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Author/Originator: R.L. Brownlee | Company: Asst. Sec of the Army | Date: 6/11/2002

Recipient (s): Sen. Harry Reid, Rep. S | Company (-ies): Senate Appropriations S | Version: Final

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Cotner, Sharon R MVS

om: McDaniel, Tomiann HQ02
nt: Monday, June 17, 2002 9:04 AM
To: DellOrco, Lou MVS; Cotner, Sharon R MVS; Shelton, Thomas C MVD
Cc: Wagner, Sharon HQ02; Micik, John HQ02
Subject: Iowa letter to Hill


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Attached is scanned copy of signed letter and enclosure that was hand carried to Reid and Callahan last week. As discussed earlier, we have to give the subcommittees approximately 15 days to respond. Any questions, call.

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DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
CIVIL WORKS
108 ARMY PENTAGON
WASHINGTON DC 20310-0108

11 June 2002

REPLY TO
ATTENTION OF

Honorable Harry Reid
Chairman
Subcommittee on Energy
And Water Development
Committee on Appropriations
United States Senate
Washington, DC 20510-1801

Dear Mr. Chairman:

Enclosed is a copy of the report requested in Senate Report 107-39, dated July 13, 2001, regarding the Iowa Army Ammunition Plant (IAAAP) in Middletown, Iowa. Our report includes Army Corps of Engineers recommendations regarding the utility and justification for a radiological survey of the entire site. The Corps has consulted with the State of Iowa on this matter, and the report includes the views of the State along with our response.

The Corps plans to designate portions of the IAAAP as a Formerly Utilized Sites Remedial Action Program (FUSRAP) site.

Sincerely,

R. L. Brownlee
Acting Assistant Secretary
of the Army (Civil Works)

Enclosure

Mr. Chairman -
I apologize for the delay in transmitting this report. I believe that the report addresses the issues of interest to your sub-committee -
Please let me know if I can be of further assistance -
Very Respectfully,
R. L. Brownlee

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
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108 ARMY PENTAGON
WASHINGTON DC 20310-0108

11 June 2002

REPLY TO
ATTENTION OF

Honorable Sonny Callahan
Chairman
Subcommittee on Energy
And Water Development
Committee on Appropriations
House of Representatives
Washington, DC 20515-6020

Dear Mr. Chairman:

Enclosed is a copy of the report requested in Senate Report 107-39, dated July 13, 2001, regarding the Iowa Army Ammunition Plant (IAAAP) in Middletown, Iowa. Our report includes Army Corps of Engineers recommendations regarding the utility and justification for a radiological survey of the entire site. The Corps has consulted with the State of Iowa on this matter, and the report includes the views of the State along with our response.

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Very Respectfully,
Lee Brownlee

Iowa Army Ammunition Plant
Site-wide Radiological Survey Analysis and Recommendations
June 2002

Executive Summary

The Iowa Army Ammunition Plant (IAAAP) is an active facility where ammunition is loaded, assembled, and packed. All of the IAAAP is currently owned by and under the control of the Army. From 1947 through 1975, the Atomic Energy Commission (AEC) utilized and controlled a portion of the site and operated, according to currently available historical documents, in a number of identifiable areas.

In March 2000, the Corps of Engineers began a preliminary assessment on the areas of the IAAAP site known to have been utilized by the AEC or impacted by AEC operations to determine whether they should be included for cleanup in the Formerly Utilized Sites Remedial Action Program (FUSRAP). The preliminary assessment is tentatively scheduled for release to the public in June 2002. Portions of the remainder of the site are being remediated under the Army's Installation Restoration Program.

Senate Report 107-39 directs the Corps to report, in consultation with the State of Iowa, on its recommendations regarding a radiological survey of the entire site. The enclosed report finds that:

-a flyover survey of the entire site is not warranted, since it would be of only limited value in locating any further areas of possible FUSRAP-related contamination; and

-establishing the existence of any further areas of possible FUSRAP-related contamination through other means, such as walkover/driveover surveys or subsurface sampling, is not warranted.

The Corps will continue to cleanup other areas of the IAAAP under the Army's Installation Restoration Program. If any data developed through those efforts or any other data indicate AEC involvement beyond the current FUSRAP boundaries, the Corps will take appropriate action under the FUSRAP program.

Analysis of Site-wide Radiological Survey

Iowa Army Ammunition Plant
June 2002

1. PURPOSE OF DOCUMENT

The purpose of this document is to respond to Senate Report 107-39 of the Energy and Water Development Appropriation Bill, 2002 (S.1171) that stated:

"The Committee notes that significant radiological contamination has been discovered in the past year at the former nuclear weapons facility at the Iowa Army Ammunition Plant in Middletown, Iowa, and understands that the Corps is currently conducting a Preliminary Assessment of the site for inclusion under FUSRAP. The Committee is disappointed that the Preliminary Assessment is not yet done. The Committee directs the Corps, in consultation with the State of Iowa, to report back to the Committee, by December 1, 2001, on their recommendations regarding a radiological survey of the entire plant site and to take all appropriate actions in accordance with rules and procedures governing the program."

