

HOMESTAKE MINING COMPANY

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UPS NEXT DAY AIR TRACKING NO.: 0858 0860 853

March 27, 1997

U.S. Nuclear Regulatory Commission
Division of Waste Management, MST-7-J-9
Attn. Mr. Joseph J. Holonich, Chief
High Level Waste and Uranium
Recovery Projects Branch
11555 Rockville Pike
Rockville, MD 20850

Re: Docket No. 40-8903
License No. SUA-1471
Response Comments to Draft TER

Dear Mr. Holonich:

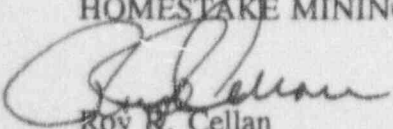
As discussed with Mr. Ken Hooks on March 25th, Homestake Mining Company respectfully submits the attached responses to the NRC staff comments from the "DRAFT" Technical Evaluation of the Completion Report for Reclamation of Off-Pile Areas and the Mill Decommissioning Completion Report which was faxed to Homestake, Grants on February 11, 1997. I sincerely hope this information will satisfy any remaining questions concerning the two completion reports.

Also discussed, the Mine IX Completion Report is near final form and should be submitted to the NRC within the next two weeks.

If you have any additional questions please contact me at the Grants project.

Sincerely,

HOMESTAKE MINING COMPANY OF CALIFORNIA


Roy R. Cellan
Corporate Manager of Reclamation

xc: Mr. C. Cain, NRC

Enclosures (2)

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Response to the NRC's Technical Evaluation of the Completion Report for Reclamation
of Off-Pile Areas at the Homestake Mining Company Uranium Mill and the Mill
Decommissioning Report

On February 11, the NRC faxed their draft Technical Evaluation of the Completion Report for Reclamation of Off-Pile Areas at the Homestake Mining Company Uranium Mill and the Mill Decommissioning Completion Report. Of the original 26 comments on the Off-Pile Report, all but four have been resolved. Two comments on the Mill Decommissioning report are unresolved at this date. HMC's further responses to the comments are discussed below.

Completion Report for Off-Pile Areas

Comment 5 requested the criteria HMC used to distinguish ore contamination from tailings contamination along State Highway 605 north of the mill site, and how the northern cleanup boundary (north of County Road 63) was chosen. HMC indicated that 12 samples analyzed for radium and uranium were believed sufficient to support the contention that the material is principally ore. However, CR Table F.5 (Road 605 right-of-way north of Road 63) presents radium and limited uranium data which staff interprets as indicating 11 possibly tailings contaminated samples, 3 ore contaminated, and several samples with about background levels of both radionuclides. The radium values are primarily elevated in the top 6 inches (indicating possible windblown tailings), although some elevated levels were obtained at the 1 to 1.5 and 1.5 to 2.0-foot depth intervals.

HMC should indicate what data support the assumption that local ore has a Ra-226/U-238 ratio greater than 2.0, or other evidence for their conclusion that the northern road right-of-way did not require surface excavation. Staff notes that the ratio for the ore sample analysis (response Attachment 4) from one laboratory was 0.9 and the other laboratory was 1.5. HMC could also point out which 12 samples their response referred to and indicate the location of the samples identified as SR-N (first two pages) in Table F-5.

HMC should also indicate why a boundary to the cleanup was set at 400 feet from the ore pad. If this is a reasonable distance for HMC ore contamination as compared to ore contamination from other trucks on the road, then HMC should indicate why it was assumed that windblown tailings did not extend farther than the 400 feet along the road (response 5 says the top layer of soil was removed, but did not indicate how far north of the county road this extended). Also, HMC should explain why this unremediated ore spillage zone, as indicated on the large CR map dated November 10, 1995, is wider on the east side of the road.

Response

After reviewing the information submitted in the Completion Report, HMC decided that the information was insufficient and poorly presented. We hope that the following is helpful and complete. First, the fences were removed on both sides of State Road 605 for a distance of 3,000 feet north, beginning at County Road 63. This removal extended slightly beyond the windblown tailings removal boundary for that area of the site. A minimum of a six-inch soil layer was removed from the road right-of-way (ROW) and areas beyond the fence. HMC has documented the removal in the ROW by survey cross sections of the removal and the restoration to the original grade at 500-ft intervals. These have been submitted to the State of New Mexico and are available for NRC review, if desired. The removal of windblown material outside of the fence extended to the buffer zone boundary, as indicated on the maps that have been provided to the NRC.

The characterization data provided in the completion report for the ROW was taken prior to the cleanup. While many of the 0-6 inch samples indicated the presence of tailings plus ore, all of this has been removed. Looking at the available data for subsurface samples where Ra-226 and uranium concentration data exist, there were five samples available. SRNP 3B 1.5', SRNP 8B 1.5', SRNP 13B 1.5', SRNP 6A 1.5', and SRNP 11A 1.5'. These samples fortunately spanned almost the entire length and were evenly distributed. These five samples all indicate elevated radium and uranium with ratios that one would expect from uranium ore. This is the basis for not removing more than the surface six-inch layer from the ROW.

During the cleanup of the windblown areas outside of the ROW fence, some of the areas near the fence did not clean up with the removal of a reasonable depth of soil, compared to the adjacent areas not affected by the ore spillage and dusting from the road. A very fair assumption was that the area was impacted from the ore and was not to be included in the windblown cleanup. While the data map shows that most of the area outside of the fence was cleaned to the cleanup criteria, there were a few places where the contamination extended to as far as 400 feet from the east side of the road. HMC thus drew an arbitrary line parallel to the ROW indicating this as the ore spillage (impacted) area. This imaginary line was misleading in that the impacted area is a fairly small fraction of the area indicated. The only explanation for the wider area on the east side of the road is probably due to windblown dusting from the ore trucks (they weren't tarped) in the prominent wind direction.

Some of the gamma radiation maps that were produced were erroneously labeled as not having scraped near the road. These notations should be ignored in that they are not correct.

Comment 9 asked HMC why meters shielded with a sheet of lead were not used to provide supporting verification data (no gamma levels were measured for county road 63 because of the shine from the uncovered north side of the large pile). HMC responded that lead shields were not available at the time (early 1994). Staff does not consider this

an adequate reason for lack of data. Staff therefore, considered if the radium data (154 soil samples) in CR Appendix F-4 were adequate to support compliance. The samples were taken at 100-foot intervals at the bottom of approximately 2-foot deep trenches. HMC should indicate the width of each excavation so that staff can determine if the single soil sample adequately represents a 100 m² area, since the gamma readings required by license condition 29A were not obtained. This license condition was deleted upon approval of a revised verification plan March 1, 1995, but after this area was verified.

