

Per the Federal Facility Agreement for Iowa Army Ammunition Plant, Article X.B.1, the attached document is the final version of the submitted document.

Health Consultation

IOWA ARMY AMMUNITION PLANT
MIDDLETOWN, DES MOINES COUNTY, IOWA
EPA FACILITY ID: IA7213820445

MARCH 19, 2001

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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BACKGROUND AND STATEMENT OF ISSUES

The Agency for Toxic Substances and Disease Registry (ATSDR) is required under the Comprehensive Environmental Response, Compensation, and Liability Act to prepare public health assessments (PHA) of hazardous waste sites either proposed or listed on the National Priorities List (NPL). The Iowa Army Ammunition Plant (IAAP) was added to the NPL in July 1989 and in 1999 ATSDR prepared the PHA as required [1]. Prior to the release of the PHA, information became available that radioactive materials may have been used or processed at the facility. ATSDR determined that it would be prudent to release the PHA addressing other issues and to address the radioactive issues when data were received. Therefore, one of the recommendations made in the PHA was that ATSDR prepare a separate document concerning the possible presence of radioactive material at IAAP. This document addresses that recommendation.

Concerns were raised by various members of the public and public officials regarding the presence of radioactive material and the potential for residual radioactivity to impact the public health of both workers and local residents. Because of the time line associated with the discovery, survey, and data review, ATSDR determined not to delay the issuance of the PHA. Instead, the decision was made to obtain the radiological data and evaluate the issue at a later date in a public health consultation. The agency contacted the US Army in 2000 and they supplied data for our review. These data included memoranda, letters, waste shipments, environmental reports and similar documents prepared during the time portions of the IAAP were under control of the Atomic Energy Commission. This document reviews those data made available to ATSDR by the US Army. The ATSDR also received a draft report of a recent radiological survey that identified contaminated areas within IAAP [2].

From 1947 to 1975, the Department of Energy (DOE) and its predecessor organizations used the facility to process nuclear components for weapons systems. From draft documentation reviewed by ATSDR, the nuclear materials processed contained some or all of the following: depleted uranium, enriched uranium, plutonium, tritium, and radium. Other information available suggested that radioactive cobalt and cesium may have been used or is present in the environment.

This public health consultation makes specific recommendations related to those data and future work that should be considered at the Iowa Army Ammunition Plant.

Discussion

Releases to the environment – Portions of the IAAP were used to assemble nuclear weapons from component parts. These radioactive materials are considered sealed sources meaning that they are contained within sealed capsules or containers. No chemical processing of radioactive materials occurred at the site. Based on the reviewed information, nuclear weapons assembly ended in 1975. During the assembly process, testing of components required that portions be subjected to destructive testing. This resulted in releases to the environment. Major releases included

fragments of depleted uranium (DU) in the testing areas (firing lines). The amounts of DU subjected to these tests varied. For example, in November 1969, documents exist indicating that during high explosives testing, 3556 pounds of DU were released to the environment although it is not clear if that amount was for the month. Of this amount, all but 590 pounds (17%) was recovered and believed, at that time, to still be in the firing area ¹. Much of the DU fragments was removed during cleanup activities at the end of nuclear weapons work at the site. Existing documentation states that about 15 cubic feet of radioactive wastes were removed from July 1974 to June 1975². This waste included radioactive material including DU, plutonium 239, radium, cobalt 60, and cesium 137 and that between 1968 and 1969 over 30 cubic feet of DU were shipped off-site for disposal.

The report for 1971 indicates that monitoring has been ongoing since September 1971 with no observed readings above background. Two soil (sediment) samples were collected from the bottom of a lake and the uranium concentration was 0.66 picocuries³ per gram (pCi/g) and 1.1 pCi/g. The environmental monitoring report for 1973 indicated that DU was intermittently dispersed into the atmosphere but no detectable amounts were seen in air monitors located off AEC property. Furthermore, no detectable amounts were found in surface water as analysed by fluorometric methods⁴. The report also states that all testing using DU was completed as of December 31, 1973 but samples would be collected until June 1974.