2. BACKGROUND

a. Site Description.

The Iowa Army Ammunition Plant (IAAAP) is a secured, operational, facility located on approximately 19,100 acres in Des Moines County, in southeastern Iowa, approximately six miles west of Burlington, Iowa. All of the IAAAP land is currently owned and under the control of the Army. Throughout its use as an army facility, portions of the site were under the control of other tenant organizations, including the Atomic Energy Commission. IAAAP is an active facility, currently operating to load, assemble, and pack (LAP) ammunition items, including projectiles, mortar rounds, warheads, demolition charges, anti-tank mines, anti-personnel mines, depleted uranium armor piercing munitions, and components of these munitions. The LAP operations use explosive material and lead based initiating compounds. Only a few of the production lines are currently in operation. For these operations the site contractor, Mason & Hanger-Silas Mason Co., Inc. was issued a Nuclear Regulatory Commission Source Material License authorizing possession of depleted uranium in solid form. The plant is generally subdivided into several areas: Lines (1 through 9, and 800), Yards (A through M and O), Firing Sites Areas, Demolition Area, Administration Area, Explosives Disposal Area, and Inert Disposal Area.

b. Historical Atomic Energy Commission Operations at Iowa Army Ammunition Plant (IAAAP).

Historical documents indicate that Atomic Energy Commission (AEC) operations occurred on approximately 1,600 acres. These operations were conducted from 1947 to 1975, at which time, the Army regained control of the affected areas. AEC operations were conducted in a portion of Line 1, the Explosives Disposal Area sites, Yards C, G

and L, the North Burn Pads Landfill and the Firing Site areas, particularly Firing Sites 6 and 12.

The AEC process appears to have been conducted under the following general approach. Materials were brought to the IAAAP by rail to buildings on Line 1 and igloos at Yard C (from where they were later transferred by truck to Line 1 buildings). Storage buildings at Line 1 were used to store explosives and radiological materials until they were moved to the melt buildings via conveyor belts. The melt buildings were used to convert the raw materials to explosive casts known as baratols. The baratol (later replaced by boracitol) then underwent machining to fit around the physics packages. (Physics packages are the radioactive component. Tritium was received in cylinders and added to the physics package.) Following the machining processes, the baratols were subjected to quality assurance x-rays in the laboratory. "Rest houses" were then utilized to allow the baratols to attain thermal equilibrium. The majority of the baratols were then stored in Yards C and G. Three Yard L warehouses were converted to provide additional Line 1 storage space for certain component parts. The remaining baratols were used in assembly of "hydroshots". Hydroshots were comprised of baratols surrounded by a ring of depleted uranium. The hydroshots were taken to the Firing Site for storage and test firing using conventional (non-radioactive) explosives. Firing Site 12 was constructed specifically by the AEC in 1964 to test these hydroshots. Approximately 700 hydroshots were conducted prior to the conclusion of the AEC testing at this site in 1973. Any scrap that was produced during the AEC process was transported to the Explosives Disposal Area burn pads for disposal by burning. An AEC Standard Operating Procedure showed that once uranium contaminated waste was burned, any residual ash possessing excessive alpha contamination was to be collected and shipped to the Pantex, Texas plant for burial.

c. AEC Contaminants.

The AEC radioactive materials known to have been present at the IAAAP Line 1 include depleted uranium (DU), enriched uranium, plutonium, tritium gas, and polonium-210. The physics packages, which contained the radioactive components, were "received in a sealed configuration" and swipe tested for leakage upon receipt. Elemental tritium gas was received in cylinders and added to the physics package. Elemental tritium gas was stored in these cylinders. Elemental tritium is an isotope of relatively low activity that readily disperses into the atmosphere. Reports indicated a release of approximately 0.006 curies / year. Review of historical documents also indicates chemical contamination consisting of explosives and/or other metals such as barium.

d. Investigations, Surveys and Cleanups.

At the conclusion of AEC operations in 1975, a radiological survey of AEC-occupied areas was conducted. Results of the survey, in which the U.S. Environmental Protection Agency (EPA) concurred, were that no property contained residual radioactive contamination above the then applicable standards. Although specific information on these "applicable standards" is currently unknown, references to EPA test results of less than 15 picocuries / gram was found in historical documents.

Prior to the Army taking control of the site in 1975, the AEC conducted a cleanup of Firing Site 12. Contaminated materials were taken to a disposal facility in Illinois. From 1975 through November 2000, the Army conducted conventional weapons testing (which did not involve depleted uranium) at Firing Site 12. No cleanup activities at Firing Site 12 have occurred since cessation of testing by the Army at the site in November 2000.

