



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

November 22, 2002

Docket No. 04008980
Control No. 131796

License No. SMB-1541

Edele Hovnanian
Vice President
Heritage Minerals, Inc.
One Hovchild Plaza
4000 Route 66
Tinton Falls, NJ 07753

**SUBJECT: DECOMMISSIONING OF THE HERITAGE MINERALS, INC. (HMI),
LAKEHURST, NEW JERSEY SITE**

Dear Ms. Hovnanian:

This responds to the June 20, 2002 letter from Mr. Anthony J. Thompson, Attorney, to Mr. Craig Gordon of my staff, regarding radiation detection methodology used by our contractor, the Oak Ridge Institute for Science and Education (ORISE), for performance of confirmatory surveys at the HMI site. You provided contractor (RSI) and third party (SENES Consultants Limited) evaluations of the ORISE measurement techniques used for surveys of mill structures and equipment, indicating that beta surface activity was overestimated.

The evaluations were forwarded by Technical Assistance Request (TAR) to the NRC Office of Nuclear Materials Safety and Safeguards (NMSS) for review. NMSS has completed their review and provided responses to each comment (enclosed). Overall, the review supports ORISE's conclusions for considering the beta contribution to determine residual contamination on surfaces. This information should be used to develop revised final survey plans for mill buildings and contents prior to requesting NRC release for unrestricted use.

In the ORISE report, concerns were identified about characterization of soils outside the dry mill and around the monazite pile. Mr. Thompson's letter indicated that a report of operational history was being prepared which addresses the issues related to outdoor contamination. The extent of soil contamination and additional remediation needed should be noted in your report and provided for NRC review at the earliest possible date.

Should you have any questions about our review, please contact me at (610) 337-5200.

E. Hovnanian
Heritage Minerals, Inc.

2

Thank you for your cooperation.

Sincerely,

Original signed by Ronald R. Bellamy

Ronald R. Bellamy, Chief
Decommissioning and Laboratory Branch
Division of Nuclear Materials Safety

Enclosures:

1. TAR Response
2. Letter from A. J. Thompson to NRC dated June 20, 2002

cc: Anthony J. Thompson, Esquire
Nancy Stanley, New Jersey DEP
Hon. Michael Fressola, Mayor, Manchester Twp., NJ

E. Hovnanian
Heritage Minerals, Inc.

3

Distribution:

G. Pangburn
R. Bellamy
C. Gordon
L. Camper, NMSS
S. Moore, NMSS
D. Orlando, NMSS
G. Purdy, NMSS
T. Vitkus, ORISE

DOCUMENT NAME: C:\ORPCheckout\FileNET\ML023310240.wpd

To receive a copy of this document, indicate in the box: "C" = Copy w/o attach/encl "E" = Copy w/ attach/encl "N" = No copy

OFFICE	DNMS/RI		DNMS/RI		DNMS/RI			
NAME	CGordon/czg		RBellamy/rrb1		GPangburn/gcp			
DATE	11/22/2002		11/22/2002		11/22/2002			

OFFICIAL RECORD COPY

Enclosure 1

Technical Assistance Request Response Regarding Heritage Minerals, Inc.

The NRC review of comments made by HMI's contractor (RSI) regarding ORISE's confirmatory survey are:

2. The licensee's contractor believes that ORISE should have used direct measurement of alpha radiation to measure Thorium contamination.

Response: We disagree that direct measurement of alpha radiation is a preferable method for measuring Thorium contamination. Table 4.1 in NUREG 1575, Rev. 1, indicates that the best method for direct measurement of Thorium contamination is by use of a gas proportional counter in the beta counting mode. As discussed in draft NUREG-1761, NUREG-1575, Rev.1, and NUREG-1507 alpha measurement is dependent on the characteristics of the surface being measured. Knowledge of the surface efficiency of each surface being measured would be required to quantify the Thorium contamination by direct alpha measurement. Surface characteristics have a greater effect on the measurement of alpha radiation as compared to beta radiation. The following quote is from NUREG-1575 regarding measuring alpha radiation, "Surveying surfaces that are dirty, non-planer, or weathered can significantly affect the detection efficiency and therefore bias the expected MDC for the scan." NUREG-1507 Table 5.14 shows the effects of dust layers on the MDC for alpha detection for Th-232 using a gas proportional counter in the alpha only mode. The MDC increased from 30 dpm/100cm² (no dust) to 974 dpm/100cm² (9.99 mg/cm² dust). In comparison, Table 5.13 shows the effects of dust layers on the MDC for betas from TI-204. The MDC increased from 202 dpm/100cm² (no dust) to 323 dpm/100cm² (9.99 mg/cm² dust). The results in Table 5.13 were obtained from a gas proportional counter operated in alpha + beta mode.

