HOMESTAKE MINING COMPANY OF CALIFORNIA GRANTS PROJECT



SEMI-ANNUAL ENVIRONMENTAL MONITORING REPORT

July - December

2009

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 July through December 2009. 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>U.S. NRC Standards for Protection Against Radiation</u> and closely approximates programs as described in NRC's Regulatory Guide 4.14, <u>Radiological Effluent and Environmental Monitoring at Uranium Mills</u>. 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 outslopes. Bedding and erosion protection was placed on the outslopes 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 July through December, the RO plant processed an average 275-gpm while producing an average of 166-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 currently representative of off-site groundwater quality conditions.

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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. HMC-7 is a blank Whatman filter that is analyzed as a lab and filter manufacturer quality check sample. The results are presented in Attachment 1.

Homestake uses Sierra Instruments Model #305-200 High Volume Air Samplers (or equivalent) to continuously sample the ambient air at 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

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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 through 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 reflective 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.). 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

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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:

$$LLD = \frac{3+4.66 \text{ S}_{b}}{3.7 \text{ E} 4 \text{ EvY exp } (-\lambda t)}$$

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;
Е	is the counting efficiency (counts per disintegration);
v	is the sample volume (milliliters);
Y	is the fractional radiochemical yield (when applicable);
λ	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 µCi/ml
Rn-222 in air	30 pCi(d/l)
U-nat in air	1 E-16 µCi/ml
U-rad in water	2 E-10 µCi/ml
Ra-226, Th-230 in water	2 E-10 µCi/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. During the report period, Homestake has not exceeded 10 CFR Part 20 values in any of their effluents 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 2008, 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 ExcludingGroundwater Monitoring

Table 1 - Environmental Monitoring Program Excluding Groundwater Monitoring

Type of Sample	Number	Eocations	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.)	Continuous Weekly filter (High Vol.) change, or more frequently as required. Samples composited and analyzed quarterly.	
	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	В	Annually

B = Water Level, pH, TDS, SO₄, Cl, HCO₃, CO₃, Na, Ca, Mg, K, NO₃, U, Se, Mo, Ra-226

D = Ca, Mg, K, Na, HCO₃, CO₃, Cl, SO₄, pH, TDS, Al, As, Ba, Cd, Co, Cu, CN, F, Fe, Pb, Mn, Hg, Mo, Ni, NO₃ as N, Se, Ag, Zn, U, Filtered Ra-226

F = V, Ra-228, Th-230

G = Water Level, SO₄, U, Se, TDS, Mo



Table 2.1.1 – Water Quality Analysis for Well D1



ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Rox 3258 • Casper, WY 82602 Toll Free 888.235.0515 (`7.235.0515 • Fax 307.234.1639 • casper@energ(com • www.energylab.com

LABORATORY ANALYTICAL REPORT

ENTERED AUG 2 4 2009

Client:Homestake Mining CompanyProject:GrantsLab ID:C09070587-004Client Sample ID:D1