In 1990, the IAAAP facility was placed on the National Priorities List. Remedial investigation and removal activities were initiated by the U.S. Army Operations Support Command under the Environmental Restoration Account Installation Restoration Program (ERA) to remediate Army-generated contamination (i.e. metals, explosives, etc.). Since many of these areas were used by the Army after AEC ceased operation, several of the AEC-impacted areas were cleaned up using ERA funding. One such area was the Explosives Disposal Area (EDA). The EDA was remediated in 1997 by removing 14,200 cubic yards of material. This material was placed in an on-site Inert Landfill. Radioactive nuclides were not a contaminant of concern for the EDA cleanup. Therefore, the Corps under FUSRAP will need to examine the area (including the Inert Landfill) for any potential radionuclide contamination.

In March 2000, the Department of Energy requested that the Corps of Engineers consider the IAAAP for designation and inclusion under the Formerly Utilized Sites Remedial Action Program (FUSRAP). Subsequently, the St. Louis District Corps of Engineers began development of a Preliminary Assessment. As part of this effort, St. Louis District began conducting extensive historical research. Personnel visited multiple archives, contacted Department of Energy for release of classified documents and interviewed former AEC workers. The Preliminary Assessment is tentatively scheduled for release to the public in June 2002.

In June 2000, as a result of considerable public interest, the Oak Ridge National Laboratory completed an Indoor Radiological Survey of Line 1 and Yard C buildings for the Department of Energy (DOE). Depleted uranium was detected in four buildings. One building (Building 1-11) had depleted uranium contamination, which likely was the result of AEC activities. Another building (Building 1-12) had depleted uranium contamination of undetermined origin (i.e. either AEC or Army) and the remaining two buildings (Buildings 1-63-6 and 1-61) had depleted uranium contamination attributable to recent Army activities. (Of these two Army-contaminated buildings, the depleted uranium contamination in one of the buildings was located in a pan, which was removed immediately following the survey.) In addition, in April 2001, the St. Louis District conducted a walkover survey of Firing Sites 6 and 12. These comprehensive radiological surveys detected chunks of depleted uranium and depleted uranium in surface and subsurface soils at Firing Sites 6 and 12.

Prior to release of this area to the Army, the AEC conducted closeout surveys of the igloos in Yard Area C (which were used to store raw materials) and found no contamination above background levels. (The exact date of this effort is unknown.) In June 2000, the DOE did perform limited radiological surveys of this area and determined

the area contained only very low levels of residual radioactivity, which would not require remediation.

3. AVAILABLE AUTHORITIES

There are two authorities available for cleanup actions at the IAAAP. They are (1) the Formerly Utilized Sites Remedial Action Program (FUSRAP) which is funded to clean up contamination resulting from the Nation's early efforts to develop atomic weapons, and (2) the Environmental Restoration Account Installation Restoration Program (ERA), which is funded to cleanup Department of Defense hazardous waste sites / contaminated land to an acceptable level of risk on Army installations. Both programs follow the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) process and utilize the Multi-Agency Radiation Site Survey and Investigation Manual for investigation of radionuclides.

4. CERCLA PROCESS

a. Process Steps

The National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR Part 300), commonly known as the NCP, implements CERCLA. The NCP sets out a deliberate and structured program for responding to releases, and threatened releases, of hazardous substances, pollutants, and contaminants at a site. This program begins with a Preliminary Assessment and proceeds through a Site Investigation and/or Remedial Investigation, and Feasibility Study, ultimately ending in remediation of the contaminated portions of a site. Each subsequent step of the program is more complex and comprehensive, building on the preceding step. The first step, the Preliminary Assessment, is a limited-scope, relatively quick, low-cost compilation of readily available information regarding a site and its surroundings. The primary objective of the Preliminary Assessment is to collect and review information concerning operations and current conditions at a site sufficient to determine if there has been a release or there is threat of a release of a hazardous substance. The collection and review of information during the Preliminary Assessment consists of file searches to obtain historical, chemical, and physical information for a site; location and evaluation of available current and historical aerial photographs; performance of an onsite reconnaissance, as appropriate (NCP, 40 CFR 300.420); interviews with current and former site operators and workers; evaluation of potential pathways for migration; and an analysis of post release site operations to determine if inadvertent spread of contamination could have occurred. The Preliminary Assessment also distinguishes between those portions of a site that pose little or no threat to human health and the environment and those portions that require further investigation. File searches and searches for aerial photographs are generally conducted on files held by the US Environmental Protection Agency regional office, state environmental agencies, state geological survey, US Geological Survey, local university libraries, local agencies, and onsite files. Site reconnaissance activities may include an onsite visit, an offsite perimeter survey, a site environs survey, and the collection of information from local authorities. During the onsite visit, the focus is on identifying and characterizing potential contaminant sources. Sampling is generally not conducted during a Preliminary Assessment. (*Guidance for Performing Preliminary Assessments Under CERCLA*, September 1991, EPA/540/G-91/013, Publication 9345.0-01A).