Response

The road base was removed and a soil sample taken every 100 feet. The road base is approximately 30 feet wide. Thus each sample represents an area of approximately 3,000 square feet. The NRC license condition 27A, applicable at the time, called for soil samples to be taken on 50-meter grid intersection lines (representing 2500 square meters) and gamma measurements to be made on 10-meter grids. Of the 154 soil samples that were taken, all passed the criteria the first time indicating that the area had uniform concentrations radionuclides.

There were no gamma measurements made due to the high gamma shine from the pile. While lead would have reduced the levels, the shine from the pile was not constant and therefore gamma measurements would not have been a good indicator of uniformity which was probably the primary purpose of making the gamma measurements specified in License Condition 27A. As indicated above, the fact that 154 soil samples all passed in a very good indicator of uniformity.

In summary, the soil sampling density was approximately 10 times higher than the requirement specified in the License. HMC still believes that any information gathered at that time from shielded gamma-ray detectors would have been difficult to interpret, and probably useless. We therefore believe that HMC expended a considerable and appropriate effort in confirming that the area meets the cleanup criteria.

Comment 11 asked HMC why the verification sample for grid DC22109, which resulted in 11.1 pCi/g Ra-226, is acceptable. HMC indicated that the sample result was discussed in response 21, but that response merely indicated that the gamma value for the grid was less than 16,000 cpm. HMC should explain why additional cleanup was not done and why the elevated radium value should be accepted as documenting that the grid (100 m² area) meets the cleanup standard.

Response

The Ra-226 value for Grid Block D022109 was 11.1 pCi/g. Homestake submitted split samples for this grid block to two outside laboratories for analysis. Energy Laboratories reported a Ra-226 concentration for Sample S-4744 of 10.4 pCi/g. TMA Eberline

measured 8.5 pCi/g. Averaging the results for the three laboratories gives a value of 10.0 pCi/g. Since the two outside vendor laboratories reported that the sample meets the 10.5 pCi/g criteria, we believe that this is ample evidence that the grid block meets the cleanup criteria. We have attached the laboratory reports for Sample S-4744.

Comment 18 indicated that Table F-1 data for State Highway 605 along the mill site had gamma levels for 29 grids greater than 5000 cphm (over the 10,000 cpm guideline) with a high value of 9962 cphm. According to page 17, grab soil samples were taken at these "few" elevated gamma areas, and if the Ra-226 value approached the limit, additional soil was removed. HMC was asked to provide the measured Ra-226 levels for these high gamma grids. HMC responded that the gamma action level varied from location to location because of the varied shine field, so soil samples were taken and immediately analyzed to determine the action level. Maps were provided in response Attachment 6 indicating location numbers. HMC should state if/where the grab sample data (immediate Ra-226 analysis) were documented, and if the elevated gamma areas were excavated, or were documented to be high shine areas.

Also, a staff notes that:

HMC's response 3 indicates that two grids at the north edge of the large pile were found to be lacking Ra-226 verification data. Soil samples were taken during the inspection and the Ra-226 data were provided by letter dated November 26, 1996. Both values were less than 1 pCi/g which is well below the average background value.

As a part of response 2, HMC committed to survey, and take soil samples if required, in the corner of the trucking yard, after the contaminated water processing equipment is removed. Also, as part of response 23, HMC indicated that the entire periphery of the small tailings pile as well as the areas of the collection ponds and evaporation pond #2 will require verification of the soil after the groundwater corrective action program is complete. This data must be evaluated before NRC staff can conclude that the site soil meets the standards. In addition, surface activity measurements for the remaining buildings (three as of October 1995) and equipment must be reviewed.

Response

The 5,000 cphm would have been an appropriate action level for cleanup to 10.5 pCi/g for surface soils. During the calibration studies, no attempt was made to determine an action level for subsurface contamination (cleanup to 20.5 pCi/g) or for monitoring in deep excavation.

An additional problem in interpreting gamma measurements arose when the road base material was exposed. It had been constructed from rock with a naturally high uranium content and measured as high as 100 microR/h in places. Because of this and the fact that much of the area was excavated to depths of 4-5 feet, we had to rely on on-site spectral

analysis if there was a question of whether cleanup had been achieved. Unfortunately, these records were not retained.

The data from the calibration studies for the shielded detector indicate an action level of 7500 cphm would have been appropriate for cleanup to 20.5 pCi/g on the surface. Placing the detector in a deep excavation would have increased the reading due to geometry effects, probably as much as 20 percent. This does not consider the addition count rate due to shine from the road base, where present.

Looking at the available data, we compared the count rates for locations given in Table F-1 to the corresponding soil sampling locations and Ra-226 concentrations in Table F-2. The highest count rate was for STA#541 where a count rate of 7164 cphm corresponded to 3.1 pCi/g. At STA #547, a count rate of 7145 cphm corresponded to 13.5 pCi/g. All other values were below 5,000 cphm and 10 pCi/g Ra-226. While two data points are not sufficient to confirm an action level, they are consistent with what one would expect.

During the cleanup of State Highway 605 the State of New Mexico required HMC to backfill at the end of each day for the safety of the motorists. HMC therefore attempted to be conservative in the cleanup since there was no data available other than the quick read results from the samples taken. The facts that all 78 samples passed the 20.5 pCi/g subsurface cleanup criterion (all but two passed the 10.5 pCi/g cleanup criterion) indicate the degree of conservatism.

We want to point out that even though the Sample ID refers to a 0-6" sample, these samples were taken from the surface of the cut and therefore were all subsurface samples. The restoration was made to the original grade. Cross sections at 500-ft intervals showing the original grade and the excavation depths were submitted to the State Highway Department. The cross section maps were reviewed by Bob Evans during the February 1997 NRC site inspection.

In summary, while we cannot provide the quick read results for the locations for the highest elevated gamma measurements, HMC strongly believes that the area meets the standards.

Response to Comments on Mill Decommissioning Completion Report

Comment 27 requested that HMC provide the surface activity data for the released maintenance shop to verify that the building met the release guidelines. HMC provided data (response Attachment 9) that indicates the surface release guidelines had been met, even though the wrong efficiency factor had been used; see below. However, one data form indicates at the bottom that the limit is 40 μ R/hr. Another form indicates that a PRM 7 (gamma survey instrument) was used for beta-gamma measurements with an efficiency of 60 μ R/hr. HMC should provide information on the origin of the gamma limit and the detector used for beta-gamma measurements.