 Report Date:
 08/11/09

 Collection Date:
 07/13/09
 10:00

 Date Received:
 07/15/09

 Matrix:
 Aqueous

Analyses Result Units Qual RL QCL Method Analysis Date / By MAJOR IONS 77 Akkalinity, Total as CaCO3 300 mg/L 1 A2320 B 07/16/09 21:02 / iji 006 Carbonate as CO3 367 mg/L 1 A2320 B 07/16/09 21:02 / iji 006 Carbonate as HCO3 367 mg/L D 1 A2320 B 07/16/09 21:02 / iji 007 Chioride 162 mg/L D 1 E200 R 07/16/09 21:02 / iji 007 Chioride 162 mg/L D 1 E200 R 07/16/09 12:03 / iii 007 Chioride 192 mg/L D.1 E332.2 07/17/1700 13:05 / eib-0 003 Potassium 3.9 mg/L D 1 E300.7 07/28/09 13:15 / cp 004 Sodium 3.8 mg/L D 1 E300.7 07/28/09 13:15 / cp 010 Solids, Total Dissolved TDS @ 180 C 2360 mg/L 10 A450			MCL/							
MAJOR IONS 075 Alkalinity, Total as CaCO3 300 mg/L 1 A2320 B 07/16/09 21:02 / iji 005 Carbonate as CO3 41 mg/L 1 A2320 B 07/16/09 21:02 / iji 005 Bicarbonate as CO3 367 mg/L 1 A2320 B 07/16/09 21:02 / iji 005 Bicarbonate as HCO3 367 mg/L 1 A2320 B 07/16/09 21:02 / iji 007 Choride 162 mg/L 1 E300.0 07/17/09 11:31 / izi 007 Choride 162 mg/L 0.5 E200.7 07/28/09 13:15 / cp 003 Nitrogen, Nitrate+Nitrite as N 4.0 mg/L 0.1 E300.0 07/17/09 11:31 / fo 004 Sodium 3.8 mg/L D 1 E200.7 07/28/09 13:15 / cp 004 Sodium 3.8 mg/L D 1 E200.7 07/28/09 13:15 / cp 005 Sulfate 1210 mg/L D 1 E200.7 07/28/09 1	Ana	lyses	Result	Units	Qual	RL QCL	Method	Analysis Date / By		
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008 Suifate 1210 mg/L 1 E300.0 07/17/09 01:43 / ji PHYSICAL PROPERTIES 009 pH 7.42 s.u. 0.01 A4500-H B 07/16/09 11:31 / lib 010 Solids, Total Dissolved TDS @ 180 C 2360 mg/L 10 A2540 C 07/17/09 12:25 / emm VETALS - DISSOLVED 040 Selenium 0.30 mg/L 0.003 E200.8 07/16/09 22:55 / sml 15 Uranium 1.41 mg/L 0.0003 E200.8 07/16/09 22:55 / sml 14 Uranium, Activity precision (±) 0.186 mg/L 0.0003 E200.8 07/16/09 22:55 / sml 113 Uranium, Activity precision (±) 1.3E-07 uC/mL 2.0E-10 E200.8 07/16/09 22:55 / sml 1242 Vanadum <0.01	004	Sodium	388	mg/L	D	1	E200.7	07/28/09 13:15 / cp		
PHYSICAL PROPERTIES 009 pH 7.42 s.u. 0.01 A4500-H B 07/16/09 11:31 / Ib 010 Solids, Total Dissolved TDS @ 180 C 2360 mg/L 10 A2540 C 07/17/09 12:25 / emm METALS - DISSOLVED 036 Molybdenum 1.20 mg/L 0.03 E200.8 07/16/09 22:55 / sml 040 Selenium 0.330 mg/L 0.0003 E200.8 07/16/09 22:55 / sml 044 Uranium Precision (±) 0.186 mg/L 0.00004 E200.8 07/16/09 22:55 / sml 144 Uranium Precision (±) 1.3E-07 uCi/mL 2.0E-10 E200.8 07/16/09 22:55 / sml 143 Uranium, Activity precision (±) 1.3E-07 uCi/mL 3.0E-11 E200.8 07/16/09 22:55 / sml 142 Vanadium <0.01	800	Sulfate	1210	mg/L		1	E300.0	07/17/09 01:43 / ljl		
009 pH 7.42 s.u. 0.01 A4500-H B 07/16/09 11:31 / tb 010 Solids, Total Dissolved TDS @ 180 C 2360 mg/L 10 A2540 C 07/16/09 12:25 / emm 026 Molybdenum 1.20 mg/L 0.03 E200.8 07/16/09 22:55 / sml 040 Selenium 0.330 mg/L 0.0005 E200.8 07/16/09 22:55 / sml 015 Uranium 1.41 mg/L 0.0003 E200.8 07/16/09 22:55 / sml 014 Uranium, Activity 9.5E-07 uCi/mL 2.0E-10 E200.8 07/16/09 22:55 / sml 114 Uranium, Activity precision (±) 1.3E-07 uCi/mL 3.0E-11 E200.8 07/16/09 22:55 / sml 1042 Vanadium <0.01	РНҮ	SICAL PROPERTIES								
010 Solids, Total Dissolved TDS @ 180 C 2360 mg/L 10 A2540 C 07/17/09 12:25 / emm METALS - DISSOLVED	009	рН	7.42	s.u.		0.01	A4500-H B	07/16/09 11:31 / tlb		
Mathematical distribution Market and the second distribution of the secon	010	Solids, Total Dissolved TDS @ 180 C	2360	mg/L		10	A2540 C	07/17/09 12:25 / emm		
036 Molybdenum 1.20 mg/L 0.03 E20.8 07/16/09 22:55 / sml 040 Selenium 0.330 mg/L 0.0005 E20.8 07/16/09 22:55 / sml 015 Uranium 1.41 mg/L 0.0003 E20.8 07/16/09 22:55 / sml 244 Uranium Precision (±) 0.186 mg/L 0.00004 E20.8 07/16/09 22:55 / sml 114 Uranium, Activity precision (±) 1.3E-07 uCi/mL 2.0E-10 E20.8 07/16/09 22:55 / sml 042 Vanadium <0.01	NIE1	ALS - DISSOLVED								
040 Selenium 0.330 mg/L 0.005 E20.8 07/16/09 22:55 / sml 015 Uranium 1.41 mg/L 0.0003 E200.8 07/16/09 22:55 / sml 244 Uranium Precision (±) 0.186 mg/L 0.00004 E200.8 07/16/09 22:55 / sml 114 Uranium, Activity precision (±) 1.3E-07 uCi/mL 2.0E-10 E200.8 07/16/09 22:55 / sml 113 Uranium, Activity precision (±) 1.3E-07 uCi/mL 3.0E-11 E200.8 07/16/09 22:55 / sml 114 Vanadium -0.01 mg/L 0.01 E200.8 07/16/09 22:55 / sml 115 Kadium 226 0.09 pCi/L U E903.0 08/04/09 08:36 / jah 1245 Radium 226 precision (±) 0.11 pCi/L U E903.0 08/04/09 08:36 / jah 1256 Radium 226 altu precision (±) 0.16 pCi/L U E903.0 08/04/09 08:36 / jah 1258 Radium 226 altu precision (±) 1.0E-10 uCi/mL E903.0 08/04/09 08:36 / j	036	Molybdenum	1.20	mg/L		0.03	E200.8	07/16/09 22:55 / sml		
015 Uranium 1.41 mg/L 0.0003 E200.8 07/16/09 22:55 / sml 244 Uranium Precision (±) 0.186 mg/L 0.00004 E200.8 07/16/09 22:55 / sml 114 Uranium, Activity 9.5E-07 uCl/mL 2.0E-10 E200.8 07/16/09 22:55 / sml 113 Uranium, Activity precision (±) 1.3E-07 uCl/mL 3.0E-11 E200.8 07/16/09 22:55 / sml 042 Vanadium 0.01 mg/L 0.01 E200.8 07/16/09 22:55 / sml 042 Vanadium 0.01 mg/L 0.01 E200.8 07/16/09 22:55 / sml 042 Vanadium 0.01 mg/L 0.01 E200.8 07/16/09 22:55 / sml 043 Radium 226 DUSOL/VED 0.01 E200.8 07/16/09 22:55 / sml 044 Radium 226 precision (±) 0.11 pCi/L U E903.0 08/04/09 08:36 / jah 258 Radium 226 altu precision (±) 0.16 pCi/L U E903.0 08/04/09 08:36 / jah <td< td=""><td>040</td><td>Selenium</td><td>0.330</td><td>mg/L</td><td></td><td>0.005</td><td>E200.8</td><td>07/16/09 22:55 / sml</td></td<>	040	Selenium	0.330	mg/L		0.005	E200.8	07/16/09 22:55 / sml		
244 Uranium Precision (±) 0.186 mg/L 0.00004 E200.8 07/16/09 22:55 / sml 114 Uranium, Activity 9.5E-07 uCi/mL 2.0E-10 E200.8 07/16/09 22:55 / sml 113 Uranium, Activity precision (±) 1.3E-07 uCi/mL 3.0E-11 E200.8 07/16/09 22:55 / sml 042 Vanadium <0.01	015	Uranium	1.41	mg/L		0.0003	E200.8	07/16/09 22:55 / sml		
114 Uranium, Activity 9.5E-07 uCi/mL 2.0E-10 E200.8 07/16/09 22:55 / sml 113 Uranium, Activity precision (±) 1.3E-07 uCi/mL 3.0E-11 E200.8 07/16/09 22:55 / sml 042 Vanadium <0.01	244	Uranium Precision (±)	0.186	mg/L		0.00004	E200.8	07/16/09 22:55 / sml		
113 Uranium, Activity precision (±) 1.3E-07 uCi/mL 3.0E-11 E200.8 07/16/09 22:55 / sml 042 Vanadium <0.01	114	Uranium, Activity	9.5E-07	uCi/mL		2.0E-10	E200.8	07/16/09 22:55 / sml		
042 Vanadium <0.01 mg/L 0.01 E200.8 07/16/09 22:55 / sml Radium 226 0.09 pCi/L U E903.0 08/04/09 08:36 / jah 245 Radium 226 precision (±) 0.11 pCi/L U E903.0 08/04/09 08:36 / jah 245 Radium 226 precision (±) 0.11 pCi/L U E903.0 08/04/09 08:36 / jah 256 Radium 226 altu 9.0E-11 uCi/mL U E903.0 08/04/09 08:36 / jah 258 Radium 226 altu 9.0E-11 uCi/mL U E903.0 08/04/09 08:36 / jah 258 Radium 226 altu Precision (±) 1.0E-10 uCi/mL U E903.0 08/04/09 08:36 / jah 257 Radium 228 altu MDC 2.0E-10 uCi/mL U RA-05 07/28/09 09:36 / plj 257 Radium 228 MDC 1.0 pCi/L U RA-05 07/28/09 09:36 / plj 259 Radium 228 altu -3.0E-10 uCi/mL U RA-05 07/28/09 09:36 / plj <td< td=""><td>113</td><td>Uranium, Activity precision (±)</td><td>1.3E-07</td><td>uCi/mL</td><td></td><td>3.0E-11</td><td>E200.8</td><td>07/16/09 22:55 / smi</td></td<>	113	Uranium, Activity precision (±)	1.3E-07	uCi/mL		3.0E-11	E200.8	07/16/09 22:55 / smi		
RAJUNUCLIDES - DISSOLVED 045 Radium 226 0.09 pCi/L U E903.0 08/04/09 08.36 / jah 245 Radium 226 precision (±) 0.11 pCi/L E903.0 08/04/09 08.36 / jah 245 Radium 226 MDC 0.16 pCi/L E903.0 08/04/09 08.36 / jah 256 Radium 226 altu 9.0E-11 uCi/mL U E903.0 08/04/09 08.36 / jah 258 Radium 226 altu precision (±) 1.0E-10 uCi/mL U E903.0 08/04/09 08.36 / jah 258 Radium 226 altu precision (±) 1.0E-10 uCi/mL U E903.0 08/04/09 08.36 / jah 257 Radium 228 1.0E-10 uCi/mL U RA-05 07/28/09 09.36 / pj 257 Radium 228 precision (±) 0.6 pCi/L U RA-05 07/28/09 09.36 / pj 258 Radium 228 altu -3.0E-10 uCi/mL U RA-05 07/28/09 09.36 / pj 257 Radium 228 altu -3.0E-10 uCi/mL U RA-05 07	042	Vanadium	<0.01	mg/L		0.01	E200.8	07/16/09 22:55 / sml		
045 Radium 226 0.09 pCi/L U E903.0 08/04/09 08:36 / jah 245 Radium 226 precision (±) 0.11 pCi/L E903.0 08/04/09 08:36 / jah 245 Radium 226 MDC 0.16 pCi/L E903.0 08/04/09 08:36 / jah 256 Radium 226 altu 9.0E-11 uCi/mL U E903.0 08/04/09 08:36 / jah 258 Radium 226 altu precision (±) 1.0E-10 uCi/mL U E903.0 08/04/09 08:36 / jah 258 Radium 226 altu precision (±) 1.0E-10 uCi/mL U E903.0 08/04/09 08:36 / jah 258 Radium 226 altu MDC 2.0E-10 uCi/mL U E903.0 08/04/09 08:36 / jah 257 Radium 228 -0.3 pCi/L U RA-05 07/28/09 09:36 / plj 257 Radium 228 MDC 1.0 pCi/L U RA-05 07/28/09 09:36 / plj 258 Radium 228 altu precision (±) 0.6 pCi/L U RA-05 07/28/09 09:36 / plj 259 Radium 228 altu precision (±) 0.0E-10 uCi/mL U RA-05 <t< td=""><td>RAD</td><td>NONUCLIDES - DISSOLVED</td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	RAD	NONUCLIDES - DISSOLVED								
245 Radium 226 precision (±) 0.11 pCi/L E903.0 08/04/09 08:36 / jah 256 Radium 226 MDC 0.16 pCi/L E903.0 08/04/09 08:36 / jah 256 Radium 226 altu 9.0E-11 uCi/mL U E903.0 08/04/09 08:36 / jah 258 Radium 226 altu precision (±) 1.0E-10 uCi/mL U E903.0 08/04/09 08:36 / jah 258 Radium 226 altu precision (±) 1.0E-10 uCi/mL U E903.0 08/04/09 08:36 / jah 257 Radium 226 altu MDC 2.0E-10 uCi/mL U RA-05 07/28/09 09:36 / pij 257 Radium 228 precision (±) 0.6 pCi/L U RA-05 07/28/09 09:36 / pij 258 Radium 228 MDC 1.0 pCi/L U RA-05 07/28/09 09:36 / pij 259 Radium 228 altu -3.0E-10 uCi/mL U RA-05 07/28/09 09:36 / pij 259 Radium 228 altu MDC 1.0E-09 uCi/mL U RA-05 07/28/09 09:36 / pij 260 Radium 228 altu MDC 1.0E-09 uCi/mL U RA-05	045	Radium 226	0.09	pCi/L	U		E903.0	08/04/09 08:36 / jah		
Radium 226 MDC 0.16 pCi/L E903.0 08/04/09 08:36 / jah 256 Radium 226 altu 9.0E-11 uCi/mL U E903.0 08/04/09 08:36 / jah 258 Radium 226 altu precision (±) 1.0E-10 uCi/mL U E903.0 08/04/09 08:36 / jah 258 Radium 226 altu mecision (±) 1.0E-10 uCi/mL E903.0 08/04/09 08:36 / jah 057 Radium 228 altu MDC 2.0E-10 uCi/mL U RA-05 07/28/09 09:36 / plj 257 Radium 228 precision (±) 0.6 pCi/L U RA-05 07/28/09 09:36 / plj 259 Radium 228 MDC 1.0 pCi/L U RA-05 07/28/09 09:36 / plj 259 Radium 228 altu precision (±) 0.6 pCi/L U RA-05 07/28/09 09:36 / plj 359 Radium 228 altu precision (±) 6.0E-10 uCi/mL U RA-05 07/28/09 09:36 / plj 360 Radium 228 altu MDC 1.0E-09 uCi/mL RA-05 07/28/09 09:36 / plj 364 Thorium 230 0.02 pCi/L U E907.0 07/30/09 13:27 / trs <td>245</td> <td>Radium 226 precision (±)</td> <td>0.11</td> <td>pCi/L</td> <td></td> <td></td> <td>E903.0</td> <td>08/04/09 08:36 / jah</td>	245	Radium 226 precision (±)	0.11	pCi/L			E903.0	08/04/09 08:36 / jah		
256 Radium 226 altu 9.0E-11 uCi/mL U E903.0 08/04/09 08:36 / jah 258 Radium 226 altu precision (±) 1.0E-10 uCi/mL E903.0 08/04/09 08:36 / jah 258 Radium 226 altu MDC 2.0E-10 uCi/mL E903.0 08/04/09 08:36 / jah 057 Radium 228 altu MDC 2.0E-10 uCi/mL U RA-05 07/28/09 09:36 / plj 258 Radium 228 precision (±) 0.6 pCi/L RA-05 07/28/09 09:36 / plj 259 Radium 228 MDC 1.0 pCi/L RA-05 07/28/09 09:36 / plj 359 Radium 228 altu precision (±) 6.0E-10 uCi/mL U RA-05 07/28/09 09:36 / plj 360 Radium 228 altu precision (±) 6.0E-10 uCi/mL RA-05 07/28/09 09:36 / plj 361 Radium 228 altu MDC 1.0E-09 uCi/mL RA-05 07/28/09 09:36 / plj 363 Thorium 230 0.02 0.02 pCi/L U E907.0 07/30/09 13:27 / trs 363 Thorium 230 MDC 0.2 pCi/L E907.0 07/30/09 13:27 / trs		Radium 226 MDC	0.16	pCi/L			E903.0	08/04/09 08:36 / jah		
258 Radium 226 altu precision (±) 1.0E-10 uCi/mL E903.0 08/04/09 08:36 / jah 057 Radium 226 altu MDC 2.0E-10 uCi/mL E903.0 08/04/09 08:36 / jah 057 Radium 228 -0.3 pCi/L U RA-05 07/28/09 09:36 / plj 258 Radium 228 precision (±) 0.6 pCi/L RA-05 07/28/09 09:36 / plj 259 Radium 228 altu -3.0E-10 pCi/L RA-05 07/28/09 09:36 / plj 359 Radium 228 altu precision (±) -3.0E-10 uCi/mL U RA-05 07/28/09 09:36 / plj 360 Radium 228 altu precision (±) 6.0E-10 uCi/mL U RA-05 07/28/09 09:36 / plj 361 Radium 228 altu MDC 1.0E-09 uCi/mL RA-05 07/28/09 09:36 / plj 362 Radium 230 altu MDC 1.0E-09 uCi/mL RA-05 07/28/09 09:36 / plj 363 Thorium 230 precision (±) 0.08 pCi/L U E907.0 07/30/09 13:27 / trs 363 Thorium 230 MDC 0.2 pCi/L E907.0 07/30/09 13:27 / trs E907.0 07/30/09	256	Radium 226 altu	9.0E-11	uCi/mL	U		E903.0	08/04/09 08:36 / jah		
Radium 226 altu MDC 2.0E-10 uCi/mL E903.0 08/04/09 08:36 / jah 057 Radium 228 -0.3 pCi/L U RA-05 07/28/09 09:36 / plj 257 Radium 228 precision (±) 0.6 pCi/L RA-05 07/28/09 09:36 / plj 258 Radium 228 MDC 1.0 pCi/L RA-05 07/28/09 09:36 / plj 359 Radium 228 altu -3.0E-10 uCi/mL U RA-05 07/28/09 09:36 / plj 360 Radium 228 altu precision (±) 6.0E-10 uCi/mL U RA-05 07/28/09 09:36 / plj 361 Radium 228 altu MDC 1.0E-09 uCi/mL RA-05 07/28/09 09:36 / plj 362 Radium 228 altu MDC 1.0E-09 uCi/mL RA-05 07/28/09 09:36 / plj 363 Thorium 230 precision (±) 0.02 pCi/L U E907.0 07/30/09 13:27 / trs 363 Thorium 230 MDC 0.2 pCi/L E907.0 07/30/09 13:27 / trs	258	Radium 226 altu precision (±)	1.0E-10	uCi/mL			E903.0	08/04/09 08:36 / jah		
057 Radium 228 -0.3 pCi/L U RA-05 07/28/09 09:36 / plj 257 Radium 228 precision (±) 0.6 pCi/L RA-05 07/28/09 09:36 / plj 258 Radium 228 MDC 1.0 pCi/L RA-05 07/28/09 09:36 / plj 359 Radium 228 altu -3.0E-10 uCi/mL U RA-05 07/28/09 09:36 / plj 360 Radium 228 altu precision (±) 6.0E-10 uCi/mL U RA-05 07/28/09 09:36 / plj 361 Radium 228 altu precision (±) 6.0E-10 uCi/mL RA-05 07/28/09 09:36 / plj 362 Radium 228 altu MDC 1.0E-09 uCi/mL RA-05 07/28/09 09:36 / plj 363 Thorium 230 precision (±) 0.02 pCi/L U E907.0 07/30/09 13:27 / trs 363 Thorium 230 MDC 0.2 pCi/L E907.0 07/30/09 13:27 / trs		Radium 226 altu MDC	2.0E-10	uCi/mL			E903.0	08/04/09 08:36 / jah		
257 Radium 228 precision (±) 0.6 pCi/L RA-05 07/28/09 09:36 / plj 258 Radium 228 MDC 1.0 pCi/L RA-05 07/28/09 09:36 / plj 359 Radium 228 altu -3.0E-10 uCi/mL U RA-05 07/28/09 09:36 / plj 360 Radium 228 altu precision (±) 6.0E-10 uCi/mL RA-05 07/28/09 09:36 / plj 361 Radium 228 altu MDC 1.0E-09 uCi/mL RA-05 07/28/09 09:36 / plj 048 Thorium 230 0.02 pCi/L U E907.0 07/30/09 13:27 / trs 363 Thorium 230 MDC 0.2 pCi/L E907.0 07/30/09 13:27 / trs	057	Radium 228	-0.3	pCi/L	U		RA-05	07/28/09 09:36 / plj		
Radium 228 MDC 1.0 pCi/L RA-05 07/28/09 09:36 / plj 359 Radium 228 altu -3.0E-10 uCi/mL U RA-05 07/28/09 09:36 / plj 360 Radium 228 altu precision (±) 6.0E-10 uCi/mL RA-05 07/28/09 09:36 / plj 361 Radium 228 altu MDC 1.0E-09 uCi/mL RA-05 07/28/09 09:36 / plj 048 Thorium 230 0.02 pCi/L U E907.0 07/30/09 13:27 / trs 363 Thorium 230 MDC 0.2 pCi/L E907.0 07/30/09 13:27 / trs	257	Radium 228 precision (±)	0.6	pCi/L			RA-05	07/28/09 09:36 / plj		
359 Radium 228 altu -3.0E-10 uCi/mL U RA-05 07/28/09 09:36 / plj 360 Radium 228 altu precision (±) 6.0E-10 uCi/mL RA-05 07/28/09 09:36 / plj Radium 228 altu MDC 1.0E-09 uCi/mL RA-05 07/28/09 09:36 / plj 048 Thorium 230 0.02 pCi/L U E907.0 07/30/09 13:27 / trs 363 Thorium 230 precision (±) 0.08 pCi/L E907.0 07/30/09 13:27 / trs Thorium 230 MDC 0.2 pCi/L E907.0 07/30/09 13:27 / trs		Radium 228 MDC	1.0	pCi/L			RA-05	 07/28/09 09:36 / plj 		
360 Radium 228 altu precision (±) 6.0E-10 uCi/mL RA-05 07/28/09 09:36 / plj Adium 228 altu MDC 1.0E-09 uCi/mL RA-05 07/28/09 09:36 / plj 048 Thorium 230 0.02 pCi/L U E907.0 07/30/09 13:27 / trs 363 Thorium 230 precision (±) 0.08 pCi/L E907.0 07/30/09 13:27 / trs 7horium 230 MDC 0.2 pCi/L E907.0 07/30/09 13:27 / trs	359	Radium 228 altu	-3.0E-10	uCi/mL	U		RA-05	07/28/09 09:36 / plj		
Radium 228 altu MDC 1.0E-09 uCi/mL RA-05 07/28/09 09:36 / plj 048 Thorium 230 0.02 pCi/L U E907.0 07/30/09 13:27 / trs 363 Thorium 230 precision (±) 0.08 pCi/L E907.0 07/30/09 13:27 / trs Thorium 230 MDC 0.2 pCi/L E907.0 07/30/09 13:27 / trs	360	Radium 228 altu precision (±)	6.0E-10	uCi/mL			RA-05	07/28/09 09:36 / plj		
048 Thorium 230 0.02 pCi/L U E907.0 07/30/09 13:27 / trs 363 Thorium 230 precision (±) 0.08 pCi/L E907.0 07/30/09 13:27 / trs Thorium 230 MDC 0.2 pCi/L E907.0 07/30/09 13:27 / trs		Radium 228 altu MDC	1.0E-09	uCi/mL			RA-05	07/28/09 09:36 / plj		
363 Thorium 230 precision (±) 0.08 pCi/L E907.0 07/30/09 13:27 / trs Thorium 230 MDC 0.2 pCi/L E907.0 07/30/09 13:27 / trs	048	Thorium 230	0.02	pCi/L	U		E907.0	07/30/09 13:27 / trs		
Thorium 230 MDC 0.2 pCi/L E907.0 07/30/09 13:27 / trs	363	Thorium 230 precision (±)	0.08	pCi/L			E907.0	07/30/09 13:27 / trs		
		Thorium 230 MDC	0.2	pCi/L			E907.0	07/30/09 13:27 / trs		