If the Preliminary Assessment recommends further investigation, a Site Inspection may be done before performing a Remedial Investigation. Performing a Site Inspection is optional and is done on a site-specific basis [40 CFR 300.420(c)(1)]. During the Site Inspection, waste and environmental samples are typically collected to determine the substances present at a site and whether they are being released to the environment. If there is such a release, then the next step is conducting a Remedial Investigation.

The Remedial Investigation is a comprehensive field investigation that characterizes the nature and extent of contamination at a site and determines the potential risks posed by the site to human health and the environment. The Remedial Investigation supports the development, evaluation, and selection of the appropriate response alternative in the Feasibility Study. Alternatives for final remedial action are developed and evaluated in the Feasibility Study. A recommended plan is also identified. The recommended plan is formally presented to the public for review in the Proposed Plan document. After consideration of public comments, the final alternative is selected and presented in a Record of Decision.

Once the Record of Decision is completed, a remedial design (which consists of the engineering plan to address the contamination) is developed and remedial action (which implements the selected remedy) is conducted. Additional monitoring or operations activities may occur after construction is complete – depending upon the nature of the selected remedy.

b. Screening and Remedial Goals.
As can be seen in the preceding paragraph, the CERCLA planning process is an iterative process in which one moves from generalized assumptions regarding acceptable levels of contaminants (referred to as screening levels in the Site Inspection) to site-specific remedial action goals and cleanup criteria in the Record of Decision. While these numbers may change, it is important to note that the commonality lies in the fact that whether a screening level or a remedial goal, the value must be selected prior to initiation of field work. Such field work includes the sampling and surveying activities associated with implementation of Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM).

5. MARSSIM PROCESS

The Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) first published in 1997 as a consensus technical position of the EPA, NRC, DOE and DoD, provides a detailed, consistent approach for planning, implementing, and assessing/evaluating environmental and facility radiological surveys to demonstrate compliance with a dose- or risk-based regulation, while encouraging an effective use of resources. In other words, MARSSIM defines the process to release areas for use based on compliance with dose- or risk-based regulatory criteria.

There are six principal steps in the Radiation Site Survey Investigation Process (RSSI). They are: Site Identification, Historical Site Assessment, Scoping Survey, Characterization Survey, Remedial Action Support Survey and Final Status Survey. Of relevance to this discussion is the Historical Site Assessment for it is within this step that a designation of "impacted" and "non-impacted" is given to various areas. This designation forms the basis for determining the overall geographic coverage of all subsequent surveys and sampling. (For IAAAP, it is the point at which it is decided whether to investigate all 19,000 acres of the IAAAP or some fraction thereof.)

During the Historical Site Assessment (HSA) step (which is comparable to the Preliminary Assessment Phase previously discussed and which is combined with the PA phase for IAAAP), historical records are gathered, interviews are performed and a site reconnaissance is completed. Based upon this information, an initial classification of the site areas as impacted or non-impacted is completed.

Per MARSSIM, "Information gathered during the HSA should be used to provide an initial classification of the site areas as 'impacted' or 'non-impacted.' Impacted areas have a potential for radioactive contamination." Typically this includes areas where 1) radioactive materials were used and stored; 2) records indicate spills, discharges, or other unusual occurrences that could result in the spread of contamination; and 3) radioactive materials were buried or disposed. Areas immediately surrounding or adjacent to these locations are included in this classification because of the potential for inadvertent spread of contamination.

Non-impacted areas - identified through site history or previous survey information - are those areas where there is no reasonable probability for residual radioactive contamination. Non-impacted areas do not receive any level of survey coverage. The reasons for classifying an area as non-impacted are maintained as a written record. It should be noted that based on accumulated survey data, an impacted area's classification may change as the RSSI process progresses.

Once the delineation process is complete and an impacted area has been found to pose a threat, the investigation proceeds to the survey steps of the Remedial Site Survey Investigation (i.e. scoping, characterization, remedial action support and final status surveys). The process of "planning, implementing and assessing/evaluating" surveys prior to making a decision (to release) is called the Data Life Cycle. It was developed to ensure that survey results are of sufficient quality and quantity to support technically defensible decisions with an acceptable level of confidence. There are four phases of the Data Life Cycle: Planning Phase, Implementation Phase, Assessment Phase and Decision Making Phase. Of these four phases, the Planning Phase is most relevant to the purpose of this document (i.e. addressing the need for a site-wide survey.)

