



Grants Project

Alan D. Cox  
Project Manager – Grants

24 February 2006

UPS Next Day Air:

Mr. Bill Von Till, Site Manager  
c/o Document Control Desk  
Chief of 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 – July through December 2005

Dear Mr. Von Till:

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 second-half of 2005 (July through December) 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 295-gpms during the July through December 2005 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,

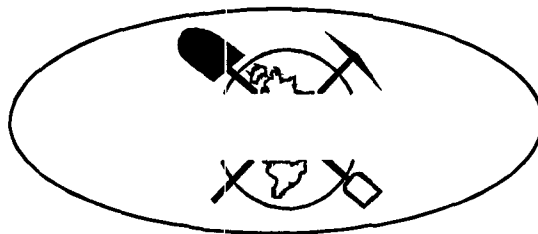
HOMESTAKE MINING COMPANY OF CALIFORNIA  
Alan D. Cox

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

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**HOMESTAKE MINING COMPANY  
OF  
CALIFORNIA  
GRANTS PROJECT**



**SEMI-ANNUAL ENVIRONMENTAL  
MONITORING REPORT**

**JULY - DECEMBER**

**2005**

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

## **TABLE OF CONTENTS**

1.0	INTRODUCTION .....	1
2.0	ENVIRONMENTAL MONITORING PROGRAMS .....	1
2.1	Air Particulate Monitoring.....	2
2.2	Radon Gas Monitoring.....	2
3.0	WATER QUALITY MONITORING .....	2
4.0	DIRECT RADIATION.....	3
5.0	SURFACE CONTAMINATION.....	3
5.1	Personnel Skin and Clothing.....	3
5.2	Survey of Equipment Prior to Release for Unrestricted Use .....	3
6.0	LOWER LIMIT OF DETECTION.....	3
7.0	DATA SUMMARY AND CONCLUSIONS.....	4

## **TABLES**

Table 1 – Environmental Monitoring Program Excluding Groundwater Monitoring

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

Water Quality - Point of Compliance and Background

Table 2.1.1 - Water Quality Analyses for Well D1

Table 2.1.2 - Water Quality Analyses for Well S4

Table 2.1.3 - Water Quality Analyses for Well X

Table 2.1.4 - Water Quality Analyses for Background Well P

Table 3 – Occupational Monitoring Program

## **FIGURES**

Figure 1 – Monitoring & Sampling Locations

## **ATTACHMENTS**

Attachment 1 – High Volume Air Sampling Results

Attachment 2 – Radon Gas Monitoring Results

Attachment 3 – Environmental Gamma Radiation Results

Attachment 4 - Annual Effective Dose Equivalent to Individuals of the Public

## 1.0 INTRODUCTION

This Semi-Annual Environmental Monitoring Report summarizes effluent monitoring data recorded for Homestake Mining Company of California - Grants Project (Homestake) from July through December 2005. The submittal of this report to the appropriate Nuclear Regulatory Commission (NRC) 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 has 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 the 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 July through December, the RO plant processed an average 295-gpm while producing an average of 212-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 is included in this report. It should be noted that while the POC wells will eventually be used to demonstrate groundwater restoration, they are not 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, are reported in Tables 2.1.1-2.1.4. The water quality of the POC wells is currently being restored and therefore the reported levels are not representative of steady state aquifer conditions at the present time. The concentration levels are therefore not compared to 10 CFR 20 effluent limits. A hydraulic barrier forces the water in the

aquifer near these POC wells to move in the direction of the collection wells where the water is withdrawn and treated. Due to these conditions water level data on these wells are also not reflection of steady state conditions, and therefore are not reported here.

#### **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.). 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. The maximum annual effective dose equivalent to the public has been calculated for the year 2005, based upon the environmental monitoring data. The report, Attachment 4, shows that the effective dose equivalent to the nearest resident is less than the 100-mrem/year NRC limit.



**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 2.1.1 - Water Quality Analyses for Well D1**



# LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company  
Project: Grants Project NM  
Lab ID: C05070230-001  
Client Sample ID: D1

Revised Date: 08/17/05  
Report Date: 07/28/05  
Collection Date: 07/05/05 13:07  
Date Received: 07/07/05  
Matrix: Aqueous

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
MAJOR IONS							
075 Alkalinity, Total as CaCO3	433	mg/L		1		A2320 B	07/08/05 15:07 / sl
006 Carbonate as CO3	6	mg/L		1		A2320 B	07/08/05 15:07 / sl
005 Bicarbonate as HCO3	518	mg/L		1		A2320 B	07/08/05 15:07 / sl
001 Calcium	209	mg/L		0.5		E200.7	07/12/05 17:22 / cp
007 Chloride	213	mg/L		1		E200.7	07/12/05 17:22 / cp
002 Magnesium	54.0	mg/L		0.5		E200.7	07/12/05 17:22 / cp
039 Nitrogen, Nitrate+Nitrite as N	2.7	mg/L		0.1		E353.2	07/08/05 11:43 / jal
003 Potassium	4.4	mg/L		0.5		E200.7	07/12/05 17:22 / cp
004 Sodium	352	mg/L		0.5		E200.7	07/12/05 17:22 / cp
008 Sulfate	821	mg/L		1		E200.7	07/12/05 17:22 / cp
PHYSICAL PROPERTIES							
009 pH	7.66	s.u.		0.01		A4500-H B	07/11/05 15:23 / th
010 Solids, Total Dissolved TDS @ 180 C	1960	mg/L		10		A2540 C	07/11/05 09:37 / th
METALS - DISSOLVED							
036 Molybdenum	1.08	mg/L		0.03		E200.8	07/11/05 18:48 / bws
040 Selenium	0.098	mg/L		0.005		E200.8	07/11/05 18:48 / bws
015 Uranium	1.10	mg/L		0.0003		E200.8	07/11/05 18:48 / bws
244 Uranium Precision (±)	0.0044	mg/L				E200.8	07/11/05 18:48 / bws
114 Uranium, Activity	7.4E-07	uCi/mL		2.0E-10		E200.8	07/11/05 18:48 / bws
113 Uranium, Activity precision (±)	3.0E-09	uCi/mL				E200.8	07/11/05 18:48 / bws
042 Vanadium	<0.01	mg/L		0.01		E200.8	07/11/05 18:48 / bws
RADIONUCLIDES - DISSOLVED							
045 Radium 226	2.7	pCi/L		0.2		E903.0	07/12/05 13:10 / trs
245 Radium 226 precision (±)	0.8	pCi/L				E903.0	07/12/05 13:10 / trs
256 Radium 226 altu	3.0E-09	uCi/mL		2.0E-10		E903.0	07/12/05 13:10 / trs
258 Radium 226 altu precision (±)	8.0E-10	uCi/mL				E903.0	07/12/05 13:10 / trs
057 Radium 228	<1	pCi/L		1		E904.0	07/12/05 13:10 / trs
257 Radium 228 precislon (±)	2	pCi/L				E904.0	07/12/05 13:10 / trs
359 Radium 228 altu	<1.0E-09	uCi/mL		1.0E-09		E904.0	07/12/05 13:10 / trs
360 Radium 228 altu precision (±)	2.1E-09	uCi/mL				E904.0	07/12/05 13:10 / trs
048 Thorium 230	0.3	pCi/L		0.2		E907.0	07/12/05 10:30 / ph
363 Thorium 230 precision (±)	0.3	pCi/L				E907.0	07/12/05 10:30 / ph
248 Thorium 230 altu	3.0E-10	uCi/mL		2.0E-10		E907.0	07/12/05 10:30 / ph
362 Thorium 230 altu precision (±)	3.0E-10	uCi/mL				E907.0	07/12/05 10:30 / ph

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  
**Project:** Grants Project NM  
**Lab ID:** C05070230-001  
**Client Sample ID:** D1

**Revised Date:** 08/17/05  
**Report Date:** 07/28/05  
**Collection Date:** 07/05/05 13:07  
**Date Received:** 07/07/05  
**Matrix:** Aqueous

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
DATA QUALITY							
192 A/C Balance (± 5)	-2.70	%				Calculation	07/15/05 15:36 / smd
194 Anions	31.9	meq/L				Calculation	07/15/05 15:36 / smd
195 Cations	30.3	meq/L				Calculation	07/15/05 15:36 / smd
079 Solids, Total Dissolved Calculated	1920	mg/L				Calculation	07/15/05 15:36 / smd
200 TDS Balance (0.80 - 1.20)	1.02	dec. %				Calculation	07/15/05 15:36 / smd