Report RL -

Definitions:

RL - Analyte reporting limit.

QCL - Quality control limit.

MDC - Minimum detectable concentration

MCL - Maximum contaminant level.

ND - Not detected at the reporting limit.

D - RL increased due to sample matrix interference.



LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company Project: Grants Lab ID: C09070587-004 Client Sample ID: D1
 Report Date:
 08/11/09

 Collection Date:
 07/13/09
 10:00

 Date Received:
 07/15/09

 Matrix:
 Aqueous

Ana	lyses	Result	Units	Qual	MCL/ RL QCL	Method	Analysis Date / By
RAE	DIONUCLIDES - DISSOLVED						
248	Thorium 230 altu	2.0E-11	uCi/mL	U		E907.0	07/30/09 13:27 / trs
362	Thorium 230 altu precision (±)	8.0E-11	uCi/mL			E907.0	07/30/09 13:27 / trs
	Thorium 230 altu MDC	2.0E-10	uCi/mL			E907.0	07/30/09 13:27 / trs
DAT	A QUALITY						
192	A/C Balance (± 5)	0.113	%			Calculation	07/30/09 09:38 / kbh
194	Anions	36.0	meq/L			Calculation	07/30/09 09:38 / kbh
195	Cations	36.1	meq/L			Calculation	07/30/09 09:38 / kbh
079	Solids, Total Dissolved Calculated	2340	mg/L			Calculation	07/30/09 09:38 / kbh
200	TDS Balance (0.80 - 1.20)	1.01	unitless			Calculation	07/30/09 09:38 / kbh





 Report
 RL - Analyte reporting limit.