Response

HMC Standard Operating Procedure HP-4 presents the basis for making gamma exposure rates using a microR-meter to demonstrate compliance with the beta-gamma dose rate limit. The 40 $\mu\text{R/h}$ is an administrative limit. A copy of HP-4 is attached.

Comment 28 asked HMC to indicate how the guidelines/criteria for disposal have been met for the burial pits. HMC responded to this comment and comment 29 by indicating that the area of pits 4 and 5, as well as the former mill yard, meet the radon flux, gamma exposure, and stability standards for waste byproduct disposal areas (Part 40 Appendix A). HMC should indicate when this data was submitted.

Response

The burial pits were designed for mill debris. Pits were dug within the mill yard area and immediately south of Large Tailing Pile. The debris was placed to within four feet of the ground surface and filled with grout (a mixture of soil and cement) to fill the voids. A minimum thickness of four feet of radon barrier was then applied to restore the area to the original grade. All but two of the pits were inside the Mill Yard. The flux from the pits within the Mill Yard is included in the measurements for the Mill Yard. The two very small additional burial pits were located just south of the Large Tailings Pile as shown in the attached figure labeled East and West Burial Pit. The sizes of the pits were approximately one and three acres.

The data for the two burial pits was inadvertently omitted from the report. A copy of the original flux report is attached. The following table presents the flux data for the West and East Burial Pits. The data indicate that the pits are well within the 20 $\text{pCi/m}^2\text{s}$ limit.

Table 28-1 Radon Flux Measurements on West Burial Pit

Location ID	Canister Number	Radon Flux ($\text{pCi/m}^2\text{s}$)
95G25	83	7.17
95G26	254	0.51
95G27	108	3.52
95G28	37	2.57

Table 28-2 Radon Flux Measurements on East Burial Pit

Location I.D.	Canister Number	Radon Flux (pCi/m ² s)
95G29	34	0.0
95G30	21	1.51
95G31	12	8.77
95G32	258	1.06
95G33	29	12.5
95G34	14	9.90

The GPS-based gamma survey was conducted in the area as part of the final cleanup of the off-pile-contaminated soils. The restored burial pits showed no elevated gamma-ray count rates above the contiguous areas.

Comments Resulting From The October 1996 Inspection

Comment 1 The inspection plan indicated staff would review the site soil background RA-226 value (5.5 pCi/g), even though it had previously been approved by NRC. During the inspection, staff pointed out that several of the background samples were from areas that were later excavated for windblown tailings and that three samples listed in the 1980 study also appeared in the 1988 study (same results). In addition, many of the verification samples had Ra-226 levels at 2 to 3 pCi/g.

Homestake provided the background Ra-226 data with 15 samples from windblown tailings areas eliminated. The average value for the remaining 45 samples was not significantly different than the original value. Staff determined that several other samples are suspect (one sample 4 miles to the WNW is near the ARCO mill site, 3 high values from one location), but is satisfied that the approved value is not significantly in error.

Response

None Required

Comment 2 During inspection of HMC's equipment calibration data, it was noticed that the 2 pi efficiency factor was used to convert counts per minute to disintegrations per minute in the determination of surface activity.

Staff indicated that a 4 pi factor should have been used. HMC staff then provided their procedure that indicated the 2 pi factor was to be used at the direction of the NRC project manager (1992 phone conversation noted on page 3 of SOP HP-10). Staff confirmed that this direction had been given and that no significant health risk should have resulted from this error. An Information Notice on this topic will be distributed to licensees soon.

Response

A consultant reviewed the procedures for taking surface contamination measurements and concluded that the procedure for taking removable contamination measurements actually overestimated the contamination by a factor of 2.3. For the total measurement, another conservatism related to the area of the probe face compensated somewhat for the use of the 2π efficiency. A copy of the report is attached.

In addition, during the second week in February, 1997, an NRC inspector reviewed the release data and concluded that HMC was always within the release criterion, assuming that the 4π emission rate had been used to calculate the efficiency.

Comment 3 During review of the large gamma contour maps, staff noted areas larger than 100 m², primarily in the buffer zone (bordering the excavated area) that exceeded the gamma guideline. HMC provided Ra-226 data from the buffer zone, but when asked for the sample location information, HMC indicated that individual samples were taken, but the gamma level and sample location were not recorded. Four of the elevated gamma areas were examined during the confirmatory survey and found not to be a problem. However, six more of these areas will need to be examined during the next NRC inspection. If there is any question of any of these areas exceeding the gamma guideline, HMC will need to provide adequate soil sample data.

Response

During the February 1997 NRC inspection, five of the remaining six areas were walked and a biased six-inch soil sample was taken in the area having the highest exposure rate. The samples were split three ways. One sample was given to the NRC, one was analyzed in the on-site HMC laboratory, and the other sample was sent to a vendor laboratory of radiochemical analysis. Excellent agreement was achieved between HMC laboratory and the vendor laboratory with a maximum Ra-226 concentration of 6.1 pCi/g. The sixth area is not on HMC property. HMC does not expect to be able to obtain access to this property in the near future. A map showing the sampling locations and the data results are attached.

Comment 4 During review of the license, staff noted that condition 9 allows use of an auxiliary ion exchange facility in McKinley County. During the October inspection, HMC indicated that the facility had been decommissioned and a report would be submitted soon. HMC provided a map and a one-page letter dated December 10, 1996. Staff has determined that this brief information does not provide confidence that an adequate decommissioning effort has been performed. In fact, the HMC letter indicates that the highest gamma reading was 15 mr/hr, but background is 1000 times less than this. HMC should provide a complete report that includes site history, references to key documents and verification data.

Response

At the advice of the NRC, HMC has prepared a detailed completion report which will be submitted to the NRC within a few weeks. We should also point out the exposure rate cited in the December 10, 1996 letter was an error.

HMC specifically requests that the Completion Report for the IX Plant, the Off-Pile Completion Report, and the final reclamation of the Small Tailings Pile and Evaporation Ponds not be linked.

HMC considered that the cleanup of the trucking yard area was part of the cleanup of the off-pile area and included the data in the Off-Pile Completion Report. To complete the verification for this small area, HMC will remove the contaminated process facilities from the trucking yard area and confirm that the area meets the cleanup criteria. The data will be submitted at a later date.

