USAEHA

U.S. Army Environmental Hygiene Agency

INDUSTRIAL RADIATION CONSULTATION NO. 27-43-EU66-93
U.S. ARMY CHEMICAL SCHOOL AND MILITARY POLICE CENTER AND FORT MCCLELLAN
FORT MCCLELLAN, ALABAMA
30 MARCH - 2 APRIL 1993

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DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010-5422

REPLY TO
ATTENTION OF

EXECUTIVE SUMMARY
INDUSTRIAL RADIATION CONSULTATION NO. 27-43-EU66-93
U.S. ARMY CHEMICAL SCHOOL AND MILITARY POLICE CENTER AND FORT MCCLELLAN
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1. PURPOSE. This consultation was requested by the U.S. Army Environmental Center (AEC) to conduct a radiological evaluation of past operations at the U.S. Army Chemical School (ACS), Fort McClellan, AL.

2. CONCLUSIONS. A review of historical records of past operations at the ACS indicated that several buildings and land areas should be further surveyed before their release as an unrestricted area. If any radiological contamination is found to be present that exceed regulatory criteria for release as an unrestricted area, then a comprehensive decommissioning plan should be developed to remediate these areas to acceptable levels. A final termination survey should be made of such areas before release as an unrestricted area.

3. RECOMMENDATIONS. Several recommendations have been provided in the appendices for specific facilities and land areas. These recommendations specify what additional radiological surveys should be undertaken. Also, the recommendation for Building 3192 and the fenced in ground area around the building includes the need to further decontaminate the facility before it can be released for unrestricted use.

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HSHB-MR-HI

27 JUL 1993

INDUSTRIAL RADIATION CONSULTATION NO. 27-43-EU66-93
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CENTER AND FORT MCCELLAN
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1. REFERENCES. See Appendix A for a list of references.

2. AUTHORITY. Memorandum, THAMA, CETHA-TS-S, subject: Request for U.S. Army Environmental Hygiene Agency (USAEHA) Support, 7 April 1992.

3. PURPOSE. This consultation was performed to determine the current radiological status of several buildings and land areas that were formerly used to accomplish the training mission of the ACS.

4. GENERAL.

a. An entrance interview and exit briefing was held with Mr. John May, Health Physicist and Radiation Protection Officer (RPO) for the ACS.

b. Mr. May is to be commended for his assemblage of radiological files pertaining to past operations at the ACS. His files provided the basis for USAEHA's analysis and recommendations on what should be done to release previous ACS radiological facilities as unrestricted areas.

c. Appendix B contains a list of abbreviations used in this report.

5. FINDINGS.

a. Background. The AEC requested that USAEHA conduct a radiological evaluation of past operations at ACS. A general orientation of previous sites where radiological operations were conducted was accomplished. Also, an extensive review was made of the radiological files pertaining to past operations at the ACS.

b. Facilities and Land Areas. Appendix C is a listing of ACS facilities and areas that used or stored radioactive material in the past. Iron Mountain is not included in the listing because a memorandum for that area was previously provided to AEC on 15 January 1993. Appendix D through L provide a detailed status of each of the facilities or areas along with recommendations regarding what future action is required, if any.

c. Report Restriction.

(1) This report is limited to past radiological operations at the ACS only. It does not include any current operations, such as Buildings 256 and 1081, that still use, possess or store radioactive material. A follow-up report is required of these facilities after current operations are terminated and all radioactive materials are removed from the premises.

(2) An additional evaluation would also have to be undertaken of all other Fort McClellan activities, to include tenant activities, to determine if radioactive material was ever used, stored or disposed at those activities. This evaluation, to include the possibility of radiological surveys, would have to be conducted before Fort McClellan could be released in its entirety as an unrestricted area.

6. CONCLUSIONS.

a. A review of the findings indicate that several buildings and land areas should be further surveyed before their release as an unrestricted area.

b. If any radiological contamination is found to be present, that exceed regulatory criteria for release as an unrestricted area, then a comprehensive decommissioning plan should be developed to remediate these areas to acceptable levels.

c. A final termination survey should then be made of such areas before release as an unrestricted area.