 Definitions:
 QCL - Quality control limit.

 MDC - Minimum detectable concentration

Table 2.1.2 – Water Quality Analysis for Well S4

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ENERGY LABORATORIES, INC. • 2393 Salt Creek Highway (82601) • P.O. Box 3258 • Casper, WY 82602 Toll Free 888.235.0515 (7.235.0515 • Fax 307.234.1639 • casper@energ com • www.energylab.com

LABORATORY ANALYTICAL REPORT

ENTERED AUG 2 4 2009

Client: Homestake Mining Company Project: Grants Lab ID: C09070587-006 Client Sample ID: S4
 Report Date:
 08/11/09

 Collection Date:
 07/13/09
 13:00

 Date Received:
 07/15/09

 Matrix:
 Aqueous

MCL/							
Ana	lyses	Result	Units	Qual	RL QCL	Method	Analysis Date / By
MA	IOR IONS						
075	Alkalinity, Total as CaCO3	441	mg/L		1	A2320 B	07/16/09 21:17 / Iji
006	Carbonate as CO3	<1	mg/L		1	A2320 B	07/16/09 21:17 Ì Iji
005	Bicarbonate as HCO3	538	mg/L		1	A2320 B	07/16/09 21:17 / lji
001	Calcium	242	mg/L	D	1	E200.7	07/28/09 13:24 / cp
007	Chloride	211	mg/L		1	E300.0	07/17/09 02:14 / ljl
002	Magnesium	64.2	mg/L		0.5	E200.7	07/28/09 13:24 / cp
039	Nitrogen, Nitrate+Nitrite as N	1.7	mg/L		0.1	E353.2	07/17/09 13:16 / eli-b
003	Potassium	4.8	mg/L		0.5	E200.7	07/28/09 13:24 / cp
004	Sodium	284	mg/L	D	1	E200.7	07/28/09 13:24 / cp
008	Sulfate	719	mg/L		1	E300.0	07/17/09 02:14 / ljl
РНҮ	SICAL PROPERTIES						
009	рН	7.31	s.u.		0.01	A4500-H B	07/16/09 11:36 / tlb
010	Solids, Total Dissolved TDS @ 180 C	1910	mg/L		10	A2540 C	07/17/09 12:26 / emm
MET	ALS - DISSOLVED						
036	Molybdenum	0.80	mg/L		0.03	E200.8	07/16/09 23:36 / sml
040	Selenium	0.023	mg/L		0.005	E200.8	07/16/09 23:36 / sml
015	Uranium	0.581	mg/L		0.0003	E200.8	07/16/09 23:36 / sml
244	Uranium Precision (±)	0.0769	mg/L		0.00004	E200.8	07/16/09 23:36 / sml
114	Uranium, Activity	3.9E-07	uCi/mL		2.0E-10	E200.8	07/16/09 23:36 / sml
113	Uranium, Activity precision (±)	5.2E-08	uCi/mL		3.0E-11	E200.8	07/16/09 23:36 / sml
042	Vanadium	<0.01	mg/L		0.01	E200.8	07/16/09 23:36 / sml
RAD	IONUCLIDES - DISSOLVED						
045	Radium 226	0.25	pCi/L			E903.0	08/04/09 08:36 / jah
245	Radium 226 precision (±)	0.13	pCi/L			E903.0	08/04/09 08:36 / jah
	Radium 226 MDC	0.17	pCi/L			E903.0	08/04/09 08:36 / jah
256	Radium 226 altu	2.0E-10	uCi/mL			E903.0	08/04/09 08:36 / jah
258	Radium 226 altu precision (±)	1.0E-10	uCi/mL			E903.0	08/04/09 08:36 / jah
	Radium 226 altu MDC	2.0E-10	uCi/mL			E903.0	08/04/09 08:36 / jah
057	Radium 228	0.1	pCi/L	ν U		RA-05	07/28/09 09:36 / plj
257	Radium 228 precision (±)	0.6	pCi/L			RA-05	07/28/09 09:36 / plj
	Radium 228 MDC	1.1	pCi/L			RA-05	07/28/09 09:36 / plj
359	Radium 228 altu	1.0E-10	uCi/mL	U		RA-05	07/28/09 09:36 / plj
360	Radium 228 altu precision (±)	6.0E-10	uCi/mL			RA-05	07/28/09 09:36 / plj
	Radium 228 altu MDC	1.0E-09	uCi/mL			RA-05	07/28/09 09:36 / plj
048	Thorium 230	0.003	pCi/L	U		E907.0	07/30/09 13:27 / trs
363	Thorium 230 precision (±)	0.07	pCi/L			E907.0	07/30/09 13:27 / trs
	Thorium 230 MDC	0.2	pCi/L			E907.0	07/30/09 13:27 / trs

Report RL - Analyte reporting limit.

Definitions: QCL - Quality control limit.

MDC - Minimum detectable concentration

MCL - Maximum contaminant level.

ND - Not detected at the reporting limit.

D - RL increased due to sample matrix interference.



LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company Project: Grants Lab ID: C09070587-006 Client Sample ID: S4 **Report Date:** 08/11/09 **Collection Date:** 07/13/09 13:00 **Date Received:** 07/15/09 **Matrix:** Aqueous

Analyses		Result	Units	Qual	RL QCL	Method	Analysis Date / By	
RADIONUCLI	DES - DISSOLVED							
248 Thorium 2	230 altu	3.0E-12	uCi/mL	U		E907.0	07/30/09 13:27 / trs	
362 Thorium 2	230 altu precision (±)	7.0E-11	uCi/mL			E907.0	07/30/09 13:27 / trs	
Thorium 2	230 altu MDC	2.0E-10	uCi/mL			E907.0	07/30/09 13:27 / trs	
	ТҮ							
192 A/C Balar	nce (± 5)	-0.136	%			Calculation	07/30/09 09:38 / kbh	
194 Anions		29.9	meq/L			Calculation	07/30/09 09:38 / kbh	
195 Cations		29.8	meq/L			Calculation	07/30/09 09:38 / kbh	
079 Solids, To	otal Dissolved Calculated	1840	mg/L			Calculation	07/30/09 09:38 / kbh	
200 TDS Bala	nce (0.80 - 1.20)	1.04	unitless			Calculation	07/30/09 09:38 / kbh	





RL - Analyte reporting limit. QCL - Quality control limit. MDC - Minimum detectable concentration





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LABORATORY ANALYTICAL REPORT

ENTERED AUG 2 4 2009

Client: Homestake Mining Company Project: Grants Lab ID: C09070587-002 Client Sample ID: X **Report Date:** 08/11/09 **Collection Date:** 07/13/09 08:30 **Date Received:** 07/15/09 **Matrix:** Aqueous

		MCL/							
Ana	lyses	Result	Units	Qual	RL QCL	Method	Analysis Date / By		
MAJ									
075	Alkalinity, Total as CaCO3	307	mg/L		1	A2320 B	07/16/09 20:47 / ljl		
006	Carbonate as CO3	<1	mg/L		1	A2320 B	07/16/09 20:47 / ljl		
005	Bicarbonate as HCO3	375	mg/L		1	A2320 B	07/16/09 20:47 / ljl		
001	Calcium	139	mg/L		0.5	E200.7	07/28/09 13:03 / cp		
007	Chloride	80	mg/L		1	E300.0	07/17/09 00:41 / ljl		
002	Magnesium	24.0	mg/L		0.5	E200.7	07/28/09 13:03 / cp		
039	Nitrogen, Nitrate+Nitrite as N	0.8	mg/L		0.1	E353.2	07/17/09 13:02 / eli-b		
003	Potassium	2.7	mg/L		0.5	E200.7	07/28/09 13:03 / cp		
004	Sodium	116	mg/L		0.5	E200.7	07/28/09 13:03 / cp		
800	Sulfate	247	mg/L		1	E300.0	07/17/09 00:41 / ljl		
РНҮ	SICAL PROPERTIES								
009	рН	7.42	s.u.		0.01	A4500-H B	07/16/09 11:26 / tlb		
010	Solids, Total Dissolved TDS @ 180 C	852	mg/Ļ		10	A2540 C	07/17/09 12:25 / emm		
MET	ALS - DISSOLVED								
036	Molybdenum	0.05	mg/L		0.03	E200.8	07/16/09 22:41 / sml		
040	Selenium	<0.005	mg/L		0.005	E200.8	07/16/09 22:41 / sml		
015	Uranium	0.0634	mg/L		0.0003	E200.8	07/16/09 22:41 / sml		
244	Uranium Precision (±)	0.00840	mg/L		0.00004	E200.8	07/16/09 22:41 / sml		
114	Uranium, Activity	4.3E-08	uCi/mL		2.0E-10	E200.8	07/16/09 22:41 / sml		
113	Uranium, Activity precision (±)	5.7E-09	uCi/mL		3.0E-11	E200.8	07/16/09 22:41 / sml		
042	Vanadium	<0.01	mg/L		0.01	E200.8	07/16/09 22:41 / sml		
RAD	IONUCLIDES - DISSOLVED								
045	Radium 226	-0.2	pCi/L	U		E903.0	08/04/09 08:36 / jah		
245	Radium 226 precision (±)	0.08	pCi/L			E903.0	08/04/09 08:36 / jah		
	Radium 226 MDC	0.19	pCi/L			E903.0	08/04/09 08:36 / jah		
256	Radium 226 altu	-2.0E-10	uCi/mL	U		E903.0	08/04/09 08:36 / jah		
258	Radium 226 altu precision (±)	8.0E-11	uCi/mL			E903.0	08/04/09 08:36 / jah		
	Radium 226 altu MDC	2.0E-10	uCi/mL			E903.0	08/04/09 08:36 / jah		
057	Radium 228	-0.9	pCi/L	U		RA-05	07/28/09 09:36 / plj		
257	Radium 228 precision (±)	0.7	pCi/L			RA-05	07/28/09 09:36 / plj		
	Radium 228 MDC	1.2	pCi/L			RA-05	07/28/09 09:36 / plj		
359	Radium 228 altu	-9.0E-10	uCi/mL	U		RA-05	07/28/09 09:36 / plj		
360	Radium 228 altu precision (±)	7.0E-10	uCi/mL			RA-05	07/28/09 09:36 / plj		
	Radium 228 altu MDC	1.0E-09	uCi/mL			RA-05	07/28/09 09:36 / plj		
048	Thorium 230	0.08	pCi/L	U		E907.0	07/30/09 13:27 / trs		
363	Thorium 230 precision (±)	0.1	pCi/L			E907.0 ·	07/30/09 13:27 / trs		
	Thorium 230 MDC	0.2	pCi/L			E907.0	07/30/09 13:27 / trs		

Report RL - A Definitions: QCL

RL - Analyte reporting limit.

