



Pennsylvania Department of Environmental Protection

Rachel Carson State Office Building

P.O. Box 8469

Harrisburg, PA 17105-8469

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**Bureau of Radiation Protection**

717-787-2480

Fax: 717-783-8965

Claudia M. Craig, Chief  
Reactor Decommissioning Branch  
Division of Waste Management and Environmental Protection  
Office of Federal and State Materials and  
Environmental Management Programs  
Mail Stop T 7 F 27  
Washington, D.C. 20555-0001

Re: Draft Environmental Assessment for Decommissioning of the Cabot Reading Site

Dear Ms. Craig:

This letter is in response to your request for comments on the U.S. Nuclear Regulatory Commission (NRC) draft environmental assessment for decommissioning of the Cabot Reading site.

The Pennsylvania Department of Environmental Protection (DEP) has previously documented long standing concerns with Cabot's decommissioning plan (DP) for the Reading site regarding the future uses of the site, the uncertainties in the characterization, and the assumption that the material will remain buried in place in perpetuity under Cabot's previous "no action required" decommissioning plan. These concerns are included with this letter. DEP believes these concerns were instrumental in Cabot's decision to incorporate an engineered barrier in a recently revised plan to decommission the site. Nevertheless, DEP continues to have concerns regarding future "unrestricted" use of the site and potential safety issues and liabilities for the Commonwealth should the radioactive slag be left behind and someday become uncovered.

DEP has not changed its fundamental position that the Cabot Reading site has not been fully characterized and that the exposure scenarios used by Cabot and NRC to determine potential radiological impacts to members of the public are not adequate. The use of an engineered barrier partially addresses inadequate characterization concerns but in and of itself does not provide justification for an unrestricted release for the Cabot Reading site. Nevertheless, DEP is willing to accept the proposed decommissioning plan and license termination with the existing characterization provided that there will be institutional controls in place to prevent any future development of the site that could uncover the buried waste. In order to insure transparent and legally enforceable institutional controls are in place prior to NRC's



release of the Cabot site for unrestricted use, DEP has been working with the City of Reading and the Reading Redevelopment Authority to execute a Consent Order and Agreement (CO&A) in this regard. The CO&A will establish deed restrictions on the Cabot Reading site that will prevent future disturbance of the buried waste and provide for periodic inspections of the engineered cover that Cabot will construct to prevent erosion into the waste disposal area.

As stated above, DEP is willing to accept the NRC's decision to terminate Cabot's material license SMC-1562 without restrictions contingent upon execution of the CO&A with the City of Reading. We will keep you informed as to when the CO&A is executed and will provide you with a copy for your records if you so desire.

Thank you for the opportunity to comment on the draft EA for the Cabot Reading site. If you have any questions regarding these comments please contact Mr. Robert Maiers at (717) 783-8979 or the undersigned at (717) 783-5403.

Sincerely,



David J. Allard, CHP  
Director

Enclosures

cc: Robert Maiers, PA DEP, BRP  
Rusty Diamond, PA DEP, SCRO  
Steve Williams, PA DEP SCRO  
Ted Smith, NRC, HQ  
Richard Morrison, PA DEP

## Previously Documented Concerns:

### Source term used by Cabot to assess doses may be underestimated:

Bases for the two largest and most significant values for "Total Th tons" listed in Reference 3, Table 2 are based on employee recollections (i.e., Reference 3.g, a handwritten note, and Reference 12, a 1979 letter from consultant- AHP) rather than data from formal reports or actual samples.

Cabot's value of 0.01 for wt % Thorium for 1977-78 Sand and Sn Slag appears to be low. This sand and Sn slag was trucked to the site from Baltimore, MD. Reference 3.e states on Page 10 that "KBI's tin slag contains 0.7% thorium." Even if one accepts Cabot's questionable assumption of a 20:1 dilution (basis Reference 3.g handwritten note on 1991 inspection report) this equates to 0.035%.

AHP's 12/3/76 report (Reference 3.e), Page 7 indicates that an "extremely large quantity of tin slag" remained in Baltimore after the M/S Holthav was loaded. Based on the referenced photos (fig. 27 & 28) it appears that the vast majority of this material could have been moved without the unavoidable dilution with soil as claimed by employee recollection.

Reference 3.e also states on Page 11 that "It is fortunate that KBI has a licensed waste disposal ground... otherwise it would be necessary to ship hundreds of tons of material to... Barnwell, South Carolina" (the location of a licensed radioactive waste disposal facility). If the material was truly as diluted as Cabot now claims (i.e., 0.01% Thorium), it seems quite unlikely that KBI would have gone to the expense of trucking it to Reading for disposal. Rather they could have disposed of it locally in the Baltimore area.