7. RECOMMENDATIONS.

a. Several recommendations have been provided in the Appendices for specific facilities and land areas. These recommendations specify what additional surveys should be undertaken.

b. The recommendation for Building 3192 and the fenced in ground area around the building include the need to further decontaminate the facility before it can be released for unrestricted use. A termination survey should be conducted once the facility is decontaminated.

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APPENDIX A

REFERENCES

1. Memorandum, THAMA, CETHA-TS-S, subject: Request for U.S. Army Environmental Hygiene Agency (USAEHA) Support, 7 Apr 92.

2. Fort McClellan site visit by Mr. Allen Hilsmeier and 1LT Christopher J. Clayton on 30 March - 2 April 1993.

3. USAEHA Radiation Special Study No. 43-075-73/74, U.S. Army Chemical Center and School, Fort McClellan, AL 36201, 28-31 May 1973.

4. U.S. Atomic Energy Commission Regulatory Guide 1.86, Termination of Operating Licenses for Nuclear Reactors, June 1974.

5. U.S. Nuclear Regulatory Commission (NRC) Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material, July 1982.

6. USAEHA Radiation Protection Survey No. 43-0046-77, U.S. Army School/Training Center, Fort McClellan, Alabama, 4-5 May 1977.

7. USAEHA Radiation Special Study No. 43-041-73, Evaluation of Radioactive Contamination, U.S. Army Chemical Center and School, Fort McClellan, AL 36201, 5-7 February 1973.

8. Project Report for Fort McClellan, Alabama, Decontamination Project, Prepared by Hilbert Associates, Inc. for Chem-Nuclear Systems, Inc., 1985.

9. Memorandum for Record, ATZN-CM-AHP, subject: Discovery of Unlicensed Material Within the Hot Cell Area, 13 December 1985.

10. Memorandum for Record, ATZN-CM-AHP, subject: Demolition of Building 3180, 3 August 1989.

11. Memorandum for Record, ATZN-CM-AHP, subject: Demolition of Control Pit and Removal of Building 3180's Floor, 1 Dec 89.

12. Memorandum for Record, ATZN-CM-NR (LAB), subject: Finding of Lead Source Container, 6 December 1989.

13. U.S. Army Corps of Engineers Toxic and Hazardous Materials Agency, Task Order 11, Draft Enhanced Preliminary Assessment, Volume 1, Fort McClellan, AL, Prepared by Roy F. Weston, Inc., September 1990.

Industrial Radn Consult No. 27-43-EU66-93, 30 Mar-2 Apr 93

14. USAEHA Radiation Protection Study No. 27-43-0002-88, U.S. Army Chemical School, Fort McClellan, AL, 29 Mar - 1 Apr 1988.

15. Daily Activity Logbook, subject: Close-out - Health Physics Division, 21 Feb 73 - 31 May 73.

16. Memorandum for Record, subject: Final Radiological Clearance, 14 June 1973.

17. U.S. Army Training and Doctrine Command, Final Environmental Impact Statement, 16 July 1979.

18. After Action Report, Test and Evaluation Program, Radiological Decontamination Training Facility (Bromine field), undated, (about 1967).

19. Information Paper, ATZN-CM-AHP, subject: History of the Rideout Field Cobalt-60 Radiation Sources, 4 February 1985.

20. Letter, CMLTC-SDI-T, to Commanding Officer, Fort McClellan, AL, subject: Extension of Radiological Training Area in Pelham Range, undated (probably about April 1958).

21. Letter, ATSSM-DM, to MAJ Charles Wickstrom, subject: Rideout Field Documentation, 16 February 1973.

22. After Action Report, Discovery and Disposal of a Cobalt-60 Radiation Source, 22 January - 1 February 1985, undated, with numerous attachments.

23. Disposition Form 2496, ATSCM-H, to Record File, subject: Iron Mountain Site - Memo for Record, 23 February 1971, with enclosures.