Samples collected in 1973 and analyzed by a fluorometric method (mass only) shows that uranium contamination was only present at the Firing Site 12 (FS-12) area and the background concentration of uranium was listed as 5 micrograms per gram ($\mu\text{g/g}$) of soil. Concentrations in the firing area range from background to over 1000 $\mu\text{g/g}$ soil. The report also states that tests with DU ran from December 1965 through December 1973. Over 700 tests were performed with a total amount about 4 million grams of DU reported as lost⁵. Soil samples collected during 1974 decontamination activities at FS-12 showed elevated uranium at a depth of 6 inches with concentrations ranging from 2.4 picocuries per gram (pCi/g) to 335 pCi/g depending on distance from "ground zero" and the results from air monitors indicates there is no resuspension of U

¹No author given. Title given as "For Albuquerque, New Mexico Sandia Base 17 & 18 February 1971.

²Letter from R.L. Holmberg, Plant Manager, Mason & Hanger-Silas Mason Co., Inc. to Contracting Officer Burlington ERDA Plant (IAAP) dated April 8, 1975. Subject – Radioactive waste – FY 1975 final report.

³Radioactivity is measured in units of disintegrations per second. The conventional unit, the Curie, is equivalent to 37 billion disintegrations per second. The Curie, abbreviated as Ci, is too large to express easily so prefixes are used. The most common unit for environmental levels is the picocurie (pCi), 1/1,000,000,000,000 of a Curie. Other units are the nanocurie (nCi or a billionth of a Curie), the microcurie (μCi , a millionth), and a millicurie (mCi, a thousandth).

⁴Environmental monitoring report for calendar year 1973. Burlington AEC Plant.

⁵Letter dated February 6, 1973 from R.L. Holmberg, Plant Manager, Mason & Hanger-Silas Mason Co., Inc. to Contracting Officer Burlington ERDA Plant (IAAP). Subject – Areas contaminated with radioactive material and the Burlington AEC Plant.

during other tests⁶. Soil and water samples were collected and analyzed by the EPA in 1977 with the results listed as non detects⁷ but the data did not indicate which samples were water or soil nor where samples were collected, other than downstream from FS-12. However, the method used for these analyses had high detection limits for the uranium and plutonium. If the detection limit is too high, then environmental samples could be classified as “non-detects” even if material was present at levels that may be considered a public health concern.

Data collected from FS 12 in 1974 during decontamination activities indicated that DU was present in air ranging from 0.08 to 1.96 E-12 microcuries per cubic centimeter ($\mu\text{Ci}/\text{cm}^3$) and during one measurement, the resuspension of DU in air increased to 101.4E-3 $\mu\text{Ci}/\text{cm}^3$. Soil samples collected at ground zero indicated that the distribution of DU was not uniform. For example, the activity was 1.72 nanocuries per gram (nCi/g) at the surface and 2.1 nCi/g at a depth of 6 inches. From 10 to 100 yards from ground zero and in a north direction, the DU activity ranged from 0.83 pCi/g to 216 pCi/g at the surface and from 0.52 pCi/g to 175 pCi/g at a depth of 6 inches. In a south direction, the activity ranged from 0.22 to 355 pCi/g at the surface and 0.87 to 4.8 pCi/g at 6 inches. In the east direction, the values were 1.4 nanocuries per gram (nCi/g) to 2.6 pCi/g at the surface and 0.6 to 23 pCi/g at a depth of 6 inches. To the west, the values ranged from 1.3 nCi/g to 3.6 pCi/g at the surface and 1.4 to 140 pCi/g at a depth of 6 inches⁸.