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

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

**Table 2.1.2 - Water Quality Analyses for Well S4**





## LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company

Project: Grants Project NM

Lab ID: C05070230-003

Client Sample ID: S4

Revised Date: 08/17/05

Report Date: 07/28/05

Collection Date: 07/05/05 14:50

Date Received: 07/07/05

Matrix: Aqueous

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
MAJOR IONS							
075 Alkalinity, Total as CaCO3	412	mg/L		1		A2320 B	07/11/05 11:18 / sl
006 Carbonate as CO3	<1	mg/L		1		A2320 B	07/11/05 11:18 / sl
005 Bicarbonate as HCO3	503	mg/L		1		A2320 B	07/11/05 11:18 / sl
001 Calcium	168	mg/L		0.5		E200.7	07/12/05 17:26 / cp
007 Chloride	209	mg/L		1		E200.7	07/12/05 17:26 / cp
002 Magnesium	44.3	mg/L		0.5		E200.7	07/12/05 17:26 / cp
039 Nitrogen, Nitrate+Nitrite as N	3.1	mg/L		0.1		E353.2	07/08/05 11:48 / jal
003 Potassium	5.0	mg/L		0.5		E200.7	07/12/05 17:26 / cp
004 Sodium	409	mg/L		0.5		E200.7	07/12/05 17:26 / cp
008 Sulfate	845	mg/L		1		E200.7	07/12/05 17:26 / cp
PHYSICAL PROPERTIES							
009 pH	7.80	s.u.		0.01		A4500-H B	07/11/05 15:25 / th
010 Solids, Total Dissolved TDS @ 180 C	2000	mg/L		10		A2540 C	07/11/05 09:38 / th
METALS - DISSOLVED							
036 Molybdenum	4.62	mg/L		0.03		E200.8	07/11/05 19:01 / bws
040 Selenium	0.094	mg/L		0.005		E200.8	07/11/05 19:01 / bws
015 Uranium	4.29	mg/L		0.0003		E200.8	07/11/05 19:01 / bws
244 Uranium Precision (±)	0.0172	mg/L				E200.8	07/11/05 19:01 / bws
114 Uranium, Activity	2.9E-06	uCi/mL		2.0E-10		E200.8	07/11/05 19:01 / bws
113 Uranium, Activity precision (±)	1.2E-08	uCi/mL				E200.8	07/11/05 19:01 / bws
042 Vanadium	<0.01	mg/L		0.01		E200.8	07/11/05 19:01 / bws
RADIONUCLIDES - DISSOLVED							
045 Radium 226	0.9	pCi/L		0.2		E903.0	07/12/05 13:10 / trs
245 Radium 226 precision (±)	0.4	pCi/L				E903.0	07/12/05 13:10 / trs
256 Radium 226 altu	9.0E-10	uCi/mL		2.0E-10		E903.0	07/12/05 13:10 / trs
258 Radium 226 altu precision (±)	4.0E-10	uCi/mL				E903.0	07/12/05 13:10 / trs
057 Radium 228	<1	pCi/L		1		E904.0	07/12/05 13:10 / trs
257 Radium 228 precision (±)	1	pCi/L				E904.0	07/12/05 13:10 / trs
359 Radium 228 altu	<1.0E-09	uCi/mL		1.0E-09		E904.0	07/12/05 13:10 / trs
360 Radium 228 altu precision (±)	1.3E-09	uCi/mL				E904.0	07/12/05 13:10 / trs
048 Thorium 230	0.4	pCi/L		0.2		E907.0	07/12/05 10:30 / ph
363 Thorium 230 precision (±)	0.4	pCi/L				E907.0	07/12/05 10:30 / ph
248 Thorium 230 altu	4.0E-10	uCi/mL		2.0E-10		E907.0	07/12/05 10:30 / ph
362 Thorium 230 altu precision (±)	4.0E-10	uCi/mL				E907.0	07/12/05 10:30 / ph

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

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



ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602  
Toll Free 888.235.0515 • 307.235.0515 • Fax 307.234.1639 • casper@energylab.com • www.energylab.com

## LABORATORY ANALYTICAL REPORT

**Client:** Homestake Mining Company  
**Project:** Grants Project NM  
**Lab ID:** C05070230-003  
**Client Sample ID:** S4

**Revised Date:** 08/17/05  
**Report Date:** 07/28/05  
**Collection Date:** 07/05/05 14:50  
**Date Received:** 07/07/05  
**Matrix:** Aqueous

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
DATA QUALITY							
192	A/C Balance (± 5)	-3.24	%			Calculation	07/15/05 15:37 / smd
194	Anions	31.9	meq/L			Calculation	07/15/05 15:37 / smd
195	Cations	29.9	meq/L			Calculation	07/15/05 15:37 / smd
079	Solids, Total Dissolved Calculated	1940	mg/L			Calculation	07/15/05 15:37 / smd
200	TDS Balance (0.80 - 1.20)	1.03	dec. %			Calculation	07/15/05 15:37 / smd

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

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

**Table 2.1.3 - Water Quality Analyses for Well X**



## LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company  
Project: Grants Project NM  
Lab ID: C05070230-002  
Client Sample ID: X

Revised Date: 08/17/05  
Report Date: 07/28/05  
Collection Date: 07/05/05 14:00  
Date Received: 07/07/05  
Matrix: Aqueous

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
MAJOR IONS							
075 Alkalinity, Total as CaCO3	105	mg/L		1		A2320 B	07/11/05 11:07 / sl
006 Carbonate as CO3	<1	mg/L		1		A2320 B	07/11/05 11:07 / sl
005 Bicarbonate as HCO3	128	mg/L		1		A2320 B	07/11/05 11:07 / sl
001 Calcium	49.1	mg/L		0.5		E200.7	07/12/05 15:57 / cp
007 Chloride	49	mg/L		1		E200.7	07/12/05 15:57 / cp
002 Magnesium	4.4	mg/L		0.5		E200.7	07/12/05 15:57 / cp
039 Nitrogen, Nitrate+Nitrite as N	0.8	mg/L		0.1		E353.2	07/08/05 11:45 / jal
003 Potassium	1.1	mg/L		0.5		E200.7	07/12/05 15:57 / cp
004 Sodium	60.7	mg/L		0.5		E200.7	07/12/05 15:57 / cp
008 Sulfate	114	mg/L		1		E200.7	07/12/05 15:57 / cp
PHYSICAL PROPERTIES							
009 pH	7.65	s.u.		0.01		A4500-H B	07/11/05 15:24 / th
010 Solids, Total Dissolved TDS @ 180 C	348	mg/L		10		A2540 C	07/11/05 09:38 / th
METALS - DISSOLVED							
036 Molybdenum	0.30	mg/L		0.03		E200.8	07/11/05 18:55 / bws
040 Selenium	<0.005	mg/L		0.005		E200.8	07/11/05 18:55 / bws
015 Uranium	0.0475	mg/L		0.0003		E200.8	07/11/05 18:55 / bws
244 Uranium Precision (±)	0.0002	mg/L				E200.8	07/11/05 18:55 / bws
114 Uranium, Activity	3.2E-08	uCi/mL		2.0E-10		E200.8	07/11/05 18:55 / bws
113 Uranium, Activity precision (±)	1.3E-10	uCi/mL				E200.8	07/11/05 18:55 / bws
042 Vanadium	<0.01	mg/L		0.01		E200.8	07/11/05 18:55 / bws
RADIONUCLIDES - DISSOLVED							
045 Radium 226	<0.2	pCi/L		0.2		E903.0	07/12/05 13:10 / trs
245 Radium 226 precision (±)	0.3	pCi/L				E903.0	07/12/05 13:10 / trs
256 Radium 226 altu	<2.0E-10	uCi/mL		2.0E-10		E903.0	07/12/05 13:10 / trs
258 Radium 226 altu precision (±)	3.0E-10	uCi/mL				E903.0	07/12/05 13:10 / trs
057 Radium 228	<1	pCi/L		1		E904.0	07/12/05 13:10 / trs
257 Radium 228 precision (±)	1	pCi/L				E904.0	07/12/05 13:10 / trs
359 Radium 228 altu	<1.0E-09	uCi/mL		1.0E-09		E904.0	07/12/05 13:10 / trs
360 Radium 228 altu precision (±)	1.3E-09	uCi/mL				E904.0	07/12/05 13:10 / trs
048 Thorium 230	0.4	pCi/L		0.2		E907.0	07/12/05 10:30 / ph
363 Thorium 230 precision (±)	0.4	pCi/L				E907.0	07/12/05 10:30 / ph
248 Thorium 230 altu	4.0E-10	uCi/mL		2.0E-10		E907.0	07/12/05 10:30 / ph
362 Thorium 230 altu precision (±)	4.0E-10	uCi/mL				E907.0	07/12/05 10:30 / ph