24. Memorandum for LTC James, ATZN-CM-AHP, subject: Radioactive Material Disposal Site, 22 January 1985.

25. Memorandum for Record, ATZN-CM-AHP, subject: Discovery of Cobalt-60 Source at Pelham Range, 25 January 1985.

26. Installation Assessment of Fort McClellan, Report No. 110, Volume I, April 1977.

27. USAEHA Radiation Protection Study No. 28-43-0012-84, Hot Cell Contamination, Fort McClellan, Alabama, 1 August 1983.

28. U.S. Army Chemical School Minutes of the Installation Ionizing Radiation Control Committee, 23 February 1984.

Industrial Radn Consult No. 27-43-EU66-93, 30 Mar-2 Apr 93

29. U.S. Army Chemical School Minutes of the Radiation Safety Committee Meeting, 17 May 1973.

30. NUREG/CR-5849, Manual for Conducting Radiological Surveys in Support of License Termination, June 1992.

APPENDIX B

ABBREVIATIONS

ACS	Army Chemical School
AEC	U.S. Army Environmental Center
AEC/NRC	Atomic Energy Commission/Nuclear Regulatory Commission
Al	aluminum
Br	bromine
Ci	Curie
cm	centimeter
Co	cobalt-60
Cs	cesium-137
dpm/100 cm^2	disintegrations per minute per 100 square centimeters
EOD	Explosive Ordnance Disposal
Kr	Krypton
MDA	minimum detectable activity
MP	Military Police
mr/hr	milliroentgen per hour
mrad/hr	millirad per hour
NaI	sodium-iodide
NRC	Nuclear Regulatory Commission
pCi/g	picocurie per gram
RPO	Radiation Protection Officer
Sr	Strontium
TMDE	Test, Measurement and Diagnostic Equipment
µR/hr	microroentgen per hour
USAEHA	U.S. Army Environmental Hygiene Agency

APPENDIX C

LISTING OF PAST RADIOLOGICAL FACILITIES/AREAS AT FORT MCCLELLAN, AL

* Building T-812 1/2	Appendix D
Building 228 2281	Appendix E
* Building 3180	Appendix F
* Building 3181	Appendix G
Building 3182	Appendix H
* Building 3192 including fenced area	Appendix I
* Alpha Field	Appendix J
Bromine Field	Appendix K
* Rideout Field	Appendix L

* FURTHER ACTION NEEDED

APPENDIX D

RADIOLOGICAL STATUS OF BUILDING T-812 1/2

1. Past Operations: Reference 3 identified Building T-812 1/2 as a former radium storage vault. The radium would have been in a sealed form with very little likelihood of contamination occurring within the facility.

2. Current Radiological Status: Per discussion with the current RPO for the Chemical School, Building T-812 1/2 is no longer used to store radioactive material. The facility has not been used since the USAEHA close-out survey was completed in May 1973.

3. Termination Survey: The USAEHA conducted a radiological survey of the building per reference 3. While the survey report was adequate to meet the NRC requirement in 1973, current NRC license termination procedures and methodologies are much more restricted. Also, the survey report did not address the potential contamination from a radium sealed source. Even though the radium source was in a sealed form and was not regulated by the NRC, we believe the overall termination survey would be greatly enhanced if all Army licensed facilities (NRC and DA licenses) termination surveys could integrate the NRC guidelines presented in the NRC NUREG/CR-5849 (Reference 30). No alpha radiation measurements were performed and no wipe test surveys were taken within the building. However, reference 7 indicates that one wipe test was taken on the floor and the result was well below the NRC limits for unrestricted use.

4. Recommendation: Conduct an alpha survey and take an adequate number of wipe test surveys to comply with the provisions specified in reference 30 for release of an affected area for unrestricted use.

APPENDIX E

RADIOLOGICAL STATUS OF BUILDING 228 Bldg 228/

1. Past Operations: Reference 6 indicated that one AN/UDM-6 calibrator and two TS-784A/PD calibrators were present in Building 228 in the time period of 1977. The reference stated that the required leak tests were performed on these sealed sources. Reference 2 confirmed that Building 228 was only used as the TMDE radiac calibration facility.