Following clean up and surveys, the firing site was declared clean as agreed by the former Atomic Energy Commission in a letter dated August 12, 1974. “We are of the opinion that the FS area is decontaminated to the extent required, and does meet the requirements of the agreement.”⁹

The materials collected during the clean up of the FS-12 area were stored in Building 1-11. Estimates of the waste volume at that time suggested that 1200 barrels, each with a 2.5 cubic feet volume, would be needed. The estimated amount of DU at FS-12 ranged from about 5 micrograms per gram ($\mu\text{g}/\text{g}$) soil at 100 yards to 4800 $\mu\text{g}/\text{g}$ at ground zero¹⁰.

Additional information regarding decontamination of FS-12 is found in an August 12, 1974 letter. From July through August, 1221 containers (19 gallon capacity) were shipped to a disposal area (thought to be the now closed Sheffield, Illinois burial ground) for a total of 31,746 cubic

⁶Letter dated September 20, 1974 from R.L. Holmberg, Plant Manager, Mason & Hanger-Silas Mason Co., Inc. to Contracting Officer Burlington AEC Plant (IAAP). Subject – Decontamination of FS-12.

⁷Letter dated May 30, 1978 from Gerald Jacobson EPA to CO, IAAP

⁸Letter dated April 9, 1974 from R.L. Holmberg to contracting officer, Burlington AEC Plant. Subject – recommended decontamination – FS 12.

⁹Letter dated August 12, 1974, from R.L. Holmberg to contracting officer, Burlington AEC Plant. Subject – FS-12 area decontamination.

¹⁰Burlington AEC Plant, Burlington, Iowa. Radioactive waste management site plans. June 1974.

feet. Each container held less than 0.01 Ci of DU. An air sample collected during an Army test at this time indicated a DU concentration of $1.3E-16$ microcuries per cubic meter ($\mu\text{Ci}/\text{m}^3$)¹¹.

Additional documentation from this time period states that no DU had been found in the air beyond the perimeter and that known releases of radioactivity to the soil is estimated at 1.69 Ci based on mass balance equations. Tritium releases at that time were estimated at 0.13 Ci¹². In a 1971 letter, the amount of tritium released was estimated at 6 millicurie (mCi) per year and the amount of DU at 22 kilograms per test. As of March 1, 1971, 57 tests had been conducted. In another document, tritium releases range from 6 mCi in 1969 to as high as 70 mCi in 1967¹³. These values were to be considered estimates for environmental purposes. The amounts of tritium migrating off the site were not known.

Building contamination – In 1974 during a wipe survey, the following bays in Building 1-13 were found to have excess removable contamination but the type of contamination was not identified – Bay A (24 dpm average); Bay B (20 dpm); and Bay E (23 dpm) [no references were given for author of report or name of report – swipe samples were performed on 8/13/74].

Portions of Building 1-11 appear to have elevated levels of removable contamination as well. Swipe surveys were performed on November 5, 1965, February 11, 1968, July 8, 1969, March 16, 1971, and February 1, 1974. Building 1-13, surveyed on November 17, 1966, showed elevated levels of contamination as well.

As early as 1965¹⁴ and in 1969, a health protection survey was performed and in general the plant received a passing grade. Adequate controls were listed as being in place and progress had been made in addressing recommendations made in previous inspections. The survey indicated that there was “excellent control of radioactivity” and air monitors in fixed locations near work areas were run on a continuous basis. The report also stated that liquid radioactive waste was not normally produced. Other radioactive wastes were placed in drums and disposed of at the high explosives disposal site by burning. If the wastes contain plutonium, then it was shipped to the Pantex plant outside Amarillo, Texas¹⁵.

¹¹Letter dated August 12, 1974, from R.L. Holmberg to contracting officer Burlington AEC plant. Subject – FS-12 area decontamination.

¹²Letter dated November 8, 1973 from R.L. Holmberg to contracting officer Burlington AEC plant. No subject given.

¹³Telecommunication dated April 10, 1970 from D.E. Heffelbower to J.F. Burke, Albuquerque office.