During the Planning Phase, the survey design is developed and documented using the Data Quality Objectives (DQO) Process. The DQOs for the project are established and preliminary surveys (e.g., scoping, characterization) are performed to provide information necessary to design the final status survey for compliance demonstration.

The DQOs for the project are re-evaluated for each of the preliminary surveys. These preliminary surveys may be designed to demonstrate compliance with the release criterion as one of the survey objectives, thus, serving the purpose of a final status survey. In any event, the Planning Phase produces a final status survey design that is used for demonstrating compliance with the release criterion.

The final status survey considers the results of the historical assessment and any other previously accomplished surveys and sampling events. The primary steps in a final status survey are: 1) identification of contaminants, 2) establishment of release criteria (Derived Contaminant Guideline Levels, DCGL), 3) classification of impacted areas by contamination potential, 4) subdivision into survey units, 5) determination of number of data points, 6) instrument selection based upon required detection/scan sensitivity, and 7) development of an integrated survey design.

Identification of contaminants and establishment of release criteria must be performed early in this process to avoid repetitive sampling efforts that would waste resources. This information is typically developed as part of the CERCLA process (Reference paragraph 4.) It is key to the development of the remaining five steps in the final status survey.

The identification of contaminants and release criteria influences classification of areas because impacted areas are classified as Class 1, 2 or 3 based upon comparison of suspected contamination levels to levels required for release of the area (DCGL). Class 1 areas are impacted areas that have or had prior to remediation, a potential for radioactive contamination above the release criteria. Class 2 areas are those impacted areas that have or had prior to remediation, a potential for radioactive contamination but are not expected to exceed release criteria. Measurement data for these areas must provide a high degree of confidence that no individual measurement exceeds release criteria to classify an area as Class 2 versus Class 1. Class 3 areas are those impacted areas that are not expected to contain residual radioactivity or are expected to contain levels of radioactivity at a small fraction of the release criteria based on site history and previous radiological surveys. The classification of an area dictates the survey/sampling requirements.

The identification of contaminants and release criteria also influences instrument selection and the number of data points. The number of data points per survey unit depends partially on scan sensitivity and acceptable decision errors (i.e., the required degree of confidence that survey units achieve criteria). Scan sensitivity needs to be as far below the release criteria (DCGL) as possible. MARSSIM states that for direct measurements and sample analyses, minimum detectable concentrations (MDC) less than 10% of the DCGL are preferable while up to 50% of the DCGL are acceptable. The scan MDC is the product of the DCGL and the area factor. Failure to achieve scan MDC results in increased soil sampling and reduced confidence in results.

The integrated survey design for soil combines scanning surveys with sampling. The level of survey effort is determined by the potential for contamination as indicated by the survey unit classification. Class 3 survey units receive judgmental scanning and randomly located measurements. Class 2 survey units receive scanning over a portion of

the survey unit based on the potential for contamination combined with sampling performed on a systematic grid. Class 1 survey units receive scanning over 100% of the survey unit combined with sampling performed on a systematic grid.

Upon completion of the Planning Phase, the Implementation Phase begins and the final status survey is carried out accordingly.

Upon completion of the Implementation Phase, the Assessment Phase begins. Assessment of data to verify that a given area is below DCGL, includes a review of the graphical representation of the radionuclide distribution, appropriate statistical testing to demonstrate for a uniformly distributed radionuclide, and elevated measurement comparison to demonstrate compliance for small areas of elevated activity. The data are validated to ensure that the objectives were met, or to allow a determination that the objectives require modification. If the data has met all of the requirements, it is then used to make a determination as to the final status of the area. This is the Decision Phase. Inability to detect small areas of contamination would preclude the ability to verify that areas achieve criteria.

6. SURVEY OPTIONS FOR RADIONUCLIDES

Final Status Surveys (FSS) consist of soil sampling and scan surveys using field radiation detection equipment. As stated earlier, the number of soil samples required depends directly on the applicable scan sensitivity.

The options available for scan surveys include: 1) a traditional walkover survey using a NaI 2"x2" scintillation detector, 2) an aerial radiometric survey using NaI scintillators in various configurations, and 3) a drive-over survey using NaI scintillators in various configurations. If the contaminant of concern at the IAAAP is DU, we are able to compare the various survey options on their minimum detection capability. Using vendor supplied data and data from the USACE *IAAAP Scoping Survey Plan for Firing Site 6 and 12,* the following is found. At a confidence level of 95%, a walkover survey can detect a DU fragment weighing 0.042 pounds lying on the ground surface and DU at a uniform concentration of 56 pCi/g. The drive over survey vendor provided no point source data for comparison, but the uniform concentration was 14 pCi/g. The DOE reported that the minimum detectable activity of the aerial radiometric survey was 84 pounds for DU on the ground surface and 40 pCi/g for a uniform distribution.