2. Current Radiological Status: Building 228 is now being used as an EOD facility. The previous TMDE radiological operations have been terminated.

3. Termination Survey: No specific radiological close-out survey was located for Building 228. However, reference 6 states that the required leak tests were being performed and that only sealed sources were used in the facility. Thus, a conclusion can be made that the likelihood of radiological contamination remaining in the facility after it was released for unrestricted use is extremely unlikely.

4. Recommendation: No further radiological monitoring is warranted. The leak test data are sufficient to constitute a termination radiological survey for this facility.

APPENDIX F

RADIOLOGICAL STATUS OF BUILDING 3180

1. Past Operations: Reference 7 identified Building 3180 as a Radioactive Material Storage Area Vault that probably contained Co-60 and Cs-137. The report stated that the building was in use after the time of the survey in 1973. It indicated that the building was contaminated. Reference 3, however, conducted wipe tests in the building and storage well and found that radiological contamination was not significant in May 1973. A concrete pad around Building 3180 had been previously removed and disposed of as radioactive waste. Radiation levels using beta/gamma measuring instruments by the current RPO were within the AEC/NRC limits specified in references 4 and 5. Reference 8 indicated that contamination must have occurred inside and outside of the building at sometime in the past but some level of decontamination must have been done. Survey reports indicated that some low level contamination was still present in 1985. The contamination was along the expansion joints in the concrete aprons and the joints adjacent to Building 3180 and on the concrete floor inside Building 3180. Reference 9 indicated that a source well next to Building 3180 had a radioisotope buried in it.

2. Current Radiological Status: Reference 10 stated that Building 3180 was demolished in August 1989. During the demolition, both beta and gamma radiation measurements were made of the demolished structure. Only background radiation measurements were recorded. Reference 11 stated that the floor of Building 3180 was removed in November 1989 and monitored for contamination. The report indicated that one spot on the floor had a high reading but subsequent concrete samples were analyzed and showed no radionuclide to be present. The concrete sample results were not documented. Also, the radioactive source believed to be Sr-90, was removed from the well adjoining Building 3180 and the well itself was monitored after the source was removed. No readings greater than three times background were noted. Reference 12 has a further discussion of the removal of the radioactive source from the well.

3. Termination Survey: All of the building, concrete floor, and outside concrete pad area has been removed and disposed either as radioactive waste or in a landfill if no radioactive contamination was found. The instruments used to conduct the survey were appropriate for the type of radiation emitted, properly calibrated, and daily source checked. Data are not available that documents the radiological status of the ground area below and near the demolished Building 3180 and the concrete pad.

4. Recommendation: Collect about 3 surface and core soil samples under and around the demolished Building 3180 and 3 additional surface soil samples at the rear foundation of Building 3182 where expansion joints and seams indicated trace amounts of radioactive contamination to be present in 1985. Analyze these samples for Cs-137, Co-60, and Sr-90.

APPENDIX G

RADIOLOGICAL STATUS OF BUILDING 3181

1. Past Operation: A draft enhanced preliminary assessment (Reference 13) identified one radioisotope laboratory, Room 35, in Building 3181 where unsealed and liquid (unsealed) sources were authorized and used. Another room, Room 36, only had low-level sealed calibration sources occasionally brought into the room for training purposes. The report mentioned that a hood duct might still be inside the building above Room 35 with both ends sealed. A wipe test survey throughout the radioisotope laboratory was conducted during a USAEHA special study (Reference 3). All wipe tests were well below the limits specified in NRC Regulatory Guide 1.86 (Reference 4) and NRC Guidelines for Decontamination of Facilities and Equipment prior to release for unrestricted use (Reference 5) for beta/gamma emitting radioisotopes, which were the unsealed and liquid sources present in the laboratory. However, the laboratory was still in use at the time of the 1973 study, so this study could not represent a termination survey of the facility. A decontamination report (Reference 8) completed in 1985, does not include Building 3181 in its radiological survey and analysis.