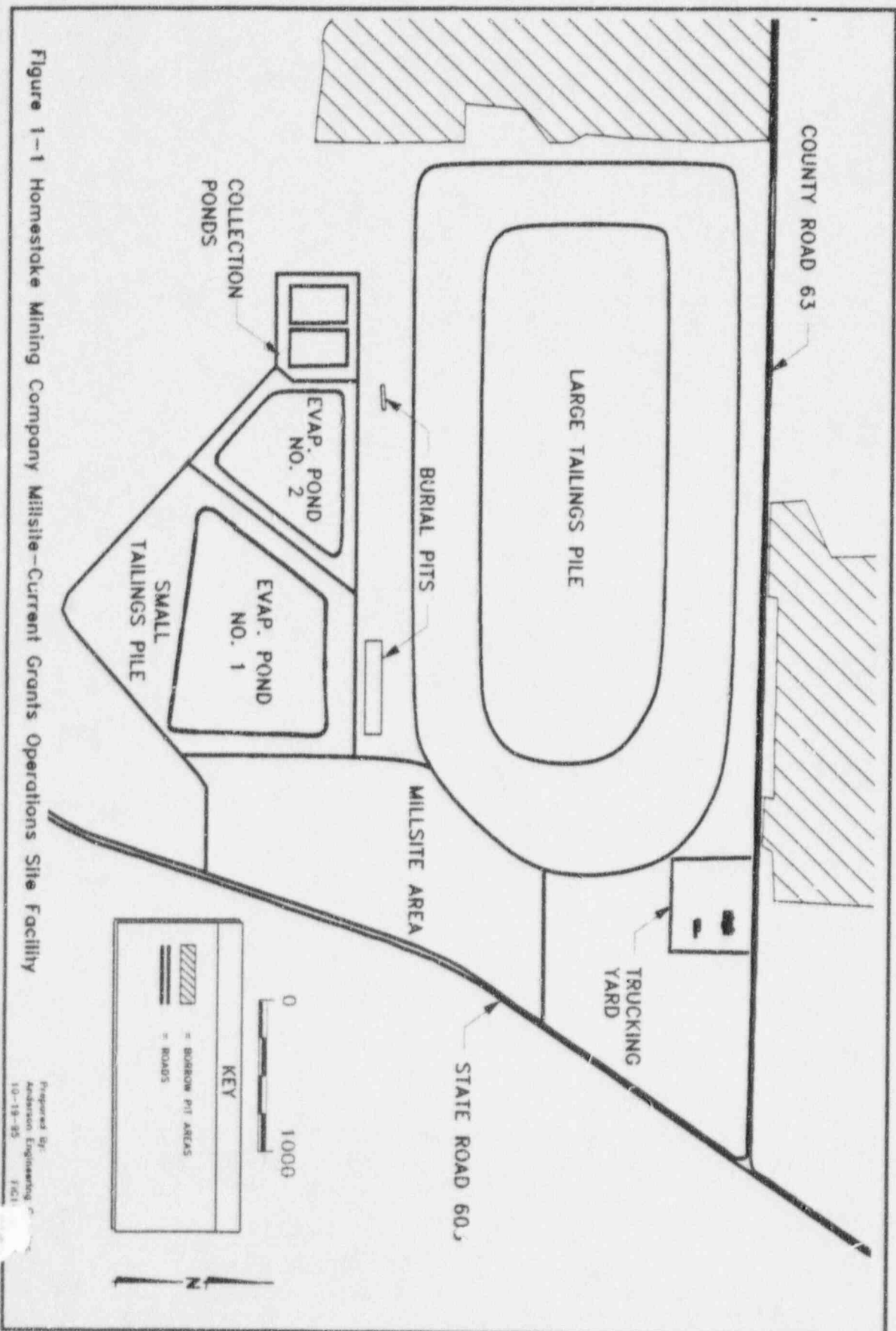


Figure 1-1 Homestake Mining Company Millsite--Current Grants Operations Site Facility

Prepared by:
Anderson Engineering
10-19-85
TCL

HMC PROCEDURE FOR THE SURVEY OF EQUIPMENT PRIOR TO RELEASE FOR UNRESTRICTED USE

EQUIPMENT:

1. Alpha scintillation survey meter.
2. GM survey meter or μ R/hr survey meter.
3. Geiman type A/E 50 mm glass fiber wipes (wipe label RC-5B) or the equivalent.

REGULATORY REQUIREMENTS

1. HMC Source Material License SUA-1471 condition 14 states *"Any equipment, supplies or manpower that come in contact with tailing sand and/or slimes will be determined to be free of radioactive material by a personal scan and equipment decontamination."*
2. Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials, dated September 1984.

PROCEDURE FOR SURVEYING EQUIPMENT

1. Fill out and obtain the required signatures on the "Property and Material Removal Permit" in Appendix 1 or the equivalent.
2. All equipment or materials that have potentially been contaminated with tailings sand and/or slimes must be surveyed for surface contamination and evaluated against the release criteria as specified below. Potentially contaminated equipment and materials includes but is not limited to equipment that has been used in a Radiation Work Permit in tailing sand or tailing slimes. When in doubt, survey prior to release.
3. Schedule the survey with the Radiation Protection Administrator at least one day before the survey is needed to allow time for calibration and operational checks of the survey equipment prior to monitoring. If equipment has been washed prior to surveying, make sure equipment is dry. Alpha particles will not penetrate a layer of water on the equipment.
4. On form EDF-5 in Addendum 2, or the equivalent, document the location where the equipment was obtained, the type of equipment, the operator conducting the survey, the date, the specific pieces of equipment, and the quantity. In addition document the serial number of the survey instrument, the date calibrated, the instrument efficiency, and the background.
5. Survey the alpha activity on the surface and on the inside of potentially contaminated items by placing the probe of the alpha scintillation counter within approximately 1/4 inch of the

surface and recording the observed counts per minute (CPM) on form EDF-5. Convert the CPM to disintegrations per minute (DPM) per 100 cm² by:

a. Converting the actual probe size, usually 76cm², to 100 cm² by multiplying by 100/76

$$\frac{20 \text{ CPM}}{76 \text{ cm}^2} = (20) \left(\frac{100}{76} \right) \frac{\text{CPM}}{100 \text{ cm}^2} = \frac{26 \text{ CPM}}{100 \text{ cm}^2}$$

- b. Converting from CPM/100 cm² to DPM by dividing by the 4π counting efficiency, of approximately 0.15, e.g.

$$\frac{(26 \text{ CPM})}{100 \text{ cm}^2 (0.15)} = \frac{173 \text{ DPM}}{100 \text{ cm}^2}$$

Record the DPM per 100 cm² under the column for total alpha (fixed plus removable) on form EDF-5.