QCL - Quality control limit.

MDC - Minimum detectable concentration

MCL - Maximum contaminant level.

ND - Not detected at the reporting limit.

U - Not detected at minimum detectable concentration



LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company Project: Grants Lab ID: C09070587-002 Client Sample ID: X
 Report Date:
 08/11/09

 Collection Date:
 07/13/09 08:30

 Date Received:
 07/15/09

 Matrix:
 Aqueous

Ana	lyses	Result	Units	Qual	MCL/ RL QCL	Method	Analysis Date / By
PAT		تعجيب ومستشفقت ويهجم			anna an		
248	Thorium 230 altu	8.0E-11	uCi/mL	U		E907.0	07/30/09 13:27 / trs
362	Thorium 230 altu precision (±)	1.0E-10	uCi/mL			E907.0	07/30/09 13:27 / trs
	Thorium 230 altu MDC	2.0E-10	uCi/mL			E907.0	07/30/09 13:27 / trs
DAT	A QUALITY						
192	A/C Balance (± 5)	1.51	%			Calculation	07/30/09 09:38 / kbh
194	Anions	13.6	meq/L			Calculation	07/30/09 09:38 / kbh
195	Cations	14.0	meq/L			Calculation	07/30/09 09:38 / kbh
079	Solids, Total Dissolved Calculated	818	mg/L			Calculation	07/30/09 09:38 / kbh
200	TDS Balance (0.80 - 1.20)	1.04	unitless			Calculation	07/30/09 09:38 / kbh



Report Definitions: RL - Analyte reporting limit. QCL - Quality control limit. MDC - Minimum detectable concentration MCL - Maximum contaminant level. ND - Not detected at the reporting limit. U - Not detected at minimum detectable concentration Table 2.1.4 – Water Quality Analysis for Well P



LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company roject: Grants Lab ID: C09090670-001 Client Sample ID: P

Report Date: 09/29/09 **Collection Date:** 09/15/09 08:30 **Date Received:** 09/17/09 **Matrix:** Aqueous

				MCL/		
Analyses	Result	Units	Qual	RL QCL	Method	Analysis Date / By
MAJOR IONS						
008 Sulfate	1040	mg/L		1	E300.0	09/25/09 20:14 / Ijl
PHYSICAL PROPERTIES						
010 Solids, Total Dissolved TDS @ 180 C	: 1810	mg/L		10	A2540 C	09/18/09 16:57 / th
METALS - DISSOLVED						
036 Molybdenum	<0.03	mg/L	(0.03	E200.8	09/19/09 06:10 / ts
040 Selenium	0.118	mg/L	0	.005	E200.8	09/19/09 06:10 / ts
015 Uranium	0.0281	mg/L	0.	0003	E200.8	09/19/09 06:10 / ts
244 Uranium Precision (±)	0.00372	mg/Ľ	0.0	00004	E200.8	09/19/09 06:10 / ts
114 Uranium, Activity	1.9E-08	uCi/mL	2.0	DE-10	E200.8	09/19/09 06:10 / ts
113 Uranium, Activity precision (±)	2.5E-09	uCi/mL	3.0	DE-11	E200.8	09/19/09 06:10 / ts





RL - Analyte reporting limit. QCL - Quality control limit.



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

Table 3 – Occupational Monitoring Program (6-00)

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

Figure 1 – Monitoring & Sampling Locations

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Homestake Mining Company Properties Grants, NM Air Monitoring & Sampling Locations



Location Id	Sampling Unit	Northing	Easting	Air Monitors
HMC 1	Hi-Volume Particulate Monitor, Track -Etch Passive Radon Gas Monitor & OSL Gamma Badge	1547458.838	491370.45	- Roads
HMC 2	Hi-Volume Particulate Monitor, Track -Etch Passive Radon Gas Monitor & OSL Gamma Badge	1546349.53	495053.16	
НМС 3	Hi-Volume Particulate Monitor, Track -Etch Passive Radon Gas Monitor & OSL Gamma Badge	1543048.74	495640.47	- Gates 's
HMC 4	Hi-Volume Particulate Monitor, Track -Etch Passive Radon Gas Monitor & OSL Gamma Badge	1538751.127	488918.03	Fence Lines
HMC 5	Hi-Volume Particulate Monitor, Track -Etch Passive Radon Gas Monitor & OSL Gamma Badge	1541268.442	488546.31	Section Lines
HMC 6	Hi-Volume Particulate Monitor, Track -Etch Passive Radon Gas Monitor & OSL Gamma Badge	1543813.054	486297.26	
HMC 7	Track-Etch Passive Radon Gas Monitor	1540395.708	493293.8	FIGURE 1
HMC 16 (BKG)	Track-Etch Passive Radon Gas Monitor & OSL Gamma Badoe	1556470,456	485135.12	

HOMBEAKE

U

0.25

0.5

1 ∎Miles Attachment 1 – High Volume Air Sampling Results



HIGH VOLUME AIR SAMPLING REPORT

CLIENT: Homestake Mining Co PROJECT: 4th Quarter 2009 REPORT DATE: February 3, 2010

SAMPLE ID: HMC-1 Hi-Vol Filter

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision μCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C09040159-001	^{nat} U	1.44E-17	N/A	N/A	1.00E-16	9.00E-14	1.60E-02
First Quarter 2009	²³⁰ Th	5.73E-17	1.72E-17	9.79E-18	1.00E-16	3.00E-14	1.91E-01
Air Volume in mLs	²²⁶ Ra	5.20E-17	1.35E-17	1.16E-17	1.00E-16	9.00E-13	5.78E-03
1 28E+11				·		······································	·····

Quarter/Date Sampled Air Volume	Radionuclide	Concentration μCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C09070146-001	^{nat} U	1.11E-15	N/A	N/A	1.00E-16	9.00E-14	1.23E+00
Second Quarter 2009	²³⁰ Th	7.05E-17	1.96E-17	6.43E-18	1.00E-16	3.00E-14	2.35E-01
Air Volume in mLs	²²⁶ Ra	1.24E-16	1.56E-17	7.32E-18	1.00E-16	9.00E-13	1.38E-02
1.29E+11		• · · · · · · · · · · · · · · · · · · ·		·		• • • • • • • • • • • •	·

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision μCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C09100103-001	^{nat} U	1.35E-15	N/A	N/A	1.00E-16	9.00E-14	1.50E+00
Third Quarter 2009	²³⁰ Th	2.50E-17	5.73E-18	3.36E-18	1.00E-16	3.00E-14	8.32E-02
Air Volume in mLs	²²⁶ Ra	2.22E-17	4.29E-18	3.29E-18	1.00E-16	9.00E-13	2.46E-03
1.42E+11			L.,			······································	L

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision μCi/mL	MDC µCi/mL	L.L.D. µCi/mŁ	Effluent Conc.* µCi/mL	% Effluent Concentration
C10010142-001	natU	1.49E-16	N/A	N/A	1.00E-16	9.00E-14	1.65E-01
Fourth Quarter 2009	²³⁰ Th	7.14E-18	2.65E-18	2.11E-18	1.00E-16	3.00E-14	2.38E-02
Air Volume in mLs	²²⁶ Ra	2.21E-17	3.95E-18	2.26E-18	1.00E-16	9.00E-13	2.45E-03
1.41E+11		·				1	

LLD's are from Reg. Guide 4.14 *Effluent Concentration from the NEW 10 CFR Part 20 - Appendix B - Table 2 Year for Natural Uranium Year for Thorium-230 Week for Radium-226 Day for Lead-210



LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company roject: 4th Quarter 2009 Lab ID: C10010142-001 Client Sample ID: HMC-1 Hi-Vol Filter Report Date: 02/03/10 Collection Date: Not Provided Date Received: 01/06/10 Matrix: Air

	MCL/							
Analyses	Result	Units	Qual I	RL QCL	Method	Analysis Date / By		
METALS - TOTAL								
Vanadium	<0.10	mg/filter	· 0.	10	SW6020	01/14/10 05:15 / sml		
RADIONUCLIDES - TOTAL						`		
Radium 226	3.1	pCi/Filter			E903.0	01/26/10 01:32 / jah		
Radium 226 precision (±)	0.6	pCi/Filter			E903.0	01/26/10 01:32 / jah		
Radium 226 MDC	0.3	pCi/Filter			E903.0	01/26/10 01:32 / jah		
Thorium 230	1.0	pCi/Filter			E907.0	01/19/10 14:26 / dmf		
Thorium 230 precision (±)	0.37	pCi/Filter			E907.0	01/19/10 14:26 / dmf		
Thorium 230 MDC	. 0.30	pCi/Filter			E907.0	01/19/10 14:26 / dmf		
Uranium, Activity	21	pCi/Filter	0.	20	SW6020	01/14/10 05:15 / sml		



Report Definitions: RL - Analyte reporting limit. QCL - Quality control limit. MDC - Minimum detectable concentration



HIGH VOLUME AIR SAMPLING REPORT

CLIENT: Homestake Mining Co PROJECT: 4th Quarter 2009 REPORT DATE: February 3, 2010

SAMPLE ID: HMC-2 Hi-Vol Filter

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision μCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* μCi/mL	% Effluent Concentration
C09040159-002	^{nat} U	1.41E-17	N/A	N/A	1.00E-16	9.00E-14	1.56E-02
First Quarter 2009	²³⁰ Th	7.83E-17	2.15E-17	1.06E-17	1.00E-16	3.00E-14	2.61E-01
Air Volume in mLs	²²⁶ Ra	8.11E-17	1.54E-17	1.07E-17	1.00E-16	9.00E-13	9.01E-03
1.31E+11		• · · • • · · • • • • • • • • • • • • •	• • • • • • • • • •	· · · · · · · · · · · · · · · · · · ·			•