2. Current Radiological Status: Building 3181 is no longer being used for a radiological laboratory. It has been extensively remodeled to accommodate MP operations at Fort McClellan.

3. Termination Survey: Records were not available that indicated a termination survey was ever conducted of Building 3181, particularly Room 35.

4. Recommendations:

a. Determine if a hood duct system is still in place above Room 35. If a system exists, the seals should be removed and a radiological survey conducted within the interior. If contamination is present above the NRC limits for unrestricted use, the duct system will have to be decontaminated or removed and disposed of as radioactive waste.

b. Conduct a radiological termination survey of Room 35 to document that the room is acceptable for unrestricted use.

APPENDIX H

RADIOLOGICAL STATUS OF BUILDING 3182

1. Past Operations: Reference 13 stated that only two sealed sources were used in Laboratory W, 1 106 Curie (Ci) Cs-137 calibrator and 1 Ci Co-60 calibrator. However, a survey conducted in February 1973 (Reference 7), indicated areas of fixed contamination within the building. Reference 15, entries dated 10, 11, 12, 13, 16, 17, 23 April, and 2, 3, 4, 7, 14, 29, and 31 May 1973, discusses decontamination operations and follow-up radiological surveys of the contaminated areas to verify that the contamination was removed. A USAEHA study (Reference 14) mentioned an external radiation survey was taken outside the walls of Building 3182. Any measurements slightly above background levels were attributed to natural thorium in the bricks of the building. A USAEHA study (Reference 3) conducted 6 smear tests throughout Building 3182. Two smear tests were slightly above minimum detectable activity (MDA) but well below regulatory concern.

2. Current Radiological Status: Building 3182 is no longer used as a radiological facility. It is currently used as a MP museum, offices, and classrooms.

3. Termination Survey: The daily activity logbook (Reference 15) provides documentation that Building 3182 was decontaminated prior to release. The final radiological clearance (Reference 16), page 9, titled - Statement of Bldg Clearance, cites Building 3182 as either being free of contamination or having a very small amount of contamination which are within acceptable limits. Reference 16 concludes that the building is acceptable for unlimited [unrestricted] use.

4. Recommendation: Building 3182 has adequate documentation to support the conclusion that the building is acceptable for unrestricted use. No further action is required.

APPENDIX I

RADIOLOGICAL STATUS OF BUILDING 3192 Including Fenced Area

1. Past Operations:

a. Building 3192 housed a classroom and a radiological hot cell. The hot cell was used primarily to prepare, maintain and transfer multicurie Co-60 sources for the training exercises at Rideout Field (Pelham Range). At sometime prior to 1973, an excursion occurred that caused high level radioactivity within the hot cell to be released throughout the facility to include the ventilation system to the outside. Both Co-60 and Cs-137 radioisotopes were released to the environment and contaminated the ground area around Building 3192. The underground piping, storage tanks, valve control pit and manway that serviced the hot cell by collecting decontamination water was already contaminated from normal operations. Thus, Building 3192 and the area surrounding the building, both on and below the surface, was contaminated with low level radioactivity. References 3 and 7 provide survey data on the general level of contamination within Building 3192 and the nearby surrounding area during the period prior to 1973.

b. The Chemical School Radiation Committee meeting on 17 May 1973 (reference 29), indicated that decontamination of Building 3192 was 99 percent complete. The engineers were still working on the remaining 1 percent. The health physicists overseeing the clean-up operation used decontamination criteria specified in reference 7.

c. Reference 27 is a report prepared in 1983 by USAEHA. Several points are noteworthy in this report. First, surface soil contamination had spread slightly outside the originally fenced in area. The contaminants were both Co-60 and Cs-137. Second, low-level surface soil contamination was generally over the entire area west of Building 3192. Third, low-level soil contamination was detected as deep as 8 feet below the surface and about 15 feet down the slope from the underground storage tanks. The contamination probably occurred as a result of tank leakage rather than percolation through the soil. The Radiation Committee, in reference 28, did not know what could have caused the cesium contamination. Also, the Committee recommended that ground monitoring wells be established to determine if leaching into the underground aquifer was occurring.