6. If the total alpha is less than 250 DPM/100 cm² no further alpha surveys are necessary. If not smear an area of 100 cm², approximately 4" x 4", with a wipe and count the smear with the alpha survey instrument or a laboratory alpha scintillation counter. Convert the results to DPM as done in step 5b above.
7. Using the μR/hr survey meter measure the gamma surface contamination levels and record on EDF-5. In HP-3 procedure 7, the beta exposure rate was determined to be equal to the gamma exposure rate for old yellowcake. Thus to account for both beta and gamma exposure rates double the gamma exposure rate determined with the μR/hr meter and subtract the background, i.e.

$$(2)(\mu\text{R/hr measured}) - (\text{background } \mu\text{R/hr}) = \text{beta-gamma exposure rate}$$

Compare the beta-gamma exposure rate with the limits of 40 μR/hr above background to determine if the item can be released.

As an alternative a GM counter may be used.

8. If the total alpha, removable alpha, and gamma levels respectively are smaller than the limits specified on EDF-5, the piece of equipment being surveyed may be released for unrestricted use. See reference 1 in Appendix 3 for additional information. Use your professional judgment in releasing equipment and materials. If you know or suspect some unusual circumstance that could cause a radiation problem with the release of an item, consult the Radiation Protection Administrator before releasing the equipment or material. On form EDF-5 check the release column yes or no.

9. If the survey results indicate an item is not to be released, the item may be decontaminated using a pressurized soapy-water cleaner and resurveyed.

RECORD RETENTION

The Utility Operator is to file the HMC Property and Materials Removal Permit and the HMC Equipment Release Survey Form EDF-5 in the project files.

QUALITY CONTROL

The Utility Operator assigned and trained to monitor equipment and materials for unrestricted release is to verify that all potentially contaminated items have been monitored, that the results have been documented on form EDF-5 or the equivalent, and that the item meets the release criteria specified in reference 1.

REFERENCES

1. "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials,' dated September 1984."
2. USNRC Regulatory Guide 8.30, Health Physics Surveys in Uranium Mills.
3. 10 CFR 20, Standards for Protection Against Radiation.

APPENDIXES

1. Property and Materials Removal Permit EDF-20
2. Equipment Release Survey form EDF-5
3. "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use of Termination of Licenses for Byproduct or Source Materials,' dated September 1984."

REVISIONS

Original	11-22-88
Revision 1:	01-17-89
Revision 2:	02-01-90
Revision 3:	04-18-91
Revision 4:	09-16-92
Revision 5:	05-17-93

Env. Dept. SOP:
Revision No.:
Issue Date:
Page 4 of 4

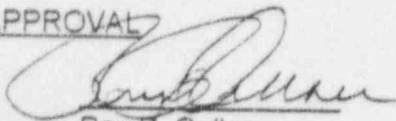
HP-4
9
02-07-97

Revision 6: 07-12-93
Revision 7: 06-05-95
Revision 8: 02-27-96
Revision 9: 02-07-97

DISTRIBUTION

Corporate Manager of Reclamation/RPA
Utility Operator/Radiation Management
Utility Operator/Water Management
Project Supervisor

APPROVAL



Roy R. Cellan
Corporate Manager of Reclamation/RPA

APPENDIX 1

EDF-20

HMC PROPERTY AND MATERIALS REMOVAL PERMIT

EDF-20 - PROPERTY AND MATERIAL REMOVAL PERMIT

Prepare in duplicate, guard retain original, employee retain copy.

Name	Classification & Dept.	Vehicle or License #
Material Removed From (bldg. or area)	Destination	Date
Description of Material: _____		

NO ERASURES PERMITTED ON THIS FORM - LINE UNUSED SPACE

Signature Of Supervisor Authorizing Removal	Date
Checked Out By Environmental Department (signature)	Date
Passed Out By (signature of Guard)	Date
	Time
	A.M. P.M.

APPENDIX 2

EDF-5

HMC EQUIPMENT RELEASE SURVEY FORM

EDF-5 - HMC EQUIPMENT RELEASE SURVEY FORM

Location (Source of equipment)
Equipment being

Equipment being surveyed

Surveyed by:

Date: _____

RWP No.:

[illegible]

- if total is less than 250, no swipe samples (removable) are necessary.
- An administrative limit of 40 $\mu\text{R}/\text{h}$ has been established by HMC.

* An administrative limit of 40 μ R/h has been established by HMC.

APPENDIX 3

"Guidelines for Decontamination of Facilities and Equipment
Prior to Release for Unrestricted Use or Termination of Licenses
for Byproduct or Source Materials,' dated September 1984."



Environmental Restoration Group, Inc.
12809 Arroyo de Vista NE
Albuquerque, New Mexico 87111
(505) 298-4224

July 24, 1995

Mr. Fred Craft
Homestake Mining Company
P. O. Box 98
Grants, NM 87020

Dear Mr. Craft:

Enclosed is the final radon flux measurement report for the 36 radon flux canisters that were deployed on July 10, 1995 on the Aprons, East Side Slope, and Debris Pits. Canisters numbered 35 and 105 were trip blanks used for quality assurance purposes. Our procedures require that ten percent of the canisters be counted twice. Where this was done, the canister number was recorded with a "B" suffix. An arithmetic average of the two values is suggested for use as the best value.

Please advise me if you have any questions.

Sincerely,

A handwritten signature in cursive script, reading "Kenneth R. Baker".

