

**Report Date:** 08/02/07  
**Collection Date:** Not Provided  
**Date Received:** 07/02/07  
**Matrix:** Filter

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
<b>RADIONUCLIDES - TOTAL</b>							
Radium 226	6.7	pCi/Filter		0.2		E903.0	07/19/07 08:55 / crw
Radium 226 precision (±)	2.8	pCi/Filter				E903.0	07/19/07 08:55 / crw
Thorium 230	8.1	pCi/Filter		0.2		E907.0	07/13/07 15:00 / dmf
Thorium 230 precision (±)	2.6	pCi/Filter				E907.0	07/13/07 15:00 / dmf
Uranium, Activity	66.8	pCi/Filter		0.2		SW6020	07/11/07 01:31 / bws

**Report Definitions:** RL - Analyte reporting limit.  
 QCL - Quality control limit.

MCL - Maximum contaminant level.  
 ND - Not detected at the reporting limit.



LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company  
 Site Name: Grants 1st Quarter 2007 Comp

Report Date: 05/09/07

Lab ID: C07040032-007  
 Client Sample ID: HMC 7 Hi Vol Filter  
 Matrix: Filter

Collection Date: Not Provided  
 Date Received: 04/02/07

Analyses	Result	Units	Qualifier	RL	MCL/ QCL	Method	Analysis Date / By
<b>RADIONUCLIDES - TOTAL</b>							
Radium 226	ND	pCi/Filter	D	0.4	E903.0		04/17/07 10:16 / crw
Thorium 230	ND	pCi/Filter	D	0.4	E907.0		04/13/07 15:00 / dmf
Uranium, Activity	0.6	pCi/Filter		0.2	SW6020		04/12/07 03:20 / aln

Report Definitions: RL - Analyte reporting limit.  
 QCL - Quality control limit.  
 D - RL increased due to sample matrix interference.

MCL - Maximum contaminant level.  
 ND - Not detected at the reporting limit.



LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company  
 Project: 2nd Quarter 2007 Comp  
 Lab ID: C07070020-007  
 Client Sample ID: HMC-7 Hi-Vol Filter

Report Date: 08/02/07  
 Collection Date: Not Provided  
 Date Received: 07/02/07  
 Matrix: Filter

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
<b>RADIONUCLIDES - TOTAL</b>							
Radium 226	ND	pCi/Filter		0.2		E903.0	07/19/07 08:55 / crw
Thorium 230	ND	pCi/Filter		0.2		E907.0	07/13/07 15:00 / dmf
Uranium, Activity	0.6	pCi/Filter		0.2		SW6020	07/11/07 01:36 / bws

Report Definitions: RL - Analyte reporting limit.  
 QCL - Quality control limit.

MCL - Maximum contaminant level.  
 ND - Not detected at the reporting limit.

## ANALYTICAL SUMMARY REPORT

May 16, 2007

Homestake Mining Company

Hwy 601  
PO Box 98  
Grants, NM 87020

Workorder No.: C07040032

Project Name: Grants 1st Quarter 2007 Comp

Energy Laboratories, Inc. received the following 7 samples from Homestake Mining Company on 4/2/2007 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C07040032-001	HMC-1 Hi Vol Filter		04/02/07	Filter	Metals, Total Digestion, Total Metals Radium 226 Thorium, Isotopic
C07040032-002	HMC 2 Hi Vol Filter		04/02/07	Filter	Same As Above
C07040032-003	HMC 3 Hi Vol Filter		04/02/07	Filter	Same As Above
C07040032-004	HMC 4 Hi Vol Filter		04/02/07	Filter	Same As Above
C07040032-005	HMC 5 Hi Vol Filter		04/02/07	Filter	Same As Above
C07040032-006	HMC 6 Hi Vol Filter		04/02/07	Filter	Same As Above
C07040032-007	HMC 7 Hi Vol Filter		04/02/07	Filter	Same As Above

There were no problems with the analyses and all data for associated QC met EPA or laboratory specifications except where noted in the Case Narrative or Report.

If you have any questions regarding these tests results, please call.