2. Current Radiological Status:

a. Reference 8 is a report prepared in 1986 that fully characterized the extent and level of contamination remaining in Building 3192 and the surrounding area. The report indicated that extensive core sampling was conducted for soil, concrete and asphalt areas. It also provided information on the remedial action taken to remove much of the contamination. The remedial action taken by the contractor included: excavation and removal of the 1500 and 100 gallon underground holding tanks; removal and disposal of some contaminated material in the hot cell of Building 3192 as radioactive waste; and removal of some contaminated surface soil around Building 3192.

b. Regarding the decontamination in Building 3192, the criteria specified was to reduce general area radiation exposure to less than 160 μR/hr and remove loose surface contamination to a level less than 1000 dpm/100 cm^2. Considerable effort was made, within the funds authorized, to reduce contamination below these limits. However, the inaccessible parts of the hot cell, to include the cell door trough, is still contaminated with primarily fixed contamination. The classroom area, except for the ventilation system, indicated no areas above background radiation. In general, the air conditioning system is still contaminated with low-level fixed radioactivity. The roof truss system still has fixed and removable contamination present. Insulation material over the classroom and office have low-level removable contamination.

c. Regarding the status of the underground drain system, the piping system was cut and capped at the effluent line from the building and at the inlet lines into the valve control pit. The excavated 1500 gallon tank showed several points (1/8 to 1/4-inch holes) of total rust through of the carbon steel plate. The open excavation where the tanks were removed was sampled for radioactivity. Only negative results were obtained. The valve control pit contained highly radioactive silt of the radioisotopes Co-60 and Cs-137. The concrete floor would have to be decontaminated or disposed of as radioactive waste. Of particular note was a comment that the pit was pumped out but the following day about 2 feet of water had seeped back into it; a breach in the structure wall was not evident. The capped pit discharge piping is still underground as is the effluent end of the sewer manway which was connected to the control pit. All piping would have to be removed and thoroughly surveyed for contamination. The manway is still contaminated and would have to be decontaminated before release as an unrestricted area.

d. Regarding the status of surface contamination of outside areas, Cs-137 was spread into concrete expansion joints along the apron behind Building 3182. Cesium-137 and Co-60 contamination was generally spread over the soil around Building 3192. Specific areas indicating higher levels of soil contamination were subject to minor excavation and soil removal. However, the grid layout diagram attached to Reference 8 identified a number of areas that are still contaminated, i.e., A-28,A-41,A-64,A-68,A-70,A-72,A-74, A-77,A-80,A-81,A-82,A-94,A-100,A-113,A-114,A-117,A-119,A-122, A-123,B-34,E-109,E-110, the control pit at E-121 and E-122, and the manway at E-130. The reference recommended soil removal in these areas to a maximum depth of 6 inches.

3. Termination Survey: A termination survey cannot be conducted until Building 3192 and nearby ground areas are decontaminated to levels below regulatory concern, i.e., release for unrestricted use. As a condition of the termination survey, additional surface and subsurface soil samples would have to be taken of any areas suspected of being contaminated. Criteria specified in Reference 30 for an affected area (an area known or suspected of being contaminated with radioactive material) would have to be followed for Building 3192 and the nearby ground areas.

4. Recommendations:

a. All contaminated facility and ground areas identified in Reference 8 should be decontaminated or removed for radioactive waste disposal in accordance with Reference 30.

b. After decontamination is completed to levels specified in References 4 and 5, a termination survey for an affected area should be conducted of Building 3192 and the land area inside the fence around Building 3192.

(1) Biased monitoring should be extensively conducted of special areas such as concrete expansion joints, difficult to reach areas in Building 3192, and around removed underground pipes, the valve control pit, and the manway.

(2) Core sampling should be conducted, at least 12 feet deep, in the vicinity of the removed 1500 and 100 gallon storage tanks, the valve control pit, and the manway.

c. A termination survey for an unaffected area (an area that is not suspected of ever being contaminated with radioactive material) should be conducted outside the fenced area.