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

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



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## LABORATORY ANALYTICAL REPORT

**Client:** Homestake Mining Company  
**Project:** Grants Project NM  
**Lab ID:** C05070230-002  
**Client Sample ID:** X

**Revised Date:** 08/17/05  
**Report Date:** 07/28/05  
**Collection Date:** 07/05/05 14:00  
**Date Received:** 07/07/05  
**Matrix:** Aqueous

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
DATA QUALITY							
192 A/C Balance (± 5)	-3.68	%				Calculation	07/15/05 15:36 / smd
194 Anions	5.90	meq/L				Calculation	07/15/05 15:36 / smd
195 Cations	5.48	meq/L				Calculation	07/15/05 15:36 / smd
079 Solids, Total Dissolved Calculated	344	mg/L				Calculation	07/15/05 15:36 / smd
200 TDS Balance (0.80 - 1.20)	1.01	dec. %				Calculation	07/15/05 15:36 / smd

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

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

**Table 2.1.4 - Water Quality Analyses for Background Well P**



## LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company

Project: Grants Project NM

Lab ID: C05050278-001

Client Sample ID: P

Revised Date: 08/17/05

Report Date: 05/31/05

Collection Date: 05/04/05 13:21

Date Received: 05/07/05

Matrix: Aqueous

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
MAJOR IONS							
075 Alkalinity, Total as CaCO3	200	mg/L		1		A2320 B	05/16/05 14:37 / slb
006 Carbonate as CO3	<1	mg/L		1		A2320 B	05/16/05 14:37 / slb
005 Bicarbonate as HCO3	244	mg/L		1		A2320 B	05/16/05 14:37 / slb
001 Calcium	228	mg/L		0.5		E200.7	05/20/05 17:39 / cp
007 Chloride	62	mg/L		1		E200.7	05/20/05 17:39 / cp
002 Magnesium	47.5	mg/L		0.5		E200.7	05/20/05 17:39 / cp
039 Nitrogen, Nitrate+Nitrite as N	6.7	mg/L	D	0.2		E353.2	05/10/05 13:43 / jal
003 Potassium	5.1	mg/L		0.5		E200.7	05/20/05 17:39 / cp
004 Sodium	236	mg/L		0.5		E200.7	05/20/05 17:39 / cp
008 Sulfate	1020	mg/L		1		E200.7	05/20/05 17:39 / cp
PHYSICAL PROPERTIES							
009 pH	7.72	s.u.		0.01		A4500-H B	05/09/05 14:15 / th
010 Solids, Total Dissolved TDS @ 180 C	1860	mg/L		10		A2540 C	05/09/05 13:55 / th
METALS - DISSOLVED							
036 Molybdenum	<0.03	mg/L		0.03		E200.8	05/12/05 09:09 / bws
040 Selenium	0.171	mg/L		0.005		E200.8	05/12/05 09:09 / bws
015 Uranium	0.0256	mg/L		0.0003		E200.8	05/12/05 09:09 / bws
114 Uranium, Activity	0	uCi/mL		2.0E-10		E200.8	05/12/05 09:09 / bws
042 Vanadium	<0.01	mg/L		0.01		E200.8	05/12/05 09:09 / bws
RADIONUCLIDES - DISSOLVED							
045 Radium 226	<0.2	pCi/L		0.2		E903.0	05/09/05 17:45 / trs
245 Radium 226 precision (±)	0.5	pCi/L				E903.0	05/09/05 17:45 / trs
256 Radium 226 altu	<2.0E-10	uCi/mL		2.0E-10		E903.0	05/09/05 17:45 / trs
258 Radium 226 altu precision (±)	5.0E-10	uCi/mL				E903.0	05/09/05 17:45 / trs
057 Radium 228	<1	pCi/L		1		E904.0	05/09/05 17:45 / pj
257 Radium 228 precision (±)	1	pCi/L				E904.0	05/09/05 17:45 / pj
359 Radium 228 altu	<1.0E-09	uCi/mL		1.0E-09		E904.0	05/09/05 17:45 / pj
360 Radium 228 altu precision (±)	1.1E-09	uCi/mL				E904.0	05/09/05 17:45 / pj
048 Thorium 230	<0.2	pCi/L		0.2		E907.0	05/13/05 10:30 / ph
363 Thorium 230 precision (±)	0.1	pCi/L				E907.0	05/13/05 10:30 / ph
248 Thorium 230 altu	<2.0E-10	uCi/mL		2.0E-10		E907.0	05/13/05 10:30 / ph
362 Thorium 230 altu precision (±)	1.0E-10	uCi/mL				E907.0	05/13/05 10:30 / ph

Report RL - Analyte reporting limit.

Definitions: QCL - Quality control limit.

D - RL increased due to sample matrix interference.

MCL - Maximum contaminant level.

ND - Not detected at the reporting limit.



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### LABORATORY ANALYTICAL REPORT

**Client:** Homestake Mining Company  
**Project:** Grants Project NM  
**Lab ID:** C05050278-001  
**Client Sample ID:** P

**Revised Date:** 08/17/05  
**Report Date:** 05/31/05  
**Collection Date:** 05/04/05 13:21  
**Date Received:** 05/07/05  
**Matrix:** Aqueous

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
DATA QUALITY							
192 A/C Balance (± 5)	-3.25	%				Calculation	05/25/05 19:39 / smd
194 Anions	27.5	meq/L				Calculation	05/25/05 19:39 / smd
195 Cations	25.8	meq/L				Calculation	05/25/05 19:39 / smd
079 Solids, Total Dissolved Calculated	1750	mg/L				Calculation	05/25/05 19:39 / smd
200 TDS Balance (0.80 - 1.20)	1.06	dec. %				Calculation	05/25/05 19:39 / smd

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

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



**Table 3 - Occupational Monitoring Program**

**Table 3 – Occupational Monitoring Program**

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)