Report Approved By:



ROGER GARLUNG  
LABORATORY SUPERVISOR



## ANALYTICAL SUMMARY REPORT

August 02, 2007

Homestake Mining Company

Hwy 601  
PO Box 98  
Grants, NM 87020

Workorder No.: C07070020

Project Name: 2nd Quarter 2007 Comp

Energy Laboratories, Inc. received the following 7 samples from Homestake Mining Company on 7/2/2007 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C07070020-001	HMC-1 Hi Vol Filter		07/02/07	Filter	Metals, Total Digestion, Total Metals Radium 226 Thorium, Isotopic
C07070020-002	HMC-2 Hi-Vol Filter		07/02/07	Filter	Same As Above
C07070020-003	HMC-3 Hi-Vol Filter		07/02/07	Filter	Same As Above
C07070020-004	HMC-4 Hi-Vol Filter		07/02/07	Filter	Same As Above
C07070020-005	HMC-5 Hi-Vol Filter		07/02/07	Filter	Same As Above
C07070020-006	HMC-6 Hi-Vol Filter		07/02/07	Filter	Same As Above
C07070020-007	HMC-7 Hi-Vol Filter		07/02/07	Filter	Same As Above

There were no problems with the analyses and all data for associated QC met EPA or laboratory specifications except where noted in the Case Narrative or Report.

If you have any questions regarding these tests results, please call.

Report Approved By:

P.A. Leasing  
POWER GENERATION  
LABORATORY SUPERVISOR



## QA/QC Summary Report

Client: Homestake Mining Company  
 Project: Grants 1st Quarter 2007 Comp

Report Date: 05/16/07  
 Work Order: C07040032

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
<b>Method: E903.0</b>							Batch: 14058		
Sample ID: C07040032-001AMS Radium 226	Sample Matrix Spike 57.9 pCi/Filter		0.20	89	70	130			Run: BERTHOLD 770_070410A 04/17/07 10:16
Sample ID: MB-RA226-1992 Radium 226	Method Blank ND pCi/L		0.2						Run: BERTHOLD 770_070410A 04/17/07 11:18
Sample ID: LCS-RA226-1992 Radium 226	Laboratory Control Sample 12 pCi/L		0.20	94	70	130			Run: BERTHOLD 770_070410A 04/17/07 11:18
<b>Method: E907.0</b>							Batch: 14058		
Sample ID: LCS-R82505 Thorium 230	Laboratory Control Sample 3.90 pCi/Filter		0.20	80	70	130			Run: EGG-ORTEC_070413A 04/13/07 15:00
Sample ID: C07040032-002ADUP Thorium 230	Sample Duplicate 4.35 pCi/Filter		0.40				8.3		Run: EGG-ORTEC_070413A 04/13/07 15:00 30
Sample ID: C07040032-003AMS Radium 230	Sample Matrix Spike 44.6 pCi/Filter		0.40	86	70	130			Run: EGG-ORTEC_070413A 04/13/07 15:00
<b>Method: SW6020</b>							Batch: 14058		
Sample ID: MB-14058 Uranium	Method Blank ND mg/filter		6E-05						Run: ICPMS2-C_070411A 04/12/07 01:49
Sample ID: LCS-14058 Uranium	Laboratory Control Sample 0.0528 mg/filter		0.00030	106	75	125			Run: ICPMS2-C_070411A 04/12/07 01:53
Sample ID: C07040032-001AMS Uranium	Sample Matrix Spike 0.155 mg/filter		0.00030	112	75	125			Run: ICPMS2-C_070411A 04/12/07 02:30
Sample ID: C07040032-001AMSD Uranium	Sample Matrix Spike Duplicate 0.155 mg/filter		0.00030	112	75	125	0.1	20	Run: ICPMS2-C_070411A 04/12/07 02:35