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision μCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* μCi/mL	% Effluent Concentration
C09070146-002	^{nat} U	1.09E-15	N/A	N/A	1.00E-16	9.00E-14	1.22E+00
Second Quarter 2009	²³⁰ Th	1.14E-16	3.39E-17	9.18E-18	1.00E-16	3.00E-14	3.79E-01
Air Volume in mLs	²²⁶ Ra	9.33E-17	1.17E-17	5.46E-18	1.00E-16	9.00E-13	1.04E-02
1 23E+11		L					

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision μCi/mL	MDC μCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C09100103-002	^{nat} U	9.64E-16	N/A	N/A	1.00E-16	9.00E-14	1.07E+00
Third Quarter 2009	²³⁰ Th	3.07E-17	6.38E-18	2.95E-18	1.00E-16	3.00E-14	1.02E-01
Air Volume in mLs	²²⁶ Ra	3.91E-17	5.77E-18	3.64E-18	1.00E-16	9.00E-13	4.35E-03
1 34E+11							

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C10010142-002	^{nat} U	1.88E-16	N/A	N/A	1.00E-16	9.00E-14	2.09E-01
Fourth Quarter 2009	²³⁰ Th	2.04E-17	3.94E-18	2.04E-18	1.00E-16	3.00E-14	6.80E-02
Air Volume in mLs	²²⁶ Ra	2.91E-17	4.65E-18	2.41E-18	1.00E-16	9.00E-13	3.24E-03
1 25E+11		<u> </u>				····	•

LLD's are from Reg. Guide 4.14 *Effluent Concentration from the NEW 10 CFR Part 20 - Appendix B - Table 2 Year for Natural Uranium Year for Thorium-230 Week for Radium-226

Day for Lead-210



LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company Project: 4th Quarter 2009 Lab ID: C10010142-002 Client Sample ID: HMC-2 Hi-Vol Filter Report Date: 02/03/10 Collection Date: Not Provided Date Received: 01/06/10 Matrix: Air

		MCL/							
Analyses	Result	Units	Qual	RL QCL	Method	Analysis Date / By			
METALS - TOTAL									
Vanadium	<0.10	mg/filter		0.10	SW6020	01/14/10 05:46 / sml			
RADIONUCLIDES - TOTAL									
Radium 226	3.6	pCi/Filter			E903.0	01/26/10 01:32 / jah			
Radium 226 precision (±)	0.6	pCi/Filter			E903.0	01/26/10 01:32 / jah			
Radium 226 MDC	0.3	pCi/Filter			E903.0	01/26/10 01:32 / jah			
Thorium 230	2.6	pCi/Filter			E907.0	01/19/10 14:26 / dmf			
Thorium 230 precision (±)	0.49	pCi/Filter			E907.0	01/19/10 14:26 / dmf			
Thorium 230 MDC	0.25	pCi/Filter			E907.0	01/19/10 14:26 / dmf			
, Uranium, Activity	23	pCi/Filter		0.20	SW6020	01/14/10 05:46 / sml			



RL - Analyte reporting limit. QCL - Quality control limit. MDC - Minimum detectable concentration



HIGH VOLUME AIR SAMPLING REPORT

CLIENT: Homestake Mining Co PROJECT: 4th Quarter 2009 REPORT DATE: February 3, 2010

SAMPLE ID: HMC-3 Hi-Vol Filter

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* μCi/mL	% Effluent Concentration
C09040159-003	^{nat} U	3.35E-17	N/A	N/A	1.00E-16	9.00E-14	3.73E-02
First Quarter 2009	²³⁰ Th	3.69E-17	1.44E-17	1.07E-17	1.00E-16	3.00E-14	1.23E-01
Air Volume in mLs	²²⁶ Ra	3.55E-17	1.11E-17	1.07E-17	1.00E-16	9.00E-13	3.95E-03
, 1.33E+11		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·				

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C09070146-003	^{nat} U	6.23E-15	N/A	N/A	1.00E-16	9.00E-14	6.92E+00
Second Quarter 2009	²³⁰⁻ Гh	5.83E-17	2.74E-17	1.64E-17	1.00E-16	3.00E-14	1.94E-01
Air Volume in mLs	²²⁶ Ra	6.50E-17	9.21E-18	4.80E-18	1.00E-16	9.00E-13	7.22E-03
1.32E+11					· · · ·		

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* μCi/mL	% Effluent Concentration
C09100103-003	^{nat} U	1.93E-15	N/A	N/A	1.00E-16	9.00E-14	2.15E+00
Third Quarter 2009	²³⁰ Th	1.77E-17	3.94E-18	1.93E-18	1.00E-16	3.00E-14	5.89E-02
Air Volume in mLs	²²⁶ Ra	1.82E-17	3.34E-18	2.47E-18	1.00E-16	9.00E-13	2.02E-03
2.25E+11						• , • • ·	· · · ·

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C10010142-003	^{nat} U	5.88E-16	N/A	N/A	1.00E-16	9.00E-14	6.53E-01
Fourth Quarter 2009	²³⁰ Th	1.98E-17	3.72E-18	2.43E-18	1.00E-16	3.00E-14	6.61E-02
Air Volume in mLs	²²⁶ Ra	4.31E-17	6.40E-18	3.11E-18	1.00E-16	9.00E-13	4.79E-03
1 45E+11							

LLD's are from Reg. Guide 4.14 *Effluent Concentration from the NEW 10 CFR Part 20 - Appendix B - Table 2 Year for Natural Uranium Year for Thorium-230 Week for Radium-226 Jay for Lead-210



LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company Project: 4th Quarter 2009 Lab ID: C10010142-003 Client Sample ID: HMC-3 Hi-Vol Filter Report Date: 02/03/10 Collection Date: Not Provided Date Received: 01/06/10 Matrix: Air

				MCL/		
Analyses	Result	Units	Qual I	RL QCL	Method	Analysis Date / By
METALS - TOTAL						
Vanadium	<0.10	mg/filter	0.	10	SW6020	01/14/10 05:51 / sml
RADIONUCLIDES - TOTAL						
Radium 226	6.3	pCi/Filter			E903.0	01/26/10 01:32 / jah
Radium 226 precision (±)	0.9	pCi/Filter			E903.0	01/26/10 01:32 / jah
Radium 226 MDC	0.5	pCi/Filter			E903.0	01/26/10 01:32 / jah
Thorium 230	2.9	pCi/Filter			E907.0	01/19/10 14:26 / dmf
Thorium 230 precision (±)	0.54	pCi/Filter			E907.0	01/19/10 14:26 / dmf
Thorium 230 MDC	0.35	pCi/Filter			E907.0	01/19/10 14:26 / dmf
Uranium, Activity	85	pCi/Filter	0.	20	SW6020	01/14/10 05:51 / sml



RL - Analyte reporting limit. QCL - Quality control limit. MDC - Minimum detectable concentration



HIGH VOLUME AIR SAMPLING REPORT

CLIENT: Homestake Mining Co PROJECT: 4th Quarter 2009 REPORT DATE: February 3, 2010

SAMPLE ID: HMC-4 Hi-Vol Filter

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C09040159-004	^{nat} U	1.80E-17	N/A	N/A	1.00E-16	9.00E-14	2.00E-02
First Quarter 2009	²³⁰ Th	4.39E-17	1.73E-17	1.23E-17	1.00E-16	3.00E-14	1.46E-01
Air Volume in mLs	²²⁶ Ra	5.40E-17	1.33E-17	1.11E-17	1.00E-16	9.00E-13	6.00E-03
1.25E+11		*- <u></u>	· · · · · · · · · · · · · · · · · · ·				· · · · · · · · · · · · · · · · · · ·

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C09070146-004	^{nat} U	2.57E-15	N/A	N/A	1.00E-16	9.00E-14	2.86E+00
Second Quarter 2009	²³⁰ Th	5.10E-17	2.01E-17	7.71E-18	1.00E-16	3.00E-14	1.70E-01
Air Volume in mLs	²²⁶ Ra	7.31E-17	1.19E-17	6.96E-18	1.00E-16	9.00E-13	8.12E-03
1.34E+11				· · · · · · · · · · · · · · · · · · ·	••	•	

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC μCi/mL	L.L.D. µCi/mL	Effluent Conc.* μCi/mL	% Effluent Concentration
C09100103-004	nat U	4.31E-15	N/A	N/A	1.00E-16	9.00E-14	4.79E+00
Third Quarter 2009	²³⁰ Th	3.40E-17	7.30E-18	3.46E-18	1.00E-16	3.00E-14	1.13E-01
Air Volume in mLs	²²⁶ Ra	3.23E-17	5.93E-18	4.39E-18	1.00E-16	9.00E-13	3.59E-03
1.29E+11				······································			• • • • • • •

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision μCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C10010142-004	natU	5.21E-16	N/A	N/A	1.00E-16	9.00E-14	5.78E-01
Fourth Quarter 2009	²³⁰ Th	2.45E-17	4.39E-18	2.37E-18	1.00E-16	3.00E-14	8.16E-02
Air Volume in mLs	²²⁶ Ra	3.97E-17	5.10E-18	2.18E-18	1.00E-16	9.00E-13	4.41E-03
1.38E+11		••••				<u></u>	·

LLD's are from Reg. Guide 4.14

*Effluent Concentration from the NEW 10 CFR Part 20 - Appendix B - Table 2 Year for Natural Uranium Year for Thorium-230 Week for Radium-226 ay for Lead-210



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 roject: 4th Quarter 2009 Lab ID: C10010142-004 Client Sample ID: HMC-4 Hi-Vol Filter

Report Date: 02/03/10 Collection Date: Not Provided Date Received: 01/06/10 Matrix: Air