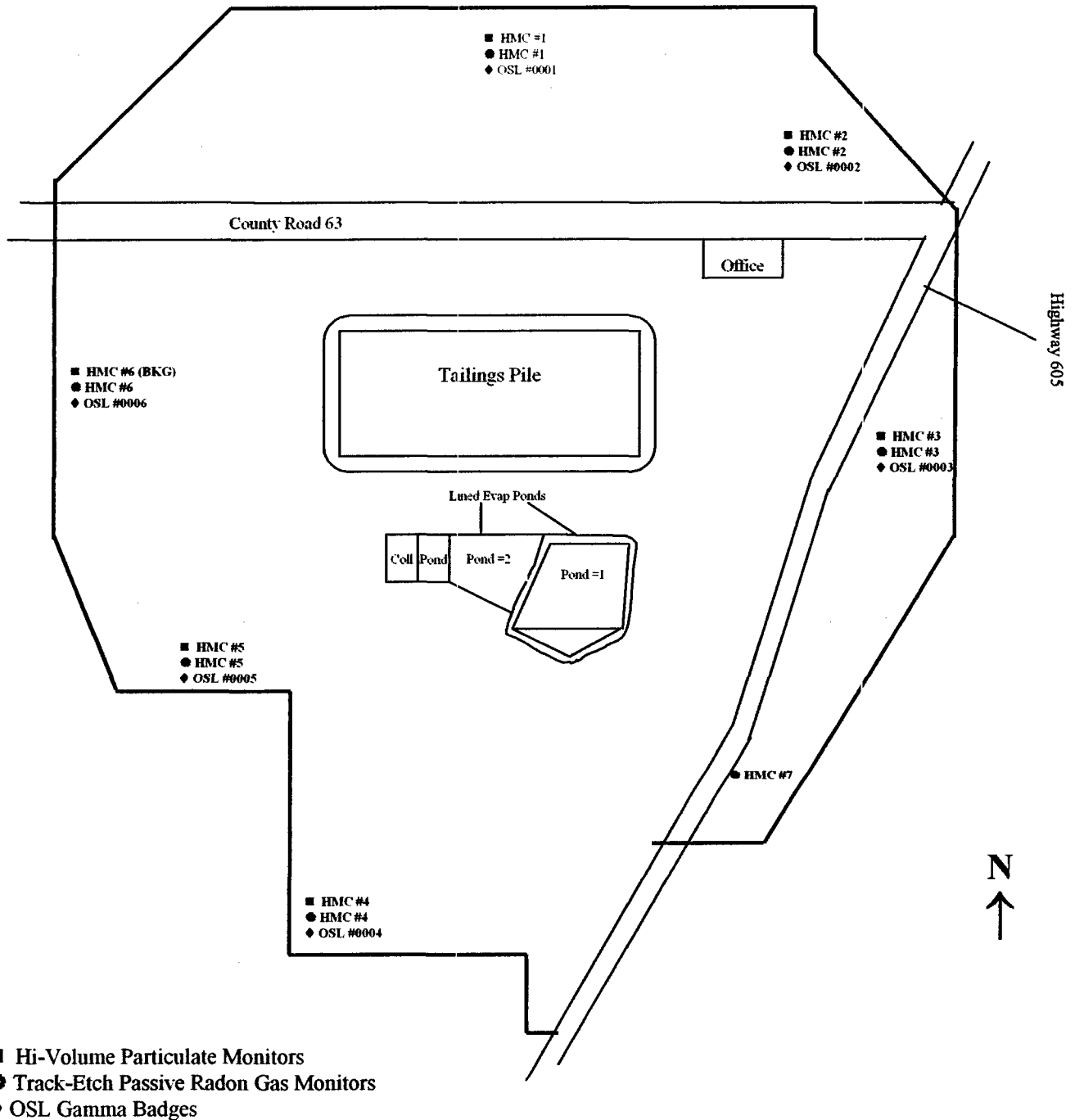


FIGURE 1

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



### HIGH VOLUME AIR SAMPLING REPORT

CLIENT: HOMESTAKE MINING COMPANY - GRANTS, NEW MEXICO

REPORT DATE: January 16, 2006  
REVISED REPORT DATE: January 31, 2006

SAMPLE ID: HMC 1

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05040073-001 First Quarter 2005 Air Volume in mLs 1.52E+11		$^{238}\text{U}$	1.10E-16	N/A	1.00E-16	9.00E-14	1.22E-01
		$^{230}\text{Th}$	< 1.00E-16	3.95E-18	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.26E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05070041-001 Second Quarter 2005 Air Volume in mLs 1.40E+11		$^{238}\text{U}$	1.96E-15	N/A	1.00E-16	9.00E-14	2.18E+00
		$^{230}\text{Th}$	< 1.00E-16	1.49E-17	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.89E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05100072-001 Third Quarter 2005 Air Volume in mLs 1.42E+11		$^{238}\text{U}$	2.04E-15	N/A	1.00E-16	9.00E-14	2.26E+00
		$^{230}\text{Th}$	< 1.00E-16	1.06E-17	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.13E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05121275-001 Fourth Quarter 2005 Air Volume in mLs 1.40E+11		$^{238}\text{U}$	1.07E-15	N/A	1.00E-16	9.00E-14	1.18E+00
		$^{230}\text{Th}$	< 1.00E-16	9.45E-18	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.08E-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

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## LABORATORY ANALYTICAL REPORT

**Client:** Homestake Mining Company  
**Project:** 3rd Quarter 2005 Comp  
**Lab ID:** C05100072-001  
**Client Sample ID:** HMC-1 Hi-Vol Filter

**Report Date:** 11/10/05  
**Collection Date:** Not Provided  
**Date Received:** 10/03/05  
**Matrix:** Filter

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
RADIONUCLIDES - TOTAL							
Radium 226	1.5	pCi/Filter		0.2		E903.0	10/18/05 15:00 / trs
Radium 226 precision (±)	1.6	pCi/Filter				E903.0	10/18/05 15:00 / trs
Thorium 230	5.5	pCi/Filter		0.2		E907.0	10/31/05 10:30 / ph
Thorium 230 precision (±)	1.5	pCi/Filter				E907.0	10/31/05 10:30 / ph
Uranium, Activity	289	pCi/Filter		0.2		SW6020	10/20/05 21:06 / bws

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

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

## LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company  
Project: 4th Quarter 2005 Comp  
Lab ID: C05121275-001  
Client Sample ID: HMC-1

Report Date: 01/23/06  
Collection Date: No: Provided  
Date Received: 12/30/05  
Matrix: Filter

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
RADIONUCLIDES - TOTAL							
Radium 226	3.7	pCi/Filter		0.2		E903.0	01/05/06 14:45 / trs
Radium 226 precision (±)	1.5	pCi/Filter				E903.0	01/05/06 14:45 / trs
Thorium 230	4.2	pCi/Filter		0.2		E907.0	01/05/06 10:30 / ph
Thorium 230 precision (±)	1.3	pCi/Filter				E907.0	01/05/06 10:30 / ph
Uranium, Activity	149	pCi/Filter		0.2		SW6020	01/04/06 22:32 / sml

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: January 16, 2006

REVISED REPORT DATE: January 31, 2006

SAMPLE ID: HMC 2

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration μCi/mL	Error Estimate μCi/mL	L.L.D. μCi/mL	Effluent Conc.* μCi/mL	% Effluent Concentration
C05040073-002 First Quarter 2005  Air Volume in mLs 1.64E+11		<sup>nat</sup> U	< 1.00E-16	N/A	1.00E-16	9.00E-14	< 1.11E-01
		<sup>230</sup> Th	< 1.00E-16	6.10E-18	1.00E-16	2.00E-14	< 5.00E-01
		<sup>226</sup> Ra	< 1.00E-16	1.34E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration μCi/mL	Error Estimate μCi/mL	L.L.D. μCi/mL	Effluent Conc.* μCi/mL	% Effluent Concentration
C05070041-002 Second Quarter 2005  Air Volume in mLs 1.42E+11		<sup>nat</sup> U	1.75E-15	N/A	1.00E-16	9.00E-14	1.94E+00
		<sup>230</sup> Th	1.13E-16	2.53E-17	1.00E-16	2.00E-14	5.66E-01
		<sup>226</sup> Ra	< 1.00E-16	1.73E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration μCi/mL	Error Estimate μCi/mL	L.L.D. μCi/mL	Effluent Conc.* μCi/mL	% Effluent Concentration
C05100072-008 Third Quarter 2005  Air Volume in mLs 1.43E+11		<sup>nat</sup> U	1.55E-15	N/A	1.00E-16	9.00E-14	1.72E+00
		<sup>230</sup> Th	< 1.00E-16	1.05E-17	1.00E-16	2.00E-14	< 5.00E-01
		<sup>226</sup> Ra	< 1.00E-16	1.40E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration μCi/mL	Error Estimate μCi/mL	L.L.D. μCi/mL	Effluent Conc.* μCi/mL	% Effluent Concentration
C05121275-002 Fourth Quarter 2005  Air Volume in mLs 1.35E+11		<sup>nat</sup> U	6.08E-16	N/A	1.00E-16	9.00E-14	6.75E-01
		<sup>230</sup> Th	< 1.00E-16	9.80E-18	1.00E-16	2.00E-14	< 5.00E-01
		<sup>226</sup> Ra	3.42E-15	9.94E-17	1.00E-16	9.00E-13	3.80E-01

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

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### LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company  
Project: 3rd Quarter 2005 Comp  
Lab ID: C05100072-002  
Client Sample ID: HMC-2 Hi-Vol Filter

Report Date: 11/10/05  
Collection Date: Not Provided  
Date Received: 10/03/05  
Matrix: Filter

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
RADIONUCLIDES - TOTAL							
Radium 226	4.3	pCi/Filter		0.2		E903.0	10/18/05 15:00 / trs
Radium 226 precision (±)	2.0	pCi/Filter				E903.0	10/18/05 15:00 / trs
Thorium 230	4.3	pCi/Filter		0.2		E907.0	10/31/05 10:30 / ph
Thorium 230 precision (±)	1.5	pCi/Filter				E907.0	10/31/05 10:30 / ph
Uranium, Activity	221	pCi/Filter		0.2		SW6020	10/20/05 21:34 / 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  
Project: 4th Quarter 2005 Comp  
Lab ID: C05121275-002  
Client Sample ID: HMC-2

Report Date: 01/23/06  
Collection Date: Not Provided  
Date Received: 12/30/05  
Matrix: Filter

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
RADIONUCLIDES - TOTAL							
Radium 226	460	pCi/Filter		0.2		E903.0	01/05/06 14:45 / trs
Radium 226 precision (±)	13	pCi/Filter				E903.0	01/05/06 14:45 / trs
Thorium 230	4.9	pCi/Filter		0.2		E907.0	01/05/06 10:30 / ph
Thorium 230 precision (±)	1.3	pCi/Filter				E907.0	01/05/06 10:30 / ph
Uranium, Activity	82.0	pCi/Filter		0.2		SW6020	01/04/06 23:08 / smi