3. HMI contends that the ORISE technique over-estimates the true activity, because up to 200 gamma rays can be emitted per decay event. These gamma rays cannot be distinguished from beta particles and are counted as individual decay events.

Response: The gamma component, in this case, is not significant. Gas proportional counters are less than 1% efficient for gamma radiation. If 200 gamma rays are emitted per decay event, less than 2 counts would be registered by the meter.

4. The licensee's contractor used a plexiglass shield to determine gamma contribution. From the results they contend that the beta counts were over estimated by 33%.

Response: The report did not provide enough information to determine the validity of licensee contractor's assertion. No information was given on counts before and after shield use, or ambient background. The counts with the shield in place could be from ambient background alone, not from ambient background plus gammas from contamination. For example, the percentage of gross counts per minute due to ambient background ranged from 2 percent to greater than 50 percent.

Additionally, there is a discrepancy in the reported thickness of the plexiglass shield. The contractor's report states that the plexiglass was 3/8" thick while the SENES Consultants Limited report states that the plexiglass shield was 1/4" thick. If the plexiglass was 1/4" thick, the shield was not thick enough to stop all of the beta radiation. 1.4 MeV (max. energy) betas have a range of approximately 1/4" in plexiglass. 11% of the potential betas have max energies greater than 1.4 MeV (27% if radon daughters are present) and thus could penetrate the 1/4" thick plexiglass.

Finally, gas proportional counters are less than 1% efficient for gamma radiation. Gamma radiation would not be expected to significantly increase the measured beta count rate.

Three comments made by SENES Consultants Limited

1. The gamma background has not been properly subtracted out of the alpha/beta measurements (alpha/beta measurements were made at gamma exposure rates that were at least four times higher than the gamma exposure rate in which the alpha/beta background was measured).

Response: We disagree with SENES's comment. As stated on page 7 of the ORISE report, ORISE measured material specific backgrounds and the ambient background at each location. These background measurements were used to correct gross surface activities measurements. The gamma background rate at the surface would be higher than the measure in the center of the room. However, the gas proportional counter is not very sensitive to gamma radiation. The manufacturer states that the gamma efficiency of the model 43-68 probe is less than 1%. Therefore, any gamma component of the measurements would be insignificant, compared to the alpha/beta measurement results.

2. The alpha activity has not been subtracted out of the alpha/beta count. The results of the alpha/beta surface scans are reported in the third column from the left in Table 2 (p. 43-49, ORISE 2002). It appears that ORISE has overestimated the beta activity by concluding that it is equal to the alpha/beta total activity. ORISE reports that "the alpha contribution to the alpha plus beta surface activity measurement count rate was consistently less than ten percent." The alpha activity is not less than 10% in the following examples: I-Beam-42A (p. 49); SU40-24 and Floor-34A (p. 48); etc. Therefore, ORISE has over estimated the beta activity on surfaces, if they have not subtracted the alpha activity from the alpha/beta activity in Table 2 (p. 43-49, ORISE 2002)

Response: The measured alpha activity in counts per minute (cpm) was less than 10 % of the alpha/beta cpm. The values reported in Table 2 are in disintegrations per minute (dpm). When the cpm are converted to dpm, the alpha dpm can be greater than 10% of the alpha/beta dpm due to the differences in efficiencies in counting alphas and betas. HMI is limited to 1000 dpm/100 cm² alpha, averaged over 1 m². For the thorium series, 1000 dpm/ 100 cm² alpha results in 670 dpm/100cm² beta. SENES is correct. ORISE did not subtract the alpha activity. The issue of not subtracting alpha activity could have been of concern if the alpha/beta dpm were close to the 670 dpm/100 cm² limit.

However, the reported alpha/beta activity was 16,000 dpm/100 cm² for I-Beam-42A, 2700 dpm/100 cm² for SU40-24, and 4800 dpm/100cm² Floor-34A.

3. The contribution of low energy gamma and x-rays to the alpha/beta count has not been subtracted in the calculation of beta activity.

Response: See response to HMI's contractor's comment number 3.