APPENDIX J

RADIOLOGICAL STATUS OF ALPHA FIELD

1. Past Operations:

a. A site visit by USAEHA (Reference 2) confirmed that the original Alpha Field was near Bromine Field. Alpha field was in operation until the early 1970's when operations were terminated. A USAEHA study (Reference 7), February 1973, recommended all uranium plates be removed from Alpha Field, and the pedestals on which the plates were placed be surveyed for any residual contamination; the pedestals should be decontaminated if necessary, and the field plowed after the pedestals are removed. Reference 6 states: that all uranium plates were removed and transferred to Aberdeen Proving Ground, Maryland; that the pedestals were removed and disposed of; and the field was plowed to a depth of 6 inches.

b. Reference 17, prepared in 1979, is an environmental impact statement that discusses an Alpha Field located near Galloway Gate. Per reference 2, the field was never operated because the sources were never installed. Therefore, no termination survey is required for this area.

2. Current Radiological Status: The ground area used for the original Alpha Field has been released for unrestricted use. A parking lot and new building has been built on the ground area.

3. Termination Survey: An USAEHA study (Reference 6) states that a termination radiological survey of Alpha Field was conducted and that all radiation levels were within AEC/NRC limits for unrestricted use. A Geiger Mueller beta-gamma radiation measuring instrument and a survey meter with a FIDLER probe were used to conduct the survey. If residual contamination or a uranium source was buried when the field was plowed, the beta radiation might not be detected because it is doubtful that the beta radiation could penetrate the 6 inches of plowed soil. Currently, the FIDLER probe is not the instrument of choice for monitoring low energy gamma radiation and characteristic x-rays, resulting from the uranium decay products. Thus the termination radiation survey conducted in 1973 might not be conclusive in substantiating that a uranium plate or residual contamination was not buried when operations were shut down. One surface soil sample (6 inches deep), was collected and analyzed for alpha activity. The 6 soil sample analyses performed were all less than 4 picocuries per gram (pCi/gm) gross alpha activity.

4. Recommendations:

a. Conduct a gamma radiation survey using a thin NaI crystal connected to a microroentgen survey meter over the parking lot and ground areas where the original Alpha Field was located.

b. Take several soil samples, at least 12 inches deep, of any accessible ground surfaces and analyze for gross alpha and beta activity.

c. If the survey results are all below the NRC criteria, the area can be officially classified as acceptable for unrestricted use.

APPENDIX K
RADIOLOGICAL STATUS OF BROMINE FIELD

1. Past Operations. A final Environmental Impact Statement (Reference 17) describes the use of a liquid solution of Br-82, to provide Chemical School students with a realistic decontamination exercise of military equipment. The effluent would be collected after the exercise and stored until sufficiently decayed to permit discharge into the sanitary sewage system. The radioisotope Br-82 has a half-life of 37 hours. It decays to a nonradioactive material, Kr-82, which is an inert gas. A normal exercise for students required approximately 1 to 2 curies of Br-82. References 17 and 18 discuss the possibility of other radioisotopes being present due to the induced activity in the aluminum container and impurities in the potassium bromide. These isotopes are Br-80m, Br-80, K-42, Na-24, and Al-28 with half-lives of 4.5 hours, 18 minutes, 12.5 hours, 15 hours and 23 minutes respectively. It is obvious that this operation conducted in the 1970's, would not have created a long-term residual contamination problem.

2. Current Radiological Status: The facility has been placed out of commission. Several tanks and concrete pads are all that remain at the abandoned facility.

3. Termination Survey: A USAEHA study (Reference 3) conducted in 1973 documents that a radiation survey was made of Bromine Field; however, no actual survey results were included in the report. The instrumentation used were appropriate for the type of radiation emitted by Br-82 and any other radioactive contaminants that could have been present. The short half-life of the main radioisotope Br-82, as well as the even shorter half-lives of other possible contaminants, attest to the unlikelihood of any residual contamination still being present at Bromine Field.