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: January 17, 2006

REVISED REPORT DATE: January 31, 2006

SAMPLE ID: HMC 3

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05040073-003 First Quarter 2005  Air Volume in mLs 1.64E+11		$^{235}\text{U}$	2.67E-16	N/A	1.00E-16	9.00E-14	2.97E-01
		$^{230}\text{Th}$	< 1.00E-16	4.88E-18	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.34E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05070041-003 Second Quarter 2005  Air Volume in mLs 1.36E+11		$^{235}\text{U}$	1.38E-14	N/A	1.00E-16	9.00E-14	1.54E+01
		$^{230}\text{Th}$	1.33E-16	2.50E-17	1.00E-16	2.00E-14	6.67E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.81E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05100072-008 Third Quarter 2005  Air Volume in mLs 1.40E+11		$^{235}\text{U}$	6.98E-15	N/A	1.00E-16	9.00E-14	7.75E+00
		$^{230}\text{Th}$	< 1.00E-16	1.64E-17	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.79E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05121275-003 Fourth Quarter 2005  Air Volume in mLs 1.40E+11		$^{235}\text{U}$	2.82E-15	N/A	1.00E-16	9.00E-14	3.14E+00
		$^{230}\text{Th}$	< 1.00E-16	1.49E-17	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	1.20E-14	1.89E-16	1.00E-16	9.00E-13	1.34E+00

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

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### LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company  
Project: 3rd Quarter 2005 Comp  
Lab ID: C05100072-003  
Client Sample ID: HMC-3 Hi-Vol Filter

Report Date: 11/10/05  
Collection Date: Not Provided  
Date Received: 10/03/05  
Matrix: Filter

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
RADIONUCLIDES - TOTAL							
Radium 226	7.6	pCi/Filter		0.2		E903.0	10/18/05 15:00 / trs
Radium 226 precision (±)	2.5	pCi/Filter				E903.0	10/18/05 15:00 / trs
Thorium 230	9.8	pCi/Filter		0.2		E907.0	10/31/05 10:30 / ph
Thorium 230 precision (±)	2.3	pCi/Filter				E907.0	10/31/05 10:30 / ph
Uranium, Activity	977	pCi/Filter		0.2		SW6020	10/20/05 21:38 / 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  
**Project:** 4th Quarter 2005 Comp  
**Lab ID:** C05121275-003  
**Client Sample ID:** HMC-3

**Report Date:** 01/23/06  
**Collection Date:** Not Provided  
**Date Received:** 12/30/05  
**Matrix:** Filter

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
RADIONUCLIDES - TOTAL							
Radium 226	1680	pCi/Filter		0.2		E903.0	01/05/06 14:45 / trs
Radium 226 precision (±)	27	pCi/Filter				E903.0	01/05/06 14:45 / trs
Thorium 230	13.0	pCi/Filter		0.2		E907.0	01/05/06 10:30 / ph
Thorium 230 precision (±)	2.1	pCi/Filter				E907.0	01/05/06 10:30 / ph
Uranium, Activity	396	pCi/Filter		0.2		SW6020	01/04/06 23:12 / smi

**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: January 17, 2006

REVISED REPORT DATE: January 31, 2006

SAMPLE ID: HMC 4

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05040073-004 First Quarter 2005  Air Volume in mLs 1.61E+11		$^{235}\text{U}$	1.42E-16	N/A	1.00E-16	9.00E-14	1.57E-01
		$^{230}\text{Th}$	< 1.00E-16	3.73E-18	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.19E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05070041-004 Second Quarter 2005  Air Volume in mLs 1.41E+11		$^{235}\text{U}$	8.93E-15	N/A	1.00E-16	9.00E-14	9.93E+00
		$^{230}\text{Th}$	< 1.00E-16	2.01E-17	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.61E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05100072-008 Third Quarter 2005  Air Volume in mLs 1.40E+11		$^{235}\text{U}$	8.36E-15	N/A	1.00E-16	9.00E-14	9.29E+00
		$^{230}\text{Th}$	< 1.00E-16	1.79E-17	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.64E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05121275-004 Fourth Quarter 2005  Air Volume in mLs 1.40E+11		$^{235}\text{U}$	3.60E-15	N/A	1.00E-16	9.00E-14	4.01E+00
		$^{230}\text{Th}$	< 1.00E-16	1.35E-17	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.22E-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

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### LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company  
Project: 3rd Quarter 2005 Comp  
Lab ID: C05100072-004  
Client Sample ID: HMC-4 Hi-Vol Filter

Report Date: 11/10/05  
Collection Date: Not Provided  
Date Received: 10/03/05  
Matrix: Filter

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
RADIONUCLIDES - TOTAL							
Radium 226	6.5	pCi/Filter		0.2		E903.0	10/18/05 15:00 / trs
Radium 226 precision (±)	2.3	pCi/Filter				E903.0	10/18/05 15:00 / trs
Thorium 230	9.6	pCi/Filter		0.2		E907.0	10/31/05 10:30 / ph
Thorium 230 precision (±)	2.5	pCi/Filter				E907.0	10/31/05 10:30 / ph
Uranium, Activity	1170	pCi/Filter		0.2		SW6020	10/20/05 21:41 / 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  
Project: 4th Quarter 2005 Comp  
Lab ID: C05121275-004  
Client Sample ID: HMC-4

Report Date: 01/23/06  
Collection Date: Not Provided  
Date Received: 12/30/05  
Matrix: Filter

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
RADIONUCLIDES - TOTAL							
Radium 226	5.5	pCi/Filter		0.2		E903.0	01/05/06 14:45 / trs
Radium 226 precision (±)	1.7	pCi/Filter				E903.0	01/05/06 14:45 / trs
Thorium 230	8.5	pCi/Filter		0.2		E907.0	01/05/06 10:30 / ph
Thorium 230 precision (±)	1.9	pCi/Filter				E907.0	01/05/06 10:30 / ph
Uranium, Activity	505	pCi/Filter		0.2		SW6020	01/04/06 23:17 / sml

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: January 17, 2006  
REVISED REPORT DATE: January 31, 2006

SAMPLE ID: HMC 5

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05040073-005 First Quarter 2005  Air Volume in mLs 2.03E+11		$^{235}\text{U}$	1.50E-16	N/A	1.00E-16	9.00E-14	1.66E-01
		$^{230}\text{Th}$	< 1.00E-16	2.96E-18	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	8.18E-18	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05070041-005 Second Quarter 2005  Air Volume in mLs 1.43E+11		$^{235}\text{U}$	2.15E-14	N/A	1.00E-16	9.00E-14	2.39E+01
		$^{230}\text{Th}$	1.40E-16	2.11E-17	1.00E-16	2.00E-14	7.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.72E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05100072-008 Third Quarter 2005  Air Volume in mLs 1.37E+11		$^{235}\text{U}$	1.35E-14	N/A	1.00E-16	9.00E-14	1.50E+01
		$^{230}\text{Th}$	1.12E-16	2.19E-17	1.00E-16	2.00E-14	5.58E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.75E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05121275-005 Fourth Quarter 2005  Air Volume in mLs 1.41E+11		$^{235}\text{U}$	3.31E-15	N/A	1.00E-16	9.00E-14	3.68E+00
		$^{230}\text{Th}$	< 1.00E-16	1.21E-17	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.07E-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

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## LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company  
Project: 3rd Quarter 2005 Comp  
Lab ID: C05100072-005  
Client Sample ID: HMC-5 Hi-Vol Filter

Report Date: 11/10/05  
Collection Date: Not Provided  
Date Received: 10/03/05  
Matrix: Filter

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
RADIONUCLIDES - TOTAL							
Radium 226	6.7	pCi/Filter		0.2		E903.0	10/18/05 15:00 / trs
Radium 226 precision (±)	2.4	pCi/Filter				E903.0	10/18/05 15:00 / trs
Thorium 230	15.3	pCi/Filter		0.2		E907.0	10/31/05 10:30 / ph
Thorium 230 precision (±)	3.0	pCi/Filter				E907.0	10/31/05 10:30 / ph
Uranium, Activity	1850	pCi/Filter		0.2		SW6020	10/20/05 21:48 / 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  
Project: 4th Quarter 2005 Comp  
Lab ID: C05121275-005  
Client Sample ID: HMC-5

Report Date: 01/23/06  
Collection Date: Not Provided  
Date Received: 12/30/05  
Matrix: Filter

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
RADIONUCLIDES - TOTAL							
Radium 226	3.6	pCi/Filter		0.2		E903.0	01/05/06 14:45 / trs
Radium 226 precision (±)	1.4	pCi/Filter				E903.0	01/05/06 14:45 / trs
Thorium 230	7.0	pCi/Filter		0.2		E907.0	01/05/06 10:30 / ph
Thorium 230 precision (±)	1.7	pCi/Filter				E907.0	01/05/06 10:30 / ph
Uranium, Activity	467	pCi/Filter		0.2		SW6020	01/04/06 23:21 / sml