¹⁴Letter dated June 10, 1965 from Vincent C. Vespe to E.W. Giles. Subject – Health protection survey.

¹⁵Jerome D. Shaykin (1969). Health protection appraisal report. Burlington AEC Plant – Burlington, Iowa. January 21-23, 1969.

In a 1971 health protection survey, several problems were found with plant radiation contamination monitoring. Areas not covered by the monitoring system included the change room (dress out) and cafeteria areas¹⁶. The report, however, does state that "contamination of work areas by radioactive materials and the spread of the contaminants [sic] has historically not been a problem at the Burlington AEC Plant." The report noted that workers wearing contractor supplied clothing that were potentially contaminated would wear the clothing to the cafeteria.

Iowa Army Ammunition Plant – Radiological Survey

This survey, currently in draft, was performed by the Oak Ridge National Laboratory's Measurement Applications and Development Group in June 2000. The surveyed areas included both indoor and outdoor surveys in and around Line 1, the C Yard, and FS-12.

Based on a realignment of the DOE operations, portions of IAAP are now considered Formerly Utilized Sites Remedial Action Program (FUSRAP) responsibility and future surveys will be performed by the FUSRAP operations that were transferred to the Army Corps of Engineers.

The survey identified areas apparently contaminated with DU in four buildings associated with Line 1 – 1-11, 1-63-6, 1-12, and 1-61. The contamination found appeared to be associated with floor seams and cracks within the buildings. Furthermore, soil contamination and uranium fragments were found at FS-12, indicating that prior efforts of remediation had not been successful. In one particular area, Building 1-63-6, the survey found air filters that contained elevated levels of contamination. The report also states in Table I that the air filters "appeared relatively new."

CONCLUSIONS

In the public health assessment released in 1999 [1], ATSDR concluded the conditions at the Iowa Army Ammunition Plant were of no apparent public health concern. However, considering the presence of radioactive materials and incomplete characterization of these materials, additional environmental characterization of soils and groundwater is needed.

The information supplied to and reviewed by ATSDR indicates that the levels of contamination in and around the on-site grounds of the Iowa Army Ammunition Plant exceed current clean up standards. Depleted uranium health effects are thought to be related to its chemical toxicity as a heavy metal, not to its radiological properties. Compared to natural uranium, DU contains about 50% of the radiation found in natural uranium. However, the information supplied to ATSDR is not complete with respect to potential routes of human exposure or extent of contamination in the

¹⁶Health protection survey Burlington AEC Plant March 23-26, 1971 enclosed in letter dated April 27, 1971, from D.E. Heffelbower, plant manager to contracting officer.

environment. Because there is still insufficient information available to ATSDR, no determination as to the impact on public health can be made at this time.

The draft report from the Oak Ridge National Laboratory stated that there was no immediate threat to health in the areas surveyed. The report did recommend that FS-12 be restricted until a more thorough survey has been completed. This survey should also include those facilities associated with the firing site. The report also recommended that those buildings listed as having areas of contamination be posted as contaminated.

RECOMMENDATIONS

ATSDR makes the following recommendations to the US Army in order for ATSDR to complete its evaluation:

- 1). Fully characterize the environmental extent of radiological contamination on Firing Site 12. This would include soils, any surface waters, and ground water associated with the area.
- 2). Perform a complete survey of those buildings listed in the Oak Ridge National Laboratory survey to include the presence of depleted uranium on building surfaces, evaluate the potential for airborne uranium in Building 1-63-6 in light of the fact the air filters may be recently installed yet are highly contaminated.
- 3). Perform environmental surveys of grounds associated with those buildings previously reported to contain depleted uranium or other indications of elevated radioactivity.
- 4). Confer with ATSDR during these evaluations to determine if additional environmental pathways should be included based on the results obtained during the new rounds of characterization.