Another way to illustrate the above data, a standard brick used in home construction occupies approximately 1000 cm^3. It measures 8.89 cm by 19.69 cm by 5.72 cm and weighs approximately 3.5 lbs. The smallest DU fragment that the walkover survey could detect with a 95% confidence would be 1 cm^3 at a distance of 0.6 meters. The smallest fragment that the aerial radiometric survey would detect with similar confidence would be about 2,200 cm^3 at a distance of 50 meters. To put this in perspective, the aerial radiometric survey would be able to detect a DU fragment the size of two bricks laying on the surface of the ground in an open field. If we were to bury this same DU fragment

under 6" of soil, the shielding provided by the soil would reduce the effectiveness of the instruments to 30%. That is, the minimum size DU fragment that may be detected is now on the order of 300 pounds.

Other variables to be accounted for which will impact the available scanning options, include, speed of traverse of the area, distance from ground, background radiation fluctuations, and spacing between measurement lines. Each of these can greatly affect the measurements. The aerial and drive-over surveys are also limited by accessibility of vehicles to the area. The source-to-detector distance is also limited by accessibility (e.g. aerial detectors are constrained to areas above the tree canopy).

The cost of the drive over and aerial surveys is highly dependent on the final design of a site specific survey. The cost of a flyover survey has been estimated to be approximately $500,000 for the entire 19,000-acre site. If the area to be covered were limited to the area potentially impacted by AEC operations, the cost would be approximately $134,000. On top of this cost, it would be necessary to include additional monies for walkover/drive-over of areas unable to be surveyed from the air and those areas detected during the flyover that require further investigation.

7. IOWA DEPARTMENT OF PUBLIC HEALTH CONCERNS

The following paragraphs were received from the Iowa Department of Public Health as a statement of their concerns. To ensure that there is no misunderstanding, their statement is included verbatim.

"Several discussions and meetings with the Iowa Department of Public Health have occurred regarding the investigation of the IAAAP. The most recent occurred on 17 October 2001 when representatives of the Iowa Department of Public Health, IAAAP, Army Operations Support Command and the St. Louis District met in Burlington, Iowa to discuss the flyover and site survey issues. Several concerns were posed by the Iowa Department of Public Health (IDPH).

"The State's major concern is that, with the exception of Fire Site 12, there currently is no data, anecdotal or empirical, from which anyone can generate a statement with any degree of statistical certainty about the existence or non-existence of residual radioactive contamination at IAAAP. The methodology contained in the "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)", which is described elsewhere in this document, will generate the required data. In April 2000 all stakeholders, including the signatories of the Federal Facilities Agreement, chose to follow this methodology. MARSSIM requires the conduct of a scoping survey to verify that the historical record has identified all "impacted" areas. For anyone, including the State of Iowa, to make a statement about radioactive environmental contamination at IAAAP, the boundaries of this survey must be the entire site, not just isolated portions of it. The issue has been and continues to be the conduct of a site-wide survey not the conduct of a flyover.

"For the federal agencies to take action there must be an indication of an actual or potential release of radioactivity to the environment. This means that specific events must have occurred to release radioactivity to the environment or the existence of a waste stream, from industrial operations, containing unsealed radioactive materials which may have been released to the environment. In researching the historical record, the State has discovered a number of unresolved issues that indicate the possibility of these releases. They are as follows:

a. A shipping summary for FY 1975 indicated that 0.031 Ci of Cesium-137, 0.008 Ci of Cobalt-60 and 4.0 Ci of Plutonium-239 was sent to Texas for disposal. The shipments consisted of contaminated items – clothing and tools. There is no documentation that these wastes ever arrived. Additionally, the existence of contaminated items indicates that the radioactive materials were in an unsealed form.

b. Interviews of former employees at the IAAAP indicated that large dust clouds were visible from off-site shortly after explosions were heard or felt. It is possible that these dust clouds carried particles of DU.

c. An informal discussion indicated a concern with respect to a criticality incident. An interview with a former site employee described a blue flash one night. In addition the University of Iowa College Public Health Department interviewed former security guards who said they saw or new of the "blue flash" criticality incident which is believed to have occurred in late 1972 or early 1973.

d. "Ground zero" is mentioned in prior correspondence. This is further evidence of a criticality incident.

"The inability to resolve these and other items plus the confidential nature of AEC operations at the site and the resultant lack of a complete release of all documents prevents the complete assessment of all historical operations at the site. Therefore, no areas can be ruled out as "non-impacted" and all 19,000 (M/L) acres must be examined.

"The specific topic of this report is the conduct of a flyover. Since the information required of a scoping survey is to verify the historical record and not to characterize the extent of contamination, the State's position is that a flyover is the most economical way of conducting this survey. The State has investigated the technical efficacy of using a flyover and found that it is sufficient to generate the required data. This research included an assessment of detecting not only depleted uranium, but also other isotopes including plutonium, cobalt and cesium.