Kenneth R. Baker, Ph.D.
Principal

Radon Flux Measurements

Site: Homestake Mining Company ESS, Aprons, and Debris Pits

EG&G System

Canister Number	Lab Date	Start Count Time	Deploy Date	Deploy Time	Retrieve Date	Retrieve Time	Collection Time (sec)	Count Time (sec)	Peak Count	Error	Bkg counts	Error	Detector Efficiency	Canister Activity (pCi)	Flux pCi/m ² s	Flux Error 1.00 S.D.	LLD pCi/m ² s
21	07/12/95	08:30	07/10	17:31	07/11	17:18	85620	1200	1761	234.0	-125	207	7.93E-03	6.43E+03	1.51	0.25	0.77
108	07/12/95	08:58	07/10	17:24	07/11	17:13	85740	1200	4250	285.0	-125	207	7.93E-03	1.49E+04	3.52	0.28	0.78
34	07/12/95	09:22	07/10	17:30	07/11	17:13	85380	1200	14163	377.0	-125	207	7.93E-03	4.87E+04	0.00	0.00	6.00
37	07/12/95	09:48	07/10	17:25	07/11	17:14	85740	1200	3041	244.0	-125	207	7.93E-03	1.08E+04	2.57	0.26	0.78
14	07/12/95	10:22	07/10	17:36	07/11	17:24	85680	1200	12044	362.0	-125	207	7.93E-03	4.15E+04	9.90	0.34	0.78
29	07/12/95	10:45	07/10	17:35	07/11	17:23	85680	1200	15151	379.0	-125	207	7.93E-03	5.20E+04	12.46	0.35	0.79
258	07/12/95	11:06	07/10	17:34	07/11	17:21	85620	1200	1174	218.0	-125	207	7.93E-03	4.43E+03	1.06	0.25	0.79
12	07/12/95	11:29	07/10	17:33	07/11	17:20	85620	1200	10562	365.0	-125	207	7.93E-03	3.64E+04	8.77	0.34	0.79
13	07/12/95	12:32	07/10	17:17	07/11	17:08	85860	1200	847	218.0	-125	207	7.93E-03	3.31E+03	0.80	0.25	0.80
254	07/12/95	12:55	07/10	17:22	07/11	17:12	85800	1200	381	242.0	-125	207	7.93E-03	1.72E+03	0.42	0.26	0.80
254B	07/12/95	13:20	07/10	17:22	07/11	17:12	85800	1200	596	241.0	-125	207	7.93E-03	2.46E+03	0.60	0.26	0.80
91	07/12/95	13:43	07/10	17:15	07/11	17:07	85920	1200	15426	410.0	-125	207	7.93E-03	5.30E+04	12.96	0.38	0.80
83	07/12/95	14:06	07/10	17:20	07/11	17:11	85860	1200	8455	327.0	-125	207	7.93E-03	2.92E+04	7.17	0.32	0.81
110	07/12/95	14:30	07/10	17:08	07/11	17:02	86040	1200	6341	297.0	-125	207	7.93E-03	2.20E+04	5.42	0.30	0.81
18	07/12/95	14:52	07/10	17:12	07/11	17:05	85980	1200	2126	257.0	-125	207	7.93E-03	7.67E+03	1.89	0.28	0.81
9	07/12/95	15:15	07/10	17:10	07/11	17:03	85980	1200	346	232.0	-125	207	7.93E-03	1.65E+03	0.40	0.26	0.81
87	07/12/95	15:38	07/10	17:07	07/11	17:01	86040	1200	620	235.0	-125	207	7.93E-03	2.54E+03	0.63	0.26	0.82
11	07/12/95	16:01	07/10	16:59	07/11	16:51	85920	1200	643	220.0	-125	207	7.93E-03	2.62E+03	0.65	0.26	0.82
252	07/12/95	16:22	07/10	17:03	07/11	16:54	85860	1200	363	222.0	-125	207	7.93E-03	1.66E+03	0.42	0.26	0.82
94	07/12/95	16:45	07/10	16:50	07/11	16:50	86400	1200	903	238.0	-125	207	7.93E-03	3.50E+03	0.87	0.27	0.82

Radon Flux Measurements

Site: Homestake Mining Company ESS, Aprons, and Debris Pits

EG&G System

Canister Number	Lab Date	Start Count Time	Deploy Date	Deploy Time	Retrieve Date	Retrieve Time	Collection Time (sec)	Count Time (sec)	Peak Counts	Error	Bkg counts	Error	Detector Efficiency	Canister Activity (nCi)	Flux pCi/m ² s	Flux Error 1.00 S.D.	LLD pCi/m ² s
27	07/12/95	17:08	07/10	17:05	07/11	16:58	85980	1200	1689	253.0	-125	207	7.93E-03	6.18E+03	1.55	0.28	0.83
27B	07/12/95	17:31	07/10	17:05	07/11	16:58	85980	1200	1789	248.0	-125	207	7.93E-03	6.52E+03	1.64	0.28	0.83
26	07/12/95	18:16	07/10	16:28	07/11	16:28	86400	1200	764	231.0	-141	222	7.93E-03	3.08E+03	0.78	0.28	0.89
250	07/12/95	18:38	07/10	15:55	07/11	15:56	86460	1200	2725	269.0	-141	222	7.93E-03	9.77E+03	2.49	0.30	0.90
95	07/12/95	19:07	07/10	16:25	07/11	16:25	86400	1200	1110	247.0	-141	222	7.93E-03	4.26E+03	1.09	0.29	0.90
201	07/12/95	19:47	07/10	16:23	07/11	16:23	86400	1200	3000	249.0	-141	222	7.93E-03	1.07E+04	2.74	0.29	0.90
50	07/12/95	20:10	07/10	15:44	07/11	15:48	86640	1200	7634	322.0	-141	222	7.93E-03	2.65E+04	6.82	0.34	0.91
203	07/12/95	20:32	07/10	15:47	07/11	15:50	86580	1200	1037	225.0	-141	222	7.93E-03	4.01E+03	1.04	0.28	0.91
40	07/12/95	20:54	07/10	15:42	07/11	15:45	86580	1200	1180	237.0	-141	222	7.93E-03	4.50E+03	1.17	0.29	0.91
19	07/12/95	21:19	07/10	15:52	07/11	15:53	86460	1200	1093	242.0	-141	222	7.93E-03	4.20E+03	1.09	0.29	0.92
10	07/12/95	21:44	07/10	15:38	07/11	15:41	86580	1200	882	218.0	-141	222	7.93E-03	3.49E+03	0.91	0.28	0.92
103	07/12/95	22:07	07/10	15:34	07/11	15:37	86580	1200	1098	241.0	-141	222	7.93E-03	4.22E+03	1.11	0.29	0.92
103B	07/12/95	22:30	07/10	15:34	07/11	15:37	86580	1200	994	237.0	-141	222	7.93E-03	3.87E+03	1.02	0.29	0.93
65	07/12/95	22:52	07/10	15:36	07/11	15:39	86580	1200	2306	240.0	-141	222	7.93E-03	8.34E+03	2.19	0.29	0.93
43	07/12/95	23:14	07/10	15:40	07/11	15:43	86580	1200	1205	229.0	-141	222	7.93E-03	4.59E+03	1.21	0.29	0.93
105	07/12/95	23:35	07/10	15:40	07/11	15:43	86580	1200	153	208.0	-141	222	7.93E-03	1.00E+03	0.27	0.27	0.93
28	07/12/95	23:58	07/10	15:32	07/11	15:35	86580	1200	933	231.0	-141	222	7.93E-03	3.66E+03	0.97	0.29	0.94
259	07/13/95	00:20	07/10	15:30	07/11	15:33:00	86580	1200	801	224.0	-141	222	7.93E-03	3.21E+03	0.85	0.29	0.94
35	07/13/95	00:42	07/10	15:30	07/11	15:33:00	86580	1200	90	207.0	-141	222	7.93E-03	7.87E+02	0.21	0.28	0.94