Paul A. Charp, Ph.D.
Senior Health Physicist

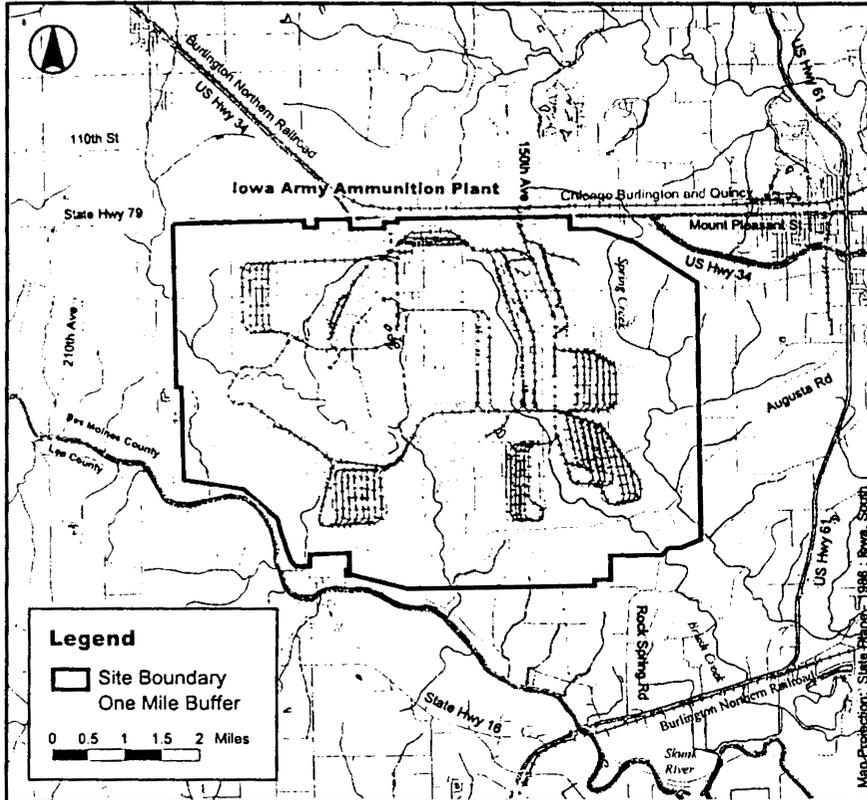
REFERENCES

1. ATSDR (1999). Public Health Assessment of the Iowa Army Ammunition Plant. Agency for Toxic Substances and Disease Registry. Atlanta, Georgia.
2. Department of Energy (2000). Results of the indoor radiological survey of the Iowa Army Ammunition Plant, Middletown, Iowa. ORNL/TM-2000/305.

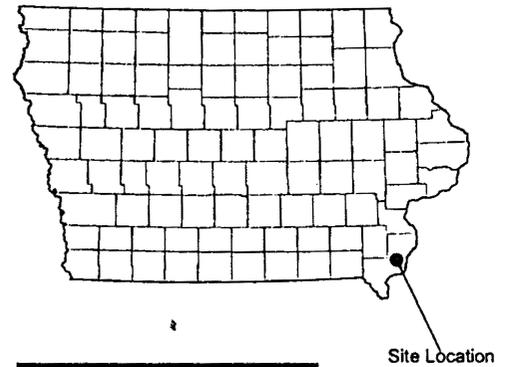
Iowa Army Ammunition Plant

Middletown, Iowa

CERCLIS No. IA7213820445



Base Map Source: 1995 TIGER/Line Files



Des Moines County, Iowa

Demographic Statistics Within One Mile of Site*

Total Population	1727
White	1679
Black	34
American Indian, Eskimo, Aleut	2
Asian or Pacific Islander	8
Other Race	3
Hispanic Origin	15
Children Aged 6 and Younger	167
Adults Aged 65 and Older	280
Females Aged 15 - 44	369
Total Housing Units	769

Demographics Statistics Source: 1990 U.S. Census
*Calculated using an area-proportion spatial analysis technique