"Other methods are available to conduct this survey, but the State believes that a flyover should be used to perform a site-wide survey of the IAAAP."

8. CORPS RESPONSE TO IOWA DEPARTMENT OF PUBLIC HEALTH CONCERNS

The St. Louis District's response to the Iowa Department of Public Health's concerns is as follows:

a. Use of MARSSIM to Generate Data.

The State indicates that there is "no data, anecdotal or empirical" (except at Firing Site 12) from which one can conclude the existence or non-existence of residual radioactive contamination. This is not correct. In addition to the data that the Corps has collected at Firing Site 12, some survey data was collected by the Corps at Firing Site 6 and by the Department of Energy at Line 1 and Yard Area C. This data is sufficient to include these areas within the FUSRAP site designation. In addition, while not conclusively confirming the existence of radioactive contamination, (which is generally accomplished during a properly planned survey or sampling event), a review of historical information, examination of migration pathways and interviews of former AEC workers do indicate AEC operations and potential impacts on several additional areas. These areas (Yard L and others) are included in the FUSRAP site designation. While the data collected to date are not statistically conclusive in accordance with MARSSIM, all future activities at IAAP will be consistent with the MARSSIM methodology. In accordance with MARSSIM, "if the data collected during the Historical Site Assessment indicate that a site or area is impacted, a scoping survey could be performed." (Reference MARSSIM – Revision 1, dated August 2000, Paragraph 5.2.1.) The objective of a scoping survey is to augment the Historical Site Assessment "*for sites with potential residual contamination*," not to verify the information gathered during the Historical Site Assessment step. The Corps does intend to perform scoping surveys for the sites with potential residual contamination that have been identified during the Historical Site Assessment step.

b. Shipping of Cesium-137, Cobalt-60 and Plutonium-239 in 1975.

If the cesium and cobalt were still present at the IAAAP and were buried, the original quantities of the radionuclides would have decayed to a fraction of the original amounts. With 6" of soil covering, the 4 mCi of cesium-137 and the 0.1 mCi of cobalt-60 (as identified in historical document) would not be detectable with an aerial radiometric survey. In fact, the cesium-137 would not be detectable from the air if it were laying on the surface of the ground. The same is true for the 4 Ci of plutonium-239. Therefore, the use of a flyover to find such contaminants would not be effective.

In addition, Nuclear Criticality Surveys consisted of inspection of procedures and records with emphasis on criticality and transportation of radioactive materials. These surveys were conducted annually at the IAAAP during the period of AEC operation. These survey reports noted that only non-safety related discrepancies existed with respect to transportation and criticality. We have no basis for concluding that any shipment was lost. This is particularly relevant to the plutonium which is tracked meticulously from cradle to grave. It is unlikely that a loss of plutonium would not have been reported. Further, based upon examination of the levels of radioactivity for each radionuclide and the volume (i.e. cubic feet) identified in the historical shipping summary, it appears that the previously mentioned cesium, cobalt, and plutonium were check sources (i.e. sources

used to assure proper instrument response/calibration). Based on the nature of AEC operations at IAAAP, it would be common operating procedure to use such sources as calibration tools for the type of equipment used at IAAAP. This conclusion is consistent with the timeframe for shipment (i.e. when AEC is shutting down the facility). The Corps continues to research this aspect of the AEC operation.

c. Dust Clouds.
Per discussions with Iowa Department of Public Health personnel, preliminary atmospheric dispersion modeling has been used to bound the area that may have been contaminated due to clouds formed during the hydroshot testing. During the testing period, up to 4.E+6 grams (1.5 Ci) of depleted uranium were not accounted for. If twenty percent of this quantity of depleted uranium (8.E+5 grams or 0.3 Ci) was aerosolized and dispersed, the amount of depleted uranium in the resulting detonation "cloud" was calculated to be 2.13E-11 microcuries/ml in the detonation area. It should be noted that AEC air testing at the IAAAP site boundary showed no detectable activity. For a predominant wind direction of 29° to 30°, modeling calculations indicate that the ground deposition concentration downwind from the Firing Site would be less than 1 pCi/g. This concentration would not pose a threat to human health and is below current cleanup goals for sites contaminated with uranium.

d. Criticality Incident.
No historical records have been located that support occurrence of a "blue flash" (which would indicate a criticality incident at the IAAAP). (A criticality incident occurs when the amount of fissionable material necessary to sustain a nuclear reaction inadvertently comes together and sets off a chain reaction.) The Department of Energy (DOE) annually conducted Nuclear Criticality Surveys of the AEC areas of the IAAAP. There were a number of minor discrepancies noted in the reviewed records, but no report of a criticality event. An event of such a magnitude definitely should have been reported in such annual surveys. There is no reason to believe that AEC/DOE ignored such an event at IAAAP. In addition, radiological surveys performed by DOE in 2000 of Line 1 buildings failed to detect elevated radiation indicative of a criticality incident. (Such an incident would have required disposal of the resultant fission products from weapon materials and would have contaminated the concrete and other construction materials in the buildings.)