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: January 17, 2006

REVISED REPORT DATE: January 31, 2006

SAMPLE ID: HMC 6

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05040073-006 First Quarter 2005  Air Volume in mLs 1.59E+11		$^{238}\text{U}$	< 1.00E-16	N/A	1.00E-16	9.00E-14	< 1.11E-01
		$^{230}\text{Th}$	< 1.00E-16	3.77E-18	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.38E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05070041-006 Second Quarter 2005  Air Volume in mLs 1.41E+11		$^{238}\text{U}$	2.81E-15	N/A	1.00E-16	9.00E-14	3.13E+00
		$^{230}\text{Th}$	< 1.00E-16	1.61E-17	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	4.66E-16	4.16E-17	1.00E-16	9.00E-13	5.18E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05100072-008 Third Quarter 2005  Air Volume in mLs 1.40E+11		$^{238}\text{U}$	2.60E-15	N/A	1.00E-16	9.00E-14	2.89E+00
		$^{230}\text{Th}$	< 1.00E-16	1.21E-17	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.57E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05121275-006 Fourth Quarter 2005  Air Volume in mLs 1.29E+11		$^{238}\text{U}$	6.52E-16	N/A	1.00E-16	9.00E-14	7.24E-01
		$^{230}\text{Th}$	< 1.00E-16	1.17E-17	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.32E-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

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### LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company  
Project: 3rd Quarter 2005 Comp  
Lab ID: C05100072-006  
Client Sample ID: HMC-6 Hi-Vol Filter

Report Date: 11/10/05  
Collection Date: Not Provided  
Date Received: 10/03/05  
Matrix: Filter

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
RADIONUCLIDES - TOTAL							
Radium 226	5.8	pCi/Filter		0.2		E903.0	10/18/05 15:00 / trs
Radium 226 precision (±)	2.2	pCi/Filter				E903.0	10/18/05 15:00 / trs
Thorium 230	5.7	pCi/Filter		0.2		E907.0	10/31/05 10:30 / ph
Thorium 230 precision (±)	1.7	pCi/Filter				E907.0	10/31/05 10:30 / ph
Uranium, Activity	364	pCi/Filter		0.2		SW6020	10/20/05 21:52 / 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

Project: 4th Quarter 2005 Comp

Lab ID: C05121275-006

Client Sample ID: HMC-6

Report Date: 01/23/06

Collection Date: Not Provided

Date Received: 12/30/05

Matrix: Filter

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
RADIONUCLIDES - TOTAL							
Radium 226	5.1	pCi/Filter		0.2		E903.0	01/05/06 14:45 / trs
Radium 226 precision (±)	1.7	pCi/Filter				E903.0	01/05/06 14:45 / trs
Thorium 230	6.2	pCi/Filter		0.2		E907.0	01/05/06 10:30 / ph
Thorium 230 precision (±)	1.5	pCi/Filter				E907.0	01/05/06 10:30 / ph
Uranium, Activity	84.1	pCi/Filter		0.2		SW6020	01/04/06 23:25 / smf

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: January 17, 2006  
REVISED REPORT DATE: January 31, 2006

SAMPLE ID: HMC 8

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05040071-001 First Quarter 2005  Air Volume in mLs 1.39E+11		$^{235}\text{U}$	4.78E-16	N/A	1.00E-16	9.00E-14	5.31E-01
		$^{230}\text{Th}$	< 1.00E-16	1.01E-17	1.00E-16	2.00E-14	< 5.00E-01
		$^{226}\text{Ra}$	< 1.00E-16	1.87E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05070041-008 Second Quarter 2005  Air Volume in mLs 1.36E+11		$^{235}\text{U}$	1.33E-14	N/A	1.00E-16	9.00E-14	1.48E+01
		$^{230}\text{Th}$	1.95E-16	2.08E-17	1.00E-16	2.00E-14	9.73E-01
		$^{226}\text{Ra}$	1.45E-16	2.36E-17	1.00E-16	9.00E-13	1.61E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05100072-008 Third Quarter 2005  Air Volume in mLs 1.42E+11		$^{235}\text{U}$	1.94E-14	N/A	1.00E-16	9.00E-14	2.15E+01
		$^{230}\text{Th}$	1.72E-16	2.11E-17	1.00E-16	2.00E-14	8.59E-01
		$^{226}\text{Ra}$	< 1.00E-16	2.25E-17	1.00E-16	9.00E-13	< 1.11E-02

Quarter/Date Sampled Volume	Air	Radionuclide	Concentration $\mu\text{Ci/mL}$	Error Estimate $\mu\text{Ci/mL}$	L.L.D. $\mu\text{Ci/mL}$	Effluent Conc.* $\mu\text{Ci/mL}$	% Effluent Concentration
C05121275-008 Fourth Quarter 2005  Air Volume in mLs 1.39E+11		$^{235}\text{U}$	9.61E-15	N/A	1.00E-16	9.00E-14	1.07E+01
		$^{230}\text{Th}$	1.60E-16	2.04E-17	1.00E-16	2.00E-14	8.02E-01
		$^{226}\text{Ra}$	2.09E-15	7.61E-17	1.00E-16	9.00E-13	2.33E-01

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

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### LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company  
Project: 3rd Quarter 2005 Comp  
Lab ID: C05100072-008  
Client Sample ID: HMC-8 Hi-Vol Filter

Report Date: 11/10/05  
Collection Date: Not Provided  
Date Received: 10/03/05  
Matrix: Filter

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
RADIONUCLIDES - TOTAL							
Radium 226	14	pCi/Filter		0.2		E903.0	10/18/05 15:00 / trs
Radium 226 precision (±)	3.2	pCi/Filter				E903.0	10/18/05 15:00 / trs
Thorium 230	24.4	pCi/Filter		0.2		E907.0	10/31/05 10:30 / ph
Thorium 230 precision (±)	3.0	pCi/Filter				E907.0	10/31/05 10:30 / ph
Uranium, Activity	2750	pCi/Filter		0.2		SW6020	10/20/05 21:59 / bws

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

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

## LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company

Project: 4th Quarter 2005 Comp

Lab ID: C05121275-008

Client Sample ID: HMC-8

Report Date: 01/23/06

Collection Date: Not Provided

Date Received: 12/30/05

Matrix: Filter

Analyses	Result	Units	Qual	MCL/		Method	Analysis Date / By
				RL	QCL		
RADIONUCLIDES - TOTAL							
Radium 226	292	pCi/Filter		0.2		E903.0	01/05/06 14:45 / trs
Radium 226 precision (±)	11	pCi/Filter				E903.0	01/05/06 14:45 / trs
Thorium 230	22.3	pCi/Filter		0.2		E907.0	01/05/06 10:30 / ph
Thorium 230 precision (±)	2.8	pCi/Filter				E907.0	01/05/06 10:30 / ph
Uranium, Activity	1340	pCi/Filter		0.2		SW6020	01/04/06 23:57 / sml

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

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



## ANALYTICAL SUMMARY REPORT

December 05, 2005

Adrian Venable  
Homestake Mining Company  
Hwy 601  
PO Box 98  
Grants, NM 87020

Workorder No.: C05100072

Quote ID: C775 - Hi-Vol Filters

Project Name: 3rd Quarter 2005 Comp

Energy Laboratories Inc. received the following 8 samples from Homestake Mining Company on 10/3/2005 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C05100072-001	HMC-1 Hi-Vol Filter		10/03/05	Filter	Metals, Total Digestion, Total Metals Radium 226 Thorium, Isotopic
C05100072-002	HMC-2 Hi-Vol Filter		10/03/05	Filter	Same As Above
C05100072-003	HMC-3 Hi-Vol Filter		10/03/05	Filter	Same As Above
C05100072-004	HMC-4 Hi-Vol Filter		10/03/05	Filter	Same As Above
C05100072-005	HMC-5 Hi-Vol Filter		10/03/05	Filter	Same As Above
C05100072-006	HMC-6 Hi-Vol Filter		10/03/05	Filter	Same As Above
C05100072-007	HMC-7 Hi-Vol Filter		10/03/05	Filter	Same As Above
C05100072-008	HMC-8 Hi-Vol Filter		10/03/05	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 GARLYO  
LABORATORY SUPERVISOR



## QA/QC Summary Report

Client: Homestake Mining Company

Project: 3rd Quarter 2005 Comp

Report Date: 11/10/05

Work Order: C05100072

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E903.0									Batch: 9278
Sample ID: C05100072-001ADUP	Sample Duplicate								10/18/05 15:00
Radium 226	3.57	pCi/Filter	0.20				81	93.7	
Radium 226 precision (±)	1.27	pCi/Filter							
Sample ID: C05100072-008AMS	Matrix Spike								10/18/05 15:00
Radium 226	41.2	pCi/Filter	0.20	85.2	70	130			
Sample ID: MB-RA226-1272	Method Blank								10/18/05 15:00
Radium 226	ND	pCi/Filter	0.2						
Sample ID: LCS-RA226-1272	Laboratory Control Spike								10/18/05 15:00
Radium 226	12.0	pCi/Filter	0.20	94.2	70	130			
Sample ID: MB-9278	Method Blank								10/18/05 15:00
Radium 226	3	pCi/Filter	0.4						
Method: E907.0									Batch: 9278
Sample ID: MB-R57778	Method Blank								10/31/05 10:30
Thorium 230	0.5	pCi/Filter	0.2						
Sample ID: LCS-R57778	Laboratory Control Spike								10/31/05 10:30
Thorium 230	23.0	pCi/Filter	0.20	90	70	130			
Sample ID: C05100363-003AMS	Matrix Spike								10/31/05 10:30
Thorium 230	68.1	pCi/Filter	0.20	79.5	70	130			
Sample ID: C05100363-003AMSD	Matrix Spike Duplicate								10/31/05 10:30
Thorium 230	72.8	pCi/Filter	0.20	87.4	70	130	6.7	30	

### Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.