Criteria:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

## QA/QC Summary Report

**Client:** Homestake Mining Company  
**Project:** 2nd Quarter 2007 Comp

**Report Date:** 08/02/07  
**Work Order:** C07070020

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
<b>Method: E903.0</b> <span style="float: right;">Batch: 15117</span>									
<b>Sample ID:</b> C07070018-001AMS Radium 226	Sample Matrix Spike 75.5	pCi/Filter	0.20	102	70	130			Run: BERTHOLD 770_070713A 07/19/07 07:49
<b>Sample ID:</b> C07070020-003ADUP Radium 226	Sample Duplicate 6.90	pCi/Filter	0.40				31	83.1	Run: BERTHOLD 770_070713A 07/19/07 07:49
<b>Sample ID:</b> MB-RA226-2176 Radium 226	Method Blank ND	pCi/L	0.2						Run: BERTHOLD 770_070713A 07/19/07 08:55
<b>Sample ID:</b> LCS-RA226-2176 Radium 226	Laboratory Control Sample 12	pCi/L	0.20	97	70	130			Run: BERTHOLD 770_070713A 07/19/07 08:55
<b>Method: E907.0</b> <span style="float: right;">Batch: 15117</span>									
<b>Sample ID:</b> LCS-R87277 Thorium 230	Laboratory Control Sample 4.00	pCi/L	0.20	82	70	130			Run: EGG-ORTEC_070713A 07/13/07 15:00
<b>Sample ID:</b> C07070109-005AMS Thorium 230	Sample Matrix Spike 37.9	pCi/L	0.20	77	70	130			Run: EGG-ORTEC_070713A 07/13/07 15:00
<b>Sample ID:</b> C07070109-005AMSD Thorium 230	Sample Matrix Spike Duplicate 38.6	pCi/L	0.20	79	70	130	1.8	30	Run: EGG-ORTEC_070713A 07/13/07 15:00
<b>Sample ID:</b> MB-R87277 Thorium 230	Method Blank ND	pCi/L	0.2						Run: EGG-ORTEC_070713A 07/13/07 15:00
<b>Method: SW6020</b> <span style="float: right;">Batch: 15117</span>									
<b>Sample ID:</b> MB-15117 Uranium	Method Blank 4E-05	mg/L	2E-05						Run: ICPMS2-C_070710A 07/10/07 23:53
<b>Sample ID:</b> LCS-15117 Uranium	Laboratory Control Sample 0.0548	mg/L	0.00030	104	80	120			Run: ICPMS2-C_070710A 07/10/07 23:57
<b>Sample ID:</b> C07061548-001FMS Uranium	Sample Matrix Spike 1.33E-05	mg/L	0.00030	99	70	130			Run: ICPMS2-C_070710A 07/11/07 00:26
<b>Sample ID:</b> C07061548-001FMSD Uranium	Sample Matrix Spike Duplicate 1.33E-05	mg/L	0.00030	99	70	130	0.0	20	Run: ICPMS2-C_070710A 07/11/07 00:30

**Qualifiers:**

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

**Attachment 2 - Radon Gas Monitoring Results**

Attachment 2 - Radon Gas Monitoring Results  
Track-Etch Passive Survey

Location	Monitoring Period	Rn Concentration ( $\mu\text{Ci/ml}$ )	Error Estimate ( $\mu\text{Ci/ml}$ )	% Limit* (%)	LLD ( $\mu\text{Ci/ml}$ )
Hi-Vol #1 N Outer Perimeter	1/4/07 - 6/28/07	1.5E-09	1.6E-10	15	1.7E-10
Hi-Vol #2 NE Outer Perimeter	1/4/07 - 6/28/07	1.0E-09	1.3E-10	10	1.7E-10
Hi-Vol #3 E Outer Perimeter	1/4/07 - 6/28/07	7.0E-10	9.8E-11	7	1.7E-10
Hi-Vol #4 S Outer Perimeter	1/4/07 - 6/28/07	1.8E-09	1.8E-10	18	1.7E-10
Hi-Vol #5 N of Nearest Residence	1/4/07 - 6/28/07	1.3E-09	1.5E-10	13	1.7E-10
Hi-Vol #6 W of Outer Perimeter	1/4/07 - 6/28/07	1.3E-09	1.5E-10	13	1.7E-10
HMC #7 S Boundary	1/4/07 - 6/28/07	9.0E-10	1.2E-10	9	1.7E-10
HMC #16 Background	1/4/07 - 6/28/07	8.0E-10	1.1E-10	8	1.7E-10

\*Limit of  $1\text{E-}8$   $\mu\text{Ci/ml}$  for radon-222 with daughters removed as given in 10 CFR20, Appendix B, Table 2

**Attachment 3 - Environmental Gamma Radiation Results**

Attachment 3 - Environmental Gamma Radiation Results  
OSL Perimeter Survey

Direct Radiation Measurements

Location	Monitoring Period	Exposure Rate (mrem/6 mo)	Error (mrem/6 mo)*
Hi-Vol #1 N Outer Perimeter	1/1/07 - 6/30/07	8	0.8
Hi-Vol #2 NE Outer Perimeter	1/1/07 - 6/30/07	13	1.3
Hi-Vol #3 E Outer Perimeter	1/1/07 - 6/30/07	11	1.1
Hi-Vol #4 S Outer Perimeter	1/1/07 - 6/30/07	15	1.5
Hi-Vol #5 N of Nearest Residence	1/1/07 - 6/30/07	19	1.9
Hi-Vol #6 W of Outer Perimeter	1/1/07 - 6/30/07	16	1.6
#16 Background	1/1/07 - 6/30/07	12	1.2

\*Error is 1.96 std. dev.