				MCL/		
Analyses	Result	Units	Qual	RL QCL	Method	Analysis Date / By
METALS - TOTAL				1		
Vanadium	<0.10	mg/filter		0.10	SW6020	01/14/10 05:56 / sml
RADIONUCLIDES - TOTAL						
Radium 226	5.5	pCi/Filter			E903.0	01/26/10 01:32 / jah
Radium 226 precision (±)	0.7	pCi/Filter			E903.0	01/26/10 01:32 / jah
Radium 226 MDC	0.3	pCi/Filter			E903.0	01/26/10 01:32 / jah
Thorium 230	3.4	pCi/Filter			E907.0	01/19/10 14:26 / dmf
Thorium 230 precision (±)	0.61	pCi/Filter			E907.0	01/19/10 14:26 / dmf
Thorium 230 MDC	0.33	pCi/Filter			E907.0	01/19/10 14:26 / dmf
Uranium, Activity	72	pCi/Filter		0.20	SW6020	01/14/10 05:56 / sml



Definitions:

RL - Analyte reporting limit. QCL - Quality control limit. MDC - Minimum detectable concentration



HIGH VOLUME AIR SAMPLING REPORT

CLIENT: Homestake Mining Co PROJECT: 4th Quarter 2009 REPORT DATE: February 3, 2010

SAMPLE ID: HMC-5 Hi-Vol Filter

Quarter/Date Sampled Air Volume	Radionuclide	Concentration μCi/mL	Counting Precision μCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C09040159-005	^{nat} U	1.73E-17	N/A	N/A	1.00E-16	9.00E-14	1.92E-02
First Quarter 2009	²³⁰ Th	5.34E-17	1.75E-17	9.75E-18	1.00E-16	3.00E-14	1.78E-01
Air Volume in mLs	²²⁶ Ra	5.96E-17	1.32E-17	1.03E-17	1.00E-16	9.00E-13	6.62E-03
1.36E+11							· · · · · · · · · · · · · · · · · · ·

Quarter/Date Sampled Air Volume	Radionuclide	Concentration μCi/mL	Counting Precision μCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C09070146-005	^{nat} U	3.56E-15	N/A	N/A	1.00E-16	9.00E-14	3.95E+00
Second Quarter 2009	²³⁰ Th	4.21E-17	1.24E-17	5.47E-18	1.00E-16	3.00E-14	1.40E-01
Air Volume in mLs	²²⁶ Ra	6.08E-17	9.26E-18	5.13E-18	1.00E-16	9.00E-13	6.75E-03
1.31E+11		•	A. 1994 - 94	· · · · · · · · · · · · · · · · · · ·			

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MĐC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C09100103-005	^{nat} U	7.62E-15	N/A	N/A	1.00E-16	9.00E-14	8.46E+00
Third Quarter 2009	²³⁰ Th	5.50E-17	9.95E-18	2.71E-18	1.00E-16	3.00E-14	1.83E-01
Air Volume in mLs	²²⁶ Ra	4.27E-17	6.10E-18	3.75E-18	1.00E-16	9.00E-13	4.74E-03
1.26E+11		den and and and a second s	•				• • • • • • • • • • • • • • • • • • • •

Quarter/Date Sampled Air Volume	Radionuclide	Concentration μCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C10010142-005	natU	1.08E-15	N/A	N/A	1.00E-16	9.00E-14	1.20E+00
Fourth Quarter 2009	²³⁰ Th	2.77E-17	4.48E-18	2.11E-18	1.00E-16	3.00E-14	9.24E-02
Air Volume in mLs	²²⁶ Ra	3.82E-17	4.79E-18	2.01E-18	1.00E-16	9.00E-13	4.24E-03
1 37E+11		•				· · · · · · · · · · · · · · · · · · ·	

LLD's are from Reg. Guide 4.14

*Effluent Concentration from the NEW 10 CFR Part 20 - Appendix B - Table 2 Year for Natural Uranium Year for Thorium-230 Week for Radium-226 Pay for Lead-210



LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company roject: 4th Quarter 2009 Lab ID: C10010142-005 Client Sample ID: HMC-5 Hi-Vol Filter

Report Date: 02/03/10 Collection Date: Not Provided Date Received: 01/06/10 Matrix: Air

Analyses	Result	Units	MC Qual RL QC	L/ L Method	Analysis Date / By
METALS - TOTAL					
Vanadium	0.10	mg/filter	0.10	SW6020	01/14/10 06:01 / sml
RADIONUCLIDES - TOTAL					
Radium 226	5.2	pCi/Filter		E903.0	01/26/10 01:32 / jah
Radium 226 precision (±)	0.7	pCi/Filter		E903.0	01/26/10 01:32 / jah
Radium 226 MDC	0.3	pCi/Filter		E903.0	01/26/10 01:32 / jah
Thorium 230	3.8	pCi/Filter		E907.0	01/19/10 14:26 / dmf
Thorium 230 precision (±)	0.61	pCi/Filter		E907.0	01/19/10 14:26 / dmf
Thorium 230 MDC	0.29	pCi/Filter		E907.0	01/19/10 14:26 / dmf
Uranium, Activity	150	pCi/Filter	0.20	SW6020	01/14/10 06:01 / sml



RL - Analyte reporting limit. QCL - Quality control limit. MDC - Minimum detectable concentration



HIGH VOLUME AIR SAMPLING REPORT

1

CLIENT: Homestake Mining Co PROJECT: 4th Quarter 2009 REPORT DATE: February 3, 2010

SAMPLE ID: HMC-6 Hi-Vol Filter

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision μCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C09040159-006	^{nat} U	1.82E-17	N/A	N/A	1.00E-16	9.00E-14	2.02E-02
First Quarter 2009	²³⁰ Th	7.56E-17	2.35E-17	1.25E-17	1.00E-16	3.00E-14	2.52E-01
Air Volume in mLs	²²⁶ Ra	1.15E-16	1.78E-17	1.07E-17	1.00E-16	9.00E-13	1.28E-02
1.32E+11						<u></u>	

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC μCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C09070146-006	^{nat} U	6.74E-16	N/A	N/A	1.00E-16	9.00E-14	7.49E-01
Second Quarter 2009	²³⁰ Th	4.90E-17	1.34E-17	5.60E-18	1.00E-16	3.00E-14	1.63E-01
Air Volume in mLs	²²⁶ Ra	6.08E-17	1.07E-17	6.67E-18	1.00E-16	9.00E-13	6.75E-03
1.21E+11		L	L			· · · · · · · · · · · · · · · · · · ·	L

Quarter/Date Sampled Air Volume	Radionuclide	Concentration µCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* μCi/mL	% Effluent Concentration
C09100103-006	^{nat} U	1.20E-15	N/A	N/A	1.00E-16	9.00E-14	1.33E+00
Third Quarter 2009	²³⁰ Th	3.99E-17	8.03E-18	2.39E-18	1.00E-16	3.00E-14	1.33E-01
Air Volume in mLs	²²⁶ Ra	3.28E-17	5.74E-18	4.11E-18	1.00E-16	9.00E-13	3.65E-03
145E+11		•	£				• • • • • • • • • • • • • • • • • • • •

Quarter/Date Sampled Air Volume	Radionuclide	Concentration μCi/mL	Counting Precision µCi/mL	MDC µCi/mL	L.L.D. µCi/mL	Effluent Conc.* µCi/mL	% Effluent Concentration
C10010142-006	^{nat} U	1.29E-16	N/A	N/A	1.00E-16	9.00E-14	1.43E-01
Fourth Quarter 2009	²³⁰ Th	2.48E-17	4.47E-18	2.22E-18	1.00E-16	3.00E-14	8.26E-02
Air Volume in mLs	²²⁶ Ra	3.08E-17	4.30E-18	1.98E-18	1.00E-16	9.00E-13	3.42E-03
1 38E+11		· · · · · · · · · · · · · · · · · · ·	· · · ·				

LLD's are from Reg. Guide 4.14 *Effluent Concentration from the NEW 10 CFR Part 20 - Appendix B - Table 2 Year for Natural Uranium Year for Thorium-230 Week for Radium-226 Yay for Lead-210



LABORATORY ANALYTICAL REPORT

Client: Homestake Mining Company roject: 4th Quarter 2009 Lab ID: C10010142-006 Client Sample ID: HMC-6 Hi-Vol Filter

Report Date: 02/03/10 Collection Date: Not Provided Date Received: 01/06/10 Matrix: Air

		MCL/						
Analyses	Result	Units	Qual F	RL QCL	Method	Analysis Date / By		
METALS - TOTAL								
Vanadium	<0.10	mg/filter	0.	10	SW6020	01/14/10 06:06 / sml		
RADIONUCLIDES - TOTAL								
Radium 226	4.2	pCi/Filter			E903.0	01/26/10 01:32 / jah		
Radium 226 precision (±)	0.6	pCi/Filter			E903.0	01/26/10 01:32 / jah		
Radium 226 MDC	0.3	pCi/Filter			E903.0	01/26/10 01:32 / jah		
Thorium 230	3.4	pCi/Filter			E907.0	01/19/10 14:26 / dmf		
Thorium 230 precision (±)	0.62	pCi/Filter			E907.0	01/19/10 14:26 / dmf		
Thorium 230 MDC	0.31	pCi/Filter			E907.0	01/19/10 14:26 / dmf		
Uranium, Activity	18	pCi/Filter	0.2	20	SW6020	01/14/10 06:06 / sml		

Report Definitions: RL - Analyte reporting limit. QCL - Quality control limit. MDC - Minimum detectable concentration



ANALYTICAL SUMMARY REPORT

February 03, 2010

Homestake Mining Company Hwy 605

Grants, NM 87020

Workorder No.: C10010142

Project Name: 4th Quarter 2009

Energy Laboratories, Inc. received the following 7 samples for Homestake Mining Company on 1/6/2010 for analysis.

Quote ID: C775 - Hi-Vol Filters

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C10010142-00	01 HMC-1 Hi-Vol Filter		01/06/10	Air	Metals by ICP/ICPMS, Total Digestion, Total Metals Radium 226 Thorium, Isotopic
C10010142-00	2 HMC-2 Hi-Vol Filter		01/06/10	Air	Same As Above
C10010142-00	3 HMC-3 Hi-Vol Filter		01/06/10	Air	Same As Above
C10010142-00	4 HMC-4 Hi-Vol Filter		01/06/10	Air	Same As Above
C10010142-00	5 HMC-5 Hi-Vol Filter	· · · · · · · · · · · · · · · · · · ·	01/06/10	Air	Same As Above
C10010142-00	6 HMC-6 Hi-Vol Filter		01/06/10	Air	Same As Above
C10010142-00	7 HMC-7 Filter Comp		01/06/10	Air	Same As Above

As appropriate, any exceptions or problems with the analyses are noted in the Laboratory Analytical Report, the QA/QC Summary Report, or the Case Narrative.