## QA/QC Summary Report

Client: Homestake Mining Company

Project: 3rd Quarter 2005 Comp

Report Date: 11/10/05

Work Order: C05100072

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Batch: 9278
Sample ID: MB-9278	Method Blank								10/20/05 20:55
Uranium	0.0002	mg/filter	0.0001						
Sample ID: LCS1-9278	Laboratory Control Spike - Low								10/20/05 20:59
Uranium	0.0467	mg/filter	0.00030	93.1	75	125			
Sample ID: C05100072-001AMS	Matrix Spike								10/20/05 21:09
Uranium	0.506	mg/filter	0.00030		75	125			A
Sample ID: C05100072-001AMSD	Matrix Spike Duplicate								10/20/05 21:13
Uranium	0.501	mg/filter	0.00030		75	125	1.1		20 A
Sample ID: MB-9278	Method Blank								10/30/05 19:41
Uranium	ND	mg/kg-dry	0.003						
Sample ID: LCS1-9278	Laboratory Control Spike - Low								10/30/05 19:46
Uranium	0.098	mg/kg-dry	0.15	97.8	70	130			
Sample ID: C05100363-001AMS4	Post Digestion Spike								10/30/05 20:00
Uranium	0.97	mg/kg-dry	0.15	96.6	75	125			
Sample ID: C05100363-001AMSD4	Post Digestion Spike Dup								10/30/05 20:05
Uranium	0.94	mg/kg-dry	0.15	93.6	75	125	3.2		20

### Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.

## QA/QC Summary Report

**Client:** Homestake Mining Company  
**Project:** 4th Quarter 2005 Comp

**Report Date:** 01/23/06  
**Work Order:** C05121275

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
<b>Method: E903.0</b>							<b>Batch: RA226-1371</b>		
<b>Sample ID: C05121275-008AMS</b>	Matrix Spike								01/05/06 14:45
Radium 226	304	pCi/Filter	0.40	19.5	70	130			S
Poor MS/MSD recovery due to high initial sample activity.									
<b>Sample ID: C05121275-008AMSD</b>	Matrix Spike Duplicate								01/05/06 14:45
Radium 226	298	pCi/Filter	0.40	9.75	70	130	1.9	17.1	S
Poor MS/MSD recovery due to high initial sample activity.									
<b>Sample ID: MB-RA226-1371</b>	Method Blank								01/05/06 14:45
Radium 226	ND	pCi/Filter	0.2						
<b>Sample ID: LCS-RA226-1371</b>	Laboratory Control Spike								01/05/06 14:45
Radium 226	8.39	pCi/Filter	0.20	66.1	70	130			S
<b>Method: E907.0</b>							<b>Batch: 9921</b>		
<b>Sample ID: MB-R60832</b>	Method Blank								01/05/06 10:30
Thorium 230	ND	pCi/Filter	0.2						
<b>Sample ID: LCS-R60832</b>	Laboratory Control Spike								01/05/06 10:30
Thorium 230	29.0	pCi/Filter	0.20	116	70	130			
<b>Sample ID: C05121275-008AMS</b>	Matrix Spike								01/05/06 10:30
Thorium 230	114	pCi/Filter	0.20	73.6	70	130			
<b>Sample ID: C05121275-008AMSD</b>	Matrix Spike Duplicate								01/05/06 10:30
Thorium 230	103	pCi/Filter	0.20	89.8	70	130	11	30	
<b>Method: SW6020</b>							<b>Batch: 9921</b>		
<b>Sample ID: MB-9921</b>	Method Blank								01/04/06 22:19
Uranium	0.0006	mg/filter	0.00006						
<b>Sample ID: LCS1-9921</b>	Laboratory Control Spike - Low								01/04/06 22:24
Uranium	0.0468	mg/filter	0.00030	92.5	75	125			
<b>Sample ID: C05121275-001AMS</b>	Matrix Spike								01/04/06 22:36
Uranium	0.346	mg/filter	0.00030		75	125			A
<b>Sample ID: C05121275-001AMSD</b>	Matrix Spike Duplicate								01/04/06 23:00
Uranium	0.309	mg/filter	0.00030		75	125	11	20	A

### Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated.  
 S - Spike recovery outside of advisory limits.

**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	6/30/2005 - 12/28/2005	1.5E-09	1.8E-10	15	1.7E-10
Hi-Vol #2 NE Outer Perimeter	6/30/2005 - 12/28/2005	1.5E-09	1.8E-10	15	1.7E-10
Hi-Vol #3 E Outer Perimeter	6/30/2005 - 12/28/2005	1.2E-09	1.6E-10	12	1.7E-10
Hi-Vol #4 S Outer Perimeter	6/30/2005 - 12/28/2005	2.0E-09	2.1E-10	20	1.7E-10
Hi-Vol #5 N of Nearest Residence	6/30/2005 - 12/28/2005	1.7E-09	1.9E-10	17	1.7E-10
Hi-Vol #6 W of Outer Perimeter	6/30/2005 - 12/28/2005	1.6E-09	1.9E-10	16	1.7E-10
HMC #7 S Boundary	6/30/2005 - 12/28/2005	1.3E-09	1.7E-10	13	1.7E-10
HMC #16 Background	6/30/2005 - 12/28/2005	1.1E-09	1.6E-10	11	1.7E-10

\*Limit of 1E-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	7/1/2005 - 12/31/2005	17	1.7
Hi-Vol #2 NE Outer Perimeter	7/1/2005 - 12/31/2005	24	2.4
Hi-Vol #3 E Outer Perimeter	7/1/2005 - 12/31/2005	18	1.8
Hi-Vol #4 S Outer Perimeter	7/1/2005 - 12/31/2005	24	2.4
Hi-Vol #5 N of Nearest Residence	7/1/2005 - 12/31/2005	24	2.4
Hi-Vol #6 W of Outer Perimeter	7/1/2005 - 12/31/2005	18	1.8
#16 Background	7/1/2005 - 12/31/2005	16	1.6

\*Error is 1.96 std. dev.

**Attachment 4 - Annual Effective Dose Equivalent to Individuals  
of the Public**

## Annual Effective Dose Equivalent to Individuals of the Public

### 1.0 Introduction

There were very few activities in 2005 at the Grants Uranium Mill Site other than those associated with the groundwater restoration program. All off-pile tailings were consolidated with the tailings in 1995 and covered with a soil cover. All tailings currently have either an interim or permanent cover.

The 10 CFR 20.1301 radiation dose limit for individual members of the public from NRC-licensed facilities is specified as a total effective dose equivalent (TEDE) of 100 mrem/year. A licensee may request permission from the NRC to operate a facility up to a maximum of 500 mrem/year. Compliance may be demonstrated by calculations or measurements showing that the individual likely to receive the maximum dose from the facility does not exceed the limit, or by comparing the concentrations at the site perimeter to those specified in Table 2 of Appendix B to 10 CFR Part 20. Radiation from external sources for individuals in the unrestricted area may not deliver a dose equivalent of 0.002 rem in any hour or 0.050 rem in one year.

HMC has submitted environmental monitoring reports as required by 10 CFR 40.65 and License No. SUA-1471. The data from these reports have been used in this dose assessment.