Date	Count time	Standard (nCi)	Counts	Error	Bkg Counts	Bkg error	Efficiency	Error(1.00 SD)
07/12	1200	80	29442	495	-125	207	0.00832	0.00015
07/12	1200	78.83	26267	516	-125	207	0.00754	0.00016
07/13	1200	78.83	27659	511	-141	222	0.00794	0.02060

Radon - 222 Canister Chain of Custody Record

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Facility
Pile or Stack Name
Area of Pile or Stack
Field Representative

HMC
GRANTS RECLAMATION
LARGE TAILINGS PILE
EAST SIDE, NORTH & SOUTH APRONS, BURIAL PITS
Dennis Riche

	Deployment	Retrieval
Date	7/10/95	7/11/95
Rel. Humid.		
Bar. Press		
Temp. (F)		

Deployment/Retrieval Record

Item	Location ID or Description	Coordinates		Canister Number	Deployment		Retrieval		Comments
		North	East		Time	By	Time	By	
1	9561			259	1530	FC/DR	1533	DR	
2	2			28	1532		1535		
3	3			103	1534		1537		
4	4			65	1536		1539		
5	5			10	1538		1541		
6	6			43	1540		1543		
7	7			40	1542		1545		
8	8			50	1544		1548		
9	9			203	1547		1550		
10	10			19	1552		1553		
11	11			250	1555		1556		
12	12			201	1623		1623		
13	13			95	1625		1625		
14	14			26	1628		1628		
15	15			94	1650		1650		
16	16			11	1659		1651		
17	17			252	1703		1654		
18	18			27	1705		1658		
19	19			87	1707		1701		
20	20			110	1708		1702		

Radon - 222 Canister Chain of Custody Record

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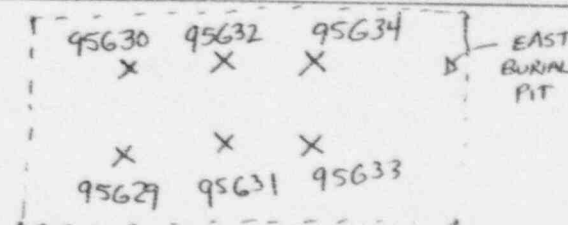
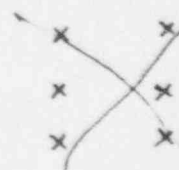
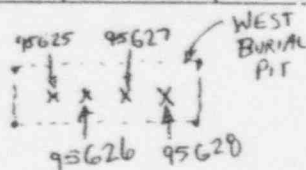
Facility
 Pile or Stack Name
 Area of Pile or Stack
 Field Representative

HMC
GRANTS RECLAMATION
LARGE TAILINGS PILE
EAST SIDE, NORTH & SOUTH AREAS, BURIAL PITS
Dan Rabe

	Deployment	Retrival
Date	7/10/95	7/11/95
Rel. Humid.		
Bar. Press		
Temp. (F)		

Deployment/Retrieval Record

Item	Location ID or Description	Coordinates		Canister Number	Deployment		Retrieval		Comments
		North	East		Time	By	Time	By	
21	95G21			9	1710	FC/DR	1703	DR	
22	22			18	1712		1705		
23	23			91	1715		1707		
24	24			13	1717		1708		
25	95G25			83	1720		1711		WEST BURIAL PIT
26	95G26			254	1722		1712		
27	95G27			108	1724		1713		
28	95G28			37	1725		1714		
29	95G29			34	1730		1717		EAST BURIAL PIT
30	95G30			21	1731		1718		
31	95G31			12	1733		1720		
32	95G32			258	1734		1721		
33	95G33			29	1735		1723		
34	95G34			14	1736		1724		
35				105					TRIP BLANK
36				35					TRIP BLANK
37									
38									
39									
40									



Radon - 222 Canister Chain of Custody Record

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Facility

Pile or Stack Name

Area of Pile or Stack

Field Representative

HMC
GRANTS RECLAMATION
LARGE TAILINGS PILE
E. SIDE NIS ARROWS
BUTIAL PITS

	Deployment	Retrival
Date	7/10/95	7/11/95
Rel. Humid.		
Bar. Press		
Temp. (F)		

Deployment/Retrieval Record

Item	Location ID or Description	Coordinates		Canister Number	Deployment		Retrieval		Comments
		North	East		Time	By	Time	By	
101									
102									
103									
104									
105									
106									
107									
108									
109									
110									
111									
112									
113									
114									

Custody Transfer Record

Items Nos.	Relinquished By	Date	Time	Accepted By	Date	Time
1-36	Dave Baker	7-11-95	1804	Kenneth C. Baker	7/11/95	1804

CUSTOMER Homestake Mining Co.
 ATTENTION Adrian Venable\Joe Vigil
 ADDRESS P.O. Box 98
 CITY Grants, NM 87020-0011
 W.O. NO. 95-04-028



Soil-Gamma
 TYPE OF ANALYSIS

161537
 CUSTOMER ORDER NUMBER

04/07/95
 SAMPLES RECEIVED

Customer Identification	Date Collected	Type of Analysis	sample Wt. (gm)	pCi/g
S-4698	03/07/95	K40 Ra226 U238	646	15±1.8 2.8±0.28 3.9±1.6
S-4708	03/08/95	K40 Ra226 U238	700	12±1.7 4.1±0.29 3.0±1.6
S-4718	03/08/95	K40 Ra226 U238	655	18±2.0 8.8±0.40 6.1±2.1
S-4728	03/08/95	K40 Ra226 U238	736	11±1.7 7.1±0.35 <2.3
S-4738	03/28/95	K40 Ra226 U238	725	13±1.7 3.8±0.29 2.5±1.3
S-4744	03/28/95	K40 Ra226 U238	639	14±2.1 8.5±0.37 <3.1
S-4751	03/29/95	K40 Ra226 U238	707	13±1.6 1.1±0.20 2.9±1.2
S-4758	03/29/95	K40 Ra226 U238	727	14±2.1 21±0.58 7.8±1.6
S-4765	03/31/95	K40 Ra226 U238	636	15±1.9 2.3±0.27 3.1±1.5

☐ REPORTED VIA TELEPHONE

☐ FAX

PAGE 1 OF 2

TMA Eberline
 Thermo Analytical Inc.

