STATE OF COLORADO

Bill Owens, Governor
Douglas H. Benevento, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-2000
TDD Line (303) 691-7700
Located in Glendale, Colorado

http://www.cdphe.state.co.us

Laboratory Services Division
8100 Lowry Blvd.
Denver, Colorado 80230-6928
(303) 692-3090

Colorado Department
of Public Health
and Environment

Linn D. Havelick, CIH
Director, Environmental Health and Safety Department
Colorado School of Mines
1500 Illinois St.,
Golden, CO 80401-1887

Subject: CSMRI soil cutoff values for planning and budgeting purposes

Dear Mr. Havelick:

As part of discussions pertaining to the review of the Remedial Investigation/Feasibility Study (RI/FS) for the Colorado School of Mines Research Institute, a question was posed to the State asking if there would be a cut-off level below which materials remediated from the site could go to a solid waste landfill instead of a facility specifically licensed for radioactive materials.

As you are aware, the RI/FS is still under review, and the Department is evaluating the classification of the material proposed by the School in the RI/FS. However, for project budget and schedule planning purposes, a cut-off value is being provided in this letter. Please note that the value is subject to change, predicated on the review of modeling and the outcome of the State review of the RI/FS. Most importantly, it must be emphasized that it is up to the permitting authority of a solid waste facility (usually the County) to approve any changes to the Certificate of Designation (CD), if necessary.

The materials handled at CSMRI over the years could fall into a variety of categories, based on the practice that generated them. For planning purposes in this letter, a designation of technologically-enhanced naturally occurring radioactive material (TENORM) as defined in the Radiation Control Act at C.R.S. 25-11-201(1)(c)(4) is assumed. The 1999 American National Standards Institute (ANSI) standard (in conjunction with the Health Physics Society) "Surface and Volumetric Radioactivity Standards for Clearance" is useful for reference in this situation. A table showing the values and certain caveats that must be addressed is attached for your review. For budget and schedule planning purposes, the 3 pCi/g and 30 pCi/g values will be used in this case for a cutoff as to what can go to a solid waste facility.

This is a case-by-case approval and does not mean that these values will be automatically acceptable in future requests. If you have additional questions, please contact Phil Egidi of the HMWMD at phil.egidi@state.co.us or 303-692-3447.

Sincerely,

Joe Schieffelin, Manager
Compliance Program
Hazardous Materials and Waste Management Division

JS/pve

Attachment: As stated

Cc: Phil Stoffey (Remedial Programs)
Phil Egidi (Radiation Management)
File 617-01

Table 1. Guidance for release to landfill[(a)]

Radionuclide Groups	Volume Release Level[(b)]	Surface Release Level[(b)]
Group 1: Radium and thorium, and associated decay products: ^{210}Po, ^{210}Pb, ^{226}Ra, ^{228}Ra, ^{228}Th, ^{230}Th, and ^{232}Th.	0.1 Bq/g or 3 pCi/g	0.1 Bq/cm^2 or 600 dpm/100 cm^2
Group 2: Natural-U: ^{238}U, ^{235}U, and ^{234}U.	1.0 Bq/g or 30 pCi/g	1.0 Bq/cm^2 or 6,000 dpm/100 cm^2

(a) Endorsed by reference to ANSI/HPS N13.12-1999, Surface and Volume Radioactivity Standards for Unconditional Clearance, August 31, 1999. For ^{40}K, the volume release level is based on its specific activity of 834 pCi/g and rounded off to 800 pCi/g, assuming an elemental abundance of 0.0118%. The surface release level for ^{40}K was derived using the NRC's "DandD" code and bench-marking the result to N13-12. All levels assume an annual dose (TEDE) of less than or equal to 1.0 mrem, as cited in ANSI/HPS N13.12.

(b) In demonstrating compliance, the analysis shall consider the applicability of each note listed below. The release level limits are exclusive of background.

Notes:

1) For natural uranium, the isotopic distribution is given as 48.9% for ^{238}U, 48.9% for ^{234}U, and 2.2% for ^{235}U.

2) When two or more radionuclides are present from dissimilar decay series (e.g., ^{210}Po and ^{228}Th), the sum-of-the-fractions method shall be used in determining if the release limit is met.

3) The sum-of-the-fractions method need not be applied when radionuclides present are part of a decay series and its decay products are in secular equilibrium, based on process knowledge or radiochemical analysis. However, if sufficient time has elapsed since the parent and decay chains were last separated, secular equilibrium may be assumed taking into account their respective radioactive half-lives.

4) To account for radionuclides that are known or assumed to be present in the mixture, but are not detectable by the survey equipment, the sum-of-the-fractions expression may be modified by dividing the sum-of-the-fractions by the detectable fraction of the radionuclide in the mixture to account for the radioactivity associated with undetectable radionuclides. The presence and fraction of the undetectable radionuclides, given the type of radiation survey instrumentation being used, may be determined by radiochemical methods or process knowledge.

5) For implementation purposes, additional guidance may be obtained from the following documents: Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (NUREG-1575); Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions (NUREG-1507); A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys (NUREG-1505, Rev.1); and recognized dose assessment codes, such as: Development of Probabilistic RESRAD 6.0 and RESRAD-BUILD 3.0 Computer Codes (NUREG/CR-6697); Residual Radioactive Contamination from Decommissioning - User's Manual DandD, Ver. 2.1 (NUREG/CR-5512, Vol. 2); and MicroShield® (Ver. 5.0).