### 2.0 DOSE ASSESSMENT

The important pathways for assessing the dose to the maximum exposed individual are: inhalation of airborne particulate from the site, exposure to radon generated at the site, and the exposure to direct gamma radiation originating from the site. The nearest residence is located within 100 yards of the HMC-4 and HMC-5 monitoring stations and therefore the exposure may be conservatively assumed to be comparable to that at the monitoring stations. The exposure at both monitoring stations is considered and the station with the highest exposure is used for calculating the total effective dose equivalent to the maximum exposed individual. It is known that the nearby residents have typical lifestyles.

NUREG/CR-5512 recommends default values for the residential scenario. The values for indoor and outdoor occupancy are 200 effective days/year and 71 effective days/year, respectively. This is equivalent to a 75 percent total occupancy factor. This has been used in this analysis for all pathways.

#### 2.1 Inhalation of Radionuclides

The committed effective dose equivalent from inhalation of particulate was calculated for the four principal long-lived radionuclides, U-238, U-234, Th-230, and Ra-226, using the quarterly environmental monitoring data given in the Semi-Annual Environmental Reports for 2005. The monitoring stations HMC #4 and HMC#5 were considered as Nearest Residence Locations. These stations are located on the southwestern perimeter of the site near existing residences. The use of these data to predict the dose to the nearest resident is very conservative in that the exposure at the residences should be less than that at the site perimeter.

Committed Effective Dose Equivalent per Unit Intake via Inhalation factors were taken from ICRP 30 tables. The values are given below:

<u>Nuclide</u>	<u>CEDE (mrem/<math>\mu</math>Ci)</u>
U-234	13.2E4
U-238	11.8E4
Th-230	32.6E4
Ra-226	8.6E3

Continuous occupancy at a breathing rate of 20,000 liters/day (Table A-1, NUREG-0859) was assumed. The CEDE was calculated for each of the radionuclides at each station. The CEDE at locations HMC#4 and HMC#5 for 100 percent occupancy was calculated to be 5.1 mrem/year and 8.8 mrem/y, respectively while that at the background location (HMC#6) was calculated to be 1.7 mrem/y, for a net CEDE at locations HMC #4 and HMC#5 of 3.4 mrem/y and 7.1 mrem/y. The results from these calculations are shown in Table 2-1, Table 2-2, and Table 2-3. Considering the 75 percent occupancy factor, this results in a net dose equivalent of 2.6 mrem/y at HMC #4 and 5.3 mrem/year at HMC #5. The location with the highest exposure from all pathways will be chosen for calculating the TEDE to the public.

## 2.2 Exposure to Radon

The outdoor radon levels in the Grants Uranium Belt are known to be high and variable, depending on the location relative to mine vents, surface ore deposits, and topographical features. The natural background radon concentrations, arising from the calm winds during the evenings and at times from temperature inversions, generally follow the drainage path of the heavy air. The HMC site is situated at the lowest point in the drainage path for radon generated over a very large area to the North, Northwest, and Lobo Canyon to the East. Therefore the natural background levels at the site are expected to be very high and variable over short periods of time due to being in this drainage path.

The radon data for the two monitoring periods are provided in Attachment 2 of the semi-annual monitoring reports. Monitoring Station 16 has been accepted as the radon background location for the site. The yearly average of the radon concentration for HMC#4 and HMC#5 was 1.9 pCi/l and 1.55 pCi/l; the average concentration for the background location was 1.15 pCi/l. This results in net radon concentrations at HMC#4 and HMC#5 of 0.75 pCi/l and 0.4 pCi/l.

Since the nearest residence is within a few hundred feet of the site perimeter and within 3500 feet of the major source of radon, the radon daughter equilibrium should be low. We have selected 20 percent radon daughter equilibrium as an estimate for use in the calculations. NRC uses continuous exposure to 0.1 pCi/l Rn-222 in full equilibrium with the daughter products as being equivalent to a CEDE of 50 mrem/y (10CFR Part 20, Appendix B). With 20 percent equilibrium, the CEDE would be 100 mrem/pCi/l. Considering the 75 percent occupancy factor, the net radon concentration at the nearest residence locations HMC#4 and HMC#5 therefore results in a calculated CEDE of 56.3 and 30.0 mrem/y, respectively.

## 2.3 Dose from Exposure to Direct Radiation

An estimate of the dose equivalent from direct exposure to radiation sources at the site is obtained from the environmental Luxel dosimeters placed at the monitoring stations. The direct radiation measurements for the two monitoring periods are provided in Attachment 3 of the semi-annual monitoring reports. The average annual effective dose equivalents measured at both HMC#4 and HMC#5 locations was 41 mrem/year and 44 mrem/y, respectively. The average annual effective dose equivalent at the background location, HMC#16, was 28 mrem/year. The net annual effective dose equivalents for HMC#4 and HMC#5 were therefore 13 mrem/y and 16 mrem/y,

respectively assuming 100 percent occupancy. Considering the 75 percent occupancy factor, the net annual effective dose equivalent is 9.8 mrem/year and 12 mrem/y, respectively for HMC#4 and HMC#5.

#### 2.4 Total Effective Dose Equivalent to the Nearest Resident

The TEDE to the Nearest Resident can be calculated by adding the effective dose equivalent (EDE) from inhalation of airborne particulate, the EDE from the exposure to radon coming from the site, and the dose equivalent from direct gamma radiation. Comparing the TEDEs for the two monitoring stations, the TEDE is larger for location HMC#4. Using the HMC#4 data, the TEDE is obtained by summing 2.6 mrem/y from airborne particulate, 56.3 mrem/y from radon, and 9.8 mrem/y from direct gamma radiation exposure for a total TEDE of 69 mrem/y. This is clearly within the 100 mrem/year limit.

Table 2-1 Annual Effective Dose at the Nearest Residence from Airborne Particulate

Year: 2005

STATION: HMC #4 Nearest Residence

	AIRBORNE CONCENTRATION				
	U-nat μCi/ml	U-234 μCi/ml	U-238 μCi/ml	Th-230 μCi/ml	Ra-226 μCi/ml
1st qtr	1.42E-16	6.92E-17	6.92E-17	1.00E-16	1.00E-16
2nd qtr	9.93E-15	4.84E-15	4.84E-15	1.00E-16	1.00E-16
3rd qtr	8.36E-15	4.07E-15	4.07E-15	1.00E-16	1.00E-16
4th qtr	3.60E-15	1.75E-15	1.75E-15	1.00E-16	1.00E-16
Average	5.51E-15	2.68E-15	2.68E-15	1.00E-16	1.00E-16
	ANNUAL EFFECTIVE DOSE EQUIVALENT				
	U-234 mrem	U-238 mrem	Th-230 mrem	Ra-226 mrem	TOTAL mrem
	2.587	2.313	0.238	0.006	5.1

Table 2-2 Annual Effective Dose at the Nearest Residence from Airborne Particulate

Year: 2005

STATION: HMC #5 Nearest Residence

	AIRBORNE CONCENTRATION				
	U-nat μCi/ml	U-234 μCi/ml	U-238 μCi/ml	Th-230 μCi/ml	Ra-226 μCi/ml
1st qtr	1.50E-16	7.31E-17	7.31E-17	1.00E-16	1.00E-16
2nd qtr	2.15E-14	1.05E-14	1.05E-14	1.40E-16	1.00E-16
3rd qtr	1.35E-14	6.58E-15	6.58E-15	1.12E-16	1.00E-16
4th qtr	3.31E-15	1.61E-15	1.61E-15	1.00E-16	1.00E-16
Average	9.62E-15	4.69E-15	4.69E-15	1.13E-16	1.00E-16
	ANNUAL EFFECTIVE DOSE EQUIVALENT				
	U-234 mrem	U-238 mrem	Th-230 mrem	Ra-226 mrem	TOTAL mrem
	4.516	4.037	0.269	0.006	8.8



Table 2-3 Annual Effective Dose at the Site Background Location from Airborne Particulate

Year:2005

STATION: HMC #6 Background

	AIRBORNE CONCENTRATION				
	U-nat μCi/ml	U-234 μCi/ml	U-238 μCi/ml	Th-230 μCi/ml	Ra-226 μCi/ml
1st qtr	1.00E-16	4.87E-17	4.87E-17	1.00E-16	1.00E-16
2nd qtr	2.81E-15	1.37E-15	1.37E-15	1.00E-16	4.66E-15
3rd qtr	2.60E-15	1.27E-15	1.27E-15	1.00E-16	1.00E-16
4th qtr	6.52E-16	3.18E-16	3.18E-16	1.00E-16	1.00E-16
Average	1.54E-15	7.51E-16	7.51E-16	1.00E-16	1.24E-15
ANNUAL EFFECTIVE DOSE EQUIVALENT					
	U-234 mrem	U-238 mrem	Th-230 mrem	Ra-226 mrem	TOTAL mrem
	0.724	0.647	0.238	0.078	1.7