221 PAN AMERICAN FREEWAY, N.E.
 ALBUQUERQUE, NEW MEXICO 87109
 PHONE (505) 345-3461
 FAX (505) 345-5416

APPROVED BY Mary Kamoss, Data Analyst

DATE

[Signature] 4/27/95



ENERGY LABORATORIES, INC.

P.O. BOX 3258 • CASPER, WY 82602 • PHONE (307) 235-0515
254 NORTH CENTER, SUITE 100 • CASPER, WY 82601 • FAX (307) 234-1639

LABORATORY ANALYSIS REPORT -- HOMESTAKE MINE

Report Date: 05-02-95

Sample I.D.: S-4744

Sample Date: 03-28-95

Sample Number: 95-23983

Radiometric

		Units	Results	Detection Limit
Uranium	U-Nat	pCi/g	6.2	0.02
Radium 226	Ra 226	pCi/g	10.4	0.02
Radium Precision \pm			0.6	

Report Approved by: *DB Ra* #1 5/26/95

GMS 23983HSM.WK3

5-16-95

Location: HMC Site, See Map Buffer Zone

Date Collected: FEB 11-1997

Date Sealed: FEB 12-1997

Date Read: FEB 29-1997

JV&AV PICK UP SAMPLE JV&AV PREP, 15 day READING

1997

SOIL SAMPLES

LAB	Samples	TOTAL COUNTS				CPs			SAMPLE	TRUE	INMC	TMA	Energy	Energy	TMA	Energy
		RA(ROI) 609KEV	TH(ROI) 911KE	K(ROI) 1406KEV	COUNT TIME	RA 609 KEV	TH 911 KEV	K 1460 KEV								
		CH549-CH658	CH861-CH961	CH1338-CH1458	SECONDS	CH549-CH658	CH861-CH961	CH1338-CH1458								
ID	ID	CH549-CH658	CH861-CH961	CH1338-CH1458	SECONDS	CH549-CH658	CH861-CH961	CH1338-CH1458	WT.	CT. RATE	pCi/g	pCi/g	pCi/g	pCi/g	Li 258	Unat
5672	E 14 XX	8007	2681	2492	1719	4.68	1.56	1.45	1388.40	2.34	5.68			6.10		3.83
5073	K 101137	4788	1752	1745	1403	3.41	1.25	1.24	1586.16	1.45	3.07			3.20		4.19
5074	J 10 XX	8248	2070	1837	1435	4.35	1.44	1.28	1604.20	2.19	4.60			5.30		4.80
5075	K 23159	6831	2214	2030	1402	4.87	1.58	1.45	1597.80	2.57	5.40			5.80		5.79
5076	E 10	2682	1324	1426	1531	1.88	0.86	0.93	1556.50	0.34	0.73			1.10		2.76

RECEIVED FEB - 7 1997

Environmental Restoration Group, Inc.
12809 Arroyo de Vista NE
Albuquerque, NM 87111

February 7, 1997

Mr. Roy Cellan
Homestake Mining Company of California
P. O. Box 98
Grants, New Mexico 87620

Dear Mr. Cellan:

At your request, I have reviewed the procedures related to making surface contamination measurements at the Grants Uranium Mill. These procedures were in the process of being modified to incorporate changes recommended by the NRC. During the review of these procedures, several questions arose that forced me to review the old procedures. In doing so, I found that in two cases, conservatism was incorporated into the measurement procedures. I have suggested that these conservative measures be removed and that any conservatism be incorporated into administrative limits, if desired. These findings will also have a bearing on NRC's concern that the 2π emission rate was used to calculate the efficiency of detectors when making fixed or total surface contamination measurements. These findings will be discussed below.

1. Removable Contamination Measurements

Standard Operating Procedure HP-2, HMC Removable Alpha Survey Procedure, instructs the user to "wipe an area of approximately 100 cm^2 ($6'' \times 6''$) ...". While removing the activity from this large area is conservative, it overestimates the activity by the ratio of the area to 100 cm^2 . Since this area is 232 cm^2 , this results in an overestimate of the surface activity by 2.3. I independently asked the two radiation specialists to demonstrate how wipe samples were taken. They both indicated that a $6''$ by $6''$ area was used. They also confirmed that the 4π emission rate of the standard source was used in calculating detector efficiency. In summary HMC has been overestimating the removable surface activity by a factor of 2.3. I therefore recommend a change in the procedure to wiping a $4''$ by $4''$ area.

2. Total Surface Activity

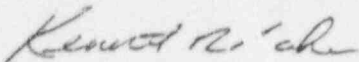
Section 5 of Standard Operating Procedure HP-4, "HMC Procedure for the Survey of Equipment Prior to Release for Unrestricted Use", shows how to calculate the surface activity per 100 cm^2 based on the count per minute (cpm) of the alpha probe. The alpha probe used for these measurements is a Ludlum 43-5 model which has an open area of 50 cm^2 and an active area of 76 cm^2 . The difference in the open area and the active area is the area of the metal grid across the face of the detector. The procedure calls for doubling the count rate to compensate for an area less than 100 cm^2 and dividing by the 2π efficiency.

The doubling of the open area leads to an overestimate of the surface activity per unit area. This can be explained by the fact that when one measures the efficiency of the detector, one measures the efficiency of the detector with the metal grid in place, which relates to the active area rather than the open area. Therefore by using the measured efficiency, the count rate is expressed as a count rate per the active area of the detector, or 76 cm^2 . In order to convert to activity per 100 cm^2 , one should multiply by $100/76$ or 1.32. This will effectively reduce the surface activity by 34% compared to multiplying by 2 as is currently being done.

The change in the calculation to use the 4π emission rate efficiency rather than 2π will result in a factor of two increase in the calculated surface activity. Therefore implementing these changes together in the new procedure will result in a new value $(\text{cpm}/0.5 \text{ Eff})(1.32)$ compared to the old value of $(\text{cpm})(2)/\text{Eff}$, where Eff is the 2π efficiency and cpm is the measured count rate. Correcting the old data to reflect these changes would require multiplying the old data by a factor equal to the ratio of the two numbers ($2.64 \text{ cpm}/\text{Eff}$ Vs $2 \text{ cpm}/\text{Eff}$), or 1.32.

In summary, there were two apparent errors in calculating the total surface activity, one conservative and one non conservative. The net result was an underestimate of the surface activity by 24 percent. The changes in the procedure for measuring the removable surface contamination will eliminate the 130 percent overestimate that was inherent in the old procedures.

Sincerely,



Kenneth R. Baker, Ph.D.
Principal