4. Recommendation: No further action is required.

APPENDIX L

RADIOLOGICAL STATUS OF RIDEOUT FIELD

1. Past Operation:

a. An information paper (Reference 19) describes Rideout Field Radiological Training Area as being in use from about 1965 to 1972. Reference 20 states that the purpose of the field was to conduct aerial and ground radiological training surveys over large areas. The reference describes the location of the field and had drawings attached of both the commercially obtained and locally fabricated sources and assemblies. When operations were terminated, a close-out survey was conducted in 1973 by USAEHA (see Reference 3) which indicated that all radiation levels were within the NRC limits. The instrumentation used for the survey was appropriate for the radioisotope, Co-60. Reference 21 is a local document that certifies that no residual contamination or radioactive sources remained at Rideout Field in March 1973.

b. An information paper (Reference 19) and an after action report (Reference 22) however, document an incident that discovered a Co-60 source at Pelham Range, Rideout Field. The source had an estimated activity of 140 millicuries. The source was removed on 30 January 1985. No additional sources were found after a radiation survey was completed on 1 February 1985.

c. In addition to the radiological training area, reference 23, Enclosure IV, mentions that radioactive waste from the Iron Mountain burial site was transferred to Pelham Range, Rideout Field, in about 1959. The reference stated that several truckloads of contaminated (radioactive) dirt was delivered to a burial pit site near Rideout Hall. The radiation levels were reportedly significant. The contaminated dirt was placed in a trench, back filled, mounded and fenced. This waste was supposedly dug up and moved to Oak Ridge (Tennessee) for burial. No time frame was provided for the transfer and burial.

d. Low-level radiation was detected at the north side of the disposal site on 23 January 1983, which was about 25 years after the radioactive waste was deposited on Pelham Range. The Co-60 source discovered during this same period of time was about 10 feet to the south of the suspected disposal site per Reference 25.

2. Current Radiological Status: The field training operations were terminated in 1972. Reference 26 indicates that a backhoe was used to dig up buried radioactive waste and Rideout Field was subsequently certified clean by the AEC/NRC. The reference cautions, however, that in view of the random manner used to bury radioactive waste, it is felt that there is a possibility that all of this material was not recovered. Regardless, the field is currently inactive.

3. Termination Survey:

a. A USAEHA study (Reference 7) was conducted in 1973 of the old burial grounds and stated that radiation measurements were within the levels specified in References 4 and 5. The highest reading recorded was 0.15 mR/hr at 1 cm distance from the ground. Reference 24 reported on 22 January 1985 that a maximum reading, 0.25 mR/hr [0.25 millirads per hour (mrad/hr)] was detected at the north side of the disposal site. This value is also within the NRC criteria as being acceptable for unrestricted release (1 mrad/hr at 1 cm).

b. Four soil samples were collected in the burial ground site during a USAEHA study (Reference 7). The soil samples were analyzed at 5 cm intervals down to a depth of 20 cm. Two surface samples had a measured activity of about 230 pCi/g expressed in terms of Co-60. The rest of the soil samples had a measured activity of about 0.6 pCi/g. Reference 14 cites a soil contamination level above 8 pCi/g for Co-60 as unacceptable. Appendix D in reference 14 is correspondence from the NRC that provided this contamination limit. Appendix E in reference 14 indicated that a background sample measured for Co-60 was about 0.3 pCi/g. Thus, two of the four soil samples had a measured concentration for Co-60 that significantly exceeded the allowable limit.

4. Recommendations:

a. No further action is required for the field training area.

b. The radiological disposal site should be extensively characterized by taking surface and core soil samples (about 7 feet deep). The samples should be analyzed for gross alpha and beta-gamma activity, Co-60 and Cs-137.

c. The radiological disposal site should also be monitored with a gamma radiation detector using a microroentgen survey meter.

The gamma exposure at 1 meter above the ground surface shall not exceed 10 μR/hr above background for an area of greater than 30 feet X 30 feet and shall not exceed 20 μR/hr above background for any discrete area, i.e., less than 30 feet X 30 feet. This criteria was specifically given to Fort McClellan by the NRC as documented in Appendix D to reference 14.