If the original concentration of the tin slags was 0.7% (as stated in Reference 3.e) then dilution with soil by a factor of 20:1 would have resulted in a concentration of 0.035%. This is below the concentration at which it would be classified as "source material" (i.e., 0.05%). Even at 0.035% it seems unlikely that it would have been trucked to Reading since, at that concentration, it could have been released without restrictions. The fact that it was transported to and disposed of at Reading indicates that it was between the 0.7% undiluted value and the 0.05% source material limit, not the 0.01% value used in Reference 3, Table 2 nor the 20:1 dilution value of 0.035%.

Calculating the quantity of Thorium in the slag pile resulting from disposal of the sand and Sn slag using the conservative value of 0.7% (i.e., assuming no dilution) yields a quantity of 7.28 tons vs. the 0.104 tons reported in Reference 3, Table 2. If the dilution value is presumed correct, the quantity would be 0.36 tons.

Reference 3.e, Page 12, 1<sup>st</sup> paragraph indicates that 2447 tons of waste source material were removed by November 30, 1976. Some was salvaged for reprocessing at Boyertown and some was buried at Reading. No data has ever been presented to indicate how much material went to each location. This same paragraph states that "each truckload has been sampled so that an approximation of the total amount of source material can be determined." No sample analysis results were presented to support material concentration estimates used.

Reference 3.b, Page 3 states that the A.E.C. license covers possession of up to 0.3% Thorium in 60,000,000 lbs of slag. This equates to approximately 90 tons of Thorium in raw materials. This page also cites a "formal request to the A.E.C. for an exemption... to permit burial of approximately nine million pounds of slag containing 1% or less thorium." This equals up to 45 tons of Thorium.

The Pennsylvania Department of Health Permit for Burial of Radioactive Materials (an attachment to Reference 12) allows "disposal by burial in soil of approximately 105 tons of natural thorium and uranium contained in slag residue..."

Reference 3.h, Att. #2 "Smelting Operation" indicates that 32,000 pounds of slag would be produced "Per 24 hour Day." Cabot asserts (based on Reference 3.g, a handwritten note and Reference 12) that a total of only 600 tons of slag was disposed on the pile. If this figure is correct it would indicate that the plant operated for less than 38 production days during the 2-year operation of the plant.

Cabot references the photo of slag being dumped onto the slope in Reference 3, Page 7 apparently for the purpose of estimating the ultimate thickness (and hence volume) of the slag layer. This photo first appeared as Figure 6 of AHP report #1 dated May 1967. This report is an attachment to the October 1967 application for license renewal (Reference 3.h) that indicated that full operation had not yet been achieved at that time. It is reasonable to assume that a great deal of additional slag would be produced and deposited during full operation and therefore the slag layer would be a great deal thicker than may be indicated in the photo.

Despite the information and uncertainties presented above, Cabot claims in Reference 3, Table 2 that only 2.19 tons of Thorium were disposed of at the Reading site.

#### **Potential use of radioactive waste as site fill material:**

Reference 3.d, AHP letter to Kawecki dated May 3, 1968, indicates that Kawecki may have considered using (and possibly used) sludge containing 3000 pCi/g as fill for the plant site.

#### **Slag is non-homogenous and consists of large pieces that were not included in Cabot's characterization:**

Cabot claims (Reference 1, Cabot letter to Camper dated 11/21/02) that the "slag bearing radioactive material is mixed, not uniformly, but considerably, in a larger volume of debris..." Contrast this with the "Representative Cross Section, Reading Slag Pile" (Reference 3, Att. A, Figure 1) which shows a distinct layer for waste slag.

Reference 3.h (the October 1967 application for A.E.C. license renewal), supplemental information section, Page 3, Item 9.B. indicates that it was Kawecki's intent (and possibly their practice) to pour the molten slag from their operation "over the side of the slag dump where it will cool to form a black glassy mass containing most of the source material." This is supported by Reference 12, a letter from AHP to NRC, which states "KBI waste slag was often dumped while still molten ..." The presence and effect of large solidified masses of slag deposited down the slope are not addressed in Cabot's characterization nor in their radiological assessment.

Reference 3.h, supplemental information section also states on Page 14, 4<sup>th</sup> paragraph that “waste slag contains 0.2 to 0.29 percent thorium in the form of a black glass-like material which is broken into **large pieces.**” (emphasis added).