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

Report Approved By:

Steven E. Carlston Technical Director

Attachment 2 - Radon Gas Monitoring Results

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

Location	Monitoring Period	Rn Concentration	Error Estimate	% Limit*	LLD
	5	(µCı/ml)	(µCi/ml)	(%)	(µCi/ml)
Hi-Vol #1	7/1/2000 12/31/2000				
N Outer Perimeter	1/1/2009 - 12/3 1/2009	1.6E-09	7.0E-11	16	1.6E-10
Hi-Vol #2	7/1/2000 12/21/2000				
NE Outer Perimeter	//1/2009 - 12/31/2009	1.8E-09	7.0E-11	18	1.6E-10
Hi-Vol #3	7/1/2000 12/21/2000				
E Outer Perimeter	7/1/2009 - 12/31/2009	1.4E-09	6.0E-11	14	1.6E-10
Hi-Vol #4	7/1/2000 12/21/2000				
S Outer Perimeter	77172009 - 12/31/2009	1.8E-09	7.0E-11	18	1.6E-10
Hi-Vol #5	7/1/2000 12/21/2000				
N of Nearest Residence	//1/2009 - 12/31/2009	1.5E-09	6.0E-11	15	1.6E-10
Hi-Vol #6	7/1/2000 12/21/2000				
W of Outer Perimeter	77172009 - 12/31/2009	1.4E-09	6.0E-11	14	1.6E-10
HMC #7	7/1/2000 12/21/2000				
S Boundary	7/1/2009 - 12/31/2009	1.2E-09	6.0E-11	12	1.6E-10
HMC #16	7/1/2000 12/21/2000				
Background	//1/2009 - 12/31/2009	2.5E-09	9.0E-11	25	1.6E-10

*Limit of 1E-8 µCi/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	7/1/2009 - 12/31/2009	14	1.4
Hi-Vol #2			
NE Outer Perimeter	7/1/2009 - 12/31/2009	14	1.4
Hi-Vol #3	-		
E Outer Perimeter	7/1/2009 - 12/31/2009	51	5.0
Hi-Vol #4			
S Outer Perimeter	7/1/2009 - 12/31/2009	16	1.6
Hi-Vol #5			
N of Nearest Residence	7/1/2009 - 12/31/2009	17	1.7
Hi-Vol #6			
W of Outer Perimeter	7/1/2009 - 12/31/2009	18	1.8
#16			
Background	7/1/2009 - 12/31/2009	6	0.6

*Error is 1.96 std. dev.

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

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Annual Effective Dose Equivalent to Individuals of the Public

1.0 Introduction

There were very few activities in 2009 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 NRClicensed facilities is specified as a total effective dose equivalent (TEDE) of 100 mrem/year. In addition, 10 CFR 20.1101 has a constraint on air emissions (excluding Rn-222 and its daughters) from a site limiting the TEDE to the maximum exposed member of the public from such emissions to10 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 2009. 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/µCi)</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 1.7 mrem/year and 2.8 mrem/y, respectively while that at the background location (HMC #6) was calculated to be 0.6 mrem/y, for a net CEDE at locations HMC #4 and HMC #5 of 1.1 mrem/y and 2.2 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 0.8 mrem/y at HMC #4 and 1.6 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 six-month monitoring periods is provided in Attachment 2 of the semiannual monitoring reports. Monitoring Station 16 has been accepted as the radon background location for the site. The average radon concentration for the first and second six-month periods was measured as 1.2 pCi/l and 2.5 pCi/l, respectively. These measurements are based on a single track-etch detector provided and processed by Landauer, Inc. at their highest level of sensitivity. The concentration of 2.5 pCi/l for the second six-month period is considered an anomaly since it is significantly higher than has ever been measured at that location over a period of many years. The use of the 2.5 pCi/l as a background concentration for the site would result in a negative net radon exposure at the site perimeter since it is higher than the concentrations measured at the perimeter monitoring stations.

HMC initiated a study to assess the precision of the track-etch detectors and to determine whether HMC#16 is appropriate for use as the radon background location for the site. Four highsensitivity track-etch detectors from Landauer, Inc. were placed at several locations including HMC#16 for three-month periods beginning in April 2009. While the study is still underway, the data for the third and fourth quarters of 2009 may be used for evaluating what the average radon concentration was at the HMC#16 location. The results from the study at HMC#16 for the third and fourth quarters are presented in Table A4-1 below. The average concentration for the third and fourth quarter periods was 0.73 pCi/l and 1.95 pCi/l, respectively. Accounting for the slightly different exposure times, an average of 1.36 pCi/l for the last half of the year is calculated. In order to calculate a yearly average, the concentration at HMC#16 for the first half of the year (as reported in Attachment 2 of the semi-annual environmental report) of 1.2 pCi/l is averaged with the 1.36 pCi/l for the last half of the year, as derived from the special study, resulting in an annual average of 1.3 pCi/l.

Detector	Time Period	Avg. Radon	Time Period	Avg. Radon
	· · · ·	Concentration	•	Concentration
2	7/2/2009-10/2/2009	0.86	10/2/2009 -1/7/2010	1.4
3	7/2/2009-10/2/2009	0.71	10/2/2009 -1/7/2010	0.88
4	7/2/2009-10/2/2009	0.68	10/2/2009 -1/7/2010	2.2
5	7/2/2009-10/2/2009	0.68	10/2/2009 -1/7/2010	3.2
Average		0.73		1.95

Table A4-1	Radon Concentrations	for HMC#16	Background	Location

The average and standard deviation for the reported annual average radon concentration at HMC#16 for the years 2003-2008 was 1.12 ± 0.14 pCi/l. The 1.3 pCi/l value for the yearly average agrees well with the data collected over the last six years. We therefore have used 1.3 pCi/l as a site background value for 2009.

The yearly average of the radon concentration for HMC #4 and HMC #5 were both 1.8 pCi/1 pCi/l. Assuming the average concentration for the background location was 1.3 pCi/l, this results in net radon concentrations at HMC#4 and HMC#5 of 0.5 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/1 Rn-222 in full equilibrium with the daughter products as being equivalent to a committed effective dose equivalent (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 results in a calculated CEDE of 38 mrem/y.

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 HMC #4 and HMC#5 locations was 32 mrem/year and 30 mrem/year, respectively. The average annual effective dose equivalent at the background location, HMC #16, was 21 mrem/year. The net annual effective dose equivalent for HMC #4 and HMC #5 was therefore 11 mrem/year and 9 mrem/year assuming 100 percent occupancy. Considering the 75 percent occupancy factor, the net annual effective dose equivalent is 8 mrem/y and 7 mrem/year for HMC #4 and HMC #5, respectively.

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 slightly larger for location HMC#4. Using the HMC#4 data, the TEDE is obtained by summing 0.8 mrem/y from airborne particulate, 38 mrem/y from radon,

and 8 mrem/y from direct gamma radiation exposure for a total TEDE of 46.8 mrem/y. This is clearly within the 100 mrem/year limit and the particulate TEDE is within the 10 mrem/y constraint limit on particulate emissions

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

Year 2009

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	1.80E-17	8.77E-18	8.77E-18	4.39E-17	5.40E-17
2nd qtr	2.57E-15	1.25E-15	1.25E-15	5.10E-17	7.31E-17
3rd qtr	4.31E-15	2.10E-15	2.10E-15	3.40E-17	3.23E-17
4th qtr	5.21E-16	2.54E-16	2.54E-16	2.45E-17	3.97E-17
Average	1.85E-15	9.04E-16	9.04E-16	3.84E-17	4.98E-17



U-234 mrem	U-238 mrem	Th-230 mrem	Ra-226 mrem	TOTAL mrem	
		,			
0.871	0.779	0.091	0.003	1.7	

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

Year: 2009

STATION: HMC #5 Nearest Residence

AIRBORNE CONCENTRATION

U-nat U-234 U-2 μ Ci/ml μ Ci/ml μ Ci/ml	$\begin{array}{ccc} 38 & Th-230 \\ ml & \mu Ci/ml \\ = = & = = = = = = = = = = = = = = = =$	$Ra-226$ $\mu Ci/ml$ $=======$
1.73E-17 8.43E-18 8.43	E-18 5.34E-17	5.96E-17
3.56E-15 1.74E-15 1.74	E-15 4.21E-17	6.08E-17
7.62E-15 3.71E-15 3.71	E-15 5.50E-17	4.27E-17
1.08E-15 5.26E-16 5.26	E-16 2.77E-17	3.82E-17
3.07E-15 1.50E-15 1.50	E-15 4.46E-17	5.03E-17
1.73E-17 8.43E-18 8.43 3.56E-15 1.74E-15 1.74 7.62E-15 3.71E-15 3.71 1.08E-15 5.26E-16 5.26 3.07E-15 1.50E-15 1.50	E-18 5.34E-17 E-15 4.21E-17 E-15 5.50E-17 E-16 2.77E-17 E-15 4.46E-17	

ANNUAL EFFECTIVE DOSE EQUIVALENT

U-234	U-238	Th-230	Ra-226	TOTAL
mrem	mrem	mrem	mrem	mrem
1.442	1.289	0.106	0.003	2.8

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

Year:2009

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	1.82E-17	8.87E-18	8.87E-18	7.56E-17	1.15E-16
2nd qtr	6.74E-16	3.29E-16	3.29E-16	4.90E-17	6.08E-17
3rd qtr	1.20E-15	5.85E-16	5.85E-16	3.99E-17	3.28E-17
4th qtr	1.29E-16	6.29E-17	6.29E-17	2.48E-17	3.08E-17
Average	5.05E-16	2.46E-16	2.46E-16	4.73E-17	5.99E-17

ANNUAL EFFECTIVE DOSE EQUIVALENT

U-234	U-238	Th-230	Ra-226	TOTAL
mrem	mrem	mrem	mrem	mrem
0.237	0.212	0.113	0.004	0.6