e. "Ground Zero" Reference. The term "ground zero" was frequently used in reference to the Firing Sites. Ground zero at the Firing Sites is the location where the packages are placed prior to detonation. The review of the historical documents turned up no other references to a "ground zero" other than that referred to concerning the Firing Sites.

f. Confidential Nature of AEC Operations.
The State has indicated concern regarding the "confidential nature of AEC operations at the site and the resultant lack of a complete release of all documents." The Corps of Engineers initiated with DOE personnel a focused declassification of historical documents in early 2001. The Corps of Engineers has reviewed the documents that DOE has redacted and released. As a result of this process, the Corps has incorporated some

additional information into its Preliminary Assessment of the IAAAP. (Copies of the declassified documents have been furnished to the IAAAP, U.S. Environmental Protection Agency, and the State of Iowa.) The Corps is committed to completing a fully comprehensive review of historical activities and is working with DOE for the release of the few remaining applicable documents. The flexibility to include any further "new" data on potentially impacted areas is an integral part of the CERCLA process.

g. Use of Flyover Survey.
The flyover survey does not appear appropriate for the IAAAP. The limited amount of data gained from an aerial radiometric survey is not likely to be useful in identifying further areas for cleanup under the FUSRAP program. This conclusion is based on the following technical factors:

1) A flyover survey would not likely detect the presence of Depleted Uranium fragments unless they were sizeable and located on the ground surface.

2) Several areas of the plant currently use and/or store Depleted Uranium for the Army. This "Army" Depleted Uranium would "mask" adjacent contamination thus, flyover surveys will be useless for delineation of "non-Army" Depleted Uranium in these areas.

3) Flyover surveys are unable to reach some areas due to manmade or natural obstructions such as water, trees, or power lines.

4) A radiological flyover survey would fail to detect non-radiological contaminants.

h. Examination of All 19,000 Acres.
The St. Louis District has performed the historical assessment and Preliminary Assessment in accordance with the CERCLA/NCP and MARSSIM processes. The District has used historical documents, pursued release of previously classified documents by DOE, interviewed former AEC workers, examined migration pathways and researched post AEC activities performed by IAAAP tenants (including Army). This effort is evidence of the District's commitment to identify all AEC contamination at IAAAP and perform a thorough remediation of the site. The District follows standard industry practices with regard to identification of "impacted/non-impacted" areas and, at this time, there is no documented basis – not even in interviews – to expand the scope of the FUSRAP investigation. However, the St. Louis District is willing to consider any recently identified documents furnished by the Iowa Department of Public Health that would indicate AEC operations on areas of the IAAAP other than those already identified. In addition, the St. Louis District will continue to incorporate the final previously classified documents into the FUSRAP investigations/remediation.

9. CORPS OF ENGINEERS RECOMMENDATIONS AND SUMMARY

a. The flyover survey technique is not justified for use at the IAAAP. This technique is not well suited to answer the specific questions about contamination at the IAAAP, and its use is not recommended.

b. The Corps is not proposing walkover, driveover or flyover surveys, or subsurface sampling at portions of the IAAAP beyond the boundaries of the areas already identified as impacted by AEC operations. If any new data or information indicates AEC involvement beyond the currently identified impacted areas, the Corps will take appropriate action under the FUSRAP program.

c. The Corps of Engineers shares the State's commitment to perform a thorough and complete investigation of AEC activities at IAAAP, and of the impacts of those actions, and to pursue remedial action where appropriate. The Corps will implement the following actions:

(1) Continue to work with DOE to complete declassification of documents and to incorporate any "new" information into FUSRAP investigations and activities.

(2) Continue to research AEC operations to gather additional information regarding the FY75 shipment and any possible criticality event.

(3) Follow the MARSSIM approach for planning, implementing, and evaluating environmental radiological surveys.

(4) Continue to work with the State, IAAAP, the University of Iowa and other interested stakeholders regarding any evidence of additional AEC activities and potential contamination.

(5) In the on-going Installation Restoration Program at the IAAAP, incorporate screening level radioactive surveying as a quality control measure.

(6) Adjust designation of areas or make adjustments in the design of surveys as appropriate, based on the available data.

d. The Corps of Engineers will consider any further specific evidence of AEC activities or impacts identified by the Department of Army, the Iowa Department of Public Health, other state or federal agencies, or other stakeholders. If warranted, the Corps will expand the area to be cleaned up in the FUSRAP program.