Despite this information, Cabot claims in Reference 1 (Cabot letter to Camper dated 11/21/02) that “the vast majority of the slag pile consists of small particles...”

**The number and location of test borings was not adequate to provide a representative characterization of the slag pile:**

Cabot has not demonstrated that the limited number (17) and location of test borings meets the objective of ensuring that sufficient representative locations have been sampled. As stated in both NUREG/CR-5849 and MARSSIM, meeting this objective requires a statistically based plan for selecting measurement and sampling locations. Furthermore, NUREG/CR-5849 states that if there is unusual localized contamination, the survey should be supplemented with sampling in the areas of suspected localized contamination. Based on this guidance, the large blocks of slag that are reported to be a concentrated source should have been specifically investigated.

**Sampling by split-spoon method is inappropriate for sampling slag:**

Split-spoon techniques are intended for non-consolidated material (e.g., soil), not “black glass-like material which is broken into large pieces” (see Page 14 of Health Physics Report # 1, attached to Reference 3.h). The inappropriateness of the split-spoon technique for sampling the large pieces of slag that are known to exist in the pile is indicated in Cabot’s response to NRC question 12.d. on the characterization report (Reference 10, General Comments, Page 12).

Cabot asserts in Reference 3, Page 9 that “there is good reason to believe the split-spoon would penetrate and sample any large blocks of waste slag that were encountered. The fact that the slag was reportedly broken up by dropping an iron ball onto it indicates that it is possible to drill and sample it. The split-spoon technique uses a 140-pound hammer dropped 30 inches to drive a 2-inch diameter hollow tube. The impact force per unit area is likely similar to the force per unit area as of the dropped ball used to break the slag.” Cabot provides no calculations to support this assertion.

In Reference 6, (letter from Larry Camper to Dave Allard dated 6/20/2002), NRC clearly opposes Cabot’s current position that the split-spoon sampling obtained representative samples of the slag blocks, viz. “We [NRC] agree that split-spoon techniques used for subsurface characterization would be unable to sample the larger blocks of radioactive slag.” In addition, Reference 12 (letter from AHP to NRC dated 5/3/1979), includes the following statement: “The usual practice of core sampling the dump is impractical if not impossible. The dumpsite is actually an embankment with a treacherous 70° slope that precludes core drilling which would be meaningless anyway since most of the source materials consist of large skulls and fragments having high density and extreme hardness. Furthermore, the distribution of source materials is by no means homogeneous.”

### **Dose from slag pile underestimated:**

Reference 3.b, Page 15, section II.A.1.(c).1. and Reference 3.h, AHP Health Physics Report #1, Page 14, 2<sup>nd</sup> paragraph indicate that the existing exposure rate of the slag dump in 1967-68 was 1.0 to 1.5 mr/hr.

Reference 3.f (a page apparently from a 1980 NRC inspection report) states that "measurements taken at the slag dump indicate a maximum radiation reading of 0.2 mr/hr on contact with the ground." These readings are lower than the readings from 1967-68. This is likely due the shielding effect of the 580 tons of soil and debris from the plant and 500 tons of crushed rock and soil placed on the slag pile during decontamination of the plant.

If excavated, individual pieces of slag would produce significant exposure rates (e.g. 100's of microR/hr). See Reference 3.b, Health Physics Report #2 Page 15 and Reference 3.h, Health Physics Report #1, Page 14. This is confirmed by measurements taken at the site on exposed large pieces of slag by Decommissioning Section staff (and confirmed by Cabot).

These values may give a good indication of the dose rates that could be expected in an eroded or excavated slag pile scenario. Despite this information, Cabot scenarios that assume an eroded slag pile appear to use an external dose rate of 0.055 mrem/hr or 55 µrem/hr (e.g., Reference 9, Case BT, Trespasser- eroded pile: external dose of 10 mrem in 180 hours).

### **Cabot does not consider all (or discounts) plausible land use scenarios:**

Reference 1, Cabot letter to Camper dated 11/21/02 states (Item 9) that future excavation is "highly unlikely" despite the existence of a right-of-way for River Road through the slag pile. Within the past 3 to 4 years, interest has been expressed in extending River Road (see Reference 13). Additionally Cabot states that, if the pile were excavated, "it would most likely not result in doses greater than those estimated for short-duration incidental exposures evaluated in the Cabot Radiological Assessment." (Reference 9). The doses in Reference 9 appear to indicate an external dose rate on the eroded slope of approximately 0.055 mrem/h (e.g., Case BT: external dose of 10 mrem in 180 hours). This is contrasted by exposure rate readings of 1 to 1.5 mR/hr taken on the slag pile by AHP during the period of April through September 1967 (Reference 3.h). This was early in Kawecki's operational period, so it is safe to assume that additional radioactive slag was subsequently deposited. These readings were taken prior to any soil cover being placed on the pile. The conditions during the 1967 AHP survey could be considered a bounding condition for exposure rate from an eroded slag pile.

## References:

1. Letter from Wayne M. Reiber, Cabot to Larry Camper, NRC, Subject: Characterization and Exposure Scenarios for the Reading Slag Pile Site; License No SMC-1562, November, 21, 2002.
2. Letter from Wayne M. Reiber, Cabot to Max M. Howie, JR., ATSDR, Subject: ATSDR Health Consultation (Exposure Investigation), American Chain and Cable Cabot Corporation (a/k/a American Chain and Cable); Reading, Berks County, Pennsylvania; July 18, 2002, November, 21, 2002.
3. Cabot Corporation Comment Report on the Johns Hopkins Draft Progress Report and Related Issues, November 21, 2002. Historical documents related to the Reading site, listed below, were provided as Attachment A to this document.
  - a. AHP, 1967, Letter to John A. Cenerazzo (Kawecki), Applied Health Physics, Inc., November 10; 1967.
  - b. AHP, 1968a, Health Physics Report #2 for the Kawecki Chemical Company, Applied Health Physics, Inc., February 6, 1968.
  - c. AHP, 1968b, Laboratory Report, Waste Sludge from Reading, 2.p, Applied Health Physics, Inc., April 29, 1968.
  - d. AHP, 1968c, Letter to Frank Coyle (Kawecki), Applied Health Physics, Inc., May 3, 1968.
  - e. AHP, 1976, Health Physics Report of the Radiological Safety Aspects Associated with KBI Tin Slags Stored at the Canton Railroad Yards, Applied Health Physics, Inc., December 3, 1976.
  - f. Cabot, 1991 a, Hand written notes on bottom of copy of an 1980 inspection report, stamped January 23; 1991.
  - g. Cabot, 1991 b, Hand written note in file, to Tony, from W. Gannon, January 23, 1991.
  - h. Kawecki, 1967, Application Renewal for Source Material License #SMB-920, with attachments including Health Physics Report #1, Kawecki Chemical Company, October 4, 1967.
  - i. Kawecki, 1974, Amine Extraction - Eastern Tin Slag, Summary, Kawecki Chemical Company, March 15, 1974.
  - j. Kawecki, 1976a, Radioactive Materials Transfer Records, Kawecki Berylco Industries, Inc., May - June 1976, Untitled, 2 p.
  - k. Kawecki, 1976b, Eastern T. S. Removal from reading to Baltimore, May and June 1976, Inter-Office Correspondence from W. C. Gannon to A. Zabrowski, 3 p., Kawecki Berylco Industries, Inc., June 17, 1976.
4. ATSDR Health Consultation (Exposure Investigation), American Chain and Cable Cabot Corporation (a/k/a American Chain and Cable); Reading, Berks County, Pennsylvania; July 18, 2002.
5. Letter from David Allard, Pennsylvania Department of Environmental Protection to Larry Camper, NRC, July 10, 2002.
6. Letter from Larry Camper, NRC to David Allard, Pennsylvania Department of Environmental Protection, June 20, 2002.
7. Letter from David Allard, Pennsylvania Department of Environmental Protection to Larry Camper, NRC, May 2, 2002.

8. Characterization of Radioactive Slags, Draft Progress Report, Johns Hopkins University, Veblen, Linda A, et. al., March 2000.
9. Radiological Assessment for Reading Slag Pile Site, Revision 1, ST Environmental Professionals, Inc., March 2000.
10. Characterization Report for the Reading Slag Pile, Revision 1, NES, Inc., April 22, 1996.
11. Preliminary Assessment of the Cabot Corporation Reading Slag Pile Site, Reading, Pennsylvania, Sandia National Laboratories, 1999.
12. Letter from Robert G. Gallagher, AHP to Nathan Bassin, NRC, May 3, 1979.
13. Letter from John R. Morahan, St. Joseph Medical Center to Theodore Smith, NRC, May 12, 2001.
14. Manual for Conducting Radiological Surveys in Support of License Termination, Draft Report for Comment, NUREG/CR-5849, J. D. Berger, Oak Ridge Associated Universities, 1992.
15. Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NUREG-1575, Rev.1, August 2000.